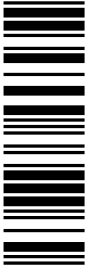


EDSVF9333V
13347725



System Manual

9300 vector 0.37 ... 90 kW



EVF9321-xV ... EVF9333-xV

Frequency inverter

Lenze

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1 Preface

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1.1 How to use this System Manual

1.1.1 Information provided by the System Manual

Target group

This System Manual is intended for all persons who design, install, commission, and adjust the 9300 vector frequency inverter.

Together with the System Manual (extension), document number EDSV9383V-EXT and the catalog it forms the basis for project planning for the manufacturer of plants and machinery.

Contents

The System Manual is the basis for the description of the 9300 vector frequency inverter. Together with the System Manual (extension), document number EDSVF9383V-EXT, a complete System Manual is available:

- The features and functions are described in detail.
- Examples describe how to set the parameters for typical applications.
- In case of doubt, the Operating Instructions delivered together with the 9300 vector frequency inverter always apply.

Contents of the System Manual	Contents of the System Manual (extension)
1 Preface	1 Preface
2 Safety	–
3 Technical data	–
4 Installing the standard device	–
5 Wiring the standard device	–
6 Commissioning	–
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11 Safety engineering	–
–	3 Application examples
–	4 Signal flow diagrams
12 Accessories	–
13 Appendix	5 Appendix

1 Preface and general information

1.1 How to use this System Manual

1.1.2 Document history

How to find information

Use the System Manual as the basis. It contains references to the corresponding chapters in the System Manual Supplement:

- Each chapter is a complete unit and comprehensively informs about a subject.
- The Table of Contents and Index help you to find all information about a certain topic.
- Descriptions and data of other Lenze products (Drive PLC, Lenze geared motors, Lenze motors, ...) can be found in the corresponding catalogs, Operating Instructions and manuals. The required documentation can be ordered at your Lenze sales partner or downloaded as PDF file from the Internet.



Tip!

Information and auxiliary devices related to the Lenze products can be found in the download area at

<http://www.Lenze.com>

1.1.2 Document history

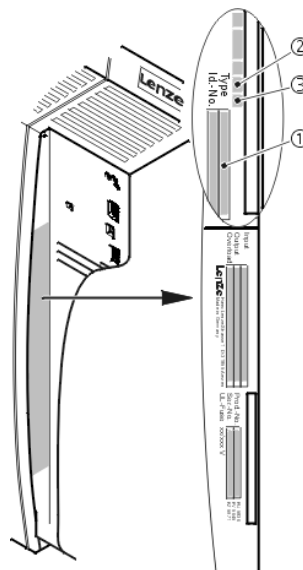
What is new / what has changed?

Material number	Version			Description
13347725	6.2	04/2012	TD23	Error corrections
13347725	6.0	09/2010	TD23	Revision for software version 8.0. Error corrections
13189122	3.0	06/2005	TD23	The documentation is divided into 2 parts: System Manual and System Manual (extension). Complete revision for software version 7.0.
00410591	2.0	05/1999	-	Documentation for hardware version 3.x and software version 2.x.

1.1.3 Products to which the System Manual applies

This documentation applies to 9300 frequency inverters as of version:

	EVF	93xx	① —	E	V	Vxxx	② 6x	③ 8x	Nameplate
Product range	EVF	Frequency inverter							
Type no. / power									
	400 V	480 V							
9321	0.37 kW	0.37 kW							
9322	0.75 kW	0.75 kW							
9323	1.5 kW	1.5 kW							
9324	3.0 kW	3.0 kW							
9325	5.5 kW	5.5 kW							
9326	11 kW	11 kW							
9327	15 kW	18.5 kW							
9328	22 kW	30 kW							
9329	30 kW	37 kW							
9330	45 kW	55 kW							
9331	55 kW	75 kW							
9332	75 kW	90 kW							
9333	90 kW	110 kW							
Design									
E	Built-in unit (standard mounting)								
C	Cold plate technique								
Version									
V	Vector-controlled frequency inverter								
Variant									
—	Standard								
V003	Cold plate								
V004	Safe standstill								
V024	Safe standstill and IT system								
V100	IT system								
Hardware version									
Software version									



1.2 Legal regulations

Labelling	Lenze controllers are unambiguously designated by the contents of the nameplate.
Manufacturer	Lenze Automation GmbH, Hans-Lenze-Str. 1, D-31855 Aersen, Germany
CE conformity	Conforms to the EC Low-Voltage Directive
Application as directed	9300 vector frequency inverter and accessories ▶ must only be operated under the conditions prescribed in this System Manual. ▶ are components – for open and closed loop control of variable speed drives with asynchronous standard motor or asynchronous servo motors – for installation in a machine – for assembly with other components to form a machine. ▶ comply with the requirements of the Low-Voltage Directive. ▶ are not machines for the purpose of the Machinery Directive. ▶ are not to be used as domestic appliances, but only for industrial purposes. Drives with 9300 vector frequency inverters ▶ comply with the EMC Directive if they are installed according to the guidelines of CE-typical drive systems. ▶ can be used – for operation on public and non-public mains – for operation in industrial premises and residential areas. ▶ The user is responsible for the compliance of his application with the EC directives. Any other use shall be deemed as inappropriate!

Liability

The information, data, and notes in this System Manual met the state of the art at the time of printing. Claims on modifications referring to controllers and components which have already been supplied cannot be derived from the information, illustrations, and descriptions.

The specifications, processes, and circuitry described in this System Manual are for guidance only and must be adapted to your own specific application. Lenze does not take responsibility for the suitability of the process and circuit proposals.

The specifications in this System Manual describe the product features without guaranteeing them.

Lenze does not accept any liability for damage and operating interference caused by:

- ▶ Disregarding the System Manual
- ▶ Unauthorised modifications to the controller
- ▶ Operating errors
- ▶ Improper working on and with the controller

Warranty

See terms of sales and delivery of the Lenze Automation GmbH.

Warranty claims must be made to Lenze immediately after detecting the deficiency or fault.

The warranty is void in all cases where liability claims cannot be made.

1.3 Conventions used

This documentation uses the following conventions to distinguish between different types of information:

Type of information	Identification	Examples/notes
Spelling of numbers		
Decimal separator	language-dependent	In each case, the signs typical for the target language are used as decimal separators. For example: 1234.56 or 1234,56
Warnings		
UL warnings		Are only given in English.
UR warnings		
Text		
Program name	» «	PC software For example: »Engineer«, »Global Drive Control« (GDC)
Icons		
Page reference		Reference to another page with additional information For instance:  16 = see page 16

1.4 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:



Danger!

(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
Danger!	Danger of personal injury through dangerous electrical voltage. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
Danger!	Danger of personal injury through a general source of danger. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
Stop!	Danger of property damage. Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
Note!	Important note to ensure troublefree operation
Tip!	Useful tip for simple handling
Reference to another documentation	

Special safety instructions and application notes for UL and UR

Pictograph and signal word	Meaning
Warnings!	Safety or application note for the operation of a UL-approved device in UL-approved systems. Possibly the drive system is not operated in compliance with UL if the corresponding measures are not taken.
Warnings!	Safety or application note for the operation of a UR-approved device in UL-approved systems. Possibly the drive system is not operated in compliance with UL if the corresponding measures are not taken.

2 Safety instructions

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2.1 General safety information

Scope

The following general safety instructions apply to all Lenze drive and automation components.

The product-specific safety and application notes given in this documentation must be observed!

Note for UL-approved systems: UL warnings are notes which only apply to UL systems. The documentation contains specific notes with regard to UL.

For your own safety



Danger!

Disregarding the following basic safety measures may lead to severe personal injury and damage to material assets!

- ▶ Lenze drive and automation components ...
 - ... must only be used for the intended purpose.
 - ... must never be operated if damaged.
 - ... must never be subjected to technical modifications.
 - ... must never be operated unless completely assembled.
 - ... must never be operated without the covers/guards.
 - ... can - depending on their degree of protection - have live, movable or rotating parts during or after operation. Surfaces can be hot.
- ▶ All specifications of the corresponding enclosed documentation must be observed.

This is vital for a safe and trouble-free operation and for achieving the specified product features.

The procedural notes and circuit details provided in this document are proposals which the user must check for suitability for his application. The manufacturer does not accept any liability for the suitability of the specified procedures and circuit proposals.
- ▶ Only qualified skilled personnel are permitted to work with or on Lenze drive and automation components.

According to IEC 60364 or CENELEC HD 384, these are persons ...

 - ... who are familiar with the installation, assembly, commissioning and operation of the product,
 - ... possess the appropriate qualifications for their work,
 - ... and are acquainted with and can apply all the accident prevent regulations, directives and laws applicable at the place of use.
- ▶ Transport and storage in a dry, low-vibration environment without aggressive atmosphere; preferably in the packaging provided by the manufacturer.
 - Protect against dust and shocks.
 - Comply with climatic conditions according to the technical data.

Transport, storage

Mechanical installation

- ▶ Install the product according to the regulations of the corresponding documentation. In particular observe the section "Operating conditions" in the chapter "Technical data".
- ▶ Provide for a careful handling and avoid mechanical overload. During handling neither bend components, nor change the insulation distances.
- ▶ The product contains electrostatic sensitive devices which can easily be damaged by short circuit or static discharge (ESD). Thus, electronic components and contacts must not be touched unless ESD measures are taken beforehand.

Electrical installation

- ▶ Carry out the electrical installation according to the relevant regulations (e. g. cable cross-sections, fusing, connection to the PE conductor). Additional notes are included in the documentation.
- ▶ When working on live products, observe the applicable national regulations for the prevention of accidents (e.g. BGV 3).
- ▶ The documentation contains information about EMC-compliant installation (shielding, earthing, arrangement of filters and laying cables). The system or machine manufacturer is responsible for compliance with the limit values required by EMC legislation.
Warning: The controllers are products which can be used in category C2 drive systems as per EN 61800-3. These products may cause radio interference in residential areas. If this happens, the operator may need to take appropriate action.
- ▶ For compliance with the limit values for radio interference emission at the site of installation, the components - if specified in the technical data - have to be mounted in housings (e. g. control cabinets). The housings have to enable an EMC-compliant installation. In particular observe that for example control cabinet doors preferably have a circumferential metallic connection to the housing. Reduce openings or cutouts through the housing to a minimum.
- ▶ Only plug in or remove pluggable terminals in the deenergised state!

Commissioning

- ▶ If required, you have to equip the system with additional monitoring and protective devices in accordance with the respective valid safety regulations (e. g. law on technical equipment, regulations for the prevention of accidents).
- ▶ Before commissioning remove transport locking devices and keep them for later transports.

Operation

- ▶ Keep all protective covers and doors closed during operation.

Safety functions

- ▶ Without a higher-level safety system, the described product must neither be used for the protection of machines nor persons.
- ▶ Certain controller versions support safety functions (e.g. "Safe torque off", formerly "Safe standstill").
 The notes on the safety functions provided in the documentation of the versions must be observed.

Maintenance and servicing

- ▶ The components are maintenance-free if the required operating conditions are observed.
- ▶ If the cooling air is polluted, the cooling surfaces may be contaminated or the air vents may be blocked. Under these operating conditions, the cooling surfaces and air vents must be cleaned at regular intervals. Never use sharp objects for this purpose!
- ▶ Only replace defective fuses in the deenergised state to the type specified.
- ▶ After the system has been disconnected from the supply voltage, live components and power connections must not be touched immediately because capacitors may be charged. Please observe the corresponding notes on the device.

Disposal

- ▶ Recycle metals and plastic materials. Ensure professional disposal of assembled PCBs.

2.2 Thermal motor monitoring

2.2.1 Description



Note!

From software version 8.0 onwards, the 9300 controllers are provided with an I²t function for sensorless thermal monitoring of the connected motor.

- ▶ I²t monitoring is based on a mathematical model which calculates a thermal motor utilisation from the detected motor currents.
- ▶ The calculated motor utilisation is saved when the mains is switched off.
- ▶ The function is UL-certified, i.e. additional protective measures for the motor are not required in UL-approved systems.
- ▶ Nevertheless, I²t monitoring does **not** provide full motor protection because other influences on the motor utilisation such as changes in the cooling conditions (e.g. cooling air flow interrupted or too warm) cannot be detected.

The I² × t-load of the motor is constantly calculated by the drive controller and displayed in C0066.

The I² × t-monitoring is designed in a way, that a motor with a thermal motor time factor of 5 min, a motor current of 1.5 × I_r and a trigger threshold of 100 % releases the monitoring after 179 s.

You can set different reactions with two adjustable trigger thresholds.

- ▶ Adjustable reaction OC8 (TRIP, Warning, Off).
 - The reaction is set in C0606.
 - The trigger threshold is set in C0127.
 - The reaction OC8 can be used for example for an advance warning.
- ▶ Fixed reaction OC6-TRIP.
 - The trigger threshold is set in C0120.

Response of the I ² × t-monitoring	Condition
The I ² × t-monitoring is deactivated. C0066 = 0 % and MCTRL-LOAD-I2XT = 0,00 % is set.	Set the controller inhibit at C0120 = 0 % and C0127 = 0 %.
The I ² × t-monitoring is stopped. The actual value in C0066 and at the MCTRL-LOAD-I2XT output is held.	Allow controller release at C0120 = 0 % and C0127 = 0 %.
The I ² × t-monitoring is deactivated. The motor load is displayed in C0066.	Set C0606 = 3 (Off) and C0127 > 0 %.



Note!

An OC6 or OC8 error message can only be reset if the I² × t-monitoring has fallen below the set trigger threshold by 5 %.

2.2.2 Parameter setting

Parameter setting			
Code	Meaning	Value range	Lenze setting
C0066	Display of the I ² t utilisation of the motor	0 ... 250 %	-
C0120	Threshold: Triggering of an "OC6" error	0 ... 120 %	0 %
C0127	Threshold: Triggering of an "OC8" error	0 ... 120 %	0 %
C0128	Thermal time constant of the motor	0.1 ... 50.0 min	5.0 min
C0606	Response to "OC8" error	Trip, warning, off	Warning

Calculating the release time

$$t = - (C0128) \cdot \ln \left[1 - \frac{y + 1}{\left(\frac{I_M}{I_r} \right)^2 \cdot 100} \right]$$

I_M Actual motor current
 I_r Rated motor current
 y C0120 or C0127

- The thermal capacity of the motor is expressed by the thermal motor time factor (C0128). Please see the rated data of the motor for the value or ask the manufacturer of the motor.

Reading the release time off the diagram

Diagram for the determination of the release times of a motor with a thermal motor time factor of 5 min:

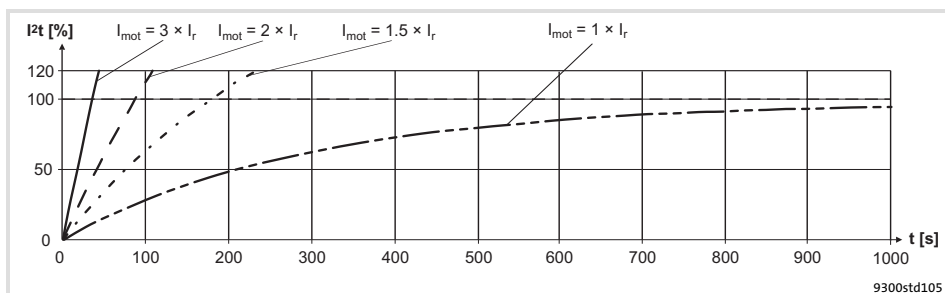


Fig. 2.2-1 I² × t-monitoring: Release times for different motor currents and trigger thresholds

I_{mot}	Motor current
I_r	Rated motor current
I^2t	I^2t load
T	Time

2.3 Residual hazards

Protection of persons

- ▶ According to their enclosure, Lenze controllers (frequency inverters, servo inverters, DC speed controllers) and their components can carry a voltage, or parts of the controllers can move or rotate during operation. Surfaces can be hot.
 - If the required cover is removed, the controllers are used inappropriately or installed or operated incorrectly, severe damage to persons or material assets can occur.
 - For more detailed information please see the documentation.
- ▶ There is a high amount of energy within the controller. Therefore always wear personal protective equipment (body protection, headgear, eye protection, ear protection, hand guard) when working on the controller when it is live.
- ▶ Before working on the controller, check if no voltage is applied to the power terminals.
 - the power terminals U, V, W, +UG and -UG still carry dangerous voltage for at least 3 minutes after power-off.
 - the power terminals L1, L2, L3; U, V, W, +UG and -UG carry dangerous voltage when the motor is stopped.
- ▶ Before power-off during DC-bus operation, all controllers must be inhibited and disconnected from the mains.
- ▶ The discharge current to PE potential is > 3.5 mA. In accordance with EN 61800-5-1
 - a fixed installation is required.
 - the design of the PE conductor has to be double or, in the case of a single design, must have a cable cross-section of at least 10 mm².
- ▶ The controller can only be safely disconnected from the mains via a contactor on the input side.
- ▶ During parameter set transfer the control terminals of the controller can have undefined states.
 - Therefore the connectors X5 and X6 must be disconnected from the controller before the transfer takes place. This ensures that the controller is inhibited and all control terminals have the defined state "LOW".
- ▶ If you use the "flying-restart circuit" function (C0142 = 2, 3) for machines with a low moment of inertia and minimum friction:
 - After controller enable in standstill, the motor may start or change its direction of rotation for a short time, because the flying restart process also is carried out at a speed of 0.

- ▶ Controllers can cause a DC current in the PE conductor. If a residual current device (RCD) or a fault current monitoring unit (RCM) is used for protection in the case of direct or indirect contact, only one RCD/RCM of the following type can be used on the current supply side:
 - Type B for the connection to a three-phase system
 - Type A or type B for the connection to a single phase systemAlternatively another protective measure can be used, like for instance isolation from the environment by means of double or reinforced insulation, or isolation from the supply system by using a transformer.

Device protection

- ▶ Frequent mains switching (e.g. inching mode via mains contactor) can overload and destroy the input current limitation of the drive controller:
 - At least 3 minutes must pass between switching off and restarting the devices EVF9321-xV and EVF9322-xV.
 - At least 3 minutes must pass between two starting procedures of the devices EVF9323-xV ... EVF9333-xV.
 - Use the "safe torque off" safety function (STO) if safety-related mains disconnections occur frequently. The drive variants Vxx4 are equipped with this function.

Motor protection

- ▶ For some controller settings, the connected motor may overheat (e.g. when operating the DC injection brake or a self-ventilated motor at low speed for longer periods).
 - Using an overcurrent relay or a temperature monitoring device provides a large degree of protection against overload.
 - We recommend to use PTC thermistors or thermal contacts for motor temperature monitoring. (Lenze three-phase AC motors are equipped with thermal contacts (NC contacts) as standard)
 - PTC thermistors or thermal contacts can be connected to the controller.
- ▶ Drives can attain dangerous overspeeds (e.g. setting of high output frequencies with motors and machines not qualified for this purpose).

2.4 Safety instructions for the installation according to U_L or U_R



Warnings!

- ▶ **Motor Overload Protection**
 - For information on the protection level of the internal overload protection for a motor load, see the corresponding manuals or software helps.
 - If the integral solid state motor overload protection is not used, external or remote overload protection must be provided.
- ▶ **Branch Circuit Protection**
 - The integral solid state protection does not provide branch circuit protection.
 - Branch circuit protection has to be provided externally in accordance with corresponding instructions, the National Electrical Code and any additional codes.
- ▶ Please observe the specifications for fuses and screw-tightening torques in these instructions.
- ▶ **EVF9321 ... EVF9326:**
 - Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 480 V maximum, when protected by fuses.
 - Suitable for use on a circuit capable of delivering not more than 50000 rms symmetrical amperes, 480 V maximum, when protected by CC, J, T or R class fuses.
 - Maximum surrounding air temperature: 0 ... +55 °C
 - > +40 °C: reduce the rated output current by 2.5 %/°C
 - Use 75 °C copper wire only.
- ▶ **EVF9327 ... EVF9329:**
 - Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 480 V maximum, when protected by fuses.
 - Suitable for use on a circuit capable of delivering not more than 50000 rms symmetrical amperes, 480 V maximum, when protected by J, T or R class fuses.
 - Maximum surrounding air temperature: 0 ... +50 °C
 - > +40 °C: reduce the rated output current by 2.5 %/°C
 - Use 60/75 °C or 75 °C copper wire only.

- ▶ EVF9330 ... EVF9333:
 - Suitable for use on a circuit capable of delivering not more than 10000 rms symmetrical amperes, 480 V maximum, when protected by fuses.
 - Suitable for use on a circuit capable of delivering not more than 50000 rms symmetrical amperes, 480 V maximum, when protected by J, T or R class fuses.
 - Maximum surrounding air temperature: 0 ... +50 °C
 - > +40 °C: reduce the rated output current by 2.5 %/°C
 - Use 60/75 °C or 75 °C copper wire only.

3 Technical data

Contents

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3.1 General data and operating conditions

General data

Conformity and approval		
Conformity		
CE	2006/95/EC	Low-Voltage Directive
	2004/108/EG	EMC Directive
Approval		
UL	cULus	Power Conversion Equipment (File No. E132659)

Protection of persons and equipment		
Type of protection	EN 60529	IP20 IP41 in case of thermally separated installation (push-through technique) between the control cabinet (inside) and the environment.
	NEMA 250	Protection against accidental contact in accordance with type 1
Earth leakage current	IEC/EN 61800-5-1	> 3.5 mA Observe regulations and safety instructions!
Insulation of control circuits	IEC/EN 61800-5-1	Safe mains isolation by double (reinforced) insulation for the terminals X1 and X5. Basic insulation (single isolating distance) for the terminals X3, X4, X6, X8, X9, X10 and X11.
Insulation resistance	EN 61800-5-1	< 2000 m site altitude: Overvoltage category III
		> 2000 m site altitude: Overvoltage category II
Protective measures		Against short circuit, earth fault (earth-fault protected during operation, limited earth-fault protection during operation), overvoltage, motor stalling, motor overtemperature (input for PTC or thermal contact)

EMC		
Noise emission	IEC/EN 61800-3	Cable-guided, up to 10 m motor cable length with mains filter A: category C2.
		Radiation, with mains filter A and installation in control cabinet: category C2
Interference immunity	IEC/EN 61800-3	Category C3

Operating conditions

Ambient conditions			
Climatic			
Storage	IEC/EN 60721-3-1	1K3 (-25 ... +55 °C)	< 6 months
		1K3 (-25 ... +40 °C)	> 6 months > 2 years: form DC bus capacitors
Transport	IEC/EN 60721-3-2	2K3 (-25 ... +70 °C)	
Operation			
EVF9321 ... EVF9326	IEC/EN 60721-3-3	3K3 (0 ... +55 °C)	> +40 °C: reduce the rated output current by 2.5 %/°C.
		3K3 (0 ... +50 °C)	> +40 °C: reduce the rated output current by 2.5 %/°C.
EVF9327 ... EVF9333			
Pollution	IEC/EN 61800-5-1	Degree of pollution 2	

Ambient conditions			
Site altitude		< 4000 m amsl > 1000 m amsl: reduce the rated output current by 5 %/ 1000 m.	
Mechanical			
Vibration resistance (9.81 m/s² = 1 g)	Germanischer Lloyd 5 ... 13.2 Hz	Amplitude ±1 mm 13.2 ... 100 Hz: acceleration resistant up to 0.7 g	
	IEC/EN 60068-2-6 10 ... 57 Hz	Amplitude 0.075 mm 57 ... 150 Hz: acceleration resistant up to 1 g	
Electrical			
AC-mains connection			
Max. mains voltage range		320 V - 0 % ... 528 V + 0 %	
Mains frequency		45 Hz - 0 % ... 65 Hz + 0 %	
Power system TT, TN		Operation permitted without restrictions with earthed neutral.	
Power system IT		Operation only permitted with the device variants V024 or V100. Operation permitted without restrictions with insulated neutral. Observe instructions on specific measures!	
Operation on public supply systems	EN 61000-3-2	Limitation of harmonic currents	
		Total output at the mains	Compliance with the requirements ¹⁾
		< 1 kW	With mains choke.
		> 1 kW	Without additional measures.
		¹⁾ The additional measures mentioned have the effect that solely the controllers meet the requirements of EN 61000-3-2. The machine/system manufacturer is responsible for the compliance with the requirements for the machine/system!	
DC-mains connection			
Max. mains voltage range		450 V - 0 % ... 740 V + 0 %	
Operating conditions		DC voltage must be symmetrical to PE. The controller will be destroyed when +U _G or -U _G are earthed.	
Motor connection			
Length of the motor cable		< 50 m	shielded
		< 100 m	unshielded
		At rated mains voltage and a switching frequency of ≤ 8 kHz without additional output filter. For compliance with EMC regulations, the permissible cable length might change.	
Mounting conditions			
Mounting place		In the control cabinet	
Mounting position		Vertical	
Free spaces		📖 4-1	
Dimensions			
Weights			

3.2 Open and closed loop control

Field	Values	
Control methods	V/f characteristic control (linear, square), vector control	
Switching frequency	1 kHz, 2 kHz or 4 kHz	
Torque behaviour in case of vector control		
Maximum torque	$1.5 \times M_r$ for 60 s if rated motor power = rated 9300 vector power	
Setting range	to 1:10 (1 : 20 with feedback)	in the range of 6 ... 100 % f_r
Speed control without feedback		
Min. mechanical motor frequency	1 % f_r	Torque 0 ... M_N
Setting range	1 : 100	relating to f_r and M_r
Accuracy	± 0.5 % f_N	in the range of 6 ... 100 % f_N
Speed control without feedback		
Min. mechanical motor frequency	0.1 % f_N	Torque 0 ... M_N
Setting range	1 : 1000	relating to f_r and M_r
Accuracy	± 0.1 % of f_r	
Output frequency		
Field	- 300 Hz ... + 300 Hz	
Absolute resolution	0.06 Hz	
Standardised resolution	Parameter data: 0.01 %, Process data: 0.006 % (= 2^{14})	
Digital setpoint selection		
Accuracy	± 0.005 Hz (= ± 100 ppm)	
Analog setpoint selection		
Linearity	± 0.15 %	signal level: 5 V or 10 V
Temperature sensitivity	± 0.1 %	0 ... 50 °C
Offset	± 0.1 %	
Analog inputs/outputs	• 2 inputs (bipolar) • 2 outputs (bipolar)	
Digital inputs/outputs	• 6 inputs (freely assignable) • 1 input for controller inhibit • 4 outputs freely assignable • 1 incremental encoder input (500 kHz, TTL level); Design: 9-pole Sub-D socket • 1 digital frequency input (500 kHz, TTL level or 200 kHz, HTL level); type: 9-pole Sub-D socket; can be alternatively used as incremental encoder input (200 kHz, HTL level) • 1 master frequency output (500 kHz, TTL level); Design: 9-pole Sub-D socket	
Cycle times		
Digital inputs	1 ms	
Digital outputs	1 ms	
Analog inputs	1 ms	
Analog outputs	1 ms (smoothing time: $\tau\tau = 2$ ms)	
Operation in generator mode	Integrated brake transistor (optional)	

f_r rated motor frequency
 M_r rated motor torque

3.3 Safety relay K_{SR}

Terminal	Description	Field	Values
X11/K32 X11/K31 X11/33 X11/34	Safety relay K _{SR} 1st disconnecting path	Coil voltage at +20 °C	DC 24 V (20 ... 30 V)
		Coil resistance at +20 °C	823 Ω ±10 %
		Rated coil power	Approx. 700 mW
		Max. switching voltage	AC 250 V, DC 250 V (0.45 A)
		Max. AC switching capacity	1500 VA
		Max. switching current (ohmic load)	AC 6 A (250 V), DC 6 A (50 V)
		Recommended minimum load	> 50 mW
		Max. switching rate	6 switchings per minute
		Mechanical service life	10 ⁷ switching cycles
		Electrical service life	
		at 250 V AC (ohmic load)	10 ⁵ switching cycles at 6 A 10 ⁶ switching cycles at 1 A 10 ⁷ switching cycles at 0.25 A
		at 24 V DC (ohmic load)	6 × 10 ³ switching cycles at 6 A 10 ⁶ switching cycles at 3 A 1.5 × 10 ⁶ switching cycles at 1 A 10 ⁷ switching cycles at 0.1 A

3.4 Operation with rated power (normal operation)



Note!

The controllers EVF9324, EVF9326 and EVF9328 ... EVF9333 may only be operated with the prescribed mains chokes and mains filters.

3.4.1 Rated data for 400 V mains voltage

Basis of the data			
		Voltage	Frequency
AC mains connection	$[V_{rated}]$	3/PE AC 320 V - 0 % ... 440 V + 0 %	45 Hz - 0 % ... 65 Hz + 0 %
DC-mains connection (alternatively)	$[U_{DC}]$	DC 450 V - 0 % ... 620 V + 0 %	—
Output voltage			
With mains choke		3 ~ 0 approx. 94 % V_{rated}	—
Without mains choke		3 ~ 0 ... U_N	—

9300	Mains current ¹⁾		Typical motor power		Output power			Power loss
	With Mains choke	Without Mains choke	ASM (4-pole)		2/4 kHz ²⁾ U, V, W	8 kHz ²⁾ U, V, W	+ U_G , - U_G ³⁾	
Type	I_r [A]	I_r [A]	P_{rated} [kW]	P_{rated} [hp]	S_{rated} [kVA]	S_{rated} [kVA]	P_{DC} [kW]	P_{loss} [W]
EVF9321-xV	1.5	2.1	0.37	0.5	1.0	1.0	1.9	50
EVF9322-xV	2.5	3.5	0.75	1.0	1.7	1.7	0.7	65
EVF9323-xV	3.9	5.5	1.5	2.0	2.7	2.7	0	100
EVF9324-xV	7.0	—	3.0	4.0	4.8	4.8	2.0	150
EVF9325-xV	12.0	16.8	5.5	7.5	9.0	9.0	0	210
EVF9326-xV	20.5	—	11.0	15.0	16.3	16.3	0	390
EVF9327-xV	29.0	43.5	15.0	20.0	22.2	22.2	10.2	430
EVF9328-xV	42.0	—	22.0	30.0	32.6	32.6	4.0	640
EVF9329-xV	55.0	—	30.0	40.0	41.6	41.6	0	810
EVF9330-xV	80.0	—	45.0	60.0	61.7	61.7	5.1	1100
EVF9331-xV	100	—	55.0	75.0	76.2	76.2	0	1470
EVF9332-xV	135	—	75.0	100	103.9	103.9	28.1	1960
EVF9333-xV	165	—	90.0	125	131.2	124.7	40.6	2400

¹⁾ Mains currents at a switching frequency of 8 kHz

²⁾ Switching frequency of the inverter

³⁾ Power supplied by the DC bus when operating with power-adapted motor

3

Technical data

3.4

Operation with rated power (normal operation)

3.4.1

Rated data for 400 V mains voltage

9300	Rated output current at switching frequency					Max. permissible output current at switching frequency ¹⁾				
Type	2/4 kHz ³⁾ I _r [A]	8 kHz I _r [A]	8 kHz sin I _r [A]	8/2 kHz ²⁾ I _r [A]	16 kHz I _r [A]	2/4 kHz I _{max} [A]	8 kHz I _{max} [A]	8 kHz sin I _{max} [A]	8/2 kHz ²⁾ I _{max} [A]	16 kHz I _{max} [A]
EVF9321-xV	1.5	1.5	1.5	1.5	1.1	2.2	2.2	2.2	2.2	1.6
EVF9322-xV	2.5	2.5	2.5	2.5	1.8	3.7	3.7	3.7	3.7	2.7
EVF9323-xV	3.9	3.9	3.9	3.9	2.9	5.8	5.8	5.8	5.8	4.3
EVF9324-xV	7.0	7.0	7.0	7.0	5.2	10.5	10.5	10.5	10.5	1.8
EVF9325-xV	13.0	13.0	13.0	13.0	9.7	19.5	19.5	19.5	19.5	14.5
EVF9326-xV	23.5	23.5	23.5	23.5	15.2	35.0	35.0	35.0	35.0	22.9
EVF9327-xV	32.0	32.0	29.0	32.0	21.0	48.0	48.0	43.0	48.0	31.0
EVF9328-xV	47.0	47.0	43.0	47.0	30.0	70.5	70.5	64.0	70.5	46.0
EVF9329-xV	59.0	59.0	47.0	59.0	35.0	89.0	89.0	70.0	89.0	53.0
EVF9330-xV	89.0	89.0	59.0	89.0	46.0	134	134	88.0	134	69.0
EVF9331-xV	110	110	76.0	110	52.0	165	165	114	165	165
EVF9332-xV	150	147	92.0	150	58.0	225	221	138	225	87.0
EVF9333-xV	180	147	100	180	63.0	270	221	150	270	94.0

Bold print = Lenze setting

- ¹⁾ The currents apply to a periodic load change with an overcurrent time of maximally 1 minute and a base load time of 2 minutes with maximally 75 % I_{rated}
- ²⁾ Power-optimised operation with automatic switching frequency reduction. When the max. permissible output current is exceeded, the switching frequency is reduced to 2 kHz.
- ³⁾ Possible for some types in case of other operating conditions: Operation with increased rated output current at the same load change (see chapter "Operation with increased rated power")

3.4.2 Rated data for 480 V mains voltage

Basis of the data			
		Voltage	Frequency
AC mains connection	[U _N]	3/PE AC 384 V - 0 % ... 528 V + 0 %	45 Hz - 0 % ... 65 Hz + 0 %
DC-mains connection (alternatively)	[U _{DC}]	DC 540 V - 0 % ... 740 V + 0 %	–
Output voltage			
With mains choke		3 ~ 0 approx. 94 % V _{rated}	–
Without mains choke		3 ~ 0 ... U _N	–

9300	Mains current ¹⁾		Typical motor power		Output power			Power loss
	With Mains choke	Without Mains choke	ASM (4-pole)		2/4 kHz ²⁾ U, V, W S _{rated} [kVA]	8 kHz ²⁾ U, V, W S _{rated} [kVA]	+U _G , -U _G ³⁾ P _{DC} [kW]	
Type	I _r [A]	I _r [A]	P _{rated} [kW]	P _{rated} [hp]				P _{loss} [W]
EVF9321-xV	1.5	2.1	0.37	0.5	1.2	1.2	2.3	50
EVF9322-xV	2.5	3.5	0.75	1.0	2.1	2.1	0.9	65
EVF9323-xV	3.9	5.5	1.5	2.0	3.2	3.2	0	100
EVF9324-xV	7.0	–	3.0	4.0	5.8	5.8	2.5	150
EVF9325-xV	12.0	16.8	5.5	7.5	10.8	10.8	0	210
EVF9326-xV	20.5	–	11.0	15.0	18.5	18.5	0	390
EVF9327-xV	29.0	43.5	18.5	25.0	26.6	26.6	11.8	430
EVF9328-xV	42.0	–	30.0	40.0	39.1	39.1	4.6	640
EVF9329-xV	55.0	–	37.0	50.0	49.9	49.9	0	810
EVF9330-xV	80.0	–	55.0	75.0	69.8	69.8	5.9	1100
EVF9331-xV	100	–	75.0	100	91.4	91.4	0	1470
EVF9332-xV	135	–	90.0	125	124	124	32.4	1960
EVF9333-xV	165	–	110.0	150	158.2	149	47.1	2400

¹⁾ Mains currents at a switching frequency of 8 kHz

²⁾ Switching frequency of the inverter

³⁾ Power supplied by the DC bus when operating with power-adapted motor

3

Technical data

3.4

Operation with rated power (normal operation)

3.4.2

Rated data for 480 V mains voltage

9300	Rated output current at switching frequency					Max. permissible output current at switching frequency ¹⁾				
Type	2/4 kHz I_r [A]	8 kHz I_r [A]	8 kHz sin I_r [A]	8/2 kHz ²⁾ I_r [A]	16 kHz I_r [A]	2/4 kHz I_{max} [A]	8 kHz I_{max} [A]	8 kHz sin I_{max} [A]	8/2 kHz ²⁾ I_{max} [A]	16 kHz I_{max} [A]
EVF9321-xV	1.5	1.5	1.5	1.5	1.1	2.2	2.2	2.2	2.2	1.6
EVF9322-xV	2.5	2.5	2.5	2.5	1.8	3.7	3.7	3.7	3.7	2.7
EVF9323-xV	3.9	3.9	3.9	3.9	2.9	5.8	5.8	5.8	5.8	4.3
EVF9324-xV	7.0	7.0	7.0	7.0	5.2	10.5	10.5	10.5	10.5	7.8
EVF9325-xV	13.0	13.0	13.0	13.0	9.7	19.5	19.5	19.5	19.5	14.5
EVF9326-xV	22.3	22.3	22.3	22.3	14.6	33.5	33.5	33.5	33.5	21.8
EVF9327-xV	30.4	30.4	27.0	30.4	19.0	45.6	45.6	41.0	45.6	29.0
EVF9328-xV	44.7	44.7	41.0	44.7	29.0	67.0	67.0	61.0	67.0	43.5
EVF9329-xV	56.0	56.0	44.0	56.0	33.0	84.0	84.0	66.0	84.0	49.0
EVF9330-xV	84.0	84.0	55.0	84.0	43.7	126	126	82.0	126	65.6
EVF9331-xV	105	105	71.0	105	49.5	157	157	107	157	74.0
EVF9332-xV	142	142	87.0	142	55.0	213	213	130	213	83.0
EVF9333-xV	171	171	94.0	171	59.0	256	211	141	256	89.0

Bold print = Lenze setting

- ¹⁾ The currents apply to a periodic load change with an overcurrent time of maximally 1 minute and a base load time of 2 minutes with maximally 75 % I_{rated}
- ²⁾ Power-optimised operation with automatic switching frequency reduction. When the max. permissible output current is exceeded, the switching frequency is reduced to 2 kHz.

3.5 Operation with increased rated power

Under the operating conditions described here, the drive controller can be operated in continuous operation with a more powerful motor. The overload capacity is reduced to 120 %.

Typical applications are pumps with quadratic load characteristic or fan.



Note!

- The operation with increased rated power is not UL-certified.
- Operation with increased rated power is only allowed:
 - In the listed mains voltage range
 - With the listed switching frequencies
 - With the specified fuses, cable cross-sections and mains chokes or mains filters

3.5.1 Rated data for 400 V mains voltage

Basis of the data			
		Voltage	Frequency
AC mains connection	[U _N]	3/PE AC 320 V - 0 % ... 440 V + 0 %	45 Hz - 0 % ... 65 Hz + 0 %
DC-mains connection (alternatively)	[U _{DC}]	DC 450 V - 0 % ... 620 V + 0 %	–
Output voltage			
With mains choke		3 ~ 0 approx. 94 % V _{rated}	–

9300	Mains current ¹⁾	Typical motor power		Output power		Power loss
Type	I _r [A]	ASM (4-pole)		2/4 kHz ²⁾ U, V, W S _{rated} [kVA]	+U _G , -U _G ³⁾ P _{DC} [kW]	P _{loss} [W]
EVF9321-xV	1.7	P _{rated} [kW]	P _{rated} [hp]	1.3	1.72	50
EVF9322-xV	2.8	0.55	0.75	2.1	0.35	65
EVF9323-xV	5.0	1.1	1.5	3.8	0	115
EVF9324-xV	8.8	2.2	3.0	6.5	1.0	165
EVF9325-xV	15.0	4.0	5.0	11.1	0	260
EVF9327-xV	39.0	7.5	10.0	29.8	3.2	640
EVF9328-xV	50.0	22.0	30.0	39.5	0	810
EVF9329-xV	60.0	30.0	40.0	46.4	0	950
EVF9330-xV	97.0	37.0	50.0	74.8	0	1350
EVF9331-xV	119	55.0	75.0	91.5	0	1470
EVF9332-xV	144	75.0	100	110	13.1	2100
EVF9333-xV	185	90.0	125	142	20.6	2400
		110.0	150			

¹⁾ Mains currents at a switching frequency of 2/4 kHz

²⁾ Switching frequency of the inverter

³⁾ Power supplied by the DC bus when operating with power-adapted motor

3

3.5

3.5.1

Technical data

Operation with increased rated power

Rated data for 400 V mains voltage

9300	Rated output current at switching frequency		Max. permissible output current at switching frequency ¹⁾	
Type	2/4 kHz I_r [A]	2/8 kHz ²⁾ I_r [A]	2/4 kHz I_{max} [A]	2/8 kHz ²⁾ I_{max} [A]
EVF9321-xV	1.8	1.8	2.2	2.2
EVF9322-xV	3.0	3.0	3.7	3.7
EVF9323-xV	5.5	5.5	5.8	5.8
EVF9324-xV	9.2	9.2	10.5	10.5
EVF9325-xV	15.0	15.0	19.5	19.5
EVF9327-xV	43.0	43.0	48.0	48.0
EVF9328-xV	56.0	56.0	70.5	70.5
EVF9329-xV	66.0	66.0	89.0	89.0
EVF9330-xV	100	100	134	134
EVF9331-xV	135	135	165	165
EVF9332-xV	159	159	225	225
EVF9333-xV	205	205	270	270

Bold print = Lenze setting

- ¹⁾ The currents apply to a periodic load change with an overcurrent time of maximally 1 minute and a base load time of 2 minutes with maximally 75 % I_{rated}
- ²⁾ Power-optimised operation with automatic switching frequency reduction. During operation with increased rated power, the switching frequency is reduced to 2 kHz.

3.6 Current characteristics

On some operating conditions, the maximum output current is limited for the devices EVF9326 ... EVF9333:

- For output frequencies $f_{out} < |5 \text{ Hz}|$ and a heatsink temperature $\vartheta_K > 40^\circ \text{C}$.
- The current limitation depends on the chopper frequency.

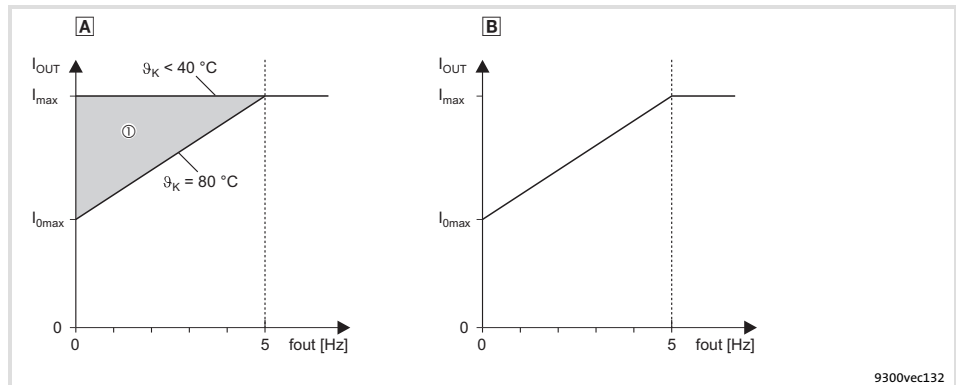


Fig. 3.6-1 Current derating characteristics

- Ⓐ Operation with chopper frequency $f_{chop} = 16/8/2 \text{ kHz}$, 2 kHz, 4 kHz, 8 kHz or 8/2 kHz (C0018 = 0, 1, 2, 3, 4, 6)
The current limitation follows the characteristic
At output frequencies $f_{out} < |5 \text{ Hz}|$ and heatsink temperatures $\vartheta_K = 40 \dots 80^\circ \text{C}$ the current limit is adjusted steplessly in the range ①.
- Ⓑ Operation with chopper frequency $f_{chop} = 16 \text{ kHz}$ (C0018 = 5)
The current limitation follows the characteristic and does not depend on the heatsink temperature

9300 vector	$I_{0max} [\text{A}]^{1)}$						$I_{0max} [\text{A}]^{2)}$	
	C0018 = 0, 1, 2, 6		C0018 = 3		C0018 = 4		C0018 = 5	
	U_{mains}		U_{mains}		U_{mains}		U_{mains}	
	400 V	480 V	400 V	480 V	400 V	480 V	400 V	480 V
EVF9326	35.0	21.6	21.6	32.0	22.7	21.6	11.2	10.6
EVF9327	48.0	45.6	32.0	32.0	28.8	27.3	11.2	10.6
EVF9328	70.5	67.0	47.0	47.0	42.3	40.2	16.5	15.6
EVF9329	89.0	84.6	59.3	59.3	53.4	50.7	17.8	16.9
EVF9330	134	125	89.4	89.4	80.4	76.3	22.0	22.0
EVF9331	143	135	115	115	103	98.8	22.0	22.0
EVF9332	194	185	157	157	138	131	30.0	30.0
EVF9333	197	188	158	158	142	135	35.9	35.9

- 1) Maximum available output current at an output frequency $f_{out} = |0 \text{ Hz}|$ and heatsink temperature $\vartheta_K = 80^\circ \text{C}$
- 2) Maximum available output current at an output frequency $f_{out} = |0 \text{ Hz}|$

4 Installation of the standard device

Contents

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4.1 Standard devices in the power range 0.37 ... 11 kW

4.1.1 Important notes

Mass of the devices

9300	Standard device	"Cold plate" device
Type	EVF93xx-EV [kg]	EVF93xx-CV [kg]
EVF9321-xV	4.0	3.1
EVF9322-xV	4.0	3.1
EVF9323-xV	5.5	3.9
EVF9324-xV	5.5	3.9
EVF9325-xV	7.4	5.2
EVF9326-xV	7.4	5.2

4 Installing of the standard device

4.1 Standard devices in the power range 0.37 ... 11 kW

4.1.2 Mounting with fixing rails (standard)

4.1.2 Mounting with fixing rails (standard)

Required mounting material from the scope of supply:

Description	Use	EVF9321 ... EVF9324	EVF9325, EVF9326
		Amount	
Fixing rails	Drive controller fixing	2	4

Dimensions

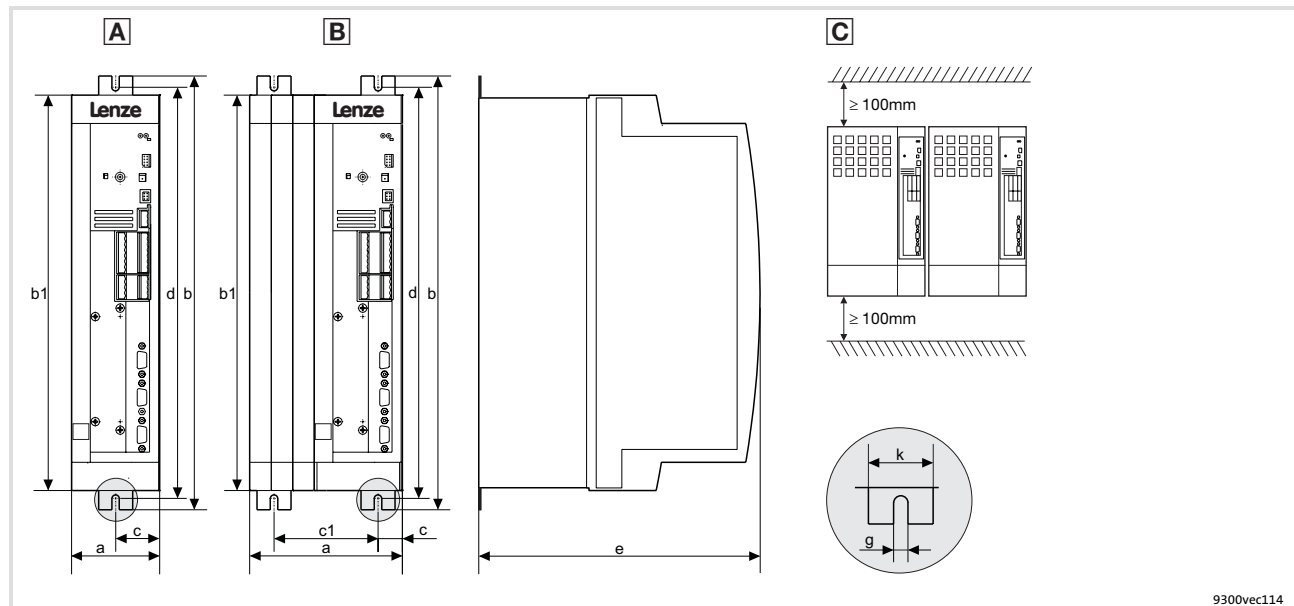


Fig. 4.1-1 Standard mounting with fixing rails 0.37 ... 11 kW

ⓐ Drive controllers can be mounted side by side without spacing

9300 vector		Dimensions [mm]									
Type		a	b	b1	c	c1	d	d1	e ¹⁾	g	k
EVF9321-EV EVF9322-EV	ⓐ	78	384	350	39	-	365	-	250	6.5	30
EVF9323-EV EVF9324-EV	ⓐ	97	384	350	48.5	-	365	-	250	6.5	30
EVF9325-EV EVF9326-EV	ⓑ	135	384	350	21.5	92	365	-	250	6.5	30

¹⁾ For a fieldbus module plugged onto X1, consider mounting space for connecting cables

Mounting

► Attach the fixing rails to the housing of the drive controller.

4.1.3 Thermally separated mounting (push-through technique)

For mounting in push-through technique, the drive controller of type EVF93xx-EV must be used. In addition, the mounting set for push-through technique is required.

Type	Mounting set	Type	Mounting set
EVF9321-EV, EVF9322-EV	EJ0036		
EVF9323-EV, EVF9324-EV	EJ0037	EVF9325-EV, EVF9326-EV	EJ0038

Dimensions

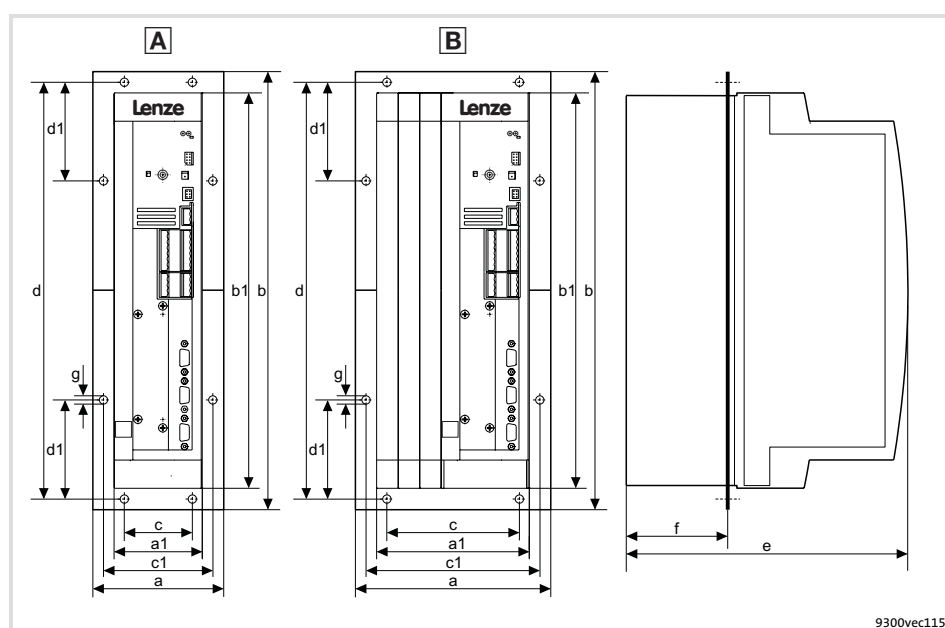


Fig. 4.1-2 Dimensions for thermally separated mounting 0.37 ... 11 kW

9300 vector		Dimensions [mm]										
Type		a	a1	b	b1	c	c1	d	d1	e ¹⁾	f	g
EVF9321-EV EVF9322-EV	A	112.5	78	385.5	350	60	95.5	365.5	105.5	250	92	6.5
EVF9323-EV EVF9324-EV	A	131.5	97	385.5	350	79	114.5	365.5	105.5	250	92	6.5
EVF9325-EV EVF9326-EV	B	169.5	135	385.5	350	117	152.5	365.5	105.5	250	92	6.5

¹⁾ For a fieldbus module plugged onto X1, consider mounting space for connecting cables

Mounting cutout in control cabinet

9300 vector		Dimensions [mm]	
Type		Width	Height
EVF9321-EV EVF9322-EV	A	82	350
EVF9323-EV EVF9324-EV	A	101	350
EVF9325-EV EVF9326-EV	B	139	350

4.1.4 Mounting in "cold plate" technique



Note!

All 9300 vector frequency inverters are approved according to UL508C. To maintain the guaranteed features, controllers in "cold plate" must be mounted by the user. For this reason, these frequency inverters have the marking UR (instead of UL).

The drive controllers can be mounted in "cold plate" technique, e.g. on collective coolers. For this purpose, the drive controllers of type EVF93xx-CV must be used.

Required mounting material from the scope of supply:

Description	Use	EVF9321 EVF9322	EVF9323 EVF9324	EVF9325 EVF9326
		Quantity		
Fixing bracket	Drive controller fixing	2	2	2
Sheet metal screw 3.5 × 13 mm (DIN 7981)	Mounting of fixing bracket to the drive controller	6	6	6

Requirements for collective coolers

The following points are important for safe and reliable operation of the controller:

- ▶ Good thermal connection to the cooler
 - The contact surface between the collective cooler and the controller must be at least as large as the cooling plate of the controller.
 - Plane contact surface, max. deviation 0.05 mm.
 - When attaching the collective cooler to the controller, make sure to use all specified screw connections.
- ▶ Observe the thermal resistance R_{th} given in the table. The values are valid for controller operation under rated conditions.

9300	Cooling path	
	Power to be dissipated	Heatsink - environment
Type	P_v [W]	R_{th} [K/W]
EVF9321-CV	24	1.45
EVF9322-CV	42	0.85
EVF9323-CV	61	0.57
EVF9324-CV	105	0.33
EVF9325-CV	180	0.19
EVF9326-CV	360	0.10

Ambient conditions

- ▶ The rated data and the derating factors at increased temperature also apply to the ambient temperature of the drive controllers.
- ▶ Temperature at the cooling plate of the drive controller: max. 75 °C.

Dimensions

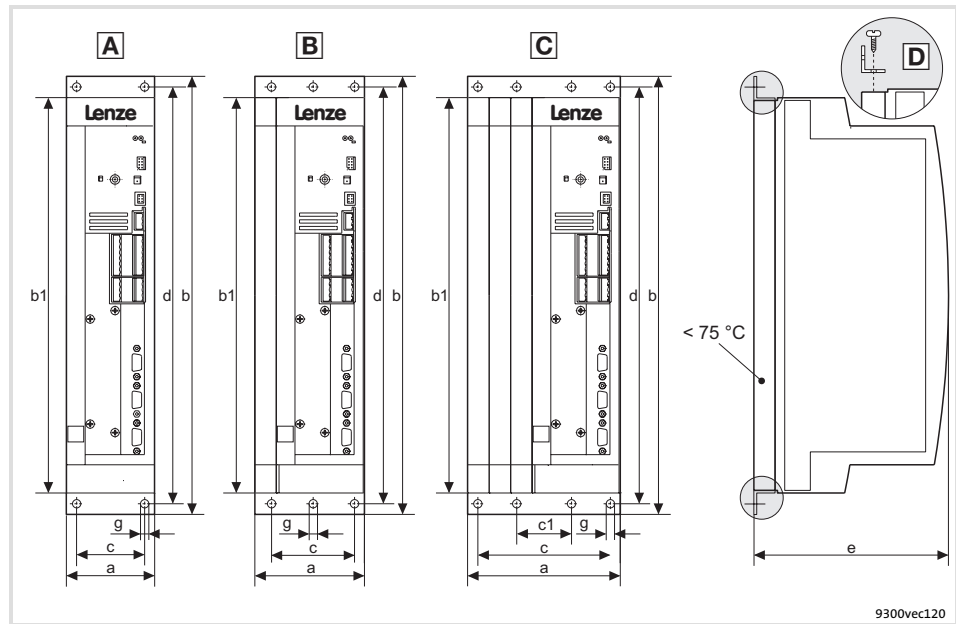


Fig. 4.1-3 Dimensions for mounting in "cold plate" technique 0.37 ... 11 kW

9300 vector		Dimensions [mm]							
Type		a	b	b1	c	c1	d	e ¹⁾	g
EVF9321-CVV003 EVF9322-CVV003	A	78	381	350	48	—	367	168	6.5
EVF9323-CVV003 EVF9324-CVV003	B	97	381	350	67	—	367	168	6.5
EVF9325-CVV003 EVF9326-CVV003	C	135	381	350	105	38	367	168	6.5

1) For a fieldbus module plugged onto X1, consider mounting space for connecting cables

Mounting

Apply heat conducting paste before screwing together the cooler and cooling plate of the drive controller so that the heat transfer resistance is as low as possible.

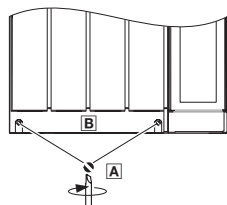
1. Fasten the fixing bracket with sheet metal screws 3.5 × 13 mm at the top and bottom of the drive controller **D**.
2. Clean the contact surface of cooler and cooling plate with spirit.
3. Apply a thin coat of heat conducting paste with a filling knife or brush.
 - The heat conducting paste in the accessory kit is sufficient for an area of approx. 1000 cm².
4. Mount the drive controller on the cooler.

4.2 Standard devices in the power range 15 ... 30 kW

4.2.1 Important notes

The accessory kit is located inside the controller.

Remove the cover of the drive controller



9300vec113

1. Remove the screws **A**
2. Lift cover **B** up and detach it

Mass of the devices

9300	Standard device	"Cold plate" device
Type	EVF93xx-EV [kg]	EVF93xx-CV [kg]
EVF9327-xV	13.5	9.5
EVF9328-xV	15.0	9.5
EVF9329-xV	15.0	—

4 Installing of the standard device

4.2 Standard devices in the power range 15 ... 30 kW

4.2.2 Mounting with fixing brackets (standard)

4.2.2 Mounting with fixing brackets (standard)

Mounting material required from the scope of supply:

Description	Use	Quantity
Fixing bracket	Drive controller fixing	4
Raised countersunk head screw M5 × 10 mm (DIN 966)	Mounting of fixing bracket to the drive controller	4

Dimensions

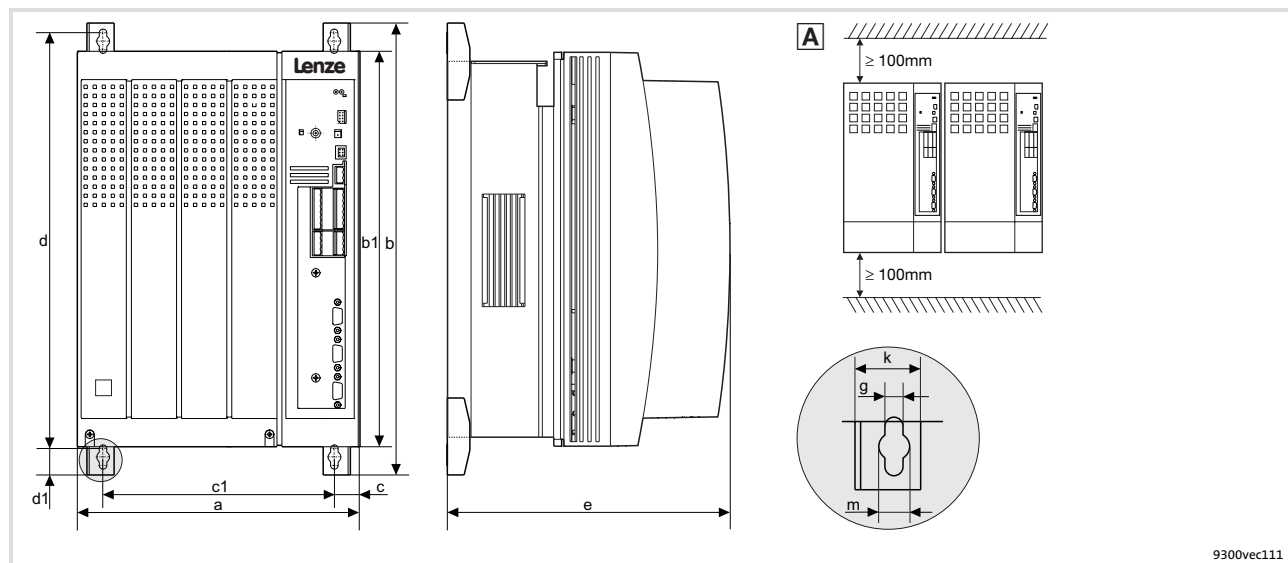


Fig. 4.2-1 Standard mounting with fixing brackets 15 ... 30 kW

A Drive controllers can be mounted side by side without spacing

9300 vector	Dimensions [mm]										
Type	a	b	b1	c	c1	d	d1	e ¹⁾	g	k	m
EVF9327-EV	250	402	350	22	206	370	24	250	6.5	24	11
EVF9328-EV											
EVF9329-EV											

¹⁾ For a fieldbus module plugged onto X1, consider mounting space for connecting cables

Mounting

► Attach the fixing brackets to the heatsink plate of the drive controller.

4.2.3 Thermally separated mounting (push-through technique)

For mounting in push-through technique, the drive controller of type EVF93xx-EV must be used. In addition, the mounting set EJ0011 for push-through technique is required.

Dimensions

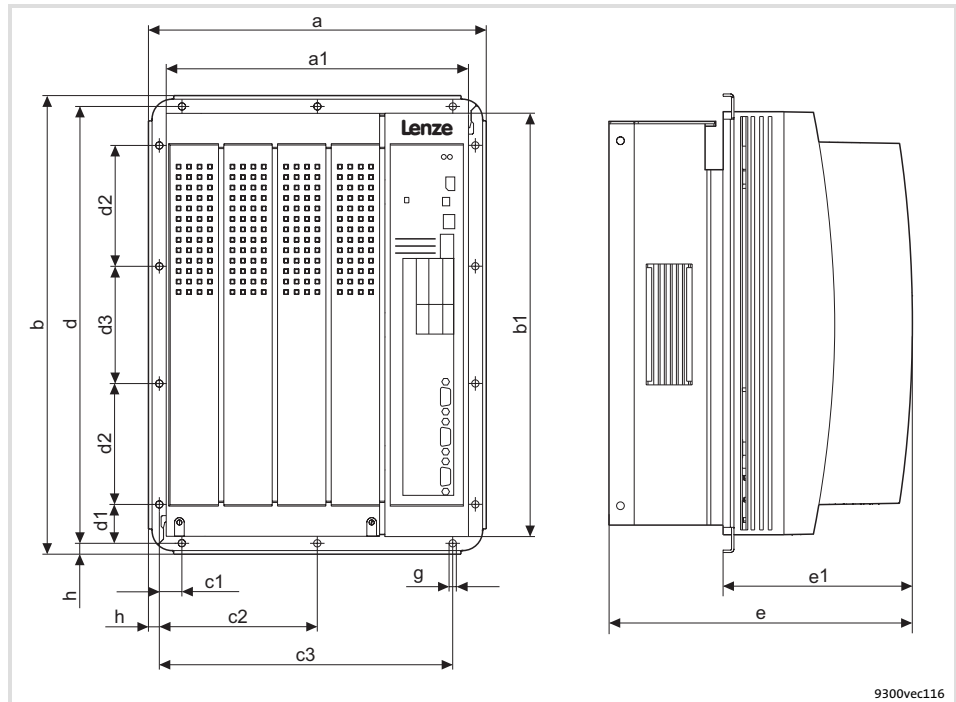


Fig. 4.2-2 Dimensions for thermally separated mounting 15 ... 30 kW

9300 vector	Dimensions [mm]														
Type	a	a1	b	b1	c1	c2	c3	d	d1	d2	d3	e ¹⁾	e1	g	h
EVF9327-EV															
EVF9328-EV	279.5	250	379.5	350	19	131	243	361.5	32	100	97	250	159.5	6	9
EVF9329-EV															

¹⁾ For a fieldbus module plugged onto X1, consider mounting space for connecting cables

Mounting cutout in control cabinet

EVF9327-EV		
EVF9328-EV	236	336
EVF9329-EV		

4.2.4 Mounting in "cold plate" technique



Note!

All 9300 vector frequency inverters are approved according to UL508C. To maintain the guaranteed features, controllers in "cold plate" must be mounted by the user. For this reason, these frequency inverters have the marking UR (instead of UL).

The drive controllers can be mounted in "cold plate" technique, e.g. on collective coolers. For this purpose, the drive controllers of type EVF93xx-CV must be used.

Requirements for collective coolers

The following points are important for safe and reliable operation of the controller:

- ▶ Good thermal connection to the cooler
 - The contact surface between the collective cooler and the controller must be at least as large as the cooling plate of the controller.
 - Plane contact surface, max. deviation 0.05 mm.
 - When attaching the collective cooler to the controller, make sure to use all specified screw connections.
- ▶ Observe the thermal resistance R_{th} given in the table. The values are valid for controller operation under rated conditions.

9300	Cooling path	
	Power to be dissipated	Heatsink - environment
Type	P_v [W]	R_{th} [K/W]
EVF9327-CV	410	0.085
EVF9328-CV	610	0.057

Ambient conditions

- ▶ The rated data and the derating factors at increased temperature also apply to the ambient temperature of the drive controllers.
- ▶ Temperature at the cooling plate of the drive controller: max. 75 °C.

Dimensions

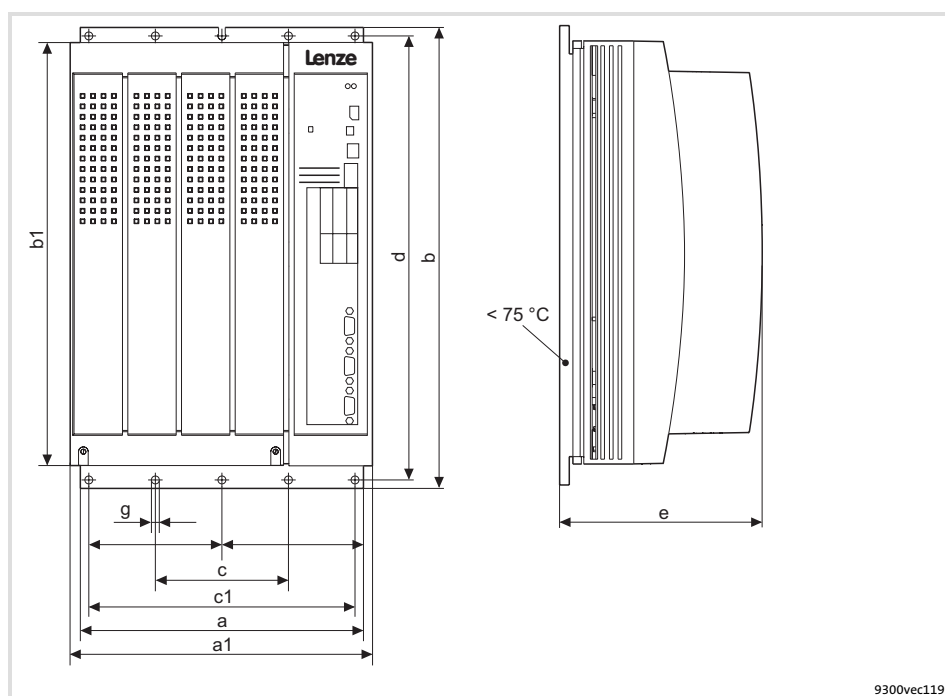


Fig. 4.2-3 Dimensions for mounting in "cold plate" technique 15 ... 22 kW

9300 vector Type	Dimensions [mm]								
	a	a1	b	b1	c	c1	d	e ¹⁾	g
EVF9327-CVV003	234	250	381	350	110	220	367	171	6.5
EVF9328-CVV003									

¹⁾ For a fieldbus module plugged onto X1, consider mounting space for connecting cables

Mounting

Apply heat conducting paste before screwing together the cooler and cooling plate of the drive controller so that the heat transfer resistance is as low as possible.

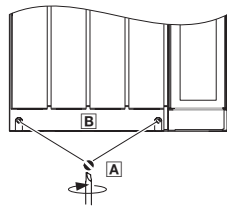
1. Clean the contact surface of cooler and cooling plate with spirit.
2. Apply a thin coat of heat conducting paste with a filling knife or brush.
 - The heat conducting paste in the accessory kit is sufficient for an area of approx. 1000 cm².
3. Mount the drive controller on the cooler.

4.3 Standard devices with a power of 45 kW

4.3.1 Important notes

The accessory kit is located inside the controller.

Remove the cover of the drive controller



9300vec113

1. Remove the screws **A**
2. Lift cover **B** up and detach it

Mass of the devices

9300	Standard device	"Cold plate" device
Type	EVF93xx-EV [kg]	EVF93xx-CV [kg]
EVF9330-xV	36.0	—

4 Installing of the standard device

4.3 Standard devices with a power of 45 kW

4.3.2 Mounting with fixing brackets (standard)

4.3.2 Mounting with fixing brackets (standard)

Mounting material required from the scope of supply:

Description	Use	Quantity
Fixing bracket	Drive controller fixing	4
Hexagon head cap screw M8 × 16 mm (DIN 933)	Mounting of fixing bracket to the drive controller	4
Washer Ø 8.4 mm (DIN 125)	For hexagon head cap screw	4
Spring washer Ø 8 mm (DIN 127)	For hexagon head cap screw	4

Dimensions

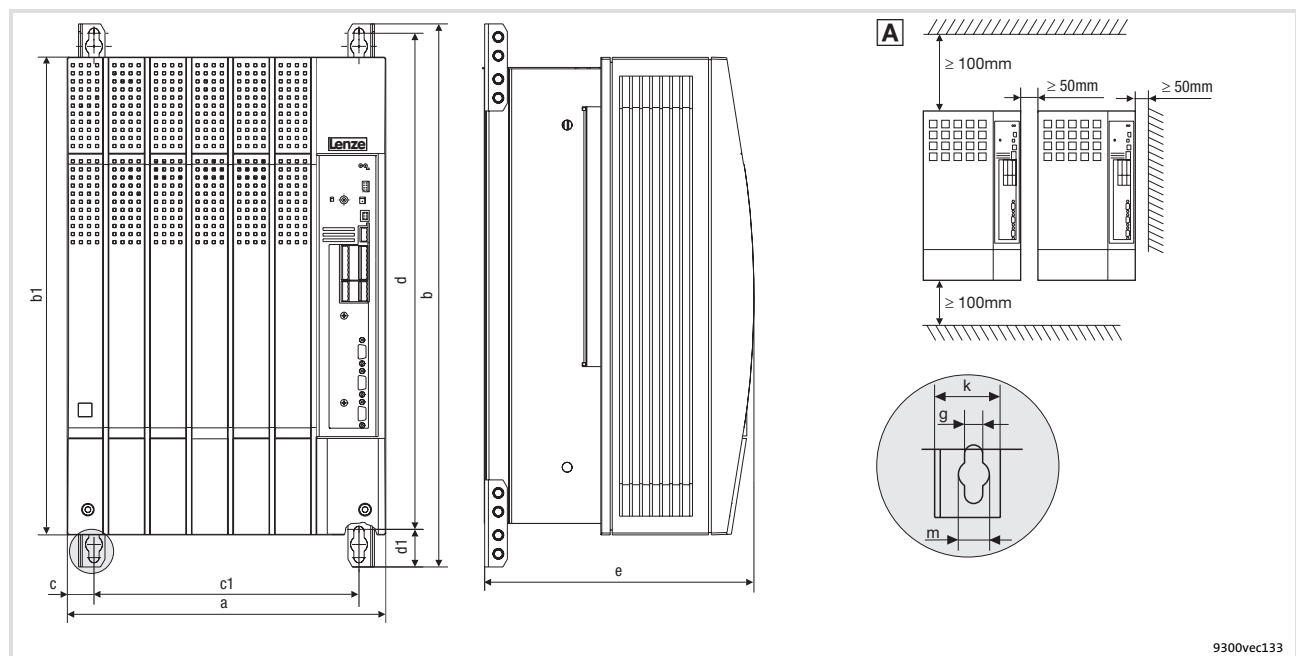


Fig. 4.3-1 Standard mounting with fixing brackets 45 kW

- A Arrange drive controllers in a row with spacing to be able to remove eye bolts

9300 vector	Dimensions [mm]										
Type	a	b	b1	c	c1	d	d1	e ¹⁾	g	k	m
EVF9330-EV	340	580	510	28.5	283	532	38	285	11	28	18

¹⁾ For a fieldbus module plugged onto X1, consider mounting space for connecting cables

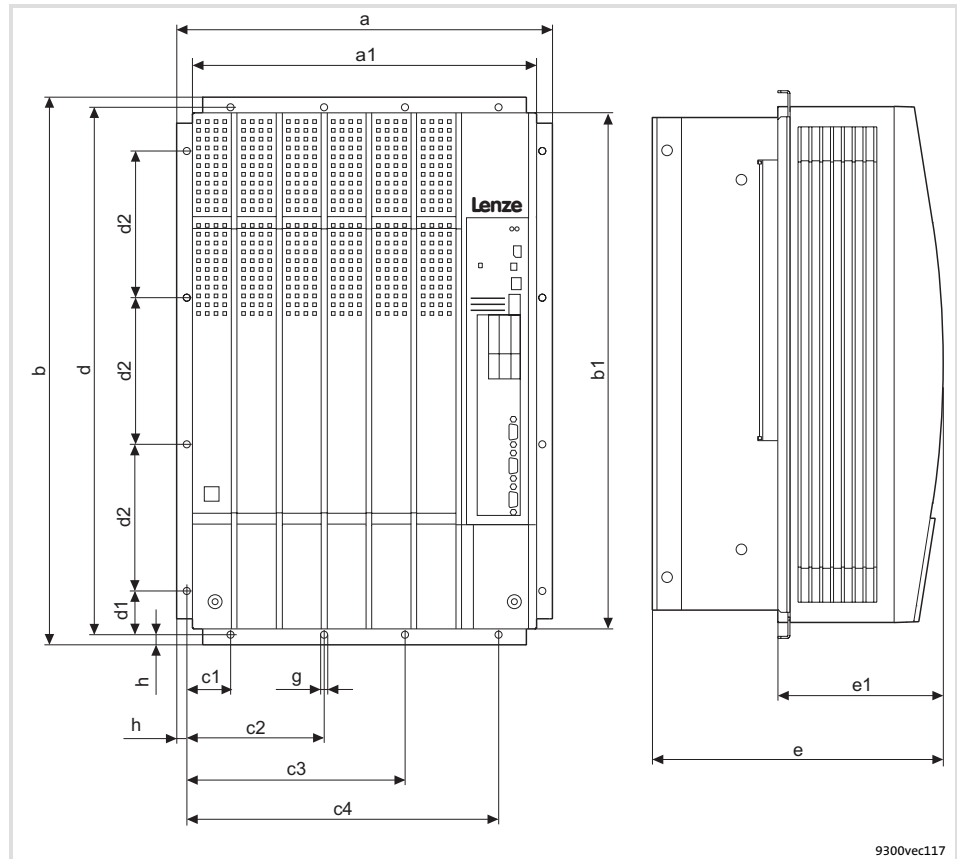
Mounting

- Attach the fixing brackets to the heatsink plate of the drive controller.

4.3.3 Thermally separated mounting (push-through technique)

For mounting in push-through technique, the drive controller of type EVF93xx-EV must be used. In addition, the mounting set EJ0010 for push-through technique is required.

Dimensions



9300vec117

Fig. 4.3-2 Dimensions for thermally separated mounting 45 kW

9300 vector	Dimensions [mm]														
Type	a	a1	b	b1	c1	c2	c3	c4	d	d1	d2	e ¹⁾	e1	g	h
EVF9330-EV	373	340	543	510	45	137.5	217.5	310	525	45	145	285	163.5	7	9

¹⁾ For a fieldbus module plugged onto X1, consider mounting space for connecting cables

Mounting cutout in control cabinet

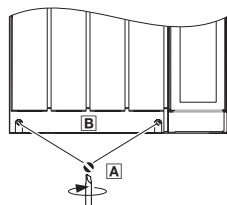
9300 vector	Dimensions [mm]	
Type	Width	Height
EVF9330-EV	320	492

4.4 Standard devices in the power range of 55 kW

4.4.1 Important notes

The accessory kit is located inside the controller.

Remove the cover of the drive controller



9300vec113

1. Remove the screws **A**
2. Lift cover **B** up and detach it

Mass of the devices

9300	Standard device	"Cold plate" device
Type	EVF93xx-EV [kg]	EVF93xx-CV [kg]
EVF9331-xV	38.0	—

4 Installing of the standard device

4.4 Standard devices in the power range of 55 kW

4.4.2 Mounting with fixing brackets (standard)

4.4.2 Mounting with fixing brackets (standard)

Mounting material required from the scope of supply:

Description	Use	Quantity
Fixing bracket	Drive controller fixing	4
Hexagon head cap screw M8 × 16 mm (DIN 933)	Mounting of fixing bracket to the drive controller	4
Washer Ø 8.4 mm (DIN 125)	For hexagon head cap screw	4
Spring washer Ø 8 mm (DIN 127)	For hexagon head cap screw	4

Dimensions

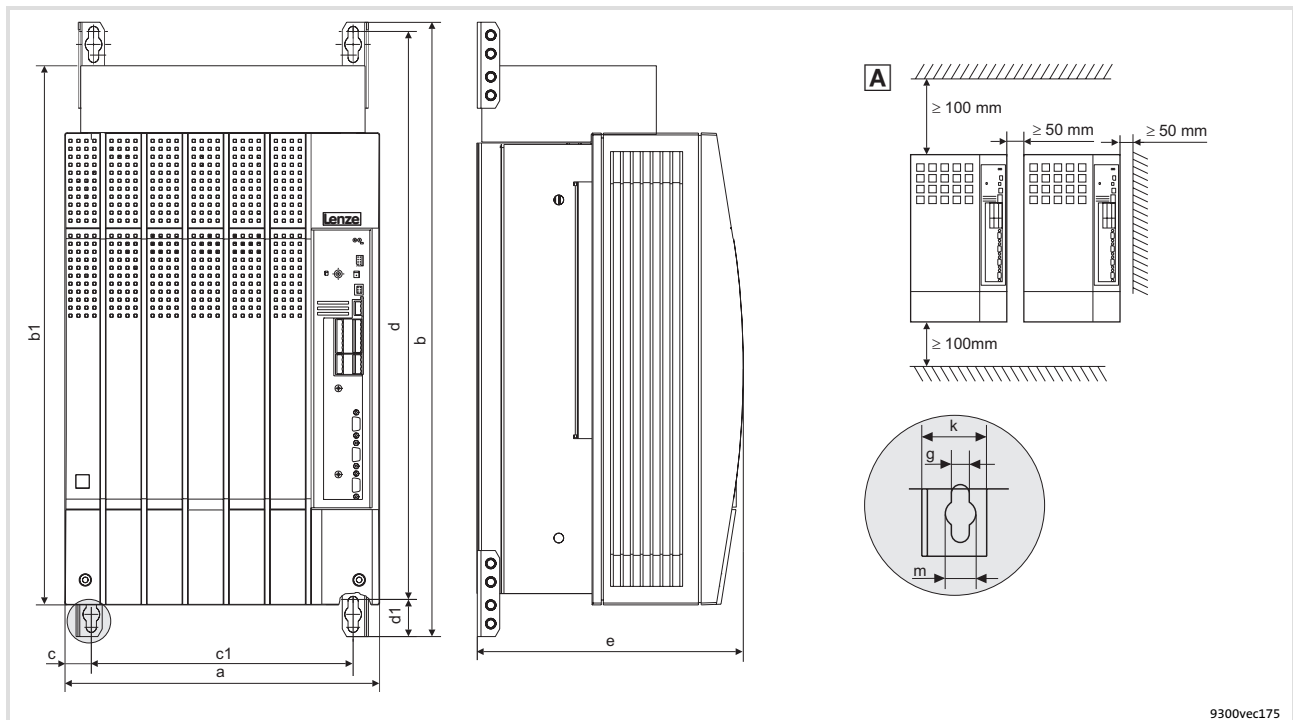


Fig. 4.4-1 Standard mounting with fixing brackets 55 kW

A Arrange drive controllers in a row with spacing to be able to remove eye bolts

9300 vector	Dimensions [mm]										
Type	a	b	b1	c	c1	d	d1	e ¹⁾	g	k	m
EVF9331-EV	340	672	591	28.5	283	615	38	285	11	28	18

¹⁾ For a fieldbus module plugged onto X1, consider mounting space for connecting cables

Mounting

► Attach the fixing brackets to the heatsink plate of the drive controller.

4.4.3 Thermally separated mounting (push-through technique)

For mounting in push-through technique, the drive controller of type EVF93xx-EV must be used. In addition, the mounting set EJ0010 for push-through technique is required.

- For thermally separated mounting you have to modify the fan module.
(4.4-4)

Dimensions

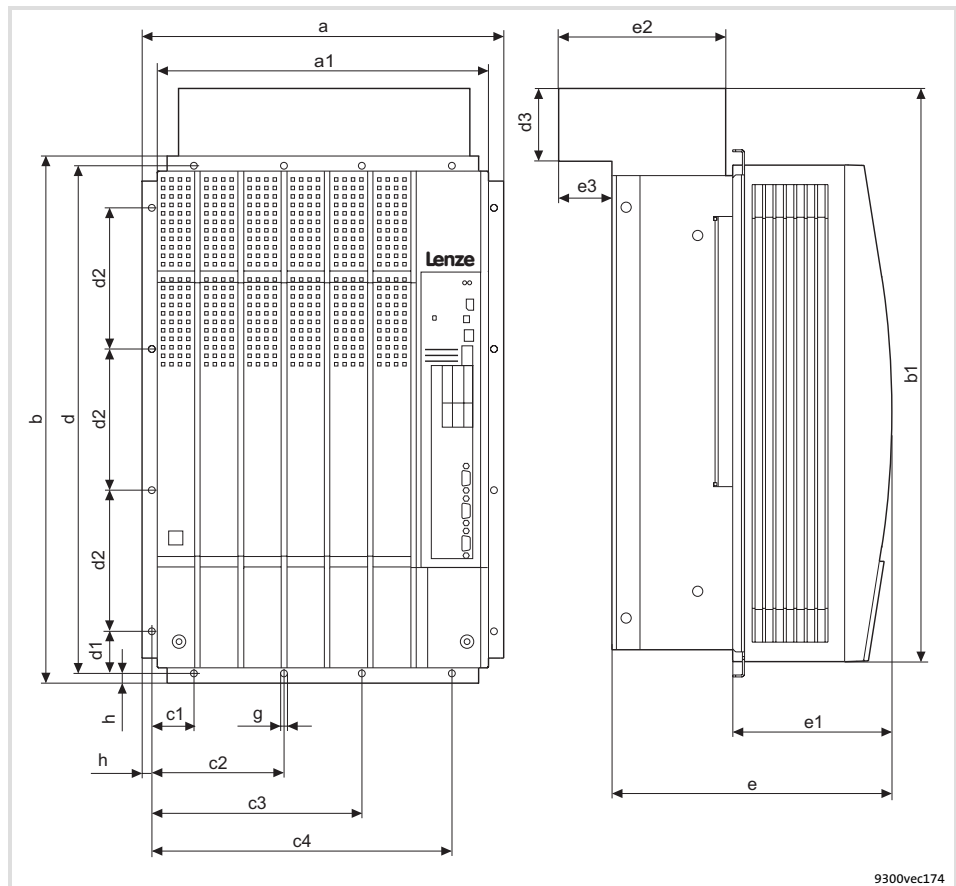


Fig. 4.4-2 Dimensions for thermally separated mounting 55 kW

9300 vector	Dimensions [mm]																	
Type	a	a1	b	b1	c1	c2	c3	c4	d	d1	d2	d3	e ¹⁾	e1	e2	e3	g	h
EVF9331-EV	373	340	543	591	45	137.5	217.5	310	525	45	145	81	285	163.5	185	66	7	9

¹⁾ For a fieldbus module plugged onto X1, consider mounting space for connecting cables

Mounting cutout in control cabinet

9300 vector	Dimensions [mm]	
Type	Width	Height
EVF9331-EV	320	515

4.4.4

Modification of the fan module for push-through technique

For thermally separated mounting the fan module has to be rotated by 180° so that the controller fits into the mounting cutout.

Removing the fan module

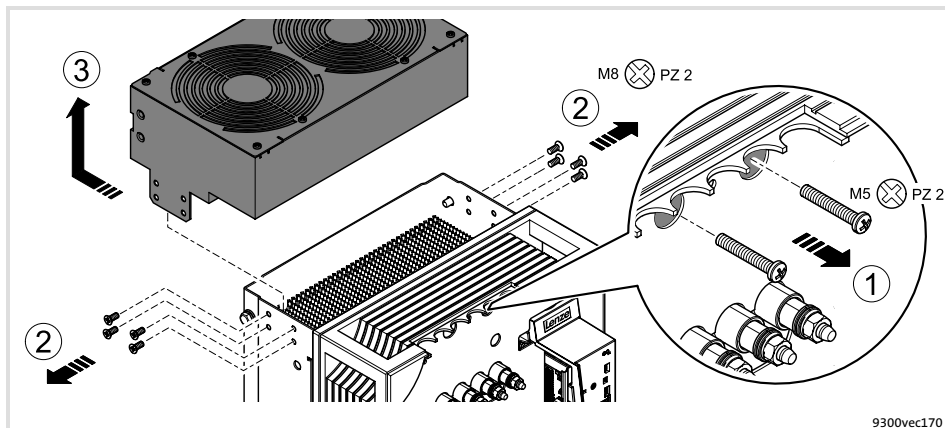


Fig. 4.4-3 Removing the fan module from the controller

1. Remove both screws.

The screws connect the fans to the supply voltage.

2. Remove the 4 screws for fixing the fan module on each side.

3. Pull back the fan module and carefully remove it to the top.

Make sure that the threaded sleeves do not touch the housing edge. They may break off.

Modifying the threaded sleeves on the fan module

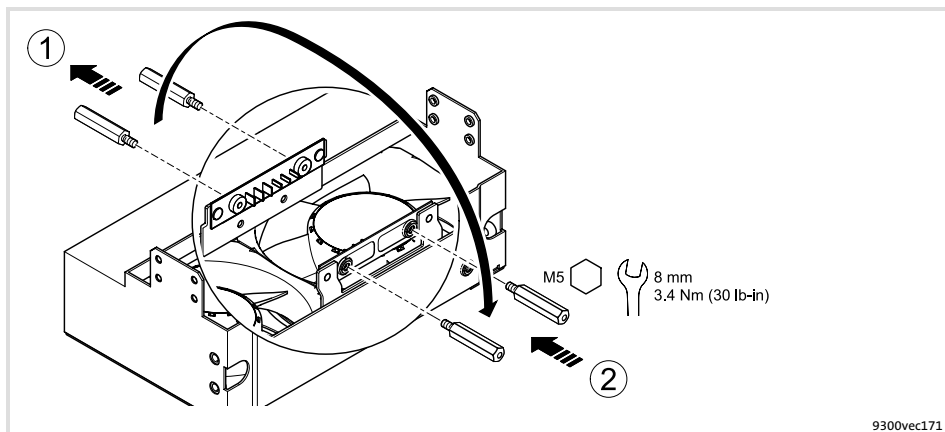


Fig. 4.4-4 Modifying the threaded sleeves for the voltage supply of the fans

1. Remove the threaded sleeves.

2. Screw-in the threaded sleeves on the opposite side and fasten them.

Plugging the fan connecting cable to another terminal on the fan module

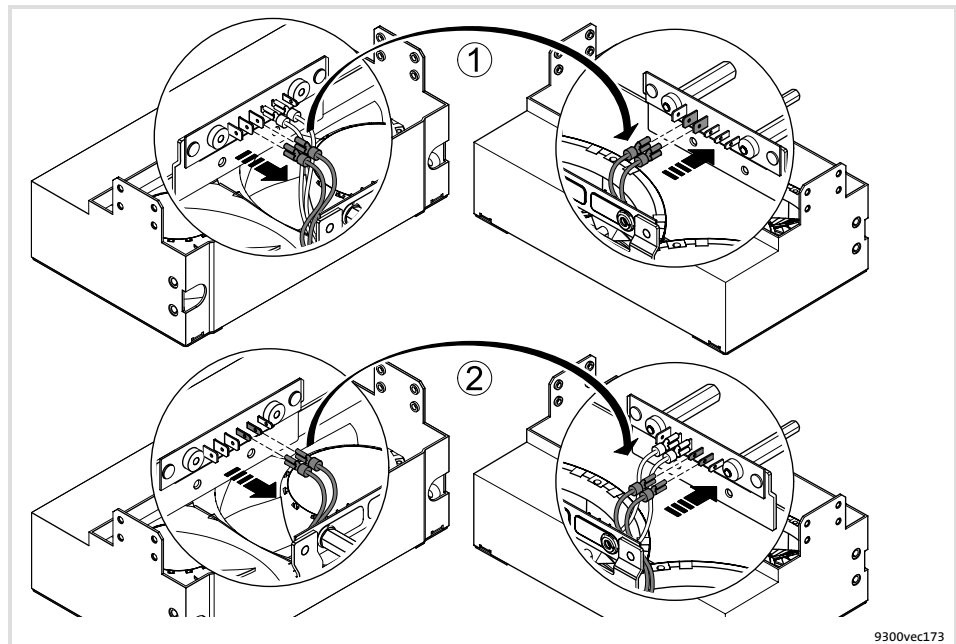


Fig. 4.4-5 Plugging the fan connecting cable for the voltage supply to another terminal

1. Remove the cable lugs of the two red connecting cables and plug them in again on the diagonally arranged side.
2. Remove the cable lugs of the two blue connecting cables and plug them in again on the diagonally arranged side.

Mounting the fan module in a manner rotated by 180°

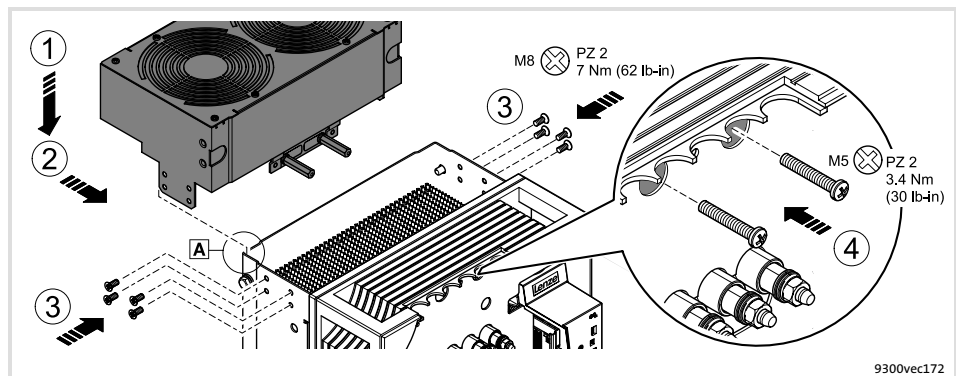


Fig. 4.4-6 Mounting the fan module on the controller

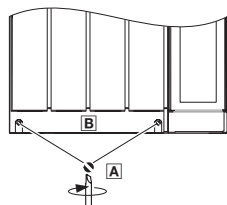
1. Place the fan module onto the controller. Insert the lugs at the back into the base plate **A**.
 Make sure that the threaded sleeves do not touch the housing edge. They may break off.
2. Push the fan module to the front.
3. Screw-in and fasten the 4 screws for fixing the fan module on each side.
4. Screw-in and fasten the two screws for the supply voltage.

4.5 Standard devices in the power range 75 ... 90 kW

4.5.1 Important notes

The accessory kit is located inside the controller.

Remove the cover of the drive controller



9300vec113

1. Remove the screws **A**
2. Lift cover **B** up and detach it

Mass of the devices

9300	Standard device	"Cold plate" device
Type	EVF93xx-EV [kg]	EVF93xx-CV [kg]
EVF9332-xV	59.0	–
EVF9333-xV	59.0	–

4 Installing of the standard device

4.5 Standard devices in the power range 75 ... 90 kW

4.5.2 Mounting with fixing brackets (standard)

4.5.2 Mounting with fixing brackets (standard)

Mounting material required from the scope of supply:

Description	Use	Quantity
Fixing bracket	Drive controller fixing	4
Hexagon head cap screw M8 × 16 mm (DIN 933)	For fixing bracket	8
Washer Ø 8.4 mm (DIN 125)	For hexagon head cap screw	8
Spring washer Ø 8 mm (DIN 127)	For hexagon head cap screw	8

Dimensions

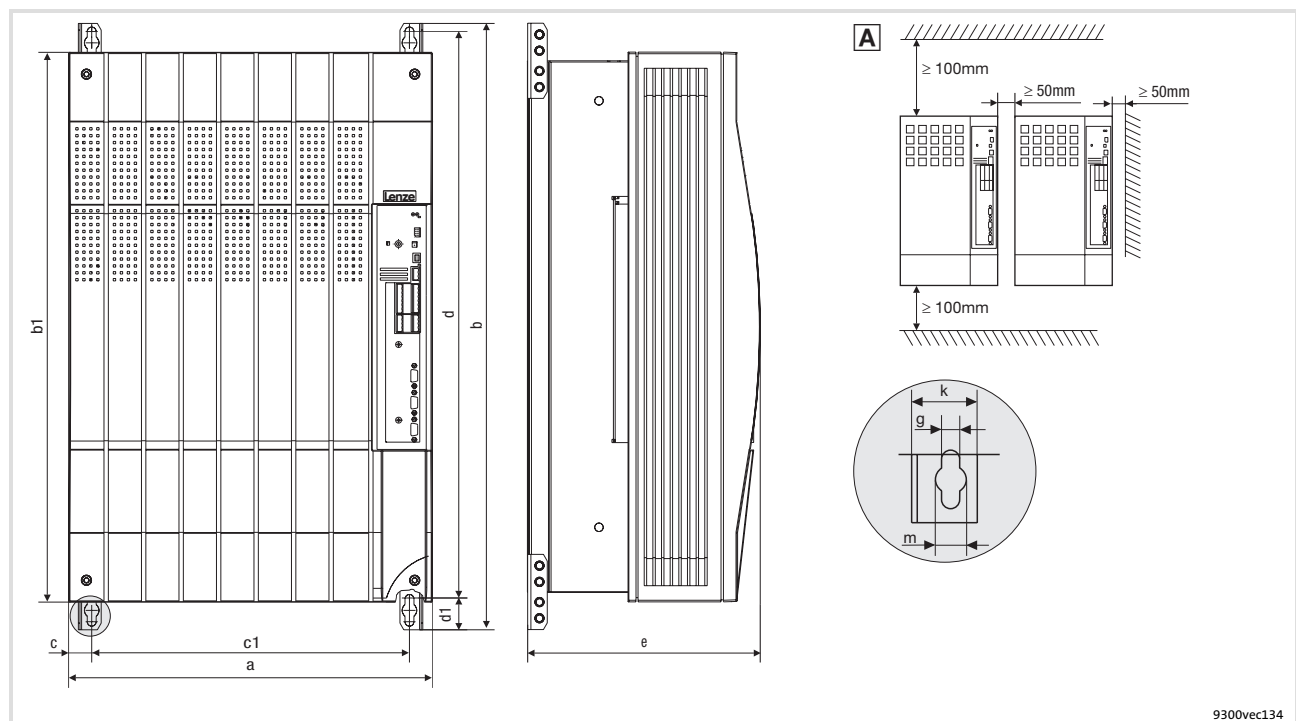


Fig. 4.5-1 Standard mounting with fixing brackets 75 ... 90 kW

A Drive controllers can be mounted side by side without spacing

9300 vector	Dimensions [mm]										
Type	a	b	b1	c	c1	d	d1	e ¹⁾	g	k	m
EVF9332-EV	450	750	680	28.5	393	702	38	285	11	28	18
EVF9333-EV											

¹⁾ For a fieldbus module plugged onto X1, consider mounting space for connecting cables

Mounting

► Attach the fixing brackets to the heatsink plate of the drive controller.

4.5.3 Thermally separated mounting (push-through technique)

For mounting in push-through technique, the drive controller of type EVF93xx-EV must be used. In addition, the mounting set EJ0009 for push-through technique is required.

Dimensions

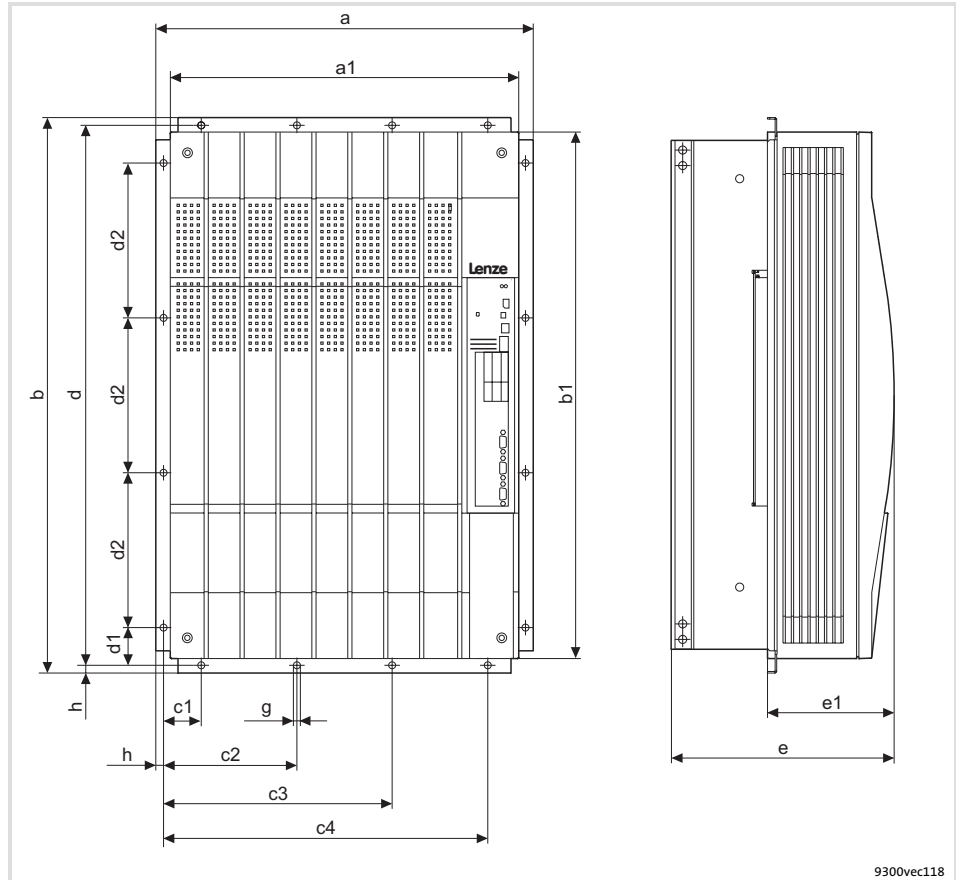


Fig. 4.5-2 Dimensions for thermally separated mounting 75 ... 90 kW

9300 vector	Dimensions [mm]														
Type	a	a1	b	b1	c1	c2	c3	c4	d	d1	d2	e ¹⁾	e1	g	h
EVF9332-EV	48	45		68					69		20	28	16		
EVF9333-EV	8	0	718	0	49	172.5	295.5	419.5	8	49	0	5	4	9	10

¹⁾ For a fieldbus module plugged onto X1, consider mounting space for connecting cables

Mounting cutout in control cabinet

EVF9332-EV	428.5	660
EVF9333-EV		

5 Wiring of the standard device

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5.1 Important notes



Stop!

The drive controller contains electrostatically sensitive components.

The personnel must be free of electrostatic charge when carrying out assembly and service operations.

5.1.1 Protection of persons



Danger!

Before working on the controller, check that all power terminals are deenergised:

- ▶ The power terminals U, V, W, +U_G and -U_G remain live for at least 3 minutes after disconnection from the mains.
- ▶ The power terminals L1, L2, L3, U, V, W, +U_G and -U_G remain live when the motor is stopped.

Pluggable terminal strips

All pluggable terminals must only be connected or disconnected when no voltage is applied!

5 Wiring of the standard device

5.1 Important notes

5.1.1 Protection of persons

Electrical isolation

The terminals X1 and X5 have a double (reinforced) insulation in accordance with EN 61800-5-1. The protection against accidental contact is ensured without any further measures.



Danger!

- Terminals X3, X4, X6, X8, X9, X10, X11 have a single basic insulation (single isolating distance).
- Protection against accidental contact in case of a defective isolating distance is only guaranteed through external measures, e.g. double insulation.
- If an external DC 24 V voltage source is used, the insulation level of the controller depends on the insulation level of the voltage source.

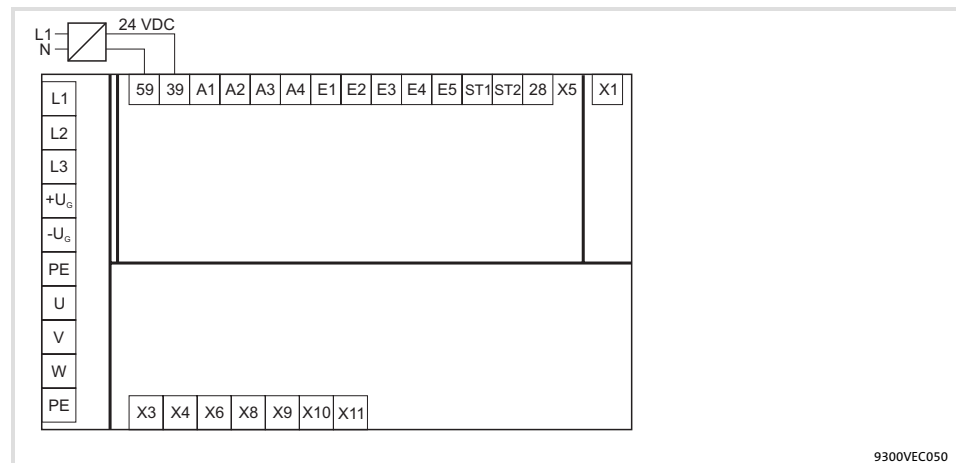


Fig. 5.1-1 Electrical isolation between power terminals, control terminals and housing



Double (reinforced) insulation
Basic insulation

Replacing defective fuses

Only replace defective fuses in the deenergised state to the type specified.

Disconnecting the controller from the mains

Only carry out the safety-related disconnection of the controller from the mains via a contactor on the input side or a manually operated toggle switch.

5.1.2 Device protection

- ▶ In the event of condensation, only connect the controller to the mains voltage after the humidity has evaporated.
- ▶ The controller is protected by external fuses.
- ▶ Drive controllers EVF9324-xV, EVF9326-xV and EVF9328-xV ... EVF9333-xV must only be operated with assigned mains choke / mains filter.
- ▶ Length of the screws for connecting the shield sheet for the control cables: **12 mm**.
- ▶ Provide unused control inputs and outputs with terminal strips. Cover unused Sub-D sockets with protective covers included in the scope of supply.
- ▶ Switching on the motor side of the controller is only permissible for safety shutdown (emergency-off).
- ▶ Frequent mains switching (e.g. inching mode via mains contactor) can overload and destroy the input current limitation of the drive controller:
 - At least 3 minutes must pass between switching off and restarting the devices EVF9321-xV and EVF9322-xV.
 - At least 3 minutes must pass between two starting procedures of the devices EVF9323-xV ... EVF9333-xV.
 - Use the "safe torque off" safety function (STO) if safety-related mains disconnections occur frequently. The drive variants Vxx4 are equipped with this function.

5.1.3 Motor protection

- ▶ Extensive protection against overload:
 - By overcurrent relays or temperature monitoring.
 - We recommend the use of PTC thermistors or thermostats to monitor the motor temperature.
 - PTC thermistors or thermostats can be connected to the controller.
 - For monitoring the motor, we recommend the use of the $I^2 \times t$ monitoring.
- ▶ Only use motors with an insulation suitable for the inverter operation:
 - Insulation resistance: min. $\hat{u} = 1.5 \text{ kV}$, min. $du/dt = 5 \text{ kV}/\mu\text{s}$
 - When using motors with an unknown insulation resistance, please contact your motor supplier.

5.2 Notes on project planning

5.2.1 Supply forms / electrical supply conditions

Observe the restrictions for the different supply forms!

Supply system	Operation of controller	Notes
Supply system: TT, TN (with earthed neutral)	Permitted without restrictions.	- Observe the rated data of the controller - RMS mains current: see chapter "Technical data".
Supply system: IT (with isolated neutral)	Possible if the controller is protected in the event of an earth fault in the supply system - by means of suitable devices which detect the earth fault and - immediately separate the controller from the supply system.	- Safe operation in the event of an earth fault at the inverter output cannot be guaranteed. - The variants V024 / V104 and V100 enable operation of the controller on IT systems.
DC supply via +U _G /-U _G	Permitted if the DC voltage is symmetrical to PE.	Earthing of the +U _G or -U _G conductor will destroy the controller.

5.2.2 Operation on public supply systems (compliance with EN 61000-3-2)

European standard EN 61000-3-2 defines limit values for the limitation of harmonic currents in the supply system. Non-linear consumers (e.g. frequency inverters) generate harmonic currents which "pollute" the supplying mains and may therefore interfere with other consumers. The standard aims at assuring the quality of public supply systems and reducing the mains load.



Note!

The standard only applies to public systems. Mains which are provided with a transformer substation of their own as in industrial plants are not public and not included in the application range of the standard.

If a device or machine consists of several components, the limit values of the standard apply to the entire unit.

Measures for compliance with the standard

With the measures described, the controllers comply with the limit values according to EN 61000-3-2.

Operation on public supply systems	EN 61000-3-2	Limitation of harmonic currents
	Total power on the mains	Compliance with the requirements ¹⁾
	< 1 kW	With mains choke
	> 1 kW	No measures required

¹⁾ The additional measures mentioned have the effect that solely the controllers meet the requirements of EN 61000-3-2. The machine/system manufacturer is responsible for the compliance with the requirements for the machine/system!

5.2.3 Controllers in the IT system

Controllers in the V024, V104 or V100 variants are suitable for operation on insulated supply systems (IT systems). The controllers also have an insulated design. This avoids the activation of the insulation monitoring, even if several controllers are installed.

The electric strength of the controllers is increased so that damage to the controller are avoided if insulation or earth faults in the supply system occur. The operational reliability of the system remains intact.



Stop!

Only operate the controllers with the mains chokes assigned.

Operation with mains filters or RFI filters by Lenze is not permitted, as these modules contain components that are interconnected against PE. By this the protective design of the IT system would be cancelled out. The components are destroyed in the case of an earth fault.

Protect the IT system against earth fault at the controller.

Due to physical conditions, an earth fault on the motor side at the controller can interfere with or damage other devices on the same IT system. Therefore appropriate measures have to be implemented, by means of which the earth fault is detected and which disconnect the controller from the mains.

Permissible supply forms and electrical supply conditions

Mains	Operation of the controllers	Notes
With isolated star point (IT systems)	Possible, if the controller is protected in the event of an earth fault in the supplying mains. • Possible, if appropriate earth fault detections are available and • the controller is immediately disconnected from the mains.	Safe operation in the event of an earth fault at the inverter output cannot be guaranteed.

DC-bus operation of several drives

Central supply with 9340 regenerative power supply module is not possible.

Installation of the CE-typical drive system

For the installation of drives on IT systems, the same conditions apply as for the installation on systems with an earthed neutral point.

According to the binding EMC product standard EN61800-3, no limit values are defined for IT systems for noise emission in the high-frequency range.

5.2.4 Operation at earth-leakage circuit breaker (e.l.c.b.)



Danger!

The controllers are internally fitted with a mains rectifier. In case of a short circuit to frame a pulsating DC residual current can prevent the AC sensitive or pulse current sensitive earth-leakage circuit breakers from being activated, thus cancelling the protective function for the entire equipment being operated on this earth-leakage circuit breaker.

- ▶ For the protection of persons and farm animals (DIN VDE 0100), we recommend
 - pulse current sensitive earth-leakage circuit breakers for plants including controllers with a single-phase mains connection (L1/N).
 - universal-current sensitive earth-leakage circuit breakers for plants including controllers with a three-phase mains connection (L1/L2/L3).
- ▶ Only install the earth-leakage circuit breaker between supplying mains and drive controller.
- ▶ Earth-leakage circuit breakers may trigger a false alarm due to
 - capacitive compensation currents flowing in the cable shields during operation (particularly with long, shielded motor cables),
 - simultaneous connection of several inverters to the mains
 - the use of additional interference filters.

5.2.5 Interaction with compensation equipment

- ▶ Controllers only consume very little reactive power of the fundamental wave from the AC supply mains. Therefore, a compensation is not required.
- ▶ If the controllers are connected to a supply system with compensation equipment, this equipment must comprise chokes.
 - For this, contact the supplier of the compensation equipment.

5.2.6 Discharge current for mobile systems

Frequency inverters with internal or external RFI filters usually have a discharge current to PE potential that is higher than 3.5 mA AC or 10 mA DC. Therefore, fixed installation as protection is required (see EN 61800-5-1). This must be indicated in the operational documents.

If a fixed installation is not possible for a mobile consumer although the discharge current to PE potential is higher than 3.5 mA AC or 10 mA DC, an additional two-winding transformer (isolating transformer) can be included in the current supply as a suitable countermeasure. Here, the PE conductor is connected to the PE of the drive (filter, inverter, motor, shieldings) and also to one of the poles of the secondary winding of the isolating transformer.

Devices with a three-phase supply must have a corresponding isolating transformer with a secondary star connection, the star point being connected to the PE conductor.

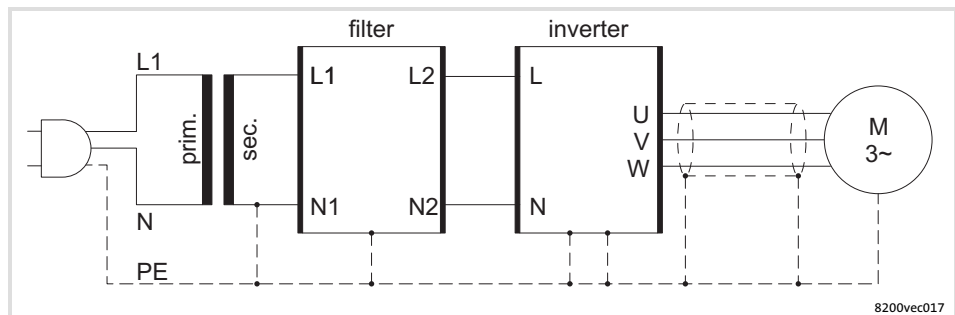


Fig. 5.2-1 Installation of a two-winding transformer (isolating transformer)

5.2.7 Optimisation of the controller and mains load

A mains choke is an inductance which can be included in the mains cable of the frequency inverter. As a result, the load of the supplying mains and the controller is optimised:

- ▶ Reduced system perturbation: The curved shape of the mains current approaches a sinusoidal shape.
- ▶ Reduced mains current: The effective mains current is reduced, i.e. the mains, cable, and fuse loads are reduced.
- ▶ Increased service life of the controller: The electrolytic capacitors in the DC bus have a considerably increased service life due to the reduced AC current load.

There are no restrictions for the combinations of mains chokes and RFI filters and/or motor filters. Alternatively, a mains filter can be used (combination of mains choke and RFI filter in a common housing).



Note!

- ▶ Some controllers must generally be operated with a mains choke or a mains filter.
- ▶ If a mains choke or a mains filter is used, the maximum possible output voltage does not reach the value of the mains voltage (typical voltage drop at the rated point 4 ... 6 %).

5.2.8 Reduction of noise emissions

Due to internal switching operations, every controller causes noise emissions which may interfere with the functions of other consumers. Depending on the site of the frequency inverter, European standard EN 61800-3 defines limit values for these noise emissions:

Limit class C2: Limit class C2 is often required for industrial mains which are isolated from the mains of residential areas.

Limit class C1: If the controller is operated in a residential area, it may interfere with other devices such as radio and television receivers. Here, interference suppression measures according to limit class C1 are often required.

Limit class C1 is much more strict than limit class C2. Limit class C1 includes limit class C2.

For compliance with limit class C1 / C2, corresponding measures for the limitation of noise emissions are required, e.g. the use of RFI filters.

There are no restrictions for the combinations of RFI filters and mains chokes and/or motor filters. Alternatively, a mains filter can be used (combination of mains choke and RFI filter in a common housing).

The selection of the frequency inverter and the corresponding filters, if applicable, always depends on the application in question and is determined by e.g. the switching frequency of the controller, the motor cable length, or the protective circuit (e.g. earth-leakage circuit breakers).



Note!

- Some controllers must generally be operated with a mains choke or a mains filter.
- If a mains choke or a mains filter is used, the maximum possible output voltage does not reach the value of the mains voltage (typical voltage drop at the rated point 4 ... 6 %).

The graphics below illustrates the maximum possible motor cable length based on the type of filter and the resulting interference voltage category according to EN 61800-3. Depending on the used motor cable, the used controller, and its switching frequency, the mentioned maximum motor cable lengths may vary.

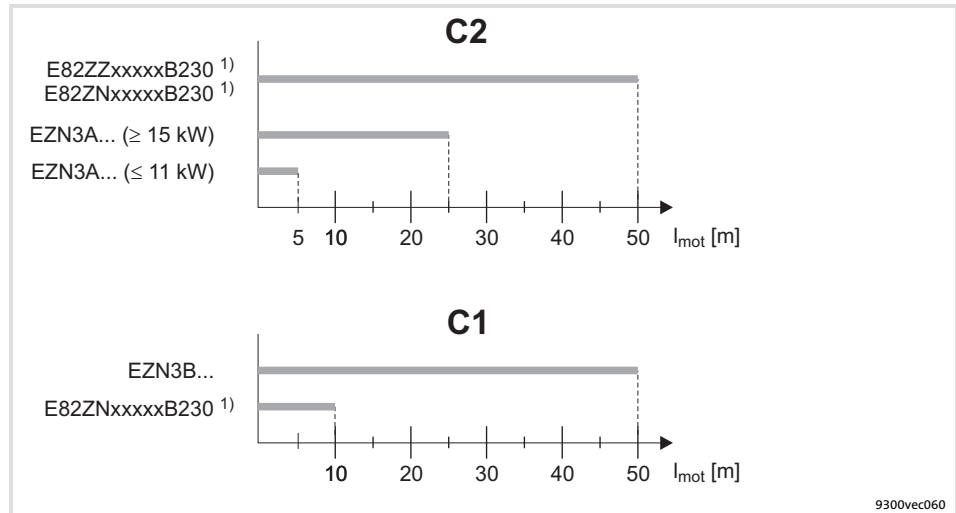


Fig. 5.2-2 Maximum motor cable lengths l_{mot} based on the type of filter for compliance with limit class C2 / C1

1) Use low-capacitance cables

5.2.9 Mains choke/mains filter assignment

Operation with rated power (normal operation)

9300	Mains choke	Interference voltage category according to EN 61800-3 and motor cable length			
Type		Component		Component	
		C2	max. [m]	C1	max. [m]
EVF9321-xV	EZN3A2400H002	EZN3A2400H002	5	EZN3B2400H002	50
EVF9322-xV	EZN3A1500H003	EZN3A1500H003	5	EZN3B1500H003	50
EVF9323-xV	EZN3A0900H004	EZN3A0900H004	5	EZN3B0900H004	50
EVF9324-xV	EZN3A0500H007	EZN3A0500H007	5	EZN3B0500H007	50
EVF9325-xV	EZN3A0300H013	EZN3A0300H013	5	EZN3B0300H013	50
EVF9326-xV	ELN3-0150H024-001	EZN3A0150H024	5	EZN3B0150H024	50
EVF9327-xV	ELN3-0088H035-001	EZN3A0110H030	25	E82ZN22334B230	10
				E82ZZ15334B230 ¹⁾	10
		E82ZN22334B230	50	EZN3B0110H030U ²⁾	50
		E82ZZ15334B230 ¹⁾	50		
EVF9328-xV	ELN3-0075H045	EZN3A0080H042	25	E82ZN22334B230	10
		E82ZN22334B230	50	EZN3B0080H042	50
EVF9329-xV	ELN3-0055H055	EZN3A0055H060	25	E82ZN30334B230	10
		E82ZN30334B230	50	EZN3B0055H060	50
EVF9330-xV	ELN3-0038H085	EZN3A0037H090	25	E82ZN45334B230	10
		E82ZN45334B230	50	EZN3B0037H090	50
EVF9331-xV	ELN3-0027H105-001	EZN3A0030H110	25	E82ZN55334B230	10
		EZN3A0030H110N001 ³⁾	25		
		E82ZN55334B230	50	EZN3B0030H110	50
EVF9332-xV	ELN3-0022H130	EZN3A0022H150	25	E82ZN75334B230	10
		E82ZN75334B230	50	EZN3B0022H150	50
EVF9333-xV	ELN3-0017H170	EZN3A0017H200	25	E82ZN90334B230	10
		E82ZN90334B230	50	EZN3B0017H200	50

- ¹⁾ RFI filter
²⁾ Footprint filter
³⁾ For controllers with thermal separation

Operation with increased rated power

9300	Mains choke	Interference voltage category according to EN 61800-3 and motor cable length			
Type		Component		Component	
		C2	max. [m]	C1	max. [m]
EVF9321-xV	EZN3A2400H002	EZN3A2400H002	5	EZN3B2400H002	50
EVF9322-xV	EZN3A1500H003	EZN3A1500H003	5	EZN3B1500H003	50
EVF9323-xV	EZN3A0750H005	EZN3A0750H005	5	EZN3B0750H005	50
EVF9324-xV	EZN3A0400H009	EZN3A0400H009	5	EZN3B0400H009	50
EVF9325-xV	EZN3A0300H013	EZN3A0300H013	5	EZN3B0250H015	50
EVF9327-xV	ELN3-0075H045	EZN3A0080H042	25	E82ZN22334B230	10
		E82ZN22334B230	50	EZN3B0080H042	50
EVF9328-xV	ELN3-0055H055	EZN3A0055H060	25	E82ZN30334B230	10
		E82ZN30334B230	50	EZN3B0055H060	50
EVF9329-xV	—	EZN3B0055H060N003	50	EZN3B0055H060N003	50
EVF9330-xV	ELN3-0027H105-001	EZN3A0030H110	25	E82ZN55334B230	10
				EZN3B0030H110N001 ³⁾	25
		E82ZN55334B230	50	EZN3B0030H110	50
EVF9331-xV	ELN3-0027H105-001	EZN3A0030H110	25	EZN3B0030H110	50
		EZN3A0030H110N001 ³⁾	25		
EVF9332-xV	ELN3-0017H170	EZN3A0017H200	25	E82ZN90334B230	10
		E82ZN90334B230	50	EZN3B0017H200	50
EVF9333-xV	ELN3-0014H200	EZN3A0015H230	25	EZN3B0015H230	50
		EZN3A0017H200	25	EZN3B0017H200	50

³⁾ For controllers with thermal separation

5.2.10 Motor cable

Specification

- The used motor cables must
 - meet the requirements on site (e.g. EN 60204-1, UL),
 - comply with the following voltage data: EN 0.6/1 kV, UL 600 V.
- For shielded motor cables, only use cables with braid made of tinned or nickel-plated copper. Shields made of steel braid are not suitable.
 - The overlap rate of the braid must be at least 70 % with an overlap angle of 90°.
- Use low-capacitance motor cables:

Power class	Capacitance per unit length	
	Core/core	Core/shield
3 ... 11 kW	from 2.5 mm ² ≤100 pF/m	≤ 150 pF/m
15 ... 30 kW	≤ 140 pF/m	≤ 230 pF/m
45 ... 55 kW	≤ 190 pF/m	≤ 320 pF/m
75 ... 90 kW	≤ 250 pF/m	≤ 410 pF/m

Cable length

- Ensure that the motor cable is as short as possible to have a positive effect on the drive behaviour.
- In group drives (multiple motors on one controller), the resulting cable length l_{res} is the crucial factor:

$l_{res} [m] = (l_1 + l_2 + l_3 \dots + l_i) \cdot \sqrt{i}$	l_x	Length of the individual motor cable
	l_{res}	Resulting length of the motor cable
	i	Number of individual motor cables

- The "technical data" (chap. 3.1) provided for the motor cable length must be observed.

Cable cross-section

**Note!**

The cable cross-sections have been assigned to the permissible current loading of the motor cables under the following conditions:

- ▶ Compliance with IEC/EN 60204-1 for fixed cable installation
- ▶ Compliance with IEC 60354-2-52, table A.52-5 when using the cable in a trailing cable
- ▶ Laying system C
- ▶ Ambient temperature 45 °C
- ▶ Continuous motor operation at a
 - standstill current I_0 for servo motors or a
 - rated current I_R for three-phase asynchronous motors

The user is responsible for selecting a motor cable which complies with the requirements of the current conditions if different situations arise. Different situations may arise due to:

- ▶ Laws, standards, national and regional regulations
- ▶ Type of application
- ▶ Motor utilisation
- ▶ Ambient and operating conditions
- ▶ Laying system and bundling of cables
- ▶ Cable type

Motor cable		Cable cross-section	
permanently installed	for trailing cable		
I_M [A]	I_M [A]	[mm ²]	[AWG]
10.0	11.8	1.0	18
13.8	17.3	1.5	16
19.1	23.7	2.5	14
25.5	30.9	4.0	12
32.8	41.0	6.0	10
45.5	55.5	10	8
60.1	75.5	16	6
76.4	92.8	25	4
94.6	115	35	2
114	140	50	1
146	179	70	00
177	217	95	000
205	252	120	0000

**Note!**

Information on the design of the motor cable is provided in the "System cables and system connectors" manual.

5.3 Basics for wiring according to EMC

5.3.1 Shielding

The quality of shielding is determined by a good shield connection:

- ▶ Connect the shield with a large surface.
- ▶ Connect the shield directly to the intended shield sheet of the device.
- ▶ In addition, connect the shield to the conductive and earthed mounting plate with a large contact surface by using a conductive clamp.
- ▶ Unshielded cable ends must be as short as possible.

5.3.2 Mains connection, DC supply

- ▶ Controllers, mains chokes, or mains filters may only be connected to the mains via unshielded single cores or unshielded cables.
- ▶ When a mains filter or RFI filter is used, shield the cable between mains filter or RFI filter and controller if its length exceeds 300 mm. Unshielded cores must be twisted.
- ▶ In DC-bus operation or DC supply, use shielded cables.
- ▶ The cable cross-section must be dimensioned for the assigned fusing (observe national and regional regulations).

5.3.3 Motor cable

- ▶ Only use shielded motor cables with braids made of tinned or nickel-plated copper. Shields made of steel braids are not suitable.
 - The overlap rate of the braid must be at least 70 % with an overlap angle of 90 °.
- ▶ The cables used must correspond to the requirements at the location (e.g. EN 60204-1).
- ▶ Shield the cable for motor temperature monitoring (PTC or thermal contact) and install it separately from the motor cable.
 - In Lenze system cables, the cable for brake control is integrated into the motor cable. If this cable is not required for brake control, it can also be used to connect the motor temperature monitoring up to a length of 50 m.
- ▶ Connect the shield with a large surface and fix it with metal cable binders or a conductive clamp.
- ▶ Connect the shield directly to the corresponding device shield sheet.
 - If required, additionally connect the shield to the conductive and earthed mounting plate in the control cabinet.
- ▶ The motor cable is optimally installed if
 - it is separated from mains cables and control cables,
 - it only crosses mains cables and control cables at right angles,

- it is not interrupted.
- If the motor cable must be opened all the same (e.g. due to chokes, contactors, or terminals):
 - The unshielded cable ends may not be longer than 100 mm (depending on the cable cross-section).
 - Install chokes, contactors, terminals etc. spatially separated from other components (with a min. distance of 100 mm).
 - Install the shield of the motor cable directly before and behind the point of separation to the mounting plate with a large surface.
- Connect the shield with a large surface to PE in the terminal box of the motor at the motor housing.
 - Metal EMC cable glands at the motor terminal box ensure a large surface connection of the shield with the motor housing.

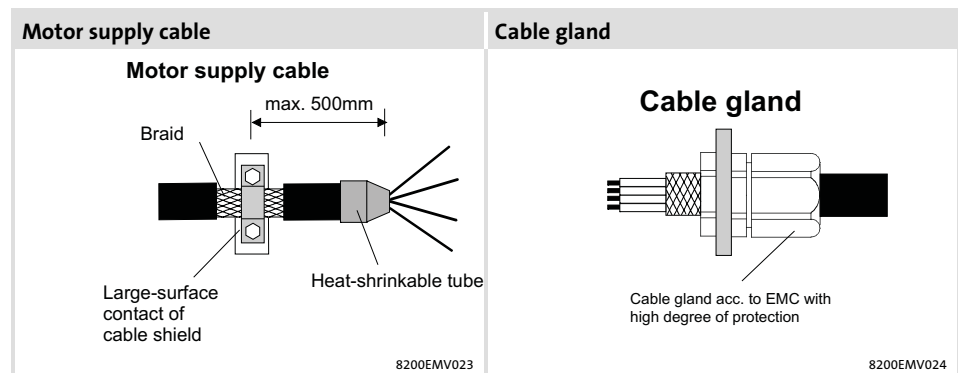


Fig. 5.3-1 Shielding of the motor cable

5.3.4 Control cables

- ▶ Control cables must be shielded to minimise interference injections.
- ▶ For lengths of 200 mm and more, use only shielded cables for analog and digital inputs and outputs. Under 200 mm, unshielded but twisted cables may be used.
- ▶ Connect the shield correctly:
 - The shield connections of the control cables must be at a distance of at least 50 mm from the shield connections of the motor cables and DC cables.
 - Connect the shield of digital input and output cables at both ends.
 - Connect the shield of analog input and output cables at one end (at the drive controller).
- ▶ To achieve an optimum shielding effect (in case of very long cables, with high interference) one shield end of analog input and output cables can be connected to PE potential via a capacitor (e.g. 10 nF/250 V) (see sketch).

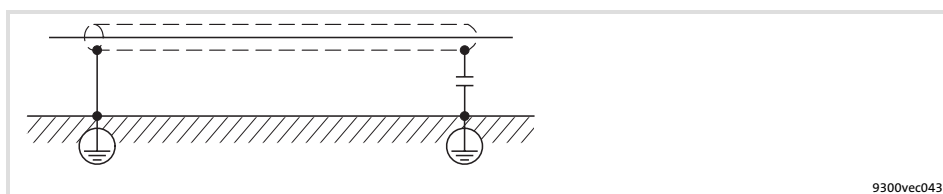


Fig. 5.3-2 Shielding of long, analog control cables

5 Wiring of the standard device

5.3 Basics for wiring according to EMC

5.3.5 Installation in the control cabinet

5.3.5 Installation in the control cabinet

Mounting plate requirements	▶ Only use mounting plates with conductive surfaces (zinc-coated or V2A-steel). ▶ Painted mounting plates are not suitable even if the paint is removed from the contact surfaces. ▶ If several mounting plates are used, ensure a large-surface connection between the mounting plates (e.g. by using earthing strips).
Mounting of the components	▶ Connect controllers, filters, and chokes to the earthed mounting plate with a surface as large as possible.
Optimum cable routing	▶ The motor cable is optimally installed if – it is separated from mains cables and control cables, – it crosses mains cables and control cables at right angles. ▶ Always install cables close to the mounting plate (reference potential), as freely suspended cables act like aerials. ▶ Lead the cables to the terminals in a straight line (avoid tangles of cables). ▶ Use separated cable channels for motor cables and control cables. Do not mix up different cable types in one cable channel. ▶ Minimise coupling capacities and coupling inductances by avoiding unnecessary cable lengths and reserve loops. ▶ Short-circuit unused cores to the reference potential. ▶ Install the positive and negative wires for DC 24 V close to each other over the entire length to avoid loops.
Earth connections	▶ Connect all components (drive controllers, chokes, filters) to a central earthing point (PE rail). ▶ Set up a star-shape earthing system. ▶ Comply with the corresponding minimum cable cross-sections.

5.3.6 Wiring outside of the control cabinet

Notes for cable routing outside the control cabinet:

- The longer the cables the greater the space between the cables must be.
- If cables for different signal types are routed in parallel, the interferences can be minimized by means of a metal barrier or separated cable ducts.

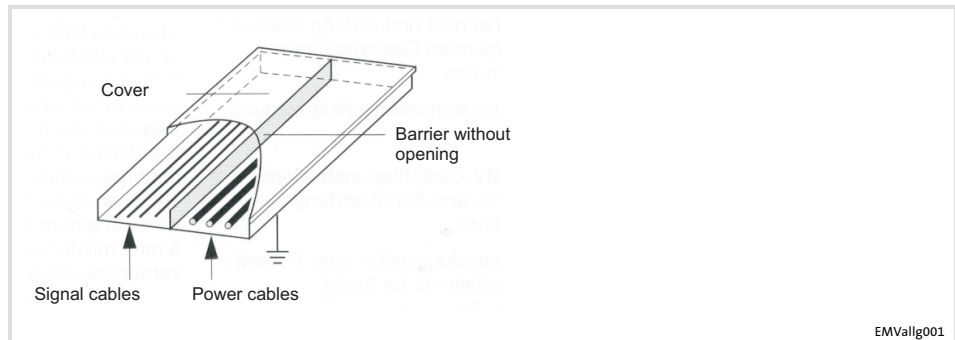


Fig. 5.3-3 Cable routing in the cable duct with barrier

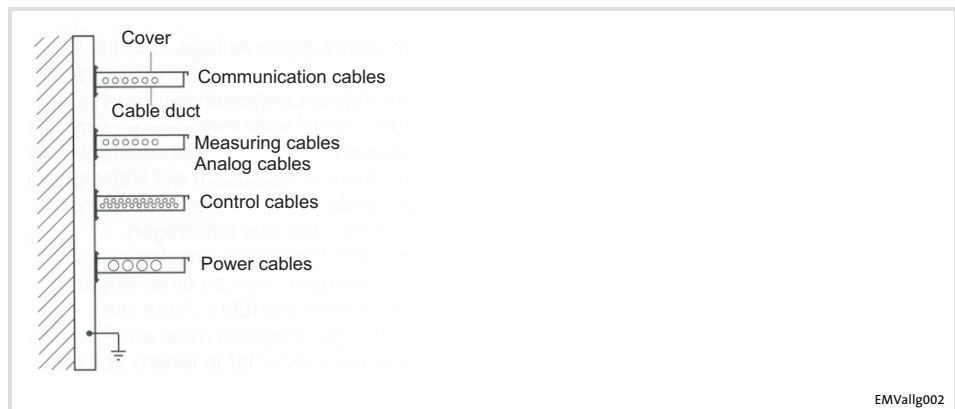


Fig. 5.3-4 Cable routing in separated cable ducts

5.3.7 Detecting and eliminating EMC interferences

Fault	Cause	Remedy
Interferences of analog setpoints of your own or other devices and measuring systems	Unshielded motor cable	Use shielded motor cable
	Shield contact is not extensive enough	Carry out optimal shielding as specified
	Shield of the motor cable is interrupted by terminal strips, switched, etc.	• Separate components from other component part with a minimum distance of 100 mm • Use motor choke/motor filter
	Install additional unshielded cables inside the motor cable (e.g. for motor temperature monitoring)	Install and shield additional cables separately
	Too long and unshielded cable ends of the motor cable	Shorten unshielded cable ends to maximally 40 mm
Conducted interference level is exceeded on the supply side	Terminal strips for the motor cable are directly located next to the mains terminals	Spatially separate the terminal strips for the motor cable from main terminals and other control terminals with a minimum distance of 100 mm
	Mounting plate varnished	Optimise PE connection: • Remove varnish • Use zinc-coated mounting plate
	HF short circuit	Check cable routing

Wiring of the standard device	5
Standard devices in the power range 0.37 ... 11 kW	5.4
Wiring according to EMC (CE-typical drive system)	5.4.1

5.4 Standard devices in the power range 0.37 ... 11 kW

5.4.1 Wiring according to EMC (CE-typical drive system)

The drives comply with the EC Directive on "Electromagnetic Compatibility" if they are installed in accordance with the specifications for the CE-typical drive system. The user is responsible for the compliance of the machine application with the EC Directive.



Note!

Observe the notes given in the chapter "Basics for wiring according to EMC"!

5

Wiring of the standard device

5.4

Standard devices in the power range 0.37 ... 11 kW

5.4.1

Wiring according to EMC (CE-typical drive system)

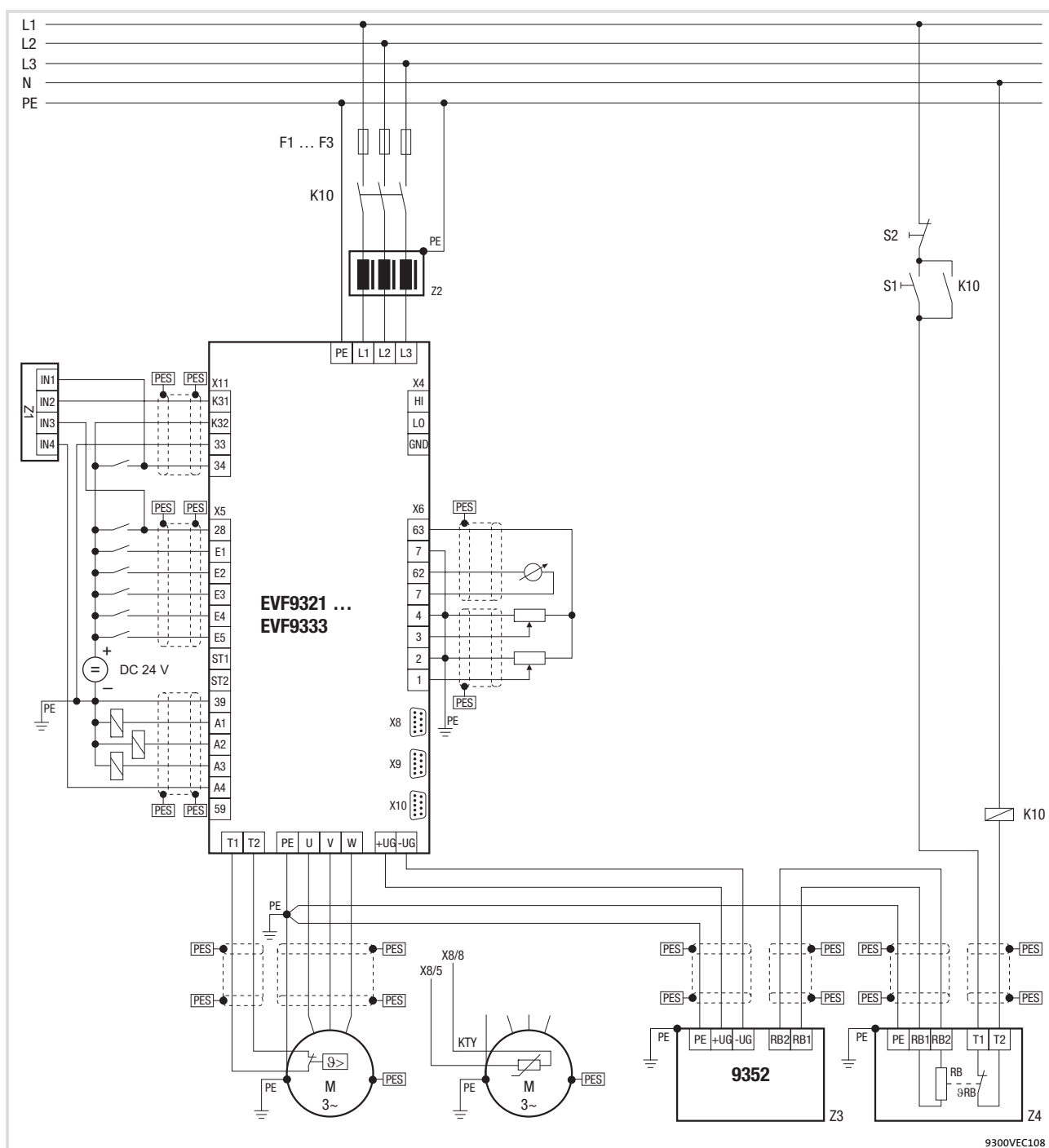


Fig. 5.4-1 Example for wiring in accordance with EMC regulations

F1 ... F3	Fuses
K10	Mains contactor
Z1	Programmable logic controller (PLC)
Z2	Mains choke or mains filter
Z3	Brake chopper EMB9352-E
Z4	Brake resistor
S1	Mains contactor on
S2	Mains contactor off
+U _G , -U _G	DC-bus connection
PES	HF shield termination through large-surface connection to PE

5.4.2 Important notes

To gain access to the power connections, remove the covers:

- Release the cover for the mains connection with slight pressure on the front and pull it off to the top.
- Release the cover for the motor connection with slight pressure on the front and pull it off to the bottom.

Installation material required from the scope of supply:

Description	Use	Quantity
Shield connection support	Support of the shield sheets for the supply cable and motor cable	2
Hexagon nut M5	Fastening of shield connection supports	4
Spring washer Ø 5 mm (DIN 127)		2
Serrated lock washer Ø 5.3 mm (DIN 125)		2
Shield sheet	Shield connections for supply cables, motor cable	2
Screw and washer assembly M4 × 10 mm (DIN 6900)	Fastening of shield sheets	4

5.4.3

Mains connection, DC supply

**Note!**

- ▶ If a mains filter or RFI filter is used and the cable length between mains/RFI filter and drive controller exceeds 300 mm, install a shielded cable.
- ▶ For DC-bus operation or DC supply, we recommend using shielded DC cables.

Shield sheet installation

**Stop!**

- ▶ To avoid damaging the PE stud, always install the shield sheet and the PE connection in the order displayed. The required parts are included in the accessory kit.
- ▶ Do not use lugs as strain relief.

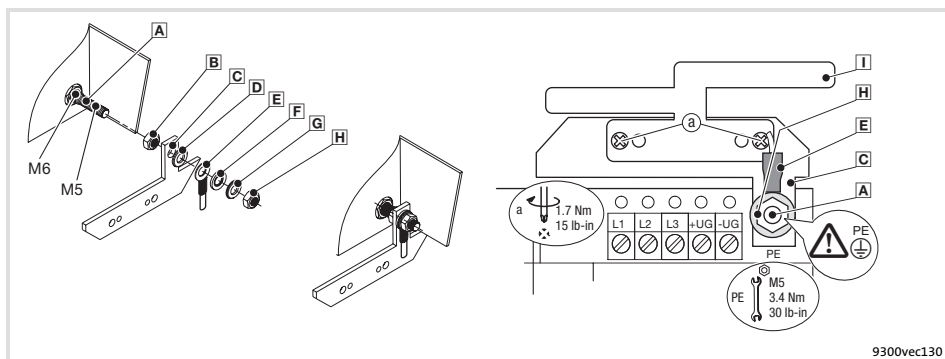


Fig. 5.4-2 Installation of shield sheet for drive controllers 0.37 ... 11 kW

- A** PE stud
- B** Screw on M5 nut and tighten hand-tight
- C** Slide on fixing bracket for shield sheet
- D** Slide on serrated lock washer
- E** Slide on PE cable with ring cable lug
- F** Slide on washer
- G** Slide on spring washer
- H** Screw on M5 nut and tighten it
- I** Screw shield sheet on fixing bracket with two M4 screws (a)

Mains connection, DC supply

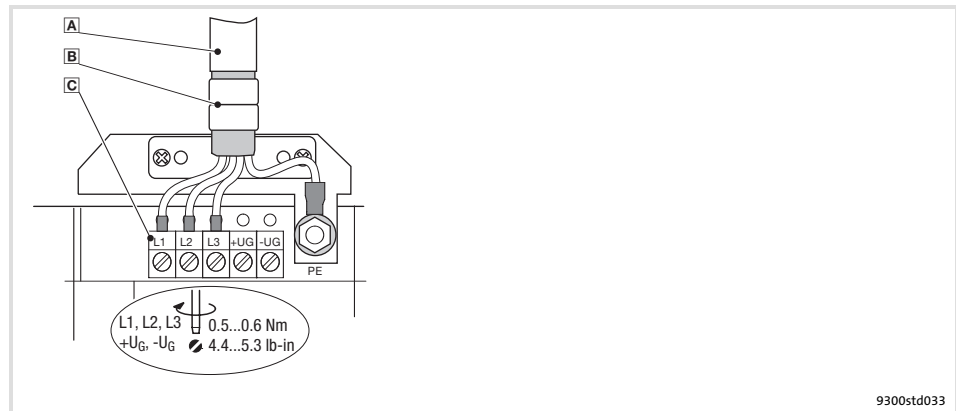


Fig. 5.4-3 Mains connection, DC supply for drive controllers 0.37 ... 11 kW

- A** Mains cable
- B** Shield sheet
Securely clamp mains cable with the lugs
- C** Mains and DC bus connection
L1, L2, L3: Connection of mains cable
+UG, -UG: Connection of DC-bus components or connection of the controller in the DC-bus system (see system manual)
Cable cross-sections up to 4 mm²: Use wire end ferrules for flexible cables
Cable cross-sections > 4 mm²: Use pin-end connectors

5.4.4 Mains connection: Fuses and cable cross-sections

Installation in accordance with EN 60204-1

Supply conditions	
Range	Description
Fuses	Utilisation category: only gG/gL or gRL
Cables	Laying systems B2 and C: Use of PVC-insulated copper cables, conductor temperature < 70 °C, ambient temperature < 40 °C, no bundling of the cables or cores, three loaded cores. The data are recommendations. Other dimensionings/laying systems are possible (e.g. in accordance with VDE 0298-4).
RCCB	- Controllers can cause a DC current in the PE conductor. If a residual current device (RCD) or a fault current monitoring unit (RCM) is used for protection in the case of direct or indirect contact, only one RCD/RCM of the following type can be used on the current supply side: - Type B (universal-current sensitive) for connection to a three-phase system - Type A (pulse-current sensitive) or type B (universal-current sensitive) for connection to a 1-phase system Alternatively another protective measure can be used, like for instance isolation from the environment by means of double or reinforced insulation, or isolation from the supply system by using a transformer. - Earth-leakage circuit breakers must only be installed between mains supply and controller.
Observe all national and regional regulations!	

Operation at rated power

9300	Rated fuse current		Cable cross-section		FI ¹⁾
Type	Fuse	Circuit-breaker	Laying system L1, L2, L3, PE		[mA]
			B2	C	
	[A]	[A]	[mm²]	[mm²]	

Operation without mains choke/mains filter

EVF9321-xV	6	C6, B6 ²⁾	1	1	300
EVF9322-xV	6	C6, B6 ²⁾	1	1	
EVF9323-xV	10	B10	1.5	1	
EVF9325-xV	25	B20	4	2.5	

Operation with mains choke/mains filter

EVF9321-xV	6	C6, B6 ²⁾	1	1	300
EVF9322-xV	6	C6, B6 ²⁾	1	1	
EVF9323-xV	10	B10	1.5	1	
EVF9324-xV	10	B10	1.5	1	
EVF9325-xV	20	B16	2.5	2.5	
EVF9326-xV	32	B25	—	4	

¹⁾ Universal current-sensitive earth-leakage circuit breaker

²⁾ For short-time mains interruptions, use circuit breakers with tripping characteristic "C"

Operation with increased rated power

9300	Rated fuse current		Cable cross-section		FI ¹⁾
	Fuse	Circuit-breaker	Laying system L1, L2, L3, PE		
			B2	C	
Type	[A]	[A]	[mm²]	[mm²]	[mA]

Operation with mains choke/mains filter

EVF9321-xV	6	C6, B6 ²⁾	1	1	300
EVF9322-xV	6	C6, B6 ²⁾	1	1	
EVF9323-xV	10	B10	1.5	1	
EVF9324-xV	10	B10	1.5	1	
EVF9325-xV	20	B16	2.5	2.5	

¹⁾ Universal current-sensitive earth-leakage circuit breaker

²⁾ For short-time mains interruptions, use circuit breakers with tripping characteristic "C"

Installation to UL

Supply conditions	
Range	Description
Fuses	- Only in accordance with UL 248 - System short-circuit current up to 5000 A_{rms} : All classes are permissible - System short-circuit current up to 50000 A_{rms} : Only classes "CC", "J", "T" or "R" permissible
Cables	- Only in accordance with UL - The cable cross-sections specified in the following apply under the following conditions: - Conductor temperature < 60 °C - Ambient temperature < 40 °C
Observe all national and regional regulations!	

Operation at rated power

9300	Rated fuse current	Cable cross-section
Type	Fuse [A]	L1, L2, L3, PE [AWG]
Operation without mains choke/mains filter		
EVF9321-xV	6	18
EVF9322-xV	6	18
EVF9323-xV	10	16
EVF9325-xV	25	10
Operation with mains choke/mains filter		
EVF9321-xV	6	18
EVF9322-xV	6	18
EVF9323-xV	10	16
EVF9324-xV	10	16
EVF9325-xV	25	10
EVF9326-xV	25	10

Max. connection cross-section of the terminal strip: AWG 12, with pin-end connector AWG 10

5 Wiring of the standard device

5.4 Standard devices in the power range 0.37 ... 11 kW

5.4.5 Mains choke/mains filter assignment

5.4.5 Mains choke/mains filter assignment

Operation with rated power (normal operation)

9300	Mains choke	Interference voltage category according to EN 61800-3 and motor cable length			
Type		Component		Component	
		C2	max. [m]	C1	max. [m]
EVF9321-xV	EZN3A2400H002	EZN3A2400H002	5	EZN3B2400H002	50
EVF9322-xV	EZN3A1500H003	EZN3A1500H003	5	EZN3B1500H003	50
EVF9323-xV	EZN3A0900H004	EZN3A0900H004	5	EZN3B0900H004	50
EVF9324-xV	EZN3A0500H007	EZN3A0500H007	5	EZN3B0500H007	50
EVF9325-xV	EZN3A0300H013	EZN3A0300H013	5	EZN3B0300H013	50
EVF9326-xV	ELN3-0150H024-001	EZN3A0150H024	5	EZN3B0150H024	50

Operation with increased rated power

9300	Mains choke	Interference voltage category according to EN 61800-3 and motor cable length			
Type		Component		Component	
		C2	max. [m]	C1	max. [m]
EVF9321-xV	EZN3A2400H002	EZN3A2400H002	5	EZN3B2400H002	50
EVF9322-xV	EZN3A1500H003	EZN3A1500H003	5	EZN3B1500H003	50
EVF9323-xV	EZN3A0750H005	EZN3A0750H005	5	EZN3B0750H005	50
EVF9324-xV	EZN3A0400H009	EZN3A0400H009	5	EZN3B0400H009	50
EVF9325-xV	EZN3A0300H013	EZN3A0300H013	5	EZN3B0250H015	50

5.4.6

Motor connection



Note!

- ▶ Fusing the motor cable is not required.
- ▶ The drive controller features 2 connections for motor temperature monitoring:
 - Terminals T1, T2 for connecting a PTC thermistor or thermal contact (NC contact).
 - Pins X8/5 and X8/8 of the incremental encoder input (X8) for connecting a KTY thermal sensor.

Shield sheet installation



Stop!

- ▶ To avoid damaging the PE stud, always install the shield sheet and the PE connection in the order displayed. The required parts are included in the accessory kit.
- ▶ Do not use lugs as strain relief.

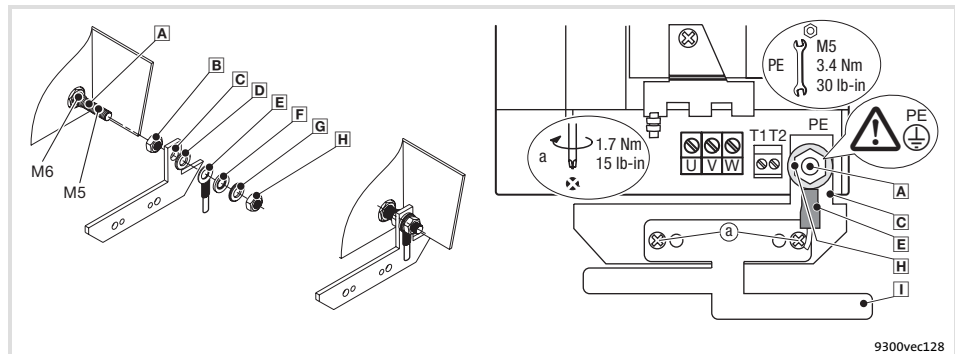


Fig. 5.4-4 Installation of shield sheet for drive controllers 0.37 ... 11 kW

- A** PE stud
- B** Screw on M5 nut and tighten hand-tight
- C** Slide on fixing bracket for shield sheet
- D** Slide on serrated lock washer
- E** Slide on PE cable with ring cable lug
- F** Slide on washer
- G** Slide on spring washer
- H** Screw on M5 nut and tighten it
- I** Screw shield sheet on fixing bracket with two M4 screws (a)

Motor with PTC thermistor or thermal contact (NC contact)

Wire T1, T2 only if the motor is equipped with a PTC thermistor or thermal contact (NC contact).

- An "open" cable acts like an antenna and can cause faults on the drive controller.



Danger!

- All control terminals only have basic insulation (single isolating distance) after connecting a PTC thermistor or a thermal contact.
- Protection against accidental contact in case of a defective isolating distance is only guaranteed through external measures, e.g. double insulation.

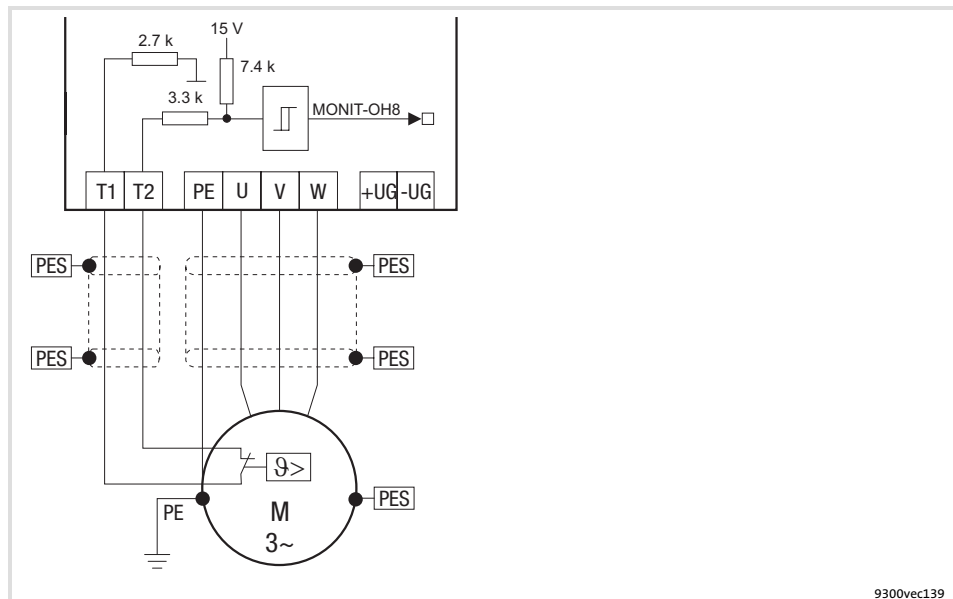


Fig. 5.4-5 Circuit diagram of motor connection with PTC thermistor or thermal contact (NC contact) at T1, T2

Characteristics of the connection for motor temperature monitoring:

Terminals T1, T2	
Connection	• PTC thermistor – PTC thermistor with defined tripping temperature (acc. to DIN 44081 and DIN 44082) • Thermal contact (NC contact) – Thermostat as NC contact
Tripping point	• Fixed (depending on the PTC/thermal contact) • PTC: $R_9 > 1600 \Omega$ • Configurable as warning or error (TRIP)
Notes	• Monitoring is not active in the Lenze setting. • If you do not use a Lenze motor, we recommend the use of a PTC thermistor up to 150°C.

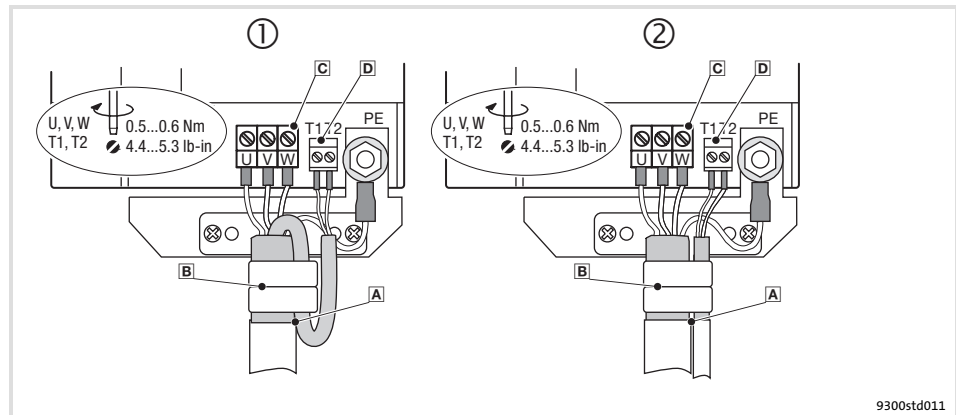


Fig. 5.4-6 Motor connection with PTC thermistor or thermal contact (NC contact)

- ① **A** Motor connection with Lenze system cable with integrated control cable for the motor temperature monitoring
- B** Shield sheet
Clamp entire shield **and** shield of the control cable for the motor temperature monitoring with the straps. If required, fix by means of cable tie.
- ② **A** Motor cable connection and separate control cable for the motor temperature monitoring
- B** Shield sheet
Clamp shield of the motor cable **and** shield of the cable for the motor temperature monitoring with the straps. If required, fix by means of cable tie.
- C** U, V, W
Motor cable connection
Check the correct polarity. Observe maximum length of the motor cable. Use wire end ferrules for flexible cables.
Max. connectable cable cross-section: 4 mm², with pin-end connector > 4 mm²
- D** T1, T2 for motor temperature monitoring
Cable connection for PTC thermistors or thermal contacts (NC contacts)

Motor with KTY thermal sensor



Note!

- We recommend to use Lenze system cables for wiring.
- For self-made cables only use cables with shielded cores twisted in pairs.

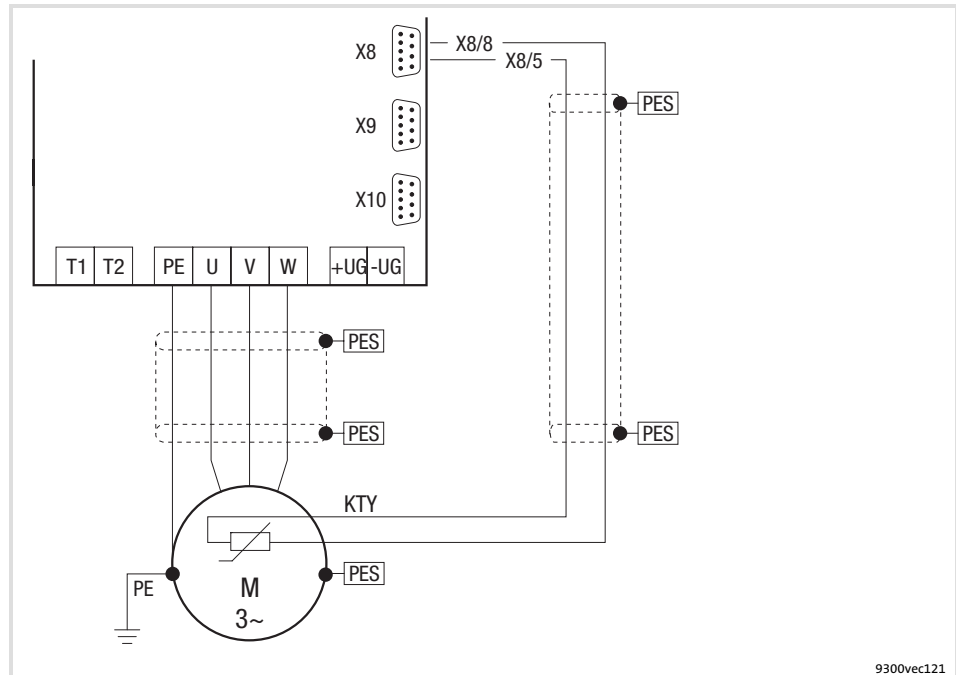


Fig. 5.4-7 Circuit diagram of motor connection with KTY thermal sensor at incremental encoder input X8

Characteristics of the connection for motor temperature monitoring:

Pins X8/5, X8/8 of incremental encoder input (X8)

Connection	Linear KTY thermal sensor
Tripping point	• Warning: Adjustable • Error (TRIP): Fixed at 150 °C
Notes	• Monitoring is not active in the Lenze setting. • The KTY thermal sensor is monitored with regard to interruption and short circuit.

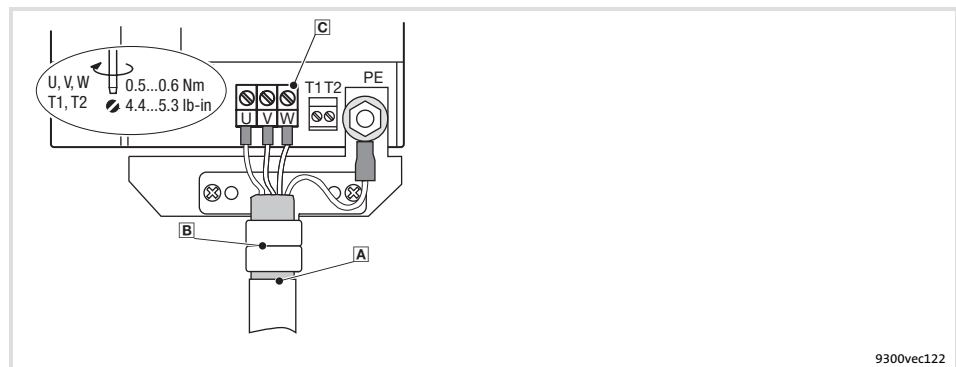


Fig. 5.4-8 Motor connection with KTY thermal sensor

- A** Motor cable
- B** Shield sheet
Clamp the motor cable shield with the straps. If required, fix by means of cable tie.
- C** U, V, W
Motor cable connection
Check the correct polarity. Observe maximum length of the motor cable. Use wire end ferrules for flexible cables.
Max. connectable cable cross-section: 4 mm², with pin-end connector > 4 mm²

5.5 Standard devices in the power range 15 ... 30 kW**5.5.1 Wiring according to EMC (CE-typical drive system)**

The drives comply with the EC Directive on "Electromagnetic Compatibility" if they are installed in accordance with the specifications for the CE-typical drive system. The user is responsible for the compliance of the machine application with the EC Directive.

**Note!**

Observe the notes given in the chapter "Basics for wiring according to EMC"!

Wiring of the standard device

5.5

Standard devices in the power range 15 ... 30 kW

5.5.1

Wiring according to EMC (CE-typical drive system)

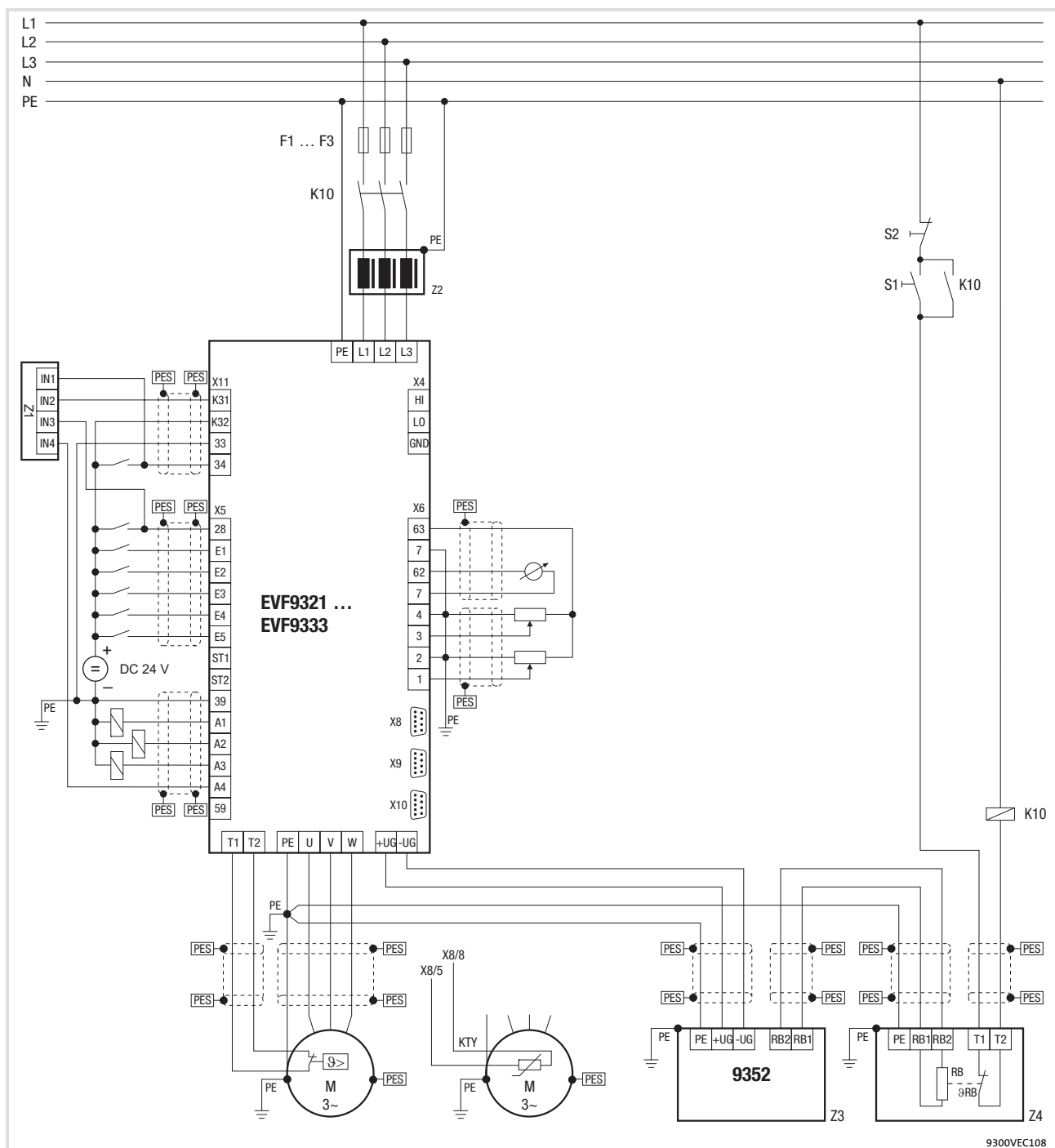


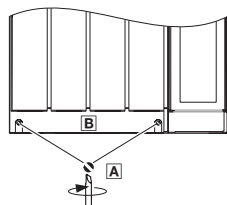
Fig. 5.5-1 Example for wiring in accordance with EMC regulations

F1 ... F3	Fuses
K10	Mains contactor
Z1	Programmable logic controller (PLC)
Z2	Mains choke or mains filter
Z3	Brake chopper EMB9352-E
Z4	Brake resistor
S1	Mains contactor on
S2	Mains contactor off
+U _G , -U _G	DC-bus connection
PES	HF shield termination through large-surface connection to PE

5.5.2 Important notes

To gain access to the power connections, remove the cover:

Remove the cover of the drive controller



9300vec113

1. Remove the screws **A**
2. Lift cover **B** up and detach it

Installation material required from the scope of supply:

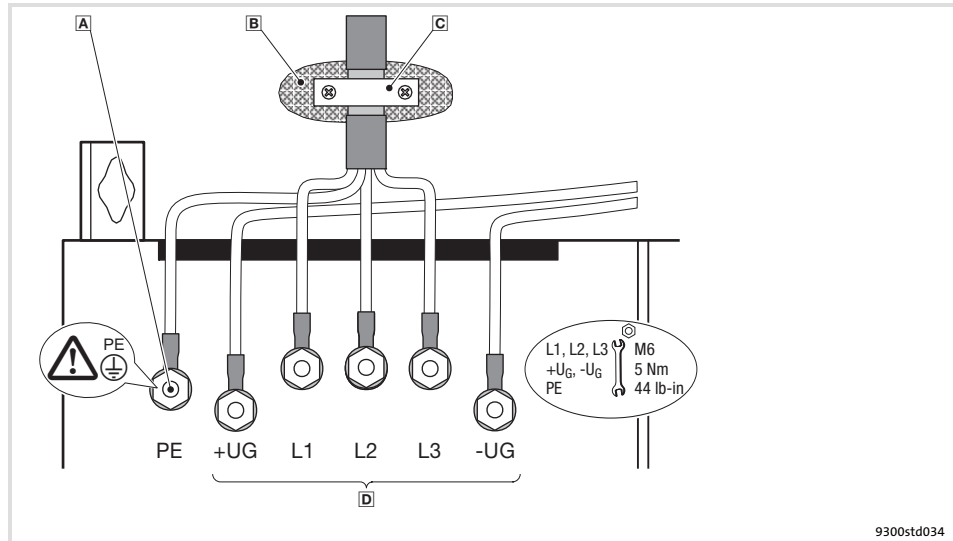
Description	Use	Quantity
Hexagon nut M6 (DIN 934)	Connection of supply cables (mains, +U _G , -U _G) and motor cable to the stud bolts	10
Washer Ø 6 mm (DIN 125)	For hexagon nut M6	10
Spring washer Ø 6 mm (DIN 127)	For hexagon nut M6	10
Grommet	Motor cable	1
Shield connection support	Support of the shield sheet for motor cable	1
Self-tapping screw Ø 4 × 14 mm	Fastening of shield connection support	2
Shield sheet	Shield connection for motor cable	1

5.5.3

Mains connection, DC supply

**Note!**

- If a mains filter or RFI filter is used and the cable length between mains/RFI filter and drive controller exceeds 300 mm, install a shielded cable.
- For DC-bus operation or DC supply, we recommend using shielded DC cables.



9300std034

Fig. 5.5-2 Mains connection, DC supply for drive controllers 15 ... 30 kW

- A** PE stud
Connect PE cable with ring cable lug
- B** Conductive surface
- C** Shield clamp
Place shield with large surface on control cabinet mounting plate and fasten with shield clamp (shield clamp is not part of the scope of supply)
To improve the shield connection, also place the shield on the PE stud
- D** Mains and DC bus connection
L1, L2, L3: Connection of mains cable with ring cable lugs
+UG, -UG: Connection of DC-bus components or connection of the controller in the DC-bus system (see system manual)

5.5.4 Mains connection: Fuses and cable cross-sections

Installation in accordance with EN 60204-1

Supply conditions	
Range	Description
Fuses	Utilisation category: only gG/gL or gRL
Cables	Laying systems B2 and C: Use of PVC-insulated copper cables, conductor temperature < 70 °C, ambient temperature < 40 °C, no bundling of the cables or cores, three loaded cores. The data are recommendations. Other dimensionings/laying systems are possible (e.g. in accordance with VDE 0298-4).
RCCB	- Controllers can cause a DC current in the PE conductor. If a residual current device (RCD) or a fault current monitoring unit (RCM) is used for protection in the case of direct or indirect contact, only one RCD/RCM of the following type can be used on the current supply side: - Type B (universal-current sensitive) for connection to a three-phase system - Type A (pulse-current sensitive) or type B (universal-current sensitive) for connection to a 1-phase system Alternatively another protective measure can be used, like for instance isolation from the environment by means of double or reinforced insulation, or isolation from the supply system by using a transformer. - Earth-leakage circuit breakers must only be installed between mains supply and controller.
Observe all national and regional regulations!	

Operation at rated power

9300	Rated fuse current		Cable cross-section		FI ¹⁾
	Fuse	Circuit-breaker	Laying system L1, L2, L3, PE		
Type	[A]	[A]	B2 [mm ²]	C [mm ²]	[mA]
Operation without mains choke/mains filter					
EVF9327-xV	63	—	16	16	300
Operation with mains choke/mains filter					
EVF9327-xV	40	—	10	10	300
EVF9328-xV	63	—	25	16	
EVF9329-xV	80	—	—	25	

¹⁾ Universal current-sensitive earth-leakage circuit breaker

Operation with increased rated power

9300	Rated fuse current		Cable cross-section		FI ¹⁾
	Fuse	Circuit-breaker	Laying system L1, L2, L3, PE		
Type	[A]	[A]	B2 [mm²]	C [mm²]	[mA]
Operation with mains choke/mains filter					
EVF9327-xV	50	—	16	10	300
EVF9328-xV	63	—	25	16	
EVF9329-xV	80	—	—	25	

¹⁾ Universal current-sensitive earth-leakage circuit breaker

Installation to UL

Supply conditions	
Range	Description
Fuses	- Only according to UL 248 - Mains short-circuit current up to 5000 A_{rms}: All classes permissible - Mains short-circuit current up to 50000 A_{rms}: Only classes "J", "T" or "R" permissible
Cables	- Only in accordance with UL - The cable cross-sections specified in the following apply under the following conditions: - Conductor temperature < 60 °C - Ambient temperature < 40 °C
Observe all national and regional regulations!	

Operation at rated power

9300	Rated fuse current	Cable cross-section
Type	Fuse [A]	L1, L2, L3, PE [AWG]
Operation with mains choke/mains filter		
EVF9327-xV	35	8
EVF9328-xV	50	6
EVF9329-xV	80	4

5.5.5 Mains choke/mains filter assignment

Operation with rated power (normal operation)

9300	Mains choke	Interference voltage category according to EN 61800-3 and motor cable length			
Type		Component		Component	
		C2	max. [m]	C1	max. [m]
EVF9327-xV	ELN3-0088H035-001	EZN3A0110H030	25	E82ZN22334B230	10
				E82ZZ15334B230 ¹⁾	10
		E82ZN22334B230	50	EZN3B0110H030U ²⁾	50
		E82ZZ15334B230 ¹⁾	50		
EVF9328-xV	ELN3-0075H045	EZN3A0080H042	25	E82ZN22334B230	10
		E82ZN22334B230	50	EZN3B0080H042	50
EVF9329-xV	ELN3-0055H055	EZN3A0055H060	25	E82ZN30334B230	10
		E82ZN30334B230	50	EZN3B0055H060	50

¹⁾ RFI filter

²⁾ Footprint filter

Operation with increased rated power

9300	Mains choke	Interference voltage category according to EN 61800-3 and motor cable length			
Type		Component		Component	
		C2	max. [m]	C1	max. [m]
EVF9327-xV	ELN3-0075H045	EZN3A0080H042	25	E82ZN22334B230	10
		E82ZN22334B230	50	EZN3B0080H042	50
EVF9328-xV	ELN3-0055H055	EZN3A0055H060	25	E82ZN30334B230	10
		E82ZN30334B230	50	EZN3B0055H060	50
EVF9329-xV	—	EZN3B0055H060N003	50	EZN3B0055H060N003	50

5.5.6

Motor connection

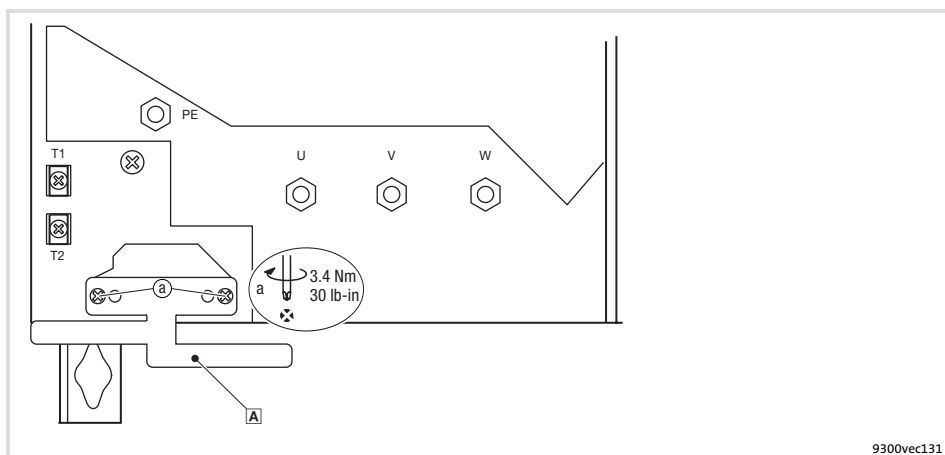
**Note!**

- ▶ Fusing the motor cable is not required.
- ▶ The drive controller features 2 connections for motor temperature monitoring:
 - Terminals T1, T2 for connecting a PTC thermistor or thermal contact (NC contact).
 - Pins X8/5 and X8/8 of the incremental encoder input (X8) for connecting a KTY thermal sensor.

Shield sheet installation

**Stop!**

Do not use lugs as strain relief.



9300vec131

Fig. 5.5-3 Installation of shield sheet for drive controllers 15 ... 30 kW

- A** Fasten the shield sheet with two self-tapping screws $\varnothing 4 \times 14$ mm (a)

Motor with PTC thermistor or thermal contact (NC contact)

Wire T1, T2 only if the motor is equipped with a PTC thermistor or thermal contact (NC contact).

- An "open" cable acts like an antenna and can cause faults on the drive controller.



Danger!

- All control terminals only have basic insulation (single isolating distance) after connecting a PTC thermistor or a thermal contact.
- Protection against accidental contact in case of a defective isolating distance is only guaranteed through external measures, e.g. double insulation.

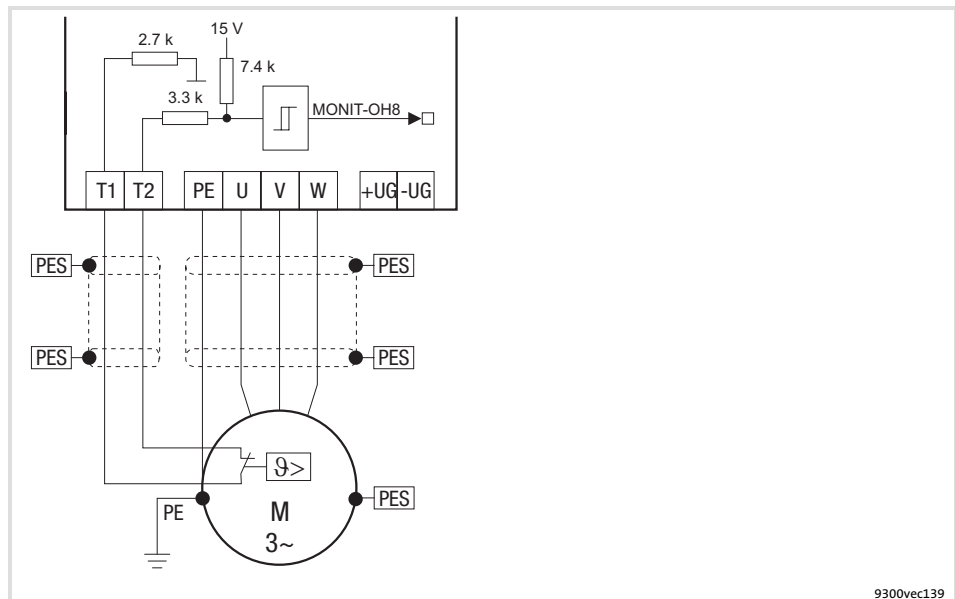


Fig. 5.5-4 Circuit diagram of motor connection with PTC thermistor or thermal contact (NC contact) at T1, T2

Characteristics of the connection for motor temperature monitoring:

Terminals T1, T2	
Connection	• PTC thermistor – PTC thermistor with defined tripping temperature (acc. to DIN 44081 and DIN 44082) • Thermal contact (NC contact) – Thermostat as NC contact
Tripping point	• Fixed (depending on the PTC/thermal contact) • PTC: $R_{\theta} > 1600 \Omega$ • Configurable as warning or error (TRIP)
Notes	• Monitoring is not active in the Lenze setting. • If you do not use a Lenze motor, we recommend the use of a PTC thermistor up to 150°C.

Wiring of the standard device

Standard devices in the power range 15 ... 30 kW

Motor connection

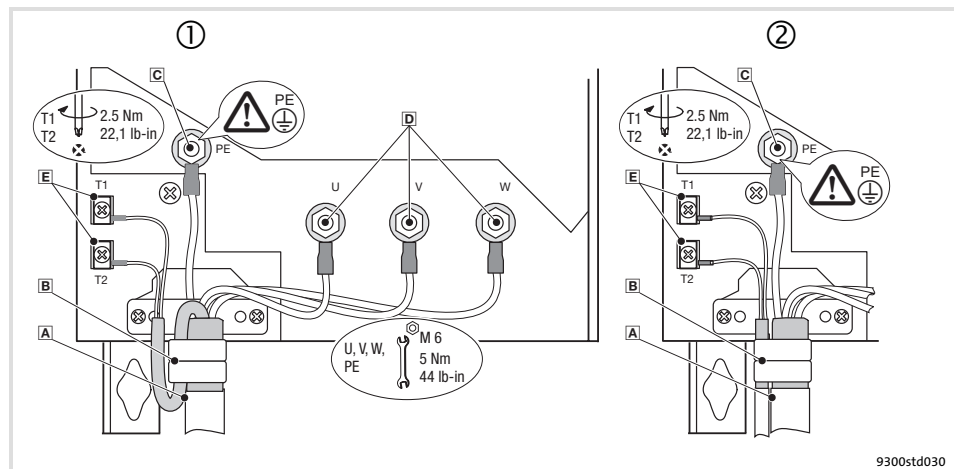


Fig. 5.5-5 Motor connection with PTC thermistor or thermal contact (NC contact)

- ① **A** Motor connection with Lenze system cable with integrated control cable for the motor temperature monitoring
- B** Shield sheet
Clamp entire shield **and** shield of the control cable for the motor temperature monitoring with the straps. If required, fix by means of cable tie.
- ② **A** Motor cable connection and separate control cable for the motor temperature monitoring
- B** Shield sheet
Clamp shield of the motor cable **and** shield of the cable for the motor temperature monitoring with the straps. If required, fix by means of cable tie.
- C** PE stud
PE cable connection with ring cable lug
- D** U, V, W
Motor cable connection
Check the correct polarity. Observe maximum length of the motor cable.
Max. connectable cable cross-section: 50 mm² with ring cable lug
- E** T1, T2 for motor temperature monitoring
Cable connection for PTC thermistors or thermal contacts (NC contacts)

Motor with KTY thermal sensor



Note!

- We recommend to use Lenze system cables for wiring.
- For self-made cables only use cables with shielded cores twisted in pairs.

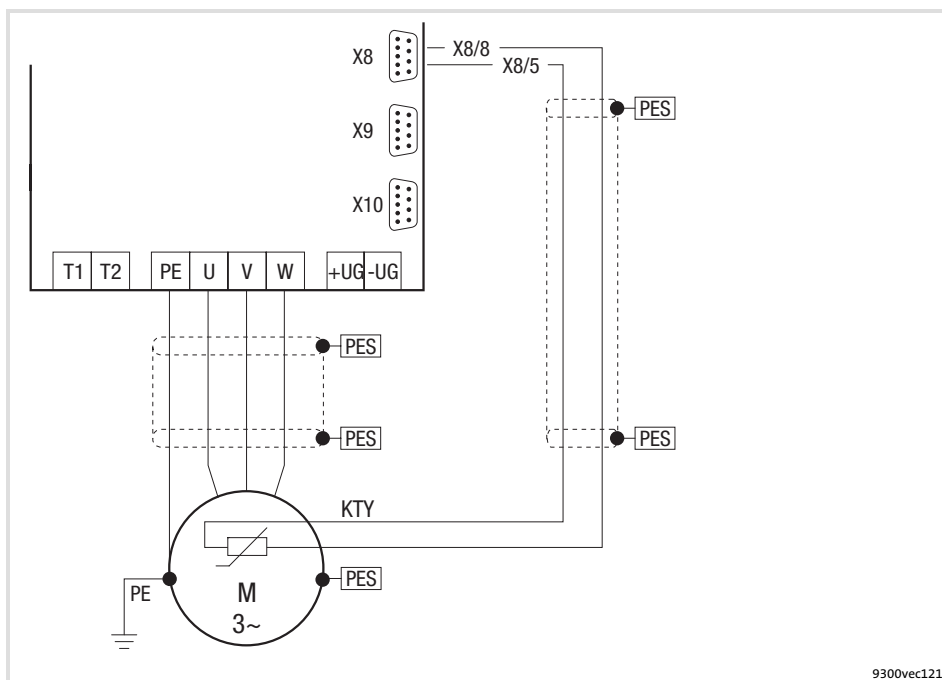


Fig. 5.5-6 Circuit diagram of motor connection with KTY thermal sensor at incremental encoder input X8

Characteristics of the connection for motor temperature monitoring:

Pins X8/5, X8/8 of incremental encoder input (X8)

Connection	Linear KTY thermal sensor
Tripping point	• Warning: Adjustable • Error (TRIP): Fixed at 150 °C
Notes	• Monitoring is not active in the Lenze setting. • The KTY thermal sensor is monitored with regard to interruption and short circuit.

Wiring of the standard device

Standard devices in the power range 15 ... 30 kW

Motor connection

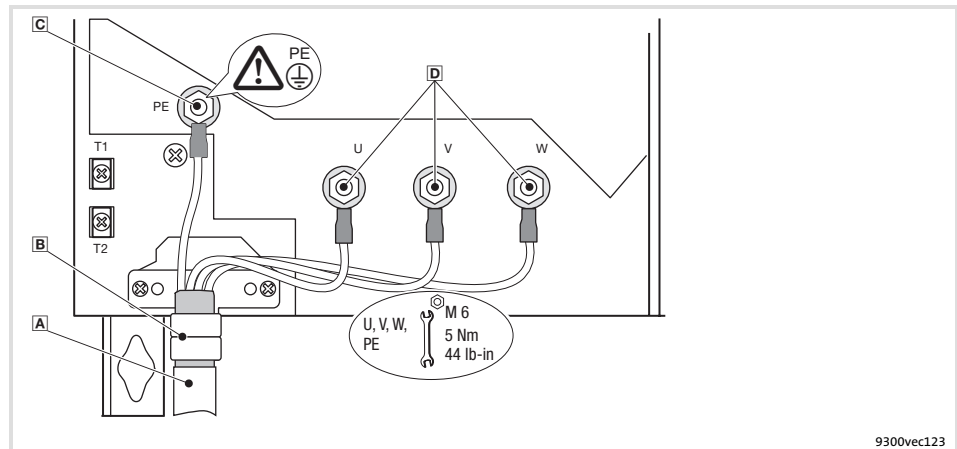


Fig. 5.5-7 Motor connection with KTY thermal sensor

- A** Motor cable
- B** Shield connection
Clamp the motor cable shield with the straps. If required, fix by means of cable tie.
- C** PE stud
PE cable connection with ring cable lug
- D** U, V, W
Motor cable connection
Check the correct polarity. Observe maximum length of the motor cable.
Max. connectable cable cross-section: 50 mm² with ring cable lug

5.6 Standard devices in the power range of 55 kW**5.6.1 Wiring according to EMC (CE-typical drive system)**

The drives comply with the EC Directive on "Electromagnetic Compatibility" if they are installed in accordance with the specifications for the CE-typical drive system. The user is responsible for the compliance of the machine application with the EC Directive.

**Note!**

Observe the notes given in the chapter "Basics for wiring according to EMC"!

5

Wiring of the standard device

5.6

Standard devices in the power range of 55 kW

5.6.1

Wiring according to EMC (CE-typical drive system)

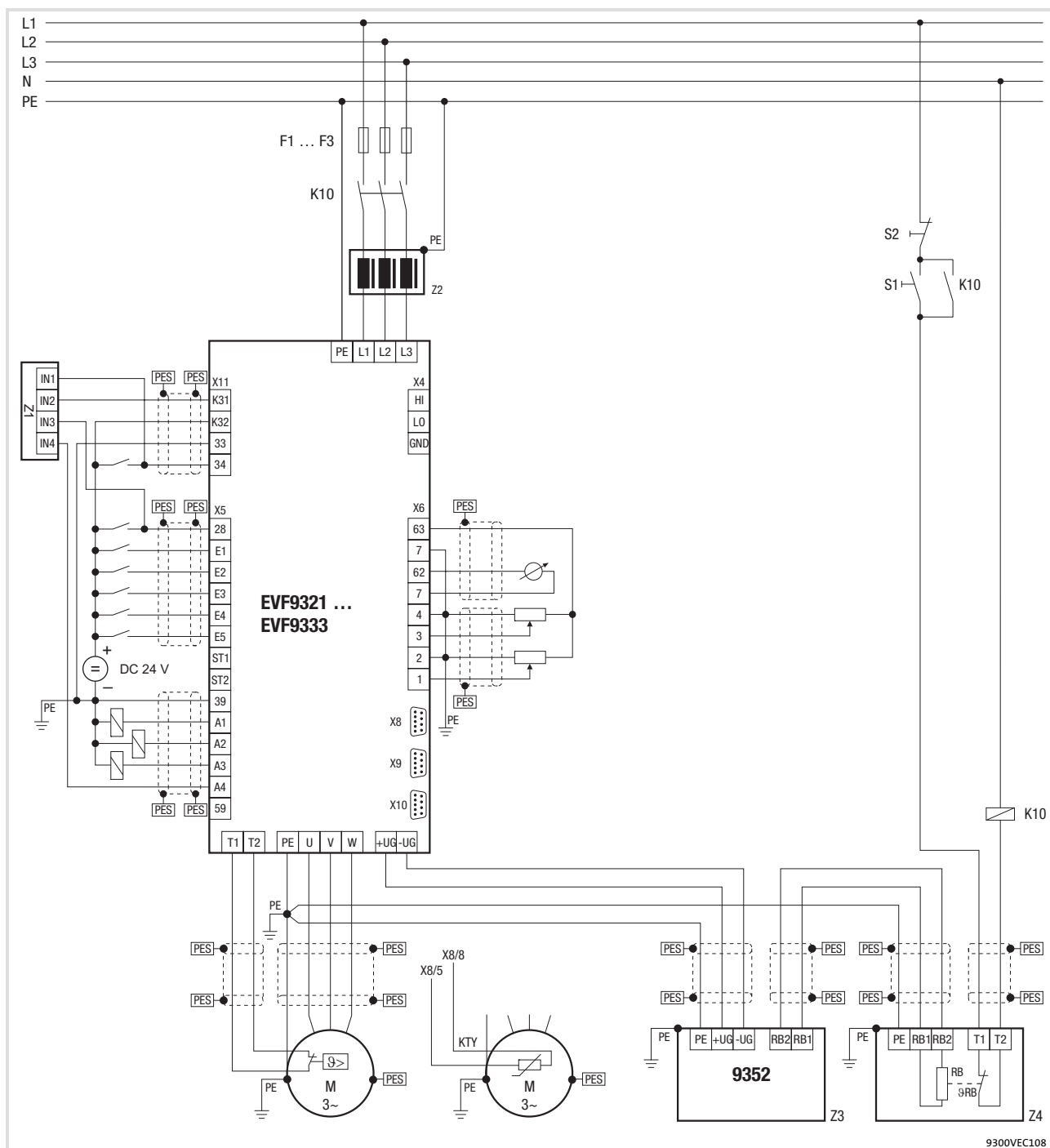


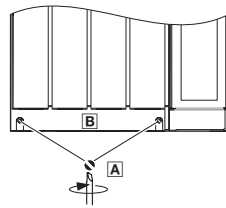
Fig. 5.6-1 Example for wiring in accordance with EMC regulations

F1 ... F3	Fuses
K10	Mains contactor
Z1	Programmable logic controller (PLC)
Z2	Mains choke or mains filter
Z3	Brake chopper EMB9352-E
Z4	Brake resistor
S1	Mains contactor on
S2	Mains contactor off
+U _G , -U _G	DC-bus connection
PES	HF shield termination through large-surface connection to PE

5.6.2 Important notes

To gain access to the power connections, remove the cover:

Remove the cover of the drive controller



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1. Remove the screws **A**
2. Lift cover **B** up and detach it

Installation material required from the scope of supply:

Description	Use	Quantity
Cable ties 3.5 × 150 mm	Strain relief/shield connection for motor cable	4

5.6.3 Mains connection, DC supply



Note!

- If a mains filter or RFI filter is used and the cable length between mains/RFI filter and drive controller exceeds 300 mm, install a shielded cable.
- For DC-bus operation or DC supply, we recommend using shielded DC cables.

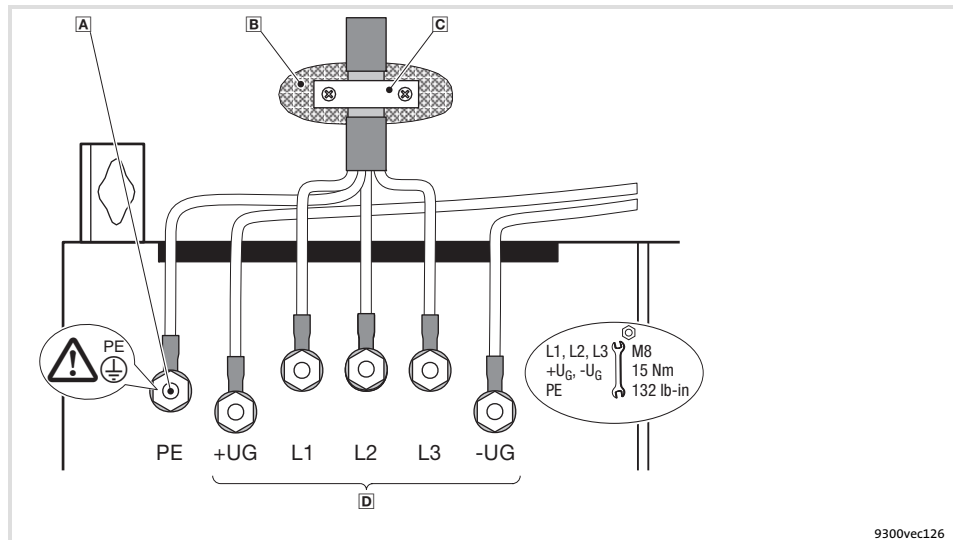


Fig. 5.6-2 Mains connection, DC supply for drive controllers 45 ... 55 kW

- A** PE stud
Connect PE cable with ring cable lug
- B** Conductive surface
- C** Shield clamp
Place shield with large surface on control cabinet mounting plate and fasten with shield clamp (shield clamp is not part of the scope of supply)
To improve the shield connection, also place the shield on the PE stud
- D** Mains and DC bus connection
L1, L2, L3: Connection of mains cable with ring cable lugs
+UG, -UG: Connection of DC-bus components or connection of the controller in the DC-bus system (see system manual)

5.6.4 Mains connection: Fuses and cable cross-sections

Installation in accordance with EN 60204-1

Supply conditions	
Range	Description
Fuses	Utilisation category: only gG/gL or gRL
Cables	Laying systems B2 and C: Use of PVC-insulated copper cables, conductor temperature < 70 °C, ambient temperature < 40 °C, no bundling of the cables or cores, three loaded cores. The data are recommendations. Other dimensionings/laying systems are possible (e.g. in accordance with VDE 0298-4).
RCCB	- Controllers can cause a DC current in the PE conductor. If a residual current device (RCD) or a fault current monitoring unit (RCM) is used for protection in the case of direct or indirect contact, only one RCD/RCM of the following type can be used on the current supply side: - Type B (universal-current sensitive) for connection to a three-phase system - Type A (pulse-current sensitive) or type B (universal-current sensitive) for connection to a 1-phase system Alternatively another protective measure can be used, like for instance isolation from the environment by means of double or reinforced insulation, or isolation from the supply system by using a transformer. - Earth-leakage circuit breakers must only be installed between mains supply and controller.

Observe all national and regional regulations!

Operation at rated power

9300	Rated fuse current		Cable cross-section		FI ¹⁾
	Fuse	Circuit-breaker	Laying system L1, L2, L3, PE		
Type	[A]	[A]	B2 [mm²]	C [mm²]	[mA]
Operation with mains choke/mains filter					
EVF9330-xV	100	—	—	35	300
EVF9331-xV	125	—	—	35	

¹⁾ Universal current-sensitive earth-leakage circuit breaker

Operation with increased rated power

9300	Rated fuse current		Cable cross-section		FI ¹⁾
	Fuse	Circuit-breaker	Laying system L1, L2, L3, PE		
Type	[A]	[A]	B2 [mm²]	C [mm²]	[mA]
Operation with mains choke/mains filter					
EVF9330-xV	125	—	—	35	300
EVF9331-xV	160	—	—	70	

¹⁾ Universal current-sensitive earth-leakage circuit breaker

5 Wiring of the standard device

5.6 Standard devices in the power range of 55 kW

5.6.5 Mains choke/mains filter assignment

Installation to UL

Supply conditions	
Range	Description
Fuses	- Only according to UL 248 - Mains short-circuit current up to 10000 A_{rms}: All classes permissible - Mains short-circuit current up to 50000 A_{rms}: Only classes "J", "T" or "R" permissible
Cables	- Only in accordance with UL - The cable cross-sections specified in the following apply under the following conditions: - Conductor temperature < 60 °C - Ambient temperature < 40 °C
Observe all national and regional regulations!	

Operation at rated power

9300	Rated fuse current	Cable cross-section
Type	Fuse [A]	L1, L2, L3, PE [AWG]
Operation with mains choke/mains filter		
EVF9330-xV	100	1
EVF9331-xV	125	1/0

5.6.5 Mains choke/mains filter assignment

Operation with rated power (normal operation)

9300	Mains choke	Interference voltage category according to EN 61800-3 and motor cable length			
Type		Component		Component	
		C2	max. [m]	C1	max. [m]
EVF9330-xV	ELN3-0038H085	EZN3A0037H090	25	E82ZN45334B230	10
		E82ZN45334B230	50	EZN3B0037H090	50
EVF9331-xV	ELN3-0027H105-001	EZN3A0030H110	25	E82ZN55334B230	10
		EZN3A0030H110N001 ³⁾	25		
		E82ZN55334B230	50	EZN3B0030H110	50

³⁾ For controllers with thermal separation

Operation with increased rated power

9300	Mains choke	Interference voltage category according to EN 61800-3 and motor cable length			
Type		Component		Component	
		C2	max. [m]	C1	max. [m]
EVF9330-xV	ELN3-0027H105-001	EZN3A0030H110	25	E82ZN55334B230	10
				EZN3B0030H110N001 ³⁾	25
		E82ZN55334B230	50	EZN3B0030H110	50
EVF9331-xV	ELN3-0027H105-001	EZN3A0030H110	25	EZN3B0030H110	50
		EZN3A0030H110N001 ³⁾	25		

³⁾ For controllers with thermal separation

5.6.6 Motor connection



Note!

- ▶ Fusing the motor cable is not required.
- ▶ The drive controller features 2 connections for motor temperature monitoring:
 - Terminals T1, T2 for connecting a PTC thermistor or thermal contact (NC contact).
 - Pins X8/5 and X8/8 of the incremental encoder input (X8) for connecting a KTY thermal sensor.

Motor with PTC thermistor or thermal contact (NC contact)

Wire T1, T2 only if the motor is equipped with a PTC thermistor or thermal contact (NC contact).

- ▶ An "open" cable acts like an antenna and can cause faults on the drive controller.



Danger!

- ▶ All control terminals only have basic insulation (single isolating distance) after connecting a PTC thermistor or a thermal contact.
- ▶ Protection against accidental contact in case of a defective isolating distance is only guaranteed through external measures, e.g. double insulation.

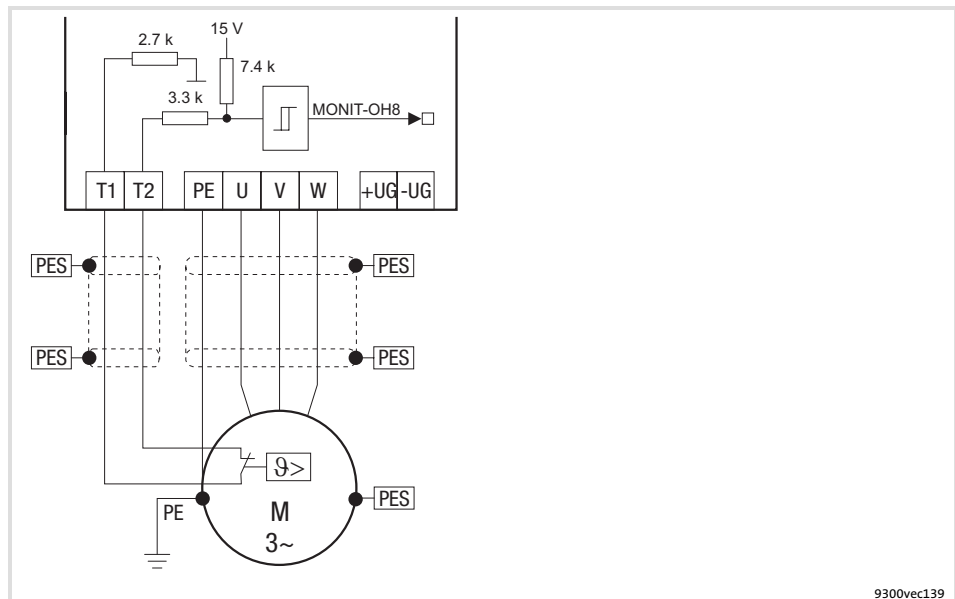


Fig. 5.6-3 Circuit diagram of motor connection with PTC thermistor or thermal contact (NC contact) at T1, T2

Characteristics of the connection for motor temperature monitoring:

Terminals T1, T2	
Connection	• PTC thermistor – PTC thermistor with defined tripping temperature (acc. to DIN 44081 and DIN 44082) • Thermal contact (NC contact) – Thermostat as NC contact
Tripping point	• Fixed (depending on the PTC/thermal contact) • PTC: $R_9 > 1600 \Omega$ • Configurable as warning or error (TRIP)
Notes	• Monitoring is not active in the Lenze setting. • If you do not use a Lenze motor, we recommend the use of a PTC thermistor up to 150°C.

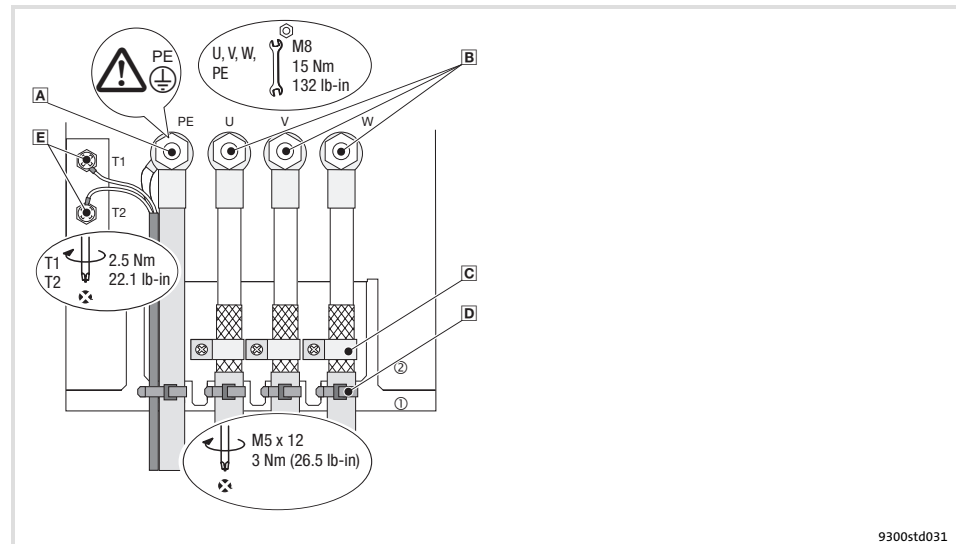


Fig. 5.6-4 Motor connection with PTC thermistor or thermal contact (NC contact)

- A** PE stud
PE cable connection with ring cable lug
- B** U, V, W
Motor cable connection
Check the correct polarity. Observe maximum length of the motor cable.
Max. connectable cable cross-section: 120 mm² with ring cable lug
- C** Shield clamps
Place shields of motor cable with large surface on the shield sheet and fasten with shield clamps and M5 × 12 mm screws
- D** Cable ties
Strain relief of motor cable
- E** T1, T2 for motor temperature monitoring
Cable connection for PTC thermistors or thermal contacts (NC contacts)
Place shield with large surface on PE stud

Motor with KTY thermal sensor



Note!

- We recommend to use Lenze system cables for wiring.
- For self-made cables only use cables with shielded cores twisted in pairs.

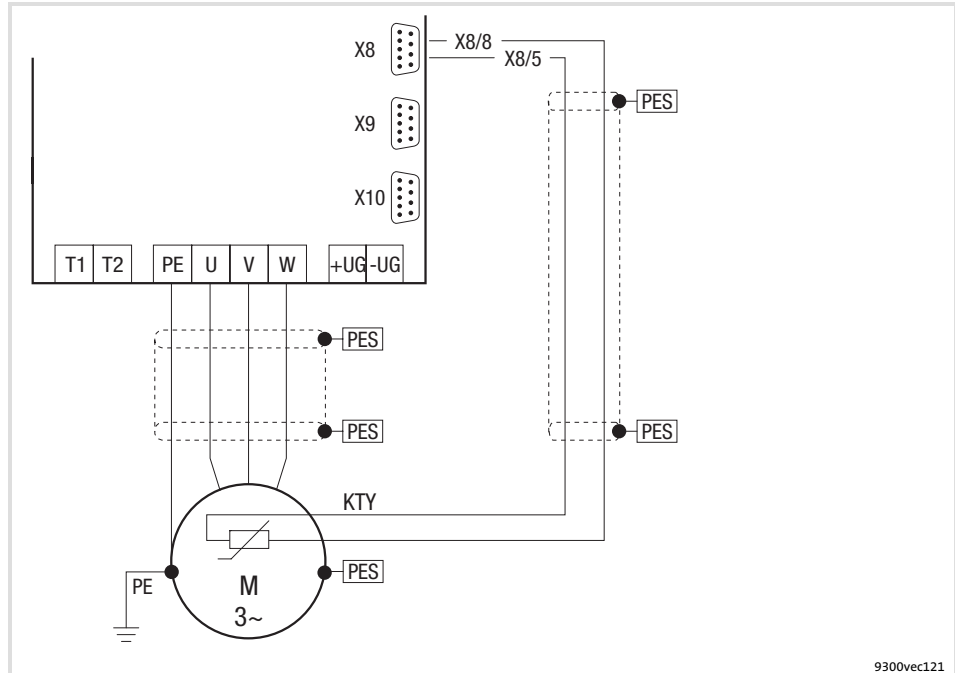


Fig. 5.6-5 Circuit diagram of motor connection with KTY thermal sensor at incremental encoder input X8

Characteristics of the connection for motor temperature monitoring:

Pins X8/5, X8/8 of incremental encoder input (X8)

Connection	Linear KTY thermal sensor
Tripping point	• Warning: Adjustable • Error (TRIP): Fixed at 150 °C
Notes	• Monitoring is not active in the Lenze setting. • The KTY thermal sensor is monitored with regard to interruption and short circuit.

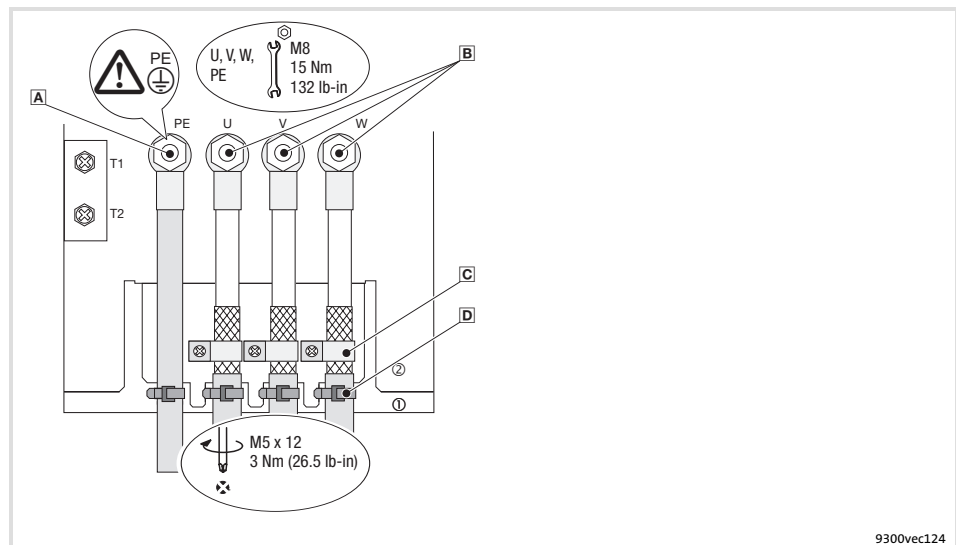


Fig. 5.6-6 Motor connection with KTY thermal sensor

- A** PE stud
PE cable connection with ring cable lug
- B** U, V, W
Motor cable connection
Check the correct polarity. Observe maximum length of the motor cable.
Max. connectable cable cross-section: 120 mm² with ring cable lug
- C** Shield clamps
Place shields of motor cable with large surface on the shield sheet and fasten with shield clamps and M5 × 12 mm screws
- D** Cable ties
Strain relief of motor cable

5.7 Standard devices in the power range 75 ... 90 kW**5.7.1 Wiring according to EMC (CE-typical drive system)**

The drives comply with the EC Directive on "Electromagnetic Compatibility" if they are installed in accordance with the specifications for the CE-typical drive system. The user is responsible for the compliance of the machine application with the EC Directive.

**Note!**

Observe the notes given in the chapter "Basics for wiring according to EMC"!

5

Wiring of the standard device

5.7

Standard devices in the power range 75 ... 90 kW

5.7.1

Wiring according to EMC (CE-typical drive system)

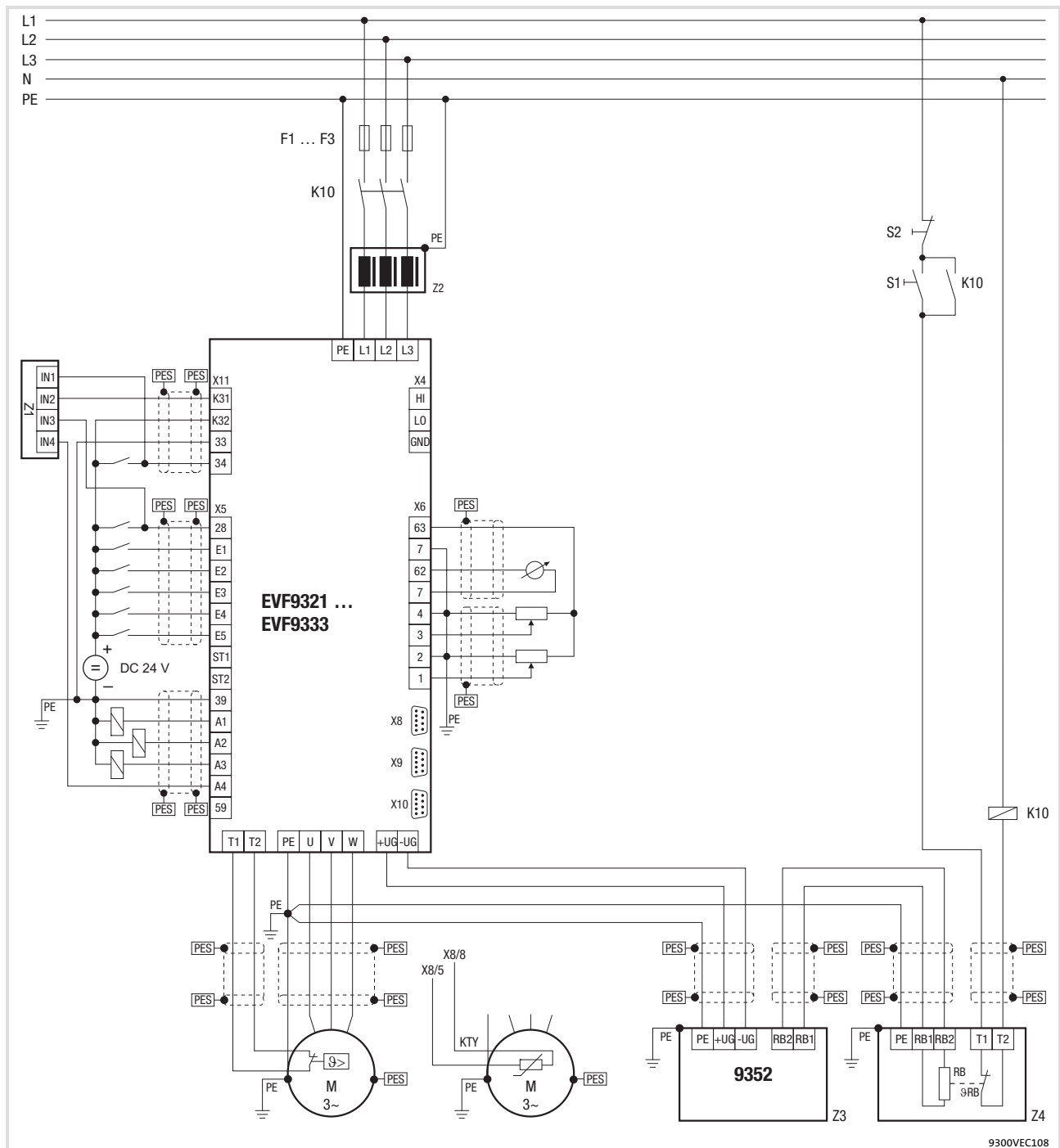


Fig. 5.7-1 Example for wiring in accordance with EMC regulations

F1 ... F3

Fuses

K10

Mains contactor

Z1

Programmable logic controller (PLC)

Z2

Mains choke or mains filter

Z3

Brake chopper EMB9352-E

Z4

Brake resistor

S1

Mains contactor on

S2

Mains contactor off

+U_G, -U_G

DC-bus connection

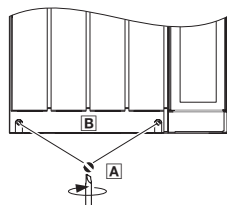
PES

HF shield termination through large-surface connection to PE

5.7.2 Important notes

To gain access to the power connections, remove the cover:

Remove the cover of the drive controller



9300vec113

1. Remove the screws **A**
2. Lift cover **B** up and detach it

Installation material required from the scope of supply:

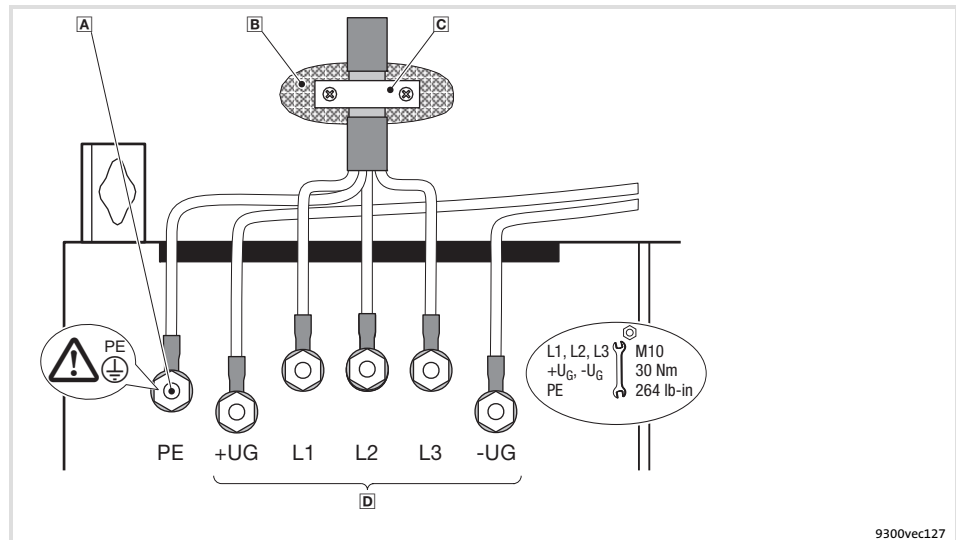
Description	Use	Quantity
Cable ties 3.5 × 150 mm	Strain relief/shield connection for motor cable	4

5.7.3

Mains connection, DC supply

**Note!**

- If a mains filter or RFI filter is used and the cable length between mains/RFI filter and drive controller exceeds 300 mm, install a shielded cable.
- For DC-bus operation or DC supply, we recommend using shielded DC cables.



9300vec127

Fig. 5.7-2 Mains connection, DC supply for drive controllers 75 ... 90 kW

- A** PE stud
Connect PE cable with ring cable lug
- B** Conductive surface
- C** Shield clamp
Place shield with large surface on control cabinet mounting plate and fasten with shield clamp (shield clamp is not part of the scope of supply)
To improve the shield connection, also place the shield on the PE stud
- D** Mains and DC bus connection
L1, L2, L3: Connection of mains cable with ring cable lugs
+UG, -UG: Connection of DC-bus components or connection of the controller in the DC-bus system (see system manual)

5.7.4 Mains connection: Fuses and cable cross-sections

Installation in accordance with EN 60204-1

Supply conditions	
Range	Description
Fuses	Utilisation category: only gG/gL or gRL
Cables	Laying systems B2 and C: Use of PVC-insulated copper cables, conductor temperature < 70 °C, ambient temperature < 40 °C, no bundling of the cables or cores, three loaded cores. The data are recommendations. Other dimensionings/laying systems are possible (e.g. in accordance with VDE 0298-4).
RCCB	- Controllers can cause a DC current in the PE conductor. If a residual current device (RCD) or a fault current monitoring unit (RCM) is used for protection in the case of direct or indirect contact, only one RCD/RCM of the following type can be used on the current supply side: - Type B (universal-current sensitive) for connection to a three-phase system - Type A (pulse-current sensitive) or type B (universal-current sensitive) for connection to a 1-phase system Alternatively another protective measure can be used, like for instance isolation from the environment by means of double or reinforced insulation, or isolation from the supply system by using a transformer. - Earth-leakage circuit breakers must only be installed between mains supply and controller.

Observe all national and regional regulations!

Operation at rated power

9300	Rated fuse current		Cable cross-section		FI ¹⁾
	Fuse	Circuit-breaker	Laying system L1, L2, L3, PE		
			B2	C	
Type	[A]	[A]	[mm²]	[mm²]	[mA]
Operation with mains choke/mains filter					
EVF9332-xV	160	—	—	70	300
EVF9333-xV	200	—	—	95	

¹⁾ Universal current-sensitive earth-leakage circuit breaker

Operation with increased rated power

9300	Rated fuse current		Cable cross-section		FI ¹⁾
	Fuse	Circuit-breaker	Laying system L1, L2, L3, PE		
			B2	C	
Type	[A]	[A]	[mm²]	[mm²]	[mA]
Operation with mains choke/mains filter					
EVF9332-xV	200	—	—	95	300
EVF9333-xV	250	—	—	120	

¹⁾ Universal current-sensitive earth-leakage circuit breaker

5 Wiring of the standard device

5.7 Standard devices in the power range 75 ... 90 kW

5.7.5 Mains choke/mains filter assignment

Installation to UL

Supply conditions	
Range	Description
Fuses	- Only according to UL 248 - Mains short-circuit current up to 10000 A_{rms}: All classes permissible - Mains short-circuit current up to 50000 A_{rms}: Only classes "J", "T" or "R" permissible
Cables	- Only in accordance with UL - The cable cross-sections specified in the following apply under the following conditions: - Conductor temperature < 60 °C - Ambient temperature < 40 °C
Observe all national and regional regulations!	

Operation at rated power

9300	Rated fuse current	Cable cross-section
Type	Fuse [A]	L1, L2, L3, PE [AWG]
Operation with mains choke/mains filter		
EVF9332-xV	175	2/0
EVF9333-xV	200	3/0

5.7.5 Mains choke/mains filter assignment

Operation with rated power (normal operation)

9300	Mains choke	Interference voltage category according to EN 61800-3 and motor cable length			
Type		Component		Component	
		C2	max. [m]	C1	max. [m]
EVF9332-xV	ELN3-0022H130	EZN3A0022H150	25	E82ZN75334B230	10
		E82ZN75334B230	50	EZN3B0022H150	50
EVF9333-xV	ELN3-0017H170	EZN3A0017H200	25	E82ZN90334B230	10
		E82ZN90334B230	50	EZN3B0017H200	50

Operation with increased rated power

9300	Mains choke	Interference voltage category according to EN 61800-3 and motor cable length			
Type		Component		Component	
		C2	max. [m]	C1	max. [m]
EVF9332-xV	ELN3-0017H170	EZN3A0017H200	25	E82ZN90334B230	10
		E82ZN90334B230	50	EZN3B0017H200	50
EVF9333-xV	ELN3-0014H200	EZN3A0015H230	25	EZN3B0015H230	50
		EZN3A0017H200	25	EZN3B0017H200	50

5.7.6 Motor connection



Note!

- ▶ Fusing the motor cable is not required.
- ▶ The drive controller features 2 connections for motor temperature monitoring:
 - Terminals T1, T2 for connecting a PTC thermistor or thermal contact (NC contact).
 - Pins X8/5 and X8/8 of the incremental encoder input (X8) for connecting a KTY thermal sensor.

Motor with PTC thermistor or thermal contact (NC contact)

Wire T1, T2 only if the motor is equipped with a PTC thermistor or thermal contact (NC contact).

- ▶ An "open" cable acts like an antenna and can cause faults on the drive controller.



Danger!

- ▶ All control terminals only have basic insulation (single isolating distance) after connecting a PTC thermistor or a thermal contact.
- ▶ Protection against accidental contact in case of a defective isolating distance is only guaranteed through external measures, e.g. double insulation.

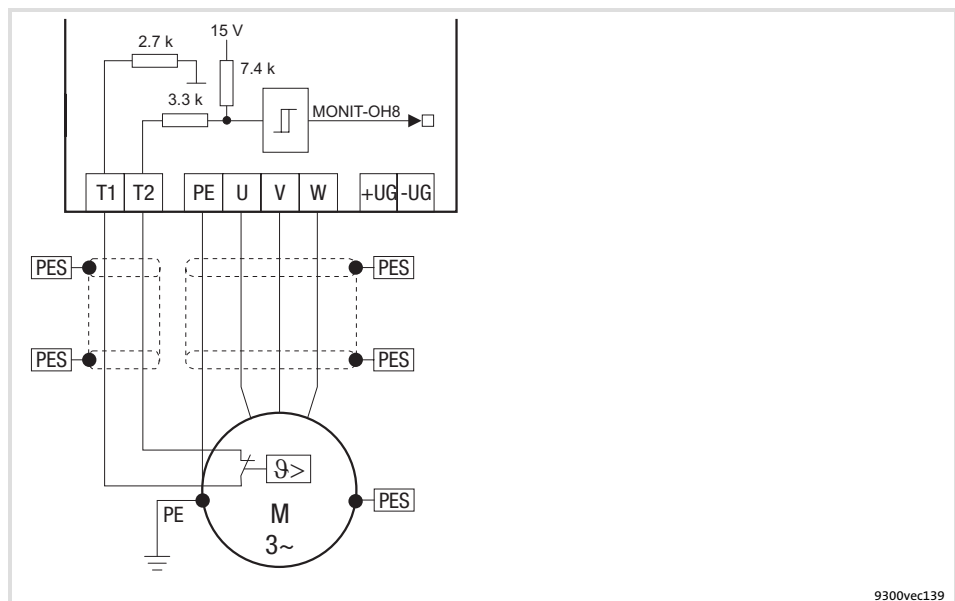


Fig. 5.7-3

Circuit diagram of motor connection with PTC thermistor or thermal contact (NC contact) at T1, T2

Wiring of the standard device

Standard devices in the power range 75 ... 90 kW

Motor connection

Characteristics of the connection for motor temperature monitoring:

Terminals T1, T2	
Connection	• PTC thermistor – PTC thermistor with defined tripping temperature (acc. to DIN 44081 and DIN 44082) • Thermal contact (NC contact) – Thermostat as NC contact
Tripping point	• Fixed (depending on the PTC/thermal contact) • PTC: $R_9 > 1600 \Omega$ • Configurable as warning or error (TRIP)
Notes	• Monitoring is not active in the Lenze setting. • If you do not use a Lenze motor, we recommend the use of a PTC thermistor up to 150°C.

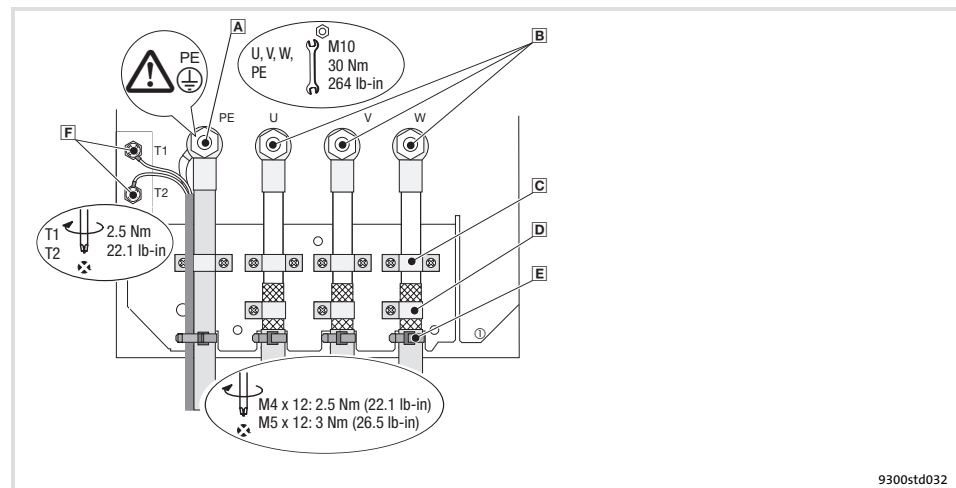


Fig. 5.7-4 Motor connection with PTC thermistor or thermal contact (NC contact)

- A** PE stud
PE cable connection with ring cable lug
- B** U, V, W
Motor cable connection
Check the correct polarity. Observe maximum length of the motor cable.
Max. connectable cable cross-section: 240 mm² with ring cable lug
- C** Cable clamps for strain relief of motor cable
Fasten cable clamps with M4 × 12 mm screws
- D** Shield clamps
Place shields of motor cable with large surface on the shield sheet and fasten with shield clamps and M5 × 12 mm screws
- E** Cable ties for additional strain relief of motor cable
- F** T1, T2 for motor temperature monitoring
Cable connection for PTC thermistors or thermal contacts (NC contacts)
Place shield with large surface on PE stud

Motor with KTY thermal sensor



Note!

- We recommend to use Lenze system cables for wiring.
- For self-made cables only use cables with shielded cores twisted in pairs.

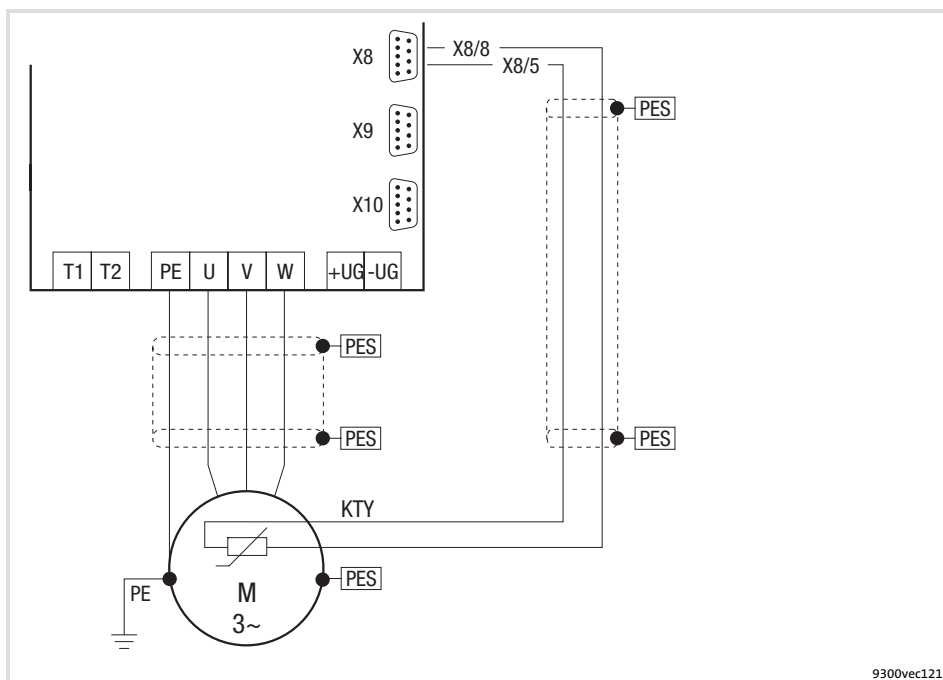


Fig. 5.7-5 Circuit diagram of motor connection with KTY thermal sensor at incremental encoder input X8

Characteristics of the connection for motor temperature monitoring:

Pins X8/5, X8/8 of incremental encoder input (X8)

Connection	Linear KTY thermal sensor
Tripping point	• Warning: Adjustable • Error (TRIP): Fixed at 150 °C
Notes	• Monitoring is not active in the Lenze setting. • The KTY thermal sensor is monitored with regard to interruption and short circuit.

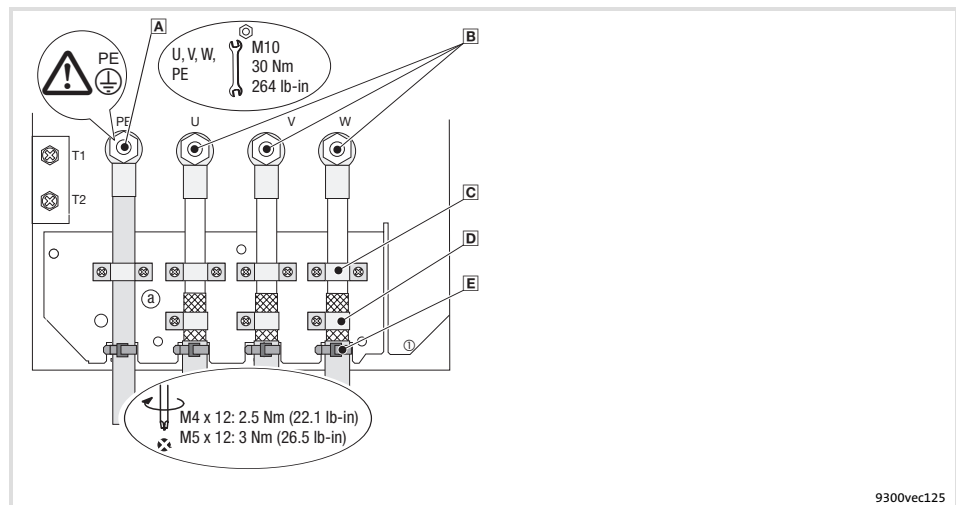


Fig. 5.7-6 Motor connection with KTY thermal sensor

- A** PE stud
PE cable connection with ring cable lug
- B** U, V, W
Motor cable connection
Check the correct polarity. Observe maximum length of the motor cable.
Max. connectable cable cross-section: 240 mm² with ring cable lug
- C** Shield clamps
Place shields of motor cable with large surface on the shield sheet and fasten with shield clamps and M5 × 12 mm screws
- D** Cable ties
Strain relief of motor cable

5.8 Control terminals

5.8.1 Important notes



Stop!

The control card will be damaged if

- ▶ the voltage between X5/39 and PE or X6/7 and PE is greater than 50 V,
- ▶ the voltage between voltage source and X6/7 exceeds 10 V (common mode) in case of supply via external voltage source.

Limit the voltage before switching on the drive controller:

- ▶ Connect X5/39, X6/2, X6/4 and X6/7 directly to PE or
- ▶ use voltage-limiting components.

- ▶ For trouble-free operation, the control cables must be shielded:
 - Connect the shield of digital input and output cables at both ends.
 - Connect the shield of analog input and output cables at one end (at the drive controller).
 - For lengths of 200 mm and more, use only shielded cables for analog and digital inputs and outputs. Under 200 mm, unshielded but twisted cables may be used.

Installation material required from the scope of supply:

Description	Use	Quantity
Shield sheet	Shield connection for control cables	1
Screw M4 × 10 mm (DIN 7985)	Shield sheet fastening	1
Terminal strip, 4-pole (only for variants V004 and V024)	Connection of safety relay K _{SR} at X11	1
Terminal strip, 7-pole	Connection of digital inputs and outputs at X5	2
Terminal strip, 4-pole	Connection of analog inputs and outputs at X6	2

How to connect the shield

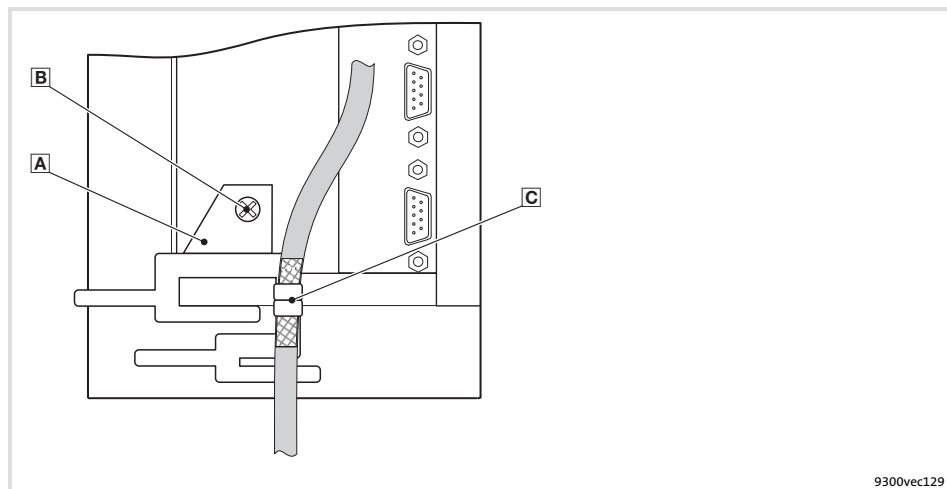


Fig. 5.8-1 Connection of cable shield to shield sheet

- A Shield sheet
- B Fasten shield sheet with M4 × 10 mm screw at the bottom of the control card
- C Securely clamp cable shield with lugs

Terminal data



Stop!

- Connect or disconnect the terminal strips only if the controller is disconnected from the mains!
- Wire the terminal strips before connecting them!
- Unused terminal strips must also be plugged on to protect the contacts.

Cable type	Wire end ferrule	Maximum cable cross-section	Tightening torque	Stripping length
Rigid	—	2.5 mm ² (AWG 14)	0.5 ... 0.6 Nm (4.4 ... 5.3 lb-in)	5 mm
Flexible	Without wire end ferrule	2.5 mm ² (AWG 14)		
Flexible	Wire end ferrule without plastic sleeve	2.5 mm ² (AWG 14)		
Flexible	Wire end ferrule with plastic sleeve	2.5 mm ² (AWG 14)		

5.8.2 Connection terminal of the control card

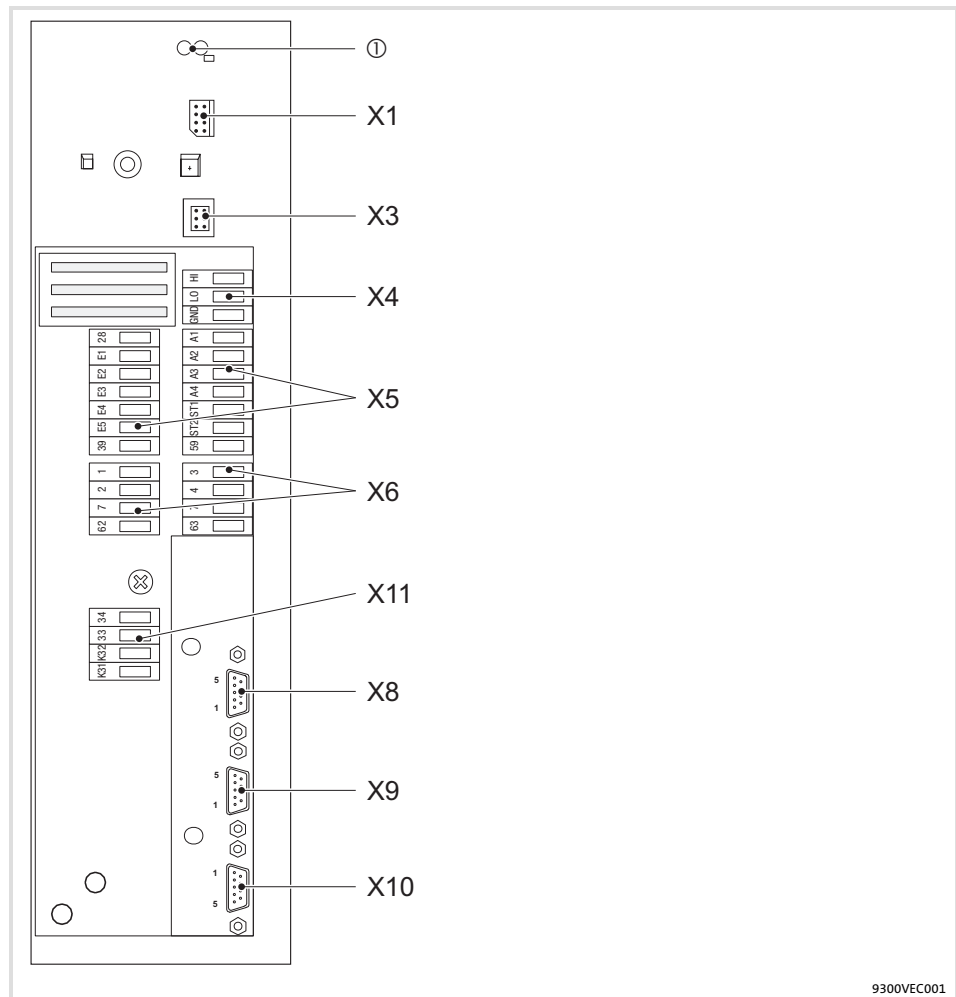


Fig. 5.8-2 Connection terminal of the control card

- ① 2 light-emitting diodes (red, green) for status display
- X1 Automation interface (AIF)
- X3 Slot for communication modules (e.g. keypad XT)
- X4 Preselection of signal type with jumper for input signal at X6/1, X6/2
- X5 Connection for system bus (CAN), terminal strip
- X6 Connection for digital inputs and outputs, terminal strips
- X6 Connection for analog inputs and outputs, terminal strips
- X8 Connection for incremental encoder connector: male, 9-pole, Sub-D
- X9 Connection for digital frequency input signal connector: male, 9-pole, Sub-D
- X10 Connection for digital frequency output signal connector: female, 9-pole, Sub-D
- X11 Connection for safety relay K_{SR} , terminal strip

5.8.3 Device variant without "Safe torque off" function

Internal voltage supply

- For the supply of the digital inputs (X5/E1 ... X5/E5) you have to set a freely assignable digital output (e. g. X5/A1) permanently to HIGH level.
- For the supply of the analog inputs (X6/1, X6/2 and X6/3, X6/4) you have to set a freely assignable analog output (e. g. X6/63) permanently to HIGH level.

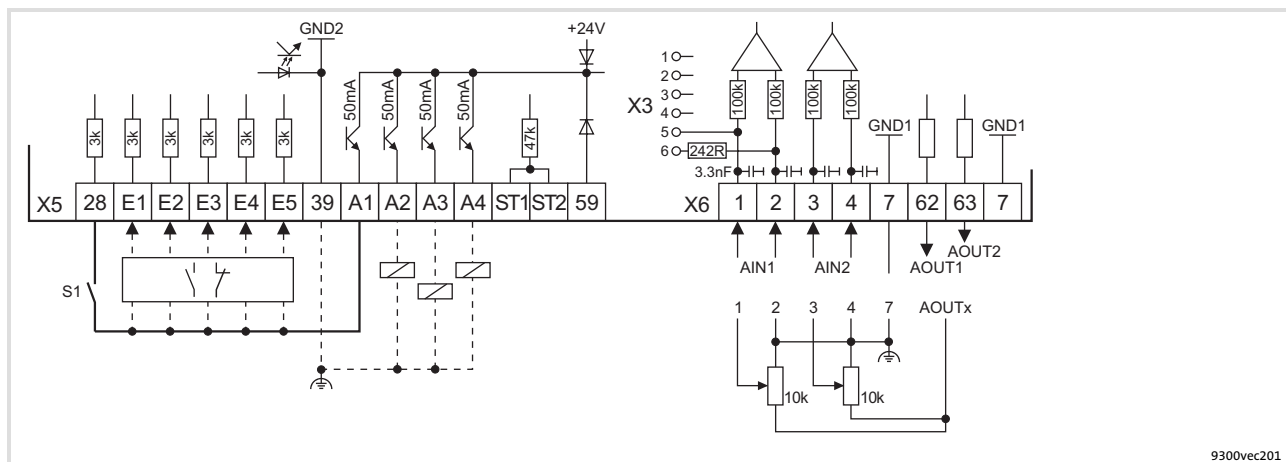


Fig. 5.8-3 Wiring of digital and analog inputs/outputs for internal voltage source

- S1 Controller enable
 NO contact or NC contact
 Load
— Minimum wiring required for operation
Terminal assignment in the Lenze setting: 5.8-8

Supply via external voltage source

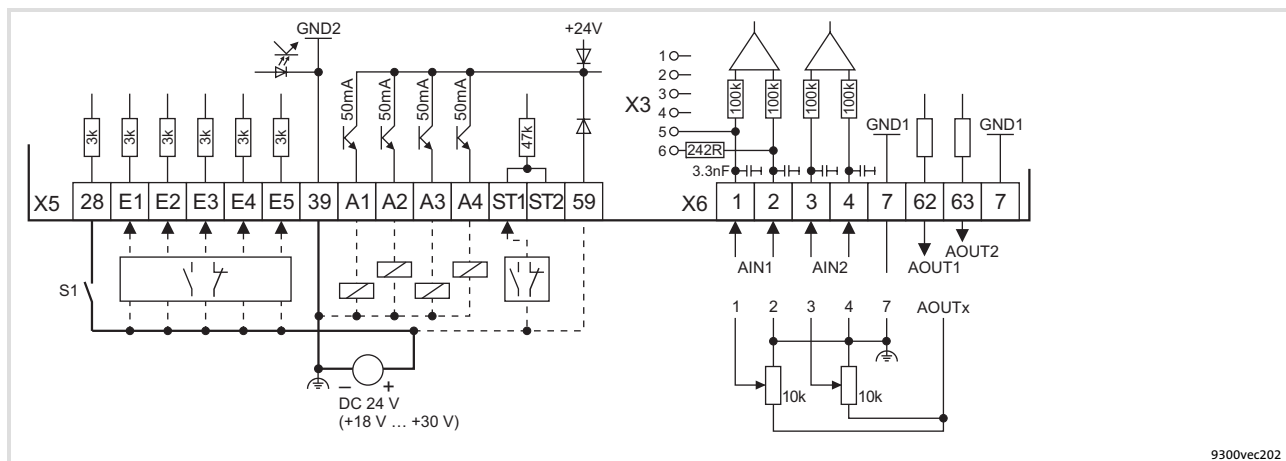


Fig. 5.8-4 Wiring of digital and analog inputs/outputs for external voltage source

- S1 Controller enable
 NO contact or NC contact
 Load
— Minimum wiring required for operation
Terminal assignment in the Lenze setting: 5.8-8

5.8.4 Device variant with "Safe torque off" function

Safety instructions for the installation of the "Safe torque off" function

- ▶ The installation and commissioning of the "Safe torque off" function must be carried out by skilled personnel only.
- ▶ All safety-relevant cables (e.g. control cable for the safety relay, feedback contact) outside the control cabinet must be protected, for instance by a cable duct. Short circuits between the single cables must be ruled out!
- ▶ Wiring of the safety relay K_{SR} with insulated wire end ferrules or rigid cables is absolutely vital.
- ▶ The electrical reference point for the coil of the safety relay K_{SR} must be connected with the protective conductor system (DIN EN 60204-1 paragraph 9.4.3). Only this measure guarantees that the operation is protected against earth faults.



Tip!

A complete description can be found in the chapter "Safe torque off".

Internal voltage supply

- ▶ If a freely assignable digital output (e.g. X5/A1) is assigned permanently to HIGH level, it serves as an internal voltage source. Every output has a maximum load capacity of 50 mA.
 - The relay K_{SR} and two digital inputs (X5/28 and e.g. X5/E1) can be supplied with voltage via a digital output.
 - Two digital outputs must be connected in parallel and assigned permanently to HIGH level in order to obtain the maximum wiring (relays K_{SR} and X5/E1 ... X5/E5, X5/ST1).
- ▶ For the supply of the analog inputs (X6/1, X6/2 and X6/3, X6/4) you have to set a freely assignable analog output (e. g. X6/63) permanently to HIGH level.

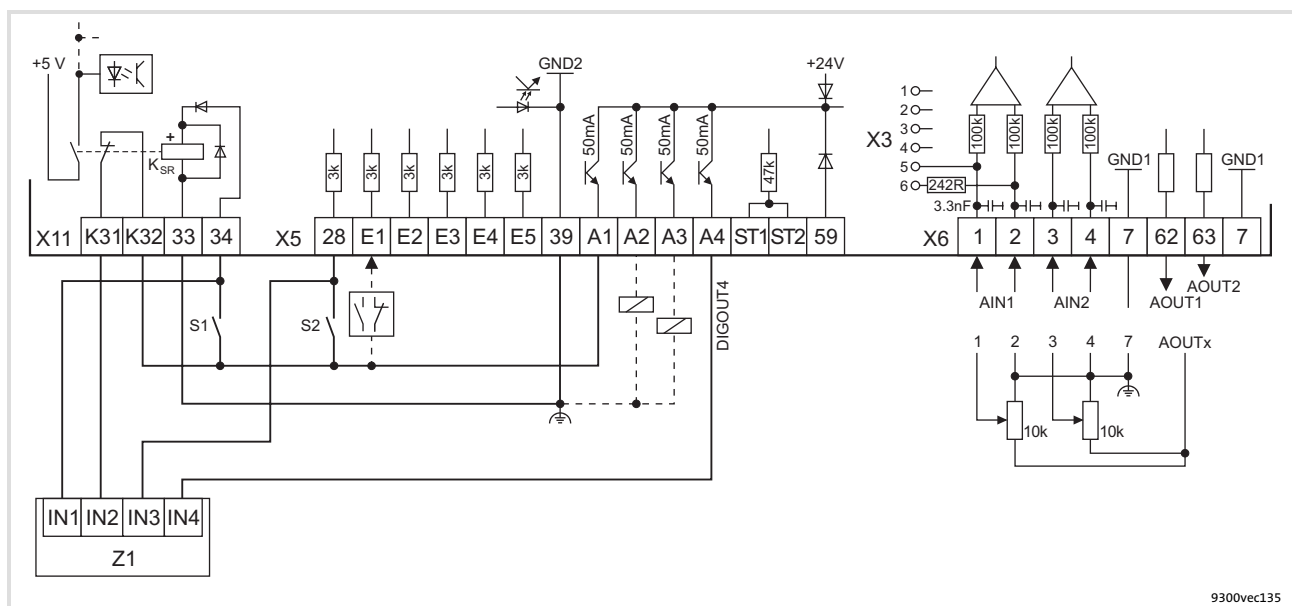


Fig. 5.8-5 Wiring of digital and analog inputs/outputs with active "Safe torque off" function and internal voltage source

- S1 Deactivate pulse inhibit (1st disconnecting path)
- S2 Enable controller (2nd disconnecting path)
- Z1 Programmable logic controller (PLC)
- The PLC monitors the "Safe torque off" function
- X5/A4 Feedback via a digital output (e. g. DIGOUT4)
- NO contact or NC contact
- Load
- Minimum wiring required for operation
- Terminal assignment in the Lenze setting: 5.8-8



Note!

If you load a basic configuration C0005 = xx1x (e.g. 1010 for speed control with control via terminals), the following terminals are switched to a fixed signal level:

- ▶ Terminal X5/A1 to FIXED1 (corresponds to DC 24 V).
- ▶ Terminal X6/63 to FIXED100% (corresponds to 10 V).

5.8.5 Terminal assignment

Terminal		Function Bold print = Lenze setting	Level / state	Technical data	
X11/K32 X11/K31	Safety relay K _{SR} 1st disconnecting path	Feedback - pulse inhibit	Open contact: Pulse inhibit is inactive (operation) Closed contact: Pulse inhibit is active	See chapter "Technical data"	
X11/33		– coil of safety relay K _{SR}	Coil is not carrying any current: Active pulse inhibit		
X11/34		+ coil of safety relay K _{SR}	Coil is carrying current: Inactive pulse inhibit (operation)		
X5/28	Controller inhibit (DCTRL-CINH) 2nd disconnecting path	Controller enable/inhibit	LOW: Controller inhibited HIGH: Controller enabled	LOW: 0 ... +3 V HIGH: +12 ... +30 V Input current at +24 V: 8 mA per input	
X5/E1	Digital inputs (freely assignable)	Deactivate CW rotation / quick stop	HIGH	Reading and processing the input signals - 1/ms (mean value)	
X5/E2		Deactivate CCW rotation / quick stop	HIGH		
X5/E3		Activate fixed frequency 1 (JOG1)	HIGH		
X5/E4		Set error message (TRIP SET)	LOW		
X5/E5		Reset error message (TRIP RESET)	LOW-HIGH edge		
X5/ST1 X5/ST2		Additional digital input (E6)	HIGH		
X5/A1	Digital outputs (freely assignable)	Error message present	LOW	LOW: 0 ... +3 V HIGH: +12 ... +30 V	
X5/A2		Switching threshold Q_{MIN}: Actual speed < setpoint speed in C0017	LOW	Load capacity: Max. 50 mA per output (load resistance at least 480 Ω at +24 V)	
X5/A3		Ready for operation (DCTRL-RDY)	HIGH		
X5/A4		Maximum current reached (DCTRL-IMAX)	HIGH	Update of the output signals - 1/ms	
X5/39	–	GND2, reference potential for digital signals	–	Isolated against GND1	
X5/59	–	Connection of external voltage source for backup operation of the drive controller in case of mains failure	DC 24 V (+18 ... +30 V)	Current consumption: Max. 1 A at 24 V	
X6/1 X6/2	Analog input 1	Voltage input range Main setpoint	 Jumper X3	-10 V ... +10 V	Resolution: 5 mV (11 bits + sign)
		Current input range	 Jumper X3	-20 mA ... +20 mA	Resolution: 20 µA (10 bits + sign)
X6/3 X6/4	Analog input 2	Voltage input range Not active	Jumper X3 has no effect	-10 V ... +10 V	Resolution: 5 mV (11 bits + sign)
X6/62	Analog output 1	Monitor 1 Actual speed value		-10 V ... +10 V max. 2 mA	Resolution: 20 mV (9 bits + sign)
X6/63	Analog output 2	Monitor 2 Actual motor current value		-10 V ... +10 V max. 2 mA	Resolution: 20 mV (9 bits + sign)
X6/7	–	GND1, reference potential for analog signals	–	–	

5.9 Wiring of the system bus (CAN)

Wiring

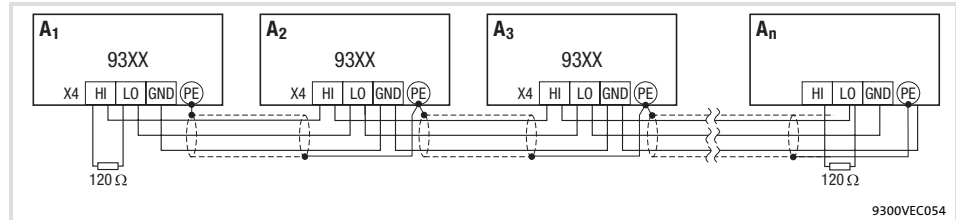


Fig. 5.9-1 System bus (CAN) wiring

A ₁	Bus device 1 (controller)
A ₂	Bus device 2 (controller)
A ₃	Bus device 3 (controller)
A _n	Bus device n (e. g. PLC), n = max. 63
X4/GND	CAN-GND: System bus reference potential
X4/LO	CAN-LOW: System bus LOW (data line)
X4/HI	CAN-HIGH: System bus HIGH (data line)



Stop!

Connect a 120 Ω terminating resistor to the first and last bus device.

We recommend the use of CAN cables in accordance with ISO 11898-2:

CAN cable in accordance with ISO 11898-2	
Cable type	Paired with shielding
Impedance	120 Ω (95 ... 140 Ω)
Cable resistance/cross-section	
Cable length ≤ 300 m	≤ 70 mΩ/m / 0.25 ... 0.34 mm ² (AWG22)
Cable length 301 ... 1000 m	≤ 40 mΩ/m / 0.5 mm ² (AWG20)
Signal propagation delay	≤ 5 ns/m

5.10 Wiring of the feedback system

5.10.1 Important notes

- ▶ An incremental encoder can be connected to input X8 or input X9:
 - Incremental encoders with TTL level are connected to X8.
 - Incremental encoders with HTL level are connected to X9.
- ▶ The incremental encoder signal can be output for slave drives at the digital frequency output X10.



Note!

- ▶ We recommend to use Lenze system cables for wiring.
- ▶ For self-made cables only use cables with shielded cores twisted in pairs.

Installation material required from the scope of supply:

Description	Use	Quantity
Protective cover	Protection for unused Sub-D connections	4

5.10.2 Incremental encoder with TTL level at X8

Technical data

Field	Values
Connection at drive controller	Connector: Pin, 9-pole, Sub-D
Connectable incremental encoder	Incremental encoder with TTL level - Encoder with two 5 V complementary signals electrically offset by 90° - Connection of zero track is possible (optional)
Input frequency	0 ... 500 kHz
Current consumption	6 mA per channel
Internal voltage source (X8/4, X8/5)	5 V DC / max. 200 mA

Wiring

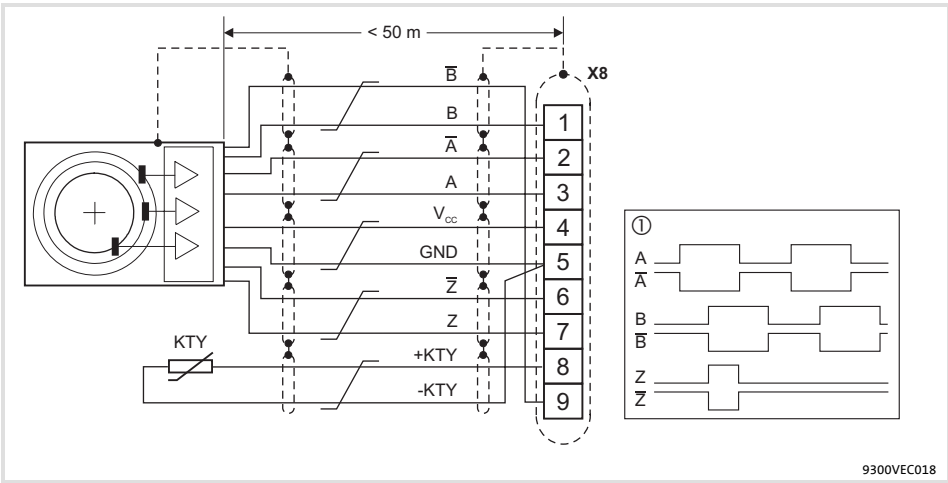


Fig. 5.10-1 Connection of incremental encoder with TTL level (RS-422)

- ① Signals for CW rotation
- / Cores twisted in pairs

X8 - Incremental encoder with TTL level									
Connector: Pin, 9-pole, Sub-D									
Pin	1	2	3	4	5	6	7	8	9
Signal	B	$\bar{A}$	A	V _{CC}	GND (-KTY)	$\bar{Z}$	Z	+KTY	$\bar{B}$
	0.14 mm ² (AWG 26)			1 mm ² (AWG 18)		0.14 mm ² (AWG 26)			

5.10.3 Incremental encoder with HTL level at X9

Technical data

Field	Values
Connection at drive controller	Connector: Pin, 9-pole, Sub-D
Connectable incremental encoder	Incremental encoder with HTL-level - Two-track with inverse signals and zero track - Two-track without inverse signals and zero track
Input frequency	0 ... 200 kHz
Current consumption	5 mA per channel
Supply of incremental encoder	External voltage source
Internal voltage source (X9/4, X9/5)	5 V DC / max. 200 mA Total current at X9/4, X9/5 and X10/4, X10/5: max. 200 mA

Wiring

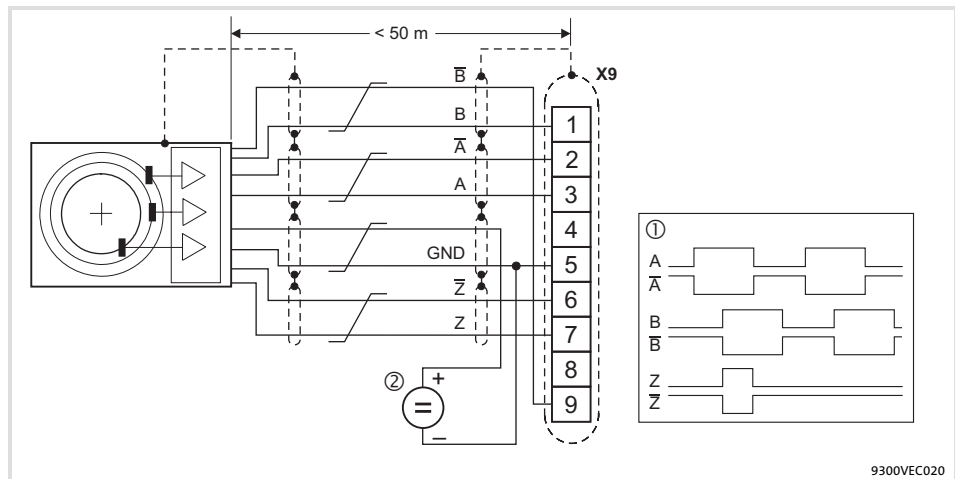


Fig. 5.10-2 Connection of incremental encoder with HTL level

- ① Signals for CW rotation
- ② External voltage source for the incremental encoder
- ⌋ Cores twisted in pairs

X9 - Incremental encoder with HTL level									
Connector: Pin, 9-pole, Sub-D									
Pin	1	2	3	4	5	6	7	8	9
Signal	B	$\bar{A}$	A	+5 V	GND	$\bar{Z}$	Z	-	$\bar{B}$
	0.14 mm ² (AWG 26)			1 mm ² (AWG 18)		0.14 mm ² (AWG 26)			



Note!

Connecting the two-track incremental encoder without inverse signals (at HTL level):

- Set signal A on pin X9/2 ($\bar{A}$) and signal B on pin X9/9 ($\bar{B}$).
- Wire pin X9/3 (A) and X9/1 (B) with the positive pole of the external voltage source for the incremental encoder.

5.11 Wiring of digital frequency input / digital frequency output

Installation material required from the scope of supply:

Description	Use	Quantity
Protective cover	Protection for unused Sub-D connections	4

Technical data

Field	Digital frequency output X10
Connection at drive controller	Connector: female, 9-pole, Sub-D
Pin assignment	Dependent on the selected basic configuration
Output frequency	0 ... 500 kHz
Signal	Two-track with inverse 5 V signals (RS422) and zero track
Load capacity	Max. 20 mA per channel (up to 3 slave drives can be connected)
Special features	The "Enable" output signal at X10/8 switches to LOW if the drive controller is not ready for operation (e.g. disconnected from mains). This may trip SD3 monitoring on the slave drive.
Internal voltage source (X10/4, X10/5)	DC 5 V / max. 50 mA Total current at X9/4, X9/5 and X10/4, X10/5: max. 200 mA
Field	Digital frequency input X9
Connection at drive controller	Connector: male, 9-pole, Sub-D
Input frequency	TTL level: 0 ... 500 kHz HTL level: 0 ... 200 kHz
Signal	Two-track with inverse signals and zero track Two-track without inverse signals and zero track (only for HTL level)
Signal evaluation	Via code C0427
Current consumption	Max. 5 mA
Special features	With activated SD3 monitoring, TRIP or warning is tripped if the "Lamp Control" input signal at X9/8 switches to LOW. Due to this the drive controller may respond if the master drive is not ready for operation.

Wiring



Note!

- We recommend to use Lenze system cables for wiring.
- For self-made cables only use cables with shielded cores twisted in pairs.

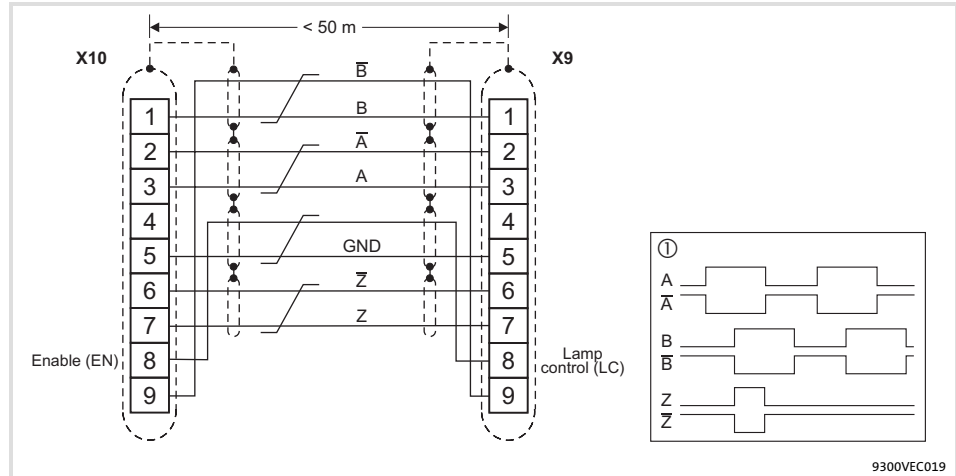


Fig. 5.11-1 Connection of digital frequency input (X9) / digital frequency output (X10)

X9 Slave drive
X10 Master drive

① Signals for CW rotation
Cores twisted in pairs

X9 - Digital frequency input
Connector: Pin, 9-pole, Sub-D

Pin	1	2	3	4	5	6	7	8	9
Signal	B	$\bar{A}$	A	+5 V	GND	$\bar{Z}$	Z	LC	$\bar{B}$
	0.14 mm ² (AWG 26)		0.5 mm ² (AWG 20)		0.14 mm ² (AWG 26)		0.5 mm ² (AWG 20)		0.14 mm ² (AWG 26)

X10 - Digital frequency output
Connector: Socket, 9-pole, Sub-D

Pin	1	2	3	4	5	6	7	8	9
Signal	B	$\bar{A}$	A	+5 V	GND	$\bar{Z}$	Z	EN	$\bar{B}$
	0.14 mm ² (AWG 26)		0.5 mm ² (AWG 20)		0.14 mm ² (AWG 26)		0.5 mm ² (AWG 20)		0.14 mm ² (AWG 26)

Adjustment

Evaluation of the input signals at X9

Code	Function	
C0427 = 0	CW rotation	Track A leads track B by 90 ° (positive value at DFIN-OUT)
	CCW rotation	Track A lags track B by 90 ° (negative value at DFIN-OUT)
C0427 = 1	CW rotation	Track A transmits the speed Track B = LOW (positive value at DFIN-OUT)
	CCW rotation	Track A transmits the speed Track B = HIGH (negative value at DFIN-OUT)
C0427 = 2	CW rotation	Track A transmits the speed and direction of rotation (positive value at DFIN-OUT) Track B = LOW
	CCW rotation	Track B transmits the speed and direction of rotation (negative value at DFIN-OUT) Track A = LOW

5.12 Communication modules



Further information

on wiring and application of communication modules can be found in the corresponding Mounting Instructions and Communication Manuals.

Possible communication modules

Communication module	Type/order number
Keypad XT	EMZ9371BC
LECOM-A/B (RS232/485)	EMF2102IBV001
LECOM-B (RS485)	EMF2102IBV002
LECOM-LI (optical fibre)	EMF2102IBV003
LON	EMF2141IB
INTERBUS	EMF2113IB
INTERBUS Loop	EMF2112IB
PROFIBUS-DP	EMF2133IB
DeviceNet/CANopen	EMF2175IB

Handling

Plug the communication module onto the AIF interface (X1) or pull it off from the interface. The communication module can also be connected/disconnected during operation.

6 Commissioning

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6.1 Before switching on



Note!

- ▶ Comply with the corresponding switch-on sequence.
- ▶ In the event of trouble during the commissioning phase, the "Troubleshooting and fault elimination" chapter will assist you.

To prevent injury to persons or damage to material assets, check ...

... before connecting the mains voltage:

- ▶ Wiring for completeness, short circuit, and earth fault
- ▶ The "EMERGENCY STOP" function of the entire system
- ▶ The motor circuit configuration (star/delta) must be adapted to the output voltage of the controller
- ▶ The in-phase connection of the motor
- ▶ The direction of rotation or the incremental encoder (if available)

... the most important drive parameter settings before the controller is enabled:

- ▶ Is the V/f rated frequency adapted to the motor circuit configuration?
- ▶ Are the drive parameters relevant for your application set correctly?
- ▶ Is the configuration of the analog and digital inputs and outputs adapted to wiring?

6.2 Selection of the correct operating mode

Description

The control mode of the controller can be selected via the operating mode. You can select between the following modes:

- ▶ V/f characteristic control
- ▶ Vector control

Selection of the correct operating mode

The V/f characteristic control is the classic operating mode for standard applications.

When using the vector control you will achieve improved drive features compared to the V/f characteristic control due to:

- ▶ Higher torque via the complete speed range
- ▶ Higher speed accuracy and higher concentricity factor
- ▶ Higher efficiency

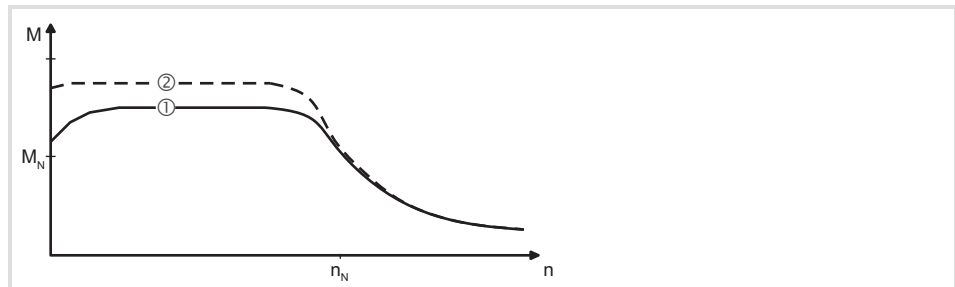


Fig. 6.2-1 Comparison of V/f characteristic control and vector control
① V/f characteristic control
② Vector control

8200vec524

Operating modes
recommended for standard
applications

The following table helps you to find the correct operating mode for standard applications:

- C0006 = 5: V/f characteristic control with constant $U_{\min}$ boost
- C0006 = 1: vector control

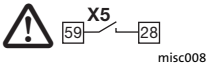
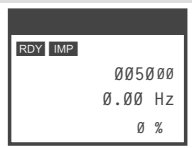
Power range 0.37 ... 90 kW	Selection of the operating mode in C0006			
	Motor cable shielded ≤ 50 m unshielded ≤ 100 m		Motor cable shielded > 50 m unshielded > 100 m	
	recommended	alternatively	recommended	alternatively
Single drives				
With constant load	1	5	5	-
With extremely alternating loads	1	5	5	-
With high starting duty	1	5	5	-
Positioning and infeed drives with high dynamics	1	5	5	-
Rewinder with dancer	1	5	-	-
Unwinder with dancer	5	-	-	-
Pump and fan drives ¹⁾	5	-	5	-
Three-phase AC reluctance motors	5	-	5	-
Three-phase AC sliding rotor motors	5	-	5	-
Three-phase AC motors with fixed voltage/frequency characteristic	5	-	5	-
Group drives (the resulting motor cable length l_{res} is decisive) $l_{\text{res}} = \sqrt{i} \cdot (l_1 + l_2 + \dots + l_i)$				
Identical motors and identical loads	1	5	5	-
Different motors and/or alternating loads	5	-	5	-

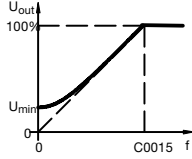
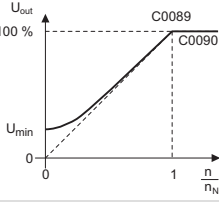
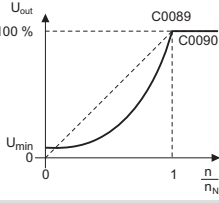
¹⁾ For this application we recommend a quadratic voltage characteristic (C0014 = 1)

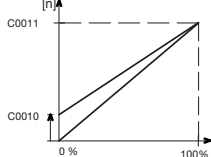
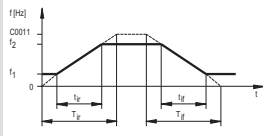
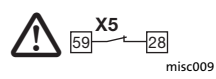
6.3 Parameter setting with the XT EMZ9371BC keypad

6.3.1 Commissioning example in V/f characteristic control mode

The example describes how to commission a speed control for the controller with power-related three-phase asynchronous motor.

Switch-on sequence		Note
1.	Insert the keypad	
2.	Ensure that the controller is inhibited after switching on the mains	 misc008
3.	Ensure that no external error is active	Terminal X5/E4 = HIGH
4.	Switch on	
A	The control card is supplied via an external voltage: Switch on the external DC 24 V supply voltage	 misc002
B	The control card is supplied via the internal voltage: Switch on the mains. The controller provides the DC 24 V supply.	
5.	After approx. 2 s the controller is initialised and the keypad is in the operating level and displays the current speed (C0051)	 9371BC004
6.	Change to the "Terminal I/O" menu and configure the function of the control terminals to adapt them to your application. Lenze setting: C0005 = 1000 (basic configuration "speed control")	Use C0002 = 0 to restore the Lenze setting (see chapter "Commissioning" → "Change assignment of the control terminal X5 and X6")
7.	For quick commissioning select the menu "Short setup"	The submenu "Setup V/f" contains the codes that are required for commissioning a standard application. The digital inputs are configured in the Lenze setting: X5/E1: Deactivate CW rotation/quick stop X5/E2: Deactivate CCW rotation/quick stop X5/E3: Activate fixed setpoint 1 (JOG1) X5/E4: Set error message (TRIP SET) X5/E5: Reset error message (TRIP RESET) (see chapter "Parameter setting")
A	Use PRG to change to the menu level	
B	Use ▲ ▶ ▶ ▶ to change to the menu "Short setup" and then to the submenu "Setup V/f"	
C	Use ▶ to change to the code level to parameterise your drive	
8.	Adapt the controller to the mains (C0173) Lenze setting: 1 (400 V mains voltage)	
9.	Only for the variants V060, V110, V270, V300 in the power range of 110 ... 400 kW: Adapt the brake transistor threshold (C0174) Lenze setting: 3 (500 V mains voltage, 885 V brake voltage)	See code table
10.	Enter the motor data	See motor nameplate and chapter "Commissioning" → "Adapt motor data" The data of the Lenze motors are saved under C0086.
A	If you use a Lenze motor: Select the motor type connected under C0086.	
B	If you do not use a Lenze motor: Enter the data of the motor nameplate	
	- Rated motor power (C0081) – Lenze setting: device-dependent	

Switch-on sequence		Note
	Rated motor speed (C0087) – Lenze setting: device-dependent	
	Rated motor current (C0088) – Lenze setting: device-dependent	Enter value for the selected motor connection method (star/delta)!
	Rated motor frequency (C0089) – Lenze setting: device-dependent	
	Rated motor voltage (C0090) – Lenze setting: device-dependent	Enter value for the selected motor connection method (star/delta)!
	Motor $\cos\varphi$ (C0091) – Lenze setting: device-dependent	
11.	If required, set a base frequency which differs from the rated motor frequency (C0015) Lenze setting: C0015 = C0089	 Changes in C0086 and C0089 overwrite the setting in C0015 (see chapter "Commissioning" → "Operating mode" → "V/f characteristic control")
12.	If required, adapt the slip compensation (C0021) Lenze setting: Rated slip in [%] with regard to $N_{\max}$ in C0011. The value is calculated from the data of the nameplate and is thus suitable for the majority of applications.	Due to changes in C0086, C0087, C0089 the rated slip is recalculated and automatically entered into C0021 (see chapter "Commissioning" → "Slip compensation")
13.	For protecting the motor, set the current limit values " $I_{\max}$ current" (C0022, C0023) Guide value ≤ 2 -fold rated motor current	Power range 0.37 ... 90 kW: For dissipating the regenerative energy, use a brake chopper or feedback module, if necessary Power range 110 ... 400 kW: For dissipating regenerative energy, use a brake resistor, if necessary (see chapter "Commissioning" → "Motor adjustment" → "Current limit values")
A	In motor mode and generator mode (C0022)	
B	Additional limitation in generator mode (C0023) Condition: C0023 < C0022	
14.	Set the operating mode "V/f" (C0006) Lenze setting: 5 (V/f characteristic control)	(see chapter "Commissioning" → "Operating mode" → "V/f characteristic control")
15.	Set the V/f characteristic (C0014) Lenze setting: 0 (linear characteristic)	
A	Linear characteristic (C0014 = 0)	
B	Square-law characteristic (C0014 = 1)	 For applications with e. g. pumps or fans
16.	If required, set $U_{\min}$ boost (C0016) Lenze setting: 0 %	C0016 = 1 % corresponds to a boost of 1 % of the rated voltage "Mot voltage" (C0090) (see chapter "Commissioning" → "Operating mode" → "V/f characteristic control")
17.	Set the switching frequency "fchop" (C0018) Lenze setting: Power range 0.37 ... 90 kW: 6 (8/2 kHz sin) Power range 110 ... 400 kW: 6 (4/2 kHz sin)	See chapter "Commissioning" → "Switching frequency of the inverter"

Switch-on sequence		Note
18.	Set your type of the speed feedback system "Feedback type" (C0025) Lenze setting: 1 (no feedback)	See chapter "Commissioning" → "Setting of speed feedback"
A	When using a TTL encoder: Select the encoder used under C0025	
B	When using a TTL encoder with a number of increments which cannot be set under C0025: Set C0025 = 100 Enter the number of increments under C0420	
C	If required, compensate a voltage drop in the incremental encoder cable. Use C0421 to adjust the supply voltage for the TTL encoder.	
D	When using a HTL encoder: Set C0025 = 101 Enter the number of increments under C0420	
19.	Set the maximum speed (C0011) Lenze setting: 3000 rpm	 See chapter "Commissioning" → "Acceleration, deceleration, braking, stopping"
20.	Set the acceleration time T_{ir} (C0012) Lenze setting: 5.00 s	$T_{ir} = t_{ir} \cdot \frac{C0011}{f_2 - f_1}$ (see chapter "Commissioning" → "Acceleration, deceleration, braking, stopping")
21.	Set the deceleration time T_{if} (C0013) Lenze setting: 5.00 s	 $T_{if} = t_{if} \cdot \frac{C0011}{f_2 - f_1}$ (see chapter "Commissioning" → "Acceleration, deceleration, braking, stopping")
22.	If required, set the quick stop deceleration ramp (C0105) Lenze setting: 5.00 s	See chapter "Commissioning" → "Acceleration, deceleration, braking, stopping"
23.	If required, adapt the fixed setpoints JOG.	See code table
A	JOG 1 (C0039/1) Lenze setting: 1500 rpm	Activation: X5/E3 = HIGH
B	Further fixed setpoints: JOG 2 (C0039/2) ... JOG 15 (C0039/15)	
24.	Ensure a powerfail-proof saving of the settings in one of the four parameter sets (C0003) Use C0003 = 1 to save the settings in parameter set 1.	Code C0003 is the first code in the menu "Setup V/f". After switching on the DC 24 V supply or mains connection, parameter set 1 is automatically activated. (see chapter "Parameter setting")
25.	Switch on the mains if the external DC 24 V supply voltage is switched on only.	
26.	Enable controller	 Terminal X5/28 = HIGH (see chapter "Commissioning" → "controller inhibit")
27.	Enter the setpoint	Analog setpoint selection: -10 ... +10 V via potentiometer at X6/1 and X6/2 Fixed speed: Activate JOG 1 with X5/E3 = HIGH JOG 1 is parameterised in C0039/1

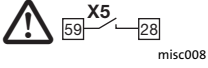
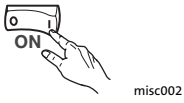
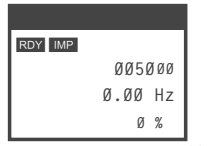
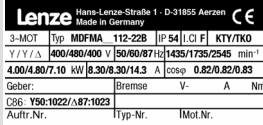
Switch-on sequence		Note
28.	The drive is running now	CW rotation: X5/E1 = HIGH and X5/E2 = LOW CCW rotation: X5/E1 = LOW and X5/E2 = HIGH If the drive does not start, press RUN in addition (see chapter "Commissioning" → "Acceleration, deceleration, braking, stopping")

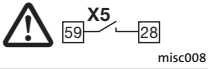
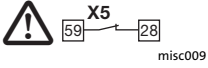
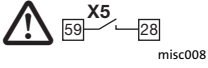
**Note!**

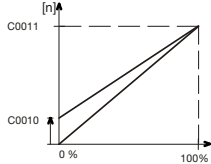
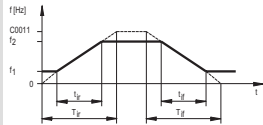
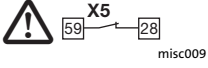
In the "Diagnostic" menu you can monitor the most important drive parameters

6.3.2 Commissioning example in vector control mode

The example describes how to commission a speed control for the controller with power-related three-phase asynchronous motor.

Switch-on sequence		Note
1.	Insert the keypad	
2.	Ensure that the controller is inhibited after switching on the mains	 Terminal X5/28 = LOW (see chapter "Commissioning" → "controller inhibit")
3.	Ensure that no external error is active	Terminal X5/E4 = HIGH
4.	Switch on	
A	The control card is supplied via an external voltage: Switch on the external DC 24 V supply voltage	
B	The control card is supplied via the internal voltage: Switch on the mains. The controller provides the DC 24 V supply.	
5.	After approx. 2 s the controller is initialised and the keypad is in the operating level and displays the current speed (C0051)	
6.	Change to the "Terminal I/O" menu and configure the function of the control terminals to adapt them to your application. Lenze setting: C0005 = 1000 (basic configuration "speed control")	Use C0002 = 0 to restore the Lenze setting (see chapter "Commissioning" → "Change assignment of the control terminal X5 and X6")
7.	For quick commissioning select the menu "Short setup"	 
A	Use PRG to change to the menu level	
B	Use ▲ ▶ ▶ ▶ to change to the menu "Short setup" and then to the submenu "Setup vector"	
C	Use ◀ to change to the code level to parameterise your drive	The submenu "Setup vector" contains the codes that are required for commissioning a standard application. The digital inputs are configured in the Lenze setting: X5/E1: Deactivate CW rotation/quick stop X5/E2: Deactivate CCW rotation/quick stop X5/E3: Activate fixed setpoint 1 (JOG1) X5/E4: Set error message (TRIP SET) X5/E5: Reset error message (TRIP RESET) (see chapter "Parameter setting")
8.	Adapt the controller to the mains (C0173) Lenze setting: 1 (400 V mains voltage)	
9.	Only for the variants V060, V110, V270, V300 in the power range of 110 ... 400 kW: Adapt the brake transistor threshold (C0174) Lenze setting: 3 (500 V mains voltage, 885 V brake voltage)	See code table
10.	Enter the motor data	 See motor nameplate and chapter "Commissioning" → "Adapt motor data" The data of the Lenze motors are saved under C0086.
A	If you use a Lenze motor: Select the motor type connected under C0086.	
B	If you do not use a Lenze motor: Enter the data of the motor nameplate	
	- Rated motor power (C0081) – Lenze setting: device-dependent - Rated motor speed (C0087) – Lenze setting: device-dependent	

Switch-on sequence		Note
	Rated motor current (C0088) – Lenze setting: device-dependent	Enter value for the selected motor connection method (star/delta)!
	Rated motor frequency (C0089) – Lenze setting: device-dependent	
	Rated motor voltage (C0090) – Lenze setting: device-dependent	Enter value for the selected motor connection method (star/delta)!
	Motor $\cos\phi$ (C0091) – Lenze setting: device-dependent	
11.	For protecting the motor, set the current limit values " $I_{\max}$ current" (C0022, C0023) Guide value ≤ 2 -fold rated motor current	Power range 0.37 ... 90 kW: For dissipating the regenerative energy, use a brake chopper or feedback module, if necessary
A	In motor mode and generator mode (C0022)	Power range 110 ... 400 kW: For dissipating regenerative energy, use a brake resistor, if necessary
B	Additional limitation in generator mode (C0023) Condition: C0023 < C0022	(see chapter "Commissioning" → "Motor adjustment" → "Current limit values")
12.	If the motor temperature is monitored with a thermal sensor KTY: Activate the temperature feedback with C0594 (fault SD6) Lenze setting: 3 (switched off)	A temperature feedback with KTY has a positive effect on the vector control, since the motor data identification considers the temperature influence in the motor model. (see chapter "Commissioning" → "Motor adjustment")
13.	Start the motor data identification "ident run" (C0148)	(see chapter "Commissioning" → "Adjusting the motor")
A	Ensure that the controller inhibit is active	 Terminal X5/28 = LOW
B	Switch on the mains	
C	Set C0148 = 1	
D	Enable controller	 Terminal X5/28 = HIGH The identification starts: - The segment IMP goes off "WRK run" is displayed - The motor is energised and "whistles" - The motor does not rotate
E	If after approx. 1 ... 2 min the segment IMP is active again, inhibit the controller	 Terminal X5/28 = LOW The identification is completed. The following values have been detected and entered into the codes: - Inverter error characteristic (C1753/xx) - Rotor resistance "Mot Rr" (C0082) - Stator resistance "Mot Rs" (C0084) - Leakage inductance "Mot Lss" (C0085) - Stator inductance "Mot Ls" (C0092)
14.	Set the operating mode "vector ctrl" (C0006) Lenze setting: 5 (V/f characteristic control)	(see chapter "Commissioning" → "Operating mode" → "Vector control")
15.	Set the switching frequency "fchop" (C0018) Lenze setting: Power range 0.37 ... 90 kW: 6 (8/2 kHz sin) Power range 110 ... 400 kW: 6 (4/2 kHz sin)	See chapter "Commissioning" → "Switching frequency of the inverter"
16.	Set your type of the speed feedback system "Feedback type" (C0025) Lenze setting: 1 (no feedback)	See chapter "Commissioning" → "Setting of speed feedback"
A	When using a TTL encoder: Select the encoder used under C0025	

Switch-on sequence		Note
B	When using a TTL encoder with a number of increments which cannot be set under C0025: Set C0025 = 100 Enter the number of increments under C0420	
C	If required, compensate a voltage drop in the incremental encoder cable. Use C0421 to adjust the supply voltage for the TTL encoder.	
D	When using a HTL encoder: Set C0025 = 101 Enter the number of increments under C0420	
17.	Set the maximum speed (C0011) Lenze setting: 3000 rpm	 See chapter "Commissioning" → "Acceleration, deceleration, braking, stopping"
18.	Set the acceleration time T_{ir} (C0012) Lenze setting: 5.00 s	$T_{ir} = t_{ir} \cdot \frac{C0011}{f_2 - f_1}$ (see chapter "Commissioning" → "Acceleration, deceleration, braking, stopping")
19.	Set the deceleration time T_{if} (C0013) Lenze setting: 5.00 s	 $T_{if} = t_{if} \cdot \frac{C0011}{f_2 - f_1}$ (see chapter "Commissioning" → "Acceleration, deceleration, braking, stopping")
20.	If required, set the quick stop deceleration ramp (C0105) Lenze setting: 5.00 s	See chapter "Commissioning" → "Acceleration, deceleration, braking, stopping"
21.	If required, adapt the fixed setpoints JOG.	See code table
A	JOG 1 (C0039/1) Lenze setting: 1500 rpm	Activation: X5/E3 = HIGH
B	Further fixed setpoints: JOG 2 (C0039/2) ... JOG 15 (C0039/15)	
22.	Ensure a powerfail-proof saving of the settings in one of the four parameter sets (C0003) Use C0003 = 1 to save the settings in parameter set 1.	Code C0003 is the first code in the menu "Setup V/f". After switching on the DC 24 V supply or mains connection, parameter set 1 is automatically activated. (see chapter "Parameter setting")
23.	Switch on the mains if the external DC 24 V supply voltage is switched on only.	
24.	Enable controller	 Terminal X5/28 = HIGH (see chapter "Commissioning" → "controller inhibit")
25.	Enter the setpoint	Analog setpoint selection: -10 ... +10 V via potentiometer at X6/1 and X6/2 Fixed speed: Activate JOG 1 with X5/E3 = HIGH JOG 1 is parameterised in C0039/1

Switch-on sequence		Note
26.	The drive is running now	CW rotation: X5/E1 = HIGH and X5/E2 = LOW CCW rotation: X5/E1 = LOW and X5/E2 = HIGH If the drive does not start, press RUN in addition (see chapter "Commissioning" → "Acceleration, deceleration, braking, stopping")

**Note!**

In the "Diagnostic" menu you can monitor the most important drive parameters

6.4 Controller inhibit

Description

If the controller inhibit is active, the power outputs are inhibited.

- ▶ The drive coasts in zero-torque mode.
- ▶ Status display of keypad: Pulse inhibit **IMP**
- ▶ Status display at the controller: The green LED is blinking.



Danger!

Do not use the "controller inhibit" function (DCTRL1-CINH) for emergency-off. The controller inhibit only inhibits the power outputs and does **not** disconnect the controller from the mains! The drive could start again any time.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0040	Ctrl enable	0		Controller enable	6.4-1
			0 Ctrl inhibit	Controller inhibited	
			1 Ctrl enable	Controller enabled	

Activation

Via terminal X5/28:

- ▶ A LOW level at the terminal inhibits the controller (cannot be inverted)
- ▶ A HIGH level re-enables the controller

Via the keys of the keypad (if C0469 = 1):

- ▶ **STOP** inhibits the controller
- ▶ **RUN** re-enables the controller

Via code C0040:

- ▶ C0040 = 0 inhibits the controller
- ▶ C0040 = 1 re-enables the controller



Note!

- ▶ The sources for controller inhibit are ANDed, i.e. the drive only restarts if the controller inhibit signals of all signal sources have been eliminated.
- ▶ The restart starts with zero speed. If centrifugal masses are still rotating, this can lead to an overcurrent.

6.5 Changing the assignment of the control terminals X5 and X6



Danger!

If you select a configuration in C0005, the signal assignment of the inputs and outputs will be overwritten with the corresponding basic assignment!

► Adapt the signal assignment to your wiring!

6.5.1 Free configuration of digital input signals

Description

- Internal digital signals can be freely linked with external digital signal sources. This serves to establish a freely configurable control of the drive controller.
 - Digital inputs X5/E1 ... X5/E5
- A signal source can be linked with several targets. Ensure reasonable linkages for not activating functions that are mutually exclusive (e. g. linking a digital input with quick stop and DC injection braking at the same time).

Codes for parameter setting

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0114			0	High active	HIGH level is active	Inversion of digital input signals at X5, function block DIGIN	 6.5-1 See System Manual (extension)
			1	LOW active	LOW level is active		
1	DIGIN1 pol	0				Terminal X5/E1	
2	DIGIN2 pol	0				Terminal X5/E2	
3	DIGIN3 pol	0				Terminal X5/E3	
4	DIGIN4 pol	1				Terminal X5/E4	
5	DIGIN5 pol	0				Terminal X5/E5	
5	DIGIN6 (ST) pol	0				Terminal X5/ST	

Linking signals

The internal digital signal can be linked with an external signal source by entering the selection figure of the external signal into the configuration code of the internal digital signal.

Example

► C0787/2 = 53 ⇒ signal source for JOG2 is terminal X5/E3

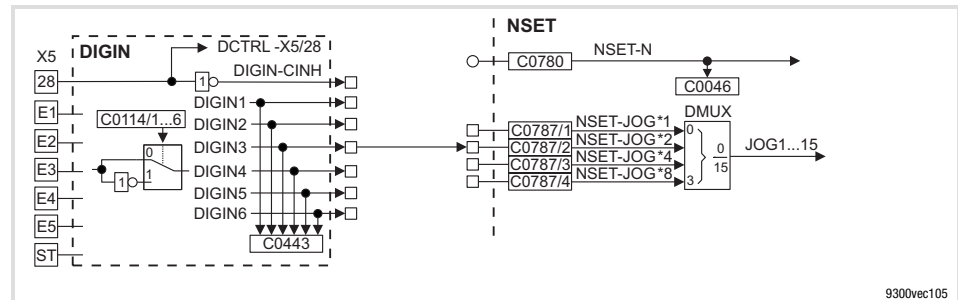


Fig. 6.5-1 Connecting digital signal JOG2 with terminal X5/E3



Tip!

- A list with all selection figures is included in the chapter "Configuration" → "Selection lists".
- For signal linkage we recommend the function block editor in GDC (ESP-GDC2).

Signal level

- Terminals (X5/E1 ... X5/E5):
 - HIGH = +12 V ... +30 V
 - LOW = 0 V ... +3 V
- Response times: 1 ms

Inverting the signal level

In C0114 you can define the active signal level (HIGH level active or LOW level active) for the terminals X5/E1 ... X5/E5.

Example

► C0114/3 = 1 ⇒ LOW level at X5/E3 activates JOG2

6.5.2 Free configuration of digital outputs

- Description**
- The digital outputs X5/A1 ... X5/A4 can be freely linked with internal digital signals.
 - One signal source can be linked with several targets.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0117 STOP			 Selection list 2			 6.5-3 See System Manual (extension)
1	CFG: DIGOUT1	15000	DCTRL-TRIP			
2	CFG: DIGOUT2	10650	CMP1-OUT			
3	CFG: DIGOUT3	500	DCTRL-RDY			
4	CFG: DIGOUT4	5003	MCTRL-MMAX			
C0118			0	High active	HIGH level is active	Inversion of digital output signals, function block DIGOUT
			1	LOW active	LOW level is active	
1	DIGOUT1 pol	1				
2	DIGOUT2 pol	1				
3	DIGOUT3 pol	0				
4	DIGOUT4 pol	0				

Linking signals

The digital outputs can be linked with internal digital signals by entering the selection figure of the internal signal into corresponding subcode of C0117.

Example

- C0117/2 = 505 ⇒ signal source for X5/A2 is the status message "direction of rotation" (DCTRL-CW/CCW)

Signal level

- Terminals (X5/A1 ... X5/A4):
 - HIGH = +12 V ... +30 V
 - LOW = 0 V ... +3 V
- Response times: 1 ms

Inverting the signal level

In C0118 you can define the active signal level (HIGH level active or LOW level active) for the terminals X5/A1 ... X5/A4.

Example

- C0118/2 = 1 ⇒ With LOW level at X5/A2 the motor rotates in CW direction (with in-phase motor connection)

6.5.3 Free configuration of analog input signals

Description

- Internal analog signals can be freely linked with external analog signal sources:
 - Analog inputs X3/1, X3/2 and X3/3, X3/4
- One signal source can be linked with several targets.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0026			-199.99	{0.01 %}	199.99	Free control code FCODE 26/1 and FCODE26/2 Offset of AIN1 (X6/1, X6/2) Offset of AIN2 (X6/3, X6/4) Free control code FCODE 27/1 and FCODE27/2 Gain AIN1 (X6/1, X6/2) ● 100 % = gain 1 Gain AIN2 (X6/3, X6/4) ● 100 % = gain 1
1	FCODE (offset)	0.00				
2	FCODE (offset)	0.00				
C0027			-199.99	{0.01 %}	199.99	Voltage / current range for analog signals at input X6/1, X6/2 ● Observe jumper position of X3
1	FCODE (gain)	100.0 0				
2	FCODE (gain)	100.0 0				
C0034	Mst current	0	0	-10 V ... +10 V		5.8-8 6.5-4
			1	4 mA ... 20 mA		
			2	-20 mA ... +20 mA		

Linking signals

The internal analog signals can be linked with an external signal source by entering the selection figure of the external signal into the configuration code of the internal analog signal.

Example

- C0780 = 50 ⇒ signal source for the main setpoint (NSET-N) is terminal X6/1, X6/2

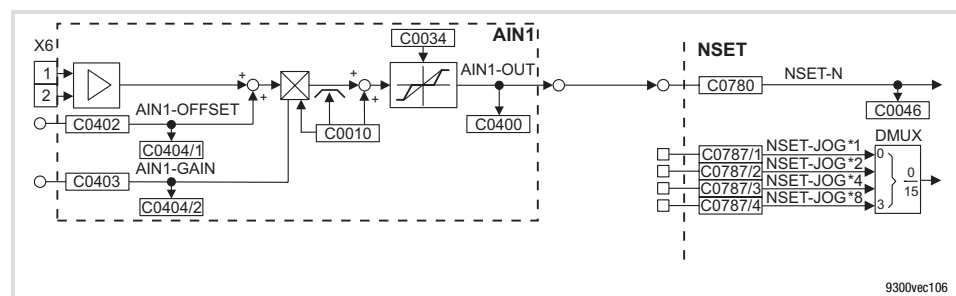


Fig. 6.5-2 Linking analog signal NSET-N with terminal X6/1, X6/2



Tip!

- A list with all selection figures is included in the chapter "Configuration" → "Selection lists".
- For signal linkage we recommend the function block editor in GDC (ESP-GDC2).

Adjustment

Gain and offset

Set gain (C0027) and offset (C0026) to adapt the input signal to the application.

Input range of X6/1, X6/2

Input range	C0034	Position of jumper at X3
-10 V ... +10 V	C0034 = 0	
+4 mA ... +20 mA	C0034 = 1	
-20 mA ... +20 mA	C0034 = 2	

**Note!**

Different settings in C0034 and of X3 result in a wrong input signal.

6.5.4 Free configuration of analog outputs

- Description**
- The analog outputs (X6/62, X6/63) can be freely linked with internal analog process or monitoring signals. The controller outputs a voltage proportional to the internal signal at the analog outputs.
 - One signal source can be linked with several targets.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0108			-199.99	{0.01 %}	199.99	Free control code FCODE108/1 and FCODE108/2
1	FCODE (gain)	100.0 0				Gain of analog output signal AOUT1 (X6/62) ● 100 % = gain 1
2	FCODE (gain)	100.0 0				Gain of analog output signal AOUT2 (X6/63) ● 100 % = gain 1
C0109			-199.99	{0.01 %}	199.99	Free control code FCODE109/1 and FCODE109/2
1	FCODE (offset)	0.00				Offset of analog output signal AOUT1 (X6/62)
2	FCODE (offset)	0.00				Offset of analog output signal AOUT2 (X6/63)

 6.5-6
See System Manual (extension)

Linking signals

Analog outputs can be linked with internal analog signals by entering the selection figure of the internal signal into the code of C0431 (AOUT1, X6/62) or C0436 (AOUT2, X6/63).

Example

- C0436 = 5006 ⇒ signal source for X6/63 is the actual motor voltage



Tip!

- A list with all selection figures is included in the chapter "Configuration" → "Selection lists".
- For signal linkage we recommend the function block editor in GDC (ESP-GDC2).

Adjustment

Set gain (C0108) and offset (C0109) to adapt the output signal to the application.

With an internal signal of 100 % and a gain of 1, a voltage of 10 V is output at the terminal.

6.6 Adjusting the motor

6.6.1 Entry of motor data

Description The vector control mode requires considerably more motor data than the V/f characteristic control mode.

Basically all motor data should be entered independent of the operating mode. This enables the controller to detect further data as e.g. slip compensation (C0021), maximum torque (C0057), number of motor pole pairs (C0059) always conclusively and enter them into the corresponding codes.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0081 	Mot power	→	0.01	{0.01 kW}	500.00	Rated motor power → Change of C0086 resets value to factory setting ● Change of C0081 sets C0086 = 0
C0086 	Mot type	→	 Motor selection list			Motor type selection → depending on the controller used ● Motor selection in C0086 sets the corresponding parameters in C0021, C0022, C0081, C0087, C0088, C0089, C0090, C0091  6.6-1
C0087 	Mot speed	→	50	{1 rpm}	36000	Rated motor speed → depending on C0086 ● Motor selection in C0086 set the corresponding rated motor speed in C0087 ● Change of C0087 sets C0086 = 0  6.6-1
C0088 	MOT CURRENT	→	0.5	{0.1 A}	500.0	Rated motor current → Depending on C0086 ● Selection of a motor in C0086 sets the corresponding rated motor current in C0088 ● Change of C0088 sets C0086 = 0  6.6-1
C0089 	Mot frequency	→	10	{1 Hz}	5000	Rated motor frequency → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor frequency in C0089 ● Change of C0089 sets C0086 = 0  6.6-1

6 Commissioning

6.6 Adjusting the motor

6.6.1 Entry of motor data

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0090 STOP	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor voltage in C0090 - Change of C0090 sets C0086 = 0	 6.6-1
C0091 STOP	Mot cos phi	→	0.50	{0.01 }	1.00	Motor cos φ → depending on C0086 - Motor selection in C0086 sets the corresponding motor cos φ in C0091 - Change of C0091 sets C0086 = 0	 6.6-1

Sequence of the motor data entry

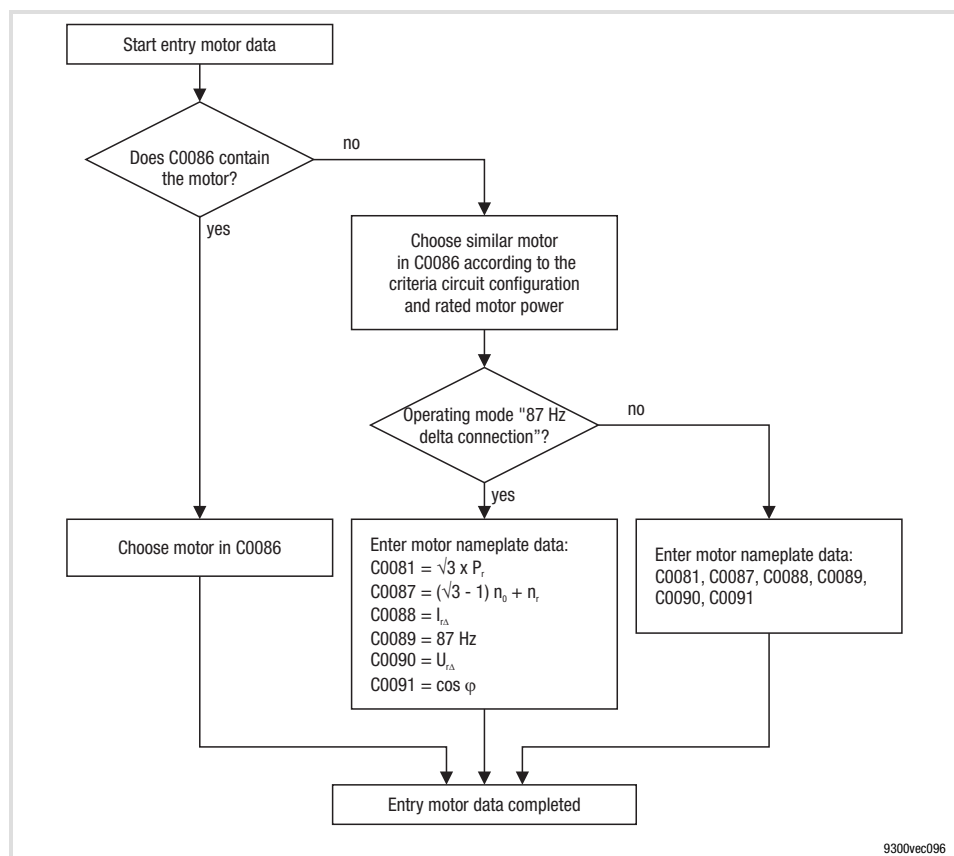


Fig. 6.6-1 Sequence diagram for motor data entry

P_N Rated motor power
 n_0 Synchronous speed
 n_N Rated motor speed
 $I_{N\Delta}$ Rated motor current for delta connection
 $U_{N\Delta}$ Rated motor voltage for delta connection

Lenze motor which is included in C0086

By selecting the motor in C0086 all required motor data are automatically entered into the following codes.

Code	Description	Code	Description
C0022	Limit current for operation in motor mode	C0087	Rated motor speed
C0023	Limit current for operation in generator mode	C0088	Rated motor current
C0081	Rated motor power	C0089	Rated motor frequency
C0082	Motor rotor resistance	C0090	Rated motor voltage
C0084	Motor stator resistance	C0091	Power factor $\cos \varphi$
C0085	Motor leakage inductance	C0092	Motor stator inductance

Motor of another manufacturer or a Lenze motor which is not included in C0086

1. Select a similar motor in C0086.
– Selection criteria: Connection method, rated motor power, rated motor frequency
2. Enter the motor data of the motor nameplate or data sheet into C0081, C0087, C0088, C0089, C0090 and C0091.

Operating mode "87 Hz delta connection"

By changing from star to delta connection and changing the base frequency ($f_{\text{base}} = 87 \text{ Hz}$), the induction machine ($f_N = 50 \text{ Hz}$) develops $\sqrt{3}$ times the power with a frequency of 87 Hz. In the total range the machine runs with a $\sqrt{3}$ times higher delta current, which must be provided by the controller.

Example

A motor with the following data is to be connected in delta connection:

► DSM 50 Hz; Δ/Y 230/400 V; 18.5 kW; 62/35 A, 1450 min^{-1} , $\cos \varphi = 0.88$

Sequence		Note
1.	Enter C0086 = 263 (DXRAXX 180-12-87; 32.4 kW; 87 Hz)	Select a motor in C0086, which has a $\sqrt{3}$ times higher rated motor power with delta connection.
2.	Enter C0087 = 2548 min^{-1}	Consider the slip speed. With a rated motor torque the slip speed of an asynchronous motor is nearly constant over the total speed range. Calculation of the rated motor speed: $C0087 = (\sqrt{3} - 1) \cdot n_0 + n_N$ $C0087 = (\sqrt{3} - 1) \cdot 1500 \text{ min}^{-1} + 1450 \text{ min}^{-1}$ n_0 = synchronous speed n_N = rated motor speed at 50 Hz
3.	Enter C0088 = 62 A	Rated motor current for delta connection
4.	Enter C0090 = 400 V	Rated motor voltage for star connection
5.	Enter C0089 = 87 Hz	Rated motor frequency
6.	Enter C0091 = 0.88	Power factor $\cos \varphi$

6.6.2 Motor selection list

Three-phase asynchronous motors

The following table contains all asynchronous motors, which can be selected via C0086.

The "reference list of asynchronous motors" contains the asynchronous motors, the data of which must be entered manually. (📖 6.6-6)

Lenze Hans-Lenze-Straße 1 · D-31855 Aerzen Made in Germany CE									
3~MOT	Typ		MDSKSBS56-33				Id. Nr. 00XXXXXX		
3.6 A	200 Hz	4000 min ⁻¹	cosφ		1	I.CL F			
4.2 Nm	1.8 kW	325 V~	M ₀	4.7 Nm	KTY	IP 54			
Bremse	24 V~	0.5 A	2.5 Nm	Geber RS00000000					
C86:	161	MDSKS56-33-200			Motor Nr. 0301077				

A

B

9300VEC058

Fig. 6.6-2 Nameplate of a Lenze motor

A	B	Lenze type	C0081 P _N [kW]	C0087 n _N [rpm]	C0088 I _r [A]	C0089 f _N [Hz]	C0090 U _N [V]	Motor type	Temperature sensor
9	DSGA56-22-100	SDSGA056-22-100	0.24	2790	0.8	100	390	Asynchronous inverter - motor (Star connection)	KTY
10	MDSKA56-140	MDSKAXX056-22	0.80	3950	2.4	140	390	Asynchronous servo motor	KTY
11	MDFKA71-120	MDFKAXX071-22	2.20	3410	6.0	120			
12	MDSKA71-140	MDSKAXX071-22	1.70	4050	4.4	140			
13	MDFKA80-60	MDFKAXX080-22	2.10	1635	4.8	60			
14	MDSKA80-70	MDSKAXX080-22	1.40	2000	3.3	70			
15	MDFKA80-120	MDFKAXX080-22	3.90	3455	9.1	120			
16	MDSKA80-140	MDSKAXX080-22	2.30	4100	5.8	140			
17	MDFKA90-60	MDFKAXX090-22	3.80	1680	8.5	60			
18	MDSKA90-80	MDSKAXX090-22	2.60	2300	5.5	80			
19	MDFKA90-120	MDFKAXX090-22	6.90	3480	15.8	120			
20	MDSKA90-140	MDSKAXX090-22	4.10	4110	10.2	140	350		
21	MDFKA100-60	MDFKAXX100-22	6.40	1700	13.9	60	390		
22	MDSKA100-80	MDSKAXX100-22	4.00	2340	8.2	80			
23	MDFKA100-120	MDFKAXX100-22	13.20	3510	28.7	120	330		
24	MDSKA100-140	MDSKAXX100-22	5.20	4150	14.0	140	390		
25	MDFKA112-60	MDFKAXX112-22	11.00	1710	22.5	60			
26	MDSKA112-85	MDSKAXX112-22	6.40	2490	13.5	85	320		
27	MDFKA112-120	MDFKAXX112-22	20.30	3520	42.5	120			
28	MDSKA112-140	MDSKAXX112-22	7.40	4160	19.8	140	360		
30	DFQA100-50	MDFQAXX100-22	10.60	1420	26.5	50			
31	DFQA100-100	MDFQAXX100-22	20.30	2930	46.9	100			
32	DFQA112-28	MDFQAXX112-22	11.50	760	27.2	28			
33	DFQA112-58	MDFQAXX112-22	22.70	1670	49.1	58			
34	DFQA132-20	MDFQAXX132-32	17.00	555	45.2	20			
35	DFQA132-42	MDFQAXX132-32	35.40	1200	88.8	42			
40	DFQA112-50	MDFQAXX112-22	20.10	1425	43.7	50			
41	DFQA112-100	MDFQAXX112-22	38.40	2935	81.9	100			
42	DFQA132-36	MDFQAXX132-32	31.10	1035	77.4	36			
43	DFQA132-76	MDFQAXX132-32	60.10	2235	144.8	76				340

A	B	Lenze type	C0081 P _N [kW]	C0087 n _N [rpm]	C0088 I _r [A]	C0089 f _N [Hz]	C0090 U _N [V]	Motor type	Temperature sensor
210	DXRAXX071-12-50	DXRAXX071-12	0.25	1410	0.9	50	400	Asynchronous inverter - motor (Star connection)	Thermal contact
211	DXRAXX071-22-50	DXRAXX071-22	0.37	1398	1.2				
212	DXRAXX080-12-50	DXRAXX080-12	0.55	1400	1.7				
213	DXRAXX080-22-50	DXRAXX080-22	0.75	1410	2.3				
214	DXRAXX090-12-50	DXRAXX090-12	1.10	1420	2.7				
215	DXRAXX090-32-50	DXRAXX090-32	1.50	1415	3.6				
216	DXRAXX100-22-50	DXRAXX100-22	2.20	1425	4.8				
217	DXRAXX100-32-50	DXRAXX100-32	3.00	1415	6.6				
218	DXRAXX112-12-50	DXRAXX112-12	4.00	1435	8.3				
219	DXRAXX132-12-50	DXRAXX132-12	5.50	1450	11.0				
220	DXRAXX132-22-50	DXRAXX132-22	7.50	1450	14.6				
221	DXRAXX160-12-50	DXRAXX160-12	11.00	1460	21.0				
222	DXRAXX160-22-50	DXRAXX160-22	15.00	1460	27.8				
223	DXRAXX180-12-50	DXRAXX180-12	18.50	1470	32.8				
224	DXRAXX180-22-50	DXRAXX180-22	22.00	1456	38.8				
225	30kW-ASM-50	—	30.00	1470	52.0	50	400	Asynchronous inverter - motor (Star connection)	—
226	37kW-ASM-50	—	37.00	1470	66.0				
227	45kW-ASM-50	—	45.00	1480	82.0				
228	55kW-ASM-50	—	55.00	1480	93.0				
229	75kW-ASM-50	—	75.00	1480	132.0				
230	75kW-ASM-50	—	90.00	1480	132.0				
250	DXRAXX071-12-87	DXRAXX071-12	0.43	2525	1.5	87	400	Asynchronous inverter - motor (Delta connection)	Thermal contact
251	DXRAXX071-22-87	DXRAXX071-22	0.64	2515	2.0				
252	DXRAXX080-12-87	DXRAXX080-12	0.95	2515	2.9				
253	DXRAXX080-22-87	DXRAXX080-22	1.3	2525	4.0				
254	DXRAXX090-12-87	DXRAXX090-12	2.0	2535	4.7				
255	DXRAXX090-32-87	DXRAXX090-32	2.7	2530	6.2				
256	DXRAXX100-22-87	DXRAXX100-22	3.9	2535	8.3				
257	DXRAXX100-32-87	DXRAXX100-32	5.35	2530	11.4				
258	DXRAXX112-12-87	DXRAXX112-12	7.10	2545	14.3				
259	DXRAXX132-12-87	DXRAXX132-12	9.7	2555	19.1				
260	DXRAXX132-22-87	DXRAXX132-22	13.2	2555	25.4				
261	DXRAXX160-12-87	DXRAXX160-12	19.3	2565	36.5				
262	DXRAXX160-22-87	DXRAXX160-22	26.4	2565	48.4				
263	DXRAXX180-12-87	DXRAXX180-12	32.4	2575	57.8				
264	DXRAXX180-22-87	DXRAXX180-22	38.7	2560	67.4				
265	30kW-ASM-87	—	52.00	2546	90.0	87	400	Asynchronous inverter - motor (Delta connection)	—
266	37kW-ASM-87	—	64.00	2546	114.0				
267	45kW-ASM-87	—	78.00	2563	142.0				
268	55kW-ASM-87	—	95.00	2563	161.0				
269	75kW-ASM-87	—	130.00	2563	228.0				
270	90kW-ASM-87	—	156.00	2590	277.0				
410	MDXMAXM-071-12-50	MDXMAXM-071-12	0.25	1400	0.82	50	400	Asynchronous inverter - motor (Star connection)	Thermal contact
411	MDXMAXM-071-32-50	MDXMAXM-071-32	0.37	1400	1.20	50	400		
412	MDXMAXM-080-12-50	MDXMAXM-080-12	0.55	1400	1.60	50	400		
413	MDXMAXM-080-32-50	MDXMAXM-080-32	0.75	1380	2.00	50	400		
414	MDXMAXM-090-12-50	MDXMAXM-090-12	1.10	1410	2.60	50	400		
415	MDXMAXM-090-32-50	MDXMAXM-090-32	1.50	1420	3.50	50	400		
416	MDXMAXM-100-12-50	MDXMAXM-100-12	2.20	1400	5.60	50	400		
417	MDXMAXM-100-32-50	MDXMAXM-100-32	3.00	1400	7.30	50	400		
418	MDXMAXM-112-22-50	MDXMAXM-112-22	4.00	1430	8.50	50	400		

6 Commissioning

6.6 Adjusting the motor

6.6.2 Motor selection list

A	B	Lenze type	C0081 P _N [kW]	C0087 n _N [rpm]	C0088 I _r [A]	C0089 f _N [Hz]	C0090 U _N [V]	Motor type	Temperature sensor
440	MDXMAXM-071-12-87	MDXMAXM-071-12	0.43	2510	1.40	87	400	Asynchronous inverter - motor (Delta connection)	Thermal contact
441	MDXMAXM-071-32-87	MDXMAXM-071-32	0.64	2510	2.10	87	400		
442	MDXMAXM-080-12-87	MDXMAXM-080-12	0.95	2510	2.80	87	400		
443	MDXMAXM-080-32-87	MDXMAXM-080-32	1.30	2490	3.50	87	400		
444	MDXMAXM-090-12-87	MDXMAXM-090-12	2.00	2520	4.50	87	400		
445	MDXMAXM-090-32-87	MDXMAXM-090-32	2.70	2530	6.10	87	400		
446	MDXMAXM-100-12-87	MDXMAXM-100-12	3.90	2510	9.70	87	400		
447	MDXMAXM-100-32-87	MDXMAXM-100-32	5.40	2510	12.70	87	400		
448	MDXMAXM-112-22-87	MDXMAXM-112-22	7.10	2540	14.80	87	400		
449	MDXMAXM-112-32-50	MDXMAXM-112-32	5.50	1440	12.50	50	400		
450	MDXMAXM-132-22-50	MDXMAXM-132-22	7.50	1460	16.80	50	400		
451	MDXMAXM-132-32-50	MDXMAXM-132-32	9.20	1450	19.50	50	400		

Reference list of asynchronous motors

The motors listed under "motor nameplate" are not available in Global Drive Control (GDC) and the device software.

1. Enter the corresponding value listed under C0086 into the code C0086.
2. Compare the codes for the motor data with the values in the table.
– If necessary, adapt the values in the controller to the values in the table.
3. If necessary, optimise the dynamic behaviour of your machine via the codes C0070 and C0071.

Information on the motor nameplate		Motor data													
C86	Field Type	C0086	C0022 I _{max} [A]	C0081 P _r [kW]	C0084 R _s [Ω]	C0085 L _σ [mH]	C0087 n _N [rpm]	C0088 I _N [A]	C0089 f _r [Hz]	C0090 U _r [V]	C0091 cos φ	C0070 V _{pn}	C0071 T _{nn}	C0075 V _{pi}	C0076 T _{ni}
1006	MDXMAxx-071-12	210	1.28	0.25	39.90	157.20	1355	0.85	50	400	0.70	6	300	3.6	2
1007	MDXMAxx-071-12	250	2.25	0.47	39.90	157.20	2475	1.50	87	400	0.66	6	300	2	2
1008	MDXMAxx-071-32	211	1.73	0.37	25.03	122.60	1345	1.15	50	400	0.74	6	300	3.4	2
1009	MDXMAxx-071-32	251	3.00	0.67	25.03	122.60	2470	2.00	87	400	0.70	6	300	2.5	2
1010	MDXMAxx-080-12	212	2.40	0.55	20.69	89.00	1370	1.60	50	400	0.78	6	300	3.2	2
1011	MDXMAxx-080-12	252	3.90	1.00	20.69	89.00	2480	2.60	87	400	0.73	6	300	1.6	2
1012	MDXMAxx-080-32	213	2.85	0.75	11.69	65.20	1390	1.90	50	400	0.80	6	300	3.5	2
1013	MDXMAxx-080-32	253	4.95	1.35	11.69	65.20	2510	3.30	87	400	0.77	6	300	1.9	3
1014	MDXMAxx-090-12	214	3.90	1.10	10.01	40.20	1405	2.60	50	400	0.80	6	300	2.5	2
1015	MDXMAxx-090-12	254	6.75	2.00	10.01	40.20	2520	4.50	87	400	0.77	6	300	2	2
1016	MDXMAxx-090-32	215	5.25	1.50	5.85	28.80	1410	3.50	50	400	0.78	6	300	2	2
1017	MDXMAxx-090-32	255	9.15	2.70	5.85	28.80	2525	6.10	87	400	0.76	6	300	1	2
1018	MDXMAxx-100-12	216	7.20	2.20	2.90	20.00	1425	4.80	50	400	0.80	6	300	1	1.5
1019	MDXMAxx-100-12	256	12.45	3.90	2.90	20.00	2535	8.30	87	400	0.76	6	300	0.8	1.5
1020	MDXMAxx-100-32	217	9.75	3.00	2.10	17.00	1415	6.50	50	400	0.81	6	300	2.5	1.5
1021	MDXMAxx-100-32	257	17.10	5.40	2.10	17.00	2530	11.40	87	400	0.78	6	300	1.4	1.8
1022	MDXMAxx-112-22	218	12.45	4.00	1.50	11.00	1435	8.30	50	400	0.82	6	300	2	2
1023	MDXMAxx-112-22	258	21.45	7.10	1.50	11.00	2545	14.30	87	400	0.83	6	300	1	2
1024	MDXMAxx-132-12	219	16.50	5.50	0.86	13.00	1450	11.00	50	400	0.84	6	300	1.5	2
1025	MDXMAxx-132-12	259	28.65	9.70	0.86	13.00	2555	19.10	87	400	0.83	6	300	1.3	2
1026	MDXMAxx-132-22	220	21.90	7.50	0.80	11.00	1450	14.60	50	400	0.85	6	300	1.5	2
1027	MDXMAxx-132-22	260	38.10	13.20	0.80	11.00	2555	25.40	87	400	0.84	6	300	0.95	1.8
1028	MDXMAxx-160-22	221	31.50	11.00	0.50	7.00	1460	21.00	50	400	0.85	6	300	1.9	2.2
1029	MDXMAxx-160-22	261	54.75	19.30	0.50	7.00	2565	36.50	87	400	0.85	6	300	1	2
1030	MDXMAxx-160-32	222	41.70	15.00	0.40	5.50	1460	27.80	50	400	0.87	6	300	1.7	2.5
1031	MDXMAxx-160-32	262	72.60	26.40	0.40	5.50	2565	48.40	87	400	0.86	6	300	1	1.8

Information on the motor nameplate		Motor data													
C86	Field	C0086	C0022	C0081	C0084	C0085	C0087	C0088	C0089	C0090	C0091	C0070	C0071	C0075	C0076
	Type		I _{max} [A]	P _r [kW]	R _s [Ω]	L _σ [mH]	n _N [rpm]	I _N [A]	f _r [Hz]	U _r [V]	cos φ	V _{pn}	T _{nn}	V _{pi}	T _{ni}
1032	MDXMAxx-180-12	223	49.20	18.50	0.40	4.00	1470	32.80	50	400	0.90	6	300	1.4	1.7
1033	MDXMAxx-180-12	263	86.70	32.40	0.40	4.00	2575	57.80	87	400	0.89	6	300	1	1.7
1034	MDXMAxx-180-22	224	58.20	22.00	0.20	3.80	1456	38.80	50	400	0.90	6	300	1	1.5
1035	MDXMAxx-180-22	264	101.1	38.70	0.20	3.80	2560	67.40	87	400	0.89	6	300	1	1.5
1036	MDXMAXM-63-12	210	0.68	0.12	87.58	610.53	1390	0.45	50	400	0.65	6	300	1.5	10
1037	MDXMAXM-63-12	250	1.17	0.21	87.58	610.53	2500	0.78	87	400	0.65	6	300	1.5	10
1038	MDXMAXM-63-32	210	0.98	0.18	56.90	342.11	1400	0.65	50	400	0.65	6	300	1.5	10
1039	MDXMAXM-63-32	250	1.70	0.31	56.90	342.11	2510	1.13	87	400	0.65	6	300	1.5	10
1040	MDXMAXM-112-32	219	18.75	5.50	0.86	7.20	1440	12.50	50	400	0.78	6	300	1.5	10
1041	MDXMAXM-112-32	259	32.55	9.60	0.86	7.20	2550	21.70	87	400	0.78	6	300	1.5	10
1042	MDXMAXM-132-22	220	25.20	7.50	0.54	4.80	1460	16.80	50	400	0.77	6	300	1.5	10
1043	MDXMAXM-132-22	260	43.80	13.10	0.54	4.80	2570	29.20	87	400	0.77	6	300	1.5	10
1044	MDXMAXM-132-32	221	29.25	9.20	0.46	4.70	1450	19.50	50	400	0.85	6	300	1.5	10
1045	MDXMAXM-132-32	261	50.70	16.00	0.46	4.70	2560	33.80	87	400	0.85	6	300	1.5	10
1046	MDXMAXM-160-22	260	31.50	11.00	1.27	18.97	1466	21.00	50	400	0.86	6	300	1.5	10
1047	MDXMAXM-160-32	260	42.30	15.00	0.87	14.28	1466	28.20	50	400	0.87	6	300	1.5	10
1048	MDXMAXM-180-22	260	54.60	18.50	0.40	4.00	1440	36.40	50	400	0.87	6	300	1.5	10
1049	MDXMAXM-180-32	260	66.15	22.00	0.20	3.80	1465	44.10	50	400	0.85	6	300	1.5	10
1050	MDXMAXM-200-32	260	90.00	30.00	0.17	3.50	1455	60.00	50	400	0.85	6	300	1.5	10
1051	MDXMAXM-225-12	260	108.0	37.00	0.15	2.00	1460	72.00	50	400	0.86	6	300	1.5	10
1052	MDXMAXM-225-22	260	128.25	45.00	0.15	2.00	1475	85.50	50	400	0.84	6	300	1.5	10
1053	MDXMAXM-063-11	210	1.43	0.18	51.00	273.7	2760	0.95	50	400	0.80	6	300	1.5	10
1054	MDXMAXM-063-31	210	1.65	0.25	33.00	93.4	2760	1.10	50	400	0.83	6	300	1.5	10
1055	MDXMAXM-071-11	211	1.50	0.37	22.50	90.2	2840	1.00	50	400	0.78	6	300	1.5	10
1056	MDXMAXM-071-31	212	2.25	0.55	16.90	62.9	2840	1.50	50	400	0.82	6	300	1.5	10
1057	MDXMAXM-080-11	213	2.85	0.75	11.36	47.4	2850	1.90	50	400	0.80	6	300	1.5	10
1058	MDXMAXM-080-31	214	4.20	1.10	6.86	33.4	2810	2.80	50	400	0.82	6	300	1.5	10
1059	MDXMAXM-090-11	215	4.80	1.50	5.10	22.2	2840	3.20	50	400	0.85	6	300	1.5	10
1060	MDXMAXM-090-31	216	7.20	2.20	3.20	14.5	2840	4.80	50	400	0.86	6	300	1.5	10
1061	MDXMAXM-100-31	217	9.30	3.00	1.81	10.7	2850	6.20	50	400	0.88	6	300	1.5	10
1062	MDXMAXM-100-41	218	12.75	4.00	1.45	8.6	2830	8.50	50	400	0.85	6	300	1.5	10
1063	MDXMAXM-112-31	250	18.30	5.50	3.10	17	2890	12.20	50	400	0.83	6	300	1.5	10
1064	MDXMAXM-112-41	250	23.25	7.50	1.96	12	2900	15.50	50	400	0.87	6	300	1.5	10
1065	MDXMAXM-132-21	250	28.05	9.00	1.41	11.292	2925	18.70	50	400	0.89	6	300	1.5	10
1066	MDXMAXM-071-13	210	1.13	0.18	58.93	342	870	0.75	50	400	0.71	6	300	1.5	10
1067	MDXMAXM-071-13	250	1.95	0.31	58.93	342	1610	1.30	87	400	0.71	6	300	1.5	10
1068	MDXMAXM-071-33	210	1.50	0.25	37.90	116.8	920	1.00	50	400	0.63	6	300	1.5	10
1069	MDXMAXM-071-33	250	2.55	0.43	37.90	116.8	1660	1.70	87	400	0.63	6	300	1.5	10
1070	MDXMAXM-080-13	211	2.10	0.37	28.00	112.7	900	1.40	50	400	0.67	6	300	1.5	10
1071	MDXMAXM-080-13	251	3.60	0.64	28.00	112.7	1640	2.40	87	400	0.67	6	300	1.5	10
1072	MDXMAXM-080-33	212	2.85	0.55	16.60	78.6	900	1.90	50	400	0.68	6	300	1.5	10
1073	MDXMAXM-080-33	252	4.95	0.95	16.60	78.6	1640	3.30	87	400	0.68	6	300	1.5	10
1078	MDFMAxx-250-22	224	147.75	55.00	0.04	1.92	1475	98.50	50	400	0.86	6	300	1	2
1079	MDFMAxx-250-22	264	255.90	95.00	0.04	1.92	2585	170.60	87	400	0.86	6	300	1	2
1080	MDEBAXM-063-12	210	0.68	0.12	87.58	610.53	1390	0.45	50	400	0.65	6	300	1.5	10
1081	MDEBAXM-063-12	250	1.17	0.21	87.58	610.53	2500	0.78	87	400	0.65	6	300	1.5	10
1082	MDEBAXM-063-32	210	0.98	0.18	56.90	342.11	1400	0.65	50	400	0.65	6	300	1.5	10
1083	MDEBAXM-063-32	250	1.70	0.31	56.90	342.11	2510	1.13	87	400	0.65	6	300	1.5	10
1084	MDEBAXM-071-12	210	1.35	0.25	39.90	157.20	1390	0.90	50	400	0.64	6	300	3.6	2
1085	MDEBAXM-071-12	250	2.34	0.43	39.90	157.20	2500	1.56	87	400	0.64	6	300	2	2
1086	MDEBAXM-071-32	211	1.95	0.37	25.03	122.60	1380	1.30	50	400	0.64	6	300	3.4	2
1087	MDEBAXM-071-32	251	3.38	0.64	25.03	122.60	2490	2.25	87	400	0.64	6	300	2.5	2
1088	MDEBAXM-080-12	212	2.40	0.55	20.69	89.00	1400	1.60	50	400	0.68	6	300	3.2	2

6 Commissioning

6.6 Adjusting the motor

6.6.3 Motor temperature monitoring with PTC or thermal contact

Information on the motor nameplate		Motor data													
C86	Field	C0086	C0022	C0081	C0084	C0085	C0087	C0088	C0089	C0090	C0091	C0070	C0071	C0075	C0076
	Type		I _{max} [A]	P _r [kW]	R _s [Ω]	L _σ [mH]	n _N [rpm]	I _N [A]	f _r [Hz]	U _r [V]	cos φ	V _{pn}	T _{nn}	V _{pi}	T _{ni}
1089	MDEBAXM-080-12	252	4.16	0.95	20.69	89.00	2510	2.77	87	400	0.68	6	300	1.6	2
1090	MDEBAXM-080-32	213	3.00	0.75	11.69	65.20	1400	2.00	50	400	0.72	6	300	3.5	2
1091	MDEBAXM-080-32	253	5.20	1.30	11.69	65.20	2510	3.46	87	400	0.72	6	300	1.9	3
1092	MDEBAXM-090-12	214	4.05	1.10	6.40	37.00	1420	2.70	50	400	0.77	6	300	2.5	2
1093	MDEBAXM-090-12	254	7.05	2.00	6.40	37.00	2535	4.70	87	400	0.77	6	300	2	2
1094	MDEBAXM-090-32	215	5.40	1.50	4.80	26.00	1415	3.60	50	400	0.77	6	300	2	2
1095	MDEBAXM-090-32	255	9.30	2.70	4.80	26.00	2530	6.20	87	400	0.77	6	300	1	2
1096	MDEBAXM-100-12	216	7.20	2.20	2.90	20.00	1425	4.80	50	400	0.80	6	300	1	1.5
1097	MDEBAXM-100-12	256	12.45	3.90	2.90	20.00	2535	8.30	87	400	0.80	6	300	0.8	1.5
1098	MDEBAXM-100-32	217	9.90	3.00	2.10	17.00	1415	6.60	50	400	0.81	6	300	2.5	1.5
1099	MDEBAXM-100-32	257	17.10	5.35	2.10	17.00	2530	11.40	87	400	0.81	6	300	1.4	1.8
1100	MDEBAXM-112-22	218	12.45	4.00	1.50	11.00	1435	8.30	50	400	0.82	6	300	2	2
1101	MDEBAXM-112-22	258	21.45	7.10	1.50	11.00	2545	14.30	87	400	0.82	6	300	1	2
1102	MDEBAXM-112-32	219	17.85	5.50	2.71	21.40	1425	11.90	50	400	0.84	6	300	1.5	10
1114	MDFMAxx-200-32	224	83.25	30.00	–	–	1465	55.50	50	400	0.85	6	300	1	2
1115	MDFMAxx-200-32	264	145.50	52.00	–	–	2575	97.00	87	400	0.85	6	300	1	2

6.6.3 Motor temperature monitoring with PTC or thermal contact

Description

PTC resistors according to DIN 44081 and DIN 44082 can be connected via the terminal inputs T1 and T2. The motor temperature is measured and integrated into the drive monitoring.

A thermal contact (NC contact) can also be connected to T1 and T2. Lenze three-phase AC motors provide thermal contacts as default.

When using motors equipped with PTC resistors or thermostats, we recommend to always activate the PTC input. This prevents the motor from being destroyed by overheating.



Stop!

- The motor temperature monitoring may only be connected to T1, T2 if the cable is terminated with a PTC or thermal contact (NC contact) on the motor side.
 - An "open" cable acts like an antenna and can cause faults on the drive controller.
 - Input signals at T1, T2 are processed with a delay of 2 s.
- The drive controller can only evaluate one PTC resistor! Do not connect several PTC resistors in series or in parallel:
 - The motor temperature would be measured incorrectly.
 - The motors could be destroyed by overheating.
- If you operate several motors on a drive controller, use thermal contacts (NC contacts) for motor temperature monitoring and connect these in series.
- To achieve full motor protection, an additional temperature monitoring with separate evaluation must be installed.

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0585	MONIT OH8	3	0 TRIP	Configuration of motor temperature monitoring • Temperature monitoring via PTC input (T1, T2)
			2 Warning	
			3 Off	

 6.6-8
 See System Manual
 (extension)

Activation



Note!

- In the Lenze setting the motor temperature monitoring is switched off!
- If you work with several parameter sets, the monitoring must be activated separately in each parameter set!

1. Connect the monitoring circuit of the motor to T1 and T2.
 - With $1.6\text{ k}\Omega < R < 4\text{ k}\Omega$, the monitoring responds.
2. Set the controller reaction:
 - C0585 = 3: Temperature monitoring of the motor is switched off.
 - C0585 = 0: TRIP error message (display of keypad: OH8 **Trip**)
 - C0585 = 2: Warning signal (display of keypad: OH8 **Warn**)

Function test

Connect the PTC input with a fixed resistor:

- $R > 4\text{ k}\Omega$: The fault message OH8 must be activated.
- $R < 1\text{ k}\Omega$: Fault message must not be activated.

6.6.4 Motor temperature monitoring with KTY

Description

Via the incremental encoder connection X8 a KTY resistor can be connected to pin X8/5 and X8/8. The motor temperature is detected and integrated in the drive monitoring.

The KTY resistor is monitored with regard to interruption and short circuit.

We recommend to always activate the KTY input when using motors which are equipped with KTY resistors. This serves to prevent the motor from being destroyed by overheating.



Stop!

- ▶ The controller can only evaluate one KTY resistor! Do not connect several KTY resistors in series or parallel:
 - The motor temperature would be measured incorrectly.
 - The motors could be destroyed by overheating.
- ▶ If several motors are operated on one controller, use thermal contacts (NC contacts) connected in series for motor temperature monitoring.
- ▶ To achieve full motor protection, an additional temperature monitoring with separate evaluation must be installed.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0121	OH7 limit	150	45	{1 °C}		150	Setting of the operating temperature for monitoring OH7 - Only for KTY at X8 - Monitoring OH7 is configured in C0584 
C0583	MONIT OH3	3	0	TRIP		Configuration of motor temperature monitoring with fixed operating temperature - Only for KTY at X8 - The operating temperature is fixed at 150 °C 	
			2	Warning			
			3	Off			
C0584	MONIT OH7	3	2	Warning		Configuration of monitoring motor temperature with variable operating temperature - Only for KTY at X8 - When reaching the temperature set in C0121 the warning OH7 is activated 	
			3	Off			

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0594	MONIT SD6	3	0 TRIP	Activation of the motor temperature monitoring with KTY at X8 • Use C0594 = 0 or 2 to activate monitoring • In case of a short circuit or interruption at X8/5 and X8/8 the fault message SD6 is activated • Configuration of the response when exceeding the motor temperature – Fixed operating temperature in C0583 – Variable operating temperature in C0584
			2 Warning	
			3 Off	

6.6-10
See System Manual (extension)

Activation



Note!

- In the Lenze setting, the motor temperature monitoring is switched off!
- If you work with several parameter sets, the monitoring must be activated separately in each parameter set!

Use C0594 = 0 or C0594 = 2 to activate the motor temperature monitoring via X8. In addition, the connection is monitored for short circuit and interruption.

1. Connecting the monitoring circuit of the motor to X8/5 and X8/8.
2. Setting controller reaction to short circuit or interruption of the connection:
 - C0594 = 3: Monitoring is switched off.
 - C0594 = 0: TRIP error message (display of keypad: Sd6 **Trip**)
 - C0594 = 2: Warning signal (display of keypad: Sd6 **Warn**)

Adjustment

Monitoring with a fixed operating temperature (150 °C)

1. Set response of the controller:
 - C0583 = 3: temperature monitoring of the motor switched off.
 - C0583 = 0: TRIP error message (keypad display: OH3 **Trip**)
 - C0583 = 2: warning signal (keypad display: OH3 **Warn**)

Monitoring with a variable operating temperature (45...150 °C)

1. Set the operating temperature in C0121.
2. Set response of the controller:
 - C0584 = 3: temperature monitoring of the motor switched off.
 - C0584 = 2: warning signal (keypad display: OH7 **Warn**)

Adjustment of KTY operating range

The temperature and resistance range can be adapted to the KTY used.

- C1190 = 0: Fixed operating range for KTY in Lenze motors (Lenze setting)
- C1190 = 1: Adjustable operating range

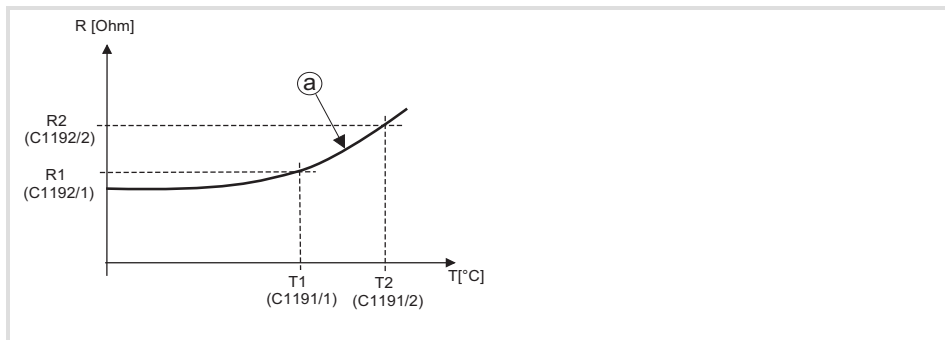


Fig. 6.6-3 Setting of the operating range for the KTY (C1190 = 1)

The operating range is specified by means of limit values and is in the almost linear section of the graph (a). The operating values are determined by interpolation.

C1191/1	Setting of the lower and upper temperature value (T_1 , T_2)
C1191/2	corresponding to the KTY used.
C1192/1	Setting of the lower and upper resistance value corresponding to
C1192/2	the KTY used.

6.6.5 Current limits

Description

The controllers are provided with a current limit value control which determines the dynamic behaviour under load. The resulting utilisation is compared to the current limit value set under C0022 for motor load and under C0023 for generator load. If the current limit values are exceeded, the controller changes its dynamic behaviour.

Controller performance when a limit value is reached

Motor overload during acceleration:

The controller extends the acceleration ramp.

Generator overload during deceleration:

The controller extends the deceleration ramp.

With increasing load and constant speed:

- ▶ When the current limit of the motor mode is reached:
 - The controller reduces the speed up to 0 min⁻¹.
 - The controller cancels the change of the speed if the load falls below the limit value again.
- ▶ When the current limit in the generator mode is reached:
 - The controller increases the speed up to the maximum speed (C0011).
 - The controller cancels the change of the speed if the load falls below the limit value again.
- ▶ If a sudden load is built up at the motor shaft (e. g. the drive is blocked), the overcurrent disconnection can respond (fault message OCx).

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0022	IMAX CURRENT	→	0 {0.01 A}	- I _{max} limit in motor mode → Depending on C0086	 6.6-13
C0023	I _{max} gen.	→	0 {0.01 A}	- I _{max} limit in generator mode → Depending on C0086	 6.6-13

Adjustment

- ▶ Set the acceleration and deceleration times so that the drive can follow the speed profile without reaching $I_{\max}$ of the drive controller.
- ▶ A correct current control in generator mode is only possible with an external brake resistor.
- ▶ Drive behaviour with overload in motor or generator mode (C0054 > C0022 or C0023):
 - The drive controller reduces the speed up to 0 min^{-1} .
 - The drive controller cancels the change of the speed if the load falls below the limit value again.
- ▶ When operating with a switching frequency > 8 kHz or 4 kHz, C0022 and C0023 must be adapted to the permissible output currents (Derating).
- ▶ Correct current (C0075, C0076) in generator mode is only possible with connected brake chopper or DC-bus operation with energy exchange.

6.6.6

Automatic collection of motor data

Description

The motor data identification serves to detect the required motor data and influences of the motor cable.

Before executing the identification you must manually enter the motor data from the motor nameplate into the corresponding codes.

Vector control (C0006 = 1)

In the vector control mode the motor data identification must be executed before initial commissioning.

- ▶ In case of vector control without temperature feedback, the heating of the motor in the motor model is not taken into consideration.
- ▶ In case of vector control with thermal sensor KTY a motor temperature of $20 \text{ }^{\circ}\text{C}$ in the motor model is considered.

Important: The temperature feedback must be activated (C0594 = 0 or C0594 = 2) before you execute the motor data identification.

V/f characteristic control (C0006 = 5)

In the Lenze setting, the controllers are defined for a power-adapted motor with 10 m of motor cable. Therefore the motor data identification is not essential.

- ▶ The identification of the motor data also influences the smooth running behaviour. When identifying the motor data for this operating mode, you can optimise the smooth running behaviour at low speeds.

Codes for parameter setting

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0084 	Mot Rs	→	0.00	{0.01 mΩ}	100000.00	Motor stator resistance → Value is determined by motor parameter identification (C0148, C0149)	 6.6-1  6.6-14
C0087 	Mot speed	→	50	{1 rpm}	36000	Rated motor speed → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor speed in C0087 ● Change of C0087 sets C0086 = 0	 6.6-1
C0088 	MOT CURRENT	→	0.5	{0.1 A}	500.0	Rated motor current → Depending on C0086 ● Selection of a motor in C0086 sets the corresponding rated motor current in C0088 ● Change of C0088 sets C0086 = 0	 6.6-1
C0089 	Mot frequency	→	10	{1 Hz}	5000	Rated motor frequency → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor frequency in C0089 ● Change of C0089 sets C0086 = 0	 6.6-1
C0090 	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor voltage in C0090 ● Change of C0090 sets C0086 = 0	 6.6-1
C0091 	Mot cos phi	→	0.50	{0.01 }	1.00	Motor cos φ → depending on C0086 ● Motor selection in C0086 sets the corresponding motor cos φ in C0091 ● Change of C0091 sets C0086 = 0	 6.6-1
C0092 	Mot Ls	→	0.0	{0.1 mH}	6500.0	Motor stator inductance → Value is evaluated by motor parameter identification from C0088, C0089, C0090 and C0091 → Selection of a motor in C0086 sets the corresponding stator inductance value in C0092	 6.6-1

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0148 	ident run	0	0	WRK stop	Ready	Motor data identification 1. Inhibit controller, wait until drive has stopped 2. Enter the correct values of the motor nameplate into C0087, C0088, C0089, C0090, C0091 3. Set C0148 = 1, confirm with  4. Enable controller The identification – starts,  goes off. The motor "whistles" but does not rotate! – lasts approx. 1 ... 2 min – is completed when  is lit again 5. Inhibit controller:	 6.6-14
			1	WRK run	Start identification		
C0149 	Auto ident	0	0	Id inactive	Automatic identification is inactive	Automatic motor data identification 1. Inhibit controller, wait until drive has stopped 2. Enter the correct values of the motor nameplate into C0087, C0088, C0089, C0090, C0091 3. Set C0149 = 1, confirm with  4. Enable controller The identification – starts,  goes off. The motor "whistles" but does not rotate! – lasts approx. 1 ... 2 min – is completed when  is lit again 5. Inhibit controller:	 6.6-14
			1	Id active	Automatic identification is active • The identification starts automatically after controller enable • After a faulty identification, the process is restarted after TRIP RESET or mains switching and subsequent controller enable		

Adjustment

The identification is only executed for the parameter set which is activated at the moment:

- If you want to identify the motor data for another parameter set, you must switch to this parameter set and restart the identification.



Note!

- During the identification the motor is supplied with current. The motor does not rotate.
- The load machine can remain to be connected. Existing holding brakes can be kept in the braking position.
- If the motor is idling, a small phase offset may occur at the motor shaft.

1. Enter C0087, C0088, C0089, C0090 and C0091 of your motor (see nameplate):
 - It is vital to enter the correct values since these entries influence important parameters such as slip compensation and no-load current.
 - Enter the values according to the connection method (star or delta) for the rated motor current (C0088) and rated motor voltage (C0090).

Manual motor data identification (C0148)

1. Inhibit the controller. Wait until drive stands still.
2. Select C0148 = 1, confirm with **ENTER**.
3. Enable the controller. The identification starts.
 - The green LED at the controller is blinking very fast.
 - "WRK run" is displayed at the keypad.
 - The rotor resistance is calculated and saved in C0082.
 - The motor stator resistance is detected and saved in C0084.
 - The motor leakage inductance is measured and saved in C0085.
 - The inverter compensation characteristic is calculated from the measured motor stator resistance and saved in C1751/1 ... C1751/17.
 - The motor stator inductance is calculated from the entered data and saved in C0092.
 - The identification takes approx. 1 ... 2 min (dependent on the rated motor power).
 - The identification is completed when the green LED at the controller is lit (keypad, GDC: **IMP** is active).
4. Inhibit the controller.

If the motor data identification has been completed incorrectly

If the identification is incorrect, the fault ID1 or ID2 is displayed.

- If the motor data identification is incorrect, the process must be repeated from step 2.

Automatic motor data identification (C0149)

The automatic motor data identification is suitable for standard and replacement devices which are pre-parameterised in the workshop and commissioned on site:

- ▶ Enter the motor data of the motor nameplate, set C0149 = 1 and save the settings.
 - ▶ The motor data identification is started with the first controller enable. After a successful identification the settings are automatically saved in the parameter set 1.
1. Inhibit controller (X5/28 = LOW).
 2. Switch on the mains.
 3. Select a Lenze motor under C0086 or enter motor data of the nameplate.
 4. If required, select C0149 = 1 and confirm with **ENTER**.
 5. Enable the controller. The identification starts.
 - The green LED at the controller is blinking very fast.
 - "WRK run" is displayed at the keypad.
 - The rotor resistance is calculated and saved in C0082.
 - The motor stator resistance is detected and saved in C0084.
 - The motor leakage inductance is measured and saved in C0085.
 - The inverter compensation characteristic is calculated from the measured motor stator resistance and saved in C1751/1 ... C1751/17.
 - The motor stator inductance is calculated from the entered data and saved in C0092.
 - The identification takes approx. 1 ... 2 min (dependent on the rated motor power).
 - The identification is completed when the green LED at the controller is lit (keypad, GDC: **IMP** is active).
 - Controller is inhibited.
 - If required, select C0149 = 0 and confirm with **ENTER**. The automatic motor data identification is deactivated.
 6. Inhibit the controller.

If the motor data identification has been completed incorrectly

If the identification is incorrect, the fault ID or ID is displayed.

1. Acknowledge fault with TRIP RESET or switch the mains.
2. Enable the controller. The identification restarts.

6.7 Setting the speed feedback

Description

For speed monitoring, the feedback signal via incremental encoder can either be supplied via input X8 or X9.

- At input X8 you can only attach an incremental encoder with TTL-levels.
- Incremental encoders with HTL-level can only be connected to input X9.

The incremental encoder signal can be output for slaves at the digital frequency output X10.

The master frequency input (DFIN) and master frequency output (DFOUT) are described in the chapter "Function library".



Note!

You can use maximally two of the three interfaces X8, X9, X10 at the same time. This may lead to the fact that the incremental encoder input cannot be activated or the master frequency input or master frequency output does not work.

- This does not apply if the input signal at X8 or X9 is directly output to master frequency output X10 (C0540 = 4 or 5).
- To deactivate the master frequency input, the internal signal connection of function block DFIN to the following function block must be removed. Remove the function block DFIN from the processing table.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0025 STOP	Feedback type	1		Speed feedback	6.7-1
			1 no feedback No feedback		
			100 IT (C420) - X8 Input of the number of increments in C0420	Incremental encoder at X8 Incremental encoders with TTL level can only be connected to X8.	
			101 IT (C420) - X9 Input of the number of increments in C0420	Incremental encoder at X9 Connect incremental encoders with HTL-level on X9 only	
				Incremental encoder at X8 Incremental encoders with TTL level can only be connected to X8.	
			110 IT512-5V 512 inc		
			111 IT1024-5V 1024 inc		
			112 IT2048-5V 2048 inc		
			113 IT4096-5V 4096 inc		

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0420 STOP	Encoder const	512	1	{1 inc/rev}	8192	Number of increments for incremental encoder at X8 or X9 Connect incremental encoders with HTL-level on X9 only	 6.7-1
C0421 STOP	Enc voltage	5.00	5.00	{0.1 V}	8.00		

 6.7-1

6.7.1 Incremental encoder with TTL level at X8

On X8, only incremental encoders with TTL level can be operated. Wiring diagram and pin assignment of X8 are described in chapter "Wiring of the standard device" → "Wiring of the feedback system".

Activation

- C0025 = 100. In addition, you have to set the number of increments in C0420.
- C0025 = 110, 111, 112 or 113. The number of increments (512, 1024, 2048 or 4096) is automatically set.

Adjustment

The incremental encoder is supplied with voltage by the drive controller.



Stop!

If the supply voltage is too high, it may destroy the incremental encoder.

Under C0421 you can adjust the supply voltage V_{CC} (5 V) of the incremental encoder in order to compensate for the voltage drop along the incremental encoder cable (if required).

Calculation of the voltage drop

$\Delta U \approx l [m] \cdot \frac{R [\Omega]}{[m]} \cdot I_{inc} [A]$	l	Length of the incremental encoder cable
	R	Resistance of the incremental encoder cable
	I_{inc}	Current consumption of the incremental encoder

6.7.2 Incremental encoder with HTL level at X9

On X9, incremental encoders with HTL level can be operated. Wiring diagram and pin assignment of X9 are described in chapter "Wiring of the standard device" → "Wiring of the feedback system".

Activation

- C0025 = 101. In addition, you have to set the number of increments in C0420.

Adjustment

The incremental encoder must be operated with an external supply voltage. C0421 has no influence.

- Incremental encoders with HTL level require DC 8 ... 30 V supply voltage. Please observe the information by the manufacturer.

6.8 Operating mode

Description	The control mode of the controller can be selected via the operating mode. You can select between the following modes: ▶ V/f characteristic control ▶ Vector control
Selection of the correct operating mode	The V/f characteristic control is the classic operating mode for standard applications. When using the vector control you will achieve improved drive features compared to the V/f characteristic control due to: ▶ Higher torque via the complete speed range ▶ Higher speed accuracy and higher concentricity factor ▶ Higher efficiency

Speed/ torque characteristics

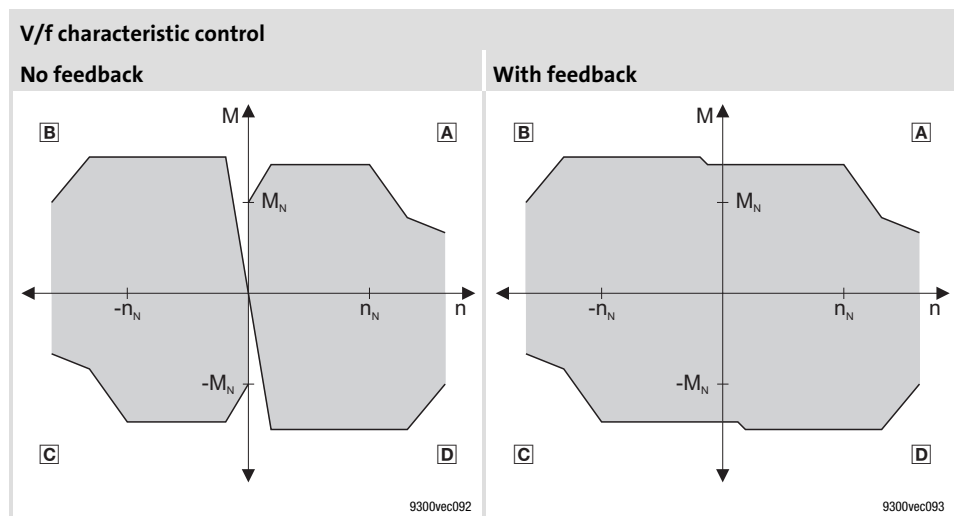


Fig. 6.8-1 Speed/ torque characteristics

- A Operation in motor mode (CW rotation)
- B Operation in generator mode (CCW rotation)
- C Operation in motor mode (CCW rotation)
- D Operation in generator mode (CW rotation)

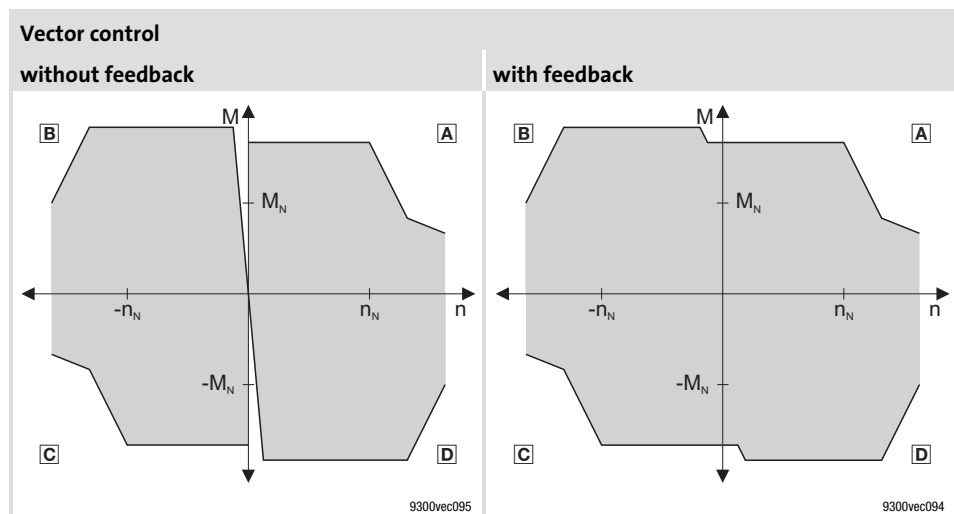


Fig. 6.8-2 Speed/ torque characteristics

- A Operation in motor mode (CW rotation)
- B Operation in generator mode (CCW rotation)
- C Operation in motor mode (CCW rotation)
- D Operation in generator mode (CW rotation)

Operating modes
recommended for standard
applications

The following table helps you to find the correct operating mode for standard applications:

- C0006 = 5: V/f characteristic control with constant $U_{\min}$ boost
- C0006 = 1: vector control

Power range 0.37 ... 90 kW	Selection of the operating mode in C0006			
	Motor cable shielded ≤ 50 m unshielded ≤ 100 m		Motor cable shielded > 50 m unshielded > 100 m	
	recommended	alternatively	recommended	alternatively
Single drives				
With constant load	1	5	5	-
With extremely alternating loads	1	5	5	-
With high starting duty	1	5	5	-
Positioning and infeed drives with high dynamics	1	5	5	-
Rewinder with dancer	1	5	-	-
Unwinder with dancer	5	-	-	-
Pump and fan drives ¹⁾	5	-	5	-
Three-phase AC reluctance motors	5	-	5	-
Three-phase AC sliding rotor motors	5	-	5	-
Three-phase AC motors with fixed voltage/frequency characteristic	5	-	5	-
Group drives (the resulting motor cable length l_{res} is decisive) $l_{\text{res}} = \sqrt{i} \cdot (l_1 + l_2 + \dots + l_i)$				
Identical motors and identical loads	1	5	5	-
Different motors and/or alternating loads	5	-	5	-

¹⁾ For this application we recommend a quadratic voltage characteristic (C0014 = 1)



Note!

Only switch between the operating modes if the controller is inhibited!

6.8.1 V/f characteristic control

Description

The output voltage of the controller follows a defined characteristic. At low output frequencies, the characteristic can be boosted. It can be adapted to different load profiles.

- ▶ Linear characteristic for drives with constant load torque over the speed.
- ▶ Quadratic characteristic for drives with quadratic load torque over the speed:
 - Quadratic V/f characteristics are preferably used in centrifugal pump and fan drives. However, it must be checked whether your pump or fan drive can be operated in this operating mode!
 - If your pump or fan drive cannot be used for the operation with a quadratic V/f characteristic, the linear V/f characteristic or vector control mode must be used.

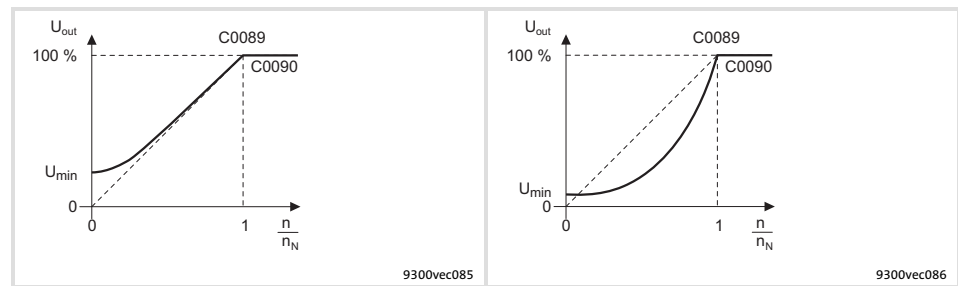


Fig. 6.8-3 Linear and square-law V/f characteristic

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0006 	Op mode	5		Selection of the operating mode for the motor control	
			1 vector ctrl	Vector control without or with speed feedback	In case of the first selection enter the motor data and identify them with C0148. 6.8-8
			5 V / f	V/f characteristic control	Commissioning without identification of the motor data is possible • Advantage of identification with C0148: Improved smooth running at low speeds 6.8-4
C0014	V/f charact.	0		Characteristic in the V/f characteristic control mode	8.2-25
			0 Linear	Linear V/f characteristic	
			1 square	Square V/f characteristic	
C0015	Rated freq	50	10 {1 Hz}	5000 V/f-rated frequency In C0015 you can set a base frequency which differs from the rated motor frequency (C0089) • Lenze setting: C0015 = C0089 • Changing C0086 or C0089 overwrites the value in C0015	8.2-25

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0016	Umin boost	0.00	0.00	{0.01 %}	100.00	U _{min} boost (FCODE) • C0016 = 1 % corresponds to a boost of 1 % of the rated motor voltage (C0090) • Code is freely configurable	6.8-4
C0021	slipcomp	→	-20.00	{0.01 %}	20.00	Slip compensation → Change of C0086, C0087 or C0089 sets C0021 to the calculated rated slip of the motor • When changing over to the vector control mode, C0021 is set to 0	6.11-1 8.2-25 8.2-48
C0090 	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 • Motor selection in C0086 sets the corresponding rated motor voltage in C0090 • Change of C0090 sets C0086 = 0	6.6-1

Adjustment

1. Select "V/f characteristic control" mode (C0006 = 5, factory adjustment).
2. Select V/f characteristic (C0014) if necessary
3. Enter the data of the motor nameplate.
4. If required, you can set a base frequency in C0015 which differs from the rated motor frequency (C0089).

Set $U_{\min}$ boost

Load-independent boost of the motor voltage for output frequencies below the V/f rated frequency. This serves to optimise the torque behaviour.

C0016 must be adapted to the asynchronous motor used. Otherwise the motor may be destroyed by overtemperature or the controller may be operated with overcurrent:

1. Operate the motor in idle state at 5 ... 10 % of the rated speed (n_N):
2. Increase $V_{\min}$ until you reach the following motor current:

A Motor in short-time operation up to $0.5 \cdot n_N$:

- For self-ventilated motors: $I_{\text{motor}} \approx I_{N \text{ motor}}$
- For forced ventilated motors: $I_{\text{motor}} \approx I_{N \text{ motor}}$

B Motor in continuous operation up to $0.5 \cdot n_N$:

- For self-ventilated motors: $I_{\text{motor}} \approx 0.8 \cdot I_{N \text{ motor}}$
- For forced ventilated motors: $I_{\text{motor}} \approx I_{N \text{ motor}}$

**Note!**

Observe for all adjusting processes the thermal behaviour of the connected asynchronous motor at low speeds:

- Usually, standard asynchronous motors with insulation class B can be driven for a short time with its rated current in the speed range up to $0.5 \cdot n_N$.
- Contact the motor manufacturer for getting the exact setting values for the max. permissible motor current of self-ventilated motors in the lower speed range.

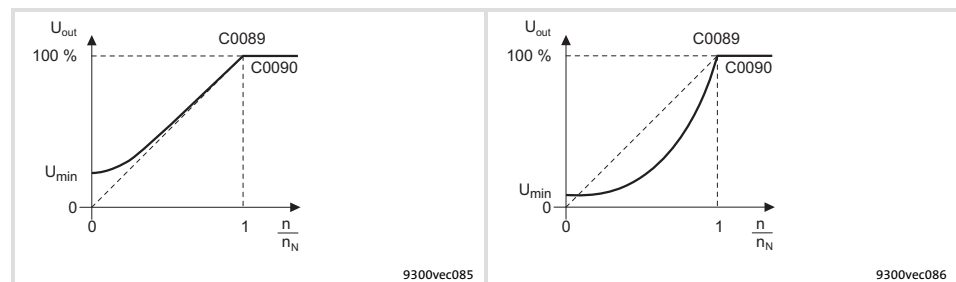


Fig. 6.8-4 $U_{\min}$ boost at linear and square-law V/f characteristic

Optimising V/f characteristic control

In general the V/f characteristic control can be operated without any further measures. The V/f characteristic control must only be optimised in case of the following drive behaviour:

Drive behaviour	Remedy
Does not rotate concentrically at low speeds, especially when operating with long motor cables	Executing motor identification
Problems in case of high starting duty (high mass inertia), in extreme cases, the error message OC1 occurs	Adjusting the voltage increase (C0016). - Set C0016 so that with an enabled controller and 5 ... 10 % of the rated speed an approx. 0.8-fold ... single rated motor current flows  6.8-6
The set voltage increase (C0016) does not result in the desired current flow (controller has problems at high starting duty, error message OC1 during acceleration).	Adapting the voltage increase with boost correction ( 6.11-5)
Drive does not follow the speed setpoint. Reason: The current controller intervenes in the rated field frequency to limit the controller output current to the maximum current (C0022, C0023)	- Increasing acceleration / deceleration time - Consider sufficient magnetising time of the motor. the magnetising time amounts to 0.1 ... 2 s depending on the motor power - Increase permissible maximum current (C0022, C0023)
For operation without speed feedback (C0025 = 1): Lack of speed stability at high load (setpoint and motor speed are not proportional anymore)	- Increase slip compensation (C0021). Important: unstable drive due to overcompensation! - In case of cyclic load impulses (e.g. centrifugal pump) a smoother motor characteristic can be achieved by smaller values in C0021 (maybe negative values) Note: The slip compensation is only active for operation without speed feedback.
Error messages OC1 or OC3 with short acceleration times (C0012) compared with the load (controller cannot follow the dynamic processes)	- Increase gain of the $I_{\max}$ controller (C0075) - Reduce integral-action time of the $I_{\max}$ controller (C0076) - Increase acceleration time (C0012)
Mechanical resonances at certain speeds	The function block NLIM1 serves to suppress those speed ranges in which resonances occur (see chapter "Function library").
Speed oscillations in no-load operation at speeds $> \frac{1}{3}$ rated speed	The oscillation damping minimises speed oscillations (see "Optimising operational performance" in chapter "Commissioning")

6.8.2 Vector control

Description

Compared to the V/f characteristic control, the vector control serves to achieve a considerably higher torque and lower current consumption in idle state.



Note!

- ▶ The connected motor may be maximally two power classes smaller than the motor assigned to the drive controller.
- ▶ The motor data identification is essential.

Codes for parameter setting

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0006 	Op mode	5				Selection of the operating mode for the motor control	
			1	vector ctrl	Vector control without or with speed feedback	In case of the first selection enter the motor data and identify them with C0148.	6.8-8
			5	V / f	V/f characteristic control	Commissioning without identification of the motor data is possible Advantage of identification with C0148: Improved smooth running at low speeds	6.8-4
C0021	slipcomp	→	-20.00	{0.01 %}	20.00	Slip compensation → Change of C0086, C0087 or C0089 sets C0021 to the calculated rated slip of the motor When changing over to the vector control mode, C0021 is set to 0	6.11-1 8.2-25 8.2-48
C0075	Vp curr CTRL	0.20	0.00	{0.01 }	0.99	Gain of current controller - Vector control: gain of current controller - V/f characteristic control: maximum current controller	8.2-25 8.2-48
C0076	Tn curr CTRL	10.0	0.1	{0.1 ms}	2000.0	Integral-action time of current controller - Vector control: integral-action time of current controller - V/f characteristic control: maximum current controller - C0076 = 2000 ms: current controller is switched off	8.2-25 8.2-48
C0077	Ti field CTRL	4.0	0.3	{0.1 ms}	6000.0	Integral-action time of field controller Only active in case of vector control with feedback	
C0081 	Mot power	→	0.01	{0.01 kW}	500.00	Rated motor power → Change of C0086 resets value to factory setting Change of C0081 sets C0086 = 0	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0087 STOP	Mot speed	→	50	{1 rpm}	36000	Rated motor speed → depending on C0086 - Motor selection in C0086 set the corresponding rated motor speed in C0087 - Change of C0087 sets C0086 = 0	6.6-1
C0088 STOP	MOT CURRENT	→	0.5	{0.1 A}	500.0	Rated motor current → Depending on C0086 - Selection of a motor in C0086 sets the corresponding rated motor current in C0088 - Change of C0088 sets C0086 = 0	6.6-1
C0089 STOP	Mot frequency	→	10	{1 Hz}	5000	Rated motor frequency → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor frequency in C0089 - Change of C0089 sets C0086 = 0	6.6-1
C0090 STOP	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor voltage in C0090 - Change of C0090 sets C0086 = 0	6.6-1
C0091 STOP	Mot cos phi	→	0.50	{0.01 }	1.00	Motor cos φ → depending on C0086 - Motor selection in C0086 sets the corresponding motor cos φ in C0091 - Change of C0091 sets C0086 = 0	6.6-1
C0092 STOP	Mot Ls	→	0.0	{0.1 mH}	6500.0	Motor stator inductance → Value is evaluated by motor parameter identification from C0088, C0089, C0090 and C0091 → Selection of a motor in C0086 sets the corresponding stator inductance value in C0092	6.6-1
C0148 STOP	ident run	0	0	WRK stop	Ready	Motor data identification 1. Inhibit controller, wait until drive has stopped 2. Enter the correct values of the motor nameplate into C0087, C0088, C0089, C0090, C0091 3. Set C0148 = 1, confirm with ENTER 4. Enable controller The identification - starts, IMP goes off. The motor "whistles" but does not rotate! - lasts approx. 1 ... 2 min - is completed when IMP is lit again 5. Inhibit controller:	6.6-14
			1	WRK run	Start identification		

Set vector control

C0006 = 1 set the vector control mode.



Note!

When setting the vector control mode, the slip compensation (C0021) is automatically set to 0.0 %.

- ▶ When you switch back to the V/f characteristic control mode, the slip compensation must be re-adapted.

Prepare the motor data identification

The motor data of the motor nameplate must be entered:

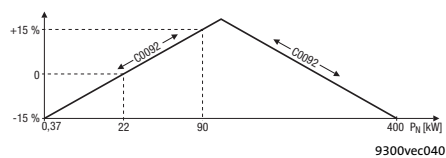
- ▶ Rated motor speed (C0087)
- ▶ Rated motor current (C0088)
- ▶ Rated motor frequency (C0089)
- ▶ Rated motor voltage (C0090)
- ▶ Motor $\cos \varphi$ (C0091)

Executing the motor data identification

Execute the motor data identification. (📖 6.6-14)

Optimising vector control

In general the vector control can be operated without any further measures. The vector control must only be optimised in case of the following drive behaviour:

Drive behaviour	Remedy
Operation without feedback: - The current consumption in idle state differs widely from the rated magnetising current ($I_{mR} \approx I_N \times \sin \varphi$). Calculate $\sin \varphi$ from the $\cos \varphi$ of the motor nameplate. - The drive has an uneven starting performance	- Optimise setpoint for the motor magnetising current. (▢ 6.11-9) - Stator inductance (C0092) must be adapted after motor parameter identification. The calculation of the stator inductance by the motor data identification is based on the motor data entered before and does not consider the physical leakage of the motor and the inductive reactance of the motor cable.  Tendency of the correction of C0092 PN: rated motor power
Lack of speed stability at high load (setpoint and motor speed are not proportional anymore)	Use C0021 (slip compensation) to change the influence of the rotor resistance (C0082) proportionally: - Reduce the value in C0021 at an increasing speed (negative values) - Increase the value in C0021 at a decreasing speed Note: If you activate the vector control (C0006 = 1), C0021 is automatically set to 0 %.
Unstable control at higher speeds	- Reduce the gain of the speed controller (C0070) (if required, speed-dependent adaptation via function block CURVE1 and MCTRL-VP-ADAPT) - Control value in C0092 by comparing the current consumption in no-load operation with the rated magnetising current ($I_{mR} \approx I_N \times \sin \varphi$). - Optimise oscillation damping (C0234 ... C0236)
Unstable control at higher speeds and high torque at high power (> 55 kW)	- Reduce gain of the I_{max} controller (C0075) or reduce gain and influence of the oscillation damping (at a power of 55 ... 90 kW). - For operation with feedback, deactivate oscillation damping with C0234 = 0.
Unstable control in field weakening range for operation with speed feedback	- Reduce integral-action time of the field controller via C0077 - Increase gain of the I_{max} controller (C0075)
Error messages OC1 or OC3 with short acceleration times (C0012) compared with the load (controller cannot follow the dynamic processes).	- Increase gain of the I_{max} controller (C0075) - Reduce integral-action time of the I_{max} controller (C0076) - Increase acceleration time (C0012)
Mechanical resonances at certain speeds	The function block NLIM1 serves to suppress those speed ranges in which resonances occur (see chapter "Function library").
Speed oscillations in no-load operation at speeds > 1/3 rated speed	The oscillation damping minimises speed oscillations (see "Optimising operational performance" in chapter "Commissioning")

6.9 Switching frequency of the inverter

Description

The switching frequency of the inverter influences the smooth running behaviour, the power loss in the controller and the noise generation in the connected motor. The Lenze setting is the optimum value for standard applications. General rule:

The lower the switching frequency the

- ▶ lower the power loss.
- ▶ higher the noise generation.
- ▶ better the concentricity factor.

You can select between two switching frequency modes:

Code	sine-wave modulated (sin)	flat top modulated (f_top)
C0018	0, 1, 4, 5, 6	2, 3



Note!

- ▶ In the flat top modulation, the concentricity factor at low speeds is lower than in the sine-wave modulation. For most standard applications a sine-wave modulated switching frequency is optimal.
- ▶ The maximum output frequency of the controller depends on the selected switching frequency (see C0018).
- ▶ When C0018 = 0 and C0018 = 6, the switching frequency is automatically changed over depending on the output current of the controller.
- ▶ Please note that for operation with high switching frequencies the output current must be reduced to prevent the controller from being heated inadmissibly (derating).
- ▶ Adapt the current limit values (C0022 and C0023) so that the currents listed in the technical data are not exceeded.

In addition you can set to change over to a lower switching frequency when the heatsink temperature reaches an adjustable limit value. This serves to prevent the drive from being inhibited by the error "overtemperature" and the motor coasts without torque.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0018	fchop	6	0	auto chop	automatic change-over of the switching frequency between 16/8/2 kHz	Switching frequency of the inverter  6.9-1 - General rule: the lower the switching frequency the - lower the power loss - higher the noise generation - better the concentricity factor - Observe derating information at high switching frequencies - The max. output frequency (f_{out}) amounts to: $f_{chop} = 16 \text{ kHz} \Rightarrow f_{out} = 600 \text{ Hz}$ $f_{chop} = 8 \text{ kHz} \Rightarrow f_{out} = 300 \text{ Hz}$ $f_{chop} = 4 \text{ kHz} \Rightarrow f_{out} = 150 \text{ Hz}$ $f_{chop} = 2 \text{ kHz} \Rightarrow f_{out} = 150 \text{ Hz}$
			1	2 kHz sin	optimised smooth running	
			2	4 kHz f_top	power-optimised	
			3	8 kHz f_top	power-optimised	
			4	8 kHz sin	noise optimised	
			5	16 kHz sin	noise optimised	
			6	auto 8/2 kHz	noise / power-optimised with automatic change-over to low switching frequency	
			C0144 	OH switch	1	
1	Switch on	Switch-over is active				

Function of automatic switching frequency reduction

C0144 = 0 (no temperature-dependent switching frequency reduction)

If the maximum permissible heatsink temperature (ϑ_{max}) is exceeded when operating with automatic switching frequency reduction, the inverter is inhibited, TRIP "OH" (overtemperature) is set and the motor coasts without torque.

C0144 = 1 (temperature-dependent switching frequency reduction is active):

- If the heatsink temperature set in C0122 (overtemperature OH4) is reached when operating with automatic switching frequency reduction, the controller automatically reduces the switching frequency to 2 kHz, thus keeping the operation running.
- After the heatsink has cooled down, the controller automatically switches to the set switching frequency again.

6.10 Acceleration, deceleration, braking, stopping

6.10.1 Speed range

Description

The speed range required for the application is set in the codes C0010 and C0011:

- The minimum speed (C0010) corresponds to a speed setpoint selection of 0 %.
- The minimum speed (C0011) corresponds to a speed setpoint selection of 100 %.

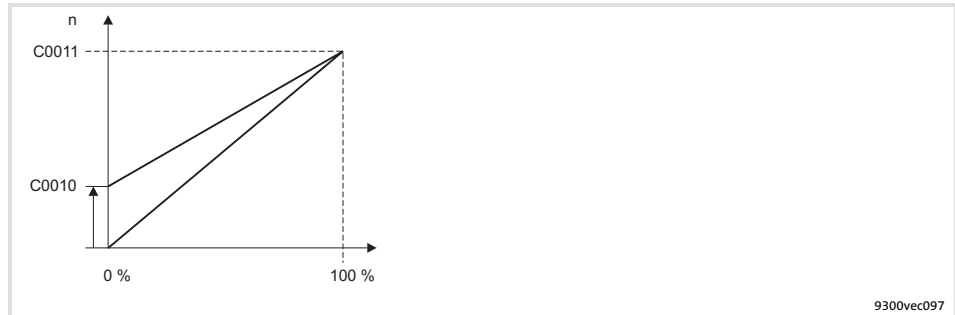


Fig. 6.10-1 Relation between setpoint and minimum and maximum output frequency

Codes for parameter setting

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C0010	N _{min}	0	0	{1 rpm}	36000	● Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times ● C0059 must be set correctly ● Set C0010 < C0011 ● C0010 is only effective in case of analog setpoint selection via AIN1 Important: For parameter setting via interface, major changes in one step should only be made when the controller is inhibited.	Minimum speed	 6.10-1
C0011	N _{max}	3000	0	{1 rpm}	36000		Maximum speed	

C0010

Features of "minimum speed" (n_{min}):

- C0010 is approached via the acceleration ramp.
- C0010 is only effective with analog setpoint selection via AIN1 (terminal X6/1 and X6/2).

C0011

Features of "maximum output frequency" ($n_{\max}$):

- ▶ When selecting fixed setpoints (JOG), C0011 acts as limitation.
- ▶ C0011 is an internal scaling variable! Therefore major changes may only be carried out when the controller is inhibited!

**Stop!**

Set 0011 so that the maximum permissible motor speed is not exceeded.

Otherwise the motor will be destroyed.

Setting tips

The internal speed limits must be observed (p = number of motor pole pairs):

- ▶ Switching frequency 16 kHz: $n_{\max} = 36000/p \text{ min}^{-1}$
- ▶ Switching frequency 8 kHz: $n_{\max} = 36000/2p \text{ min}^{-1}$
- ▶ Switching frequency 2/4 kHz: $n_{\max} = 36000/4p \text{ min}^{-1}$

6.10.2 Setting acceleration times and deceleration times in speed mode

Description The acceleration and deceleration times determine the controller response time after a setpoint change.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0012	Tir (acc)	5.00	0.00	{0.01 s}	9999.90	Acceleration time T _{ir} of the main setpoint Refers to speed change 0 ... C0011	 6.10-3
C0013	Tif (dec)	5.00	0.00	{0.01 s}	9999.90	Deceleration time T _{if} of the main setpoint Refers to speed change 0 ... C0011	

Adjustment

- The acceleration and deceleration times refer to a speed change from 0 min⁻¹ to the max. speed set in C0011.
- Calculate the times T_{ir} and T_{if}, which you can set under C0012 and C0013.

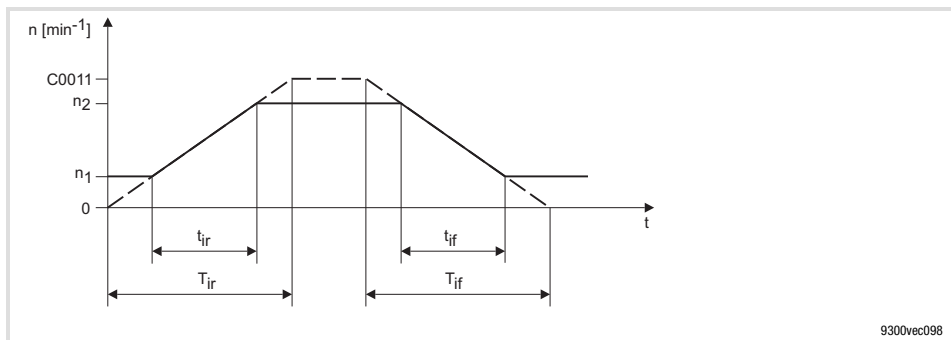


Fig. 6.10-2 Acceleration and deceleration times

$$T_{ir} = t_{ir} \cdot \frac{C0011}{n_2 - n_1}$$

t_{ir} and t_{if} are the desired times for the change between n₁ and n₂

$$T_{if} = t_{if} \cdot \frac{C0011}{n_2 - n_1}$$



Note!

If the acceleration and deceleration times are set too short and under unfavourable operating conditions the controller can be switched off with TRIP OC1 or OC3. In these cases, the acceleration and deceleration times must be set so that the drive can follow the speed profile without I_{max} reaching a drive system.

6.10.3 Quick stop

Description Quick stop brakes the drive to standstill with the deceleration time set in C0105.

► DC-injection braking (GSB) has priority over quick stop.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0105	QSP Tif	5.00	0.00	{0.01 s}	999.90	Quick stop deceleration time ● The deceleration time refers to a speed variation of C0011 ... 0
						 8.2-25  8.2-48

Activation

Via digital signal:

- MCTRL-QSP = HIGH.
- Activating signal DCTRL-QSP. The signal can be activated via 3 OR'd inputs:
 - Control word CAN-CTRL.B3 from CAN-IN1
 - Control word AIF-CTRL.B 3 from AIF-IN
 - Control word C0135.B3

Via keyboard of the keypad:

For this the key must be assigned with the quick stop function (C0469 = 2):

-  activates quick stop
-  restarts the drive

6.10.4 Changing the direction of rotation

Description

In the basic configurations (C0005) the direction of rotation of the motor is reversed in a fail-safe way via the X5/E1 and X5/E2 and the function block R/L/Q. Thus, only the main setpoint is changed.

The reversing time depends on the ramp times set for the main setpoint or quick stop.

When the direction of rotation is changed, the drive brakes along the deceleration ramp (C0013) and accelerates along the acceleration ramp (C0012) into the other direction of rotation.

Direction of rotation with in-phase connection:

Direction of rotation	Signal level at		Notes
	X5/E1	X5/E2	
CCW rotation	LOW	HIGH	- During operation: The direction of rotation results from the signal which was active first. - At mains connection: The controller activates quick stop (QSP).
CW rotation	HIGH	LOW	
Quick stop	LOW	LOW	
Unchanged	HIGH	HIGH	

6.11 Optimising the operating behaviour

6.11.1 Slip compensation

Description

The speed of an asynchronous machine decreases when being loaded. This load-dependent speed drop is called slip. By setting C0021 the slip can be partly compensated.

In the V/f characteristic control mode the slip compensation is only active at operation without feedback (C0025 = 1).

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0021	slipcomp	→	-20.00	{0.01 %}	20.00	Slip compensation → Change of C0086, C0087 or C0089 sets C0021 to the calculated rated slip of the motor ● When changing over to the vector control mode, C0021 is set to 0 6.11-1 8.2-25 8.2-48
C0078	Tn slip CTRL	100	1	{1 ms}	6000	Integral-action time of slip controller ● Filter time for slip compensation (C0021) ● Only active with V/f characteristic control 8.2-25

Adjustment

V/f characteristic control

The slip compensation (C0021) is automatically calculated from the rated motor speed (C0087) and the rated motor frequency (C0089). The entered slip constant [%] is the rated slip of the motor in [%] relating to the synchronous speed of the motor.

- Calculating the slip compensation and entering it into C0021:

$s = \frac{n_{rsyn} - n_r}{n_{rsyn}} \cdot 100 \%$ $n_{rsyn} = \frac{f_r \cdot 60}{p}$	E	Slip constant (C0021) [%]
	n_{rsyn}	Synchronous motor speed [min^{-1}]
	n_r	Rated motor speed according to motor nameplate [min^{-1}]
	f_r	Rated motor frequency according to motor nameplate [Hz]
	p	Number of motor pole pairs (1, 2, 3, ...)

- If required, the slip compensation can be adapted manually:
- If C0021 is set too high, the drive may get unstable.
 - With cyclic load impulses (e. g. centrifugal pump) a smooth motor characteristic is achieved by smaller values in C0021 (possibly negative values)
 - Parameterise C0078 (filter time for the slip compensation) if you want to change the motor response time to load changes (dynamic ↔ slow).
- The actual speed is output as an analog signal (in [%] of $n_{\max}$ (C0011)) to MCTRL-NACT.

**Note!**

When operating synchronous or reluctance motors, C0021 must be set to 0.

Vector control

Use C0021 to change the influence of the rotor resistance (C0082) proportionally:

- Reduce the value in C0021 at an increasing speed (negative values)
- Increase the value in C0021 at a decreasing speed

**Note!**

When setting the vector control mode, the slip compensation (C0021) is automatically set to 0.0 %.

- When you switch back to the V/f characteristic control mode, the slip compensation must be re-adapted.

6.11.2 Oscillation damping

Description

Suppressing no-load oscillations in case of:

- ▶ Drives with different rated power of controller and motor, e. g. when operating with high switching frequency and the power derating involved.
- ▶ Operation of higher-pole motors.
- ▶ Operation of three-phase AC drives > 10 kW.

Compensation of resonances in the drive kit:

- ▶ Certain asynchronous motors may show this behaviour above $\frac{1}{3}$ of the rated speed ($\frac{1}{3} \cdot n_n$). This may result in an unstable operation (current and speed variations).

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0234	damp value	20	-100	{1 %}	100	Influence of the oscillation damping, function block MCTRL ● Minimising a tendency to oscillation of the drive ● Influences the tendency to oscillation of the drive ● When C0025 >1 and C0006 = 1, C0234 is set to 0  8.2-25  8.2-48
C0235	damping	5	1	{1 ms}	600	Filter time of the oscillation damping, function block MCTRL ● Filter time for the internal signal for oscillation damping  8.2-25  8.2-48
C0236	damp limit	0.2	0.0	{0.1 Hz}	20.0	Limit value of oscillation damping, function block MCTRL ● Limit value for the internal signal of oscillation damping

Adjustment

The Lenze setting is designed for power-adapted motors.

Usually, the speed oscillations can be reduced by changing the Lenze setting of the codes C0234 oder C0236 by the factor 2 ... 5.

1. Approach the range with speed oscillations.
 2. Change the influence of the oscillation damping in C0234 (generally, increase it).
 3. Increase the limitation of the oscillation damping in C0236.
 4. Change filter time in C0235 in the range of 1 ... 20 ms, if necessary.
- These can be indicators for smooth running:
- Constant motor current characteristic
 - Reduction of the mechanical oscillations in the bearing seat

**Note!****Restricted effect with vector control**

- The oscillation damping has no influence on the drive behaviour at low tendency to oscillation of the speed controller.
- Especially for drives > 55 kW with a tendency to oscillation it may be necessary to deactivate the oscillation damping (C0234 = 0 %).
- For operation with feedback the oscillation damping has no influence.

6.11.3 Boost correction with V/f characteristic control

Description

In the V/f characteristic control mode (C0006 = 5), a constant voltage boost (in [%] von C0090) can be preset in code C0016 at low speeds or motor standstill.

If due to the setting in C0016 no current or a nonuniform current flows, the voltage boost can be further increased via the boost correction to inject a sufficiently high and uniform current into the motor.

If the voltage boost is insufficient, the following drive behaviour occurs:

- The required torque is not achieved at standstill.
- When the load is accelerated from standstill, the current overshoots as the motor had not been magnetised sufficiently before. OC1 can trip.



Note!

If the motor magnetising current is too low, Lenze recommends to operate the controller with sine-wave modulated switching frequency (C0018 = 0, 1, 4, 5 oder 6) only.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0080	Vp field CTRL	0.00	0.00	{0.01 }	0.99	Influence on the motor magnetising current set in C0095 ● Not effective when C0006 = 1 and C0025 > 1 ● Sphere of influence is effective from 0 Hz to the frequency set in C1583  6.6-1  6.11-5
C0095 	Mot lo	→	0.00	{0.01 A}	1000.00	Motor magnetising current → depending on C0086, C0088 and C0091 ● Change of C0086, C0088 and C0091 sets C0095 to the Lenze setting ● Change of C0095 sets C0086 = 0  6.6-1  6.11-5
C1583	fset high	100.0 0	0.00	{0.01 %}	199.99	Alterations by Lenze service only! Adaptation of the motor magnetising current set in C0095 (with V/f characteristic control: influence limit of the boost correction; with vector control: influence limit of the field precontrol) ● The output frequency is set up to which the motor magnetising current set in C0095 is to have an effect. ● C1583 = 100 % $\triangle$ half the rated motor frequency in C0089  6.11-5

Adjustment

**Stop!**

A longer operation of the motor in standstill may destroy the motor by overheating, especially in case of small motors.

- ▶ Connect the thermal contact (NC contact), PTC, or KTY of the motor and activate the motor temperature monitoring of the controller.
- ▶ Operate self-ventilated motors with a blower, if required.

Setting voltage boost

1. Set a voltage boost in C0016. (📖 6.8-6)
 - When C0016 = 0 % no boost is possible.
2. For magnetising the motor, consider enough time from controller enable to the start of the speed ramp-function generator.
 - The bigger the motor the longer the time for magnetisation. A motor with the power of 90 kW requires up to 2 s.
 - If the desired continuous current does not flow, correct the boost using the codes C0080, C0095 and C1583.

Carry out a boost correction

3. If required, set the desired motor magnetising current (standstill current) in C0095 which is to be achieved by the boost correction.
 - The value in the Lenze setting has been evaluated by the controller from the entered motor data of the motor nameplate.
 - When C0095 = 0, the boost correction is deactivated.
4. Set the influence of the boost correction in C0080.

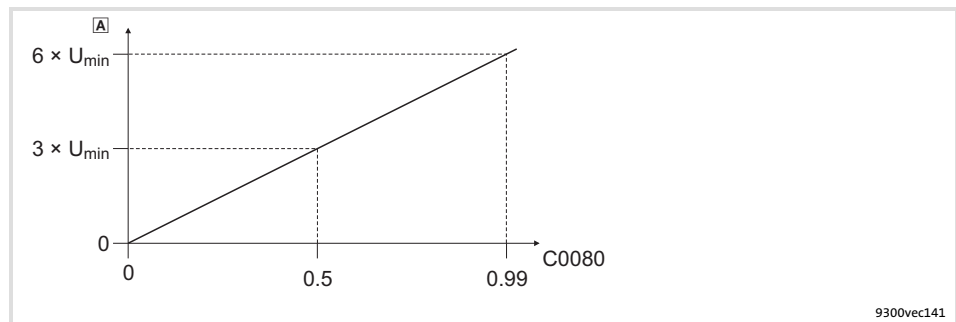


Fig. 6.11-1 Influence of boost correction

- A** Maximum height of the correction value when the field frequency is 0
- C0080 = 0.99 Maximum correction value. The voltage boost $U_{\min}$ achieved by C0016 is increased sixfold.
- C0080 = 0 No correction value. The voltage boost $U_{\min}$ achieved by C0016 is not increased, the boost correction is deactivated.

Increase the value in C0080 step by step and observe the effect on the current injection with an oscilloscope, if required.

– If the boost correction is too high, this can cause current overshoots when the current injection starts.

5. Set the adaptation of the boost correction in C1583.

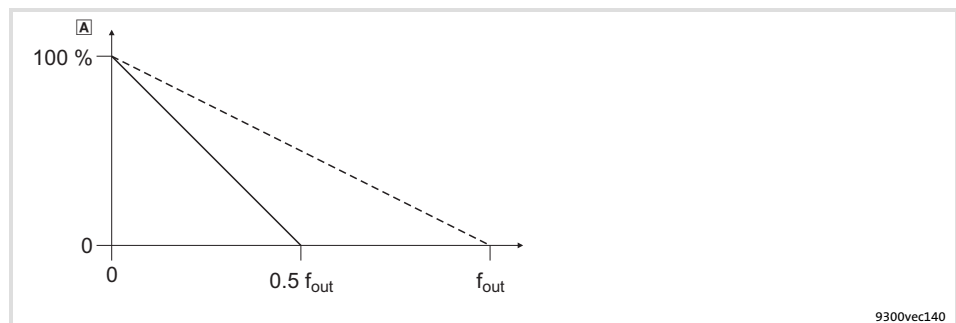


Fig. 6.11-2 Adaptation of boost correction

- A** Adaptation of boost correction
- Characteristic when C1583 = 100 % (Lenze setting). The output frequency corresponds to half the rated motor frequency in C0089.
- - - - Characteristic when C1583 = 199.99 %. The output frequency corresponds to the rated motor frequency in C0089.
- When C1583 = 0 % the boost correction is deactivated

Enter the output frequency in C1583 until which the boost correction is to have an effect.

– At an output frequency of 0 Hz the boost correction has the influence defined in C0080 and is 100 percent efficient. An increasing output frequency reduces the influence linearly to 0.

Example

A motor connected to a controller has a rated motor voltage of 400 V (C0090 = 400 V). The voltage boost $U_{\min}$ is set to 2 % (C0016 = 2 %).

- At a voltage boost of 2 % and a rated motor voltage of 400 V,
 $U_{\min} = 8 \text{ V}$.

The voltage boost $U_{\min}$ is to be optimised via C0080:

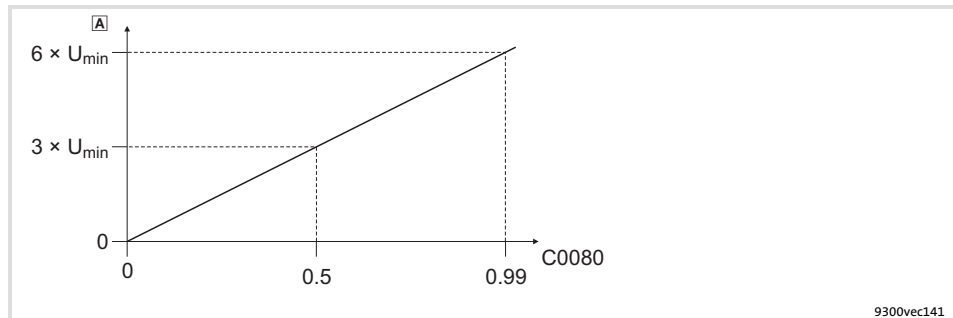


Fig. 6.11-3 Influence of boost correction

A Maximum correction value when the output frequency is 0 Hz

- When $C0080 = 0.5$, the maximum correction value is:

$$3 \times U_{\min} = 3 \times 8 \text{ V} = 24 \text{ V}$$

- The maximum voltage boost is:

$$U_{\min} + \text{correction value} = 8 \text{ V} + 24 \text{ V} = 32 \text{ V}$$

6.11.4 Motor magnetising current with vector control

This chapter describes how to optimise the setpoint for the motor magnetising current (C0095) via the codes C0080 and C1583 in case of vector control **without** feedback.

- In case of vector control **with** feedback the setpoint for the motor magnetising current is only determined by C0095. An optimisation is not required. The codes C0080 and C1583 have no effect.

The motor current consists of the exciting and active part. The magnetisation of the motor is determined by the excitation current (magnetising current). To create a torque the motor needs active current.

In the vector control mode (C0006 = 1) a magnetising current is injected into the motor after controller enable. The current level is detected by the controller from the motor data.

If a too low motor magnetising current is injected after controller enable, the following drive behaviour occurs:

- The required torque is not achieved at standstill.
- When a high load is accelerated from standstill, the current overshoots. OC1 can be activated.
- The machine runs irregularly as the motor is underexcited.



Note!

If the motor magnetising current is too low, Lenze recommends to operate the controller with sine-wave modulated switching frequency (C0018 = 0, 1, 4, 5 oder 6) only.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0080	Vp field CTRL	0.00	0.00	{0.01 }	0.99	Influence on the motor magnetising current set in C0095 ● Not effective when C0006 = 1 and C0025 > 1 ● Sphere of influence is effective from 0 Hz to the frequency set in C1583	 6.6-1  6.11-5
C0095 	Mot lo	→	0.00	{0.01 A}	1000.00	Motor magnetising current → depending on C0086, C0088 and C0091 ● Change of C0086, C0088 and C0091 sets C0095 to the Lenze setting ● Change of C0095 sets C0086 = 0	 6.6-1  6.11-5
C1583	fset high	100.0 0	0.00	{0.01 %}	199.99	Alterations by Lenze service only! Adaptation of the motor magnetising current set in C0095 (with V/f characteristic control: influence limit of the boost correction; with vector control: influence limit of the field precontrol) ● The output frequency is set up to which the motor magnetising current set in C0095 is to have an effect. ● C1583 = 100 % $\triangle$ half the rated motor frequency in C0089	 6.11-5

Adjustment



Stop!

A longer operation of the motor in standstill may destroy the motor by overheating, especially in case of small motors.

- ▶ Connect the thermal contact (NC contact), PTC, or KTY of the motor and activate the motor temperature monitoring of the controller.
- ▶ Operate self-ventilated motors with a blower, if required.

Basic setting

1. Enter the motor data of the motor nameplate and execute the motor identification. (📖 6.6-14)
2. For magnetising the motor, consider enough time. The motor is being magnetised between controller enable and motor start.
A delayed start of the motor can be achieved using e.g. the quick stop function:
 - Activate quick stop. Enable the controller and wait until the motor is magnetised sufficiently. Deactivate quick stop for the motor to start.The bigger the motor the longer the time for magnetisation. A motor with the power of 90 kW requires up to 2 s.
If the desired continuous current does not flow, the magnetisation of the motor can be optimised using the codes C0080, C0095 and C1583.

Optimisation

3. If required, select a setpoint for the motor magnetising current in C0095.
 - The value in the Lenze setting has been evaluated by the controller from the entered motor data of the motor nameplate.
4. The influence, the setpoint of the motor magnetising current is to have, can be set in C0080.
 - A P controller which increases or reduces the setpoint can be parameterised via C0080.
 - Increase the value in C0080 step by step and observe the effect on the current injection with an oscilloscope, if required.
 - When C0080 = 0 the P controller is deactivated. No setpoint is selected for the motor magnetising current.
5. Set the adaptation of the setpoint for the motor magnetising current in C1583.

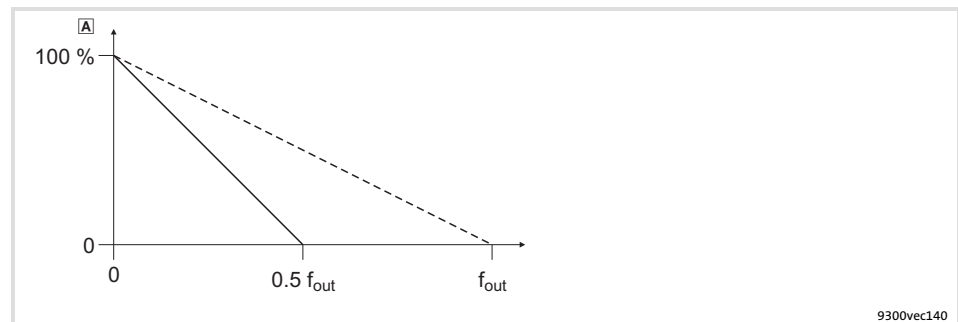


Fig. 6.11-4 Adaptation of the setpoint for the motor magnetising current

A Adaptation of the setpoint

— Characteristic when C1583 = 100 % (Lenze setting). The output frequency corresponds to half the rated motor frequency in C0089.

- - - - Characteristic when C1583 = 199.99 %. The output frequency corresponds to the rated motor frequency in C0089.

When C1583 = 0 % the adaptation is deactivated. No setpoint is selected for the motor magnetising current.

Select the output frequency in C1583, up to which the setpoint of the motor magnetising current is to have an effect.

- At an output frequency of 0 Hz the setpoint has the influence defined in C0080 and is 100 percent efficient. An increasing output frequency reduces the influence linearly to 0.

7 **Parameter setting**

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7.1 Important notes

Adapting the controller functions to the application

The controller functions can be adapted to your applications by means of parameterisation. You can either parameterise via keypad, PC or via the parameter channel of a bus system.

The function library contains a detailed description of the functions, the signal flow diagrams contain all configurable signals.

Parameters and codes

The parameters for the functions are stored in numbered codes:

- Codes are marked in the text with a "C" (e.g. C0002).
- The code table provides a quick overview of all codes. The codes are sorted according to their numbers and can be used as reference.
( 8.5-1)

Parameter setting via keypad

A quick parameter setting is provided by the keypad XT. Moreover, it serves as status display, error diagnosis and transfer of parameters to other drive controllers.

	Keypad XT EMZ9371BC
Can be used with	8200 vector, 8200 motec, starttec, Drive PLC, 9300 vector, 9300 servo
Operator buttons	8
Plain text display	yes
Menu structure	yes
Configurable menu ("user menu")	yes
Predefined basic configurations	yes
Non-volatile memory for parameter transfer	yes
Password protection	yes
Diagnosis terminal	Keypad XT in handheld design, IP 20 (E82ZBBXC)
Installation in control cabinet	no
Type of protection	IP 20
Detailed description	( 7.2-1)

Parameter setting via PC

You need the parameter setting / operating software »Global Drive Control« (GDC) or »Global Drive Control easy« (GDC easy) and an interface for communication:

- ▶ Interface for system bus (CAN) (preset in GDC):
 - PC system bus adapter
- ▶ Serial interface for LECOM:
 - Communication module LECOM-A/B (RS232/RS485)
EMF2102IB-V001

The parameter setting /operating software of the Global Drive Control family are easy-to-understand and tools for the operation, parameter setting and diagnostics or Lenze drive controllers.

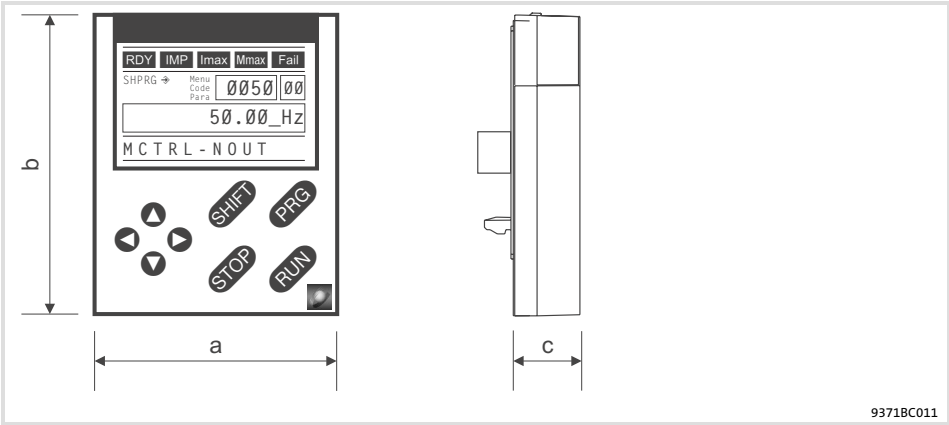
	GDC easy ESP-GDC2-E	GDC ESP-GDC2
Supply	Free download from the internet at www.lenze.com	Program package must be charged for
Operation in interactive mode	yes	yes
Comprehensive help functions	yes	yes
Menu "Short setup"	yes	yes
Monitor windows for displaying operating parameters and for diagnostic purposes	yes	yes
Saving and printing of parameter settings as code list	yes	yes
Loading of parameter files from the controller to the PC	yes	yes
Storing of parameter files from the PC in the controller	yes	yes
Function block editor	no	yes
Technology functions for 9300 Servo	no	yes
Oscilloscope function for 9300 Servo and 9300 vector	no	yes
Detailed description	Online help of the program	Online help of the program

Parameter setting via bus system

Detailed information can be found in the documentation of the corresponding bus system.

7.2
Parameter setting with the XT EMZ9371BC keypad

7.2.1
General data and operating conditions



Feature		Values
Dimensions		
Width	a	60 mm
Height	b	73.5 mm
Depth	c	15 mm
Environmental conditions		
Climate		
Storage	IEC/EN 60721-3-1	1K3 (-25 ... +60 °C)
Transport	IEC/EN 60721-3-2	2K3 (-25 ... +70 °C)
Operation	IEC/EN 60721-3-3	3K3 (-10 ... +60 °C)
Enclosure		IP 20

7.2.2 Installation and commissioning

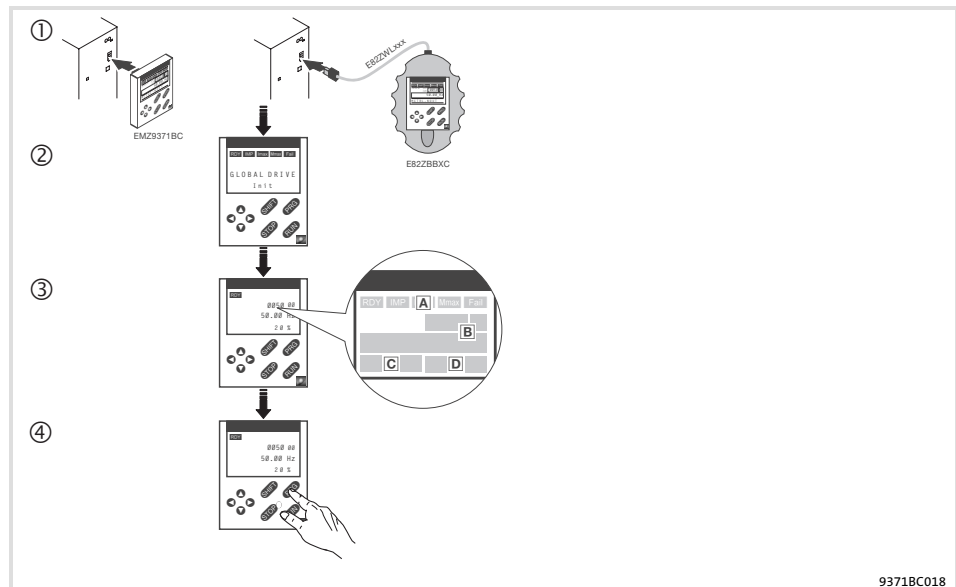


Fig. 7.2-1 Installation and commissioning of XT EMZ9371BC keypad or E82ZBBXC diagnosis terminal

- ① Connect keypad to the AIF interface on the front of the standard device. The keypad can be connected/disconnected during operation.
- ② As soon as the keypad is supplied with voltage, it carries out a short self-test.
- ③ The operation level indicates when the keypad is ready for operation:
 - A Current state of the standard device
 - B Memory location 1 of the user menu (C0517): Code number, subcode number, and current value
 - C Active fault message or additional status message
 - D Actual value in % of the status display defined in C0004
- ④ **PRG** must be pressed to leave the operation level

7.2.3 Display elements and function keys

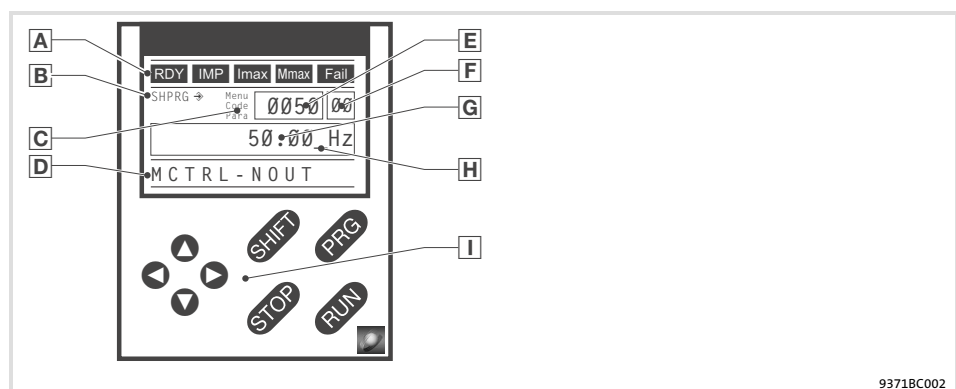


Fig. 7.2-2 Display elements and function keys of the XT EMZ9371BC keypad

Displays

A Status displays of standard device		
Display	Meaning	Explanation
RDY	Ready for operation	
IMP	Pulse inhibit is active	Power outputs are inhibited
Imax	The set current limit is exceeded in motor or generator mode	

	Menu	Speed controller 1 in the limitation	Drive is torque-controlled (Only active for operation with standard devices of the 9300 series)
	Fault	Active fault	
B	Acceptance of the parameters		
	Display	Meaning	Explanation
	→	Parameter is accepted immediately	Standard device operates immediately with the new parameter value
	SHPRG →	Parameter must be acknowledged with SHIFT PRG	Standard device operates with the new parameter value after being acknowledged
	SHPRG	Parameter must be acknowledged in case of controller inhibit SHIFT PRG	Standard device operates with the new parameter value after the controller is enabled again
	None	Display parameter	Change is not possible
C	Active level		
	Display	Meaning	Explanation
	Menu	Menu level is active	Select main menu and submenus
	Code	Code level is active	Select codes and subcodes
	Para	Parameter level is active	Change parameters in the codes or subcodes
	None	Operating level is active	Display operating parameters
D	Short text		
	Display	Meaning	Explanation
	alphanumeric	Contents of the menus, meaning of the codes and parameters	
		In the operating level display of C0004 in % and the active fault	
E	Number		
	Active level	Meaning	Explanation
	Menu level	Menu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
	Code level	Four-digit code number	
F	Number		
	Active level	Meaning	Explanation
	Menu level	Submenu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
	Code level	Two-digit subcode number	
G	Parameter value		
		Parameter value with unit	
H	Cursor		
		In the parameter level, the digit above the cursor can be directly changed	
I	Function keys		
		For description see the following table	

Parameter setting

Parameter setting with the XT EMZ9371BC keypad

Changing and saving parameters

Function keys



Note!

Shortcuts with **SHIFT**:

Press and hold **SHIFT**, then press the second key in addition.

Key	Function			
	Menu level	Code level	Parameter level	Operating level
PRG		Change to the parameter level	Change to the operating level	Change to the code level
SHIFT PRG	Go to the "Short setup" menu and load predefined configurations ¹⁾		Accept parameters when SHPRG → or SHPRG is displayed	
↶ ↷	Change between menu items	Change of code number	Change of digit via cursor	
SHIFT ↶ SHIFT ↷	Quick change between menu items	Quick change of code number	Quick change of digit via cursor	
→ ←	Change between main menu, submenu and code level		Cursor to the right Cursor to the left	
RUN	Deactivate the function of the key STOP , the LED in the key goes off			
STOP	Inhibit the controller, the LED in the key is lit.			
	Reset fault (TRIP-Reset):	1. Remove the cause of malfunction 2. Press STOP 3. Press RUN		

¹⁾ Only active for operation with standard devices of the 8200 vector or 8200 motec series

7.2.4

Changing and saving parameters



Note!

Your settings have an effect on the current parameters in the main memory. You must save your settings in a parameter set so that they are not lost when the mains are connected.

If you only need one parameter set, save your settings as parameter set 1, since parameter set 1 is loaded automatically after mains connection.

Step	Key sequence	Action
1. Select the menu	↶ ↷ ↶ ↷	Use the arrow keys to select the desired menu
2. Change to the code level	→	Display of the first code in the menu
3. Select code or subcode	↶ ↷	Display of the current parameter value
4. Change to the parameter level	PRG	
5. When SHPRG is displayed, inhibit the controller	STOP ¹⁾	The drive coasts
6. Change parameter		
	A ↶ ↷	Move cursor below the digit to be changed
	B ↶ ↷	Change of digit

Step		Key sequence	Action
		 	Quick change of digit
7.	Accept the changed parameter		
	Display of SHPRG or SHPRG ⇨	 	Confirm change to accept the parameter Display "OK"
	Display ⇨	-	The parameter has been accepted immediately
8.	Enable the controller, if required	 1)	The drive runs again
9.	Change to the code level		
	A		Display of the operating level
	B		Display of the code with changed parameter
10.	Change further parameters		Restart the "loop" with step 1. or 3.
11.	Save changed parameters		
	A	   	Select the code C0003 "PAR SAVE" in the menu "Load/Store"
	B		Change to the parameter level Display "0" and "READY"
	Select the parameter set in which the parameters are to be saved permanently C		Save as parameter set 1: ⇒ Set "1" "Save PS1"
			Save as parameter set 2: ⇒ Set "2" "Save PS2"
			Save as parameter set 3: ⇒ Set "3" "Save PS3"
			Save as parameter set 4: ⇒ Set "4" "Save PS4"
	D	 	When "OK" is displayed, the settings are permanently saved in the selected parameter set.
12.	Change to the code level		
	A		Display of the operating level
	B		Display of C0003 "PAR SAVE"
13.	Set parameters for another parameter set		Restart the "loop" with step 1. or 3.

- 1) The function of the  key can be programmed:
C0469 = 1: Controller inhibit
C0469 = 2: Quick stop (Lenze setting)

7.2.5 Loading a parameter set

The keypad serves to load a saved parameter set into the main memory when the controller is inhibited. After the controller is enabled, it operates with the new parameters.



Danger!

- ▶ When a new parameter set is loaded, the controller is reinitialised and acts as if it had been connected to the mains:
 - System configurations and terminal assignments can be changed. Make sure that your wiring and drive configuration comply with the settings of the parameter set.
- ▶ Only use terminal X5/28 as source for the controller inhibit! Otherwise the drive may start in an uncontrolled way when switching over to another parameter set.



Note!

- ▶ After switching on the supply voltage, the controller always loads parameter set 1 into the main memory.
- ▶ It is also possible to load other parameter sets into the main memory via the digital inputs or bus commands.

Step		Key sequence	Action
1.	Inhibit controller		Terminal X5/28 = LOW
2.	Load the saved parameter set into the main memory		
	A	▲ ▼ ◀ ▶	Select the code C0002 "PAR LOAD" in the menu "Load/Store"
	B	PRG	Change to the parameter level The active parameter set is displayed, e. g. display "0" and "Load Default" If you want to restore the delivery status, proceed with D
	Select the parameter set to be loaded	C	▲
			Load parameter set 1: ⇒ Set "1" "Load PS1"
			Load parameter set 2: ⇒ Set "2" "Load PS2"
			Load parameter set 3: ⇒ Set "3" "Load PS3"
			Load parameter set 4: ⇒ Set "4" "Load PS4"
	D	SHIFT PRG	"RDY" goes off. The parameter set is loaded completely into the main memory if "RDY" is displayed again.
3.	Change to the code level		
	A	PRG	Display of the operating level
	B	PRG	Display of C0002 "PAR LOAD"
4.	Enable controller		Terminal X5/28 = HIGH The drive is running with the settings of the loaded parameter set

7.2.6 Transferring parameters to other standard devices

Parameter settings can be easily copied from one standard device to another by using the keypad.

For this purpose use the "Load/Store" menu



Danger!

During the parameter transfer from the keypad to the standard device the control terminals can adopt undefined states! Therefore the plugs X5 and X6 must be disconnected from the standard device before the transfer takes place. This ensures that the controller is inhibited and all control terminals have the defined state "LOW".

Copying parameter sets from the standard device into the keypad



Note!

After copying the parameter sets into the XT keypad (C0003 = 11), always the parameter set that was loaded last via C0002 is activated.

Like this the current parameters also remain active after copying:

- Save the current parameters in the parameter set before copying and load this parameter set in the controller via C0002.

Step	Key sequence	Action
1. Connect the keypad to standard device 1		
2. Inhibit controller		Terminal X5/28 = LOW The drive coasts.
3. Select C0003 in the "Load/Store" menu	◀ ▶ ◀ ▶	Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys.
4. Change to the parameter level	PRG	Display "0" and "READY"
5. Copy all parameter set into the keypad		The settings saved in the keypad are overwritten.
	▲	Set "11" "Save extern"
6. Start copying	SHIFT PRG	The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off after approx. one minute, all parameter sets were copied into the keypad. The "RDY" status display is lit.
7. Change to the code level	A PRG	Display of the operating level
	B PRG	Display C0003 and "PAR SAVE"
8. Enable controller		Terminal X5/28 = HIGH
9. Remove keypad from standard device 1		

Copying parameter sets from keypad into the standard device

Step	Key sequence	Action
1.	Connect the keypad to standard device 2	
2.	Inhibit controller	Terminal X5/28 = LOW The "IMP" status display is lit. The drive coasts
3.	Pull the plugs X5 and X6	All control terminals have the defined "LOW" status.
4.	Select C0002 in the "Load/Store" menu	▲ ▼ ◀ ▶ Select code C0002 "PAR LOAD" in the "Load/Store" menu using the arrow keys.
5.	Change to the parameter level	PRG The active parameter set is shown, e. g. display "0" and "Load Default"
6.	Select the correct copy function	The settings saved in the standard device are overwritten.
	Copy all parameter sets available into the EEPROM of the standard device and save them permanently.	- The parameter set that was active before copying is overwritten. - The parameters are not yet active after copying. Select parameter set and load it in the main memory. 7.2-6
	▲	Set "20" "ext" -> EEPROM
	Copy individual parameter sets into the main memory of the standard device.	
	▲	Copy parameter set 1 into the main memory: Set ⇔ "11" "Load ext PS1"
		Copy parameter set 2 into the main memory: Set ⇔ "12" "Load ext PS2"
		Copy parameter set 3 into the main memory: Set ⇔ "13" "Load ext PS3"
		Copy parameter set 4 into the main memory: Set ⇔ "14" "Load ext PS4"
7.	Start copying	SHIFT PRG The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off, the parameter sets selected were copied into the standard device. The "RDY" status display is lit.
8.	Change to the code level	
	A PRG	Display of the operating level
	B PRG	Display C0002 and "PAR LOAD"
9.	- If the function "Copy all parameter sets into the EEPROM" (C0002 = 20) is selected, they might have to be loaded in the main memory manually. - If the function "Copy individual parameter sets into the main memory" (C0002 = 1x) is selected, they might have to be saved permanently in the EEPROM manually.	▲ ▼ ◀ ▶ Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys and store the contents of the main memory permanently.
10.	Plug in plugs X5 and X6	
11.	Enable controller	Terminal X5/28 = HIGH The drive is running with the new settings.

7.2.7 Activating password protection



Note!

- If the password protection is activated (C0094 = 1 ... 9999), you only have free access to the user menu.
- To access the other menus, you must enter the password. By this, the password protection is annulled until you enter a new password.
- Please observe that the password-protected parameters can be overwritten as well when transferring the parameter sets to other standard devices. The password is not transferred.
- Do not forget your password! If you have forgotten your password, it can only be reset via a PC or a bus system!

Activate password protection

Step	Key sequence	Action
1. Select the "USER menu"	▲ ▼ ◀ ▶	Change to the user menu using the arrow keys
2. Change to the code level	▶	Display of code C0051 "MCTRL-NACT"
3. Select C0094	▲	Display of code C0094 "Password"
4. Change to the parameter level	PRG	Display "0" = no password protection
5. Set password		
	A ▲	Select password (1 ... 9999)
	B SHIFT PRG	Confirm password
6. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"
7. Change to the "USER menu"	◀ ▶ ▲ ▼	

The password protection is active now.

You can only quit the user menu if you re-enter the password and confirm it with SHIFT PRG.

Remove password protection

Step	Key sequence	Action
1. Change to the code level in the user menu	▶	
2. Select C0094	▲	Display of code C0094 "Password"
3. Change to the parameter level	PRG	Display "9999" = password protection is active
4. Enter password		
	A ▼	Set valid password
	B SHIFT PRG	Confirm The password protection is deactivated by entering the password once again.
5. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"

The password protection is deactivated now. All menus can be freely accessed again.

7.2.8

Diagnostics

In the "Diagnostic" menu the two submenus "Actual info" and "History" contain all codes for

- monitoring the drive
- fault/error diagnosis

In the operating level, more status messages are displayed. If several status messages are active, the message with the highest priority is displayed.

Priority	Display	Meaning
1	GLOBAL DRIVE INIT	Initialisation or communication error between keypad and controller
2	XXX - TRIP	Active TRIP (contents of C0168/1)
3	XXX - MESSAGE	Active message (contents of C0168/1)
4	Special device states:	
		Switch-on inhibit
5	Source for controller inhibit (the value of C0004 is displayed simultaneously):	
	STP1	9300 servo: Terminal X5/28 ECSxS/P/M/A: Terminal X6/SI1
	STP3	Operating module or LECOM A/B/LI
	STP4	INTERBUS or PROFIBUS-DP
	STP5	9300 servo, System bus (CAN) ECSxA/E: ECSxS/P/M: MotionBus (CAN)
	STP6	C0040
6	Source for quick stop (QSP):	
	QSP-term-Ext	The MCTRL-QSP input of the MCTRL function block is on HIGH signal.
	QSP-C0135	Operating module or LECOM A/B/LI
	QSP-AIF	INTERBUS or PROFIBUS-DP
	QSP-CAN	9300 servo, System bus (CAN) ECSxA: ECSxS/P/M: MotionBus (CAN)
7	XXX - WARNING	Active warning (contents of C0168/1)
8	xxxx	Value below C0004

7.2.9 Menu structure

For simple, user-friendly operation, the codes are clearly arranged in function-related menus:

Main menu	Submenus	Description
Display	Display	
User-Menu		Codes defined in C0517
Code list		All available codes
	ALL	All available codes listed in ascending order (C0001 ... C7999)
	PS 1	Codes in parameter set 1 (C0001 ... C1999)
	PS 2	Codes in parameter set 2 (C2001 ... C3999)
	PS 3	Codes in parameter set 3 (C4001 ... C5999)
	PS 4	Codes in parameter set 4 (C6001 ... C7999)
Load/Store		Parameter set management Parameter set transfer, restore delivery status
Diagnostic		Diagnostic
	Actual info	Display codes to monitor the drive
	History	Fault analysis with history buffer
Short setup		Quick configuration of predefined applications Configuration of the user menu The predefined applications depend on the type of the standard device (frequency inverter, servo inverter, position controller, ...)
Main FB		Configuration of the main function blocks
	NSET	Setpoint processing
	NSET-JOG	Fixed setpoints
	NSET-RAMP1	Ramp function generator
	MCTRL	Motor control
	DFSET	Digital frequency processing
	DCTRL	Internal control
Terminal I/O		Connection of inputs and outputs with internal signals
	AIN1 X6.1/2	Analog input 1
	AIN2 X6.3/4	Analog input 2
	AOUT1 X6.62	Analog output 1
	AOUT2 X6.63	Analog output 2
	DIGIN	Digital inputs
	DIGOUT	Digital outputs
	DFIN	Digital frequency input
	DFOUT	Digital frequency output
	State bus	State bus (not with 9300 frequency inverter)
Controller		Configuration of internal control parameters
	Speed	Speed controller
	Current	Current controller or torque controller
	Phase	Phase controller (not with 9300 frequency inverter)
Motor/Feedb.		Input of motor data, configuration of speed feedback
	Motor adj	Motor data
	Feedback	Configuration of feedback systems
Monitoring		Configuration of monitoring functions

Parameter setting

Parameter setting with the XT EMZ9371BC keypad

Menu structure

Main menu	Submenus	Description
Display	Display	
LECOM/AIF		Configuration of operation with communication modules
	LECOM A/B	Serial interface
	AIF interface	Process data
	Status word	Display of status words
System bus		Configuration of system bus (CAN)
	Management	CAN communication parameters
	CAN-IN1	CAN object 1
	CAN-OUT1	
	CAN-IN2	CAN object 2
	CAN-OUT2	
	CAN-IN3	CAN object 3
	CAN-OUT3	
	Status word	Display of status words
	FDO	Free digital outputs
	Diagnostic	CAN diagnostic
FB config		Configuration of function blocks
Func blocks		Parameterisation of function blocks The submenus contain all available function blocks
FCODE		Configuration of free codes
Identify		Identification
	Drive	Software version of standard device
	Op Keypad	Software version of keypad

8 Configuration

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8.1 Important notes

The "Configuration" chapter consists of two parts.

System Manual

The "Configuration" chapter in the System Manual contains the following:

- ▶ Monitoring
- ▶ Monitoring functions
- ▶ Description of the following function blocks:
 - Diameter calculator (DCALC)
 - Digital frequency input (DFIN)
 - Digital frequency output (DFOUT)
 - Digital frequency ramp function generator (DFRFG)
 - Digital frequency processing (DFSET)
 - Internal motor control with V/f characteristic control (MCTRL1)
 - Internal motor control with vector control (MCTRL2)
- ▶ Code table
- ▶ Selection lists
- ▶ Table of attributes

System Manual (extension)

The "Configuration" chapter in the System Manual (extension) contains the following:

- ▶ Notes on the configuration with Global Drive Control
- ▶ Description of the basic configuration
- ▶ Use of function blocks
- ▶ Description of the other function blocks for the 9300 vector frequency inverter

8.2 Function blocks

8.2.1 Diameter calculator (DCALC)

Description

The function block calculates the current reel diameter in winding drives.

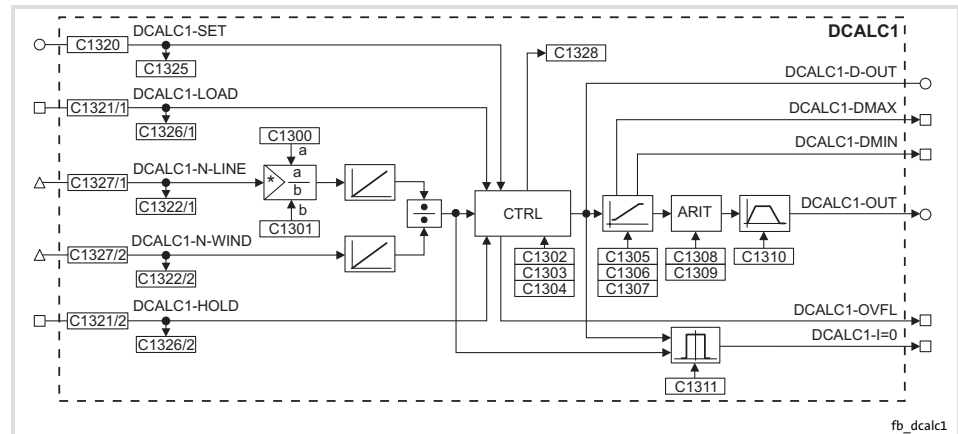


Fig. 8.2-1 Diameter calculator (DCALC1)

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C1300 STOP	N-motor/ Dmax	300	-32767	{1 rpm}	32767	Motor speed at D_{max} , function block DCALC1 • Nominal speed of the winding drive	8.2-1
C1301 STOP	N-line max	3000	1	{1 rpm}	32767	Maximum line speed, function block DCALC1 • Nominal speed of the line drive	
C1302	calc cycle	0.1	0.1	{0.1 rev}	100.0	Calculation cycle, function block DCALC1	8.2-1
C1303	time const	0.10	0.01	{0.01 s}	50.00	Filter time constant, function block DCALC1	
C1304 STOP	Dmax	500	1	{1 mm}	10000	Maximum diameter, function block DCALC1 • Nominal winding diameter	8.2-1
C1305	lower D-limit	50	1	{1 mm}	10000	Lower diameter limit, function block DCALC1 • Minimum winding diameter	
C1306	upper D-limit	500	1	{1 mm}	10000	Upper diameter limit, function block DCALC1 • Maximum winding diameter	8.2-1
C1307	hyst D-limit	1.00	0.00	{0.01 %}	100.0	Hysteresis - diameter limitation, function block DCALC1 • Hysteresis for D_{min}/D_{max} output	
C1308 STOP	arit function	1	0	DCALC1-OUT=D	DCALC1-OUT = diameter	Selection of the arithmetic function, function block DCALC1	8.2-1
			1	DCALC1-OUT=1/D	DCALC1-OUT = 1/diameter		

8 Configuration

8.2 Function blocks

8.2.1 Diameter calculator (DCALC)

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C1309 	Dmin	50	1	{1 mm}	10000	Minimum diameter, function block DCALC1	8.2-1
C1310	DCALC1-Titime	0.000	0.000	{0.001 s}	999.900	Acceleration and deceleration time, function block DCALC1	
C1311	window D-calc	1.00	0.00	{0.01 %}	100.00	Window - diameter calculation, function block DCALC1 • Window setting for permissible diameter deviation	
C1320 	CFG: SET	1000	FIXED0% Selection list 1			Configuration of analog input signal, function block DCALC1 • The signal is scaled to the value in C1304 (100 % $\triangle$ C1304)	8.2-1
C1321 			Selection list 2			Configuration of digital input signals, function block DCALC1	
1	CFG: LOAD	1000	FIXED0			• HIGH: initial value at DCALC1-SET is accepted • DCALC1-LOAD has a higher priority than DCALC1-HOLD	
2	CFG: HOLD	1000	FIXED0			• HIGH = holds the diameter value reached and resets the integrators.	
C1322			-36000	{1 rpm}	36000	Function block DCALC1 • Display of the signals linked in C1327	8.2-1
1	DIS: N-Line						
2	DIS: N-WIND						
C1325	DIS: SET		-199,99	{0.01 %}	199,99	Function block DCALC1 • Display of the signal linked in C1320	
C1326			0		1	Function block DCALC1 • Display of the signals linked in C1321	
1	DIS: LOAD						
2	DIS: HOLD						
C1327 			Selection list 3			Configuration of input signals, function block DCALC1	8.2-1
1	CFG: N-Line	1000	FIXED0INC			• Speed signal of the line drive	
2	CFG: N-WIND	1000	FIXED0INC			• Speed signal of the winding drive	
C1328	DIS: D-ACT		-200	{1 mm}	200	Function block DCALC1 • Display of the current diameter	

Setting the initial value

The signal at DCALC1-Set is set as initial value.

- With DCALC1-LOAD = 1 the initial value is accepted.
- The initial value is accepted unfiltered.

Calculating the diameter

By division of the speed signals at DCALC1-N-LINE and DCALC1-N-WIND, the current diameter is calculated.

- ▶ The signal at DCALC1-N-LINE has to correspond to the circumferential speed of the reel.
- ▶ The signal at DCALC1-N-WIND has to be proportional to the reel speed.
- ▶ You have to adapt the signal at DCALC1-N-LINE in C1300 and C1301, so that the value calculated corresponds to the actual diameter. The nominal reel diameter $d_{\max}$ is entered in C1304.
 - For operation with the nominal reel diameter $d_{\max}$ you have to enter the value at input DCALC1-N-WIND in C1300 and the value at input DCALC1-N-LINE in C1301.
- ▶ The input signals are integrated cyclically. In C1302 you alter the integration interval (calculation cycle):
 - Great value in C1302 $\Rightarrow$ high resolution
 - Low value in C1302 $\Rightarrow$ low resolution
- ▶ If the integrator overflows, DCALC1-OVFL is set to HIGH. The integrator is reset internally and starts again with the calculation of the last correct value.
- ▶ A first-order low pass filters the values calculated. The filter time constant is set via C1303.

Displaying the diameter

In C1328 the current diameter is displayed.

- ▶ For the conversion of the scaled calculated value to the absolute value [mm], the reference diameter $d_{\max}$ has to be entered via C1304.
- ▶ At DCALC1-D-OUT the current diameter is output. The signal is scaled to the value in C1304.

Maintaining/saving the current value

With DCALC1-HOLD = HIGH the last diameter value calculated is maintained and the integrators are reset.

- ▶ When the controller is switched off, the current diameter value is saved. When it is switched on, the last value saved is loaded.

Setting/displaying the diameter

In C1305 the minimum diameter ($d_{\min}$) in [mm] is entered. $d_{\min}$ is reached when DCALC1-DMIN switches to HIGH.

In C1306 the maximum diameter ($d_{\max}$) in [mm] is entered. $d_{\max}$ is reached when DCALC1-DMAX switches to HIGH.

In C1307 a hysteresis for resetting the display signal is set. The entry in [%] relates to the absolute values in C1305 and C1306.

Converting the diameter (d) to 1/d

In configurations with a speed forward control it is common to multiply the precontrol signal with the reciprocal value of the diameter (d). This value is output at DCALC1-OUT.

► C1308 = 0: DCALC1-OUT = d

► C1308 = 1: DCALC1-OUT = 1/d

For the conversion to 1/d the reference value for the diameter has to be defined in C1309, for which the signal at DCALC1-OUT is to be 100 %.

► Normally C1309 corresponds to the minimum diameter in C1305 ($d_{\min}$).

In order to ensure a continuous transition when setting new diameter values, a ramp function generator is activated if C1310 > 0 s.

Web break monitoring

A window comparator compares the corresponding newly calculated value to the value last filtered.

► In C1311 the maximum difference in [%] between the two values is defined.

► DCALC1-l=0 is set to LOW if the maximum difference is exceeded.

Formulas for calculation**Current diameter (C1328)**

$$C1328 \text{ [mm]} = \frac{DCALC1-N-LINE \text{ [inc]}}{DCALC1-N-WIND \text{ [inc]}} \cdot \frac{C1300 \text{ [rpm]}}{C1301 \text{ [rpm]}} \cdot C1304 \text{ [mm]}$$

Output signal at DCALC1-OUT

For C1308 = 0 (DCALC1-OUT = d):

$$DCALC1-OUT \text{ [%]} = \frac{C1328 \text{ [mm]}}{C1304 \text{ [mm]}} \cdot 100 \text{ %}$$

For C1308 = 1 (DCALC1-OUT = 1/d):

$$DCALC1-OUT \text{ [%]} = \frac{C1304 \text{ [mm]}}{C1328 \text{ [mm]}} \cdot \frac{C1309 \text{ [mm]}}{C1304 \text{ [mm]}} \cdot 100 \text{ %}$$

**Note!**

The value at DCALC1-OUT is limited by the maximum reel diameter (C1306) and the minimum reel diameter (C1305).

8.2.2 Master frequency input (DFIN)

Description

The function block calculates a speed signal from the rectangular signals at X9. TTL signals and HTL signals can be connected. The zero track can be selected as an option.

The edge changes are detected every 1 ms and result directly in the output value.

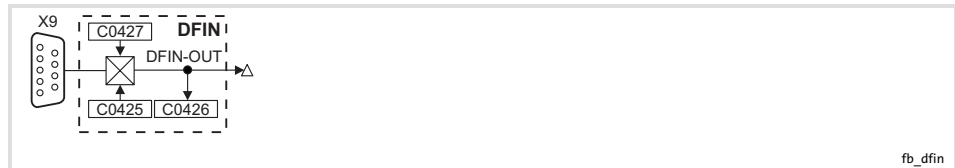


Fig. 8.2-2 Digital frequency input (DFIN)

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0425	DFIN const	3	0 256 inc/rev	Constant of the master frequency input, function block DFIN Output signal at the connected encoder or at the upstream controller in the event of a master frequency cascade/master frequency bus 8.2-5
			1 512 inc/rev	
			2 1024 inc/rev	
			3 2048 inc/rev	
			4 4096 inc/rev	
			5 8192 inc/rev	
			6 16384 inc/rev	
C0426	DIS: OUT		-36000 {1 rpm} 36000	Output signal of the master frequency input, function block DFIN Display only
C0427	DFIN function	0		Function of the master frequency input, function block DFIN
			0 2-phase	Phase-displaced signal sequence
			1 A pulse/B dir	Control of direction of rotation via track B
			2 Pulse A or B	Control of speed and direction of rotation via track A or track B

Evaluating input signals

In C0427 the different modes for the evaluation of the input signals can be selected.

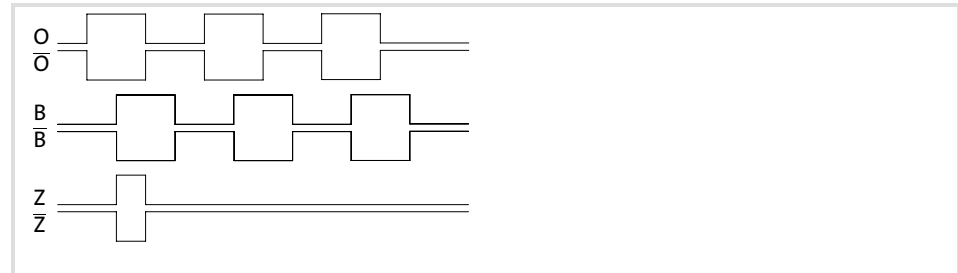
C0427 = 0 (phase-displaced signal sequence)

Fig. 8.2-3 Phase-displaced signal sequence (CW rotation)

Clockwise rotation Track A leads track B by 90 ° (positive value at DFIN-OUT)

Counter-clockwise rotation Track A lags track B by 90 ° (negative value at DFIN-OUT)

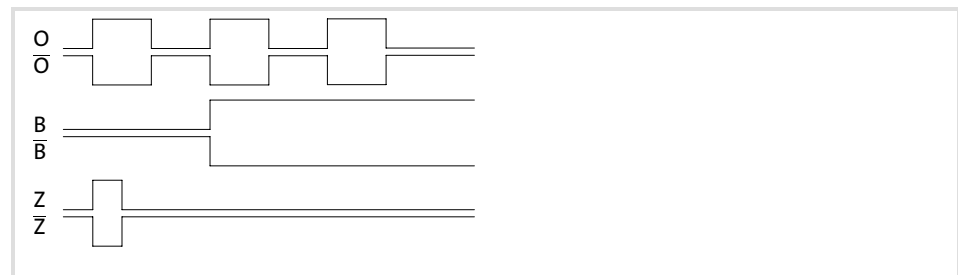
C0427 = 1 (control of the direction of rotation via track B)

Fig. 8.2-4 Control of direction of rotation via track B

Clockwise rotation Track A transmits the speed
Track B = LOW (positive value at DFIN-OUT)

Counter-clockwise rotation Track A transmits the speed
Track B = HIGH (negative value at DFIN-OUT)

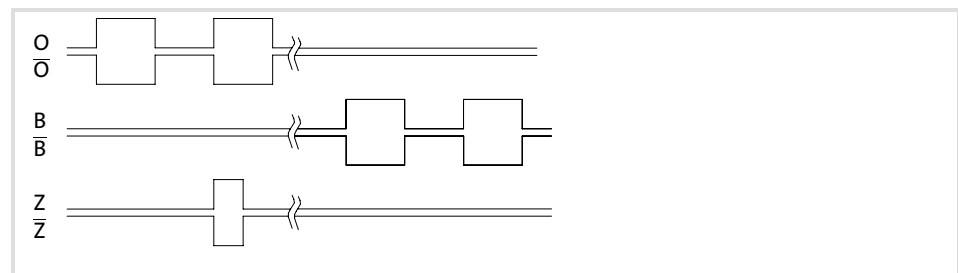
C0427 = 2 (control of speed and direction of rotation via track A or track B)

Fig. 8.2-5 Control of speed and direction of rotation via track A or track B

Clockwise rotation Track A transmits the speed and direction of rotation (positive value at DFIN-OUT)
Track B = LOW

Counter-clockwise rotation Track B transmits the speed and direction of rotation (negative value at DFIN-OUT)
Track A = LOW

Adjusting the output signal

In C0425 the output signal can be adapted:

- To the encoder at X9 or
- To the upstream controller with master frequency cascade/master frequency bus.

Transfer function

Calculating the output signal:

$$\text{DFIN-OUT [rpm]} = f [\text{Hz}] \cdot \frac{60}{C0425}$$

Example:

The input frequency amounts to 200 kHz, the number of increments corresponds to 2048 inc/rev. (C0425 = 3).

$$\text{DFIN-OUT [rpm]} = 200000 \text{ Hz} \cdot \frac{60}{2048} = 5859 \text{ rpm}$$

Signal adaptation

Signal adaptations other than by squaring in C0425 can be achieved by connecting a function block.

Example:

The function block CONV3 shall convert the speed signal into a quasi analog signal.

Calculating the output signal at CONV3:

$$\text{CONV3-OUT [\%]} = f [\text{Hz}] \cdot \frac{0.4}{C0425} \cdot \frac{C0950}{C0951}$$

Interconnecting function blocks:

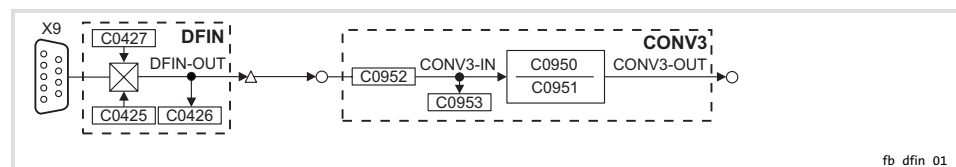


Fig. 8.2-6 Digital frequency input (DFIN) with connected converter



Note!

If a master frequency is output to DFOUT-AN-IN or DFOUT-DF (C0540 = 0 or C0540 = 1) **and** an incremental encoder is evaluated via X8, the function block DFIN cannot be used anymore.

If the input signals at X8 or X9 are output to X10, (C0540 = 4 or C0540 = 5), this restriction does not exist.

8.2.3 Master frequency output (DFOUT)

Description

The function block creates rectangular signals from an analog signal or speed signal, which are output via X10. Alternatively, you can set the master frequency output to a signal output at X8 or X9.

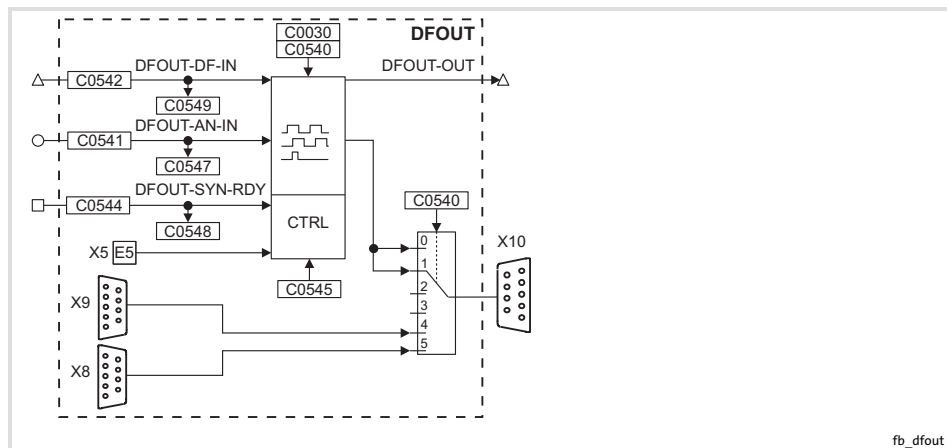


Fig. 8.2-7 Digital frequency output (DFOUT)

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0030	DFOUT const	3	0	256 inc/rev	Function block DFOUT • Setting of the constant (increments per revolution) for the master frequency output X10 8.2-8
			1	512 inc/rev	
			2	1024 inc/rev	
			3	2048 inc/rev	
			4	4096 inc/rev	
			5	8192 inc/rev	
			6	16384 inc/rev	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0540 	Function	0		Function selection, function block DFOUT ● Output signal at X10
			0 Analog input Analog input	Signal at DFOUT-AN-IN is output. Zero track can be input externally.
			1 PH diff input Phase difference input	Signal at DFOUT-DF-IN is output. Zero track can be input externally.
			2 Not assigned	
			3 Not assigned	
			4 X10 = X9 X9 is output on X10	The input signals are buffered C0030 is without function
			5 X10 = X8 X8 is output on X10	
C0541 	CFG: AN-IN	5001	MCTRL-NACT  Selection list 1	Configuration of analog input signal, function block DFOUT ● Signal in [%] of C0011
C0542 	CFG: DF-IN	1000	FIXEDPHI-0  Selection list 4	Configuration of input signal, function block DFOUT ● Speed signal
C0544 	CFG: SYN-RDY	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block DFOUT ● DFOUT-SYN-RDY = HIGH: Generating a zero pulse
C0545	PH offset	0	0 {1 inc.} 65535	Phase offset, function block DFOUT ● Displacing the zero pulse generated via DFOUT-SYN-RDY by up to 360 ° ● 1 rev. = 65535 inc (360 °)

Output signals at X10

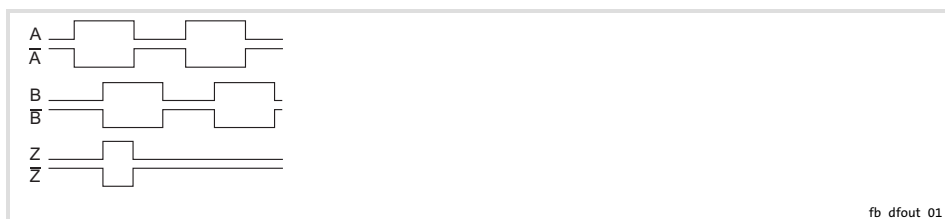


Fig. 8.2-8 Signal sequence for CW rotation (definition)

- The output signals correspond to the simulation of an incremental encoder:
 - Track A and track B and, if required, the zero track and the corresponding inverted tracks are output. The levels are TTL-compatible.
 - Positive input values (CW rotation) result in the represented signal sequence.
 - With negative input values (CCW rotation) track B leads track A by 90 °.
 - The encoder constant of the encoder simulation is set in C0030.
- C0540 serves to define which input signal or signal source shall be active. The zero track is output according to the selected setting.

C0540	Signal at X10
0	DFOUT-AN-IN is output to X10. Zero track can be selected externally.
1	DFOUT-DF-IN is output to X10. Zero track can be selected externally.
2	No function
3	No function
4	The signal at input X9 is electrically amplified and directly output (C0030 is without function)
5	The signal at input X8 is electrically amplified and directly output (C0030 is without function)



Note!

The settings C0540 = 0 and C0540 = 1 are not possible when a connection to the master frequency input X9 (DFIN) was established and an incremental encoder was connected via X8 (C0025 = 100, 110 ... 113).

Output of analog signal as frequency

Setting: C0540 = 0

- The analog signal at the input DFOUT-AN-IN is converted into a frequency and output to X10.
- Frequency calculation:

$$f [\text{Hz}] = \text{DFOUT-AN-IN} [\%] \cdot \frac{\text{C0030}}{100} \cdot \frac{\text{C0011}}{60}$$

Example:

The input signal at DFOUT-AN-IN amounts to 50 %, the number of increments corresponds to 2048 inc/rev. (C0030 = 3) and the maximum speed (C0011) is set to 3000 rpm.

$$f [\text{Hz}] = 50 \% \cdot \frac{2048}{100} \cdot \frac{3000}{60} = 51200 \text{ Hz}$$

Generating an index pulse

An artificial index signal can be generated for the output frequency.

1. Set the input DFOUT-SYN-RDY = HIGH.
 - 360° later, a LOW-HIGH edge generates the index pulse.
 - Then a zero pulse is generated every 360 ° according to C0030.
2. If necessary, shift the zero pulse by up to 360 ° (65536 inc = 360 °) via C0545.

Output of the speed signal as frequency

Setting: C0540 = 1

- The speed signal at the input DFOUT-DF-IN is converted into a frequency and output to X10.
- Frequency calculation:

$$f [\text{Hz}] = \text{DFOUT-DF-IN} [\text{rpm}] \cdot \frac{\text{C0030}}{60}$$

Example:

The input signal at DFOUT-DF-IN amounts to 3000 rpm, the number of increments corresponds to 2048 inc/revolution (C0030 = 3).

$$f [\text{Hz}] = 3000 \text{ rpm} \cdot \frac{2048}{60} = 102400 \text{ Hz}$$

Generating a zero pulse

An artificial zero pulse can be generated for the output frequency.

1. Set the input DFOUT-SYN-RDY = HIGH.
 - 360° later, a LOW-HIGH edge generates the zero pulse.
 - Then a zero pulse is generated every 360 ° according to C0030.
2. If necessary, shift the zero pulse by up to 360 ° (65536 inc = 360 °) via C0545.

Signal at X8 is directly output
at X10

- ▶ The input signals at X8 are amplified electrically and output directly.
- ▶ The signals depend on the assignment of the input X8.
- ▶ The codes C0030, C0545 and the output DFOUT-OUT have no function.
- ▶ The zero track is only output if it is connected to X8.

Signal at X9 is directly output
at X10

- ▶ The input signals at X9 are amplified electrically and output directly.
- ▶ The signals depend on the assignment of the input X9.
- ▶ The codes C0030, C0545 and the output DFOUT-OUT have no function.
- ▶ The zero track is output if it is connected to X9.

8.2.4 Master frequency ramp-function generator (DFRFG)

Description

The function block creates acceleration and deceleration ramps for the operation with master frequency, thus leading the drive to the master frequency with angular synchronism.

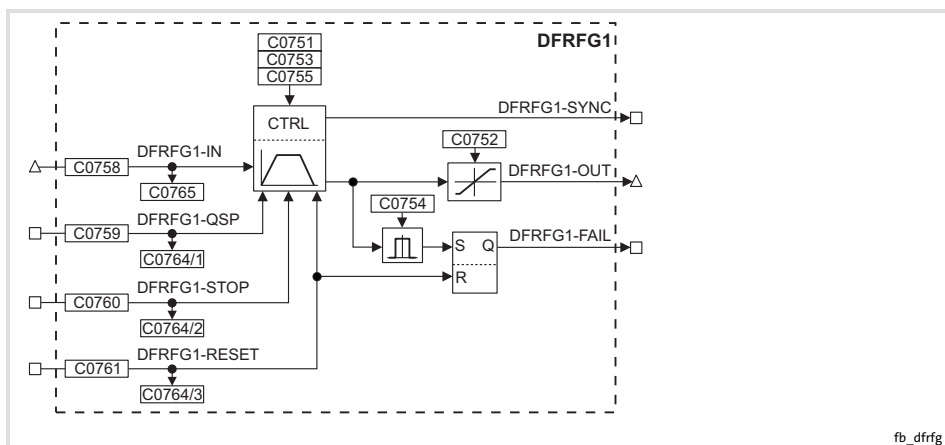


Fig. 8.2-9 Digital frequency ramp function generator (DFRFG1)

Codes for parameter setting

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0751	DFRFG1 Tir	1.000	0.001	{0.001 s}	999.999	Acceleration time T_{ir} , function block DFRFG1
C0752	Max speed	3000	1	{1 rpm}	16000	Maximum speed, function block DFRFG1
C0753	DFRFG1 QSP	0.000	0.000	{0.001 s}	999.900	Deceleration time T_{if} for quick stop, function block DFRFG1
C0754	PH error	$2 \cdot 10^9$	10	{1}	$2 \cdot 10^9$	Following error, function block DFRFG1
C0755	Syn window	100	0	{1 inc.}	65535	Synchronisation window, function block DFRFG1

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0758 STOP	CFG: IN	1000	FIXEDPHI-0	 Selection list 4	Configuration of input signal, function block DFRFG1 - Speed/phase setpoint signal Configuration of digital input signal, function block DFRFG1 - HIGH = quick stop active Configuration of input signal, function block DFRFG1 - HIGH = Status of the profile generator is maintained, setpoint is saved Configuration of input signal, function block DFRFG1 - HIGH = resetting the integrators	 8.2-13	
C0759 STOP	CFG: QSP	1000	FIXED0	 Selection list 2			
C0760 STOP	CFG: STOP	1000	FIXED0	 Selection list 2			
C0761 STOP	CFG: RESET	1000	FIXED0	 Selection list 2			
C0764			0	1			
	1 DIS: QSP				Function block DFRFG1 Display of the signals linked in C0759, C0760 and C0761		
	2 DIS: STOP						
	3 DIS: RESET						
C0765	DIS: IN		-32767	{1 rpm}	32767	Function block DFRFG1 Display of the signal linked in C0758	

Profile generator



Stop!

Do not operate the drive with this function at the torque limitation $M_{\max}$, $I_{\max}$.

The profile generator creates ramps which automatically compensate the resulting phase displacement. If you do not need this compensation, set DFRFG-RESET = HIGH.

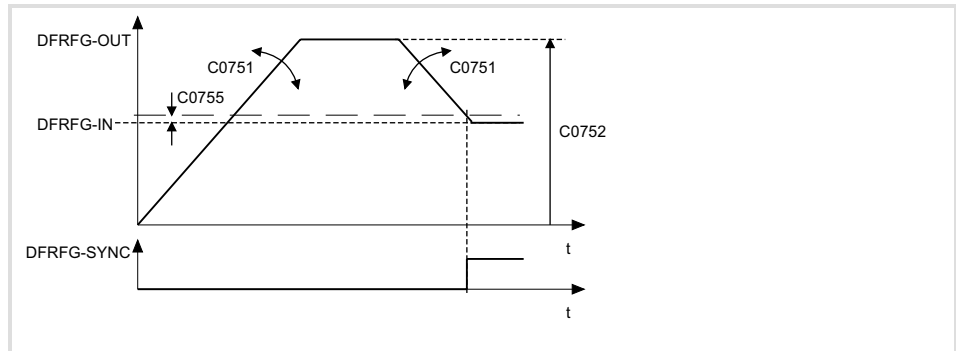


Fig. 8.2-10 Synchronisation on DFRFG

C0751	Setting the deceleration and acceleration time
C0752	Setting the maximum speed
C0755	Setting the switching point

When the actual angle has reached its setpoint and the output signal corresponds to the input signal, the drive runs in synchronism and the output DFRFG1-SYNC is set to HIGH. At the same time the profile generator is switched to the inactive state.

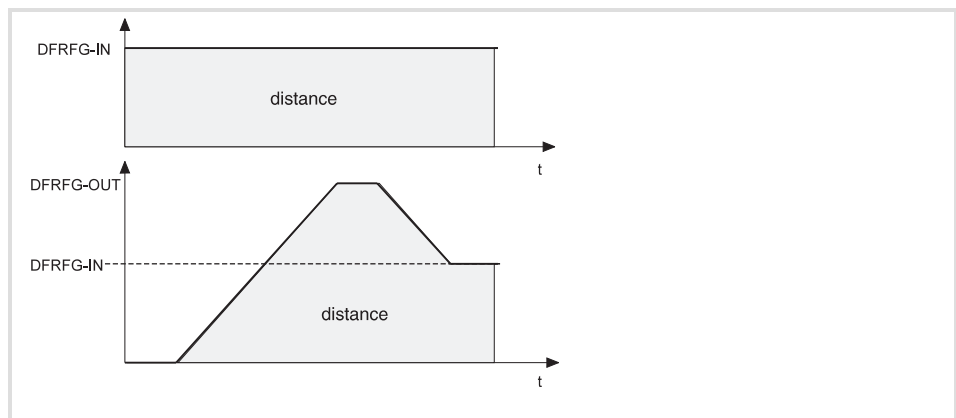


Fig. 8.2-11 Speed-time diagram DFRFG

The number of increments at DFRFG1-IN (master drive) defines the set phase. The set phase can be displayed as a path. The speed-time diagram shows the distance covered (angle) as the area below the speed profile. When synchronisation is reached, master and slave have covered the same distance (phase).

Quick stop (QSP)

Quick stop takes the drive out of the system and brings it to standstill. Setpoints and actual values are continued to be detected.

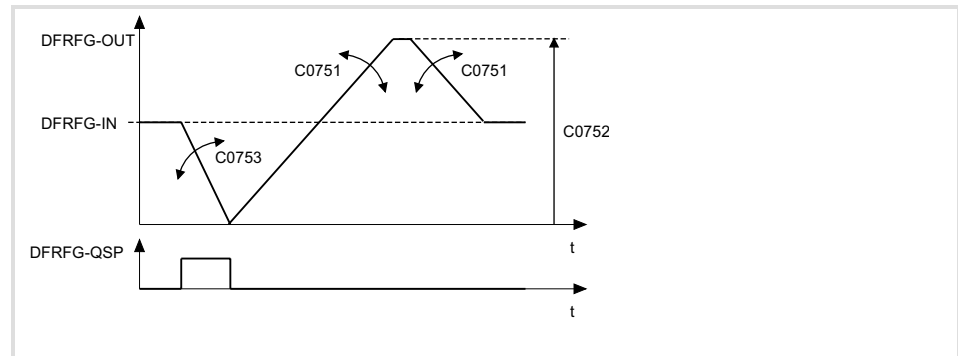


Fig. 8.2-12 Quick stop DFRFG

C0751	Acceleration and deceleration time of the profile generator
C0752	Maximum speed
C0753	Setting the deceleration time T_{if} for QSP

- QSP is activated using DFRFG1-QSP = HIGH.
- With DFRFG1-QSP = LOW, QSP is deactivated. The setpoint is approached via the profile generator.

Ramp function generator stop

The function “ramp-function generator stop” keeps the state of the profile generator during operation. Setpoints and actual values are continued to be detected.

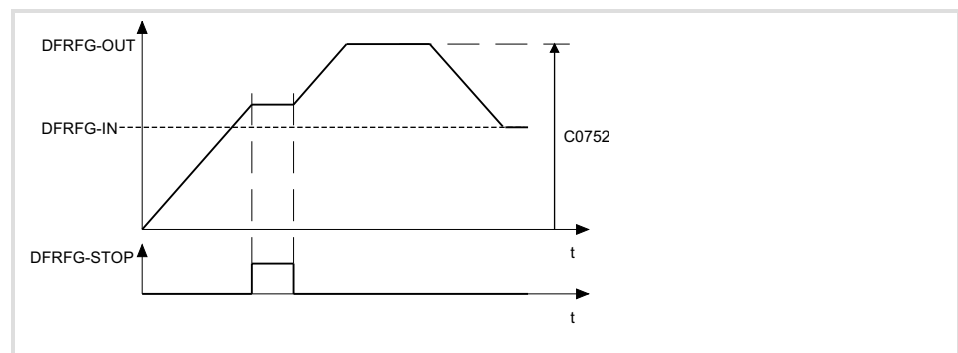


Fig. 8.2-13 Ramp function generator stop

C0752	Maximum speed

- The function “ramp-function generator stop” is activated with DFRFG1-STOP = HIGH.
 - The last status is output at DFRFG1-OUT.
- With DFRFG1-STOP = LOW the function “ramp-function generator stop” is reset. The setpoint is approached via the profile generator.

Reset ramp generator

- With DFRFG1-RESET = HIGH, the profile generator is activated. Internally added-up set phases and actual phases are reset.
- The set phase is detected using a HIGH-LOW signal at DFRFG1-RESET.

Monitoring the phase difference

The profile generator can accept a phase difference between the set phase and the actual phase of up to ± 2140000000 inc (= 32000 revolutions).

- ▶ A limit value can be set for the permissible phase difference via C0754.
- ▶ If the limit value is reached, DFRFG1-FAIL is set to HIGH and the value is saved.
- ▶ DFRFG1-FAIL is only set to LOW with DFRFG1-RESET = HIGH.

8.2.5 Master frequency processing (DFSET)

Description

The function block prepares the master frequency for the controller. You can select values for the stretching and gearbox factor and carry out a speed or phase trimming.

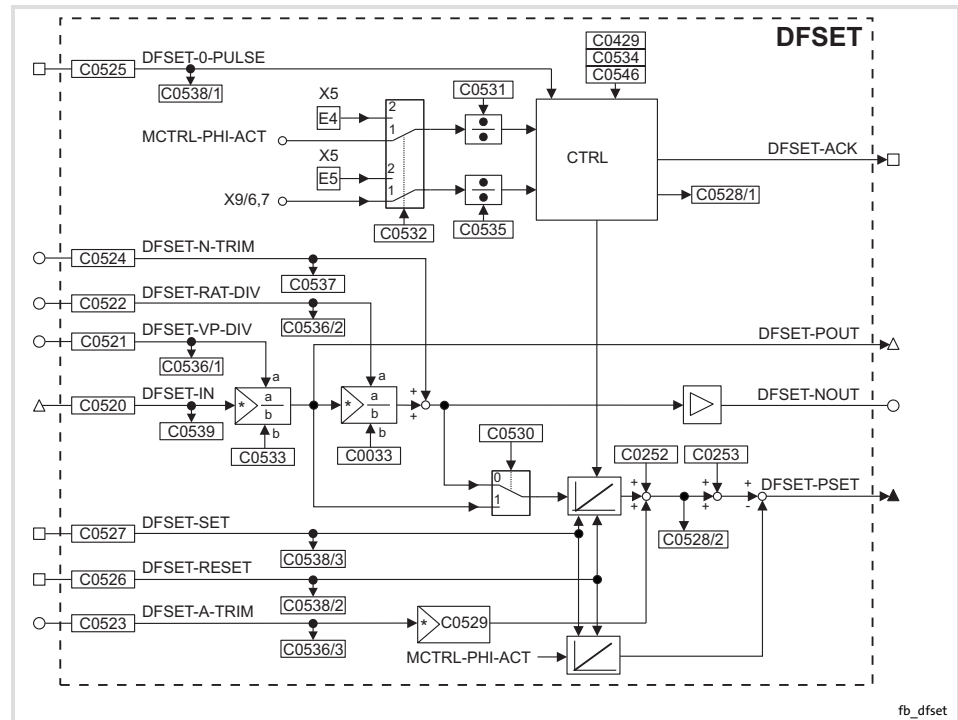


Fig. 8.2-14 Digital frequency processing (DFSET)

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0033	Gearbox denom	1	1 {1}	32767	Gearbox factor - denominator of the function block DFSET	8.2-18
C0252	Angle offset	0	-245760000 {1 inc.}	245760000	Phase offset for master frequency processing, function block DFSET - Fixed phase offset for digital frequency configuration 1 rev. = 65536 inc	8.2-18
C0253	Angle n-trim	→	-32767 {1 inc.}	32767	Speed-dependent phase trimming for the master frequency processing, function block DFSET → depending on C0005, C0025, C0490 - Change of C0005, C0025 or C0490 resets C0253 to the corresponding Lenze setting 1 rev. = 65536 inc - Value in C0253 is reached at 15000 rpm	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0520 	CFG: IN	1000	FIXEDPHI-0  Selection list 4	Configuration of input signal, function block DFSET ● Input of speed / phase setpoint signal  8.2-18
C0521 	CFG: VP-DIV	1000	FIXED0%  Selection list 1	
C0522 	CFG: RAT-DIV	1000	FIXED0%  Selection list 1	
C0523 	CFG: A-TRIM	1000	FIXED0%  Selection list 1	
C0524 	CFG: N-TRIM	1000	FIXED0%  Selection list 1	
C0525 	CFG: 0-PULSE	1000	FIXED0  Selection list 2	
C0526 	CFG: RESET	1000	FIXED0  Selection list 2	
C0527 	CFG: SET	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block DFSET ● HIGH = Set phase integrators to equal values ● LOW-HIGH edge sets DFSET-PSET = 0 ● HIGH-LOW edge sets DFSET-PSET to the current value of MCTRL-PHI-SET ● DFSET-SET has a higher priority than DFSET-RESET
C0528			-2·10 ⁹ {1} 2·10 ⁹	Function block DFSET ● Display only  8.2-18
1	DIS: 0-pulse A			
2	DIS: Offset			

8 Configuration

8.2 Function blocks

8.2.5 Master frequency processing (DFSET)

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0529	Multip offset	1	-20000 {1} 20000			Offset multiplier, function block DFSET ● Multiplier for the phase offset (C0252)	 8.2-18
C0530	DF evaluation	0	0	with factor	With gearbox factor	Master frequency evaluation, function block DFSET ● Evaluation of the setpoint integrator	
			1	no factor	Without gearbox factor		
C0531	Act 0 div	1	1 {1} 16384			Actual zero pulse divisor, function block DFSET	
C0532	0-pulse/TP	1	1	0-pulse	Index pulse	Zero pulse / touch probe, function block DFSET ● Zero pulse of the feedback system or touch probe	
			2	Touch probe	Touch probe		
C0533	Vp denom	1	1 {1} 32767			Gain factor of denominator V _p , function block DFSET	 8.2-18
C0534	0 pulse fct	0				Zero pulse function, function block DFSET ● Synchronising the drive	
			0	inactive	Inactive		
			1	Continuous	Continuous synchronisation, correction in the shortest possible way		
			2	Cont. switch	Continuous synchronisation, correction in the shortest possible way	After a LOW-HIGH signal to DFSET-0-pulse, the zero track is synchronised once	
			10	Once, fast way	One-time synchronisation, correction in the shortest possible way		
			11	Once, CW	One-time synchronisation, correction in direction of rotation to the right		
			12	Once, CCW	One-time synchronisation, correction in direction of rotation to the left		
			13	Once, 2*0-pulse	One-time synchronisation, correction is detected from setpoint pulse and actual pulse and corrected to the corresponding direction		
C0535	Set 0 div	1	1 {1} 16384			Desired zero pulse divisor, function block DFSET	 8.2-18

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0536			-32767	{1}	32767	Function block DFSET ● Display of the signals linked in C0521, C0522 and C0523 8.2-18
1	DIS: VP-DIV					
2	DIS: RAT-DIV					
3	DIS: A-TRIM					
C0537	DIS: N-TRIM		-199.99	{0.01 %}	199.99	Function block DFSET ● Display of the signal linked in C0524
C0538			0		1	Function block DFSET ● Display of the signals linked in C0525, C0526 and C0527
1	DIS: 0-pulse					
2	DIS: RESET					
3	DIS: SET					
C0539	DIS: IN		-6000	{1 rpm}	6000	Function block DFSET ● Display of the signal linked in C0520
C0546	Min inc/rev	1000	1	{1 inc.}	2147483647	Masking of the touch probe signal, function block DFSET ● Suppressing interference pulses at X5/E4 (actual pulse of touch probe signal) ● The size of the masking window between two actual pulses is set 8.2-18

Setpoint conditioning with stretching and gearbox factor

Stretching factor

The stretching factor defines the ratio with which the drive is to run faster or slower than the setpoint.

The setpoint at DFSET-IN is evaluated. The result is output to DFSET-POUT.

$$\text{DFSET-POUT} = \text{DFSET-IN} \cdot \frac{\text{DFSET-VP-DIV}}{\text{C0533}}$$

The stretching factor results from numerator and denominator.

- The numerator (DFSET-VP-DIV) can be defined as a variable from the analog signal source or as a fixed value from a code.
- Enter the denominator under C0533.

**Note!**

When calculating the stretching factor, the input signal at DFSET-VP-DIV is not processed in a scaled mode. A signal of 100 % corresponds to a count value of 16384.

Gearbox factor

The gearbox factor defines the ratio by means of which the drive speed can be changed additionally.

The setpoint at DFSET-IN, multiplied by the stretching factor, is evaluated. The result is output at DFSET-NOUT [in % of $n_{\max}$ (C0011)].

$$\text{DFSET-NOUT} = \text{DFSET-IN} \cdot \frac{\text{DFSET-VP-DIV}}{\text{C0533}} \cdot \frac{\text{DFSET-RAT-DIV}}{\text{C0033}}$$

The gearbox factor results from numerator and denominator.

- The numerator (DFSET-RAT-DIV) can be defined as a variable from the analog signal source or as a fixed value from a code.
- Enter the denominator under C0033.

**Note!**

When calculating the gearbox factor, the input signal at DFSET-RAT-DIV is not processed in a scaled mode. A signal of 100 % corresponds to a count value of 16384.

Processing of correction values

Speed trimming

The speed trimming serves to add correction values, e. g. by a superimposed control loop. This enables the drive to accelerate or decelerate.

- At the speed trimming, an analog value at DFSET-N-TRIM is added to the speed setpoint.

Phase trimming

The phase trimming adds a setpoint at DFSET-A-TRIM to the phase setpoint and changes the rotor position to the setpoint with the number of increments provided in either direction (drive is leading or lagging). The phase is trimmed within a range of ± 32767 increments (corresponds to $\pm \frac{1}{2}$ revolution). Every analog signal can be used as a source.

- The input is done in increments (1 revolution $\triangleq$ 65536 increments).
- An analog input signal at DFSET-A-TRIM of 100 % $\triangleq$ 1/4 revolution $\triangleq$ 16384 increments.
- You can extend the setting range with a multiplier (C0529).

Phase offset

The phase offset (C0252) adds a fixed phase offset to the setpoint of the drive.

Phase adjustment proportional to speed

With a phase adjustment proportional to speed, the phase leads or lags with increasing speed.

- Enter the offset in increments under C0253.
- The set phase offset is reached at 15000 rpm of the drive (linear relationship).



Note!

Phase corrections are only reasonable if the controller is operated with incremental encoder feedback and the calculated following error is used for correcting the speed setpoint. The following error is output to DFSET-PSET.

Synchronising to zero track or touch probe



Stop!

When the synchronisation via the terminals X5/E4 and X5/E5 (C0532 = 2) is activated, these terminals must not contain any other signal connections.

When selecting a basic configuration via C0005, the terminals contain a basic setting.

Selection of synchronisation

C0532 = 1 (zero pulse)	The synchronisation is performed on the zero track of the digital frequency input X9 and the zero track of the feedback system set under C0490.
C0532 = 2 (touch probe)	The synchronisation is performed using the terminals X5/E4 (actual pulse) and X5/E5 (setpoint pulse).

Touch probe initiators can have delay times which cause a speed-dependent phase offset.

Set the correction for the phase offset under C0429.

$$C0429 = 16384 \cdot \text{Correction value}$$

The correction value for the phase offset can be obtained from the data sheet of the initiator, or contact the manufacturer.

Synchronisation modes

C0534	Synchronisation mode	Note
0	Inactive	Function inactive
1	Continuous synchronisation with correction in the shortest possible way	
2	Continuous synchronisation with correction in the shortest possible way	After a LOW-HIGH signal to DFSET-0-pulse, the zero track is synchronised once
10	One synchronisation. A phase deviation is corrected in the shortest possible way.	
11	One synchronisation. A phase deviation is corrected in CW direction.	
12	One synchronisation. A phase deviation is corrected in CCW direction.	
13	Single synchronisation. A phase difference is determined between setpoint pulse and actual pulse and is corrected to the corresponding direction of rotation according to the sign.	

► During synchronisation, DFSET-ACK is set to HIGH.



Note!

Drive synchronisation is only reasonable if the controller is operated with incremental encoder feedback and the calculated following error is used for correcting the speed setpoint. The following error is output to DFSET-PSET.

8.2.6 Internal motor control with V/f characteristic control (MCTRL1)

Description

The function block MCTRL1 controls the motor. It is always carried out so that it does not need to be entered into the processing table.

In the Lenze setting, the controller is set to V/f characteristic control (C0006 = 5). Without other settings and with analog setpoint selection via X6/1, X6/2 and connected asynchronous standard motor (50 Hz/400 V) commissioning can be executed immediately.

The V/f characteristic control is suitable for single drives, multi-motor drives, synchronous motors, reluctance motors and asynchronous motors.

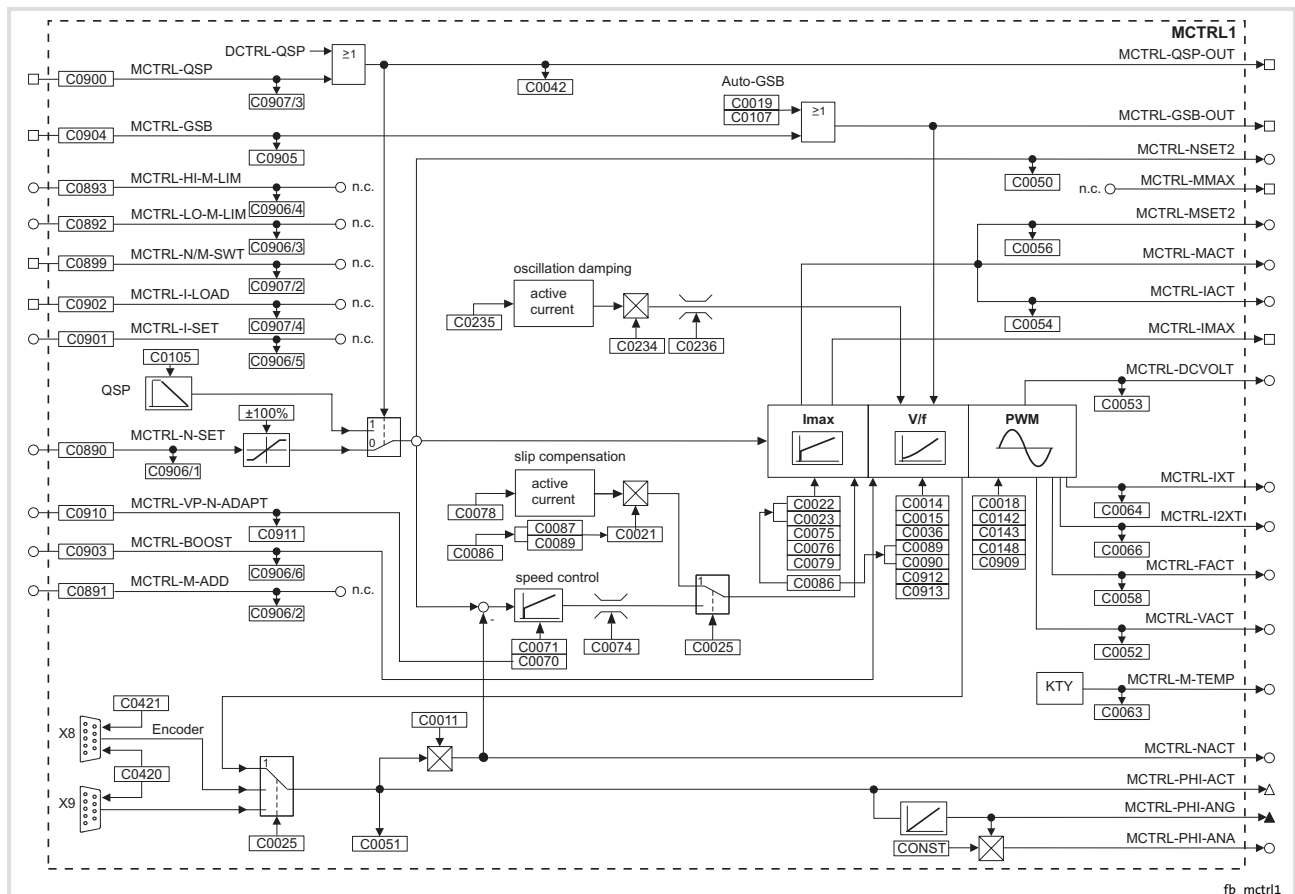


Fig. 8.2-15 Internal motor control with V/f characteristic control (MCTRL1)

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0006 STOP	Op mode	5				Selection of the operating mode for the motor control
			1	vector ctrl	Vector control without or with speed feedback	In case of the first selection enter the motor data and identify them with C0148.  6.8-8
			5	V / f	V/f characteristic control	Commissioning without identification of the motor data is possible Advantage of identification with C0148: Improved smooth running at low speeds  6.8-4
C0010	N _{min}	0	0	{1 rpm}	36000	- Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times - C0059 must be set correctly - Set C0010 < C0011 - C0010 is only effective in case of analog setpoint selection via AIN1 Important: For parameter setting via interface, major changes in one step should only be made when the controller is inhibited.
C0011	N _{max}	3000	0	{1 rpm}	36000	 6.10-1 Minimum speed Maximum speed
C0014	V/f charact.	0				Characteristic in the V/f characteristic control mode  8.2-25
			0	Linear		Linear V/f characteristic
			1	square		Square V/f characteristic
C0015	Rated freq	50	10	{1 Hz}	5000	V/f-rated frequency In C0015 you can set a base frequency which differs from the rated motor frequency (C0089) - Lenze setting: C0015 = C0089 - Changing C0086 or C0089 overwrites the value in C0015  8.2-25
C0016	U _{min} boost	0.00	0.00	{0.01 %}	100.00	U _{min} boost (FCODE) - C0016 = 1 % corresponds to a boost of 1 % of the rated motor voltage (C0090) - Code is freely configurable  6.8-4

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0018	fchop	6		Switching frequency of the inverter	6.9-1
			0 auto chop automatic change-over of the switching frequency between 16/8/2 kHz	- General rule: the lower the switching frequency the - lower the power loss - higher the noise generation - better the concentricity factor - Observe derating information at high switching frequencies	
			1 2 kHz sin optimised smooth running	- The max. output frequency (f_{out}) amounts to: $f_{chop} = 16 \text{ kHz} \Rightarrow f_{out} = 600 \text{ Hz}$ $f_{chop} = 8 \text{ kHz} \Rightarrow f_{out} = 300 \text{ Hz}$ $f_{chop} = 4 \text{ kHz} \Rightarrow f_{out} = 150 \text{ Hz}$ $f_{chop} = 2 \text{ kHz} \Rightarrow f_{out} = 150 \text{ Hz}$	
			2 4 kHz f_top power-optimised		
			3 8 kHz f_top power-optimised		
			4 8 kHz sin noise optimised		
			5 16 kHz sin noise optimised		
			6 auto 8/2 kHz noise / power-optimised with automatic change-over to low switching frequency		
C0021	slipcomp	→	-20.00 {0.01 %} 20.00	Slip compensation → Change of C0086, C0087 or C0089 sets C0021 to the calculated rated slip of the motor When changing over to the vector control mode, C0021 is set to 0	6.11-1 8.2-25 8.2-48
C0022	IMAX CURRENT	→	0 {0.01 A} -	I_{max} limit in motor mode → Depending on C0086	6.6-13
C0023	Imax gen.	→	0 {0.01 A} -	I_{max} limit in generator mode → Depending on C0086	6.6-13
C0036	DC brk value	0.0	0.0 {0.1 A} -	Set DC braking current → depends on the controller	8.2-25 8.2-48
C0042	DIS: QSP			Quick stop Display only	8.2-25
			0 QSP inactive	Quick stop is not active	8.2-48
			1 QSP active	Quick stop is active	
C0050	MCTRL-NSET2		-100.00 {0.01 %} 100.00	Speed setpoint, function block MCTRL Display of the speed in [%] of C0011	8.2-25 8.2-48
C0051	MCTRL-NACT		-36000 {1 rpm} 36000	Actual speed value, function block MCTRL Read only	8.2-25 8.2-48
C0052	MCTRL-Umot		0 {1 V} 800	Motor voltage, function block MCTRL - Read only - MCTRL-VACT = 100 % = C0090	8.2-25 8.2-48
C0053	UG-VOLTAGE		0 {1 V} 900	DC-bus voltage, function block MCTRL - Read only - MCTRL-DCVOLT = 100 % = 1000 V	8.2-25 8.2-48
C0054	IMot		0.0 {0.1 A} 500.0	Current motor current, function block MCTRL - Read only - MCTRL-IACT = 100 % = C0022	8.2-25 8.2-48

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0056	MCTRL-MSET2		-100.00	{0.01 %}	100.00	Read only. The output signal depends on the operating mode: ● Current motor current in case of V/f characteristic control, function block MCTRL1 ● Torque setpoint in case of vector control, function block MCTRL2  8.2-25  8.2-48
C0058	MCTRL-FACT		-600.0	{0.1 Hz}	600.0	Output frequency ● Display only ● MCTRL-FACT = 100.0 % = 1000.0 Hz  8.2-25  8.2-48
C0063	Mot temp		0	{1 °C}	200	Motor temperature ● Read only ● Monitoring of the motor temperature must be activated. ● KTY at X8/5, X8/8: – At 150 °C, TRIP OH3 is set – Early warning is possible via OH7, temperature is set in C0121 ● PTC, thermal contact at T1, T2: – Release sets TRIP or warning OH8  8.2-25  8.2-48
C0064	Utilization		0	{1 %}	150	Device utilisation I _{xt} ● Read only ● Device utilisation during the last 180 s of operating time ● C0064 > 100 % releases warning OC5 ● C0064 > 140 % limits the output current of the controller to 67 % of the maximum current in C0022  8.2-25  8.2-48
C0066	MOTOR LOAD		0	{1 %}	250	Motor load I ² _{xt}  8.2-25  8.2-48
C0070	Vp speed CTRL	10.0	0.0	{0.1 }	255.9	Gain of speed controller  8.2-25
C0071	Tn speed CTRL	50	1	{1 ms}	6000	Integral-action time of speed controller C0071 = 6000 ms: No integral-action time  8.2-48
C0074	limit N	10.00	0.00	{0.01 %}	100.00	Limitation of the speed controller ● Influence of the speed controller for V/f characteristic control with feedback ● max. setpoint difference in percent  8.2-25  8.2-48
C0075	Vp curr CTRL	0.20	0.00	{0.01 }	0.99	Gain of current controller ● Vector control: gain of current controller ● V/f characteristic control: maximum current controller  8.2-25  8.2-48

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0076	Tn curr CTRL	10.0	0.1	{0.1 ms}	2000.0	Integral-action time of current controller • Vector control: integral-action time of current controller • V/f characteristic control: maximum current controller • C0076 = 2000 ms: current controller is switched off	8.2-25 8.2-48
C0078	Tn slip CTRL	100	1	{1 ms}	6000	Integral-action time of slip controller • Filter time for slip compensation (C0021) • Only active with V/f characteristic control	8.2-25
C0079	Adapt I-CTRL	100.0 0	10.00	{0.01 %}	100.00	Adaption of the current controller • Evaluation for the reset time T_{ni} of the current controller • Effective for setpoint = 0 • Is increased automatically to 100 % up to rated speed • C0079 = 100 %: no adaption of the reset time • C0079 < 100 %: – evaluation of the reset time:	8.2-25 8.2-48
C0086 	Mot type	→	Motor selection list			Motor type selection → depending on the controller used • Motor selection in C0086 sets the corresponding parameters in C0021, C0022, C0081, C0087, C0088, C0089, C0090, C0091	6.6-1
C0087 	Mot speed	→	50	{1 rpm}	36000	Rated motor speed → depending on C0086 • Motor selection in C0086 set the corresponding rated motor speed in C0087 • Change of C0087 sets C0086 = 0	6.6-1
C0089 	Mot frequency	→	10	{1 Hz}	5000	Rated motor frequency → depending on C0086 • Motor selection in C0086 sets the corresponding rated motor frequency in C0089 • Change of C0089 sets C0086 = 0	6.6-1
C0090 	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 • Motor selection in C0086 sets the corresponding rated motor voltage in C0090 • Change of C0090 sets C0086 = 0	6.6-1
C0095 	Mot Io	→	0.00	{0.01 A}	1000.00	Motor magnetising current → depending on C0086, C0088 and C0091 • Change of C0086, C0088 and C0091 sets C0095 to the Lenze setting • Change of C0095 sets C0086 = 0	6.6-1 6.11-5

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0105	QSP Tif	5.00	0.00	{0.01 s}	999.90	Quick stop deceleration time The deceleration time refers to a speed variation of C0011 ... 0  8.2-25  8.2-48
C0107	holding time	0.00	0.00	{0.01 s}	9999.90	Hold time for automatic DC injection braking (Auto-GSB)  8.2-25  8.2-48
C0132 	Controller enable fly delay	→	0	{1 ms}	9999	Minimum time for controller inhibit with active flying restart circuit, delays the start of the flying restart process after controller enable → depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 A change of one of the codes resets C0132 to the minimum time of the selected motor The time is derived from the double rotor time constant  8.2-25  8.2-48
C0140 	select direct	0				Search direction during flying restart process - Positive direction of rotation: The motor rotates in CW direction with view on the motor shaft - Negative direction of rotation: The motor rotates in CCW direction with view on the motor shaft  8.2-25  8.2-48
			0	NSET		Only search in the direction of the applied setpoint
			1	inv. Nset		Only search against the direction of the applied setpoint
			2	pos.		Only search in positive direction of rotation
			3	neg.		Only search in negative direction of rotation
			4	Both, Nset		Search at first in the direction of the applied setpoint and then against the direction
			5	Both, inv. Nset		Search at first against the direction and then in the direction of the applied setpoint
			6	Both pos.		Search at first in positive then in negative direction of rotation
			7	Both neg.		Search at first in negative then in positive direction of rotation

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0142	Start options	1		Starting condition for the flying restart circuit	 8.2-36
			0 Start lock	- Automatic start is inhibited after – mains connection – Cancel of a message ($t > 0.5\text{ s}$) – Trip reset - Flying restart circuit is inactive - Start after HIGH-LOW-HIGH level change at X5/28	 8.2-65
			1 Auto start	Automatic start when X5/28 = HIGH Flying restart circuit is inactive	
			2 flying lock	- Automatic start is inhibited after – mains connection – Cancel of a message ($t > 0.5\text{ s}$) – Trip reset - Flying restart circuit is active - Start after HIGH-LOW-HIGH level change at X5/28	
			3 Fly restart	Automatic start when X5/28 = HIGH Flying restart circuit is active	
C0143	limit 2 kHz	0.0	0.0 {0.1 Hz} 20.0	Speed-dependent switching threshold - Threshold for automatic switching frequency reduction - The controller changes automatically to 2 kHz when this value falls below the threshold	 8.2-25  8.2-48
C0145 	select ref	1		Selection of the flying restart mode Reference speed with which the flying restart process is started	 8.2-36  8.2-65
			0 REF: C0011	Maximum speed	
			1 REF: N-ACT	Last current speed	
			2 REF: N-SET	Defined main speed setpoint It is referenced to the setpoint signal at input NSET-N of the function block NSET. If the setpoint signal at input NSET-N is missing, it is referenced to the active JOG setpoint (C0039/x)	
C0146	fly current	0	-500 {1} 500	Flying restart circuit, quantity of current during search process - Influences the current injection during search process $\pm 500 \approx \pm 39\%$ of $I_{\max}$ - The initial value amounts to $\approx 8\%$ of $I_{\max}$	 8.2-36  8.2-65
C0147	fly dt-f	0	-82 {1} 82	Flying restart circuit, search speed during flying restart process - For drives with great centrifugal masses, reduce the search speed, if required $\pm 82 \triangleq \pm 5.0\text{ Hz}$	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0234	damp value	20	-100	{1 %}	100	Influence of the oscillation damping, function block MCTRL - Minimising a tendency to oscillation of the drive - Influences the tendency to oscillation of the drive - When C0025 >1 and C0006 = 1, C0234 is set to 0
C0235	damping	5	1	{1 ms}	600	Filter time of the oscillation damping, function block MCTRL Filter time for the internal signal for oscillation damping
C0236	damp limit	0.2	0.0	{0.1 Hz}	20.0	Limit value of oscillation damping, function block MCTRL Limit value for the internal signal of oscillation damping
C0890 STOP	CFG: N-SET	5050	NSET-NOUT	📖 Selection list 1		Configuration of analog input signal, function block MCTRL Speed setpoint
C0900 STOP	CFG: QSP	10250	R/L/Q-QSP	📖 Selection list 2		Configuration of digital input signal, function block MCTRL HIGH = drive performs quick stop
C0903 STOP	CFG: BOOST	5015	MCTRL-BOOST	📖 Selection list 1		Configuration of analog input signal, function block MCTRL Boost of the motor voltage
C0904 STOP	CFG: DC-BREAK	1000	FIXED0	📖 Selection list 2		Configuration of digital input signal, function block MCTRL HIGH = Motor is braked
C0905	DIS: DC-BREAK		0		1	Function block MCTRL Display of the signal linked in C0904
C0906			-199.99	{0.01 %}	199.99	Function block MCTRL Display of the signals linked in C0890, C0891, C0892, C0893, C0901 and C0903
	1 DIS: N-SET					
	2 DIS: M-ADD					
	3 DIS: LO-M-LIM					
	4 DIS: HI-M-LIM					
	5 DIS: I-SET					
	6 DIS: BOOST					
C0907			0		1	Function block MCTRL Display of the signals linked in C0899, C0900 and C0902
	1 reserved					
	2 DIS: N/M-SWT					
	3 DIS: QSP					
	4 DIS: I-LOAD					
C0909	speed limit	1	1	+/- 175 %		Speed limitation, function block MCTRL Limitation of direction of rotation for the speed setpoint
			2	0 ... 175 %		
			3	-175 ... 0 %		
C0910 STOP	CFG: VP-ADAPT	1006	FIXED100%	📖 Selection list 1		Configuration of analog input signal, function block MCTRL - Gain adaptation of the speed controller - If the gain is varying, join to CURVE-OUT of FB CURVE
C0911	DIS: VP-ADAPT		-199.99	{0.01 %}	199.99	Function block MCTRL Display of the signal linked in C0910

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0912	OV delay time	→	- {1 ms}	- Delay time of the pulse enable after an OU message → Depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 A change of one of the codes resets C0912 to the time of the selected motor • The time is derived from the double rotor time constant	8.2-25 8.2-48 9.4-3
C0913 	OV handling	0		Value of the motor current during the flying restart process or after an OU message • When C0913 = 1, the motor is driven with reduced current to the setpoint speed during the flying restart process of after an OU message. • The setting is only effective for the drives EVF9326 ... EVF9333	8.2-25 8.2-48
			0 inactive Non-reduced motor current		
			1 active Reduced motor current		

Speed setpoint selection

- The signal at input MCTRL-N-SET is the speed setpoint in [%] and always refers to the maximum speed (C0011).
- In the most basic configurations, MCTRL-N-SET is connected with the function block NSET (speed setpoint conditioning).
– It is also possible to connect MCTRL-N-SET with any other analog output signal of an FB.

Speed setpoint limitation

- The speed setpoint at MCTRL-N-SET is always limited to $\pm 100\%$ of the maximum speed $n_{\max}$ (C0011).
- The speed setpoint is converted into a frequency setpoint by the motor control and is limited to a maximum output frequency depending on the chopper frequency f_{chop} .

Chopper frequency f_{chop}	Maximum output frequency
16 kHz	600Hz
8 kHz	300Hz
2/4 kHz	150Hz

Setting of the V/f characteristic

The motor voltage characteristic is set via the input of the motor ratings.

Via the input MCTRL-BOOST the motor voltage can be raised. The input is connected to C0016 (freely configurable) in all basic configurations.

- To adapt the motor voltage boost to your application, you can also connect the input with other function blocks.

Speed control

With feedback operation, a PI controller will control the slip.

Activating the speed control

The speed control is activated when you select an incremental encoder in C0025.

Parameter setting

Code	Function
C0070	Gain V_p
C0071	Integral-action time T_n
C0074	Influence of the speed controller at operation with incremental encoder. Reference is n_{max} (C0011).

**Note!**

If the speed controller influence is adapted to the motor slip to be expected, the motor cannot accelerate in an uncontrolled way when the incremental encoder fails.

Adaptation of the speed controller

The gain of the speed controller can be changed online via the input MCTRL-VP-N-ADAPT. The set gain in C0070 is the reference value for an input signal of 100 %.

- ▶ You can influence the gain (C0070) by adapting a function block (e.g. CURVE) to MCTRL-VP-N-ADAPT.
- ▶ The adaptation is switched off in the Lenze default setting.

Limitation of the output current

The limitation of the output current is mainly used for the protection of the controller and the stabilisation of the control.

When the maximum permissible motor load is exceeded, you can adapt the max. output current of the controller accordingly.

Parameter setting

Code	Function
C0022	Maximum current in motor mode
C0023	Maximum current in generator mode

If you select a motor (via C0086), the maximum current of which is clearly lower than the output current of the controller, the maximum motor current (C0022) is limited automatically to 200% of the rated motor current.

Mode of operation

In the V/f characteristic control mode, a PI controller ($V_p = C0075$, $T_n = C0076$) prevents an excess of the max. permissible motor current by reducing (motor overload) or increasing (generator overload) of the output frequency.

The N controller is not active in the V/f characteristic control mode without feedback.

Consequences

- ▶ The motor cannot follow the speed setpoint.
- ▶ MCTRL-IMAX is set to HIGH
- ▶ When selecting the automatic switching frequency setting (C0018 = 0 or 6), the controller switches to a lower switching frequency so that a disconnection is not required.

Automatic speed detection after controller enable - flying restart circuit

The flying restart circuit is especially suitable for applications with fan and drives with great mass inertia.

The flying restart circuit serves to enable the controller although the motor still rotates. The flying restart circuit automatically detects the current motor speed using this speed to start the motor control. This prevents the motor from braking to zero speed with subsequent acceleration.

Use C0140 to determine the search direction during the flying restart process.

- ▶ If the direction of rotation of the coasting machine is known, you can search in the direction of rotation or in the direction of the applied setpoint.
- ▶ If the direction of rotation of the coasting machine is not known, you can search in both directions of rotation or in both directions of the applied setpoint.

In case of applications with fan, for example, search is possible in both directions if the direction of rotation of the free-running fan impeller is not known due to the air flow.



Note!

- ▶ The flying restart circuit is optimised for a power-adapted motor. Thus, the rated motor current should not exceed the rated controller current.
- ▶ Although the flying restart circuit is activated (C0142 = 2 or C0142 = 3), the flying restart process does not start if the pulse inhibit is deactivated again after an OU message.

In order to start the flying restart process, connect e.g. the input DCTRL-CINHx with the output signal MONIT-OU. An OU message causes an internal controller inhibit. When the controller inhibit is deactivated, the flying restart process is started.

Setting

Selection	Code	Description
Search direction during flying restart process	C0140 = 0	Lenze setting Only search in the direction of the applied setpoint
	C0140 = 1	Only search against the direction of the applied setpoint
	C0140 = 2	Only search in positive direction of rotation
	C0140 = 3	Only search in negative direction of rotation
	C0140 = 4	Search at first in the direction of the applied setpoint and then against the direction
	C0140 = 5	Search at first against the direction and then in the direction of the applied setpoint
	C0140 = 6	Search at first in positive then in negative direction of rotation
	C0140 = 7	Search at first in negative then in positive direction of rotation
Reference speed for starting the search process	C0145 = 0	Flying restart circuit referenced to the maximum speed (C0011). Recommended when the motor speed is unknown
	C0145 = 1	Lenze setting Flying restart circuit referenced to the last current motor speed
	C0145 = 2	Speed setpoint, recommended when motor speed is known
Value of current during search process	C0146	Influences the value of current during the search process. Reduce the value in case of motors with low centrifugal mass (speed already increases during search process).
Search speed	C0147	Influences the search speed. A search process takes approx. 1 ... 2 s. It may be required to reduce the search speed to achieve a successful search process (reduce value).

Activation

Selection	Code	Description
Start protection	C0142 = 0	The flying restart circuit is inactive. protection against unexpected start-up means that a restart requires signal change for enabling the controller (e. g. LOW-HIGH edge at X5/28).
Automatic start	C0142 = 1	Lenze setting Automatic start, flying restart circuit is inactive
Start after deactivating the switch-on inhibit	C0142 = 2	Flying restart circuit is started after resetting LIMP (mains connection, cancel of messages, (t > 0.5 s) or TRIP RESET) and renewed controller enable (e. g. LOW-HIGH edge at X5/28)
Starting without protection against unexpected start-up	C0142 = 3	Flying restart circuit gets active immediately. No renewed controller enable required (e. g. LOW-HIGH edge at X5/28).

Flying restart circuit with protection against unexpected start-up (C0142 = 2):

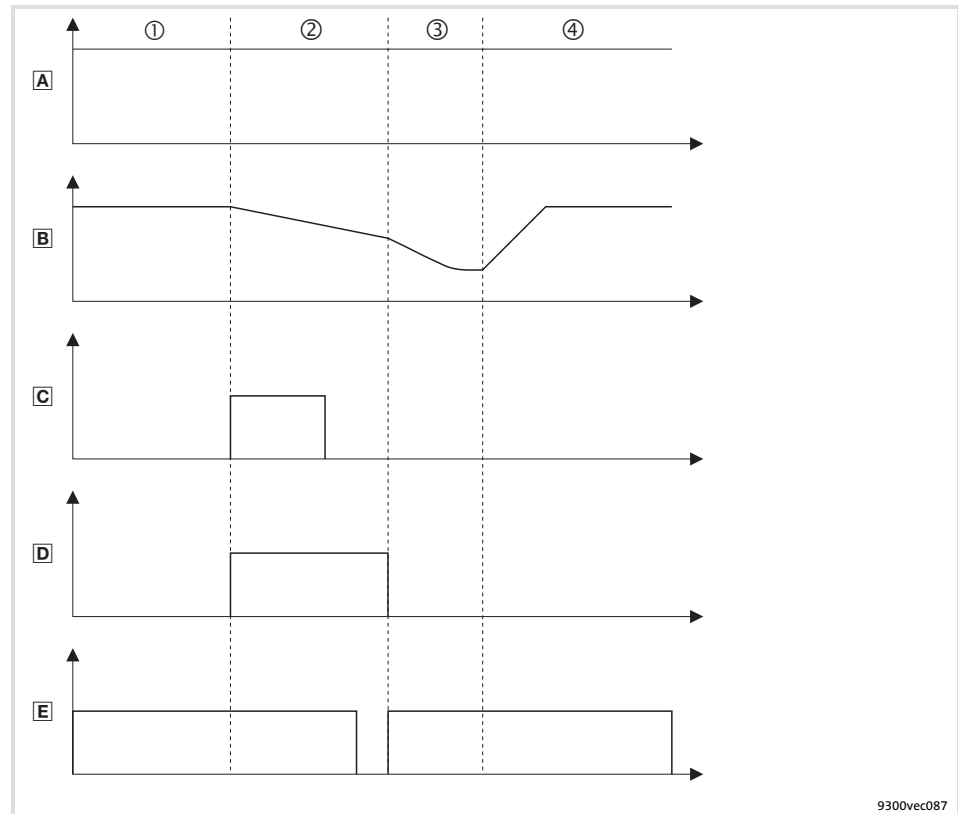


Fig. 8.2-16 Signal characteristic for manual start with flying restart circuit (C0142 = 2)

- A** Speed setpoint (e.g. AIN-OUT)
- B** Actual speed value
- C** Fault (e.g. DCTRL-FAIL = HIGH)
- D** Pulse inhibit (e.g. DCTRL-IMP = HIGH)
- E** Enable controller (e.g. X5/28 = HIGH)

① The motor rotates with setpoint

② A fault (e.g. mains failure, TRIP SET) activates a pulse inhibit **IMP**. The motor coasts. After eliminating the fault (e.g. mains recovery, TRIP RESET) the pulse inhibit remains active until the controller is enabled again (e.g. LOW-HIGH edge at X5/28)

Important in case of an OU message: if the OU message is not pending anymore, the pulse inhibit is deactivated.

③ The flying restart circuit is active now and determines the current motor speed

④ The motor is accelerated along the set acceleration ramp to the speed setpoint and is being kept there

Flying restart circuit without protection against unexpected start-up (C0142 = 3):

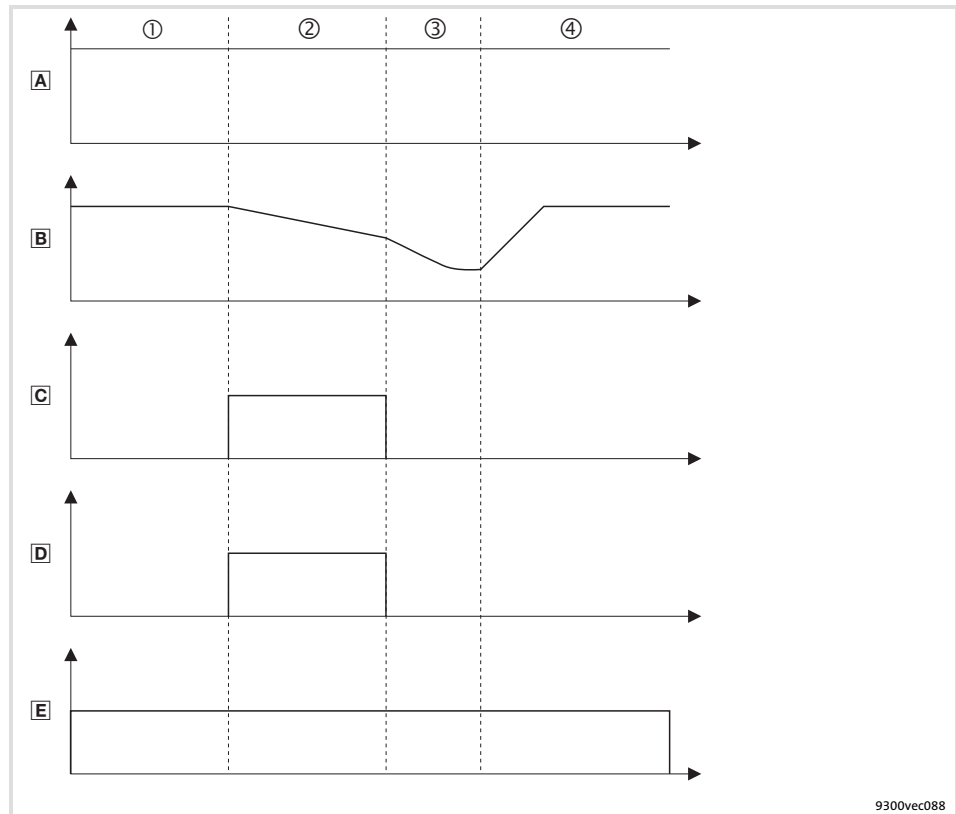


Fig. 8.2-17 Signal characteristic for automatic start with flying restart circuit (C0142 = 3)

- A** Speed setpoint (e.g. AIN-OUT)
- B** Actual speed value
- C** Fault (e.g. DCTRL-FAIL = HIGH)
- D** Pulse inhibit (e.g. DCTRL-IMP = HIGH)
- E** Enable controller (e.g. X5/28 = HIGH)
- ① The motor rotates with setpoint
- ② A fault (e.g. mains failure, TRIP SET) activates a pulse inhibit **IMP**. The motor coasts. After eliminating the fault (e.g. mains recovery, TRIP RESET) the pulse inhibit is deactivated.
- ③ The flying restart circuit is active now and calculates the current motor speed. If, after an OU message, the pulse inhibit is deactivated again, the flying restart circuit is not started.
- ④ The motor is accelerated along the set acceleration ramp to the speed setpoint and is being kept there

Quick stop (QSP)

After a signal request, the motor is decelerated to standstill when an internal ramp function generator has been activated.

Mode of operation

- ▶ Quick stop is active
 - MCTRL-QSP = HIGH
 - The control word DCTRL-QSP is applied
 - DC injection braking (GSB) is not active (GSB has priority over quick stop)
- ▶ If quick stop is active, the motor brakes to standstill with the deceleration time set in C0105. MCTRL-QSP-OUT is set to HIGH.

Manual DC injection braking

- ▶ After a signal, the motor is braked by injecting a DC current.
- ▶ Braking in generator mode must be used for controlled brake ramps.
- ▶ The hold time (C0107) has no influence. The motor remains braked until MCTRL-GSB is set to LOW.



Note!

Manual DC injection braking has priority over quick stop.

Setting

Selection	Code	Description
DC braking current	C0036	DC braking current with which the motor is braked



Stop!

An excessive DC braking current and braking time can thermally overload the motor. Special care must be taken when using self-ventilated motors.

Activation

The input MCTRL-GSB in the function block MCTRL is triggered with HIGH level.

- ▶ MCTRL-GSB = HIGH: Function is activated
- ▶ MCTRL-GSB = LOW: Function is not activated

Function procedure

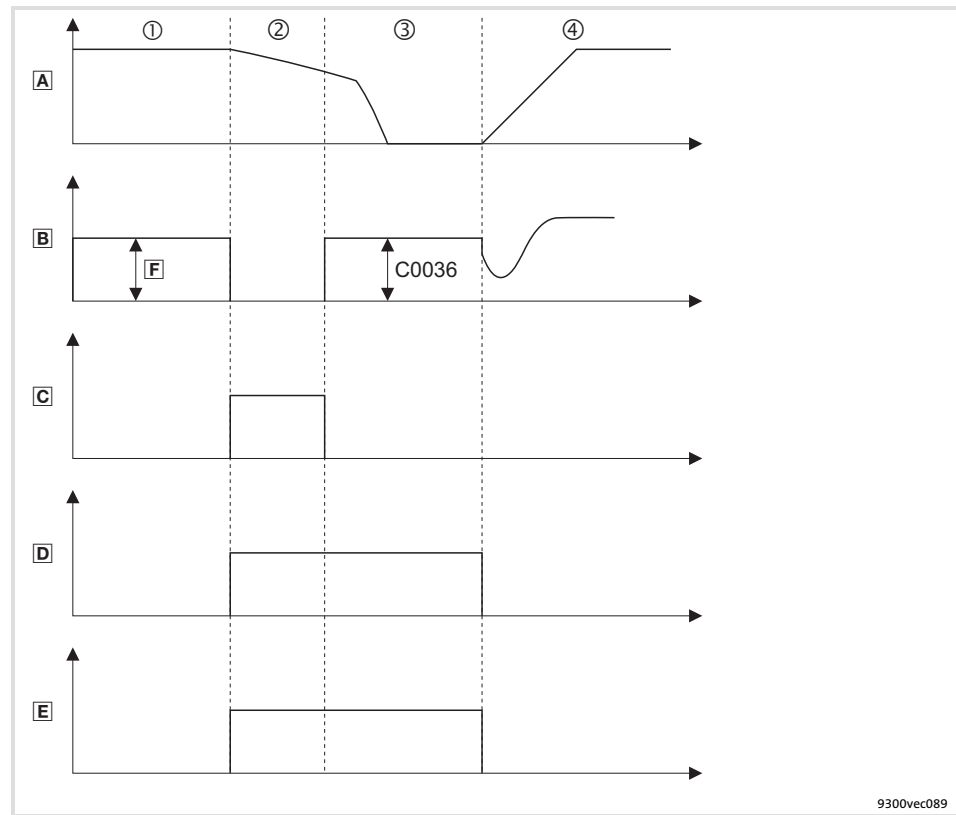


Fig. 8.2-18 Signal sequence with DC injection braking

- A** Actual speed value of the motor (e. g. MCTRL-NACT)
 - B** Controller output current (e. g. MCTRL-IACT)
 - C** Pulse inhibit (e. g. DCTRL-IMP)
 - D** Activating DC injection braking (MCTRL-GSB)
 - E** DC injection braking is active (MCTRL-GSB-OUT)
MCTRL-GSB-OUT = HIGH: Function is active
MCTRL-GSB-OUT = LOW: Function is not active
- ① The motor rotates with the preset speed. The current adjusts itself as a function of the load **F**.
 - ② DC injection braking is activated with MCTRL-GSB = HIGH. Pulse inhibit **IMP** is set. The motor coasts.
 - ③ The pulse inhibit is deactivated and the DC braking current set in C0036 is injected
 - ④ DC injection braking is deactivated with MCTRL-GSB = LOW
The motor is accelerated to speed setpoint at the set acceleration ramp and is kept there.

**Automatic DC injection
braking**

When the speed falls below a settable speed setpoint threshold, the function "DC injection braking" is activated.



Note!

Automatic DC-injection braking has priority over quick stop.

Setting

Selection	Code	Description
DC braking current	C0036	DC braking current with which the motor is braked
Speed setpoint threshold	C0019	If the values fall below the threshold, DC-injection braking is released
Hold time	C0107	Duration of DC-injection braking. After the hold time, pulse inhibit is set.



Stop!

An excessive DC braking current and braking time can thermally overload the motor. Special care must be taken when using self-ventilated motors.

Function procedure

Automatic DC injection braking provides two function procedures, each with a different reaction of the controller. The parameter setting is identical for both function procedures.

Function procedure 1:

- After the hold time has elapsed (C0107), the controller automatically sets pulse inhibit **IMP**.

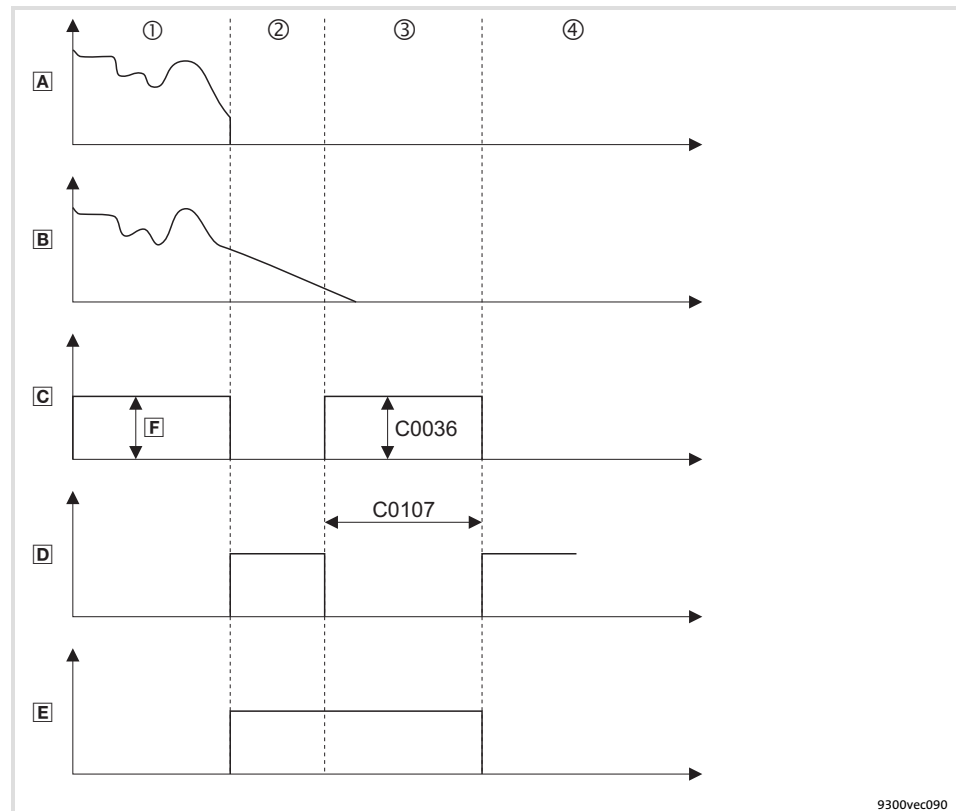


Fig. 8.2-19 Signal characteristic with automatic DC injection braking

- A Speed setpoint (e. g. AIN-OUT)
 - B Actual speed value of the motor (e. g. MCTRL-NACT)
 - C Controller output current (e. g. MCTRL-IACT)
 - D Pulse inhibit (e. g. DCTRL-IMP)
 - E DC injection braking is active (MCTRL-GSB-OUT)
MCTRL-GSB-OUT = HIGH: Function is active
MCTRL-GSB-OUT = LOW: Function is not active
- ① The motor rotates with the preset speed. The current adjusts itself as a function of the load **F**.
 - ② With a speed setpoint < speed threshold (C0019), DC injection braking is activated. Pulse inhibit **IMP** is set. The motor coasts.
 - ③ The pulse inhibit is deactivated and the DC braking current set in C0036 is injected
 - ④ After the hold time (C0107) pulse inhibit **IMP** is set

Function procedure 2:

- If you define a speed setpoint > speed threshold (C0019) before the hold time elapses, DC-injection braking is deactivated and the drive follows the speed setpoint. If the speed falls below the threshold again, DC-injection braking is reactivated and the hold time is restarted.

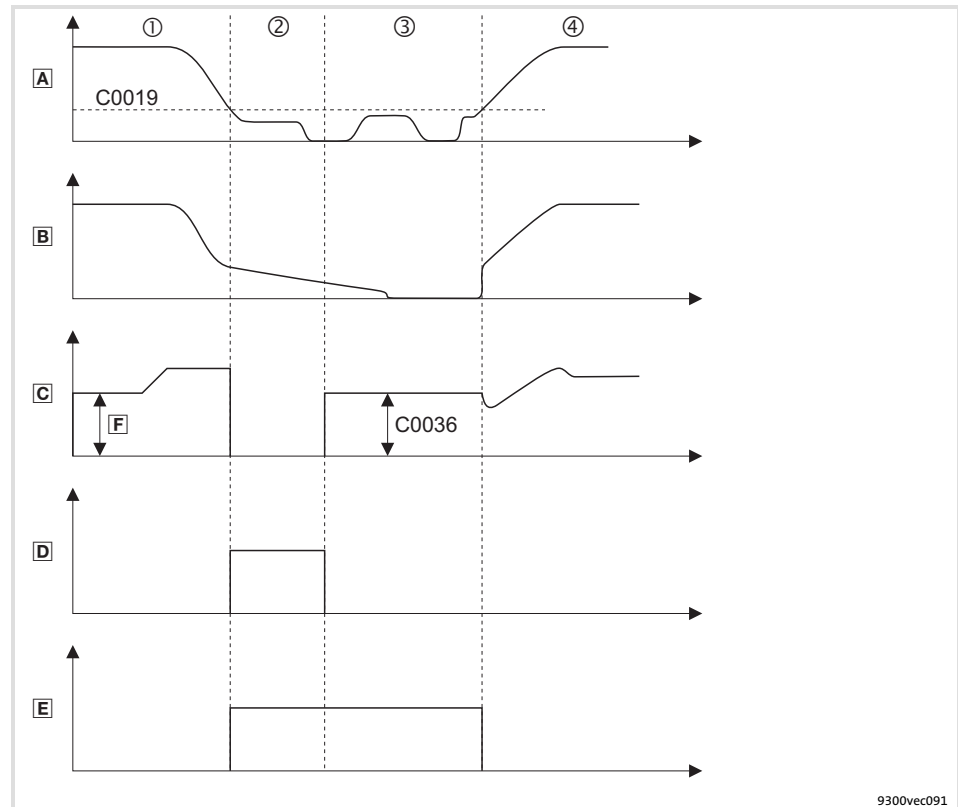


Fig. 8.2-20 Signal characteristic with automatic DC injection braking

- Ⓐ Speed setpoint (e. g. AIN-OUT)
 - Ⓑ Actual speed value of the motor (e. g. MCTRL-NACT)
 - Ⓒ Controller output current (e. g. MCTRL-IACT)
 - Ⓓ Pulse inhibit (e. g. DCTRL-IMP)
 - Ⓔ DC injection braking is active (MCTRL-GSB-OUT)
MCTRL-GSB-OUT = HIGH: Function is active
MCTRL-GSB-OUT = LOW: Function is not active
- ① The motor rotates with the preset speed. The current adjusts itself as a function of the load Ⓔ.
 - ② With a speed setpoint < speed threshold (C0019), DC injection braking is activated. Pulse inhibit **IMP** is set. The motor coasts.
 - ③ The pulse inhibit is deactivated and the DC braking current set in C0036 is injected
 - ④ DC-injection braking is deactivated as soon as the speed setpoint exceeds the speed threshold (C0019). The motor is accelerated to the defined speed setpoint and kept there.

Oscillation damping

Suppressing no-load oscillations in case of:

- ▶ Drives with different rated power of controller and motor, e. g. when operating with high switching frequency and the power derating involved.
- ▶ Operation of higher-pole motors.
- ▶ Operation of three-phase AC drives > 10 kW.

Compensation of resonances in the drive kit:

- ▶ Certain asynchronous motors may show this behaviour above $\frac{1}{3}$ of the rated speed ($\frac{1}{3} \cdot n_n$). This may result in an unstable operation (current and speed variations).

Adjustment

The Lenze setting is designed for power-adapted motors.

Usually, the speed oscillations can be reduced by changing the Lenze setting of the codes C0234 oder C0236 by the factor 2 ... 5.

1. Approach the range with speed oscillations.
 2. Change the influence of the oscillation damping in C0234 (generally, increase it).
 3. Increase the limitation of the oscillation damping in C0236.
 4. Change filter time in C0235 in the range of 1 ... 20 ms, if necessary.
- ▶ These can be indicators for smooth running:
 - Constant motor current characteristic
 - Reduction of the mechanical oscillations in the bearing seat

Slip compensation

The speed of an asynchronous machine decreases when being loaded. This load-dependent speed drop is called slip. By setting C0021 the slip can be partly compensated.

In the V/f characteristic control mode the slip compensation is only active at operation without feedback (C0025 = 1).

V/f characteristic control

The slip compensation (C0021) is automatically calculated from the rated motor speed (C0087) and the rated motor frequency (C0089). The entered slip constant [%] is the rated slip of the motor in [%] relating to the synchronous speed of the motor.

► Calculating the slip compensation and entering it into C0021:

$s = \frac{n_{rsyn} - n_r}{n_{rsyn}} \cdot 100 \%$ $n_{rsyn} = \frac{f_r \cdot 60}{p}$	E	Slip constant (C0021) [%]
	n_{rsyn}	Synchronous motor speed [min^{-1}]
	n_r	Rated motor speed according to motor nameplate [min^{-1}]
	f_r	Rated motor frequency according to motor nameplate [Hz]
	p	Number of motor pole pairs (1, 2, 3, ...)

- If required, the slip compensation can be adapted manually:
 - If C0021 is set too high, the drive may get unstable.
 - With cyclic load impulses (e. g. centrifugal pump) a smooth motor characteristic is achieved by smaller values in C0021 (possibly negative values)
 - Parameterise C0078 (filter time for the slip compensation) if you want to change the motor response time to load changes (dynamic ↔ slow).
- The actual speed is output as an analog signal (in [%] of n_{max} (C0011)) to MCTRL-NACT.



Note!

When operating synchronous or reluctance motors, C0021 must be set to 0.

Inhibiting the direction of rotation

If the motor may only rotate in one direction, you can limit the output voltage generation to one direction of rotation via C0909.

Code	Description
C0909 = 1	The motor rotates in both directions
C0909 = 2	Motor rotates clockwise, "positive direction of rotation" (View of the motor shaft)
C0909 = 3	Motor rotates counter-clockwise, "negative direction of rotation" (View of the motor shaft)

8.2.7

Internal motor control with vector control (MCTRL2)

Description

The function block MCTRL2 controls the motor. Since it is always executed, it does not need to be entered into the processing table.

Compared with the V/f characteristic control the vector control (C0006 = 1) has a much higher torque efficiency at the same motor current. The motor is monitored and controlled via an internal motor model. This serves to achieve an optimum operating behaviour of the motor at any time.

The vector control can be used for single drives, asynchronous motors and multi-motor drives of the same type with rigid coupling.

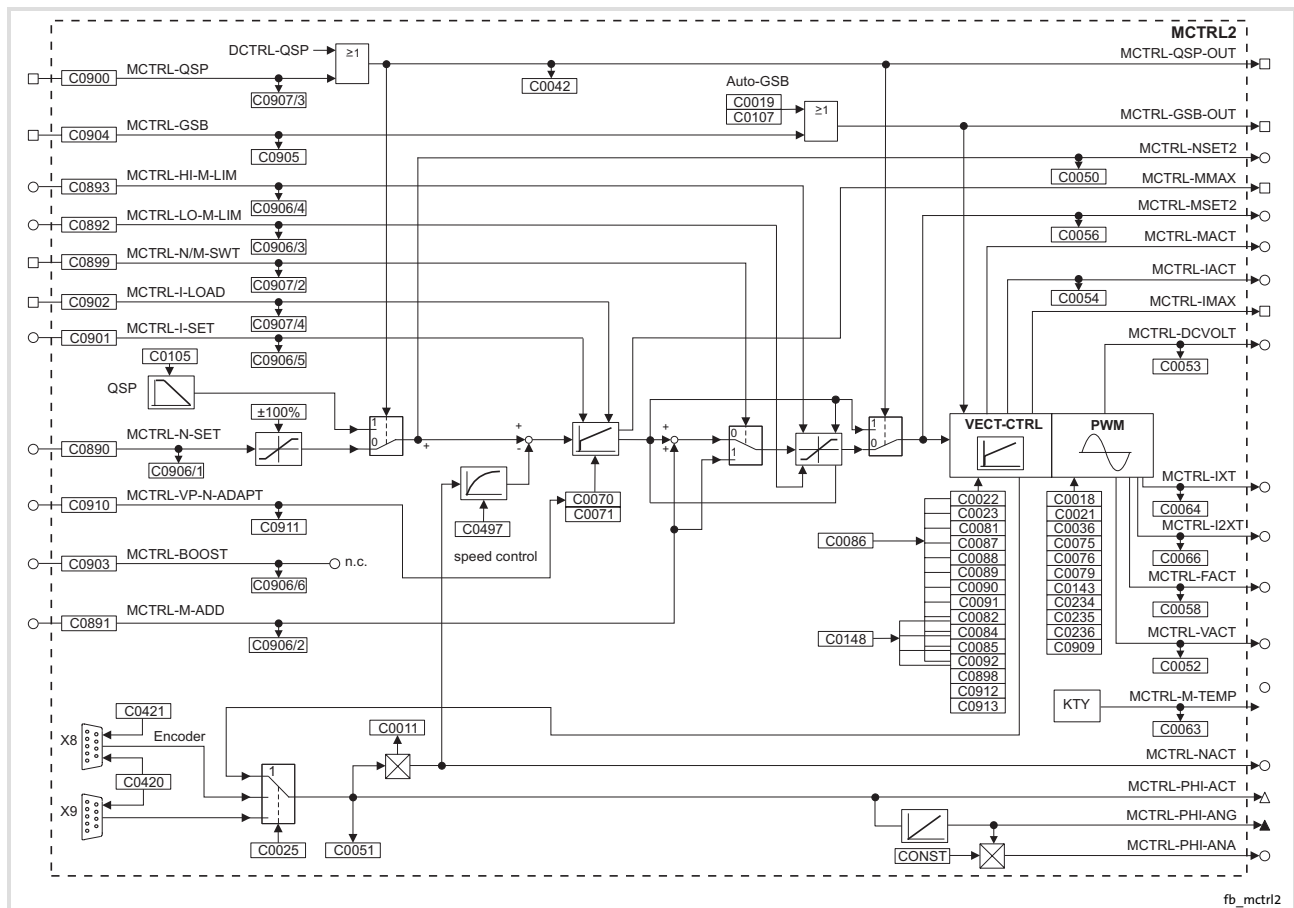


Fig. 8.2-21 Internal motor control with vector control (MCTRL2)

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0006 STOP	Op mode	5			Selection of the operating mode for the motor control	
			1	vector ctrl	Vector control without or with speed feedback	In case of the first selection enter the motor data and identify them with C0148. 6.8-8
			5	V / f	V/f characteristic control	Commissioning without identification of the motor data is possible Advantage of identification with C0148: Improved smooth running at low speeds 6.8-4
C0010	N _{min}	0	0	{1 rpm}	36000	- Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times - C0059 must be set correctly - Set C0010 < C0011 - C0010 is only effective in case of analog setpoint selection via AIN1 Important: For parameter setting via interface, major changes in one step should only be made when the controller is inhibited.
C0011	N _{max}	3000	0	{1 rpm}	36000	C0010 is only effective in case of analog setpoint selection via AIN1 Important: For parameter setting via interface, major changes in one step should only be made when the controller is inhibited.
C0018	fchop	6	0	auto chop	automatic change-over of the switching frequency between 16/8/2 kHz	Switching frequency of the inverter - General rule: the lower the switching frequency the - lower the power loss - higher the noise generation - better the concentricity factor - Observe derating information at high switching frequencies - The max. output frequency (f_{out}) amounts to: - f_{chop} = 16 kHz ⇒ f_{out} = 600 Hz - f_{chop} = 8 kHz ⇒ f_{out} = 300 Hz - f_{chop} = 4 kHz ⇒ f_{out} = 150 Hz - f_{chop} = 2 kHz ⇒ f_{out} = 150 Hz
			1	2 kHz sin	optimised smooth running	
			2	4 kHz f _{top}	power-optimised	
			3	8 kHz f _{top}	power-optimised	
			4	8 kHz sin	noise optimised	
			5	16 kHz sin	noise optimised	
			6	auto 8/2 kHz	noise / power-optimised with automatic change-over to low switching frequency	
C0019	Thresh nact=0	0	-36000	{1 rpm}	36000	Operating threshold - automatic DC injection brake (Auto-GSB) Falling below the threshold in C0019 activates automatic DC injection braking when the holding time set under C0107 > 0

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0021	slipcomp	→	-20.00	{0.01 %}	20.00	Slip compensation → Change of C0086, C0087 or C0089 sets C0021 to the calculated rated slip of the motor ● When changing over to the vector control mode, C0021 is set to 0	6.11-1 8.2-25 8.2-48
C0022	IMAX CURRENT	→	0	{0.01 A}	-	I _{max} limit in motor mode → Depending on C0086	6.6-13
C0023	Imax gen.	→	0	{0.01 A}	-	I _{max} limit in generator mode → Depending on C0086	6.6-13
C0025 	Feedback type	1				Speed feedback	6.7-1
			1	no feedback	No feedback		
			100	IT (C420) - X8	Input of the number of increments in C0420	Incremental encoder at X8 ● Incremental encoders with TTL level can only be connected to X8.	
			101	IT (C420) - X9	Input of the number of increments in C0420	Incremental encoder at X9 ● Connect incremental encoders with HTL-level on X9 only	
					Number of increments:	Incremental encoder at X8 ● Incremental encoders with TTL level can only be connected to X8.	
			110	IT512-5V	512 inc		
			111	IT1024-5V	1024 inc		
			112	IT2048-5V	2048 inc		
113	IT4096-5V	4096 inc					
C0036	DC brk value	0.0	0.0	{0.1 A}	-	Set DC braking current → depends on the controller	8.2-25 8.2-48
C0042	DIS: QSP					Quick stop ● Display only	8.2-25
		0	QSP inactive			Quick stop is not active	8.2-48
		1	QSP active			Quick stop is active	
C0050	MCTRL-NSET2		-100.00	{0.01 %}	100.00	Speed setpoint, function block MCTRL ● Display of the speed in [%] of C0011	8.2-25 8.2-48
C0051	MCTRL-NACT		-36000	{1 rpm}	36000	Actual speed value, function block MCTRL ● Read only	8.2-25 8.2-48
C0052	MCTRL-Umot		0	{1 V}	800	Motor voltage, function block MCTRL ● Read only ● MCTRL-VACT = 100 % = C0090	8.2-25 8.2-48
C0053	UG-VOLTAGE		0	{1 V}	900	DC-bus voltage, function block MCTRL ● Read only ● MCTRL-DCVOLT = 100 % = 1000 V	8.2-25 8.2-48
C0054	IMot		0.0	{0.1 A}	500.0	Current motor current, function block MCTRL ● Read only ● MCTRL-IACT = 100 % = C0022	8.2-25 8.2-48

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0056	MCTRL-MSET2		-100.00	{0.01 %}	100.00	Read only. The output signal depends on the operating mode: - Current motor current in case of V/f characteristic control, function block MCTRL1 - Torque setpoint in case of vector control, function block MCTRL2  8.2-25  8.2-48
C0058	MCTRL-FACT		-600.0	{0.1 Hz}	600.0	Output frequency - Display only - MCTRL-FACT = 100.0 % = 1000.0 Hz  8.2-25  8.2-48
C0063	Mot temp		0	{1 °C}	200	Motor temperature - Read only - Monitoring of the motor temperature must be activated. - KTY at X8/5, X8/8: - At 150 °C, TRIP OH3 is set - Early warning is possible via OH7, temperature is set in C0121 - PTC, thermal contact at T1, T2: - Release sets TRIP or warning OH8  8.2-25  8.2-48
C0064	Utilization		0	{1 %}	150	Device utilisation I _{xt} - Read only - Device utilisation during the last 180 s of operating time - C0064 > 100 % releases warning OC5 - C0064 > 140 % limits the output current of the controller to 67 % of the maximum current in C0022  8.2-25  8.2-48
C0066	MOTOR LOAD		0	{1 %}	250	Motor load I ² _{xt}  8.2-25  8.2-48
C0070	Vp speed CTRL	10.0	0.0	{0.1 }	255.9	Gain of speed controller  8.2-25
C0071	Tn speed CTRL	50	1	{1 ms}	6000	Integral-action time of speed controller C0071 = 6000 ms: No integral-action time  8.2-48
C0075	Vp curr CTRL	0.20	0.00	{0.01 }	0.99	Gain of current controller - Vector control: gain of current controller - V/f characteristic control: maximum current controller  8.2-25  8.2-48
C0076	Tn curr CTRL	10.0	0.1	{0.1 ms}	2000.0	Integral-action time of current controller - Vector control: integral-action time of current controller - V/f characteristic control: maximum current controller - C0076 = 2000 ms: current controller is switched off  8.2-25  8.2-48

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0079	Adapt I-CTRL	100.0 0	10.00	{0.01 %}	100.00	Adaption of the current controller ● Evaluation for the reset time T_{ni} of the current controller ● Effective for setpoint = 0 ● Is increased automatically to 100 % up to rated speed ● C0079 = 100 %: no adaption of the reset time ● C0079 < 100 %: – evaluation of the reset time:	 8.2-25  8.2-48
C0082 	Mot Rr	→	0.000	{0.001 Ω}	65.000	Motor rotor resistance → Value is evaluated by motor parameter identification from C0087, C0088, C0089, C0090 and C0091 ● Selection of a motor in C0086 sets the corresponding rotor resistance value	 6.6-1  6.6-14
C0084 	Mot Rs	→	0.00	{0.01 mΩ}	100000.00	Motor stator resistance → Value is determined by motor parameter identification (C0148, C0149)	 6.6-1  6.6-14
C0085 	Mot Lss	→	0.0	{0.1 mH}	6500.0	Motor leakage inductance → Value is evaluated by motor parameter identification (C0148, C0149)	 6.6-1  6.6-14
C0086 	Mot type	→	 Motor selection list			Motor type selection → depending on the controller used ● Motor selection in C0086 sets the corresponding parameters in C0021, C0022, C0081, C0087, C0088, C0089, C0090, C0091	 6.6-1
C0087 	Mot speed	→	50	{1 rpm}	36000	Rated motor speed → depending on C0086 ● Motor selection in C0086 set the corresponding rated motor speed in C0087 ● Change of C0087 sets C0086 = 0	 6.6-1
C0088 	MOT CURRENT	→	0.5	{0.1 A}	500.0	Rated motor current → Depending on C0086 ● Selection of a motor in C0086 sets the corresponding rated motor current in C0088 ● Change of C0088 sets C0086 = 0	 6.6-1
C0089 	Mot frequency	→	10	{1 Hz}	5000	Rated motor frequency → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor frequency in C0089 ● Change of C0089 sets C0086 = 0	 6.6-1
C0090 	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor voltage in C0090 ● Change of C0090 sets C0086 = 0	 6.6-1

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0091 	Mot cos phi	→	0.50	{0.01 }	1.00	Motor cos φ → depending on C0086 - Motor selection in C0086 sets the corresponding motor cos φ in C0091 - Change of C0091 sets C0086 = 0	 6.6-1
C0092 	Mot Ls	→	0.0	{0.1 mH}	6500.0	Motor stator inductance → Value is evaluated by motor parameter identification from C0088, C0089, C0090 and C0091 → Selection of a motor in C0086 sets the corresponding stator inductance value in C0092	 6.6-1
C0095 	Mot Io	→	0.00	{0.01 A}	1000.00	Motor magnetising current → depending on C0086, C0088 and C0091 - Change of C0086, C0088 and C0091 sets C0095 to the Lenze setting - Change of C0095 sets C0086 = 0	 6.6-1  6.11-5
C0105	QSP Tif	5.00	0.00	{0.01 s}	999.90	Quick stop deceleration time The deceleration time refers to a speed variation of C0011 ... 0	 8.2-25  8.2-48
C0107	holding time	0.00	0.00	{0.01 s}	9999.90	Hold time for automatic DC injection braking (Auto-GSB)	 8.2-25  8.2-48
C0132 	Controller enable fly delay	→	0	{1 ms}	9999	Minimum time for controller inhibit with active flying restart circuit, delays the start of the flying restart process after controller enable → depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 A change of one of the codes resets C0132 to the minimum time of the selected motor The time is derived from the double rotor time constant	 8.2-25  8.2-48

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0140 	select direct	0		Search direction during flying restart process - Positive direction of rotation: The motor rotates in CW direction with view on the motor shaft - Negative direction of rotation: The motor rotates in CCW direction with view on the motor shaft  8.2-25  8.2-48
			0 NSET	Only search in the direction of the applied setpoint
			1 inv. Nset	Only search against the direction of the applied setpoint
			2 pos.	Only search in positive direction of rotation
			3 neg.	Only search in negative direction of rotation
			4 Both, Nset	Search at first in the direction of the applied setpoint and then against the direction
			5 Both, inv. Nset	Search at first against the direction and then in the direction of the applied setpoint
			6 Both pos.	Search at first in positive then in negative direction of rotation
			7 Both neg.	Search at first in negative then in positive direction of rotation
C0142	Start options	1		Starting condition for the flying restart circuit  8.2-36
			0 Start lock	- Automatic start is inhibited after - mains connection - Cancel of a message ($t > 0.5\text{ s}$) - Trip reset - Flying restart circuit is inactive - Start after HIGH-LOW-HIGH level change at X5/28  8.2-65
			1 Auto start	Automatic start when X5/28 = HIGH Flying restart circuit is inactive
			2 flying lock	- Automatic start is inhibited after - mains connection - Cancel of a message ($t > 0.5\text{ s}$) - Trip reset - Flying restart circuit is active - Start after HIGH-LOW-HIGH level change at X5/28
			3 Fly restart	Automatic start when X5/28 = HIGH Flying restart circuit is active

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0143	limit 2 kHz	0.0	0.0	{0.1 Hz}		20.0	Speed-dependent switching threshold - Threshold for automatic switching frequency reduction - The controller changes automatically to 2 kHz when this value falls below the threshold  8.2-25  8.2-48
C0145 	select ref	1					Selection of the flying restart mode Reference speed with which the flying restart process is started  8.2-36  8.2-65
			0	REF: C0011			Maximum speed
			1	REF: N-ACT			Last current speed
			2	REF: N-SET			Defined main speed setpoint It is referenced to the setpoint signal at input NSET-N of the function block NSET. If the setpoint signal at input NSET-N is missing, it is referenced to the active JOG setpoint (C0039/x)
C0146	fly current	0	-500	{1}		500	Flying restart circuit, quantity of current during search process - Influences the current injection during search process $\pm 500 \approx \pm 39\%$ of $I_{\max}$ - The initial value amounts to $\approx 8\%$ of $I_{\max}$  8.2-36  8.2-65
C0147	fly dt-f	0	-82	{1}		82	Flying restart circuit, search speed during flying restart process - For drives with great centrifugal masses, reduce the search speed, if required $\pm 82 \triangleq \pm 5.0$ Hz 
C0148 	ident run	0	0	WRK stop	Ready		Motor data identification 1. Inhibit controller, wait until drive has stopped 2. Enter the correct values of the motor nameplate into C0087, C0088, C0089, C0090, C0091 3. Set C0148 = 1, confirm with  4. Enable controller The identification - starts,  goes off. The motor "whistles" but does not rotate! - lasts approx. 1 ... 2 min - is completed when  is lit again 5. Inhibit controller:
			1	WRK run		Start identification	
C0234	damp value	20	-100	{1 %}		100	Influence of the oscillation damping, function block MCTRL - Minimising a tendency to oscillation of the drive - Influences the tendency to oscillation of the drive - When C0025 >1 and C0006 = 1, C0234 is set to 0  8.2-25  8.2-48

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0235	damping	5	1	{1 ms}	600	Filter time of the oscillation damping, function block MCTRL Filter time for the internal signal for oscillation damping	 8.2-25  8.2-48
C0236	damp limit	0.2	0.0	{0.1 Hz}	20.0	Limit value of oscillation damping, function block MCTRL Limit value for the internal signal of oscillation damping	
C0420 	Encoder const	512	1	{1 inc/rev}	8192	Number of increments for incremental encoder at X8 or X9 Connect incremental encoders with HTL-level on X9 only	 6.7-1
C0421 	Enc voltage	5.00	5.00	{0.1 V}	8.00	Supply voltage for the incremental encoder at X8 CAUTION! A wrong entry can destroy the incremental encoder!	
C0497	Nact filter	2.0	0.0	{0.1 ms}	50.0	Filter time constant N _{act} for actual speed value, function block MCTRL2 - Internal filtering of the speed signal for control - C0497 = 0 ms: Switched off	 8.2-48
C0890 	CFG: N-SET	5050	NSET-NOUT  Selection list 1			Configuration of analog input signal, function block MCTRL Speed setpoint	 8.2-25  8.2-48
C0891 	CFG: M-Add	1000	FIXED0%  Selection list 1			Configuration of analog input signal, function block MCTRL Additional torque setpoint or torque setpoint	 8.2-48
C0892 	CFG: Lo-M-LIM	5700	ANEG1-OUT  Selection list 1			Configuration of analog input signal, function block MCTRL Lower torque limit in [%] of C0057	
C0893 	CFG: HI-M-LIM	19523	FCODE-472/3  Selection list 1			Configuration of analog input signal, function block MCTRL Upper torque limit in [%] of C0057	
C0898 	CFG: M-LIM switch	0	0	M-LIM ON	Reduced torque limit is active	Torque limitation in the field weakening range, function block MCTRL If the torque limit is reduced, the maximum possible torque in the field weakening range is lowered with 1/f. This provides a higher motor stability in the field weakening range	 8.2-48
			1	M-LIM OFF	Reduced torque limit is inactive		
C0899 	CFG: N/M-SWT	1000	FIXED0  Selection list 2			Configuration of digital input signal, function block MCTRL - LOW = active speed control - HIGH = active torque control	 8.2-48
C0900 	CFG: QSP	10250	R/L/Q-QSP  Selection list 2			Configuration of digital input signal, function block MCTRL HIGH = drive performs quick stop	 8.2-25  8.2-48

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0901 STOP	CFG: I-SET	1000	FIXED0%	📖 Selection list 1	Configuration of analog input signal, function block MCTRL Setting of integral action component of the speed controller 📖 8.2-48	
C0902 STOP	CFG: I-LOAD	1000	FIXED0	📖 Selection list 2	Configuration of digital input signal, function block MCTRL HIGH = the integral action component at MCTRL-I-SET is accepted by the speed controller	
C0904 STOP	CFG: DC-BREAK	1000	FIXED0	📖 Selection list 2	Configuration of digital input signal, function block MCTRL HIGH = Motor is braked 📖 8.2-25 📖 8.2-48	
C0905	DIS: DC-BREAK		0	1	Function block MCTRL Display of the signal linked in C0904	
C0906			-199.99	{0.01 %}	199.99	Function block MCTRL Display of the signals linked in C0890, C0891, C0892, C0893, C0901 and C0903 📖 8.2-25 📖 8.2-48
	1 DIS: N-SET					
	2 DIS: M-ADD					
	3 DIS: LO-M-LIM					
	4 DIS: HI-M-LIM					
	5 DIS: I-SET					
	6 DIS: BOOST					
C0907			0	1	Function block MCTRL Display of the signals linked in C0899, C0900 and C0902	
	1 reserved					
	2 DIS: N/M-SWT					
	3 DIS: QSP					
	4 DIS: I-LOAD					
C0909	speed limit	1	1	+/- 175 %		Speed limitation, function block MCTRL Limitation of direction of rotation for the speed setpoint 📖 8.2-25 📖 8.2-48
			2	0 ... 175 %		
			3	-175 ... 0 %		
C0910 STOP	CFG: VP-ADAPT	1006	FIXED100%	📖 Selection list 1	Configuration of analog input signal, function block MCTRL - Gain adaptation of the speed controller - If the gain is varying, join to CURVE-OUT of FB CURVE 📖 8.2-25 📖 8.2-48	
C0911	DIS: VP-ADAPT		-199.99	{0.01 %}	199.99	Function block MCTRL Display of the signal linked in C0910
C0912	OV delay time	→	-	{1 ms}	-	Delay time of the pulse enable after an OU message → Depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 A change of one of the codes resets C0912 to the time of the selected motor The time is derived from the double rotor time constant 📖 8.2-25 📖 8.2-48 📖 9.4-3

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0913 	OV handling	0		Value of the motor current during the flying restart process or after an OU message  8.2-25  8.2-48 - When C0913 = 1, the motor is driven with reduced current to the setpoint speed during the flying restart process of after an OU message. - The setting is only effective for the drives EVF9326 ... EVF9333
			0 inactive Non-reduced motor current	
			1 active Reduced motor current	

Speed setpoint selection

- The signal at input MCTRL-N-SET is the speed setpoint in [%] and always refers to the maximum speed (C0011).
- In the most basic configurations, MCTRL-N-SET is connected with the function block NSET (speed setpoint conditioning).
 - It is also possible to connect MCTRL-N-SET with any other analog output signal of an FB.

Speed setpoint limitation

- The speed setpoint at MCTRL-N-SET is always limited to $\pm 100\%$ of the maximum speed $n_{\max}$ (C0011).
- The speed setpoint is converted into a frequency setpoint by the motor control and is limited to a maximum output frequency depending on the chopper frequency f_{chop} .

Chopper frequency f_{chop}	Maximum output frequency
16 kHz	600Hz
8 kHz	300Hz
2/4 kHz	150Hz

Speed control

A PI controller compares the speed setpoint with the actual speed of the motor model and creates a torque setpoint from the speed variation.

- the actual speed is output as an analog signal (in [%] of $n_{\max}$ (C0011)) to MCTRL-NACT.

Parameter setting

Code	Function
C0070	Gain V_p
C0071	Integral-action time T_n

Operation with speed feedback

To change over to operation with external speed feedback, the incremental encoder must be selected via C0025. The external speed feedback serves to operate the motor in all of the four torque/speed quadrants.

Adaptation of the speed controller

Use the input MCTRL-VP-N-ADAPT to change the gain of the speed controller online. The set gain in C0070 is the reference value for an input signal of 100 %.

- By adapting a function block (e.g. CURVE) to MCTRL-VP-N-ADAPT you can influence the gain (C0070).
- In the Lenze setting the adaptation is deactivated.

Behaviour when speed setpoint = 0

If the speed setpoint = 0 (MCTRL-N-SET = 0) and actual speed value ≈ 0 (MCTRL-NACT ≈ 0), the speed controller is switched off. The motor merely receives its magnetising current.

Behaviour in braking operation at very low speed



Stop!

A longer-lasting braking operation with very low speed can lead to an unstable vector control. Remedy:

- Passing through the critical speed range more quickly.
- Using speed feedback.

Temperature detection

For motors with temperature detection (KTY83-110) the controller can consider temperature changes in its motor model. The accuracy and stability of the vector control are improved considerably.

- ▶ Sensor connection:
 - X8/5 = -KTY (rt/ws/bl)
 - X8/8 = +KTY (br/gr/sw)



Note!

You can also use the thermal sensor (KTY) without speed feedback.

- ▶ When monitoring SD6 (C0594) is activated, temperature feedback is activated at the same time.
- ▶ First, activate the temperature feedback and then start the motor identification to consider the motor temperature.
- ▶ In addition, you can activate and parameterise the monitoring functions OH3 (C0583) and OH7 (C0584).
- ▶ The current motor temperature can be displayed via C0063.

Setting integral action component

To initialise the speed controller with a starting torque, the integral action component of the speed controller can be described via MCTRL-I-SET (starting value) and MCTRL-I-LOAD (control signal).

Input signal	Effect
MCTRL-I-LOAD = HIGH	• The speed controller transmits the value at MCTRL-I-SET to its integral action component • The P component is switched off
MCTRL-I-LOAD = LOW	The speed controller is active

Torque limitation in the field weakening range

The function is suitable for applications which also require a constant torque in the field weakening range.

- ▶ With quick stop (QSP) the torque limitation becomes inactive.
- ▶ When the motor torque reaches the defined limit, the drive cannot follow the speed setpoint anymore and the output MCTRL-MMAX is set to HIGH.

External setting of torque limits

If the maximum torque reached in the field weakening operation is too low, the torque limits can be changed via the inputs MCTRL-HI-M-LIM and MCTRL-LO-M-LIM.

- ▶ MCTRL-HI-M-LIM defines the upper torque limit in [%] of the maximum torque displayed in C0057.
Maximum possible input value: 199.99 %
- ▶ MCTRL-LO-M-LIM defines the lower torque limit in [%] of the maximum torque displayed in C0057.
Minimum possible input value: -199.99 %



Note!

The maximum possible torque displayed under C0057 refers to the basic speed range (zero speed to rated speed of the motor) and is calculated from the nameplate data and the setting of the maximum motor current under C0022.

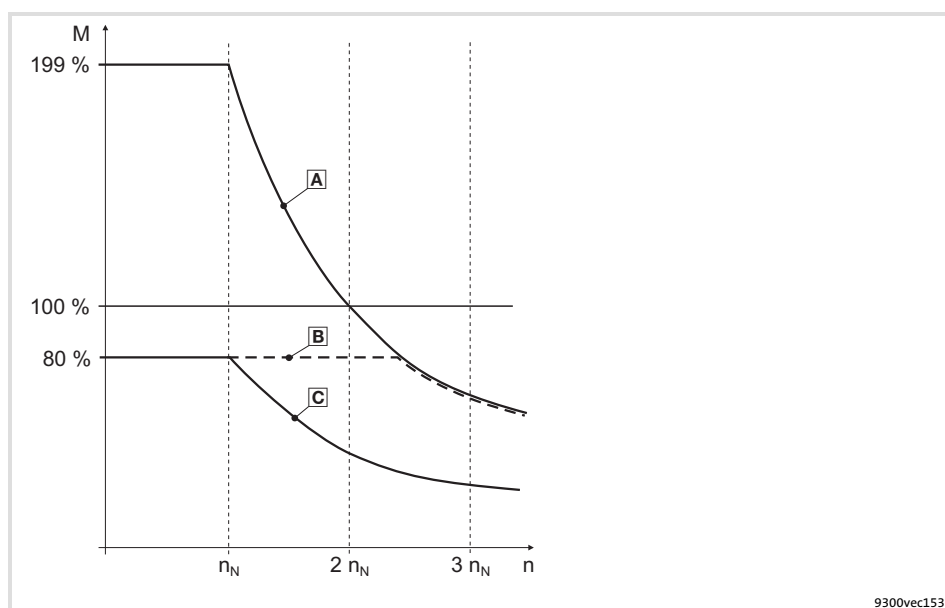


Fig. 8.2-22 Torque characteristics when being evaluated with C0898

- A** "Internal limit characteristic" when C0898 = 1 and MCTRL-HI-M-LIM = 199 %
Boost of the upper torque limit when MCTRL-HI-M-LIM = 199 % and C0898 = 0
- B** Torque characteristic when C0898 = 1 and MCTRL-HI-M-LIM = 80 %
- C** Torque characteristic when C0898 = 0 and MCTRL-HI-M-LIM = 80 %

Evaluating torque limits using C0898

Code C0898 serves to evaluate the defined torque limits at the inputs MCTRL-LO-M-LIM and MCTRL-HI-M-LIM using the function $1/f_{act}$. This serves to reduce the torque.

Selection	Code	Description
Evaluation of the torque limit in the field weakening range	C0898 = 0	Lenze setting The input signals at MCTRL-LO-M-LIM and MCTRL-HI-M-LIM are evaluated with $1/f_{act}$.
	C0898 = 1	An "internal limit characteristic" which corresponds to a maximum torque limit of $\pm 199,99\%$ is evaluated with $1/f_{act}$. - The torque remains constant until the limit characteristic is reached. This requires that the controller provides a sufficient amount of current and the motor is stable within the required speed range. - The input signals at MCTRL-LO-M-LIM and MCTRL-HI-M-LIM are not evaluated with $1/f_{act}$.

Limitation of the output current

The output current is mainly limited for protecting the controller and stabilising the drive control.

If the maximum permissible motor load is exceeded, the maximum output current of the controller must be adjusted accordingly.

Parameter setting

Code	Function
C0022	Maximum current in motor mode
C0023	Maximum current in generator mode

If you select a motor via C0086 the maximum current of which is much lower than the output current of the controller, the maximum current in motor mode (C0022) is automatically limited to the double rated motor current.

Mode of functioning

In the vector control mode the limit values are complied with by means of the automatic limitation of the speed controller.

The speed controller is limited if the motor current has reached the limit set under C0022 or C0023 (the controller supplies the max. output current). In this status

Consequences

- ▶ The motor cannot follow the speed setpoint.
- ▶ MCTRL-IMAX is set to HIGH.
- ▶ When selecting the automatic chopper frequency setting (C0018 = 0 or 6) a switch-over to a lower chopper frequency is carried out, so that the unit will not be switched off.

Torque control with speed limitation

As an alternative to the speed control, the vector control can be switched to torque control with speed limitation.

**Note!**

In the basic configurations C0005 = 4xxx the torque control with speed limitation is already set.

- ▶ When MCTRL-N/M-SWT = HIGH, the torque control with speed limitation is active.
 - The torque control with torque setpoint selection via MCTRL-M-ADD is active.
 - MCTRL-M-ADD acts as a bipolar torque setpoint.
 - The sign of the speed limitation value at MCTRL-N-SET is automatically created from the sign of the torque setpoint at MCTRL-M-ADD. Thus, the speed limitation value acts in both directions of rotation.
 - The actual torque is output as analog signal (in [%] of $M_{\max}$ (C0057)) to MCTRL-MACT.

**Stop!**

If the motor is to create a holding torque at standstill, the torque setpoint must not fall below a certain limit.

- ▶ Depending on the motor type and accuracy of the identified motor parameters, the vector control can become unstable if the torque setpoint $< 10\% \dots 20\%$.
- ▶ Operate the motor with speed feedback when the required holding torque is within the critical region.

**Automatic speed detection
after controller enable - flying
restart circuit**

The flying restart circuit is especially suitable for applications with fan and drives with great mass inertia.

The flying restart circuit serves to enable the controller although the motor still rotates. The flying restart circuit automatically detects the current motor speed using this speed to start the motor control. This prevents the motor from braking to zero speed with subsequent acceleration.

Use C0140 to determine the search direction during the flying restart process.

- If the direction of rotation of the coasting machine is known, you can search in the direction of rotation or in the direction of the applied setpoint.
- If the direction of rotation of the coasting machine is not known, you can search in both directions of rotation or in both directions of the applied setpoint.

In case of applications with fan, for example, search is possible in both directions if the direction of rotation of the free-running fan impeller is not known due to the air flow.



Note!

- The flying restart circuit is optimised for a power-adapted motor. Thus, the rated motor current should not exceed the rated controller current.
- Although the flying restart circuit is activated (C0142 = 2 or C0142 = 3), the flying restart process does not start if the pulse inhibit is deactivated again after an OU message.

In order to start the flying restart process, connect e.g. the input DCTRL-CINHx with the output signal MONIT-OU. An OU message causes an internal controller inhibit. When the controller inhibit is deactivated, the flying restart process is started.

Special features of vector control

- With a known motor speed there is no need of the flying restart circuit if a suitable setpoint becomes effective instantaneously after controller enable (e.g. assign setpoint to NSET-CINH-VAL).
- By selecting a suitable setpoint the flying restart processes can be reduced to approx. 200 ms.
- For operation with feedback there is no need to activate the flying restart circuit as the signal as the signal MCTRL-NACT acts as the setpoint at NSET-CINH-VAL.

Setting

Selection	Code	Description
Search direction during flying restart process	C0140 = 0	Lenze setting Only search in the direction of the applied setpoint
	C0140 = 1	Only search against the direction of the applied setpoint
	C0140 = 2	Only search in positive direction of rotation
	C0140 = 3	Only search in negative direction of rotation
	C0140 = 4	Search at first in the direction of the applied setpoint and then against the direction
	C0140 = 5	Search at first against the direction and then in the direction of the applied setpoint
	C0140 = 6	Search at first in positive then in negative direction of rotation
	C0140 = 7	Search at first in negative then in positive direction of rotation
Reference speed for starting the search process	C0145 = 0	Flying restart circuit referenced to the maximum speed (C0011). Recommended when the motor speed is unknown
	C0145 = 1	Lenze setting Flying restart circuit referenced to the last current motor speed
	C0145 = 2	Speed setpoint, recommended when motor speed is known
Value of current during search process	C0146	Influences the value of current during the search process. Reduce the value in case of motors with low centrifugal mass (speed already increases during search process).
Search speed	C0147	Influences the search speed. A search process takes approx. 1 ... 2 s. It may be required to reduce the search speed to achieve a successful search process (reduce value).

Activation

Selection	Code	Description
Start protection	C0142 = 0	The flying restart circuit is inactive. protection against unexpected start-up means that a restart requires signal change for enabling the controller (e. g. LOW-HIGH edge at X5/28).
Automatic start	C0142 = 1	Lenze setting Automatic start, flying restart circuit is inactive
Start after deactivating the switch-on inhibit	C0142 = 2	Flying restart circuit is started after resetting LIMP (mains connection, cancel of messages, (t > 0.5 s) or TRIP RESET) and renewed controller enable (e. g. LOW-HIGH edge at X5/28)
Starting without protection against unexpected start-up	C0142 = 3	Flying restart circuit gets active immediately. No renewed controller enable required (e. g. LOW-HIGH edge at X5/28).

Flying restart circuit with protection against unexpected start-up (C0142 = 2):

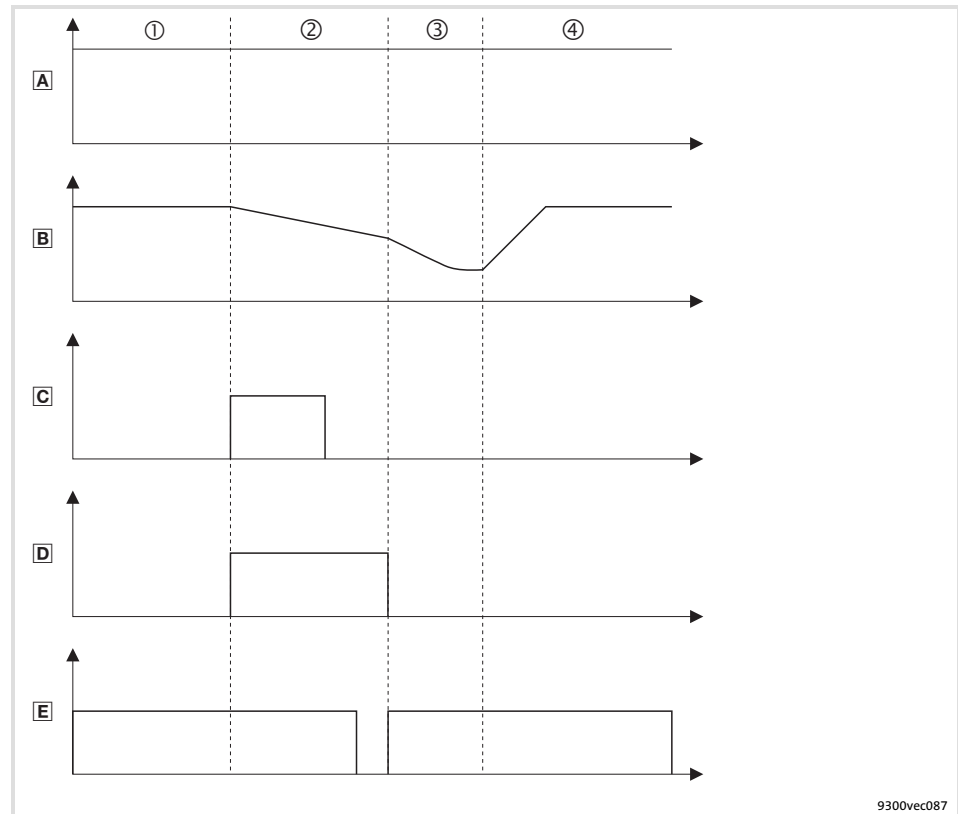


Fig. 8.2-23 Signal characteristic for manual start with flying restart circuit (C0142 = 2)

- A** Speed setpoint (e.g. AIN-OUT)
- B** Actual speed value
- C** Fault (e.g. DCTRL-FAIL = HIGH)
- D** Pulse inhibit (e.g. DCTRL-IMP = HIGH)
- E** Enable controller (e.g. X5/28 = HIGH)

① The motor rotates with setpoint

② A fault (e.g. mains failure, TRIP SET) activates a pulse inhibit **IMP**. The motor coasts. After eliminating the fault (e.g. mains recovery, TRIP RESET) the pulse inhibit remains active until the controller is enabled again (e.g. LOW-HIGH edge at X5/28)

Important in case of an OU message: if the OU message is not pending anymore, the pulse inhibit is deactivated.

③ The flying restart circuit is active now and determines the current motor speed

④ The motor is accelerated along the set acceleration ramp to the speed setpoint and is being kept there

Flying restart circuit without protection against unexpected start-up (C0142 = 3):

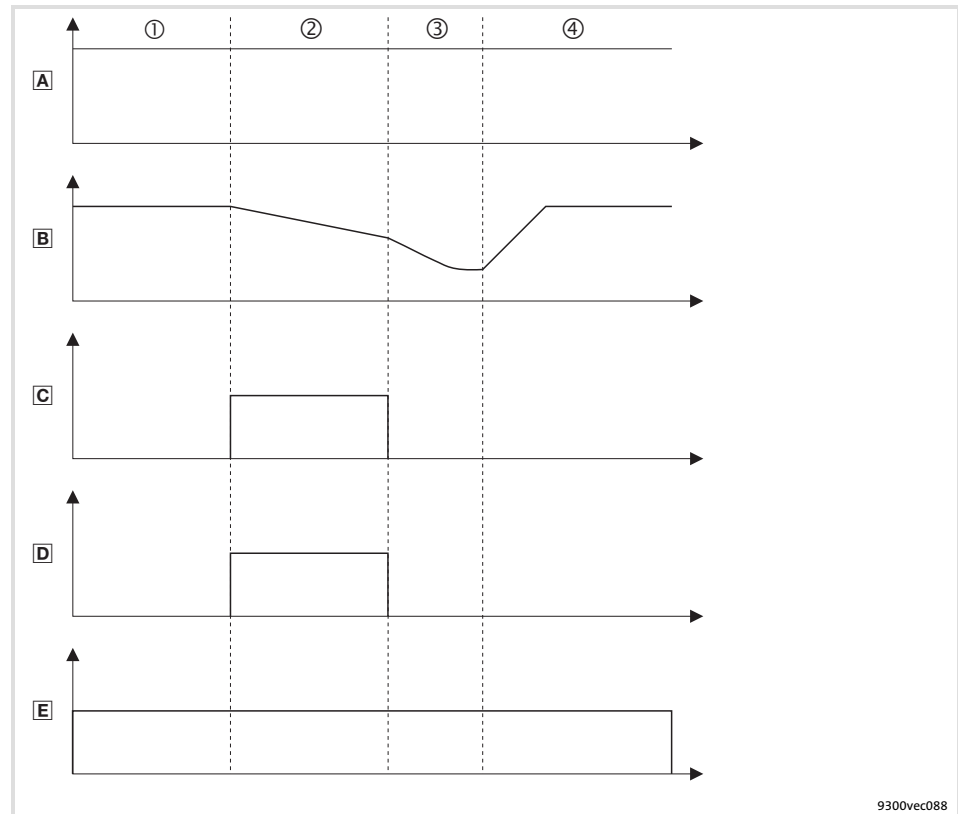


Fig. 8.2-24 Signal characteristic for automatic start with flying restart circuit (C0142 = 3)

- A** Speed setpoint (e.g. AIN-OUT)
- B** Actual speed value
- C** Fault (e.g. DCTRL-FAIL = HIGH)
- D** Pulse inhibit (e.g. DCTRL-IMP = HIGH)
- E** Enable controller (e.g. X5/28 = HIGH)
- ① The motor rotates with setpoint
- ② A fault (e.g. mains failure, TRIP SET) activates a pulse inhibit **IMP**. The motor coasts. After eliminating the fault (e.g. mains recovery, TRIP RESET) the pulse inhibit is deactivated.
- ③ The flying restart circuit is active now and calculates the current motor speed. If, after an OU message, the pulse inhibit is deactivated again, the flying restart circuit is not started.
- ④ The motor is accelerated along the set acceleration ramp to the speed setpoint and is being kept there

Quick stop (QSP)

After a signal, the motor is decelerated to standstill when an internal ramp function generator has been activated.

Mode of operation

- ▶ Quick stop is active
 - MCTRL-QSP = HIGH
 - The control word DCTRL-QSP is applied
 - DC injection braking (GSB) is not active (GSB has priority over quick stop)
- ▶ When quick stop is active:
 - the motor decelerates to standstill with the deceleration time set in C0105,
 - A torque control is deactivated and the motor is controlled by the speed controller.
 - The torque limitations MCTRL-LO-M-LIM and MCTRL-HI-M-LIM are deactivated.
 - MCTRL-QSP-OUT is set to HIGH.



Note!

When the motor is at standstill, the field current is injected into the motor.

Manual DC injection braking

- ▶ After a signal, the motor is braked by injecting a DC current.
- ▶ Braking in generator mode must be used for controlled brake ramps.
- ▶ The hold time (C0107) has no influence. The motor remains braked until MCTRL-GSB is set to LOW.

**Note!**

Manual DC injection braking has priority over quick stop.

Special features of vector control with feedback

- ▶ If the DC braking current (C0036) $\leq$ than the motor magnetising current, the motor magnetising current is injected.
- ▶ If the DC braking current (C0036) $>$ than the motor magnetising current, the DC braking current is injected.

Setting

Selection	Code	Description
DC braking current	C0036	DC braking current with which the motor is braked

**Stop!**

An excessive DC braking current and braking time can thermally overload the motor. Special care must be taken when using self-ventilated motors.

Activation

The input MCTRL-GSB in the function block MCTRL is triggered with HIGH level.

- ▶ MCTRL-GSB = HIGH: Function is activated
- ▶ MCTRL-GSB = LOW: Function is not activated

Function procedure

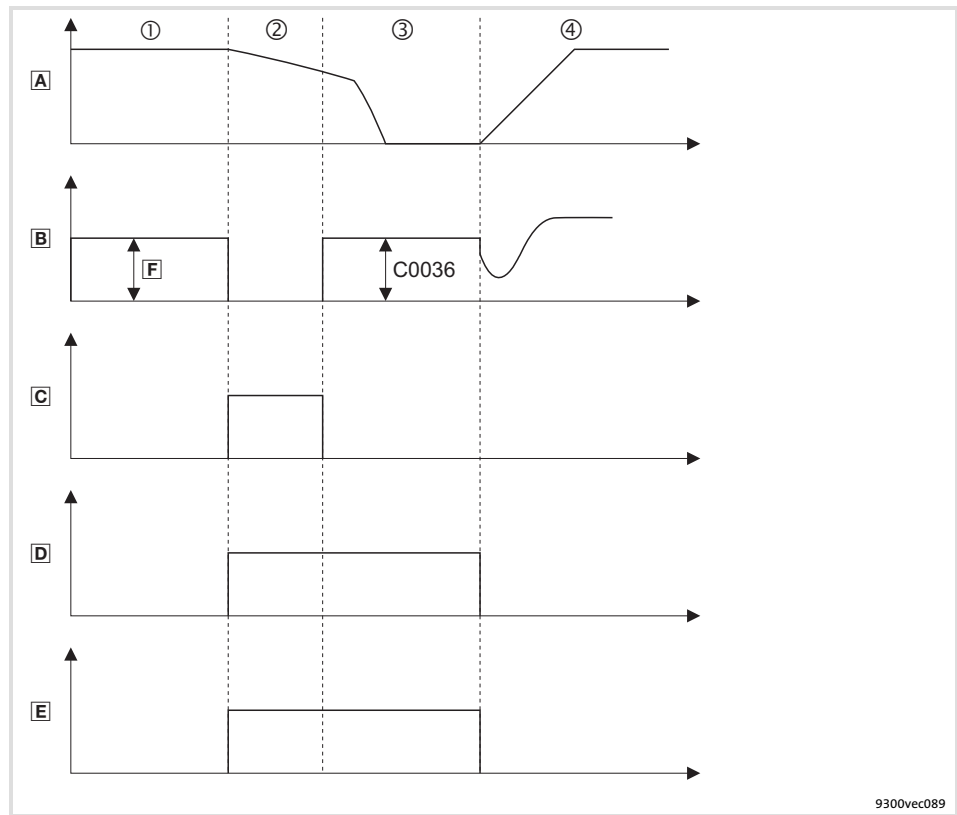


Fig. 8.2-25 Signal sequence with DC injection braking

- A** Actual speed value of the motor (e. g. MCTRL-NACT)
 - B** Controller output current (e. g. MCTRL-IACT)
 - C** Pulse inhibit (e. g. DCTRL-IMP)
 - D** Activating DC injection braking (MCTRL-GSB)
 - E** DC injection braking is active (MCTRL-GSB-OUT)
MCTRL-GSB-OUT = HIGH: Function is active
MCTRL-GSB-OUT = LOW: Function is not active
- ① The motor rotates with the preset speed. The current adjusts itself as a function of the load **F**.
 - ② DC injection braking is activated with MCTRL-GSB = HIGH. Pulse inhibit **IMP** is set. The motor coasts.
 - ③ The pulse inhibit is deactivated and the DC braking current set in C0036 is injected
 - ④ DC injection braking is deactivated with MCTRL-GSB = LOW
The motor is accelerated to speed setpoint at the set acceleration ramp and is kept there.

**Automatic DC injection
braking**

When the speed falls below a settable speed setpoint threshold, the function "DC injection braking" is activated.

**Note!**

Automatic DC-injection braking has priority over quick stop.

Special features of vector control with feedback

- ▶ If the DC braking current (C0036) $\leq$ than the motor magnetising current, the motor magnetising current is injected.
- ▶ If the DC braking current (C0036) $>$ than the motor magnetising current, the DC braking current is injected.

Setting

Selection	Code	Description
DC braking current	C0036	DC braking current with which the motor is braked
Speed setpoint threshold	C0019	If the values fall below the threshold, DC-injection braking is released
Hold time	C0107	Duration of DC-injection braking. After the hold time, pulse inhibit is set.

**Stop!**

An excessive DC braking current and braking time can thermally overload the motor. Special care must be taken when using self-ventilated motors.

Function procedure

Automatic DC injection braking provides two function procedures, each with a different reaction of the controller. The parameter setting is identical for both function procedures.

Function procedure 1:

- After the hold time has elapsed (C0107), the controller automatically sets pulse inhibit **IMP**.

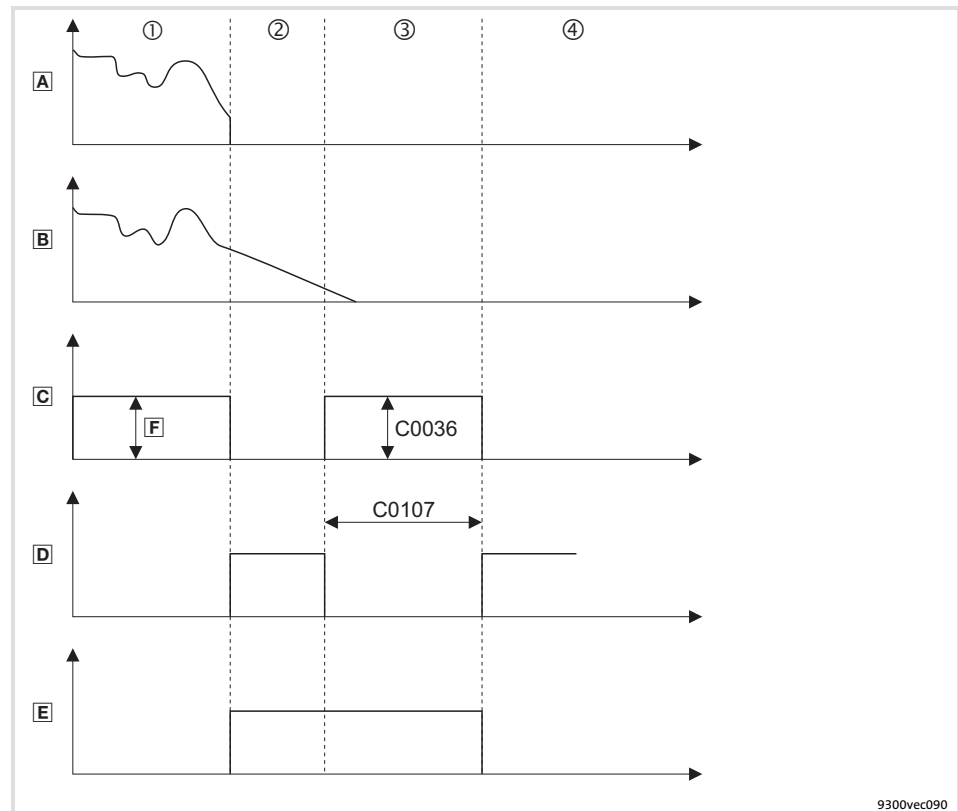


Fig. 8.2-26 Signal characteristic with automatic DC injection braking

- Ⓐ Speed setpoint (e. g. AIN-OUT)
- Ⓑ Actual speed value of the motor (e. g. MCTRL-NACT)
- Ⓒ Controller output current (e. g. MCTRL-IACT)
- Ⓓ Pulse inhibit (e. g. DCTRL-IMP)
- Ⓔ DC injection braking is active (MCTRL-GSB-OUT)
MCTRL-GSB-OUT = HIGH: Function is active
MCTRL-GSB-OUT = LOW: Function is not active
- ① The motor rotates with the preset speed. The current adjusts itself as a function of the load **F**.
- ② With a speed setpoint < speed threshold (C0019), DC injection braking is activated. Pulse inhibit **IMP** is set. The motor coasts.
- ③ The pulse inhibit is deactivated and the DC braking current set in C0036 is injected
- ④ After the hold time (C0107) pulse inhibit **IMP** is set

Function procedure 2:

- If you define a speed setpoint > speed threshold (C0019) before the hold time elapses, DC-injection braking is deactivated and the drive follows the speed setpoint. If the speed falls below the threshold again, DC-injection braking is reactivated and the hold time is restarted.

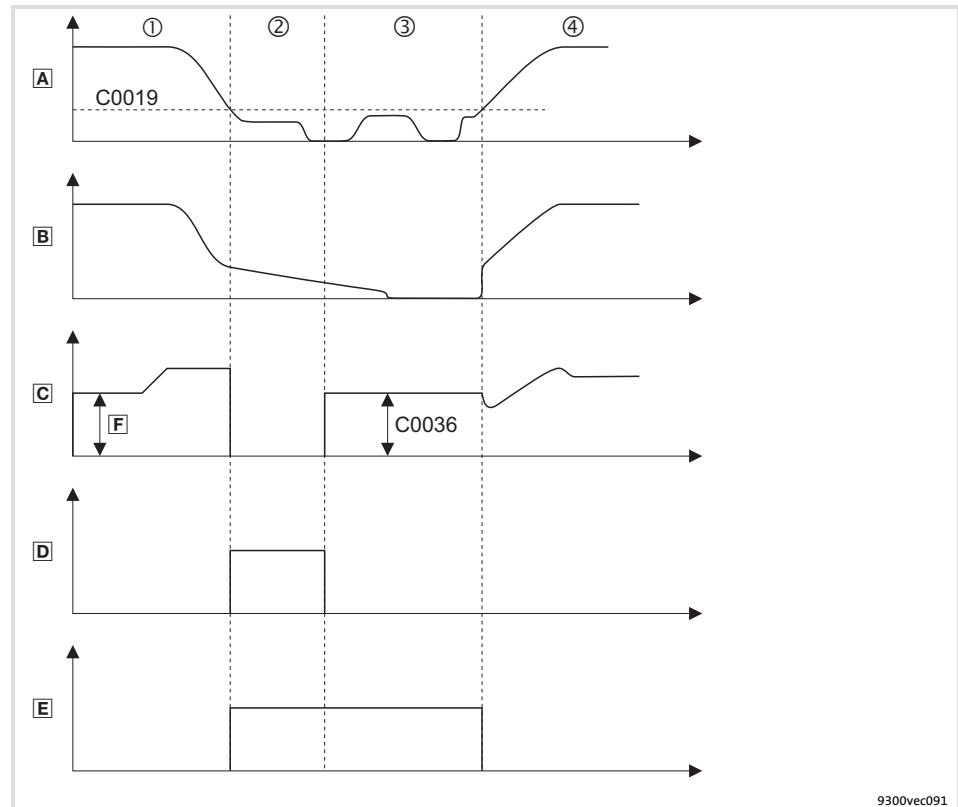


Fig. 8.2-27 Signal characteristic with automatic DC injection braking

- Ⓐ Speed setpoint (e. g. AIN-OUT)
 - Ⓑ Actual speed value of the motor (e. g. MCTRL-NACT)
 - Ⓒ Controller output current (e. g. MCTRL-IACT)
 - Ⓓ Pulse inhibit (e. g. DCTRL-IMP)
 - Ⓔ DC injection braking is active (MCTRL-GSB-OUT)
MCTRL-GSB-OUT = HIGH: Function is active
MCTRL-GSB-OUT = LOW: Function is not active
- ① The motor rotates with the preset speed. The current adjusts itself as a function of the load **F**.
 - ② With a speed setpoint < speed threshold (C0019), DC injection braking is activated. Pulse inhibit **IMP** is set. The motor coasts.
 - ③ The pulse inhibit is deactivated and the DC braking current set in C0036 is injected
 - ④ DC-injection braking is deactivated as soon as the speed setpoint exceeds the speed threshold (C0019). The motor is accelerated to the defined speed setpoint and kept there.

Oscillation damping

Suppressing no-load oscillations in case of:

- ▶ Drives with different rated power of controller and motor, e. g. when operating with high switching frequency and the power derating involved.
- ▶ Operation of higher-pole motors.
- ▶ Operation of three-phase AC drives > 10 kW.

Compensation of resonances in the drive kit:

- ▶ Certain asynchronous motors may show this behaviour above $\frac{1}{3}$ of the rated speed ($\frac{1}{3} \cdot n_n$). This may result in an unstable operation (current and speed variations).

Adjustment

The Lenze setting is designed for power-adapted motors.

Usually, the speed oscillations can be reduced by changing the Lenze setting of the codes C0234 oder C0236 by the factor 2 ... 5.

1. Approach the range with speed oscillations.
 2. Change the influence of the oscillation damping in C0234 (generally, increase it).
 3. Increase the limitation of the oscillation damping in C0236.
 4. Change filter time in C0235 in the range of 1 ... 20 ms, if necessary.
- ▶ These can be indicators for smooth running:
 - Constant motor current characteristic
 - Reduction of the mechanical oscillations in the bearing seat



Note!

Restricted effect with vector control

- ▶ The oscillation damping has no influence on the drive behaviour at low tendency to oscillation of the speed controller.
- ▶ Especially for drives > 55 kW with a tendency to oscillation it may be necessary to deactivate the oscillation damping (C0234 = 0 %).
- ▶ For operation with feedback the oscillation damping has no influence.

Slip compensation

Vector control

Use C0021 to change the influence of the rotor resistance (C0082) proportionally:

- ▶ Reduce the value in C0021 at an increasing speed (negative values)
- ▶ Increase the value in C0021 at a decreasing speed

**Note!**

When setting the vector control mode, the slip compensation (C0021) is automatically set to 0.0 %.

- ▶ When you switch back to the V/f characteristic control mode, the slip compensation must be re-adapted.

Inhibiting the direction of rotation

If the motor may only rotate in one direction, you can limit the output voltage generation to one direction of rotation via C0909.

Code	Description
C0909 = 1	The motor rotates in both directions
C0909 = 2	Motor rotates clockwise, "positive direction of rotation" (View of the motor shaft)
C0909 = 3	Motor rotates counter-clockwise, "negative direction of rotation" (View of the motor shaft)

8.3 Monitoring

Various monitoring functions (▢ 8.41) protect the drive system against impermissible operating conditions.

If a monitoring function responds,

- the set fault response is triggered to protect the drive and
- the fault message is entered at position 1 in the fault history buffer (C4168/x) (▢ 9.2-1).

8.3.1 Fault responses

Depending on the failure, one or more of the following responses are possible:

Response	Effects on the drive and controller	Danger warnings				
TRIP (highest priority)	• Switches the power outputs U, V, W to a high resistance until TRIP is reset • The drive coasts (no control!). • After TRIP reset, the drive accelerates to its setpoint on the ramps set.					
Message	Switches the power outputs U, V, W to a high resistance as long as the message is active. <table><tr><td> • Short-time message ≤ 0.5 s </td><td> The drive coasts (no control) as long as the message is active. If the message is no longer available, the drive accelerates to its setpoint with maximum torque. </td></tr><tr><td> • Longer message > 0.5 s </td><td> The drive coasts (due to internal controller inhibit) as long as the message is active. If required, restart the drive. </td></tr></table>	• Short-time message ≤ 0.5 s	The drive coasts (no control) as long as the message is active. If the message is no longer available, the drive accelerates to its setpoint with maximum torque.	• Longer message > 0.5 s	The drive coasts (due to internal controller inhibit) as long as the message is active. If required, restart the drive.	Danger! The drive restarts automatically if the message is no longer available.
• Short-time message ≤ 0.5 s	The drive coasts (no control) as long as the message is active. If the message is no longer available, the drive accelerates to its setpoint with maximum torque.					
• Longer message > 0.5 s	The drive coasts (due to internal controller inhibit) as long as the message is active. If required, restart the drive.					
Warning	• Only display of the failure. • The drive operates in a controlled manner.	Stop!				
Off	• No response on failures! Monitoring is deactivated.	As these responses have no effect on the drive behaviour, the drive can be destroyed.				

8.3.2 Monitoring times for process data input objects

Each process data input object can monitor whether a telegram has been received within a time set. As soon as a telegram arrives, the corresponding monitoring time (C0357) is restarted ("retriggerable monoflop" function).

The following assignments are valid:

Setting the response to the monitoring:

- ▶ C0591 for CAN1_IN ("CE1")
- ▶ C0592 for CAN2_IN ("CE2")
- ▶ C0593 for CAN3_IN ("CE3")

The following can be set:

- ▶ 0 = error (TRIP) - controller sets controller inhibit (CINH)
- ▶ 2 = warning
- ▶ 3 = monitoring is switched off

You can also use the signals as binary output signals, e. g. for the assignment of the output terminal.

Bus off

If the controller disconnects from the CAN bus due to faulty telegrams, the "BusOffState" (CE4) signal is set.

"BusOffState" can trigger an error (TRIP) or warning (like CE1, CE2, CE3). You can also switch the signal off. The response is set via C0595. You can also assign the terminal output.

Reset node

Changes with regard to the baud rates, the CAN node addresses, or the addresses of process data objects are only valid after a reset node.

The reset node can be effected by:

- ▶ A reconnection of the low-voltage supply
- ▶ Reset node via the bus system
- ▶ Reset node via C0358

8.3.3 Maximum speed



Stop!

Destruction of the drive!

- ▶ If the fault is triggered, the drive is without torque.
- ▶ In the event of an actual speed value encoder failure it is not guaranteed that the monitoring responds.

Protective measures:

- ▶ Use a mechanical brake if necessary.
- ▶ Special, system-specific measures are to be taken.

The NMAX fault is triggered if the system speed (MCTRL-NACT)

- ▶ exceeds the value set under C0596 or
- ▶ exceeds the maximum speed $n_{\max}$ (C0011) by twice the max. speed value.

A fault initiates TRIP NMAX. Other responses cannot be set.

8.3.4 Motor

Overcurrent in the motor cable (OC1)

Fault OC1 is triggered if the motor current exceeds the 2.25-fold rated controller current.

If a fault occurs, TRIP OC1 is triggered. Other responses cannot be set.

Earth fault in the motor cable (OC2)

Fault OC2 is activated in the case of a

- ▶ Short circuit to frame of the motor,
- ▶ Short circuit of a phase to the shield,
- ▶ Short circuit of a phase to PE,
- ▶ Too high capacitive charging current of the motor cable.

The response can be defined in C0574.

Overload during acceleration or deceleration (OC3)

Fault OC3 is activated in the case of a too great load during acceleration. The acceleration times or deceleration times (C0012, C0013, C0105) are set too short in proportion to the load.

If a fault occurs, TRIP OC3 is activated. Other responses cannot be set.

Failure of a motor phase (LP1)

If a current-carrying motor phase fails, a motor winding is broken or the current limit value set in C0599 is too high, the LP1 fault is triggered.

The monitoring is not appropriate for field frequencies > 480 Hz and when synchronous servo motors are used. Deactivate the monitoring at these conditions.

The response to exceeding the thresholds can be set under C0597.

**Note!**

The monitoring can only be activated if the function block MLP1 is entered in the processing table (C0465).

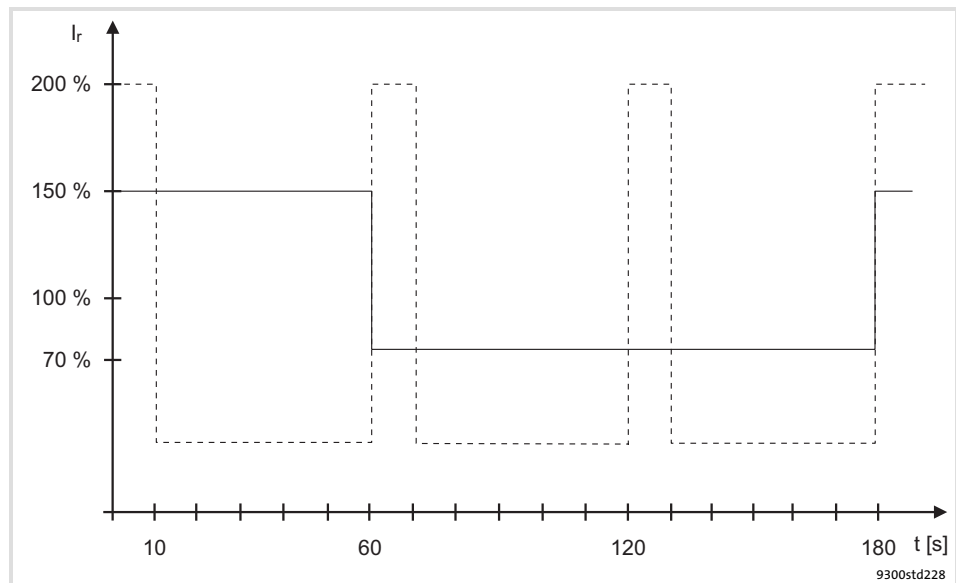
8.3.5**Controller current load (I x t monitoring)**

Fig. 8.3-1 I x t diagram

I_r	Device output current
—	100 % continuous thermal current at $C0022 \leq 1.5 I_r$
- - - -	70 % continuous thermal current at $C0022 > 1.5 I_r$

The I x t monitoring monitors the current load of the controller. The current load is calculated from the mean value of the motor current over the acquisition period of 180 s.

The monitoring is set in such a way that the following operation modes are possible:

- Continuously with device output current = I_r .
- ≤ 60 s with device output current $\leq 1.5 \times I_r$.

A fault initiates TRIP OC5. Other responses cannot be set.

8.3.6 Motor temperature

KTY at X7 or X8

The motor temperature is monitored by means of a KTY. Connect the thermal sensor to the resolver cable at X7 or the encoder cable at X8.

- ▶ Warning threshold (OH7) can be set via C0121
 - The switch-on point is 5 °C below the threshold set.
- ▶ Fixed warning threshold (OH3) = 150 °C
 - The switch-on point is 135 °C.

The response for the case when the thresholds are exceeded can be defined in:

- ▶ C0584 (adjustable threshold)
- ▶ C0583 (fixed threshold)



Stop!

With the setting C0583 = 3, monitoring is deactivated. The motor temperature in C0063 shows 0 °C, even if C0584 = 2 (warning) is set.

Monitoring of the KTY at X7 or X8

The SD6 fault is triggered if there is a short or open circuit between X7/8 and X7/9 or X8/5 and X8/8.

The response can be set under C0594.

PTC thermistor or thermal contact (NC contact) at T1, T2

The motor temperature is monitored with a PTC thermistor or thermal contact. Wire the temperature sensor to T1, T2.

- ▶ Fixed warning threshold (OH8)
 - The switch-off threshold and the hysteresis depend on the temperature sensor (DIN 44081).

The response to exceeding the threshold can be set under C0585.



Stop!

Motor could be destroyed!

- ▶ If the responses "Warning" or "Off" are set, the motor could be destroyed by overload.

Protective measure:

- ▶ Set the response "TRIP".

8.3.7

Current load of motor ($I^2 \times t$ monitoring: OC6, OC8)

The $I^2 \times t$ -load of the motor is constantly calculated by the drive controller and displayed in C0066.

The $I^2 \times t$ -monitoring is designed in a way, that a motor with a thermal motor time factor of 5 min, a motor current of $1.5 \times I_r$ and a trigger threshold of 100 % releases the monitoring after 179 s.

You can set different reactions with two adjustable trigger thresholds.

- Adjustable reaction OC8 (TRIP, Warning, Off).
 - The reaction is set in C0606.
 - The trigger threshold is set in C0127.
 - The reaction OC8 can be used for example for an advance warning.
- Fixed reaction OC6-TRIP.
 - The trigger threshold is set in C0120.

Response of the $I^2 \times t$ -monitoring	Condition
The $I^2 \times t$ -monitoring is deactivated. C0066 = 0 % and MCTRL-LOAD-I2XT = 0,00 % is set.	Set the controller inhibit at C0120 = 0 % and C0127 = 0 %.
The $I^2 \times t$ -monitoring is stopped. The actual value in C0066 and at the MCTRL-LOAD-I2XT output is held.	Allow controller release at C0120 = 0 % and C0127 = 0 %.
The $I^2 \times t$ -monitoring is deactivated. The motor load is displayed in C0066.	Set C0606 = 3 (Off) and C0127 > 0 %.

**Note!**

An OC6 or OC8 error message can only be reset if the $I^2 \times t$ -monitoring has fallen below the set trigger threshold by 5 %.

Calculating the release time

$$t = - (C0128) \cdot \ln \left[1 - \frac{y + 1}{\left(\frac{I_M}{I_r} \right)^2 \cdot 100} \right]$$

I_M Actual motor current
 I_r Rated motor current
 y C0120 or C0127

- The thermal capacity of the motor is expressed by the thermal motor time factor (C0128). Please see the rated data of the motor for the value or ask the manufacturer of the motor.

Reading the release time off the diagram

Diagram for the determination of the release times of a motor with a thermal motor time factor of 5 min:

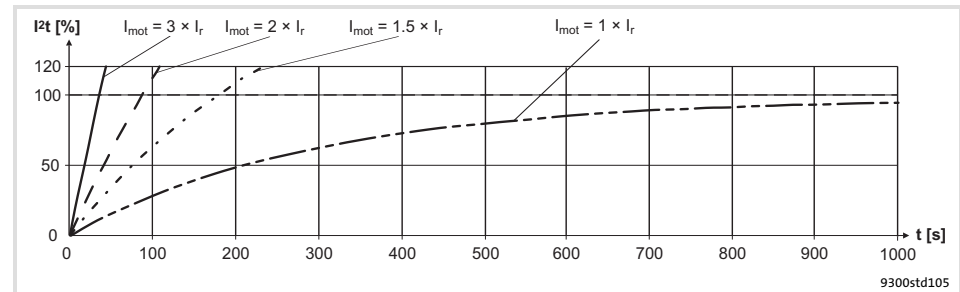


Fig. 8.3-2 $I^2t \times t$ -monitoring: Release times for different motor currents and trigger thresholds

I_{mot}	Motor current
I_r	Rated motor current
I^2t	I^2t load
T	Time

8.3.8 Heatsink temperature

Via a temperature threshold, the heatsink temperature of the controller can be monitored:

- Adjustable threshold (OH4) under C0122
 - The reset point is 5° C below the adjusted threshold.
- Fixed threshold (OH) = 85° C
 - The reset point is at 80° C.

The response for exceeding the adjustable threshold can be set under C0582.

8 Configuration

8.3 Monitoring

8.3.9 DC-bus voltage

In C0173 the mains voltage and DC-bus voltage are set. From this the switching thresholds for overvoltage and undervoltage result.

EVF9335 ... EVF9338 EVF9381 ... EVF9383	Selection	Mains voltage	Operation with brake transistor	Message LU (undervoltage)		Message OU (overvoltage)	
	C0173	[V AC]		set [V DC]	reset [V DC]	set [V DC]	reset [V DC]
ExV210 ExV240 ExV270 ExV300	0	< 400	yes / no	285	430	770	755
	1	400	yes / no	285	430	770	755
	2	460	yes / no	328	473	770	755
	3	480	no	342	487	770	755
	4	480	yes	342	487	800	785
	5	500	yes / no	342	487	900	885
Ex ExV060 ExV110	read only	400	yes / no	285	430	700	685

C0173 = 1: Lenze setting

Overvoltage

If the DC-bus voltage exceeds the upper switch-off threshold set in C0173, warning OU is activated.

Undervoltage

If the DC-bus voltage falls below the lower switch-off threshold set in C0173, the LU message is triggered.

- An undervoltage message > 3 seconds is interpreted as an operating state (e.g. mains switched off) and entered in the history buffer. The entry is, however, deleted as soon as the cause has been eliminated (e.g. mains switched on again).

This operating state can occur if the control module is already supplied externally via terminals X5/39 and X5/59, but the mains voltage is not yet switched on.

- An undervoltage message < 3 seconds is interpreted as a fault (e.g. mains fault), entered in the history buffer and saved.

8.3.10 External error (EEr)

A HIGH signal at DCTRL-TRIP-SET triggers the EEr fault.

You can, for example, connect the digital input DCTRL-TRIP-SET with an input terminal (X5/Ex). In this way an external encoder can trigger the EEr fault.

The response can be set under C0581.

8.4

Overview of monitoring functions

The responses of monitoring functions can be partly parameterised via codes – in GDC in the parameter menu under **Monitoring** –.

Monitoring				Possible responses				
				● Lenze setting ✓ Setting possible				
Error message		Description	Source	CoDe	TRIP	Message	Warning	Off
0071	CCr	System fault	Internal		●			
x091	EEr	External monitoring (activated via DCTRL)	FWM	C0581	●	✓	✓	✓
Voltage supply								
2020	OU	Overvoltage in the DC bus (C0173)	MCTRL				●	
1030	LU	Undervoltage in the DC bus (C0173)	MCTRL			●		
0107	H07	Internal fault (power section)	Internal		●			
Communication								
x061	CE0	Communication error on the automation interface (AIF)	AIF	C0126	✓		✓	●
x062	CE1	Communication error at process data input object CAN1_IN (monitoring time can be set with C0357/1)	CAN1_IN	C0591	✓		✓	●
x063	CE2	Communication error at process data input object CAN2_IN (monitoring time can be set with C0357/2)	CAN2_IN	C0592	✓		✓	●
x064	CE3	Communication error at process data input object CAN3_IN (monitoring time can be set with C0357/3)	CAN3_IN	C0593	✓		✓	●
x065	CE4	BUS-OFF state of the system bus (CAN) (too many faulty telegrams)	CAN	C0595	✓		✓	●
Temperatures / sensors								
0050	OH	Heatsink temperature > 85° C	MCTRL		●			
x053	OH3	Motor temperature > 150° C	MCTRL	C0583	✓		✓	●
x054	OH4	Heatsink temperature > C0122	MCTRL	C0582			●	✓
x057	OH7	Motor temperature > C0121	MCTRL	C0584			●	✓
x058	OH8	Motor temperature across inputs T1 and T2 is too high. Please note: In the case of "Warning" (C0585 = 2) or "Off" (C0585 = 3), the drive can be destroyed if the fault is not eliminated in time!	MCTRL	C0585	✓		✓	●
x086	Sd6	Thermal sensor error at motor (X7 or X8)	MCTRL	C0594	✓		✓	●
x110	H10	Thermal sensor error at heatsink	FWM	C0588	●		1)	1)
x111	H11	Thermal sensor error in the device interior	FWM	C0588	●		1)	1)
Motor / feedback system								
0011	OC1	Motor cable overcurrent	MCTRL		●			
x012	OC2	Motor cable earth fault	MCTRL	C0574	●			✓
0013	OC3	Overload at acceleration or deceleration	MCTRL		●			

Monitoring				Possible responses				
				● Lenze setting ✓ Setting possible				
Error message		Description	Source	CoDe	TRIP	Message	Warning	Off
0015	OC5	I x t overload	MCTRL		●			
0016	OC6	I ² x t overload	MCTRL		●			
0018	OC8	I ² x t overload advance warning	MCTRL	C0606	✓		●	✓
x032	LP1	Motor phase failure (current limit can be set in C0599) Please note: Can only be used for asynchronous motors. The function block MLP1 has to be entered in C0465.	MCTRL	C0597	✓		✓	●
x083	Sd3	Interruption of the digital frequency coupling. The input signal "Lamp Control" at X9/8 is LOW Please note: In the case of "Warning" (C0587 = 2), the drive can be destroyed if the fault is not eliminated in time!	MCTRL	C0587	●		✓	✓
x085	Sd5	At analog input X6/1, X6/2, the input current is < 2 mA Monitoring only possible if C0034 = 1	MCTRL	C0598	✓		✓	●
0140	ID1	Motor data identification - characteristic	MCTRL		●			
0141	ID2	Motor data identification - motor data	MCTRL		●			
Speed								
0200	NMAX	Maximum speed (C0596) has been exceeded.	MCTRL		●			
Time-out / overflow								
0105	H05	Intern fault (memory)	Internal		●			
Parameter setting								
0072	PR1	Checksum error in parameter set 1	Internal		●			
0073	PR2	Checksum error in parameter set 2	Internal		●			
0074	PEr	Program error	Internal		●			
0075	PR0	Error in the parameter sets	Internal		●			
0077	PR3	Checksum error in parameter set 3	Internal		●			
0078	PR4	Checksum error in parameter set 4	Internal		●			
0079	PI	Fault during the parameter initialisation	Internal		●			

Representation of the error number:

x 0 = TRIP, 1 = message, 2 = warning

E. g. "2091": An external monitoring has triggered EEr warning

1) Setting only permitted by Lenze service

8.5 Code table

How to read the code table:

Column	Abbreviation	Meaning
Code	Cxxxx	Code Cxxxx
	1	Subcode 1 of Cxxxx
	2	Subcode 2 of Cxxxx
	*	Parameter value of the code is the same in all parameter sets
	ENTER	Changed parameter or the code or subcode is accepted after pressing SHIFT PRG
	STOP	Changed parameter of the code or subcode is accepted after pressing SHIFT PRG , if the controller is inhibited
Name		Name of the code
Lenze		Lenze setting (value on delivery or after restoring the delivery status with C0002)
	→	The column "IMPORTANT" contains further information
Selection	1 { % } 99	min. value {unit} max. value
IMPORTANT	-	Short, important explanations

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0002 STOP	Par load	1		Loading a parameter set	
			0 Load default	Restore the delivery status	
			1 Load PS1	- Load parameter set saved in the controller and activate it - Parameter set 1 is loaded automatically after every mains connection	
			2 Load PS2		
			3 Load PS3	Load parameter set from the keypad into the controller and activate it	
			4 Load PS4		
			11 Load ext PS1		
			12 Load ext PS2		
			13 Load ext PS3		
			14 Load ext PS4		
			20 ext -> EEPROM	Load all parameter sets from the keypad into the controller	
C0003 ENTER	Par save	0		Save parameter set	
			0 Ready	Saving is completed	
			1 Save PS1	Save the parameters loaded in the controller into a parameter set (PS1 PS4)	
			2 Save PS2		
			3 Save PS3		
			4 Save PS4		
C0004 ENTER	Op display	56	0 {1} 1999	Operating display	
				Keypad shows selected code in the operating level if no other status messages of C0183 are active	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0005 	Signal CFG	1000	0	Common	Modified basic configuration	Selection of the basic configuration
			100	CFG: emty	All internal connections are removed	The first two digits indicate the predefined basic function, e. g.: ● 01xxx: Speed control
			1000	Speed mode	Speed control	The third digit indicates additional functions: ● xx0xx: No additional function ● xx1xx: Brake control ● xx2xx: Setpoint selection via motor potentiometer ● xx3xx: PID controller ● xx4xx: Mains failure control ● xx5xx: Setpoint selection via master frequency ● xx6xx: Gearbox factor - analog trimming ● xx7xx: Gearbox factor - digital trimming ● xx8xx: Master frequency ramp function generator
			2000	Step mode	Step control	
			3000	Lead screw	Traversing control	
			4000	Torque mode	Torque control	
			5000	DF master	Digital frequency master	
			6000	DF slv bus	Master frequency slave (bar)	
			7000	DF slv cas	Digital frequency slave (cascade)	The fourth digit indicates the predefined voltage source for the control terminals: ● xxx0x: External supply voltage ● xxx1x: Internal supply voltage
			8000	Dancer ctrl e	Dancer position control with external diameter measurement	The fifth digit indicates the predefined device control ● xxxx0: Terminal control ● xxxx1: RS232, RS485 or optical fibre ● xxxx3: INTERBUS or PROFIBUS-DP ● xxxx5: System bus (CAN)
C0006 	Op mode	5				Selection of the operating mode for the motor control
			1	vector ctrl	Vector control without or with speed feedback	In case of the first selection enter the motor data and identify them with C0148.  6.8-8
			5	V / f	V/f characteristic control	Commissioning without identification of the motor data is possible ● Advantage of identification with C0148: Improved smooth running at low speeds  6.8-4
C0009	LECOM address	1	1	{1}	99	LECOM controller address ● Bus device number when operated via interface ● 10, 20 ... 90 reserved for broadcast to device groups with RS232, RS485, optical fibre

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C0010	N _{min}	0	0	{1 rpm}	36000	- Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times - C0059 must be set correctly - Set C0010 < C0011 - C0010 is only effective in case of analog setpoint selection via AIN1 Important: For parameter setting via interface, major changes in one step should only be made when the controller is inhibited.	Minimum speed	 6.10-1
C0011	N _{max}	3000	0	{1 rpm}	36000		Maximum speed	
C0012	T _{ir} (acc)	5.00	0.00	{0.01 s}	9999.90	Acceleration time T _{ir} of the main setpoint Refers to speed change 0 ... C0011		 6.10-3
C0013	T _{if} (dec)	5.00	0.00	{0.01 s}	9999.90	Deceleration time T _{if} of the main setpoint Refers to speed change 0 ... C0011		
C0014	V/f charact.	0				Characteristic in the V/f characteristic control mode		 8.2-25
			0	Linear		Linear V/f characteristic		
			1	square		Square V/f characteristic		
C0015	Rated freq	50	10	{1 Hz}	5000	V/f-rated frequency In C0015 you can set a base frequency which differs from the rated motor frequency (C0089) - Lenze setting: C0015 = C0089 - Changing C0086 or C0089 overwrites the value in C0015		 8.2-25
C0016	U _{min} boost	0.00	0.00	{0.01 %}	100.00	U _{min} boost (FCODE) - C0016 = 1 % corresponds to a boost of 1 % of the rated motor voltage (C0090) - Code is freely configurable		 6.8-4
C0017	FCODE (Q _{min})	50	-36000	{1 rpm}	36000	Q _{min} -switching threshold (FCODE) - Programmable speed threshold - If the current speed is < C0017, CMP1-OUT is activated. - Freely configurable code		

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0018	fchop	6		Switching frequency of the inverter • General rule: the lower the switching frequency the – lower the power loss – higher the noise generation – better the concentricity factor – Observe derating information at high switching frequencies • The max. output frequency (f_{out}) amounts to: – $f_{chop} = 16 \text{ kHz} \Rightarrow f_{out} = 600 \text{ Hz}$ – $f_{chop} = 8 \text{ kHz} \Rightarrow f_{out} = 300 \text{ Hz}$ – $f_{chop} = 4 \text{ kHz} \Rightarrow f_{out} = 150 \text{ Hz}$ – $f_{chop} = 2 \text{ kHz} \Rightarrow f_{out} = 150 \text{ Hz}$
			0 auto chop automatic change-over of the switching frequency between 16/8/2 kHz	
			1 2 kHz sin optimised smooth running	
			2 4 kHz f_{top} power-optimised	
			3 8 kHz f_{top} power-optimised	
			4 8 kHz sin noise optimised	
			5 16 kHz sin noise optimised	
			6 auto 8/2 kHz noise / power-optimised with automatic change-over to low switching frequency	
C0019	Thresh nact=0	0	-36000 {1 rpm} 36000	Operating threshold - automatic DC injection brake (Auto-GSB) • Falling below the threshold in C0019 activates automatic DC injection braking when the holding time set under C0107 > 0
C0020	turn value	100	0 {1 %} 200	Influence on concentricity factor • Manual influence on the concentricity factor of the motor
C0021	slipcomp	→	-20.00 {0.01 %} 20.00	Slip compensation → Change of C0086, C0087 or C0089 sets C0021 to the calculated rated slip of the motor • When changing over to the vector control mode, C0021 is set to 0
C0022	IMAX CURRENT	→	0 {0.01 A} -	I_{max} limit in motor mode → Depending on C0086
C0023	Imax gen.	→	0 {0.01 A} -	I_{max} limit in generator mode → Depending on C0086
C0025 	Feedback type	1		Speed feedback
			1 no feedback No feedback	
			100 IT (C420) - X8 Input of the number of increments in C0420	Incremental encoder at X8 • Incremental encoders with TTL level can only be connected to X8.
			101 IT (C420) - X9 Input of the number of increments in C0420	Incremental encoder at X9 • Connect incremental encoders with HTL-level on X9 only
				Incremental encoder at X8
				• Incremental encoders with TTL level can only be connected to X8.
			110 IT512-5V 512 inc	
			111 IT1024-5V 1024 inc	
			112 IT2048-5V 2048 inc	
			113 IT4096-5V 4096 inc	

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0026			-199.99	{0.01 %}	199.99	Free control code FCODE 26/1 and FCODE26/2	6.5-4 See System Manual (extension)
1	FCODE (offset)	0.00				Offset of AIN1 (X6/1, X6/2)	
2	FCODE (offset)	0.00				Offset of AIN2 (X6/3, X6/4)	
C0027			-199.99	{0.01 %}	199.99	Free control code FCODE 27/1 and FCODE27/2	
1	FCODE (gain)	100.0 0				Gain AIN1 (X6/1, X6/2) ● 100 % = gain 1	
2	FCODE (gain)	100.0 0				Gain AIN2 (X6/3, X6/4) ● 100 % = gain 1	
C0030	DFOUT const	3	0	256 inc/rev		Function block DFOUT ● Setting of the constant (increments per revolution) for the master frequency output X10	8.2-8
			1	512 inc/rev			
			2	1024 inc/rev			
			3	2048 inc/rev			
			4	4096 inc/rev			
			5	8192 inc/rev			
			6	16384 inc/rev			
C0032	FCODE Gearbox	1	-32767	{1}	32767	Gearbox factor - numerator of the function block DFSET ● Freely configurable code	8.2-18
C0033	Gearbox denom	1	1	{1}	32767	Gearbox factor - denominator of the function block DFSET	8.2-18
C0034	Mst current	0	0	-10 V ... +10 V		Voltage / current range for analog signals at input X6/1, X6/2 ● Observe jumper position of X3	5.8-8 6.5-4
			1	4 mA ... 20 mA			
			2	-20 mA ... +20 mA			
C0036	DC brk value	0.0	0.0	{0.1 A}	-	Set DC braking current → depends on the controller	8.2-25 8.2-48
C0037	Set-value rpm	0	-36000	{1 rpm}	36000	Setpoint selection	
C0038			0	{1 rpm}	36000	Suppress speed ranges, function block NLIM1 ● Speed ranges are only run through dynamically ● Static behaviour in the inhibited range is suppressed	See System Manual (extension)
1	N 1 start	0				Suppress speed range 1	
2	N 1 stop	0					
3	N 2 start	0				Suppress speed range 2	
4	N 2 stop	0					
5	N 3 start	0				Suppress speed range 3	
6	N 3 stop	0					

Code		Possible settings			IMPORTANT				
No.	Name	Lenze	Selection						
C0039			-36000	{1 rpm}	36000	JOG setpoints for the speed setpoint conditioning, function block NSET - Parameter setting of the fixed speeds (JOG setpoints) - Activation via binary coding of digital input signals in C0787/1 ... C0787/4 - For coding see description of function block NSET	See System Manual (extension)		
1	JOG set-value	1500							
2	JOG set-value	1000							
3	JOG set-value	500							
4	JOG set-value	200							
5	JOG set-value	100							
6	JOG set-value	50							
7	JOG set-value	25							
8	JOG set-value	10							
9	JOG set-value	5							
10	JOG set-value	0							
...	...	...							
15	JOG set-value	0							
C0040	Ctrl enable	0						Controller enable Controller can only be enabled if X5/28 = HIGH	📖 6.4-1
			0	Ctrl inhibit				Controller inhibited	
			1	Ctrl enable		Controller enabled			
C0042	DIS: QSP					Quick stop Display only	📖 8.2-25 📖 8.2-48		
			0	QSP inactive		Quick stop is not active			
			1	QSP active		Quick stop is active			
C0043	Trip reset	0	0	no/trip reset		Reset actual error			
			1	trip active		There is a TRIP error			
C0045	DIS: act JOG		0	Nset active	Nset is active	Active JOG setpoint for the speed setpoint conditioning, function block NSET Display of the activated fixed speed		See System Manual (extension)	
			1	JOG1	JOG setpoint 1				
			2	JOG2	JOG setpoint 2				
			...	...	...				
			15	JOG15	JOG setpoint 15				
C0046	DIS: N		-199.99	{0.01 %}	199.99	Main setpoint for the speed setpoint conditioning, function block NSET Read only			
C0049	DIS: NADD		-199.99	{0.01 %}	199.99	Additional setpoint, function block NSET Read only	See System Manual (extension)		
C0050	MCTRL-NSET2		-100.00	{0.01 %}	100.00	Speed setpoint, function block MCTRL Display of the speed in [%] of C0011	📖 8.2-25 📖 8.2-48		
C0051	MCTRL-NACT		-36000	{1 rpm}	36000	Actual speed value, function block MCTRL Read only	📖 8.2-25 📖 8.2-48		
C0052	MCTRL-Umot		0	{1 V}	800	Motor voltage, function block MCTRL - Read only - MCTRL-VACT = 100 % = C0090	📖 8.2-25 📖 8.2-48		
C0053	UG-VOLTAGE		0	{1 V}	900	DC-bus voltage, function block MCTRL - Read only - MCTRL-DCVOLT = 100 % = 1000 V	📖 8.2-25 📖 8.2-48		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0054	IMot		0.0	{0.1 A}	500.0	Current motor current, function block MCTRL - Read only - MCTRL-IACT = 100 % = C0022  8.2-25  8.2-48
C0056	MCTRL-MSET2		-100.00	{0.01 %}	100.00	Read only. The output signal depends on the operating mode: - Current motor current in case of V/f characteristic control, function block MCTRL1 - Torque setpoint in case of vector control, function block MCTRL2  8.2-25  8.2-48
C0057	MAX TORQUE		0	{1 Nm}	500	Maximum torque - Read only - Maximum possible torque of the drive configuration - In case of V/f characteristic control depending on C0022, C0086, C0088 - In case of vector control depending on C0022, C0086, C0088, C0091
C0058	MCTRL-FACT		-600.0	{0.1 Hz}	600.0	Output frequency - Display only - MCTRL-FACT = 100.0 % = 1000.0 Hz  8.2-25  8.2-48
C0059	Mot pole no.		1	{1}	50	Pole pair number of the motor Display only
C0061	Heatsink temp		0	{1 °C}	100	Heatsink temperature - Read only - If the temperature of the heatsink > 85 °C, the controller sets TRIP OH - Early warning is possible via OH4, temperature is set in C0122  See System Manual (extension)
C0063	Mot temp		0	{1 °C}	200	Motor temperature - Read only - Monitoring of the motor temperature must be activated. - KTY at X8/5, X8/8: - At 150 °C, TRIP OH3 is set - Early warning is possible via OH7, temperature is set in C0121 - PTC, thermal contact at T1, T2: - Release sets TRIP or warning OH8  8.2-25  8.2-48
C0064	Utilization		0	{1 %}	150	Device utilisation Ixt - Read only - Device utilisation during the last 180 s of operating time - C0064 > 100 % releases warning OC5 - C0064 > 140 % limits the output current of the controller to 67 % of the maximum current in C0022  8.2-25  8.2-48

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0066	MOTOR LOAD		0	{1 %}	250	Motor load I ² ·t 8.2-25 8.2-48	
C0067	Act trip		Selection list 10			Momentary fault message ● Display only	
C0070	Vp speed CTRL	10.0	0.0	{0.1 }	255.9	Gain of speed controller 8.2-25	
C0071	Tn speed CTRL	50	1	{1 ms}	6000	Integral-action time of speed controller C0071 = 6000 ms: No integral-action time 8.2-48	
C0074	limit N	10.00	0.00	{0.01 %}	100.00	Limitation of the speed controller ● Influence of the speed controller for V/f characteristic control with feedback ● max. setpoint difference in percent 8.2-25 8.2-48	
C0075	Vp curr CTRL	0.20	0.00	{0.01 }	0.99	Gain of current controller ● Vector control: gain of current controller ● V/f characteristic control: maximum current controller 8.2-25 8.2-48	
C0076	Tn curr CTRL	10.0	0.1	{0.1 ms}	2000.0	Integral-action time of current controller ● Vector control: integral-action time of current controller ● V/f characteristic control: maximum current controller ● C0076 = 2000 ms: current controller is switched off 8.2-25 8.2-48	
C0077	Ti field CTRL	4.0	0.3	{0.1 ms}	6000.0	Integral-action time of field controller ● Only active in case of vector control with feedback	
C0078	Tn slip CTRL	100	1	{1 ms}	6000	Integral-action time of slip controller ● Filter time for slip compensation (C0021) ● Only active with V/f characteristic control 8.2-25	
C0079	Adapt I-CTRL	100.0 0	10.00	{0.01 %}	100.00	Adaption of the current controller ● Evaluation for the reset time T _{ni} of the current controller ● Effective for setpoint = 0 ● Is increased automatically to 100 % up to rated speed ● C0079 = 100 %: no adaption of the reset time ● C0079 < 100 %: – evaluation of the reset time: 8.2-25 8.2-48	
C0080	Vp field CTRL	0.00	0.00	{0.01 }	0.99	Influence on the motor magnetising current set in C0095 ● Not effective when C0006 = 1 and C0025 > 1 ● Sphere of influence is effective from 0 Hz to the frequency set in C1583 6.6-1 6.11-5	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0081 STOP	Mot power	→	0.01	{0.01 kW}	500.00	Rated motor power → Change of C0086 resets value to factory setting ● Change of C0081 sets C0086 = 0	
C0082 STOP	Mot Rr	→	0.000	{0.001 Ω}	65.000	Motor rotor resistance → Value is evaluated by motor parameter identification from C0087, C0088, C0089, C0090 and C0091 ● Selection of a motor in C0086 sets the corresponding rotor resistance value	6.6-1 6.6-14
C0084 STOP	Mot Rs	→	0.00	{0.01 mΩ}	100000.00	Motor stator resistance → Value is determined by motor parameter identification (C0148, C0149)	6.6-1 6.6-14
C0085 STOP	Mot Lss	→	0.0	{0.1 mH}	6500.0	Motor leakage inductance → Value is evaluated by motor parameter identification (C0148, C0149)	6.6-1 6.6-14
C0086 STOP	Mot type	→	Motor selection list			Motor type selection → depending on the controller used ● Motor selection in C0086 sets the corresponding parameters in C0021, C0022, C0081, C0087, C0088, C0089, C0090, C0091	6.6-1
C0087 STOP	Mot speed	→	50	{1 rpm}	36000	Rated motor speed → depending on C0086 ● Motor selection in C0086 set the corresponding rated motor speed in C0087 ● Change of C0087 sets C0086 = 0	6.6-1
C0088 STOP	MOT CURRENT	→	0.5	{0.1 A}	500.0	Rated motor current → Depending on C0086 ● Selection of a motor in C0086 sets the corresponding rated motor current in C0088 ● Change of C0088 sets C0086 = 0	6.6-1
C0089 STOP	Mot frequency	→	10	{1 Hz}	5000	Rated motor frequency → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor frequency in C0089 ● Change of C0089 sets C0086 = 0	6.6-1
C0090 STOP	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor voltage in C0090 ● Change of C0090 sets C0086 = 0	6.6-1

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0091 	Mot cos phi	→	0.50	{0.01 }	1.00	Motor cos φ → depending on C0086 ● Motor selection in C0086 sets the corresponding motor cos φ in C0091 ● Change of C0091 sets C0086 = 0  6.6-1	
C0092 	Mot Ls	→	0.0	{0.1 mH}	6500.0	Motor stator inductance → Value is evaluated by motor parameter identification from C0088, C0089, C0090 and C0091 → Selection of a motor in C0086 sets the corresponding stator inductance value in C0092  6.6-1	
C0093	DRIVE IDENT					Controller identification ● Read only	
			0	invalid		Damaged power section	
			1	none		No power section	
			9321	9321VC		Display of the controller used	
			... 9333	... 9333VC			
C0094	Password	0	0	{1}	9999	Password ● C0094 = 1 ... 9999: Free access to the user menu only  7.2-9	
C0095 	Mot Io	→	0.00	{0.01 A}	1000.00	Motor magnetising current → depending on C0086, C0088 and C0091 ● Change of C0086, C0088 and C0091 sets C0095 to the Lenze setting ● Change of C0095 sets C0086 = 0  6.6-1  6.11-5	
C0096			0	no protection	No password protection	Parameter access protection ● Extension of the access protection for AIF bus systems and CAN with activated password in C0094 ● All codes in the user menu can continued to be accessed.	
			1	R protection	Read protection		
			2	W protection	Write protection		
			3	R/W protection	Read/write protection		
1	AIF protect.	0				Parameter access protection AIF	
2	CAN protect.	0				Parameter access protection CAN	
C0099	S/W version		x.y			Software version ● Read only	
			x	Main version			
			y	Subversion			

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0101			0.00	{0.01 s}	999.90	Additional acceleration times for speed setpoint conditioning, function block NSET - Additional acceleration and deceleration times for the main setpoint - Activation via binary coding of digital input signals in C0788/1 ... C0788/4 - For coding see description of function block NSET See System Manual (extension)
1	add Tir	0.00				
2	add Tir	0.00				
...	...	...				
15	add Tir	0.00				
C0103			0.00	{0.01 s}	999.90	Additional deceleration times for speed setpoint conditioning, function block NSET - Additional acceleration and deceleration times for the main setpoint - Activation via binary coding of digital input signals in C0788/1 ... C0788/4 - For coding see description of function block NSET See System Manual (extension)
1	add Tif	0.00				
2	add Tif	0.00				
...	...	...				
15	add Tif	0.00				
C0104 	select accel.	0				Selection of acceleration function of the linear ramp function generator of NSET - Constant acceleration - Constant time - Constant path See System Manual (extension)
			0	a = const		
			1	t = const		
			2	s = const		
C0105	QSP Tif	5.00	0.00	{0.01 s}	999.90	Quick stop deceleration time The deceleration time refers to a speed variation of C0011 ... 0  8.2-25  8.2-48
C0107	holding time	0.00	0.00	{0.01 s}	9999.90	Hold time for automatic DC injection braking (Auto-GSB)  8.2-25  8.2-48
C0108			-199.99	{0.01 %}	199.99	Free control code FCODE108/1 and FCODE108/2  6.5-6 See System Manual (extension)
1	FCODE (gain)	100.0 0				Gain of analog output signal AOUT1 (X6/62) 100 % = gain 1
2	FCODE (gain)	100.0 0				Gain of analog output signal AOUT2 (X6/63) 100 % = gain 1
C0109			-199.99	{0.01 %}	199.99	Free control code FCODE109/1 and FCODE109/2
1	FCODE (offset)	0.00				Offset of analog output signal AOUT1 (X6/62)
2	FCODE (offset)	0.00				Offset of analog output signal AOUT2 (X6/63)
C0114			0	High active	HIGH level is active	Inversion of digital input signals at X5, function block DIGIN  6.5-1 See System Manual (extension)
			1	LOW active	LOW level is active	
	1	DIGIN1 pol	0			Terminal X5/E1
	2	DIGIN2 pol	0			Terminal X5/E2
	3	DIGIN3 pol	0			Terminal X5/E3
	4	DIGIN4 pol	1			Terminal X5/E4
	5	DIGIN5 pol	0			Terminal X5/E5
	5	DIGIN6 (ST) pol	0			Terminal X5/ST

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0116 STOP			📖 Selection list 2		Configuration of free digital outputs (FDO) ● Signals can only be evaluated when being networked with automation interfaced	See System Manual (extension)	
	1	CFG: FDO-0	1000	FIXED0			
	...	...	...	...			
	32	CFG: FDO-31	1000	FIXED0			
C0117 STOP			📖 Selection list 2		Configuration of digital inputs signals, function block DIGOUT A change of the basic configuration in C0005 changes the signal assignment!	📖 6.5-3 See System Manual (extension)	
	1	CFG: DIGOUT1	15000	DCTRL-TRIP			Terminal X5/A1
	2	CFG: DIGOUT2	10650	CMP1-OUT			Terminal X5/A2
	3	CFG: DIGOUT3	500	DCTRL-RDY			Terminal X5/A3
	4	CFG: DIGOUT4	5003	MCTRL-MMAX			Terminal X5/A4
C0118			0	High active	HIGH level is active	Inversion of digital output signals, function block DIGOUT	
			1	LOW active	LOW level is active		
	1	DIGOUT1 pol	1			Terminal X5/A1	
	2	DIGOUT2 pol	1			Terminal X5/A2	
	3	DIGOUT3 pol	0			Terminal X5/A3	
	4	DIGOUT4 pol	0			Terminal X5/A4	
C0120	OC6 LIMIT	0	00	{1 °C}	120	Threshold for I² × t monitoring (motor). ● 0 = I ² × t monitoring switched-off ● I ² × t > C0120 ⇒ trip OC6	
C0121	OH7 limit	150	45	{1 °C}	150	Setting of the operating temperature for monitoring OH7 ● Only for KTY at X8 ● Monitoring OH7 is configured in C0584	📖 6.6-10 See System Manual (extension)
C0122	OH4 limit	80	45	{1 °C}	85	Configuration of monitoring OH4 ● Monitoring of the heatsink temperature ● Activating monitoring with C0582 ● Temperature in C0122 reached: – Warning OH4 is initiated	See System Manual (extension)
C0125	Baudrate	0	0	9600 baud	LECOM baud rate ● Baud rate for accessory module 2102		
			1	4800 baud			
			2	2400 baud			
			3	1200 baud			
			4	19200 baud			
C0126	MONIT CEO	3	0	TRIP	Configuration of monitoring CEO ● Error message in case of communication error AIF	See System Manual (extension)	
			2	Warning			
			3	Off			
C0127	OC8 LIMIT	0	0	{1 °C}	120	Threshold for I² × t advance warning (motor). ● 0 = I ² × t advance warning switched-off ● I ² × t > C0127 ⇒ fault message OC8 (response set in C606)	
C0128	TAU MOTOR	5.0	0.1	{0.1 min}	50.0	Thermal time constant of the motor The time constant is required for calculating the I ² × t disconnection.	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0130	DIS: act Ti		0 C12/C13 1 Tir1/Tif1 2 Tir2/Tif2 ... 14 Tir14/Tif14 15 Tir15/Tif15	Active T _i times for the speed setpoint conditioning, function block NSET - Display of the additional acceleration and deceleration times for the main setpoint (C0101, C0103) - Activation via binary coding of C0788/1 ... C0788/4	See System Manual (extension)
C0132 	Controller enable fly delay	→	0 {1 ms} 9999	Minimum time for controller inhibit with active flying restart circuit, delays the start of the flying restart process after controller enable → depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 A change of one of the codes resets C0132 to the minimum time of the selected motor The time is derived from the double rotor time constant	 8.2-25  8.2-48
C0133 	RFG fly delay	100	0 {1 ms} 9999	Deceleration of the ramp function generator after flying restart process, function block NSET Deceleration time for the ramp function generator after a flying restart process	See System Manual (extension)
C0134	RFG charac	0	0 Linear linear characteristic 1 S-shaped S-shaped characteristic	Ramp function generator characteristic, function block NSET Characteristic of the main setpoint	See System Manual (extension)
C0135	Control word	0	Bit Assignment 0 reserved 1 reserved 2 reserved 3 Quick stop 4 reserved 5 reserved 6 reserved 7 reserved 8 Operation inhibited 9 Controller inhibit 10 TRIP SET 11 Trip reset 12 reserved 13 reserved 14 reserved 15 reserved	Control word, function block AIF - Decimal control word when networked via automation interface AIF 16-bit information, binary coded	See System Manual (extension)
C0136				Display of the control words in C0135, AIF-IN and CAN-IN1 Control word C0135 Control word CAN Control word AIF	See System Manual (extension)

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0140 	select direct	0		Search direction during flying restart process - Positive direction of rotation: The motor rotates in CW direction with view on the motor shaft - Negative direction of rotation: The motor rotates in CCW direction with view on the motor shaft  8.2-25  8.2-48
			0 NSET	Only search in the direction of the applied setpoint
			1 inv. Nset	Only search against the direction of the applied setpoint
			2 pos.	Only search in positive direction of rotation
			3 neg.	Only search in negative direction of rotation
			4 Both, Nset	Search at first in the direction of the applied setpoint and then against the direction
			5 Both, inv. Nset	Search at first against the direction and then in the direction of the applied setpoint
			6 Both pos.	Search at first in positive then in negative direction of rotation
			7 Both neg.	Search at first in negative then in positive direction of rotation
C0141	FCODE (setval)	0.00	-199.9 {0.01} 199.99	Main setpoint, freely configurable code (FCODE) Used as main setpoint in the basic configurations C0005 = xxx1
C0142	Start options	1		Starting condition for the flying restart circuit  8.2-36
			0 Start lock	- Automatic start is inhibited after - mains connection - Cancel of a message (t > 0.5 s) - Trip reset - Flying restart circuit is inactive - Start after HIGH-LOW-HIGH level change at X5/28  8.2-65
			1 Auto start	Automatic start when X5/28 = HIGH Flying restart circuit is inactive
			2 flying lock	- Automatic start is inhibited after - mains connection - Cancel of a message (t > 0.5 s) - Trip reset - Flying restart circuit is active - Start after HIGH-LOW-HIGH level change at X5/28
			3 Fly restart	Automatic start when X5/28 = HIGH Flying restart circuit is active

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C0143	limit 2 kHz	0.0	0.0	{0.1 Hz}		20.0	Speed-dependent switching threshold - Threshold for automatic switching frequency reduction - The controller changes automatically to 2 kHz when this value falls below the threshold	 8.2-25  8.2-48
C0144 	OH switch	1	0	Switch off	Switch-over is not active		Temperature-dependent switching frequency reduction If the heatsink temperature set in C0122 is reached (warning OH4), the controller switches to 2 kHz	
			1	Switch on	Switch-over is active			
C0145 	select ref	1					Selection of the flying restart mode Reference speed with which the flying restart process is started	 8.2-36  8.2-65
			0	REF: C0011		Maximum speed		
			1	REF: N-ACT		Last current speed		
			2	REF: N-SET		Defined main speed setpoint It is referenced to the setpoint signal at input NSET-N of the function block NSET. If the setpoint signal at input NSET-N is missing, it is referenced to the active JOG setpoint (C0039/x)		
C0146	fly current	0	-500	{1}		500	Flying restart circuit, quantity of current during search process - Influences the current injection during search process $\pm 500 \approx \pm 39\%$ of $I_{\max}$ - The initial value amounts to $\approx 8\%$ of $I_{\max}$	 8.2-36  8.2-65
C0147	fly dt-f	0	-82	{1}		82	Flying restart circuit, search speed during flying restart process - For drives with great centrifugal masses, reduce the search speed, if required $\pm 82 \triangleq \pm 5.0$ Hz	
C0148 	ident run	0	0	WRK stop	Ready		Motor data identification - Inhibit controller, wait until drive has stopped - Enter the correct values of the motor nameplate into C0087, C0088, C0089, C0090, C0091 - Set C0148 = 1, confirm with  - Enable controller The identification - starts,  goes off. The motor "whistles" but does not rotate! - lasts approx. 1 ... 2 min - is completed when  is lit again - Inhibit controller:	 6.6-14
			1	WRK run		Start identification		

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C0149 	Auto ident	0	0	Id inactive	Automatic identification is inactive		Automatic motor data identification 1. Inhibit controller, wait until drive has stopped 2. Enter the correct values of the motor nameplate into C0087, C0088, C0089, C0090, C0091 3. Set C0149 = 1, confirm with  4. Enable controller The identification – starts,  goes off. The motor "whistles" but does not rotate! – lasts approx. 1 ... 2 min – is completed when  is lit again 5. Inhibit controller:	 6.6-14
			1	Id active	Automatic identification is active - The identification starts automatically after controller enable - After a faulty identification, the process is restarted after TRIP RESET or mains switching and subsequent controller enable			
C0150	Status word		Bit00	–	Bit08	Status code	Read only Decimal status word for networking via automation interface (AIF) Binary interpretation indicates the bit states	See System Manual (extension)
			Bit01	IMP	Bit09	Status code		
			Bit02	–	Bit10	Status code		
			Bit03	–	Bit11	Status code		
			Bit04	–	Bit12	Warning		
			Bit05	–	Bit13	Message		
			Bit06	n = 0	Bit14	–		
			Bit07	CINH	Bit15	–		
C0151	DIS: FDO (DW)						Read only - Free digital outputs (FDO) - Hexadecimal representation of the digital output signals configured in C0116 - Binary interpretation indicates the bit states	See System Manual (extension)
C0155	Status word 2		Bit00	Fail	Bit08	R/L	Display only Binary interpretation indicates the bit states	
			Bit01	M _{max}	Bit09	–		
			Bit02	I _{max}	Bit10	–		
			Bit03	IMP	Bit11	–		
			Bit04	RDY	Bit12	–		
			Bit05	CINH	Bit13	–		
			Bit06	TRIP	Bit14	–		
			Bit07	Init	Bit15	–		

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0156				📖 Selection list 2	Configuration of digital input signals of function block STAT • Input signals are output as status messages in C0150, AIF status word and CAN1 status word
STOP					
1	CFG: STAT.B0	2000	DCTRL-PAR*1-O		
2	CFG: STAT.B2	5002	MCTRL-IMAX		
3	CFG: STAT.B3	5003	MCTRL-MMAX		
4	CFG: STAT.B4	5050	NSET-RFG I=O		
5	CFG: STAT.B5	10650	CMP1-OUT		
6	CFG: STAT.B14	505	DCTRL-CW/CCW		
7	CFG: STAT.B15	500	DCTRL-RDY		
C0157			0 No status message 1 Status message is output		Digital status signal of function block STAT • Display of the signals linked in C0156
1	DIS: STAT.B0				
2	DIS: STAT.B2				
3	DIS: STAT.B3				
4	DIS: STAT.B4				
5	DIS: STAT.B5				
6	DIS: STAT.B14				
7	DIS: STAT.B15				
C0161	Act trip				Display of history buffer "Active fault" • Keypad: LECOM error number
C0167	Reset failmem	0	0 Ready 1 Clear history buffer		Clear history buffer • Active fault messages are not cleared

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0168				Display of the fault messages in the history buffer ● Keypad: LECOM error number Active fault Last fault Second to last fault Third last fault Fourth-last fault Fifth-last fault Sixth-last fault Last but six fault	See System Manual (extension)
1	Fail no. act				
2	Fail no. old1				
3	Fail no. old2				
4	Fail no. old3				
5	Fail no. old4				
6	Fail no. old5				
7	Fail no. old6				
8	Fail no. old7				
C0169			Display in [s]	Displays at what time the fault (C0168) has occurred since mains connection (C0179) ● If a fault is followed by another fault for several times, only the time of the last occurrence is stored Active fault Last fault Second to last fault Third last fault Fourth-last fault Fifth-last fault Sixth-last fault Last but six fault	
1	Failtime act				
2	Failtime old1				
3	Failtime old2				
4	Failtime old3				
5	Failtime old4				
6	Failtime old5				
7	Failtime old6				
8	Failtime old7				
C0170				Displays how many times the fault (C0168) has occurred after the last mains connection Active fault Last fault Second to last fault Third last fault Fourth-last fault Fifth-last fault Sixth-last fault Last but six fault	
1	Counter act				
2	Counter old1				
3	Counter old2				
4	Counter old3				
5	Counter old4				
6	Counter old5				
7	Counter old6				
8	Counter old7				
C0173 	UG limit	1		Adaptation of UG thresholds Check during commissioning and adapt, if necessary! All controllers in the system must have the same threshold!	See System Manual (extension)
			Mains LU OU		
			0 < 400 V 285 V 770 ... 755 V	Device with or without brake chopper	
			1 400 V 285 V 770 ... 755 V		
			2 460 V 328 V 770 ... 755 V		
			3 480 V 342 V 770 ... 755 V	Device without brake chopper	
			4 480 V 342 V 800 ... 785 V	Device with brake chopper	
C0178	Op timer		{s}	Display only Total time of the controller enable (X5/28 = HIGH)	
C0179	mainstimer		{s}	Display only Total time of mains "ON"	

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0182	Ti S-shaped	20.00	0.01	{0.01 s}	50.00	Integration time of S-shaped ramp function generator, function block NSET • C0182 = 0.00: ramp function generator operates linearly • C0182 > 0.00: ramp function generator operates in an S-shape (without jerk)	See System Manual (extension)
C0183	Diagnostics					Diagnostics • Display only • If several items or fault or status information are to be shown, the information with the smallest number is displayed	 7.2-10
			0	No fault			
			101	Initialisation			
			102	TRIP/fault			
			103	Emergency stop			
			104	IMP message			
			105	Power OFF		Function is not supported	
			111	Operation inhibit via C0135			
			112	Operation inhibit via AIF			
			113	Operation inhibit via CAN			
			121	Controller inhibited via X5/28			
			122	Controller inhibited internally (DCTRL-CINH1)			
			123	Controller inhibited internally (DCTRL-CINH2)			
			124	Controller inhibited via  at the keypad			
			125	Controller inhibited via AIF			
			126	Controller inhibited via CAN			
			141	Switch-on inhibit			
			142	Pulse inhibit 			
			151	Quick stop via MCTRL-QSP			
			152	Quick stop via  at the keypad			
			153	Quick stop via AIF			
			154	Quick stop via CAN			
			161	DC injection braking via terminal			
			162	DC injection braking via C0135			
			163	DC injection braking via AIF			
			164	DC injection braking via CAN			
			170	Motor parameter identification is active			
			250	Warning is active (C0168)			
C0190	NSET arit	0	0	OUT = C46		Arithmetic function, function block NSET Connects main setpoint (C0046) and additional setpoint (C0040)	See System Manual (extension)
			1	C46 + C49			
			2	C46 - C49			
			3	C46 * C49			
			4	C46 / C49			
			5	C46/(100 - C49)			

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0195	BRK1 T act	99.9	0.0	{0.1 s}	99.9	Brake closing time, function block BRK1 • C0195 = 99.9 s: infinite • After the time has elapsed in C0195, the status "brake applied" is reached	See System Manual (extension)
C0196	BRK1 T release	0.0	0.0	{0.1 s}	60.0	Brake opening time, function block BRK1 • Opening time can be obtained from the technical data of the brake • After the time has elapsed in C0196, the status "brake released" is reached	
C0200	S/W Id		x y	Main version Subversion		Software ID • Display only	
			S9300MVxy000			9300 vector 0.37 ... 90 kW	
			S9300MVxy020			9300 vector 110 ... 400 kW	
C0201	S/W date		xxx yy zzzz	xxx = month yy = day zzzz = year		Software creation • Display only	
C0202						Internal identification • Display only	
C0203						Commission number • Display only	
C0204						Serial number • Display only	
C0206	Product date		xx/yy/zz			Date of production • Display only • xx = day, yy = month, zz = year	
C0207	DL info 1					Download info 1 • Display only	
C0208	DL info 2					Download info 2 • Display only	
C0209	DL info 3					Download info 3 • Display only	
C0220	NSET Tir add	2.00	0.00	{0.01 s}	9999.90	Acceleration time T_{ir} for additional setpoint, function block NSET • The acceleration time refers to a speed variation of 0 ... C0011	See System Manual (extension)
C0221	NSET Tif add	2.00	0.00	{0.01 s}	9999.90	Deceleration time T_{if} for additional setpoint, function block NSET • The deceleration time refers to a speed variation of C0011 ... 0	
C0222	PCTRL Vp	1.0	0.1	{0.1 }	500.0	Gain V_p , function block PCTRL1	See System Manual (extension)
C0223	PCTRL1 Tn	400	20	{1 ms}	99999	Integral action component T_n , function block PCTRL1 • C0223 = 99999 ms: no integral action component	
C0224	PCTRL1 Kd	0.0	0.0	{0.1 }	5.0	Differential component K_d , function block PCTRL1	
C0234	damp value	20	-100	{1 %}	100	Influence of the oscillation damping, function block MCTRL • Minimising a tendency to oscillation of the drive • Influences the tendency to oscillation of the drive • When C0025 >1 and C0006 = 1, C0234 is set to 0	 8.2-25  8.2-48

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0235	damping	5	1	{1 ms}	600	Filter time of the oscillation damping, function block MCTRL Filter time for the internal signal for oscillation damping	 8.2-25  8.2-48
C0236	damp limit	0.2	0.0	{0.1 Hz}	20.0	Limit value of oscillation damping, function block MCTRL Limit value for the internal signal of oscillation damping	
C0241	Cmp-RFG-I=0	1.00	0.00	{0.01 %}	100.00	Speed threshold in [%] for the digital output NSET-controller enable-I=0, function block NSET - The analog signals NSET-NOUT (without arithmetic and limiting functions) and NSET-controller enable-I are compared - NSET-controller enable-I=0 = HIGH: the differential signal between NSET-NOUT and NSET-controller enable-I falls below the value in C0241 - C0241 = 100 %: $n_{\max}$	See System Manual (extension)
C0244	BRK1 M set	0.00	0.00	{0.01 %}	100.00	Holding torque, function block BRK1 C0244 = 100 % = C0057	See System Manual (extension)
C0250	FCODE 1 Bit	0	0		1	Free control code FCODE250	
C0252	Angle offset	0	-245760000	{1 inc.}	245760000	Phase offset for master frequency processing, function block DFSET - Fixed phase offset for digital frequency configuration 1 rev. = 65536 inc	 8.2-18
C0253	Angle n-trim	→	-32767	{1 inc.}	32767	Speed-dependent phase trimming for the master frequency processing, function block DFSET → depending on C0005, C0025, C0490 - Change of C0005, C0025 or C0490 resets C0253 to the corresponding Lenze setting 1 rev. = 65536 inc - Value in C0253 is reached at 15000 rpm	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0260	MPOT1 high	100.0 0	-199.99	{0.01 %}	199.99	Upper limit, function block MPOT1 ● Condition: C0260 > C0261	See System Manual (extension)
C0261	MPOT1 low	-100.0	-199.99	{0.01 %}	199.99	Lower limit, function block MPOT1 ● Condition: C0261 < C0260	
C0262	MPOT1 TIR	10.0	0.1	{0.1 s}	6000.0	Acceleration time T _{ir} , function block MPOT1 ● The set time refers to a change of 0 ... 100 %	
C0263	MPOT1 Tif	10.0	0.1	{0.1 s}	6000.0	Deceleration time T _{if} , function block MPOT1 Motor potentiometer ● The set time refers to a change of 100 ... 0 %	
C0264	MPOT1 on/off	0	0	no change		Deactivation of motor potentiometer, function block MPOT1 ● Function is executed when MPOT1-INACT = HIGH	
			1	Deceleration with T _{if} to 0%			
			2	Deceleration with T _{if} to C0261			
			3	Jump with T _{if} = 0 to 0%			
			4	Jump with T _{if} = 0 to C0261			
			5	Acceleration with T _{ir} to C0260			
C0265	MPOT1 init	0	0	Value of MPOT1 when mains fails		Initialisation of motor potentiometer, function block MPOT1 ● Starting value which is to be accepted during mains switching and activated motor potentiometer	
			1	lower limit of C0261			
			2	0 %			
C0267			📖 Selection list 2			Configuration of digital input signals, function block MPOT	See System Manual (extension)
1	CFG: UP	1000	FIXED0			UP DOWN MPOT1-OUT 0 0 — 0 1 ↓ 1 0 ↑ 1 1 —	
2	CFG: DOWN	1000	FIXED0			↑: Output signal runs to the upper limit value ↓: Output signal runs to the lower limit value —: Output signal is unchanged	
C0268	CFG: INACT	1000	FIXED0			📖 Selection list 2	Configuration of digital input signal, function block MPOT ● HIGH: motor potentiometer is not active. Output signal runs to 0
C0269						Digital input signals, function block MPOT ● Display of the signals linked in C0267 and C0268	
1	DIS: UP						
2	DIS: DOWN						
3	DIS: INACT						

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0325	Vp2 adapt	1.0	0.1	{0.1 }	500.0	Function block PTCTRL1 Adaptation of gain V_{p2}	See System Manual (extension)
C0326	Vp3 adapt	1.0	0.1	{0.1 }	500.0	Function block PTCTRL1 Adaptation of gain V_{p3}	
C0327	Set2 adapt	100.0 0	0.00	{0.01 %}	100.00	Function block PTCTRL1 - Adaptation of setpoint speed threshold n_{set2} - Condition: C0327 > C0328	
C0328	Set1 adapt	0.00	0.00	{0.01 %}	100.00	Function block PTCTRL1 - Adaptation of setpoint speed threshold n_{set1} - Condition: C0328 < C0327	
C0329	Adapt on/off	0	0	No adaptation of the process controller		Function block PTCTRL1 Adaptation On/Off	
			1	External adaptation via input			
			2	Adaptation via setpoint			
			3	Adaptation via control difference			
C0332	PCTRL Tir	0	0	{1 s}	10000	Acceleration time T_{ir} , function block PCTRL1 The acceleration time refers to a setpoint change of 0 ... 100 %	See System Manual (extension)
C0333	PCTRL1 Tif	0	0	{1 s}	10000	Deceleration time T_{if} , function block PCTRL1 The deceleration time refers to a setpoint change of 100 % ... 0	
C0336	DIS: act Up		0.0	{0.1 }	500.0	Current gain V_p , function block PCTRL1 Read only	See System Manual (extension)
C0337	Bi/unipolar	0				Sphere of action, function block PCTRL1 Output value is limited to -100 ... 100 %	
			1	Unipolar		Output value is limited to 0 ... 100 %	
C0338	ARIT1 funct	1	0	OUT = IN1		Selection of function, function block ARIT1	See System Manual (extension)
			1	OUT = IN1 + IN2			
			2	OUT = IN1 - IN2			
			3	OUT = IN1 * IN2			
			4	OUT = IN1 / IN2			
			5	OUT = IN1 / (100 - IN2)			
C0339			📖 Selection list 1			Configuration of analog input signals, function block ARIT1	
	1 CFG: IN	1000	FIXED0%			ARIT1-IN1	
	2 CFG: IN	1000	FIXED0%			ARIT1-IN2	
C0340			-199.99	{0.01 %}	199.99	Function block ARIT1 Display of the signals linked in C0339	
	1 DIS: IN					ARIT1-IN1	
	2 DIS: IN					ARIT1-IN2	
C0350	CAN address	1	1	{1}	63	System bus node address Change is effective after "Reset node" command	
C0351	CAN baudrate	0	0	500 kbit/s		System bus baud rate Change is effective after "Reset node" command	
			1	250 kbit/s			
			2	125 kbit/s			
			3	50 kbit/s			
			4	1000 kbit/s			

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0352	CAN mst	0	0 Slave	Configuration of the system bus nodes ● Change is effective after "Reset node" command	
			1 Master		
C0353			0 C0350 is the source	Source of the system bus address	
			1 C0354 is the source		
1	CAN addr sel1	0		CAN IN1, CAN-OUT1	
2	CAN addr sel2	0		CAN IN2, CAN-OUT2	
3	CAN addr sel3	0		CAN IN3, CAN-OUT3	
C0354			1 {1} 512	Selective system bus address ● Individual addressing of the system bus process data objects	
1	IN1 addr 2	129		CAN-IN1	
2	OUT1 addr 2	1		CAN-OUT2	
3	IN2 addr 2	257		CAN-IN2	
4	OUT2 addr 2	258		CAN-OUT2	
5	IN3 addr 2	385		CAN-IN3	
6	OUT3 addr 2	386		CAN-OUT3	
C0355			0 {1} 2047	System bus identifier ● Read only	
1	CAN-IN1 Id				
2	CAN-OUT1 Id				
3	CAN-IN2 Id				
4	CAN-OUT2 Id				
5	CAN-IN3 Id				
6	CAN-OUT3 Id				
C0356			0 {1 ms} 65000	System bus time settings	
1	CAN boot-up	3000		Required for CAN interconnection without master	
2	OUT2 cycle	0		0 = event-controlled process data transfer	
3	OUT3 cycle	0		>0 = cyclic process data transfer	
4	CAN delay	20		When the NMT state "Operational" (after "Pre-operational" or "Stopped") has been reached, the delay time "CANdelay" is started. After the delay time has elapsed, the PDO's CAN-OUT2 and CAN-OUT3 are sent for the first time.	
C0357			0 {1 ms} 65000	System bus monitoring times ● After a fault message, the CAN objects remain in receive mode	
1	CE1monit time	3000		CAN-IN1	
2	CE2monit time	3000		CAN-IN2	
3	CE3monit time	3000		CAN-IN3	
C0358	Reset node	0	0 No function	Set the nodal reset point of the system bus	
			1 CAN reset		
C0359	CAN state		0 Operational	System bus status ● Read only	
			1 Pre-operational		
			2 Warning		
			3 Bus off		

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0360			0 65535	Telegram counter - Read only - For count values > 65535 the counter starts at 0
1	Message OUT			All telegrams sent
2	Message IN			All telegrams received
3	Message OUT1			Telegrams sent on CAN-OUT1
4	Message OUT2			Telegrams sent on CAN-OUT2
5	Message OUT3			Telegrams sent on CAN-OUT3
6	Message POUT1			Telegrams sent on parameter channel1
7	Message POUT2			Telegrams sent on parameter channel2
8	Message IN1			Telegrams received from CAN-IN1
9	Message IN2			Telegrams received from CAN-IN2
10	Message IN3			Telegrams received from CAN-IN3
11	Message PIN1			Telegrams received from parameter channel1
12	Message PIN2			Telegrams received from parameter channel2
C0361			0 {1 %} 100	System bus load - Read only - For a perfect operation, the entire bus load (all nodes connected) should be less than 80 %
1	Load OUT			All telegrams sent
2	Load IN			All telegrams received
3	Load OUT1			Telegrams sent on CAN-OUT1
4	Load OUT2			Telegrams sent on CAN-OUT2
5	Load OUT3			Telegrams sent on CAN-OUT3
6	Load POUT1			Telegrams sent on parameter channel1
7	Load POUT2			Telegrams sent on parameter channel2
8	Load IN1			Telegrams received from CAN-IN1
9	Load IN2			Telegrams received from CAN-IN2
10	Load IN3			Telegrams received from CAN-IN3
11	Load PIN1			Telegrams received from parameter channel1
12	Load PIN2			Telegrams received from parameter channel2
C0364	CFG: CAN activ	1000	FIXED0  Selection list 2	Configuration - digital input signal Switches the system bus via the external signal from "Pre-Operational" to "Operational"
C0365	DIS:CAN activ		0 Pre-Operational 1 Operational	System bus state Display only
C0366	Sync Response	1	0 No response 1 Response	Response to sync telegram of the master
C0367	Sync Rx ID	128	1 {1} 256	Receipt identifier (Rx) Sync Identifier for grouping for data transfer to CAN-IN1

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0368	Sync Tx ID	128	1	{1}	256	Transmission identifier (Tx) ● Identifier for generating a sync telegram	
C0369	Sync Tx Time	0	0	{1}	65000	Sync transmission time (Tx) ● Transmission interval for the object set in C0368	
C0400	DIS: OUT		-199.99	{0.01 %}	199.99	Analog output signal, function block AIN1 ● Read only	See System Manual (extension)
C0402 STOP	CFG: OFFSET	19502	FCODE-26/1 📖 Selection list 1			Configuration offset, function block AIN1 ● The offset is added to the input signal at AIN1-IN	
C0403 STOP	CFG: GAIN	19504	FCODE-27/1 📖 Selection list 1			Configuration of gain, function block AIN1 ● The gain is multiplied by the input signal at AIN1-IN	See System Manual (extension)
C0404			-199.99	{0.01 %}	199.99	Function block AIN1 ● Display of the signals linked in C0402 and C0404	
	1 DIS: OFFSET						
	2 DIS: GAIN						
C0405	DIS: OUT		-199.99	{0.01 %}	199.99	Analog output signal, function block AIN2 ● Read only	See System Manual (extension)
C0407 STOP	CFG: OFFSET	19503	FCODE-26/2 📖 Selection list 1			Configuration of offset, function block AIN2 ● The offset is added to the input signal at AIN2-IN	
C0408 STOP	CFG: GAIN	19505	FCODE-27/2 📖 Selection list 1			Configuration of gain, function block AIN2 ● The gain is multiplied by the input signal at AIN2-IN	See System Manual (extension)
C0409			-199.99	{0.01 %}	199.99	Function block AIN2 ● Display of the signals linked in C0407 and C0408	
	1 DIS: OFFSET						
	2 DIS: GAIN						📖 6.7-1
C0420 STOP	Encoder const	512	1	{1 inc/rev}	8192	Number of increments for incremental encoder at X8 or X9 ● Connect incremental encoders with HTL-level on X9 only	
C0421 STOP	Enc voltage	5.00	5.00	{0.1 V}	8.00	Supply voltage for the incremental encoder at X8 CAUTION! A wrong entry can destroy the incremental encoder!	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0425	DFIN const	3	0 256 inc/rev 1 512 inc/rev 2 1024 inc/rev 3 2048 inc/rev 4 4096 inc/rev 5 8192 inc/rev 6 16384 inc/rev	Constant of the master frequency input, function block DFIN • Output signal at the connected encoder or at the upstream controller in the event of a master frequency cascade/master frequency bus
C0426	DIS: OUT		-36000 {1 rpm} 36000	Output signal of the master frequency input, function block DFIN • Display only
C0427	DFIN function	0	0 2-phase 1 A pulse/B dir 2 Pulse A or B	Function of the master frequency input, function block DFIN • Phase-displaced signal sequence • Control of direction of rotation via track B • Control of speed and direction of rotation via track A or track B
C0431 	CFG: IN	5001	MCTRL-NACT	Configuration of analog input signal, function block AOUT1 • Signal at AOUT1-IN is output to terminal X6/62
C0432 	CFG: OFFSET	19512	FCODE-109/1	Configuration of offset, function block AOUT1 • the offset is added to the input signal at AOUT1-IN
C0433 	CFG: GAIN	19510	FCODE-108/1	Configuration of gain, function block AOUT1 • The gain is multiplied by the input signal at AOUT1-IN
C0434	1 DIS: IN 2 DIS: OFFSET 3 DIS: GAIN		-199.99 {0.01 %} 199.99	Function block AOUT1 • Display of the signals linked in C0431, C0432 and C0433
C0436 	CFG: IN	5002	MCTRL-MSET2	Configuration of analog input signal, function block AOUT2 • Signal at AOUT2-IN is output to terminal X6/63
C0437 	CFG: OFFSET	19513	FCODE-109/2	Configuration of offset, function block AOUT2 • The offset is added to the input signal at AOUT2-IN
C0438 	CFG: GAIN	19511	FCODE-108/2	Configuration of gain, function block AOUT2 • The gain is multiplied by the input signal at AOUT2-IN
C0439	1 DIS: IN 2 DIS: OFFSET 3 DIS: GAIN		-199.99 {0.01 %} 199.99	Function block AOUT2 • Display of the signals linked in C0436, C0437 and C0438

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0443	DIS: DIGIN-OUT		0	{1}	255	Terminal signals, function block DIGIN - Read only - Binary interpretation of the terminal signals at X5 See System Manual (extension)
			Bit	Assignment		
			0	DIGIN1	X5/E1	
			1	DIGIN2	X5/E2	
			2	DIGIN3	X5/E3	
			3	DIGIN4	X5/E4	
			4	DIGIN5	X5/E5	
			5	ST-DIGIN6	X5/ST	
			6	DIGIN-CINH	X5/28	
C0444			0	LOW signal	Terminal signals, function block DIGOUT Read only See System Manual (extension)	
			1	HIGH signal		
	DIS: DIGOUT1		Bit	Assignment	X5/A1	
	DIS: DIGOUT2		0	DIGIN1	X5/A2	
	DIS: DIGOUT3		1	DIGIN2	X5/A3	
	DIS: DIGOUT4		2	DIGIN3	X5/A4	
C0450 	CFG: NX	1000	FIXED0%  Selection list 1		Configuration of analog input signal, function block BRK1 Speed threshold, from which the drive may output the signal "Close brake" See System Manual (extension)	
C0451 	CFG: SET	1000	FIXED0  Selection list 2		Configuration of digital input signal, function block BRK1 - HIGH = close brake - LOW = open brake	
C0452 	CFG: SIGN	1000	FIXED0%  Selection list 1		Configuration of analog input signal, function block BRK1 Direction of torque with which the drive is to create a torque against the brake	
C0458			-199.99	{0.01 %}	199.99	Function block BRK1 Display of the signals linked in C0450 and C0452 See System Manual (extension)
1	DIS: NX					
2	DIS: SIGN					
C0459	DIS: ON					Function block BRK1 Display of the signal linked in C0451
C0464	Customer I/F		0	original	Customer interface indicates the status of the selected basic configuration - Reassignment of terminals in a basic configuration does not change C0005 and sets C0464 = 1 - Adding or removing function blocks or changing the signal flow among the function blocks in a basic configuration sets C0005 = 0 and C0464 = 1	
			1	changed		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0465		→	📖 Selection list 5		Function block - processing list Defining the sequence in which the function blocks are to be processed internally → Depending on C0005. Changing C0005 loads assigned processing list	
STOP	1 FB list	200	DFIN			
	2 FB list	0				
	3 FB list	50	AIN1			
	4 FB list	0				
	5 FB list	0				
	6 FB list	55	AIN2			
	7 FB list	0				
	8 FB list	0				
	9 FB list	10250	R/L/Q			
	10 FB list	0				
	... ..	0				
	14 FB list	0				
	15 FB list	5250	NLIM1			
	16 FB list	5050	NSET			
	... ..	0				
	19 FB list	5700	ANEG1			
	... ..	0				
	22 FB list	10650	CMP1			
	... ..	0				
	25 FB list	70	AOUT1			
	... ..	0				
	28 FB list	75	AOUT2			
	... ..	0				
	31 FB list	250	DFOUT			
	... ..	0				
	41 FB list	25000	AIF-OUT			
	42 FB list	20000	CAN-OUT			
		...				
	50 FB list	0				
C0466	CPU T remain				Remaining process time for processing the function blocks Display only	
C0469	Fct STP key	2	0	inactive	Inactive	Determines the function which is released when pressing STOP on the keypad
STOP			1	CINH	Inhibit controller:	
			2	qsp	Quick stop	
C0470			0	{1}	255	Configuration of free control codes for digital signals The data words C0470 and C0471 are in parallel and are identical.
	1 FCODE 8 Bit	0			FCODE bit 0-7	
	2 FCODE 8 Bit	0			FCODE bit 8-15	
	3 FCODE 8 Bit	0			FCODE bit 16-23	
	4 FCODE 8 Bit	0			FCODE bit 24-31	
C0471	Configuration of input FCODE 32 Bit	0	0	{1}	4294967296	Free control code for digital signals The data words C0470 and C0471 are in parallel and are identical.

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0472			-199.99	{0.01 %}	199.99	Configuration of free control codes for analog signals	
1	FCODE analog	0.00					
2	FCODE analog	0.00					
3	FCODE analog	100.0 0					
6	FCODE analog	0.00					
...	...	0.00					
20	FCODE analog	0.00					
C0473			-32767	{1}	32767	Configuration of free control codes for absolute analog signals	
1	FCODE abs	1					
2	FCODE abs	1					
3	FCODE abs	0					
...	...	0					
10	FCODE abs	0					
C0474			-2147483647	{1}	2147483647	Configuration of free control codes for phase signals ● 1 rev. = 65536 inc	
1	FCODE PH	0					
...	...	0					
5	FCODE PH	0					
C0475			-16000	{1}	16000	Configuration of free control codes for phase difference signals ● 1 rev. = 65536 inc	
1	FCODE DF	0					
2	FCODE DF	0					
C0497	Nact filter	2.0	0.0	{0.1 ms}	50.0	Filter time constant N _{act} for actual speed value, function block MCTRL2 ● Internal filtering of the speed signal for control ● C0497 = 0 ms: Switched off	 8.2-48
C0510	CFG: IN1	50	AIN1-OUT  Selection list 1			Configuration of analog input signal, function block NLIM1 ● Input for analog speed setpoint		See System Manual (extension)
C0511	DIS: IN1		-199.99	{0.01 %}	199.99	Function block NLIM1 ● Display of the input signal configured in C0510	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0517 ENTER			0.00	{0.01 }	1999.00	• The user menu contains in the Lenze setting the most important codes for commissioning the operating mode "V/f characteristic control" • With an active password protection only the codes entered in C0517 can be freely accessed • Enter the numbers of the required codes in the subcodes • The input is done in the format xxx.yy – xxx: Code number – yy: Subcode number • It is not checked whether the entered code exists.
1	User menu	51.00	Actual speed value (MCTRL-NACT)			
2	User menu	54.00	Actual motor current (MCTRL-IACT)			
3	User menu	56.00	Torque setpoint (MCTRL-MSET2)			
4	User menu	64.00	Device utilisation Ixt			
5	User menu	183.0 0	Diagnostics			
6	User menu	168.0 1	History buffer			
7	User menu	39.01	JOG-setpoints 1 (NSET)			
8	User menu	86.00	Motor type selection			
9	User menu	148.0 0	Identifying motor parameters			
10	User menu	22.00	I _{max} limit in motor mode			
11	User menu	23.00	I _{max} limit in generator mode			
12	User menu	11.00	Maximum speed N _{max}			
13	User menu	12.00	Acceleration time T _{ir} main setpoint			
14	User menu	13.00	Deceleration time T _{if} main setpoint			
15	User menu	16.00	U _{min} boost			
16	User menu	70.00	Gain V _p speed controller			
17	User menu	71.00	Integral-action time T _n speed controller			
18	User menu	75.00	Gain V _p current controller			
19	User menu	76.00	Integral-action time T _n current controller			
20	User menu	142.0 0	Starting condition			
21	User menu	92.00	Motor stator inductance			
22	User menu	36.00	DC braking current			
23	User menu	93.00	Controller identification			
24	User menu	99.00	Software version			
...	...	0	Not assigned			
31	User menu	94.00	Password			
32	User menu	3.00	Save parameter set			

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0520 STOP	CFG: IN	1000	FIXEDPHI-0 Selection list 4	Configuration of input signal, function block DFSET • Input of speed / phase setpoint signal 8.2-18
C0521 STOP	CFG: VP-DIV	1000	FIXED0% Selection list 1	
C0522 STOP	CFG: RAT-DIV	1000	FIXED0% Selection list 1	
C0523 STOP	CFG: A-TRIM	1000	FIXED0% Selection list 1	
C0524 STOP	CFG: N-TRIM	1000	FIXED0% Selection list 1	
C0525 STOP	CFG: 0-PULSE	1000	FIXED0 Selection list 2	
C0526 STOP	CFG: RESET	1000	FIXED0 Selection list 2	
C0527 STOP	CFG: SET	1000	FIXED0 Selection list 2	Configuration of digital input signal, function block DFSET • Signal for one-time zero pulse activation • HIGH = release for zero pulse synchronisation
C0528			-2·10 ⁹ {1} 2·10 ⁹	Function block DFSET • Display only 8.2-18
1	DIS: 0-pulse A			
2	DIS: Offset			
				Phase difference between two zero pulses Offset = C0523 × C0529 + C0525

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0529	Multip offset	1	-20000	{1}	20000	Offset multiplier, function block DFSET ● Multiplier for the phase offset (C0252)	 8.2-18
C0530	DF evaluation	0	0	with factor	With gearbox factor	Master frequency evaluation, function block DFSET ● Evaluation of the setpoint integrator	
			1	no factor	Without gearbox factor		
C0531	Act 0 div	1	1	{1}	16384	Actual zero pulse divisor, function block DFSET	
C0532	0-pulse/TP	1	1	0-pulse	Index pulse	Zero pulse / touch probe, function block DFSET ● Zero pulse of the feedback system or touch probe	
			2	Touch probe	Touch probe		
C0533	Vp denom	1	1	{1}	32767	Gain factor of denominator V _p , function block DFSET	
C0534	0 pulse fct	0				Zero pulse function, function block DFSET ● Synchronising the drive	 8.2-18
			0	inactive	Inactive		
			1	Continuous	Continuous synchronisation, correction in the shortest possible way		
			2	Cont. switch	Continuous synchronisation, correction in the shortest possible way	After a LOW-HIGH signal to DFSET-0-pulse, the zero track is synchronised once	
			10	Once, fast way	One-time synchronisation, correction in the shortest possible way		
			11	Once, CW	One-time synchronisation, correction in direction of rotation to the right		
			12	Once, CCW	One-time synchronisation, correction in direction of rotation to the left		
			13	Once, 2*0-pulse	One-time synchronisation, correction is detected from setpoint pulse and actual pulse and corrected to the corresponding direction		
C0535	Set 0 div	1	1	{1}	16384	Desired zero pulse divisor, function block DFSET	 8.2-18

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0536			-32767	{1}	32767	Function block DFSET Display of the signals linked in C0521, C0522 and C0523  8.2-18
1	DIS: VP-DIV					
2	DIS: RAT-DIV					
3	DIS: A-TRIM					
C0537	DIS: N-TRIM		-199.99	{0.01 %}	199.99	Function block DFSET Display of the signal linked in C0524
C0538			0		1	Function block DFSET Display of the signals linked in C0525, C0526 and C0527
1	DIS: 0-pulse					
2	DIS: RESET					
3	DIS: SET					
C0539	DIS: IN		-6000	{1 rpm}	6000	Function block DFSET Display of the signal linked in C0520
C0540 	Function	0				Function selection, function block DFOUT Output signal at X10  8.2-8
			0	Analog input	Analog input	Signal at DFOUT-AN-IN is output. Zero track can be input externally.
			1	PH diff input	Phase difference input	Signal at DFOUT-DF-IN is output. Zero track can be input externally.
			2		Not assigned	
			3		Not assigned	
			4	X10 = X9	X9 is output on X10	The input signals are buffered C0030 is without function
			5	X10 = X8	X8 is output on X10	
C0541 	CFG: AN-IN	5001	MCTRL-NACT	 Selection list 1		Configuration of analog input signal, function block DFOUT Signal in [%] of C0011
C0542 	CFG: DF-IN	1000	FIXEDPHI-0	 Selection list 4		Configuration of input signal, function block DFOUT Speed signal
C0544 	CFG: SYN-RDY	1000	FIXED0	 Selection list 2		Configuration of digital input signal, function block DFOUT DFOUT-SYN-RDY = HIGH: Generating a zero pulse
C0545	PH offset	0	0	{1 inc.}	65535	Phase offset, function block DFOUT - Displacing the zero pulse generated via DFOUT-SYN-RDY by up to 360 ° 1 rev. = 65535 inc (360 °)
C0546	Min inc/rev	1000	1	{1 inc.}	2147483647	Masking of the touch probe signal, function block DFSET - Suppressing interference pulses at X5/E4 (actual pulse of touch probe signal) - The size of the masking window between two actual pulses is set  8.2-18

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0547	DIS: AN-IN		-199.99	{0.01 %}	199.99	Function block DFOUT Display of the signal linked in C0541	8.2-8
C0548	DIS: SYN-RDY		0		1	Function block DFOUT Display of the signal linked in C0544	
C0549	DIS: DF-IN		-32767	{1 rpm}	32767	Function block DFOUT Display of the signal linked in C0542	
C0560			-199.99	{0.01 %}	199.99	Configuration of fixed setpoints, function block FIXSET1 Output of the setpoints to FIXSET1-OUT via binary coding of the inputs FIXSET1-IN1 ... FIXST1-IN4	See System Manual (extension)
1	Fix set-value	100					
2	Fix set-value	75					
3	Fix set-value	50					
4	Fix set-value	25					
5	Fix set-value	0					
...	...	0					
15	Fix set-value	0					
C0561	CFG: AIN	1000	FIXED0%		Selection list 1	Configuration of analog input signal, function block FIXSET1 The analog input signal is switched to FIXSET1-OUT if all inputs FIXSET-INx = LOW	
C0562					Selection list 2	Configuration of digital input signals, function block FIXSET1 The number of inputs to be assigned depend on the number of the fixed setpoints required.	
1	CFG: IN	1000	FIXED0			FIXSET1-IN1	
2	CFG: IN	1000	FIXED0			FIXSET1-IN2	
3	CFG: IN	1000	FIXED0			FIXSET1-IN3	
4	CFG: IN	1000	FIXED0			FIXSET1-IN4	
C0563	DIS: AIN		-199.99	{0.01 %}	199.99	Function block FIXSET1 Display of the signal linked in C0561	
C0564			0		1	Function block FIXSET1 Display of the signals linked in C0562/1, C0562/2, C0562/3 and C0562/4	
1	DIS: IN					FIXSET1-IN1	
2	DIS: IN					FIXSET1-IN2	
3	DIS: IN					FIXSET1-IN3	
4	DIS: IN					FIXSET1-IN4	
C0570	CFG: IN	1000	FIXED0%		Selection list 1	Configuration of analog input signal, function block S&H1	See System Manual (extension)
C0571	CFG: LOAD	1000	FIXED0		Selection list 2	Configuration of digital input signal, function block S&H1	
C0572	DIS: IN		-199.99	{0.01 %}	199.99	Function block S&H1 Display of the signal linked in C0570	
C0573	DIS: LOAD		0		1	Function block S&H1 Display of the signal linked in C0571	See System Manual (extension)
C0574	MONIT OC2	0	0	TRIP		Configuration of monitoring OC2, earth fault	
			3	Off			

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0581	MONIT EEr	0	0	TRIP	Configuration monitoring EEr, external fault See System Manual (extension)
			1	Message	
			2	Warning	
			3	Off	
C0582	MONIT OH4	2	2	Warning	Configuration monitoring OH4, heatsink temperature ● The operating temperature can be set in C0122 See System Manual (extension)
			3	Off	
C0583	MONIT OH3	3	0	TRIP	Configuration of motor temperature monitoring with fixed operating temperature ● Only for KTY at X8 ● The operating temperature is fixed at 150 °C 6.6-10 See System Manual (extension)
			2	Warning	
			3	Off	
C0584	MONIT OH7	3	2	Warning	Configuration of monitoring motor temperature with variable operating temperature ● Only for KTY at X8 ● When reaching the temperature set in C0121 the warning OH7 is activated 6.6-10 See System Manual (extension)
			3	Off	
C0585	MONIT OH8	3	0	TRIP	Configuration of motor temperature monitoring ● Temperature monitoring via PTC input (T1, T2) 6.6-8 See System Manual (extension)
			2	Warning	
			3	Off	
C0587	MONIT SD3	3	0	TRIP	Configuration of monitoring SD3, encoder at X9 ● Monitors the voltage supply at X9/pin 8 See System Manual (extension)
			2	Warning	
			3	Off	
C0588	MONIT H10/H11	0	0	TRIP	Configuration of monitoring H10 and H11, thermal sensors in the controller ● H10: Sensor error - heatsink temperature ● H11: Sensor error - interior temperature See System Manual (extension)
			3	Off	
C0591	MONIT CE1	3	0	TRIP	Configuration of monitoring CE1, communication error at CAN-IN1 See System Manual (extension)
			2	Warning	
			3	Off	
C0592	MONIT CE2	3	0	TRIP	Configuration of monitoring CE2, communication error at CAN-IN2
			2	Warning	
			3	Off	
C0593	MONIT CE3	3	0	TRIP	Configuration of monitoring CE3, communication error at CAN-IN3
			2	Warning	
			3	Off	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0594	MONIT SD6	3	0	TRIP		Activation of the motor temperature monitoring with KTY at X8 - Use C0594 = 0 or 2 to activate monitoring - In case of a short circuit or interruption at X8/5 and X8/8 the fault message SD6 is activated - Configuration of the response when exceeding the motor temperature - Fixed operating temperature in C0583 - Variable operating temperature in C0584	 6.6-10 See System Manual (extension)
			2	Warning			
			3	Off			
C0595	MONIT CE4	3	0	TRIP		Configuration of monitoring CE4, BUS-OFF (system bus)	See System Manual (extension)
			2	Warning			
			3	Off			
C0596	NMAX limit	4000	0	{1 rpm} 36000		Configuration of monitoring $N_{\max}$, maximum system speed exceeded	See System Manual (extension)
C0597	MONIT LP1	3	0	TRIP		Configuration of monitoring the motor phases LP1	See System Manual (extension)
			2	Warning			
			3	Off			
C0598	MONIT SD5	3	0	TRIP		Configuration of monitoring SD5, open circuit at analog input X6/1, X6/2	See System Manual (extension)
			2	Warning			
			3	Off			
C0599	Limit LP1	5.0	1.0	{0.1 %} 10.0		Configuration of current limit LP1, current limit value for monitoring the motor phases in C0597	See System Manual (extension)
C0600	Function	1	0	OUT = IN1		Function selection, function block ARIT2	See System Manual (extension)
			1	OUT = IN1 + IN2			
			2	OUT = IN1 - IN2			
			3	OUT = IN1 * IN2			
			4	OUT = IN1 / IN2			
			5	OUT = IN1 / (100 - IN2)			
C0601			 Selection list 1			Configuration of analog input signal, function block ARIT2	
	1 CFG: IN	1000	FIXED0%			ARIT2-IN1	
	2 CFG: IN	1000	FIXED0%			ARIT2-IN2	
C0602			-199.99	{0.01 %}	199.99	Function block ARIT2 Display of the signals linked in C0601	
						ARIT2-IN1	
						ARIT2-IN2	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0603	Function	1	0	OUT = IN1	Function selection, function block ARIT3	See System Manual (extension)
			1	OUT = IN1 + IN2		
			2	OUT = IN1 - IN2		
			3	OUT = IN1 * IN2		
			4	OUT = IN1 / IN2		
			5	OUT = IN1 / (100 - IN2)		
C0604			📖 Selection list 1		Configuration of analog input signal, function block ARIT3	
1	CFG: IN	1000	FIXED0%		ARIT3-IN1	
2	CFG: IN	1000	FIXED0%		ARIT3-IN2	
C0605			-199.99	{0.01 %}	199.99	Function block ARIT3
						• Display of the signals linked in C0604
1	DIS: IN					ARIT3-IN1
2	DIS: IN					ARIT3-IN2
C0606	MONIT OC8	2	0	TRIP	Configuration of the I² × t advance warning The threshold is set in C0127.	
			2	Warning		
			3	Off		
C0608	CFG: IN	1000	FIXED0%		📖 Selection list 1	Configuration of analog input signal, function block SQRT1
C0609	DIS: IN		-199.99	{0.01 %}	199.99	Function block SQRT1
						• Display of the signal linked in C0608
C0610			📖 Selection list 1		Configuration of analog input signals, function block ADD1	See System Manual (extension)
1	CFG: IN	1000	FIXED0%		Addition input ADD1-IN1	
2	CFG: IN	1000	FIXED0%		Addition input ADD1-IN2	
3	CFG: IN	1000	FIXED0%		Subtraction input ADD1-IN3	
C0611			-199.99	{0.01 %}	199.99	Function block ADD1
						• Display of the signals linked in C0610
1	DIS: IN					ADD1-IN1
2	DIS: IN					ADD1-IN2
3	DIS: IN					ADD1-IN3
C0612			📖 Selection list 1		Configuration of analog input signals, function block ADD2	See System Manual (extension)
1	CFG: IN	1000	FIXED0%		Addition input ADD2-IN1	
2	CFG: IN	1000	FIXED0%		Addition input ADD2-IN2	
3	CFG: IN	1000	FIXED0%		Subtraction input ADD2-IN3	
C0613			-199.99	{0.01 %}	199.99	Function block ADD2
						• Display of the signals linked in C0612
1	DIS: IN					ADD2-IN1
2	DIS: IN					ADD2-IN2
3	DIS: IN					ADD2-IN3
C0620	DB1 gain	1.00	-10.00	{0.01 }	10.00	Gain, function block DB1
C0621	DB1 value	1.00	0.00	{0.01 %}	100.00	Dead band, function block DB1
						• Fault signals around the zero point of the input signal are set to 0
C0622	CFG: IN	1000	FIXED0%		📖 Selection list 1	Configuration of analog input signal, function block DB1
C0623	DIS: IN		-199.99	{0.01 %}	199.99	Function block DB1
						• Display of the signal linked in C0622

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0630	Max limit	100.0 0	-199.99	{0.01 %}	199.99	Upper limit, function block LIM1	See System Manual (extension)
C0631	Min limit	-100.0	-199.99	{0.01 %}	199.99	Lower limit, function block LIM1	
C0632 	CFG: IN	1000	FIXED0%  Selection list 1			Configuration of analog input signal, function block LIM1	
C0633	DIS: IN		-199.99	{0.01 %}	199.99	Function block LIM1	
C0640	Delay T	20.00	0.01	{0.01 s}	50.00	Time constant, function block PT1-1	See System Manual (extension)
C0641 	CFG: IN	1000	FIXED0%  Selection list 1			Configuration of analog input signal, function block PT1-1	
C0642	DIS: IN		-199.99	{0.01 %}	199.99	Function block PT1-1	
C0643	Delay T	20.00	0.01	{0.01 s}	50.00	Time constant, function block PT1-2	
C0644 	CFG: IN	1000	FIXED0%  Selection list 1			Configuration of analog input signal, function block PT1-2	See System Manual (extension)
C0645	DIS: IN		-199.99	{0.01 %}	199.99	Function block PT1-2	
C0650	DT1-1 gain	1.00	-320.00	{0.01 }	320.00	Gain, function block DT1-1	
C0651	Delay T	1.000	0.005	{0.01 s}	5.000	Time constant, function block DT1-1	
C0652 	CFG: IN	1000	FIXED0%  Selection list 1			Configuration of analog input signal, function block DT1-1	See System Manual (extension)
C0653	Sensibility	1	1 15 bits 2 14 bits 3 13 bits 4 12 bits 5 11 bits 6 10 bits 7 9 bits			Input sensitivity, function block DT1-1	
C0654	DIS: IN		-199.99	{0.01 %}	199.99	Function block DT1-1	See System Manual (extension)
						• Display of the signal linked in C0652	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0655	Numerator	1	-32767	{1}	32767	Configuration of conversion factor with numerator and denominator, function block CONV5 OUT [rpm] = IN [%] · $\frac{15000 \text{ rpm}}{100 \%}$ · $\frac{C0655}{C0656}$ See System Manual (extension)
C0656	Denominator	1	1	{1}	32767	
C0657	CFG: IN	1000	FIXED0%	📖 Selection list 1		
C0658	DIS: IN		-199.99	{0.01 %}	199.99	Configuration of analog input signal, function block CONV5 Function block CONV5 • Display of the signal linked in C0657
C0661	CFG: IN	1000	FIXED0%	📖 Selection list 1		Configuration of analog input signal, function block ABS1 • Converts bipolar signals into unipolar signals See System Manual (extension)
C0662	DIS: IN		-199.99	{0.01 %}	199.99	
C0671	RFG1 Tir	0.00	0.00	{0.01 s}	999.90	Acceleration time T _{ir} , and deceleration time T _{if} , function block RFG1 • Acceleration and deceleration ramp See System Manual (extension)
C0672	RFG1 Tif	0.00	0.00	{0.01 s}	999.90	
C0673	CFG: IN	1000	FIXED0%	📖 Selection list 1		Configuration of analog input signal, function block RFG1 • Selection of a final value at RFG1-OUT
C0674	CFG: SET	1000	FIXED0%	📖 Selection list 1		Configuration of analog input signal, function block RFG1 • Selection of a starting value at RFG1-OUT
C0675	CFG: LOAD	1000	FIXED0	📖 Selection list 2		Configuration of digital input signal, function block RFG1 • HIGH: RFG1-OUT is set to the value at RFG1-Set • LOW: The signal at RFG1-OUT travels along the ramps towards the input value at RFG1-IN
C0676			-199.99	{0.01 %}	199.99	Function block RFG1 • Display of the signals linked in C0673 and C0674
	1 DIS: RFG1					RFG1-IN
	2 DIS: RFG1					RFG1-SET
C0677	DIS: LOAD		0		1	Function block RFG1 • Display of the signal linked in C0675

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0680	Function	1	1	IN1 = IN 2	Function selection, function block CMP1 ● Compare input signals at CMP1-IN1 and CMP1-IN2	See System Manual (extension)
			2	IN1 > IN2		
			3	IN1 < IN2		
			4	|IN1IN2|		
			5	|IN1IN2|		
			6	|IN1IN2|		
C0681	Hysteresis	1.00	0.00	{0.01 %}	100.00	Hysteresis, function block CMP1 ● Hysteresis for input signals which are not stable and hence the output oscillates
C0682	Window	1.00	0.00	{0.01 %}	100.00	Window, function block CMP1 ● Set the range in which the signal comparison is to be apply
C0683			📖 Selection list 1		Configuration of analog input signal, function block CMP1	
	1 CFG: IN	5001	MCTRL-NACT		CMP1-IN1	
	2 CFG: IN	19500	FCODE-17		CMP1-IN2	
C0684			-199.99	{0.01 %}	199.99	Function block CMP1 ● Display of the signals linked in C0683
	1 DIS: IN				CMP1-IN1	
	2 DIS: IN				CMP1-IN2	
C0685	Function	1	1	IN1 = IN 2	Function selection, function block CMP2 ● Compare input signals at CMP2-IN1 and CMP2-IN2	See System Manual (extension)
			2	IN1 > IN2		
			3	IN1 < IN2		
			4	|IN1IN2|		
			5	|IN1IN2|		
			6	|IN1IN2|		
C0686	Hysteresis	1.00	0.00	{0.01 %}	100.00	Hysteresis, function block CMP2 ● Hysteresis for input signals which are not stable and hence the output oscillates
C0687	Window	1.00	0.00	{0.01 %}	100.00	Window, function block CMP2 ● Set the range in which the signal comparison is to be apply
C0688			📖 Selection list 1		Configuration of analog input signal, function block CMP2	
	1 CFG: IN	1000	FIXED0%		CMP2-IN1	
	2 CFG: IN	1000	FIXED0%		CMP2-IN2	
C0689			-199.99	{0.01 %}	199.99	Function block CMP2 ● Display of the signals linked in C0688
	1 DIS: IN				CMP2-IN1	
	2 DIS: IN				CMP2-IN2	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0690	Function	1	1	IN1 = IN 2	Function selection, function block CMP3 Compare input signals at CMP3-IN1 and CMP3-IN2	See System Manual (extension)
			2	IN1 > IN2		
			3	IN1 < IN2		
			4	|IN1IN2|		
			5	|IN1IN2|		
			6	|IN1| < |IN2|		
C0691	Hysteresis	1.00	0.00	{0.01 %}	100.00	Hysteresis, function block CMP3 Hysteresis for input signals which are not stable and hence the output oscillates
C0692	Window	1.00	0.00	{0.01 %}	100.00	Window, function block CMP3 Set the range in which the signal comparison is to be apply
C0693				📖 Selection list 1		Configuration of analog input signal, function block CMP3
	1 CFG: IN	1000	FIXED0%		CMP3-IN1	
	2 CFG: IN	1000	FIXED0%		CMP3-IN2	
C0694			-199.99	{0.01 %}	199.99	Function block CMP3 Display of the signals linked in C0693
	1 DIS: IN				CMP3-IN1	
	2 DIS: IN				CMP3-IN2	
C0700	CFG: IN	19523	FCODE-472/3		📖 Selection list 1	Configuration of analog input signal, function block ANEG1 The value at ANEG1-IN is multiplied by -1 and output
C0701	DIS: IN		-199.99	{0.01 %}	199.99	Function block ANEG1 Display of the signal linked in C0700
C0703	CFG: IN	19523	FCODE-472/3		📖 Selection list 1	Configuration of analog input signal, function block ANEG2 The value at ANEG2-IN is multiplied by -1 and output
C0704	DIS: IN		-199.99	{0.01 %}	199.99	Function block ANEG2 Display of the signal linked in C0703

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0705	Function	1	1	IN1 = IN 2	Function selection, function block CMP4 ● Compare input signals at CMP4-IN1 and CMP4-IN2	See System Manual (extension)
			2	IN1 > IN2		
			3	IN1 < IN2		
			4	|IN1| = |IN2|		
			5	|IN1| > |IN2|		
			6	|IN1| < |IN2|		
C0706	Hysteresis	1.00	0.00	{0.01 %}	100.00	Hysteresis, function block CMP4 ● Hysteresis for input signals which are not stable and hence the output oscillates
C0707	Window	1.00	0.00	{0.01 %}	100.00	Window, function block CMP4 ● Set the range in which the signal comparison is to be apply
C0708				📖 Selection list 1		Configuration of analog input signal, function block CMP4
	1 CFG: IN	1000	FIXED0%		CMP4-IN1	
	2 CFG: IN	1000	FIXED0%		CMP4-IN2	
C0709			-199.99	{0.01 %}	199.99	Function block CMP4 ● Display of the signals linked in C0708
	1 DIS: IN				CMP4-IN1	
	2 DIS: IN				CMP4-IN2	
C0710	Function	0				Function selection, function block TRANS1 1. LOW-HIGH edge at TRANS1-IN switches TRANS1-OUT = HIGH 2. After the time has elapsed (C0711), TRANS1-OUT switches to LOW
			0	Rising trans	Rising edge	1. HIGH-LOW edge at TRANS1-IN switches TRANS1-OUT = HIGH 2. After the time has elapsed (C0711), TRANS1-OUT switches to LOW
			1	Falling trans	Falling edge	1. LOW-HIGH- or HIGH-LOW edge at TRANS1-IN switches TRANS1-OUT = HIGH 2. After the time has elapsed (C0711), TRANS1-OUT switches to LOW
			2	Both trans	Both edges	
C0711	Pulse T	0.001	0.001	{0.001 s}	60.000	Pulse duration, function block TRANS1 ● After the time has elapsed, TRANS1-OUT switches to LOW
C0713	CFG: IN	1000	FIXED0		📖 Selection list 2	
					Configuration of digital input signal, function block TRANS1	
C0714	DIS: IN		0		1	Function block TRANS1 ● Display of the signal linked in C0713

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0715	Function	0				Function selection, function block TRANS2	See System Manual (extension)
			0	Rising trans	Rising edge	1. LOW-HIGH edge at TRANS2-IN switches TRANS2-OUT = HIGH 2. After the time has elapsed (C0716), TRANS2-OUT switches to LOW	
			1	Falling trans	Falling edge	1. HIGH-LOW edge at TRANS2-IN switches TRANS2-OUT = HIGH 2. After the time has elapsed (C0716), TRANS2-OUT switches to LOW	
			2	Both trans	Both edges	1. LOW-HIGH or HIGH-LOW edge at TRANS2-IN switches TRANS2-OUT = HIGH 2. After the time has elapsed (C0716), TRANS2-OUT switches to LOW	
C0716	Pulse T	0.001	0.001	{0.001 s}	60.000	Pulse duration, function block TRANS2 After the time has elapsed, TRANS2-OUT switches to LOW	
C0718	CFG: IN	1000	FIXED0	📖 Selection list 2		Configuration of digital input signal, function block TRANS2	
C0719	DIS: IN		0	1		Function block TRANS2 Display of the signal linked in C0718	
C0720	Function	2				Function selection, function block DIGDEL1	See System Manual (extension)
			0	On delay	On delay	1. LOW-HIGH edge at DIGDEL1-IN starts a timing element 2. After the time has elapsed (C0721), DIGDEL1-OUT switches to HIGH	
			1	Off delay	Off delay	1. LOW-HIGH edge at DIGDEL1-IN starts a timing element and sets DIGDEL1-OUT = HIGH 2. After the time has elapsed (C0721), DIGDEL1-OUT switches to LOW	
			2	ON/OFF delay	On/off delay	1. LOW-HIGH or HIGH-LOW edge at DIGDEL1-IN starts a timing element 2. After the time has elapsed (C0721), DIGDEL1-OUT = DIGDEL1-IN	
C0721	Delay T	1.000	0.001	{0.001 s}	60.000	Delay time, function block DIGDEL1	
C0723	CFG: IN	1000	FIXED0	📖 Selection list 2		Configuration of digital input signal, function block DIGDEL1	
C0724	DIS: IN		0	1		Function block DIGDEL1 Display of the signal linked in C0723	

Code		Possible settings			IMPORTANT			
No.	Name	Lenze	Selection					
C0725	Function	2				Function selection, function block DIGDEL2	See System Manual (extension)	
			0	On delay	On delay	1. LOW-HIGH edge at DIGDEL2-IN starts a timing element 2. After the time has elapsed (C0726), DIGDEL2-OUT switches to HIGH		
			1	Off delay	Off delay	1. LOW-HIGH edge at DIGDEL2-IN starts a timing element and sets DIGDEL2-OUT = HIGH 2. After the time has elapsed (C0726), DIGDEL2-OUT switches to LOW		
			2	ON/OFF delay	On/off delay	1. LOW-HIGH or HIGH-LOW edge at DIGDEL2-IN starts a timing element 2. After the time has elapsed (C0726), DIGDEL2-OUT = DIGDEL2-IN		
C0726	Delay T	1.000	0.001	{0.001 s}	60.000	Delay time, function block DIGDEL2		
C0728	CFG: IN	1000	FIXED0	Selection list 2			Configuration of digital input signal, function block DIGDEL2	
C0729	DIS: IN		0	1			Function block DIGDEL2 ● Display of the signal linked in C0728	
C0730	Mode	0	0	Stop measurement			Function block OSZ ● Starting / stopping the measured value recording	See System Manual (extension)
			1	Start measurement				
C0731	Status		0	Measurement completed			Oscilloscope function ● Read only ● Current operating status	
			1	Measurement active				
			2	Trigger detected				
			3	Abort				
			4	Abort after trigger				
			5	Read memory				
C0732			Selection list 1			Configuration of analog input signals, function block OSZ Function block OSZ	See System Manual (extension)	
1	OSZ channel 1	1000	FIXED0%					
2	OSZ channel 2	1000	FIXED0%					
3	OSZ channel 3	1000	FIXED0%					
4	OSZ channel 4	1000	FIXED0%					
C0733			Selection list 2			Configuration of digital input signal, function block OSZ		
1	Trigger input	1000	FIXED0					
C0734	Trigger source	1	0	OSZ trigger input			Function block OSZ ● Configure digital input C0732 or C0733 with desired trigger signal	See System Manual (extension)
			1	OSZ channel 1				
			2	OSZ channel 2				
			3	OSZ channel 3				
			4	OSZ channel 4				
C0735	Trigger level	0	-32767	{1}	32767	Function block OSZ ● Trigger level OSZ channel 1 ... OSZ channel 4		
C0736	Trigger edge	0	0	LOW-HIGH edge			Oscilloscope function	
			1	HIGH-LOW edge				
C0737	Trigger Delay	0.0	-100.0	{0.1 %}	999.99	Function block OSZ ● Setting of pretriggering and posttriggering		

Code		Possible settings			IMPORTANT							
No.	Name	Lenze	Selection									
C0738	Sampling period	3	3	1 ms	Oscilloscope function	See System Manual (extension)						
			4	2 ms								
			5	5 ms								
			6	10 ms								
			7	20 ms								
			8	50 ms								
			9	100 ms								
			10	200 ms								
			11	500 ms								
			12	1 s								
			13	2 s								
			14	5 s								
			15	10 s								
			16	20 s								
			17	50 s								
			18	1 min								
			19	2 min								
			20	5 min								
			21	10 min								
			C0739	Number of channels			4	1	{1}	4	Function block OSZ	See System Manual (extension)
								● Switching on/off the channels – 1 = channel 1 – 2 = channel 1 + 2 – 3 = channel 1 ... 3 – 4 = channel 1 ... 4				
C0740		0			Oscilloscope function							
					● Reading data memory							
1	Read start position	0	0	{1}	65535	● Provides a pointed access to a storage block						
2	Enable/inhibit data reading	0	0	No data reading								
			1	Data reading								
C0741	STATUS		0	1000000000	Function block OSZ		See System Manual (extension)					
1	Version				● Read only							
2	Memory size											
3	Data width											
4	Number of channels											
C0742	Data block length	8	0	{1}	65536	Function block OSZ						
C0743	Read data block length (OSZ)		0		65535	Function block OSZ						
					● Read only							
					● Reading an 8 byte data block							
C0744	Memory depth	3	0	512 measured values	Oscilloscope function							
					● Adapt memory capacity to the measurement task							

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0749			065535		Information about storing the measured values, function block OSZ ● Read only	See System Manual (extension)
1	Abort index				Measured value no. of the abort time	
2	Trigger index				Measured value no. of the trigger time	
3	End index				Measured value no. of the end time	
C0750	Vp denom	16	1	1	Gain V_p of the position controller, function block DFRFG1	 8.2-13
			2	1/2		
			4	1/4		
			8	1/8		
			16	1/16		
			32	1/32		
			64	1/64		
			128	1/128		
			256	1/256		
			512	1/512		
			1024	1/1024		
			2048	1/2048		
			4096	1/4096		
			8192	1/8192		
			16384	1/16384		
C0751	DFRFG1 Tir	1.000	0.001	{0.001 s}	999.999	 8.2-13
C0752	Max speed	3000	1	{1 rpm}	16000	
C0753	DFRFG1 QSP	0.000	0.000	{0.001 s}	999.900	
C0754	PH error	2·10 ⁹	10	{1}	2·10 ⁹	
C0755	Syn window	100	0	{1 inc.}	65535	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0758 	CFG: IN	1000	FIXEDPHI-0 Selection list 4	Configuration of input signal, function block DFRFG1 • Speed/phase setpoint signal Configuration of digital input signal, function block DFRFG1 • HIGH = quick stop active Configuration of input signal, function block DFRFG1 • HIGH = Status of the profile generator is maintained, setpoint is saved Configuration of input signal, function block DFRFG1 • HIGH = resetting the integrators Function block DFRFG1 • Display of the signals linked in C0759, C0760 and C0761 Function block DFRFG1 • Display of the signal linked in C0758
C0759 	CFG: QSP	1000	FIXED0 Selection list 2	
C0760 	CFG: STOP	1000	FIXED0 Selection list 2	
C0761 	CFG: RESET	1000	FIXED0 Selection list 2	
C0764			0 1	
	1 DIS: QSP			Configuration of digital input signal, function block FLIP1 Configuration of digital input signal, function block FLIP1 • Each LOW-HIGH edge at FLIP1-CLK switches the signal at FLIP1-D to FLIP1-OUT Configuration of digital input signal, function block FLIP1 • Resets the flip-flop • HIGH: Sets FLIP1-OUT = LOW • Input has highest priority Function block FLIP1 • Display of the signals linked in C0770, C0771 and C0773 Configuration of digital input signal, function block FLIP2 Configuration of digital input signal, function block FLIP2 • Each LOW-HIGH edge at FLIP2-CLK switches the signal at FLIP2-D to FLIP2-OUT Configuration of digital input signal, function block FLIP2 • Resets the flip-flop • HIGH: sets FLIP2-OUT = LOW • Input has highest priority Function block FLIP2 • Display of the signals linked in C0775, C0776 and C0777
	2 DIS: STOP			
	3 DIS: RESET			
C0765	DIS: IN		-32767 {1 rpm} 32767	
C0770 	CFG: D	1000	FIXED0 Selection list 2	
C0771 	CFG: CLK	1000	FIXED0 Selection list 2	See System Manual (extension) See System Manual (extension) See System Manual (extension)
C0772 	CFG: CLR	1000	FIXED0 Selection list 2	
C0773			0 1	
	1 DIS: D			
	2 DIS: CLK			
	3 DIS: CLR			
C0775 	CFG: D	1000	FIXED0 Selection list 2	See System Manual (extension)
C0776 	CFG: CLK	1000	FIXED0 Selection list 2	
C0777 	CFG: CLR	1000	FIXED0 Selection list 2	
C0778			0 1	
	1 DIS: D			
	2 DIS: CLK			
	3 DIS: CLR			

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0780 	CFG: N	5250	NLIM1-OUT  Selection list 1	Configuration of analog input signal, function block NSET ● Main setpoint	See System Manual (extension)
C0781 	CFG: N-INV	10251	R/L/Q-R/L  Selection list 2	Configuration of digital input signal, function block NSET ● HIGH: main setpoint (C0780) is inverted	
C0782 	CFG: NADD	55	AIN2-OUT  Selection list 1	Configuration of analog input signal, function block NSET ● Additional setpoint	
C0783 	CFG: NADD-INV	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block NSET ● HIGH: additional setpoint (C0783) is inverted	
C0784 	CFG: CINH-VAL	5001	MCTRL-NACT  Selection list 1	Configuration of analog input signal, function block NSET ● The signal is accepted by the main setpoint integrator when the controller is inhibited	
C0785 	CFG: SET	5000	MCTRL-nset2  Selection list 1	Configuration of analog input signal, function block NSET ● When NSET-LOAD = HIGH, the signal is accepted by the main setpoint integrator	
C0786 	CFG: LOAD	5001	MCTRL-QSP-OUT  Selection list 2	Configuration of digital input signal, function block NSET ● HIGH: The signal at NSET-SET is accepted by the mains setpoint integrator ● Control of both ramp function generators in special situations, e.g. quick stop	See System Manual (extension)
C0787 			 Selection list 2	Configuration of digital input signals, function block NSET ● Activation of a fixed speed via binary coding of the digital input signals ● For coding see description of function block NSET ● Parameter setting of the fixed speeds (JOG setpoints) in C0039	
1	CFG: JOG	53	DIGIN3	NSET-JOG*1	
2	CFG: JOG	1000	FIXED0	NSET-JOG*2	
3	CFG: JOG	1000	FIXED0	NSET-JOG*4	
4	CFG: JOG	1000	FIXED0	NSET-JOG*8	
C0788 			 Selection list 2	Configuration of digital input signals, function block NSET ● Activation of additional acceleration and deceleration times for the mains setpoint via binary coding of the digital input signals ● For coding see description of function block NSET ● Parameter setting of the times in C0101 and 103	
1	CFG: TI	1000	FIXED0	NSET-Ti*1	
2	CFG: TI	1000	FIXED0	NSET-Ti*2	
3	CFG: TI	1000	FIXED0	NSET-Ti*4	
4	CFG: TI	1000	FIXED0	NSET-Ti*8	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0789 	CFG: RFG-0	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block NSET HIGH: Guides the main setpoint integrator to 0 via the current T_i times
C0790 	CFG: RFG-STOP	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block NSET HIGH: Keeps the main setpoint integrator on its current value
C0798			-199.99 {0.01 %} 199.99	Function block NSET Display of the signals linked in C0783 and C0785 Read only: analog input signals of NSET
	1 DIS: CINH-VAL			
	2 DIS: SET			
C0799	Input signals		0 1	Function block NSET Display of the signals linked in C0781, C0783, C0786, C0787, C0788, C0789 and C0790
	1 DIS: N-INV			
	2 DIS: NADD-INV			
	3 DIS: LOAD			
	4 DIS: JOG*1			
	5 DIS: JOG*2			
	6 DIS: JOG*4			
	7 DIS: JOG*8			
	8 DIS: TI*1			
	9 DIS: TI*2			
	10 DIS: TI*4			
	11 DIS: TI*8			
	12 DIS: RFG-0			
	13 DIS: RFG-STOP			
C0800 	CFG: SET	1000	FIXED0%  Selection list 1	Configuration of analog input signal, function block PCTRL - Input for the process setpoint - Value range: ± 200 %
C0801 	CFG: ACT	1000	FIXED0%  Selection list 1	Configuration of analog input signal, function block PCTRL Configuration of analog input signal of PCTRL1 - Input for the actual value - Value range: ± 200 %
C0802 	CFG: INFLU	1000	FIXED0%  Selection list 1	Configuration of analog input signal, function block PCTRL - Evaluation (influence) of the output signal - Value range: ± 200 %
C0803 	CFG: ADAPT	1000	FIXED0%  Selection list 1	Configuration of analog input signal, function block PCTRL - The gain V_p can be changed via the adaptation input - Value range: ± 200 %
C0804 	CFG: INACT	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block PCTRL HIGH = deactivates the process controller
C0805 	CFG: I-OFF	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block PCTRL - HIGH = Switching off integral action component - LOW = Switching on integral action component

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0808			-199.99	{0.01 %}	199.99	Function block PCTRL Display of the signals linked in C0801, C0802, C0803 and C0804 See System Manual (extension)	
1	DIS: SET						
2	DIS: ACT						
3	DIS: INFLU						
4	DIS: ADAPT						
C0809						Function block PCTRL Display of the signals linked in C0805 and C0806	
1	DIS: INACT						
2	DIS: I-OFF						
C0810		1000		 Selection list 1		Configuration of analog input signals, function block ASW1See System Manual (extension)	
1	CFG: IN		FIXED0%		ASW1-IN1		
2	CFG: IN		FIXED0%		ASW1-IN2		
C0811	CFG: SET	1000	FIXED0	 Selection list 2		Configuration of digital input signal, function block ASW1 - LOW: signal at ASW1-IN1 is output to ASW1-OUT - HIGH: signal at ASW1-IN2 is output to ASW1-OUT	
C0812			-199.99	{0.01 %}	199.99		Function block ASW1 Display of the signals linked in C0810 ASW1-IN1ASW1-IN2
1	DIS: IN						
2	DIS: IN						
C0813	DIS: SET		0		1	Function block ASW1 Display of the signal linked in C0811	
C0815		1000		 Selection list 1		Configuration of analog input signals, function block ASW2See System Manual (extension)	
1	CFG: IN		FIXED0%		ASW2-IN1		
2	CFG: IN		FIXED0%		ASW2-IN2		
C0816	CFG: SET	1000	FIXED0	 Selection list 2		Configuration of digital input signal, function block ASW2 - LOW: signal at ASW2-IN1 is output to ASW2-OUT - HIGH: signal at ASW2-IN2 is output to ASW2-OUT	
C0817			-199.99	{0.01 %}	199.99		Function block ASW2 Display of the signals linked in C0815 ASW2-IN1ASW2-IN2
1	DIS: IN						
2	DIS: IN						
C0818	DIS: SET		0		1	Function block ASW2 Display of the signal linked in C0816	
C0820		1000		 Selection list 2		Configuration of digital input signals, function block AND1See System Manual (extension)	
1	CFG: IN		FIXED0		AND1-IN1		
2	CFG: IN		FIXED0		AND1-IN2		
3	CFG: IN		FIXED0		AND1-IN3		
C0821			0		1	Function block AND1 Display of the signals linked in C0820 AND1-IN1AND1-IN2AND1-IN3	
1	DIS: IN						
2	DIS: IN						
3	DIS: IN						

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0822 			 Selection list 2	Configuration of digital input signals, function block AND2	See System Manual (extension)
1	CFG: IN	1000	FIXED0	AND2-IN1	
2	CFG: IN	1000	FIXED0	AND2-IN2	
3	CFG: IN	1000	FIXED0	AND2-IN3	
C0823			0 1	Function block AND2 ● Display of the signals linked in C0822	See System Manual (extension)
1	DIS: IN			AND2-IN1	
2	DIS: IN			AND2-IN2	
3	DIS: IN			AND2-IN3	
C0824 			 Selection list 2	Configuration of digital input signals, function block AND3	See System Manual (extension)
1	CFG: IN	1000	FIXED0	AND3-IN1	
2	CFG: IN	1000	FIXED0	AND3-IN2	
3	CFG: IN	1000	FIXED0	AND3-IN3	
C0825			0 1	Function block AND3 ● Display of the signals linked in C0824	See System Manual (extension)
1	DIS: IN			AND3-IN1	
2	DIS: IN			AND3-IN2	
3	DIS: IN			AND3-IN3	
C0826 			 Selection list 2	Configuration of digital input signals, function block AND4	See System Manual (extension)
1	CFG: IN	1000	FIXED0	AND4-IN1	
2	CFG: IN	1000	FIXED0	AND4-IN2	
3	CFG: IN	1000	FIXED0	AND4-IN3	
C0827			0 1	Function block AND4 ● Display of the signals linked in C0826	See System Manual (extension)
1	DIS: IN			AND4-IN1	
2	DIS: IN			AND4-IN2	
3	DIS: IN			AND4-IN3	
C0828 			 Selection list 2	Configuration of digital input signals, function block AND5	See System Manual (extension)
1	CFG: IN	1000	FIXED0	AND5-IN1	
2	CFG: IN	1000	FIXED0	AND5-IN2	
3	CFG: IN	1000	FIXED0	AND5-IN3	
C0829			0 1	Function block AND5 ● Display of the signals linked in C0828	See System Manual (extension)
1	DIS: IN			AND5-IN1	
2	DIS: IN			AND5-IN2	
3	DIS: IN			AND5-IN3	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0830 STOP			Selection list 2	Configuration of digital input signals, function block OR1	See System Manual (extension)
1	CFG: IN	1000	FIXED0	OR1-IN1	
2	CFG: IN	1000	FIXED0	OR1-IN2	
3	CFG: IN	1000	FIXED0	OR1-IN3	
C0831			0	1 Function block OR1 ● Display of the signals linked in C0830	
1	DIS: IN			OR1-IN1	
2	DIS: IN			OR1-IN2	
3	DIS: IN			OR1-IN3	
C0832 STOP			Selection list 2	Configuration of digital input signals, function block OR2	See System Manual (extension)
1	CFG: IN	1000	FIXED0	OR2-IN1	
2	CFG: IN	1000	FIXED0	OR2-IN2	
3	CFG: IN	1000	FIXED0	OR2-IN3	
C0833			0	1 Function block OR2 ● Display of the signals linked in C0832	
1	DIS: IN			OR2-IN1	
2	DIS: IN			OR2-IN2	
3	DIS: IN			OR2-IN3	
C0834 STOP			Selection list 2	Configuration of digital input signals, function block OR3	See System Manual (extension)
1	CFG: IN	1000	FIXED0	OR3-IN1	
2	CFG: IN	1000	FIXED0	OR3-IN2	
3	CFG: IN	1000	FIXED0	OR3-IN3	
C0835			0	1 Function block OR3 ● Display of the signals linked in C0834	
1	DIS: IN			OR3-IN1	
2	DIS: IN			OR3-IN2	
3	DIS: IN			OR3-IN3	
C0836 STOP			Selection list 2	Configuration of digital input signals, function block OR4	See System Manual (extension)
1	CFG: IN	1000	FIXED0	OR4-IN1	
2	CFG: IN	1000	FIXED0	OR4-IN2	
3	CFG: IN	1000	FIXED0	OR4-IN3	
C0837			0	1 Function block OR4 ● Display of the signals linked in C0836	
1	DIS: IN			OR4-IN1	
2	DIS: IN			OR4-IN2	
3	DIS: IN			OR4-IN3	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0838 STOP			📖 Selection list 2	Configuration of digital input signals, function block OR5	See System Manual (extension)
1	CFG: IN	1000	FIXED0	OR5-IN1	
2	CFG: IN	1000	FIXED0	OR5-IN2	
3	CFG: IN	1000	FIXED0	OR5-IN3	
C0839			0	1 Function block OR5 ● Display of the signals linked in C0838	
1	DIS: IN			OR5-IN1	
2	DIS: IN			OR5-IN2	
3	DIS: IN			OR5-IN3	
C0840 STOP	CFG: IN	1000	FIXED0 📖 Selection list 2	Configuration of digital input signal, function block NOT1	See System Manual (extension)
C0841	DIS: IN		0	1 Function block NOT1 ● Display of the signal linked in C0841	
C0842 STOP	CFG: IN	1000	FIXED0 📖 Selection list 2	Configuration of digital input signal, function block NOT2	See System Manual (extension)
C0843	DIS: IN		0	1 Function block NOT2 ● Display of the signal linked in C0842	
C0844 STOP	CFG: IN	1000	FIXED0 📖 Selection list 2	Configuration of digital input signal, function block NOT3	See System Manual (extension)
C0845	DIS: IN		0	1 Function block NOT3 ● Display of the signal linked in C0844	
C0846 STOP	CFG: IN	1000	FIXED0 📖 Selection list 2	Configuration of digital input signal, function block NOT4	See System Manual (extension)
C0847	DIS: IN		0	1 Function block NOT4 ● Display of the signal linked in C0846	
C0848 STOP	CFG: IN	1000	FIXED0 📖 Selection list 2	Configuration of digital input signal, function block NOT5	See System Manual (extension)
C0849	DIS: IN		0	1 Function block NOT5 ● Display of the signal linked in C0848	
C0850 STOP			📖 Selection list 1	Configuration of analog input signals, function block AIF-OUT	See System Manual (extension)
1	CFG: OUT.W1	1000	FIXED0%	Process output word 1 ● 100% = 16384 ● Signal is output via byte 3 and byte 4 to X1	
2	CFG: OUT.W2	1000	FIXED0%	Process output word 2 ● 100% = 16384	
3	CFG: OUT.W3	1000	FIXED0%	Process output word 3 ● 100% = 16384	
C0851 STOP	CFG: OUT.D1	1000	FIXED0INC 📖 Selection list 3	Configuration of phase input signal, function block AIF ● 32-bit phase signal	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0852	Type OUT.W2	0		Output of the signal type, function block AIF	See System Manual (extension)
			0 analog Analog signal	AIF-OUT.W2 (C0850/2) is output to X1	
			1 digital 0-15 Digital signal via bit 0 ... bit 15	FDO-00 ... FDO-15 (LOW word, C0116/1 ... C0116/15) are output to X1	
			2 low phase Low phase	AIF-OUT.D1 (LOW word, C0851) is output to X1	
C0853	Type OUT.W3	0		Output of the signal type, function block AIF	
			0 analog Analog signal	AIF-OUT.W3 (C0850/3) is output to X1	
			1 digital 16-31 Digital signal via bit 16 ... bit 31	FDO-16 ... FDO-31 (HIGH word, C0116/16 ... C0116/31) are output to X1	
			2 high phase High phase	AIF-OUT.D1 (HIGH word, C0851) is output to X1	
C0855			0	FFFF Process input words, function block AIF-IN	See System Manual (extension)
	1 DIS: IN (0 ... 15)			Bit 0 ... bit 15 (via byte 5 and byte 6)	
	2 DIS: IN (16 ... 31)			Bit 16 ... bit 31 (via byte 7 and byte 8)	
C0856			-199.99 {0.01 %} 199.99	Process input words, function block AIF-IN	See System Manual (extension)
				- Read only 100% = 16384	
	1 DIS: IN.W1			Input via byte 3 and byte 4	
	2 DIS: IN.W2			Input via byte 5 and byte 6	
	3 DIS: IN.W3			Input via byte 7 and byte 8	
C0857	DIS: IN.D1		-2147483648 {1} 2147483647	32-bit phase signal, function block AIF-IN	See System Manual (extension)
				- Read only 65536 = 1 rev.	
C0858			-199.99 {0.01 %} 199.99	Process output words, function block AIF-OUT	See System Manual (extension)
	1 DIS: OUT.W1			- Display of the signals linked in C0850 100% = 16384	
	2 DIS: OUT.W2				
	3 DIS: OUT.W3				
C0859	DIS: OUT.D1		-2147483648 {1} 2147483647	32-bit phase signal, function block AIF-OUT	See System Manual (extension)
				- Display of the signal linked in C0851 1 rev. = 65536	

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C0860 STOP			📖 Selection list 1			Configuration of analog input signals, function block CAN-OUT CAN-OUT1	See System Manual (extension)	
	1	CFG: OUT1.W1	1000	FIXED0%				
	2	CFG: OUT1.W2	1000	FIXED0%				
	3	CFG: OUT1.W3	1000	FIXED0%				
	4	CFG: OUT2.W1	1000	FIXED0%				
	5	CFG: OUT2.W2	1000	FIXED0%				
	6	CFG: OUT2.W3	1000	FIXED0%				
	7	CFG: OUT2.W4	1000	FIXED0%				
	8	CFG: OUT3.W1	1000	FIXED0%				
	9	CFG: OUT3.W2	1000	FIXED0%				
	10	CFG: OUT3.W3	1000	FIXED0%				
	11	CFG: OUT3.W4	1000	FIXED0%				
C0861 STOP			📖 Selection list 3			Configuration of input signals, function block CAN-OUT		
	1	CFG: OUT1.D1	1000	FIXED0INC		CAN-OUT1		
	2	CFG: OUT2.D1	1000	FIXED0INC		CAN-OUT2		
	3	CFG: OUT3.D1	1000	FIXED0INC		CAN-OUT3		
C0863			0		FFFF	Process input words, function block CAN-IN • Read only • Bit 0 ... bit 15 (via byte 5 and byte 6) • Bit 16 ... bit 31 (via byte 7 and byte 8)	See System Manual (extension)	
	1	DIS: IN1 dig0				CAN-IN1, bit 0 ... bit 15		
	2	DIS: IN1 dig16				CAN-IN1, bit 16 ... bit 31		
	3	DIS: IN2 dig0				CAN-IN2, bit 0 ... bit 15		
	4	DIS: IN2 dig16				CAN-IN2, bit 16 ... bit 31		
	5	DIS: IN3 dig0				CAN-IN3, bit 0 ... bit 15		
	6	DIS: IN3 dig16				CAN-IN3, bit 16 ... bit 31		
C0864						Output of the signal type, function block CAN-OUT	See System Manual (extension)	
	1	TYPEOUT1.W2	0	0	analog	Analog signal		CAN-OUTx.Wx (C0860) is output to X4
	2	TYPEOUT2.W1	0	1	digital 0-15	Digital signal bit 0 ... bit 15		FDO-00 ... FDO-15 (LOW word, C0116/1 ... C0116/15) are output to X4
	3	TypeOUT3.W1	0	2	low phase	Low phase		CAN-OUTx.D1 (LOW word, C0861) is output to X4
C0865						Output of the signal type, function block CAN-OUT		
	1	TYPEOUT1.W3	0	0	analog	Analog signal		CAN-OUTx.Wx (C0860) is output to X4
	2	TYPEOUT2.W2	0	1	digital 16-31	Digital signal bit 16 ... bit 31		FDO-16 ... FDO-31 (HIGH word, C0116/16 ... C0116/31) are output to X1
	3	TYPEOUT3.W2	0	2	high phase	High phase		CAN-OUTx.D1 (HIGH word, C0861) is output to X4

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0866			-32768.00	{0.01 %} 32767.00	Process input words, function block CAN-IN - Read only 100% = 16384	See System Manual (extension)
1	DIS: IN1.W1				CAN-IN1	
2	DIS: IN1.W2					
3	DIS: IN1.W3					
4	DIS: IN2.W1				CAN-IN2	
5	DIS: IN2.W2					
6	DIS: IN2.W3					
7	DIS: IN2.W4					
8	DIS: IN3.W1				CAN-IN3	
9	DIS: IN3.W2					
10	DIS: IN3.W3					
11	DIS: IN3.W4					
C0867			-2147483648	{1} 2147483647	32-bit phase signal, function block CAN-IN - Read only 1 rev. = 65536	
1	DIS: IN1.D1					
2	DIS: IN2.D1					
3	DIS: IN3.D1					
C0868			-199.99	{0.01 %} 199.99	Process output words, function block CAN-OUT - Display of the signals linked in C0860 100% = 16384	See System Manual (extension)
1	DIS: OUT1.W1					
2	DIS: OUT1.W2					
3	DIS: OUT1.W3					
4	DIS: OUT2.W1					
5	DIS: OUT2.W2					
6	DIS: OUT2.W3					
7	DIS: OUT2.W4					
8	DIS: OUT3.W1					
9	DIS: OUT3.W2					
10	DIS: OUT3.W3					
11	DIS: OUT3.W4					
C0869			-2147483648	{1} 2147483647	32-bit phase information, function block CAN-OUT - Display of the signals linked in C0861 1 rev. = 65536	
1	DIS: OUT1.D1					
2	DIS: OUT2.D1					
3	DIS: OUT3.D1					
C0870				Selection list 2	Configuration of digital input signals, function block DCTRL	See System Manual (extension)
1	CFG: CINH	1000	FIXED0		DCTRL-CINH1 HIGH = Controller inhibit	
2	CFG: CINH	1000	FIXED0		DCTRL-CINH2 HIGH = Controller inhibit	
C0871	CFG: TRIP-SET	54	DIGIN4	Selection list 2	Configuration of digital input signal, function block DCTRL HIGH = fault message EEr	
C0876	CFG: TRIP-RES	55	DIGIN5	Selection list 2	Configuration of digital input signal, function block DCTRL LOW-HIGH edge = TRIP reset	
C0878					Function block DCTRL Display of the signals linked in C0870, C0871 and C0876	See System Manual (extension)
1	DIS: CINH1					
2	DIS: CINH2					
3	DIS: TRIP-SET					
4	DIS: TRIP-RES					

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0879						Resetting control words
1	Reset C135	0	0	Ready		● C0879 = 1 performs one reset
2	Reset AIF	0	1	Reset		
3	Reset CAN	0				
C0880					📖 Selection list 2	Configuration of digital input signals, function block DCTRL
STOP						● Select parameter set
1	CFG: PAR*1	1000	FIXED0	C0880/1 C0880/2	Selected parameter set	● Selection of a parameter set via binary coding of the digital input signals
2	CFG: PAR*2	1000	FIXED0	0	0	Parameter set 1
				0	1	Parameter set 2
				1	0	Parameter set 3
				1	1	Parameter set 4
C0881	CFG: PAR-LOAD	1000	FIXED0		📖 Selection list 2	Configuration of digital input signal, function block DCTRL
STOP						● LOW-HIGH edge = Load selected parameter set into C0880
C0884						Function block DCTRL
1	DIS: PAR*1					● Display of the signals linked in C0880 and C0881
2	DIS: PAR*2					
3	DIS: PAR-LOAD					
C0885	CFG: R	51	DIGIN1		📖 Selection list 2	Configuration of digital input signals, function block R/L/Q
STOP						● Truth table:
						Inputs Outputs
						R L R/L QSP
						0 0 0/1 1
						1 0 0 0
						0 1 1 0
						1 1 – –
						– State is unchanged
C0886	CFG: L	52	DIGIN2		📖 Selection list 2	
STOP						
C0889			0		1	Function block R/L/Q
1	DIS: R					● Display of the signals linked in C0885 and C0886
2	DIS: L					
C0890	CFG: N-SET	5050	NSET-NOUT		📖 Selection list 1	Configuration of analog input signal, function block MCTRL
STOP						● Speed setpoint
C0891	CFG: M-Add	1000	FIXED0%		📖 Selection list 1	Configuration of analog input signal, function block MCTRL
STOP						● Additional torque setpoint or torque setpoint
C0892	CFG: Lo-M-LIM	5700	ANEG1-OUT		📖 Selection list 1	Configuration of analog input signal, function block MCTRL
STOP						● Lower torque limit in [%] of C0057
C0893	CFG: HI-M-LIM	19523	FCODE-472/3		📖 Selection list 1	Configuration of analog input signal, function block MCTRL
STOP						● Upper torque limit in [%] of C0057
C0898	CFG: M-LIM switch	0	0	M-LIM ON	Reduced torque limit is active	Torque limitation in the field weakening range, function block MCTRL
STOP			1	M-LIM OFF	Reduced torque limit is inactive	● If the torque limit is reduced, the maximum possible torque in the field weakening range is lowered with 1/f. This provides a higher motor stability in the field weakening range

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0899 STOP	CFG: N/M-SWT	1000	FIXED0	📖 Selection list 2	Configuration of digital input signal, function block MCTRL ● LOW = active speed control ● HIGH = active torque control	📖 8.2-48	
C0900 STOP	CFG: QSP	10250	R/L/Q-QSP	📖 Selection list 2	Configuration of digital input signal, function block MCTRL ● HIGH = drive performs quick stop	📖 8.2-25 📖 8.2-48	
C0901 STOP	CFG: I-SET	1000	FIXED0%	📖 Selection list 1	Configuration of analog input signal, function block MCTRL ● Setting of integral action component of the speed controller	📖 8.2-48	
C0902 STOP	CFG: I-LOAD	1000	FIXED0	📖 Selection list 2	Configuration of digital input signal, function block MCTRL ● HIGH = the integral action component at MCTRL-I-SET is accepted by the speed controller		
C0903 STOP	CFG: BOOST	5015	MCTRL-BOOST	📖 Selection list 1	Configuration of analog input signal, function block MCTRL ● Boost of the motor voltage	📖 8.2-25	
C0904 STOP	CFG: DC-BREAK	1000	FIXED0	📖 Selection list 2	Configuration of digital input signal, function block MCTRL ● HIGH = Motor is braked	📖 8.2-25 📖 8.2-48	
C0905	DIS: DC-BREAK		0	1	Function block MCTRL ● Display of the signal linked in C0904		
C0906			-199.99	{0.01 %}	199.99	Function block MCTRL ● Display of the signals linked in C0890, C0891, C0892, C0893, C0901 and C0903	📖 8.2-25 📖 8.2-48
	1 DIS: N-SET						
	2 DIS: M-ADD						
	3 DIS: LO-M-LIM						
	4 DIS: HI-M-LIM						
	5 DIS: I-SET						
	6 DIS: BOOST						
C0907			0	1	Function block MCTRL ● Display of the signals linked in C0899, C0900 and C0902		
	1 reserved						
	2 DIS: N/M-SWT						
	3 DIS: QSP						
	4 DIS: I-LOAD						
C0909	speed limit	1	1	+/- 175 %	Speed limitation, function block MCTRL ● Limitation of direction of rotation for the speed setpoint	📖 8.2-25 📖 8.2-48	
			2	0 ... 175 %			
			3	-175 ... 0 %			
C0910 STOP	CFG: VP-ADAPT	1006	FIXED100%	📖 Selection list 1	Configuration of analog input signal, function block MCTRL ● Gain adaptation of the speed controller ● If the gain is varying, join to CURVE-OUT of FB CURVE	📖 8.2-25 📖 8.2-48	
C0911	DIS: VP-ADAPT		-199.99	{0.01 %}	199.99	Function block MCTRL ● Display of the signal linked in C0910	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0912	OV delay time	→	- {1 ms}	- Delay time of the pulse enable after an OU message → Depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 A change of one of the codes resets C0912 to the time of the selected motor • The time is derived from the double rotor time constant
C0913	OV handling	0	0 inactive Non-reduced motor current 1 active Reduced motor current	Value of the motor current during the flying restart process or after an OU message • When C0913 = 1, the motor is driven with reduced current to the setpoint speed during the flying restart process of after an OU message. • The setting is only effective for the drives EVF9326 ... EVF9333
C0940	Numerator	1	-32767 {1} 32767	Configuration of conversion factor with numerator and denominator, function block CONV1
C0941	Denominator	1	1 {1} 32767	OUT [%] = IN [%] · $\frac{C0940}{C0941}$
C0942	CFG: IN	1000	FIXED0% Selection list 1	Configuration of analog input signal, function block CONV1
C0943	DIS: IN		-199.99 {0.01 %} 199.99	Function block CONV1 • Display of the signal linked in C0942
C0945	Numerator	1	-32767 {1} 32767	Configuration of conversion factor with numerator and denominator, function block CONV2
C0946	Denominator	1	1 {1} 32767	OUT [%] = IN [%] · $\frac{C0945}{C0946}$
C0947	CFG: IN	1000	FIXED0% Selection list 1	Configuration of analog input signal, function block CONV2
C0948	DIS: IN		-199.99 {0.01 %} 199.99	Function block CONV2 • Display of the signal linked in C0947
C0950	Numerator	1	-32767 {1} 32767	Configuration of conversion factor with numerator and denominator, function block CONV3
C0951	Denominator	1	1 {1} 32767	OUT [%] = IN [rpm] · $\frac{100 \%}{15000 \text{ rpm}} \cdot \frac{C0950}{C0951}$
C0952	CFG: IN	1000	FIXED0% Selection list 1	Configuration of analog input signal, function block CONV3
C0953	DIS: IN		-199.99 {0.01 %} 199.99	Function block CONV3 • Display of the signal linked in C0952
C0955	Numerator	1	-32767 {1} 32767	Configuration of conversion factor with numerator and denominator, function block CONV4
C0956	Denominator	1	1 {1} 32767	OUT [%] = IN [rpm] · $\frac{100 \%}{15000 \text{ rpm}} \cdot \frac{C0955}{C0956}$
C0957	CFG: IN	1000	FIXED0% Selection list 1	Configuration of analog input signal, function block CONV4
C0958	DIS: IN		-199.99 {0.01 %} 199.99	Function block CONV4 • Display of the signal linked in C0957

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0960	Function	1				Function selection, function block CURVE1	See System Manual (extension)
			1	Function 1		Characteristic with two base points	
			2	Function 2		Characteristic with three base points	
			3	Function 3		Characteristic with four base points	
C0961	y0	0.00	0.00	{0.01 %}	199.99	Configuration of base point y0, function block CURVE1 • Ordinate of the value pair (x = 0 % / y0)	See System Manual (extension)
C0962	y1	50.00	0.00	{0.01 %}	199.99	Configuration of base point y1, function block CURVE1 • Ordinate of the value pair (x1 / y1)	
C0963	y2	75.00	0.00	{0.01 %}	199.99	Configuration of base point y2, function block CURVE1 • Ordinate of the value pair (x2 / y2)	
C0964	y100	100.0	0.00	{0.01 %}	199.99	Configuration of base point y100, function block CURVE1 • Ordinate of the value pair (x 100 % / y100)	
C0965	x1	50.00	0.01	{0.01 %}	99.99	Configuration of base point x1, function block CURVE1 • Abscissa of the pair (x1 / y1)	See System Manual (extension)
C0966	x2	75.00	0.01	{0.01 %}	99.99	Configuration of base point x2, function block CURVE1 • Abscissa of the pair (x2 / y2)	
C0967	CFG: IN	1000	FIXED0%  Selection list 1			Configuration of analog input signal, function block CURVE1	
C0968	DIS: IN		-199.99	{0.01 %}	199.99	Function block CURVE1 • Display of the signal linked in C0967	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0970 	CFG: SET	1000	FIXED0%	 Selection list 1		Configuration of analog input signal, function block MFAIL Starting value for the controlled deceleration in [%] of C0011	See System Manual (extension)
C0971 	CFG: FAULT	1000	FIXED0	 Selection list 2		Configuration of digital input signal, function block MFAIL HIGH = activates mains failure control	
C0972 	CFG: RESET	1000	FIXED0	 Selection list 2		Configuration of digital input signal, function block MFAIL HIGH = resets mains failure control	
C0973 	CFG: ADAPT	1000	FIXED0%	 Selection list 1		Configuration of analog input signal, function block MFAIL Dynamic adaptation of the proportional gain of U_{Gsetl} controller in [%] of C0980	
C0974 	CFG: CONST	1000	FIXED0%	 Selection list 1		Configuration of analog input signal, function block MFAIL Proportional gain of U_{Gset} controller in [%] of C0980	
C0975 	CFG: THRESHLD	1000	FIXED0%	 Selection list 1		Configuration of analog input signal, function block MFAIL - Restart protection when the value falls below the speed threshold - Restart threshold in [%] of C0011	
C0976 	CFG: NACT	1000	FIXED0%	 Selection list 1		Configuration of analog input signal, function block MFAIL - Comparison value for the restart threshold in [%] of C0011 - Start for V₂ controller	
C0977 	CFG: SET	1000	FIXED0%	 Selection list 1		Configuration of analog input signal, function block MFAIL Speed starting value for the deceleration in [%] of C0011	
C0978 	CFG: DC-SET	1000	FIXED0%	 Selection list 1		Configuration of analog input signal, function block MFAIL Setting of the voltage setpoint on which the DC-bus voltage is to be kept (100 % = 1000 V)	
C0980	MFAIL V _p	0.500	0.001	{0.001}	31.000	Gain V _p , function block MFAIL	See System Manual (extension)
C0981	MFAIL T _n	100	20	{1 ms}	2000	Integral-action time T _n , function block MFAIL	
C0982	MFAIL T _{ir}	2.000	0.001	{0.001 s}	16.000	Acceleration time T _{ir} , function block MFAIL	
C0983	Retrigger T	1.000	0.001	{0.001 s}	60.000	Retrigger time, function block MFAIL After the time has elapsed, the mains failure control is terminated	

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0988	Input signals		-199.99	{0.01 %}	199.99	Function block MFAIL ● Display of the signals linked in C0970, C0973, C0974, C0975, C0976, C0977 and C0978	See System Manual (extension)
1	DIS: N-SET						
2	DIS: ADAPT						
3	DIS: CONST						
4	DIS: THRESHLD						
5	DIS: NACT						
6	DIS: SET						
7	DIS: DC-SET						
C0989			0		1	Function block MFAIL ● Display of the signals linked in C0971 and C0972	
1	DIS: FAULT						
2	DIS: RESET						
C1000	DIVISION	1	0	{1}	31	Part factor, function block CONVPHA1 ● Calculate output signal: $\text{OUT [\%]} = \text{IN [\%]} \cdot \frac{100 \%}{2^{14} \cdot 2^{C1000}}$	See System Manual (extension)
C1001	CFG: IN	1000	FIXED0INC	 Selection list 3		Configuration of input signal, function block CONVPHA1	
C1002	DIS: IN		-2147483648	{1}	2147483647	Function block CONVPHA1 ● Display of the signal linked in C1001	
C1040	Acceleration	100.000	0.001	{0.001 }	5000.000	Acceleration, function block SRFG1 ● Max. acceleration	See System Manual (extension)
C1041	Jerk	0.200	0.001	{0.001 s}	999.999	Jerk, function block SRFG1 ● S-ramp time	
C1042	CFG: IN	1000	FIXED0%	 Selection list 1		Configuration of analog input signal, function block SRFG1	
C1043	CFG: SET	1000	FIXED0%	 Selection list 1		Configuration of analog input signal, function block SRFG1 ● Starting value for the ramp function generator ● Starting value is accepted when SRFG1-LOAD = HIGH	
C1044	CFG: LOAD	1000	FIXED0	 Selection list 2		Configuration of digital input signal, function block SRFG1 ● HIGH = accepts the value at SRFG1-SET and outputs it to SRFG1-OUT. SRFG1-DIFF remains on 0 %	
C1045			-199.99	{0.01 %}	199.99	Function block SRFG1 ● Display of the signals linked in C1042 and C1043	
1	DIS: IN						
2	DIS: SET						
C1046	DIS: LOAD		0		1	Function block SRFG1 ● Display of the signal linked in C1044	See System Manual (extension)
C1090	Output signal		-2147483648	{1}	2147483647	Function block FEVAN1 ● Display of the converted signal	
C1091	Code	141	2	{1}	2000	Code, function block FEVAN1 ● Selection of the target code in which the calculated value is to be written	
C1092	Subcode	0	0	{1}	255	Subcode, function block FEVAN1 ● Selection of the target subcode in which the calculated value is to be written	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C1093	Numerator	1.000 0	0.0001	{0.0001}	100000.0000	Numerator, function block FEVAN1	See System Manual (extension)
						Scaling of the input signal	
C1094	Denominator	0.000 1	0.0001	{0.0001}	100000.0000	Denominator, function block FEVAN1	
						Scaling of the input signal	
C1095	Offset	0	0	{1}	1000000000	Offset, function block FEVAN1	
						An offset can be added to the converted signal	
C1096	CFG: IN	1000	FIXED0%	📖 Selection list 1		Configuration of analog input signal, function block FEVAN1	See System Manual (extension)
C1097	CFG: LOAD	1000	FIXED0	📖 Selection list 2		Configuration of digital input signal, function block FEVAN1	
						A LOW-HIGH edge transmits the converted signal to the target code	
C1098	DIS: IN		-32768	{1}	32767	Function block FEVAN1	See System Manual (extension)
						Display of the signal linked in C1096	
C1099	DIS: LOAD					Function block FEVAN1	
						Display of the signal linked in C1097	
C1100	Function	1				Function selection, function block FCNT1	See System Manual (extension)
			1	Return		At |counter content| ≥ |FCNT1-CMP-Val| FCNT1-EQUAL is set to HIGH for 1 ms	
			2	Hold if >=		At |counter content| ≥ |FCNT1-CMP-Val| the counter stops	
			3	Hold if =		At |counter content| = |FCNT1-CMP-Val| the counter stops	
C1101					📖 Selection list 1	Configuration of analog input signals, function block FCNT1	See System Manual (extension)
						- Starting value - Comparison value	
C1102					📖 Selection list 2	Configuration of digital input signals, function block FCNT1	See System Manual (extension)
						LOW-HIGH edge counts upwards by one	
						LOW-HIGH edge counts downwards by one	
						- HIGH = accepts starting value - Input signal has highest priority	
C1103			-32768	{1}	32768	Function block FCNT1	See System Manual (extension)
						Display of the signals linked in C1101	
C1104			0		1	Function block FCNT1	
						Display of the signals linked in C1102	

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C1160 STOP			📖 Selection list 1		Configuration of analog input signals, function block ASW3	See System Manual (extension)	
1	CFG: IN	1000	FIXED0%		ASW3-IN1		
2	CFG: IN	1000	FIXED0%		ASW3-IN2		
C1161 STOP	CFG: SET	1000	FIXED0 📖 Selection list 2		Configuration of digital input signal, function block ASW3 ● LOW: signal at ASW3-IN1 is output to ASW3-OUT ● HIGH: signal at ASW3-IN2 is output to ASW3-OUT		
C1162			-199.99	{0.01 %}	199.99	Function block ASW3 ● Display of the signals linked in C1060	
1	DIS: IN				ASW3-IN1		
2	DIS: IN				ASW3-IN2		
C1163	DIS: SET				Function block ASW3 ● Display of the signal linked in C1061		
C1190		0			Temperature characteristic for PTC thermistors Selection of the characteristic for PTC thermistors at X7 or X8 for motor temperature detection		
		0	Standard		Characteristic for PTC thermistors in Lenze motors		
		1	Characteristic		Characteristic for application-specific PTC thermistors		
C1191			0	{1 °C}	255	Temperature range for PTC thermistors Specification of temperature points on the characteristic for PTC thermistors.	
1		100			Temperature point 1		
2		150			Temperature point 2		
C1192			0	{1 Ω}	3000	Resistance range for PTC thermistors Specification of resistance points on the characteristic for PTC thermistors.	
1		1670			Resistance point 1		
2		2225			Resistance point 2		
C1300 STOP	N-motor/ Dmax	300	-32767	{1 rpm}	32767	Motor speed at D _{max} , function block DCALC1 ● Nominal speed of the winding drive	📖 8.2-1
C1301 STOP	N-line max	3000	1	{1 rpm}	32767	Maximum line speed, function block DCALC1 ● Nominal speed of the line drive	
C1302	calc cycle	0.1	0.1	{0.1 rev}	100.0	Calculation cycle, function block DCALC1	📖 8.2-1
C1303	time const	0.10	0.01	{0.01 s}	50.00	Filter time constant, function block DCALC1	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C1304 	Dmax	500	1	{1 mm}	10000	Maximum diameter, function block DCALC1 Nominal winding diameter	 8.2-1
C1305	lower D-limit	50	1	{1 mm}	10000	Lower diameter limit, function block DCALC1 Minimum winding diameter	
C1306	upper D-limit	500	1	{1 mm}	10000	Upper diameter limit, function block DCALC1 Maximum winding diameter	
C1307	hyst D-limit	1.00	0.00	{0.01 %}	100.0	Hysteresis - diameter limitation, function block DCALC1 Hysteresis for D_{min} /D_{max} output	
C1308 	arit function	1	0	DCALC1-OUT=D	DCALC1-OUT = diameter	Selection of the arithmetic function, function block DCALC1	 8.2-1
			1	DCALC1-OUT=1/D	DCALC1-OUT = 1/diameter		
C1309 	Dmin	50	1	{1 mm}	10000	Minimum diameter, function block DCALC1	 8.2-1
C1310	DCALC1-Titime	0.000	0.000	{0.001 s}	999.900	Acceleration and deceleration time, function block DCALC1	
C1311	window D-calc	1.00	0.00	{0.01 %}	100.00	Window - diameter calculation, function block DCALC1 Window setting for permissible diameter deviation	
C1320 	CFG: SET	1000	FIXED0%  Selection list 1			Configuration of analog input signal, function block DCALC1 The signal is scaled to the value in C1304 (100 % $\triangle$ C1304)	 8.2-1
C1321 			 Selection list 2			Configuration of digital input signals, function block DCALC1	
1	CFG: LOAD	1000	FIXED0			- HIGH: initial value at DCALC1-SET is accepted - DCALC1-LOAD has a higher priority than DCALC1-HOLD	
2	CFG: HOLD	1000	FIXED0			HIGH = holds the diameter value reached and resets the integrators.	
C1322			-36000	{1 rpm}	36000	Function block DCALC1 Display of the signals linked in C1327	 8.2-1
1	DIS: N-Line						
2	DIS: N-WIND						
C1325	DIS: SET		-199,99	{0.01 %}	199,99	Function block DCALC1 Display of the signal linked in C1320	
C1326			0		1	Function block DCALC1 Display of the signals linked in C1321	
1	DIS: LOAD						
2	DIS: HOLD						
C1327 			 Selection list 3			Configuration of input signals, function block DCALC1	 8.2-1
1	CFG: N-Line	1000	FIXED0INC			Speed signal of the line drive	
2	CFG: N-WIND	1000	FIXED0INC			Speed signal of the winding drive	
C1328	DIS: D-ACT		-200	{1 mm}	200	Function block DCALC1 Display of the current diameter	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C1330	PCTRL2 Tir	1.0	0.1	{0.1 s	6000.0	Acceleration time t_{ir} , function block PCTRL2	See System Manual (extension)
						- Acceleration time for the setpoint - The acceleration time refers to a setpoint change of 0 ... 100 %	
C1331	PCTRL2 Tif	1.0	0.1	{0.1 s}	6000.0	Deceleration time t_{if} , function block PCTRL2	See System Manual (extension)
						- Deceleration time for the setpoint - The deceleration time refers to a setpoint change of 100 % ... 0	
C1332	PCTRL2 Vp	1.0	0.1	{0.1 }	500.0	Gain V_p , function block PCTRL2	See System Manual (extension)
C1333	PCTRL2 Tn	400	20	{1 ms}	99999	Integral-action time T_n , function block PCTRL2	
						Setting of reset time T_n of PCTRL2	
C1334	PCTRL2 Kd	0.0	0.0	{0.1 }	5.0	Differential component K_d , function block PCTRL2	See System Manual (extension)
C1335	bipolar/unipolar	0				Sphere of action, function block PCTRL2	
			0	Bipolar		Output value is limited to -100 ... 100 %	See System Manual (extension)
			1	Unipolar		Output value is limited to 0 ... 100 %	
C1336	Tir overlay	1.0	0.1	{0.1 s}	6000.0	Fade-in time, function block PCTRL2	See System Manual (extension)
						- Acceleration time of the ramp generator - Controls the influence of the process controller	
C1337	Tif overlay	1.0	0.1	{0.1 s}	6000.0	Fade-out time, function block PCTRL2	See System Manual (extension)
						- Deceleration time of the ramp generator - Controls the influence of the process controller	
C1340						 Selection list 1	See System Manual (extension)
						Configuration of analog input signals, function block PCTRL2	
	1 CFG: RFG-SET	1000	FIXED0%			- The process setpoint is shown at PCTRL2-SET with a starting value via a ramp generator - PCTRL-RFG-LOAD = HIGH activates the function	See System Manual (extension)
	2 CFG: SET	1000	FIXED0%			- Input for process value - Value range: ± 200 %	
	3 CFG: ACT	1000	FIXED0%			- Input for actual value - Value range: ± 200 %	
	4 CFG: INFL	1000	FIXED0%			- Evaluation (influence) of the output signal - Value range: ± 200 %	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C1341 			 Selection list 2	Configuration of digital input signals, function block PCTRL2
1	CFG: RFG-LOAD	1000	FIXED0	HIGH = function of PCTRL2-RFG-SET is active
2	CFG: I-OFF	1000	FIXED0	- HIGH = Switches of integral action component - LOW = switches on integral action component
3	CFG: INACT	1000	FIXED0	HIGH = deactivates process controller
4	CFG: OVERLAY	1000	FIXED0	- HIGH = Shows influence - LOW = hides influence
C1344			-199.99 {0.01 %} 199.99	Function block PCTRL2
1	DIS: RFG-SET			Display of the signals linked in C1340
2	DIS: SET			
3	DIS: ACT			
4	DIS: INFL			
C1345			0 1	Function block PCTRL2
1	DIS: RFG-LOAD			Display of the signals linked in C1341
2	DIS: I-OFF			
3	DIS: INACT			
4	DIS: OVERLAY			
C1350	INT1 function	0		Function selection, function block INT1
		0	PHI >= REF	If INT1-IN ≥ INT1-REF, INT1-DOUT is set to HIGH
		1	|PHI| >= |REF|	If |INT1-IN| ≥ |INT1-REF|, INT1-DOUT is set to HIGH
C1351	INT1 scaling	65536 00	65536 {1} 1000000000	Scaling factor, function block INT1
				$\text{INT1} - \text{AOUT} [\%] = \frac{\text{INT1} - \text{IN} [\text{inc}]}{\text{C1351}} \cdot 100 \%$
C1354 	CFG: REF	1000	FIXED0INC  Selection list 3	Input signal configuration
				Reference value
C1355 	CFG: IN	1000	FIXEDPHI-0  Selection list 4	Configuration of input signal, function block INT1
				Angle of rotation
C1356 	CFG: RESET	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block INT1
				HIGH = Sets the integrator to 0
C1357	DIS: REF		-2000000000 {1 inc} 2000000000	Function block INT1
				Display of the signal linked in C1354
C1358	DIS: IN		-32767 {1 rpm} 32767	Function block INT1
				Display of the signal linked in C1355
C1359	DIS: RESET		0 1	Function block INT1
				Display of the signal linked in C1356
C1360	INT2 function	0		Function selection, function block INT2
		0	PHI >= REF	If INT2-IN ≥ INT2-REF, INT2-DOUT is set to HIGH
		1	|PHI| >= |REF|	If |INT2-IN| ≥ |INT2-REF|, INT2-DOUT is set to HIGH
C1361	INT2 scaling	65536 00	65536 {1} 1000000000	Scaling factor, function block INT2
				$\text{INT2} - \text{AOUT} [\%] = \frac{\text{INT2} - \text{IN} [\text{inc}]}{\text{C1361}} \cdot 100 \%$

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C1364 	CFG: REF	1000	FIXED0INC	 Selection list 3	Input signal configuration ● Reference value	See System Manual (extension)
C1365 	CFG: IN	1000	FIXEDPHI-0	 Selection list 4	Configuration of input signal, function block INT2 ● Angle of rotation	
C1366 	CFG: RESET	1000	FIXED0	 Selection list 2	Configuration of digital input signal, function block INT2 ● HIGH = Sets the integrator to 0	
C1367	DIS: REF		-2000000000 {1 inc} 2000000000		Function block INT2 ● Display of the signal linked in C13564	See System Manual (extension)
C1368	DIS: IN		-32767 {1 rpm} 32767		Function block INT2 ● Display of the signal linked in C1365	
C1369	DIS: RESET		0 1		Function block INT2 ● Display of the signal linked in C1366	
C1370	FOLL max	100.0 0	0.00 {0.01 %} 199.99		Upper limit, function block FOLL1 ● Upper limit of the ramp function generator	See System Manual (extension)
C1371	FOLL min	-100.0 0	-199.99 {0.01 %} 0.00		Lower limit, function block FOLL1 ● Lower limit of the ramp function generator	
C1372	FOLL Tir	10.0	0.1 {0.1 s} 6000.0		Acceleration time T_{ir} and deceleration time T_{if} of the ramp function generator, function block FOLL1	
C1373	FOLL Tif	10.0	0.1 {0.1 s} 6000.0			See System Manual (extension)
C1375 				 Selection list 1	Configuration of analog input signals, function block FOLL1	
1	CFG: SIGN	1000	FIXED0%		● Negative value: signal characteristic at FOLL1-OUT is opposed to the one at FOLL1-IN ● Positive value: signal characteristic at FOLL1-OUT is the same as at FOLL1-IN	
2	CFG: IN	1000	FIXED0%		If FOLL1-IN > FOLL1-REF, the ramp function generator starts	
3	CFG: REF	1000	FIXED0%		Reference value	
4	CFG: LOAD	1000	FIXED0%		Initial value for the ramp function generator	
C1376 	CFG: SET	1000	FIXED0	 Selection list 2	Configuration of digital input signal, function block FOLL1 ● HIGH: initial value at FOLL1-LOAD is accepted	See System Manual (extension)
C1377			-199.99 {0.01 %} 199.99		Function block FOLL1 ● Display of the signals linked in C1375	
1	DIS: SIGN					
2	DIS: IN					
3	DIS: REF					
4	DIS: LOAD					
C1378	DIS: SET		0 1		Function block FOLL1 ● Display of the signal linked in C1376	

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C1583	fset high	100.0 0	0.00	{0.01 %}	199.99	Alterations by Lenze service only! Adaptation of the motor magnetising current set in C0095 (with V/f characteristic control: influence limit of the boost correction; with vector control: influence limit of the field precontrol) - The output frequency is set up to which the motor magnetising current set in C0095 is to have an effect. - C1583 = 100 % $\triangle$ half the rated motor frequency in C0089	 6.11-5
C1751			0	{1}	65535	Inverter compensation characteristic (WRK) During the motor parameter identification, the characteristic is calculated from the measured motor stator resistance and saved in C1751/1 ... C1751/17	 6.6-14
	1	0					
	...	...					
	17	0					
C1753			0	Data are not o. k.		Internal data are o. k. Motor data identification for the inverter compensation characteristic has been completed successfully	
			1	Data are o. k.			
C1754			0	Data are not o. k.		Internal data are o. k. Motor data identification for the motor leakage inductance has been completed successfully	
			1	Data are o. k.			
C1755		100	0	{1}	65535	Image of inverter compensation characteristic (WRK) on the maximum current range	

8.6 Selection lists

8.6.1 Selection list 1: Analog output signals

Parameter	Analog output signal (O)
000050	AIN1-OUT
000055	AIN2-OUT
000100	DFSET-NOUT
001000	FIXED0%
001006	FIXED100%
001007	FIXED-100%
005000	MCTRL-nset2
005001	MCTRL-NACT
005002	MCTRL-MSET2
005003	MCTRL-MACT
005004	MCTRL-IACT
005005	MCTRL-DCVOLT
005006	MCTRL-VACT
005007	MCTRL-FACT
005008	MCTRL-IxT
005009	MCTRL-PHI-ACT
005010	MCTRL-M-TEMP
005015	MCTRL-BOOST
005050	NSET-NOUT
005051	NSET-RFG-I
005052	NSET-C10-C11
005100	MPOT1-OUT
005150	PCTRL1-OUT
005250	NLIM1-OUT
005500	ARIT1-OUT
005505	ARIT2-OUT
005510	ARIT3-OUT
005540	SQRT1-OUT
005550	ADD1-OUT
005555	ADD2-OUT
005600	RFG1-OUT
005610	SRFG1-OUT
005611	SRFG1-DIFF
005650	ASW1-OUT
005655	ASW2-OUT
005660	ASW3-OUT

Parameter	Analog output signal (O)
005700	ANEG1-OUT
005705	ANEG2-OUT
005750	FIXSET1-OUT
005800	LIM1-OUT
005850	ABS1-OUT
005900	PT1-1-OUT
005905	PT1-2-OUT
005950	DT1-1-OUT
006100	MFAIL-NOUT
006150	DB1-OUT
006200	CONV1-OUT
006205	CONV2-OUT
006210	CONV3-OUT
006215	CONV4-OUT
006230	CONVPHA1-OUT
006300	S&H1-OUT
006350	CURVE1-OUT
006400	FCNT1-OUT
010000	BRK1-M-SET
011000	DCALC1-D-OUT
011001	DCALC1-OUT
011050	PCTRL2-OUT
011100	INT1-AOUT
011105	INT2-AOUT
011150	FOLL1-OUT
015030	MCTRL-LOAD-I2XT
019500	FCODE-17
019502	FCODE-26/1
019503	FCODE-26/2
019504	FCODE-27/1
019505	FCODE-27/2
019506	FCODE-32
019507	FCODE-37
019510	FCODE-108/1
019511	FCODE-108/2
019512	FCODE-109/1

8

Configuration

8.6

Selection lists

8.6.1

Selection list 1: Analog output signals

Parameter	Analog output signal (O)
019513	FCODE-109/2
019515	FCODE-141
019521	FCODE-472/1
019522	FCODE-472/2
019523	FCODE-472/3
019524	FCODE-472/4
019525	FCODE-472/5
019526	FCODE-472/6
019527	FCODE-472/7
019528	FCODE-472/8
019529	FCODE-472/9
019530	FCODE-472/10
019531	FCODE-472/11
019532	FCODE-472/12
019533	FCODE-472/13
019534	FCODE-472/14
019535	FCODE-472/15
019536	FCODE-472/16
019537	FCODE-472/17
019538	FCODE-472/18
019539	FCODE-472/19
019540	FCODE-472/20
019551	FCODE-473/1

Parameter	Analog output signal (O)
019552	FCODE-473/2
019553	FCODE-473/3
019554	FCODE-473/4
019555	FCODE-473/5
019556	FCODE-473/6
019557	FCODE-473/7
019558	FCODE-473/8
019559	FCODE-473/9
019560	FCODE-473/10
020101	CAN-IN1.W1
020102	CAN-IN1.W2
020103	CAN-IN1.W3
020201	CAN-IN2.W1
020202	CAN-IN2.W2
020203	CAN-IN2.W3
020204	CAN-IN2.W4
020301	CAN-IN3.W1
020302	CAN-IN3.W2
020303	CAN-IN3.W3
020304	CAN-IN3.W4
025101	AIF-IN.W1
025102	AIF-IN.W2
025103	AIF-IN.W3

8.6.2 Selection list 2: Digital output signals

Parameter	Digital output signal (□)
000051	DIGIN1
000052	DIGIN2
000053	DIGIN3
000054	DIGIN4
000055	DIGIN5
000056	DIGIN6(ST)
000065	DIGIN-CINH
000100	DFSET-ACK
000500	DCTRL-RDY
000501	DCTRL-CINH
000502	DCTRL-INIT
000503	DCTRL-IMP
000504	DCTRL-NACT=0
000505	DCTRL-CW/CCW
001000	FIXED0
001001	FIXED1
002000	DCTRL-PAR*1
002001	DCTRL-PAR*2
002002	DCTRL-PAR-BUSY
005001	MCTRL-QSP-OUT
005002	MCTRL-IMAX
005003	MCTRL-MMAX
005006	MCTRL-GSB-OUT
005050	NSET-RFG-I=0
006000	DFRFG1-FAIL
006001	DFRFG1-SYNC
006100	MFAIL-STATUS
006101	MFAIL-I-RESET
006400	FCNT1-EQUAL
010000	BRK1-OUT
010001	BRK1-CINH
010002	BRK1-QSP
010003	BRK1-M-STORE
010250	R/L/Q-QSP
010251	R/L/Q-R/L
010500	AND1-OUT
010505	AND2-OUT
010510	AND3-OUT
010515	AND4-OUT

Parameter	Digital output signal (□)
010520	AND5-OUT
010550	OR1-OUT
010555	OR2-OUT
010560	OR3-OUT
010565	OR4-OUT
010570	OR5-OUT
010600	NOT1-OUT
010605	NOT2-OUT
010610	NOT3-OUT
010615	NOT4-OUT
010620	NOT5-OUT
010650	CMP1-OUT
010655	CMP2-OUT
010660	CMP3-OUT
010665	CMP4-OUT
010700	DIGDEL1-OUT
010705	DIGDEL2-OUT
010750	TRANS1-OUT
010755	TRANS2-OUT
010900	FLIP1-OUT
010905	FLIP2-OUT
011000	DCALC1-DMAX
011001	DCALC1-DMIN
011002	DCALC1-I=0
011003	DCALC1-OVFL
011100	INT1-DOUT
011105	INT2-DOUT
013000	FEVAN1-BUSY
013001	FEVAN1-FAIL
015000	DCTRL-TRIP
015001	DCTRL-MESS
015002	DCTRL-WARN
015003	DCTRL-FAIL
015010	MONIT-LU
015011	MONIT-OU
015012	MONIT-EEr
015013	MONIT-OC1
015014	MONIT-OC2
015015	MONIT-LP1
015016	MONIT-OH
015017	MONIT-OH3

Parameter	Digital output signal (□)
015018	MONIT-OH4
015019	MONIT-OH7
015020	MONIT-OH8
015022	MONIT-SD3
015026	MONIT-CE0
015027	MONIT-NMAX
015028	MONIT-OC5
015029	MONIT-SD5
015030	MONIT-SD6
015032	MONIT-H07
015033	MONIT-H10
015034	MONIT-H11
015040	MONIT-CE1
015041	MONIT-CE2
015042	MONIT-CE3
015043	MONIT-CE4
015044	MONIT-OC3
015045	MONIT-ID1
015046	MONIT-ID2
015047	MONIT-OC6
015048	MONIT-OC8
019500	FCODE-250
019521	FCODE-471.B0
019522	FCODE-471.B1
019523	FCODE-471.B2
019524	FCODE-471.B3
019525	FCODE-471.B4
019526	FCODE-471.B5
019527	FCODE-471.B6
019528	FCODE-471.B7
019529	FCODE-471.B8
019530	FCODE-471.B9
019531	FCODE-471.B10
019532	FCODE-471.B11
019533	FCODE-471.B12
019534	FCODE-471.B13
019535	FCODE-471.B14
019536	FCODE-471.B15
019537	FCODE-471.B16
019538	FCODE-471.B17
019539	FCODE-471.B18
019540	FCODE-471.B19
019541	FCODE-471.B20
019542	FCODE-471.B21
019543	FCODE-471.B22
019544	FCODE-471.B23

Parameter	Digital output signal (□)
019545	FCODE-471.B24
019546	FCODE-471.B25
019547	FCODE-471.B26
019548	FCODE-471.B27
019549	FCODE-471.B28
019550	FCODE-471.B29
019551	FCODE-471.B30
019552	FCODE-471.B31
019751	FCODE-135.B0
019752	FCODE-135.B1
019753	FCODE-135.B2
019755	FCODE-135.B4
019756	FCODE-135.B5
019757	FCODE-135.B6
019758	FCODE-135.B7
019763	FCODE-135.B12
019764	FCODE-135.B13
019765	FCODE-135.B14
019766	FCODE-135.B15
020001	CAN-CTRL.B0
020002	CAN-CTRL.B1
020003	CAN-CTRL.B2
020005	CAN-CTRL.B4
020006	CAN-CTRL.B5
020007	CAN-CTRL.B6
020008	CAN-CTRL.B7
020013	CAN-CTRL.B12
020014	CAN-CTRL.B13
020015	CAN-CTRL.B14
020016	CAN-CTRL.B15
020101	CAN-IN1.B0
020102	CAN-IN1.B1
020103	CAN-IN1.B2
020104	CAN-IN1.B3
020105	CAN-IN1.B4
020106	CAN-IN1.B5
020107	CAN-IN1.B6
020108	CAN-IN1.B7
020109	CAN-IN1.B8
020110	CAN-IN1.B9
020111	CAN-IN1.B10
020112	CAN-IN1.B11

Parameter	Digital output signal (□)
020113	CAN-IN1.B12
020114	CAN-IN1.B13
020115	CAN-IN1.B14
020116	CAN-IN1.B15
020117	CAN-IN1.B16
020118	CAN-IN1.B17
020119	CAN-IN1.B18
020120	CAN-IN1.B19
020121	CAN-IN1.B20
020122	CAN-IN1.B21
020123	CAN-IN1.B22
020124	CAN-IN1.B23
020125	CAN-IN1.B24
020126	CAN-IN1.B25
020127	CAN-IN1.B26
020128	CAN-IN1.B27
020129	CAN-IN1.B28
020130	CAN-IN1.B29
020131	CAN-IN1.B30
020132	CAN-IN1.B31
020201	CAN-IN2.B0
020202	CAN-IN2.B1
020203	CAN-IN2.B2
020204	CAN-IN2.B3
020205	CAN-IN2.B4
020206	CAN-IN2.B5
020207	CAN-IN2.B6
020208	CAN-IN2.B7
020209	CAN-IN2.B8
020210	CAN-IN2.B9
020211	CAN-IN2.B10
020212	CAN-IN2.B11
020213	CAN-IN2.B12
020214	CAN-IN2.B13
020215	CAN-IN2.B14
020216	CAN-IN2.B15
020217	CAN-IN2.B16
020218	CAN-IN2.B17
020219	CAN-IN2.B18
020220	CAN-IN2.B19
020221	CAN-IN2.B20
020222	CAN-IN2.B21

Parameter	Digital output signal (□)
020223	CAN-IN2.B22
020224	CAN-IN2.B23
020225	CAN-IN2.B24
020226	CAN-IN2.B25
020227	CAN-IN2.B26
020228	CAN-IN2.B27
020229	CAN-IN2.B28
020230	CAN-IN2.B29
020231	CAN-IN2.B30
020232	CAN-IN2.B31
020301	CAN-IN3.B0
020302	CAN-IN3.B1
020303	CAN-IN3.B2
020304	CAN-IN3.B3
020305	CAN-IN3.B4
020306	CAN-IN3.B5
020307	CAN-IN3.B6
020308	CAN-IN3.B7
020309	CAN-IN3.B8
020310	CAN-IN3.B9
020311	CAN-IN3.B10
020312	CAN-IN3.B11
020313	CAN-IN3.B12
020314	CAN-IN3.B13
020315	CAN-IN3.B14
020316	CAN-IN3.B15
020317	CAN-IN3.B16
020318	CAN-IN3.B17
020319	CAN-IN3.B18
020320	CAN-IN3.B19
020321	CAN-IN3.B20
020322	CAN-IN3.B21
020323	CAN-IN3.B22
020324	CAN-IN3.B23
020325	CAN-IN3.B24
020326	CAN-IN3.B25
020327	CAN-IN3.B26
020328	CAN-IN3.B27
020329	CAN-IN3.B28
020330	CAN-IN3.B29
020331	CAN-IN3.B30
020332	CAN-IN3.B31

Parameter	Digital output signal (□)
020400	CAN-SYNC-OUT
025001	AIF-CTRL.B0
025002	AIF-CTRL.B1
025003	AIF-CTRL.B2
025005	AIF-CTRL.B4
025006	AIF-CTRL.B5
025007	AIF-CTRL.B6
025008	AIF-CTRL.B7
025013	AIF-CTRL.B12
025014	AIF-CTRL.B13
025015	AIF-CTRL.B14
025016	AIF-CTRL.B15
025101	AIF-IN.B0
025102	AIF-IN.B1
025103	AIF-IN.B2
025104	AIF-IN.B3
025105	AIF-IN.B4
025106	AIF-IN.B5
025107	AIF-IN.B6
025108	AIF-IN.B7
025109	AIF-IN.B8
025110	AIF-IN.B9

Parameter	Digital output signal (□)
025111	AIF-IN.B10
025112	AIF-IN.B11
025113	AIF-IN.B12
025114	AIF-IN.B13
025115	AIF-IN.B14
025116	AIF-IN.B15
025117	AIF-IN.B16
025118	AIF-IN.B17
025119	AIF-IN.B18
025120	AIF-IN.B19
025121	AIF-IN.B20
025122	AIF-IN.B21
025123	AIF-IN.B22
025124	AIF-IN.B23
025125	AIF-IN.B24
025126	AIF-IN.B25
025127	AIF-IN.B26
025128	AIF-IN.B27
025129	AIF-IN.B28
025130	AIF-IN.B29
025131	AIF-IN.B30
025132	AIF-IN.B31

8.6.3 Selection list 3: Angle signals

Parameter	Phase signal (▲)
000100	DFSET-PSET
001000	FIXED0INC
005000	MCTRL-PHI-ANG
011100	INT1-POUT
011105	INT2-POUT

Parameter	Phase signal (▲)
019521	FCODE-474/1
019522	FCODE-474/2
020103	CAN-IN1.D1
020201	CAN-IN2.D1
020301	CAN-IN3.D1
025103	AIF-IN.D1

8.6.4 Selection list 4: Speed signals

Parameter	Speed signal (Δ)
000050	DFIN-OUT
000100	DFSET-POUT
000250	DFOUT-OUT
001000	FIXEDPHI-0

Parameter	Speed signal (Δ)
005000	MCTRL-PHI-ACT
006000	DFRFG-OUT
006220	CONV5-OUT
019521	FCODE-475/1
019522	FCODE-475/2

8.6.5 Selection list 5: Function blocks

Parameter	Function block
000000	empty
000050	AIN1
000055	AIN2
000070	AOUT1
000075	AOUT2
000100	DFSET
000200	DFIN
000250	DFOUT
005050	NSET
005100	MPOT1
005150	PCTRL1
005250	NLIM1
005500	ARIT1
005505	ARIT2
005510	ARIT3
005540	SQRT1
005550	ADD1
005555	ADD2
005600	RFG1
005610	SRFG1
005650	ASW1
005655	ASW2
005660	ASW3
005700	ANEG1
005705	ANEG2
005750	FIXSET1
005800	LIM1
005850	ABS1
005900	PT1-1
005905	PT1-2
005950	DT1-1
006000	DFRFG1
006100	MFAIL
006150	DB1
006200	CONV1
006205	CONV2
006210	CONV3
006215	CONV4
006220	CONV5
006230	CONVPHA1

Parameter	Function block
006300	S&H1
006350	CURVE1
006400	FCNT1
010000	BRK1
010250	R/L/Q
010500	AND1
010505	AND2
010510	AND3
010515	AND4
010520	AND5
010550	OR1
010555	OR2
010560	OR3
010565	OR4
010570	OR5
010600	NOT1
010605	NOT2
010610	NOT3
010615	NOT4
010620	NOT5
010650	CMP1
010655	CMP2
010660	CMP3
010665	CMP4
010700	DIGDEL1
010705	DIGDEL2
010750	TRANS1
010755	TRANS2
010900	FLIP1
010905	FLIP2
011000	DCALC1
011050	PCTRL2
011100	INT1
011105	INT2
011150	FOLL1
013000	FEVAN1
013100	OSZ
015100	MLP1
020000	CAN-OUT
025000	AIF-OUT

8.7 Table of attributes

The attribute table describes the properties of the codes used. It enables you to create your own communication programs for the controller.

How to read the table of attributes

Column		Abbreviation	Meaning	
Code		Cxxxx	Name of the Lenze code	
Index	dec	24575 - Lenze code number	Index under which the parameter is addressed	Is only required for control via INTERBUS, PROFIBUS DP or system bus (CAN)
	hex	5FFFh - Lenze code number	The subindex of array variables corresponds to the Lenze subcode number	
Data	DS	E	Data structure	Single variable (only one parameter element)
		A		Array variable (several parameter elements)
	DA	xx	Number of array elements (subcodes)	
	DT	B8	Data type	1 byte bit-coded
		B16		2 bytes bit-coded
		B32		4 bytes bit-coded
		FIX32		32-bit value with sign; decimal with four decimal places
		I32		4 bytes with sign
		U32		4 bytes without sign
		VS		ASCII string
	Format	VD	LECOM format (see also Operating Instructions of the bus module)	ASCII decimal format
		VH		ASCII hexadecimal format
		VS		String format
		VO		Octet string format for data blocks
	DL		Data length in byte	The column "Important" contains further information
Access	LCM-R/W	Ra	Access authorisation for LECOM	Reading is always permitted
		Wa		Writing is always permitted
		W		Writing is restricted
	Condition	CINH	Condition for writing	Writing permitted only when controller is inhibited

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0002	♦	♦	24573	5FFD	E	1	FIX32	VD	4	Ra/W	CINH
C0003	♦	♦	24572	5FFC	E	1	FIX32	VD	4	Ra/Wa	
C0004	♦	♦	24571	5FFB	E	1	FIX32	VD	4	Ra/Wa	
C0005	♦	♦	24570	5FFA	E	1	FIX32	VD	4	Ra/W	CINH
C0006	♦	♦	24569	5FF9	E	1	FIX32	VD	4	Ra/W	CINH
C0009	♦	♦	24566	5FF6	E	1	FIX32	VD	4	Ra/Wa	
C0010	♦	♦	24565	5FF5	E	1	FIX32	VD	4	Ra/Wa	
C0011	♦	♦	24564	5FF4	E	1	FIX32	VD	4	Ra/Wa	
C0012	♦	♦	24563	5FF3	E	1	FIX32	VD	4	Ra/Wa	
C0013	♦	♦	24562	5FF2	E	1	FIX32	VD	4	Ra/Wa	
C0014	♦	♦	24561	5FF1	E	1	FIX32	VD	4	Ra/Wa	
C0015	♦	♦	24560	5FF0	E	1	FIX32	VD	4	Ra/Wa	
C0016	♦	♦	24559	5FfF	E	1	FIX32	VD	4	Ra/Wa	
C0017	♦	♦	24558	5FEE	E	1	FIX32	VD	4	Ra/Wa	
C0018	♦	♦	24557	5FED	E	1	FIX32	VD	4	Ra/Wa	
C0019	♦	♦	24556	5FEC	E	1	FIX32	VD	4	Ra/Wa	
C0020	♦	♦	24555	5FEB	E	1	FIX32	VD	4	Ra/Wa	
C0021	♦	♦	24554	5FEA	E	1	FIX32	VD	4	Ra/Wa	
C0022	♦	♦	24553	5FE9	E	1	FIX32	VD	4	Ra/Wa	
C0023	♦	♦	24552	5FE8	E	1	FIX32	VD	4	Ra/Wa	
C0025	♦	♦	24550	5FE6	E	1	FIX32	VD	4	Ra/W	CINH
C0026	♦	♦	24549	5FE5	A	2	FIX32	VD	4	Ra/Wa	
C0027	♦	♦	24548	5FE4	A	2	FIX32	VD	4	Ra/Wa	
C0030	♦	♦	24545	5FE1	E	1	FIX32	VD	4	Ra/Wa	
C0032	♦	♦	24543	5FDF	E	1	FIX32	VD	4	Ra/Wa	
C0033	♦	♦	24542	5FDE	E	1	FIX32	VD	4	Ra/Wa	
C0034	♦	♦	24541	5FDD	E	1	FIX32	VD	4	Ra/Wa	
C0036	♦	♦	24539	5FDB	E	1	FIX32	VD	4	Ra/Wa	
C0037	♦	♦	24538	5FDA	E	1	FIX32	VD	4	Ra/Wa	
C0038	♦	♦	24537	5FD9	A	6	FIX32	VD	4	Ra/Wa	
C0039	♦	♦	24536	5FD8	A	15	FIX32	VD	4	Ra/Wa	
C0040	♦	♦	24535	5FD7	E	1	FIX32	VD	4	Ra/Wa	
C0042	♦	♦	24533	5FD5	E	1	FIX32	VD	4	Ra	
C0043	♦	♦	24532	5FD4	E	1	FIX32	VD	4	Ra/Wa	
C0045	♦	♦	24530	5FD2	E	1	FIX32	VD	4	Ra	
C0046	♦	♦	24529	5FD1	E	1	FIX32	VD	4	Ra	
C0049	♦	♦	24526	5FCE	E	1	FIX32	VD	4	Ra	
C0050	♦	♦	24525	5FCD	E	1	FIX32	VD	4	Ra	
C0051	♦	♦	24524	5FCC	E	1	FIX32	VD	4	Ra	
C0052	♦	♦	24523	5FCB	E	1	FIX32	VD	4	Ra	
C0053	♦	♦	24522	5FCA	E	1	FIX32	VD	4	Ra	
C0054	♦	♦	24521	5FC9	E	1	FIX32	VD	4	Ra	
C0056	♦	♦	24519	5FC7	E	1	FIX32	VD	4	Ra	
C0057	♦	♦	24518	5FC6	E	1	FIX32	VD	4	Ra	
C0058	♦	♦	24517	5FC5	E	1	FIX32	VD	4	Ra	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0059	♦	♦	24516	5FC4	E	1	FIX32	VD	4	Ra	
C0061	♦	♦	24514	5FC2	E	1	FIX32	VD	4	Ra	
C0063	♦	♦	24512	5FC0	E	1	FIX32	VD	4	Ra	
C0064	♦	♦	24511	5FBF	E	1	FIX32	VD	4	Ra	
C0066	♦	♦	24509	5FBD	E	1	FIX32	VD	4	Ra	
C0067	♦	♦	24508	5FBC	E	1	FIX32	VD	4	Ra	
C0070	♦	♦	24505	5FB9	E	1	FIX32	VD	4	Ra/Wa	
C0071	♦	♦	24504	5FB8	E	1	FIX32	VD	4	Ra/Wa	
C0074	♦	♦	24501	5FB5	E	1	FIX32	VD	4	Ra/Wa	
C0075	♦	♦	24500	5FB4	E	1	FIX32	VD	4	Ra/Wa	
C0076	♦	♦	24499	5FB3	E	1	FIX32	VD	4	Ra/Wa	
C0077	♦	♦	24498	5FB2	E	1	FIX32	VD	4	Ra/Wa	
C0078	♦	♦	24497	5FB1	E	1	FIX32	VD	4	Ra/Wa	
C0079	♦	♦	24496	5FB0	E	1	FIX32	VD	4	Ra/Wa	
C0080	♦	♦	24495	5FAF	E	1	FIX32	VD	4	Ra/Wa	
C0081	♦	♦	24494	5FAE	E	1	FIX32	VD	4	Ra/W	CINH
C0082	♦	♦	24493	5FAD	E	1	FIX32	VD	4	Ra/W	CINH
C0084	♦	♦	24491	5FAB	E	1	FIX32	VD	4	Ra/W	CINH
C0085	♦	♦	24490	5FAA	E	1	FIX32	VD	4	Ra/W	CINH
C0086	♦	♦	24489	5FA9	E	1	FIX32	VD	4	Ra/W	CINH
C0087	♦	♦	24488	5FA8	E	1	FIX32	VD	4	Ra/W	CINH
C0088	♦	♦	24487	5FA7	E	1	FIX32	VD	4	Ra/W	CINH
C0089	♦	♦	24486	5FA6	E	1	FIX32	VD	4	Ra/W	CINH
C0090	♦	♦	24485	5FA5	E	1	FIX32	VD	4	Ra/W	CINH
C0091	♦	♦	24484	5FA4	E	1	FIX32	VD	4	Ra/W	CINH
C0092	♦	♦	24483	5FA3	E	1	FIX32	VD	4	Ra/W	CINH
C0093	♦	♦	24482	5FA2	E	1	FIX32	VD	4	Ra	
C0094	♦	♦	24481	5FA1	E	1	FIX32	VD	4	Ra/Wa	
C0095	♦	♦	24480	5FA0	E	1	FIX32	VD	4	Ra/W	CINH
C0096	♦	♦	24479	5F9F	A	2	FIX32	VD	4	Ra/Wa	
C0099	♦	♦	24476	5F9C	E	1	FIX32	VD	4	Ra	
C0101	♦	♦	24474	5F9A	A	15	FIX32	VD	4	Ra/Wa	
C0103	♦	♦	24472	5F98	A	15	FIX32	VD	4	Ra/Wa	
C0104	♦	♦	24471	5F97	E	1	FIX32	VD	4	Ra/W	CINH
C0105	♦	♦	24470	5F96	E	1	FIX32	VD	4	Ra/Wa	
C0107	♦	♦	24478	5F94	E	1	FIX32	VD	4	Ra/Wa	
C0108	♦	♦	24467	5F93	A	2	FIX32	VD	4	Ra/Wa	
C0109	♦	♦	24466	5F92	A	2	FIX32	VD	4	Ra/Wa	
C0114	♦	♦	24461	5F8D	A	6	FIX32	VD	4	Ra/Wa	
C0116	♦	♦	24459	5F8B	A	32	FIX32	VD	4	Ra/W	CINH
C0117	♦	♦	24458	5F8A	A	4	FIX32	VD	4	Ra/W	CINH
C0118	♦	♦	24457	5F89	A	4	FIX32	VD	4	Ra/Wa	
C0120	♦	♦	24455	5F87	E	1	FIX32	VD	4	Ra/Wa	
C0121	♦	♦	24454	5F86	E	1	FIX32	VD	4	Ra/Wa	
C0122	♦	♦	24453	5F85	E	1	FIX32	VD	4	Ra/Wa	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0125	♦	♦	24450	5F82	E	1	FIX32	VD	4	Ra/Wa	
C0126	♦	♦	24449	5F81	E	1	FIX32	VD	4	Ra/Wa	
C0127	♦	♦	24448	5F80	E	1	FIX32	VD	4	Ra/Wa	
C0128	♦	♦	24447	5F7F	E	1	FIX32	VD	4	Ra/Wa	
C0130	♦	♦	24445	5F7D	E	1	FIX32	VD	4	Ra	
C0132	♦	♦	24443	5F7B	E	1	FIX32	VD	4	Ra/W	CINH
C0133	♦	♦	24442	5F7A	E	1	FIX32	VD	4	Ra/W	CINH
C0134	♦	♦	24441	5F79	E	1	FIX32	VD	4	Ra/Wa	
C0135	♦	♦	24440	5F78	E	1	B16	VH	2		
C0136	♦	♦	24439	5F77	A	3	B16	VH	2	Ra	
C0140	♦		24435	5F73	E	1	FIX32	VD	4	Ra/Wa	
C0141	♦	♦	24434	5F72	E	1	FIX32	VD	4	Ra/Wa	
C0142	♦	♦	24433	5F71	E	1	FIX32	VD	4	Ra/Wa	
C0143	♦	♦	24432	5F70	E	1	FIX32	VD	4	Ra/Wa	
C0144	♦	♦	24431	5F6F	E	1	FIX32	VD	4	Ra/W	CINH
C0145	♦	♦	24430	5F6E	E	1	FIX32	VD	4	Ra/W	CINH
C0146	♦	♦	24429	5F6D	E	1	FIX32	VD	4	Ra/Wa	
C0147	♦	♦	24428	5F6C	E	1	FIX32	VD	4	Ra/Wa	
C0148	♦	♦	24427	5F6B	E	1	FIX32	VD	4	Ra/W	CINH
C0149	♦	♦	24426	5F6A	E	1	FIX32	VD	4	Ra/W	CINH
C0150	♦	♦	24425	5F69	E	1	B16	VH	2	Ra	
C0151	♦	♦	24424	5F68	E	1	B32	VH	4	Ra	
C0155	♦	♦	24420	5F64	E	1	B16	VH	2	Ra	
C0156	♦	♦	24419	5F63	A	7	FIX32	VD	4	Ra/W	CINH
C0157	♦	♦	24418	5F62	A	7	FIX32	VD	4	Ra	
C0161	♦	♦	24414	5F5E	E	1	FIX32	VD	4	Ra	
C0167	♦	♦	24408	5F58	E	1	FIX32	VD	4	Ra/Wa	
C0168	♦	♦	24407	5F57	A	8	FIX32	VD	4	Ra	
C0169	♦	♦	24406	5F56	A	8	U32	VH	4	Ra	
C0170	♦	♦	24405	5F55	A	8	FIX32	VD	4	Ra	
C0173	♦	♦	24402	5F52	E	1	FIX32	VD	4	Ra/Wa	
C0174		♦	24401	5F51	E	1	FIX32	VD	4	Ra/Wa	
C0178	♦	♦	24397	5F4D	E	1	U32	VH	4	Ra	
C0179	♦	♦	24396	5F4C	E	1	U32	VH	4	Ra	
C0182	♦	♦	24393	5F49	E	1	FIX32	VD	4	Ra/Wa	
C0183	♦	♦	24392	5F48	E	1	FIX32	VD	4	Ra	
C0190	♦	♦	24385	5F41	E	1	FIX32	VD	4	Ra/Wa	
C0195	♦	♦	24380	5F3C	E	1	FIX32	VD	4	Ra/Wa	
C0196	♦	♦	24379	5F3B	E	1	FIX32	VD	4	Ra/Wa	
C0200	♦	♦	24375	5F37	E	1	VS	VS	14	Ra	
C0201	♦	♦	24374	5F36	E	1	VS	VS	20	Ra	
C0202	♦	♦	24373	5F35	E	1	VS	VS	20	Ra	
C0203	♦	♦	24372	5F34	E	1	VS	VS	20	Ra	
C0204	♦	♦	24371	5F33	E	1	VS	VS	20	Ra	
C0206	♦	♦	24369	5F31	E	1	VS	VS	20	Ra	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0207	♦	♦	24368	5F30	E	1	VS	VS	20	Ra	
C0208	♦	♦	24367	5F2F	E	1	VS	VS	20	Ra	
C0209	♦	♦	24366	5F2E	E	1	VS	VS	20	Ra	
C0220	♦	♦	24355	5F23	E	1	FIX32	VD	4	Ra/Wa	
C0221	♦	♦	24354	5F22	E	1	FIX32	VD	4	Ra/Wa	
C0222	♦	♦	24353	5F21	E	1	FIX32	VD	4	Ra/Wa	
C0223	♦	♦	24352	5F20	E	1	FIX32	VD	4	Ra/Wa	
C0224	♦	♦	24351	5F1F	E	1	FIX32	VD	4	Ra/Wa	
C0234	♦	♦	24341	5F15	E	1	FIX32	VD	4	Ra/Wa	
C0235	♦	♦	24340	5F14	E	1	FIX32	VD	4	Ra/Wa	
C0236	♦	♦	24339	5F13	E	1	FIX32	VD	4	Ra/Wa	
C0241	♦	♦	24334	5F0E	E	1	FIX32	VD	4	Ra/Wa	
C0244	♦	♦	24331	5F0B	E	1	FIX32	VD	4	Ra/Wa	
C0250	♦	♦	24325	5F05	E	1	FIX32	VD	4	Ra/Wa	
C0252	♦	♦	24323	5F03	E	1	I32	VH	4	Ra/Wa	
C0253	♦	♦	24322	5F02	E	1	FIX32	VD	4	Ra/Wa	
C0260	♦	♦	24315	5EFB	E	1	FIX32	VD	4	Ra/Wa	
C0261	♦	♦	24314	5EFA	E	1	FIX32	VD	4	Ra/Wa	
C0262	♦	♦	24313	5EF9	E	1	FIX32	VD	4	Ra/Wa	
C0263	♦	♦	24312	5EF8	E	1	FIX32	VD	4	Ra/Wa	
C0264	♦	♦	24311	5EF7	E	1	FIX32	VD	4	Ra/Wa	
C0265	♦	♦	24310	5EF6	E	1	FIX32	VD	4	Ra/Wa	
C0267	♦	♦	24308	5EF4	A	2	FIX32	VD	4	Ra/W	CINH
C0268	♦	♦	24307	5EF3	E	1	FIX32	VD	4	Ra/W	CINH
C0269	♦	♦	24306	5EF2	A	3	FIX32	VD	4	Ra	
C0325	♦	♦	24250	5EBA	E	1	FIX32	VD	4	Ra/Wa	
C0326	♦	♦	24249	5EB9	E	1	FIX32	VD	4	Ra/Wa	
C0327	♦	♦	24248	5EB8	E	1	FIX32	VD	4	Ra/Wa	
C0328	♦	♦	24247	5EB7	E	1	FIX32	VD	4	Ra/Wa	
C0329	♦	♦	24246	5EB6	E	1	FIX32	VD	4	Ra/Wa	
C0332	♦	♦	24243	5EB3	E	1	FIX32	VD	4	Ra/Wa	
C0333	♦	♦	24242	5EB2	E	1	FIX32	VD	4	Ra/Wa	
C0336	♦	♦	24239	5EAF	E	1	FIX32	VD	4	Ra	
C0337	♦	♦	24238	5EAE	E	1	FIX32	VD	4	Ra/Wa	
C0338	♦	♦	24237	5EAD	E	1	FIX32	VD	4	Ra/Wa	
C0339	♦	♦	24236	5EAC	A	2	FIX32	VD	4	Ra/W	CINH
C0340	♦	♦	24235	5EAB	A	2	FIX32	VD	4	Ra	
C0350	♦	♦	24225	5EA1	E	1	FIX32	VD	4	Ra/Wa	
C0351	♦	♦	24224	5EA0	E	1	FIX32	VD	4	Ra/Wa	
C0352	♦	♦	24223	5E9F	E	1	FIX32	VD	4	Ra/Wa	
C0353	♦	♦	24222	5E9E	A	3	FIX32	VD	4	Ra/Wa	
C0354	♦	♦	24221	5E9D	A	6	FIX32	VD	4	Ra/Wa	
C0355	♦	♦	24220	5E9C	A	6	FIX32	VD	4	Ra	
C0356	♦	♦	24219	5E9B	A	4	FIX32	VD	4	Ra/Wa	
C0357	♦	♦	24218	5E9A	A	3	FIX32	VD	4	Ra/Wa	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0358	♦	♦	24217	5E99	E	1	FIX32	VD	4	Ra/Wa	
C0359	♦	♦	24216	5E98	E	1	FIX32	VD	4	Ra	
C0360	♦	♦	24215	5E97	A	12	FIX32	VD	4	Ra	
C0361	♦	♦	24214	5E96	A	12	FIX32	VD	4	Ra	
C0364	♦	♦	24211	5E93	E	1	FIX32	VD	4	Ra/W	CINH
C0365	♦	♦	24210	5E92	E	1	FIX32	VD	4	Ra	
C0366	♦	♦	24209	5E91	E	1	FIX32	VD	4	Ra/Wa	
C0367	♦	♦	24208	5E90	E	1	FIX32	VD	4	Ra/Wa	
C0368	♦	♦	24207	5E8F	E	1	FIX32	VD	4	Ra/Wa	
C0369	♦	♦	24206	5E8E	E	1	FIX32	VD	4	Ra/Wa	
C0400	♦	♦	24175	5E6F	E	1	FIX32	VD	4	Ra	
C0402	♦	♦	24173	5E6D	E	1	FIX32	VD	4	Ra/W	CINH
C0403	♦	♦	24172	5E6C	E	1	FIX32	VD	4	Ra/W	CINH
C0404	♦	♦	24171	5E6B	A	2	FIX32	VD	4	Ra	
C0405	♦	♦	24170	5E6A	E	1	FIX32	VD	4	Ra	
C0407	♦	♦	24168	5E68	E	1	FIX32	VD	4	Ra/W	CINH
C0408	♦	♦	24167	5E67	E	1	FIX32	VD	4	Ra/W	CINH
C0409	♦	♦	24166	5E66	A	2	FIX32	VD	4	Ra	
C0420	♦	♦	24155	5E5B	E	1	FIX32	VD	4	Ra/W	CINH
C0421	♦	♦	24154	5E5A	E	1	FIX32	VD	4	Ra/W	CINH
C0425	♦	♦	24150	5E56	E	1	FIX32	VD	4	Ra/Wa	
C0426	♦	♦	24149	5E55	E	1	FIX32	VD	4	Ra	
C0427	♦	♦	24148	5E54	E	1	FIX32	VD	4	Ra/Wa	
C0429	♦	♦	24146	5E52	E	1	FIX32	VD	4	Ra/Wa	
C0431	♦	♦	24144	5E50	E	1	FIX32	VD	4	Ra/W	CINH
C0432	♦	♦	24143	5E4F	E	1	FIX32	VD	4	Ra/W	CINH
C0433	♦	♦	24142	5E4E	E	1	FIX32	VD	4	Ra/W	CINH
C0434	♦	♦	24141	5E4D	A	3	FIX32	VD	4	Ra	
C0436	♦	♦	24139	5E4B	E	1	FIX32	VD	4	Ra/W	CINH
C0437	♦	♦	24138	5E4A	E	1	FIX32	VD	4	Ra/W	CINH
C0438	♦	♦	24137	5E49	E	1	FIX32	VD	4	Ra/W	CINH
C0439	♦	♦	24136	5E48	A	3	FIX32	VD	4	Ra	
C0443	♦	♦	24132	5E44	E	1	B8	VH	1	Ra	
C0444	♦	♦	24131	5E43	A	4	FIX32	VD	4	Ra	
C0450	♦	♦	24125	5E3D	E	1	FIX32	VD	4	Ra/W	CINH
C0451	♦	♦	24124	5E3C	E	1	FIX32	VD	4	Ra/W	CINH
C0452	♦	♦	24123	5E3B	E	1	FIX32	VD	4	Ra/W	CINH
C0458	♦	♦	24117	5E35	A	2	FIX32	VD	4	Ra	
C0459	♦	♦	24116	5E34	E	1	FIX32	VD	4	Ra	
C0464	♦	♦	24111	5E2F	E	1	FIX32	VD	4	Ra	
C0465	♦	♦	24110	5E2E	A	50	FIX32	VD	4	Ra/W	CINH
C0466	♦	♦	24109	5E2D	E	1	FIX32	VD	4	Ra	
C0469	♦	♦	24106	5E2A	E	1	FIX32	VD	4	Ra/W	CINH
C0470	♦	♦	24105	5E29	A	4	B8	VH	1	Ra/Wa	
C0471	♦	♦	24104	5E28	E	1	B32	VH	4	Ra/Wa	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0472	♦	♦	24103	5E27	A	20	FIX32	VD	4	Ra/Wa	
C0473	♦	♦	24102	5E26	A	10	FIX32	VD	4	Ra/Wa	
C0474	♦	♦	24101	5E25	A	2	I32	VH	4	Ra/Wa	
C0475	♦	♦	24100	5E24	A	2	FIX32	VD	4	Ra/Wa	
C0497	♦	♦	24078	5E0E	E	1	FIX32	VD	4	Ra/Wa	
C0510	♦	♦	24065	5E01	E	1	FIX32	VD	4	Ra/W	CINH
C0511	♦	♦	24064	5E00	E	1	FIX32	VD	4	Ra/Wa	
C0517	♦	♦	24058	5DFA	A	32	FIX32	VD	4	Ra/Wa	
C0520	♦	♦	24055	5DF7	E	1	FIX32	VD	4	Ra/W	CINH
C0521	♦	♦	24054	5DF6	E	1	FIX32	VD	4	Ra/W	CINH
C0522	♦	♦	24053	5DF5	E	1	FIX32	VD	4	Ra/W	CINH
C0523	♦	♦	24052	5DF4	E	1	FIX32	VD	4	Ra/W	CINH
C0524	♦	♦	24051	5DF3	E	1	FIX32	VD	4	Ra/W	CINH
C0525	♦	♦	24050	5DF2	E	1	FIX32	VD	4	Ra/W	CINH
C0526	♦	♦	24049	5DF1	E	1	FIX32	VD	4	Ra/W	CINH
C0527	♦	♦	24048	5DF0	E	1	FIX32	VD	4	Ra/W	CINH
C0528	♦	♦	24047	5DEF	A	2	I32	VH	4	Ra	
C0529	♦	♦	24046	5DEE	E	1	FIX32	VD	4	Ra/Wa	
C0530	♦	♦	24045	5DED	E	1	FIX32	VD	4	Ra/Wa	
C0531	♦	♦	24044	5DEC	E	1	FIX32	VD	4	Ra/Wa	
C0532	♦	♦	24043	5DEB	E	1	FIX32	VD	4	Ra/Wa	
C0533	♦	♦	24042	5DEA	E	1	FIX32	VD	4	Ra/Wa	
C0534	♦	♦	24041	5DE9	E	1	FIX32	VD	4	Ra/Wa	
C0535	♦	♦	24040	5DE8	E	1	FIX32	VD	4	Ra/Wa	
C0536	♦	♦	24039	5DE7	A	3	FIX32	VD	4	Ra	
C0537	♦	♦	24038	5DE6	E	1	FIX32	VD	4	Ra	
C0538	♦	♦	24037	5DE5	A	3	FIX32	VD	4	Ra	
C0539	♦	♦	24036	5DE4	E	1	FIX32	VD	4	Ra	
C0540	♦	♦	24035	5DE3	E	1	FIX32	VD	4	Ra/W	CINH
C0541	♦	♦	24034	5DE2	E	1	FIX32	VD	4	Ra/W	CINH
C0542	♦	♦	24033	5DE1	E	1	FIX32	VD	4	Ra/W	CINH
C0544	♦	♦	24031	5DDF	E	1	FIX32	VD	4	Ra/W	CINH
C0545	♦	♦	24030	5DDE	E	1	FIX32	VD	4	Ra/Wa	
C0546	♦	♦	24029	5DDD	E	1	U32	VH	4	Ra/Wa	
C0547	♦	♦	24028	5DDC	E	1	FIX32	VD	4	Ra	
C0548	♦	♦	24027	5ddb	E	1	FIX32	VD	4	Ra	
C0549	♦	♦	24026	5DDA	E	1	FIX32	VD	4	Ra	
C0560	♦	♦	24015	5DCF	A	15	FIX32	VD	4	Ra/Wa	
C0561	♦	♦	24014	5DCE	E	1	FIX32	VD	4	Ra/W	CINH
C0562	♦	♦	24013	5DCD	A	4	FIX32	VD	4	Ra/W	CINH
C0563	♦	♦	24012	5DCC	E	1	FIX32	VD	4	Ra	
C0564	♦	♦	24011	5DCB	A	4	FIX32	VD	4	Ra	
C0570	♦	♦	24005	5DC5	E	1	FIX32	VD	4	Ra/W	CINH
C0571	♦	♦	24004	5DC4	E	1	FIX32	VD	4	Ra/W	CINH
C0572	♦	♦	24003	5DC3	E	1	FIX32	VD	4	Ra	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0573	♦	♦	24002	5DC2	E	1	FIX32	VD	4	Ra	
C0574	♦		24001	5DC1	E	1	FIX32	VD	4	Ra/Wa	
C0581	♦	♦	23994	5DBA	E	1	FIX32	VD	4	Ra/Wa	
C0582	♦	♦	23993	5DB9	E	1	FIX32	VD	4	Ra/Wa	
C0583	♦	♦	23992	5DB8	E	1	FIX32	VD	4	Ra/Wa	
C0584	♦	♦	23991	5DB7	E	1	FIX32	VD	4	Ra/Wa	
C0585	♦	♦	23990	5DB6	E	1	FIX32	VD	4	Ra/Wa	
C0587	♦	♦	23988	5DB4	E	1	FIX32	VD	4	Ra/Wa	
C0588	♦	♦	23987	5DB3	E	1	FIX32	VD	4	Ra/Wa	
C0591	♦	♦	23984	5DB0	E	1	FIX32	VD	4	Ra/Wa	
C0592	♦	♦	23983	5DAF	E	1	FIX32	VD	4	Ra/Wa	
C0593	♦	♦	23982	5DAE	E	1	FIX32	VD	4	Ra/Wa	
C0594	♦	♦	23981	5DAD	E	1	FIX32	VD	4	Ra/Wa	
C0595	♦	♦	23980	5DAC	E	1	FIX32	VD	4	Ra/Wa	
C0596	♦	♦	23979	5DAB	E	1	FIX32	VD	4	Ra/Wa	
C0597	♦	♦	23978	5DAA	E	1	FIX32	VD	4	Ra/Wa	
C0598	♦	♦	23977	5DA9	E	1	FIX32	VD	4	Ra/Wa	
C0599	♦	♦	23976	5DA8	E	1	FIX32	VD	4	Ra/Wa	
C0600	♦	♦	23975	5DA7	E	1	FIX32	VD	4	Ra/Wa	
C0601	♦	♦	23974	5DA6	A	2	FIX32	VD	4	Ra/W	CINH
C0602	♦	♦	23973	5DA5	A	2	FIX32	VD	4	Ra	
C0603	♦	♦	23972	5DA4	E	1	FIX32	VD	4	Ra/Wa	
C0604	♦	♦	23971	5DA3	A	2	FIX32	VD	4	Ra/W	CINH
C0605	♦	♦	23970	5DA2	A	2	FIX32	VD	4	Ra	
C0606	♦	♦	23969	5DA1	E	1	FIX32	VD	4	Ra/Wa	
C0608	♦	♦	23967	5D9F	E	1	FIX32	VD	4	Ra/W	CINH
C0609	♦	♦	23966	5D9E	E	1	FIX32	VD	4	Ra	
C0610	♦	♦	23965	5D9D	A	3	FIX32	VD	4	Ra/W	CINH
C0611	♦	♦	23964	5D9C	A	3	FIX32	VD	4	Ra	
C0612	♦	♦	23963	5D9B	A	3	FIX32	VD	4	Ra/W	CINH
C0613	♦	♦	23962	5D9A	A	3	FIX32	VD	4	Ra	
C0620	♦	♦	23955	5D93	E	1	FIX32	VD	4	Ra/Wa	
C0621	♦	♦	23954	5D92	E	1	FIX32	VD	4	Ra/Wa	
C0622	♦	♦	23953	5D91	E	1	FIX32	VD	4	Ra/W	CINH
C0623	♦	♦	23952	5D90	E	1	FIX32	VD	4	Ra	
C0630	♦	♦	23945	5D89	E	1	FIX32	VD	4	Ra/Wa	
C0631	♦	♦	23944	5D88	E	1	FIX32	VD	4	Ra/Wa	
C0632	♦	♦	23943	5D87	E	1	FIX32	VD	4	Ra/W	CINH
C0633	♦	♦	23942	5D86	E	1	FIX32	VD	4	Ra	
C0640	♦	♦	23935	5D7F	E	1	FIX32	VD	4	Ra/Wa	
C0641	♦	♦	23934	5D7E	E	1	FIX32	VD	4	Ra/W	CINH
C0642	♦	♦	23933	5D7D	E	1	FIX32	VD	4	Ra	
C0643	♦	♦	23932	5D7C	E	1	FIX32	VD	4	Ra/Wa	
C0644	♦	♦	23931	5D7B	E	1	FIX32	VD	4	Ra/W	CINH
C0645	♦	♦	23930	5D7A	E	1	FIX32	VD	4	Ra	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0650	♦	♦	23925	5D75	E	1	FIX32	VD	4	Ra/Wa	
C0651	♦	♦	23924	5D74	E	1	FIX32	VD	4	Ra/Wa	
C0652	♦	♦	23923	5D73	E	1	FIX32	VD	4	Ra/W	CINH
C0653	♦	♦	23922	5D72	E	1	FIX32	VD	4	Ra/Wa	
C0654	♦	♦	23921	5D71	E	1	FIX32	VD	4	Ra	
C0655	♦	♦	23920	5D70	E	1	FIX32	VD	4	Ra/Wa	
C0656	♦	♦	23919	5D6F	E	1	FIX32	VD	4	Ra/Wa	
C0657	♦	♦	23918	5D6E	E	1	FIX32	VD	4	Ra/W	CINH
C0658	♦	♦	23917	5D6D	E	1	FIX32	VD	4	Ra	
C0661	♦	♦	23914	5D6A	E	1	FIX32	VD	4	Ra/W	CINH
C0662	♦	♦	23913	5D69	E	1	FIX32	VD	4	Ra	
C0671	♦	♦	23904	5D60	E	1	FIX32	VD	4	Ra/Wa	
C0672	♦	♦	23903	5D5F	E	1	FIX32	VD	4	Ra/Wa	
C0673	♦	♦	23902	5D5E	E	1	FIX32	VD	4	Ra/W	CINH
C0674	♦	♦	23901	5D5D	E	1	FIX32	VD	4	Ra/W	CINH
C0675	♦	♦	23900	5D5C	E	1	FIX32	VD	4	Ra/W	CINH
C0676	♦	♦	23899	5D5B	A	2	FIX32	VD	4	Ra	
C0677	♦	♦	23898	5D5A	E	1	FIX32	VD	4	Ra	
C0680	♦	♦	23895	5D57	E	1	FIX32	VD	4	Ra/Wa	
C0681	♦	♦	23894	5D56	E	1	FIX32	VD	4	Ra/Wa	
C0682	♦	♦	23893	5D55	E	1	FIX32	VD	4	Ra/Wa	
C0683	♦	♦	23892	5D54	A	2	FIX32	VD	4	Ra/W	CINH
C0684	♦	♦	23891	5D53	A	2	FIX32	VD	4	Ra	
C0685	♦	♦	23890	5D52	E	1	FIX32	VD	4	Ra/Wa	
C0686	♦	♦	23889	5D51	E	1	FIX32	VD	4	Ra/Wa	
C0687	♦	♦	23888	5D50	E	1	FIX32	VD	4	Ra/Wa	
C0688	♦	♦	23887	5D4F	A	2	FIX32	VD	4	Ra/W	CINH
C0689	♦	♦	23886	5D4E	A	2	FIX32	VD	4	Ra	
C0690	♦	♦	23885	5D4D	E	1	FIX32	VD	4	Ra/Wa	
C0691	♦	♦	23884	5D4C	E	1	FIX32	VD	4	Ra/Wa	
C0692	♦	♦	23883	5D4B	E	1	FIX32	VD	4	Ra/Wa	
C0693	♦	♦	23882	5D4A	A	2	FIX32	VD	4	Ra/W	CINH
C0694	♦	♦	23881	5D49	A	2	FIX32	VD	4	Ra	
C0700	♦	♦	23875	5D43	E	1	FIX32	VD	4	Ra/W	CINH
C0701	♦	♦	23874	5D42	E	1	FIX32	VD	4	Ra	
C0703	♦	♦	23872	5D40	E	1	FIX32	VD	4	Ra/W	CINH
C0704	♦	♦	23871	5D3F	E	1	FIX32	VD	4	Ra	
C0705	♦	♦	23870	5D3E	E	1	FIX32	VD	4	Ra/Wa	
C0706	♦	♦	23869	5D3D	E	1	FIX32	VD	4	Ra/Wa	
C0707	♦	♦	23868	5D3C	E	1	FIX32	VD	4	Ra/Wa	
C0708	♦	♦	23867	5D3B	A	2	FIX32	VD	4	Ra/W	CINH
C0709	♦	♦	23866	5D3A	A	2	FIX32	VD	4	Ra	
C0710	♦	♦	23865	5D39	E	1	FIX32	VD	4	Ra/Wa	
C0711	♦	♦	23864	5D38	E	1	FIX32	VD	4	Ra/Wa	
C0713	♦	♦	23862	5D36	E	1	FIX32	VD	4	Ra/W	CINH

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0714	♦	♦	23861	5D35	E	1	FIX32	VD	4	Ra	
C0715	♦	♦	23860	5D34	E	1	FIX32	VD	4	Ra/Wa	
C0716	♦	♦	23859	5D33	E	1	FIX32	VD	4	Ra/Wa	
C0718	♦	♦	23857	5D31	E	1	FIX32	VD	4	Ra/W	CINH
C0719	♦	♦	23856	5D30	E	1	FIX32	VD	4	Ra	
C0720	♦	♦	23855	5D2F	E	1	FIX32	VD	4	Ra/Wa	
C0721	♦	♦	23854	5D2E	E	1	FIX32	VD	4	Ra/Wa	
C0723	♦	♦	23852	5D2C	E	1	FIX32	VD	4	Ra/W	CINH
C0724	♦	♦	23851	5D2B	E	1	FIX32	VD	4	Ra	
C0725	♦	♦	23850	5D2A	E	1	FIX32	VD	4	Ra/Wa	
C0726	♦	♦	23849	5D29	E	1	FIX32	VD	4	Ra/Wa	
C0728	♦	♦	23847	5D27	E	1	FIX32	VD	4	Ra/W	CINH
C0729	♦	♦	23846	5D26	E	1	FIX32	VD	4	Ra	
C0730	♦	♦	23845	5D25	E	1	FIX32	VD	4	Ra/Wa	
C0731	♦	♦	23844	5D24	E	1	FIX32	VD	4	Ra	
C0732	♦	♦	23843	5D23	A	4	FIX32	VD	4	Ra/W	CINH
C0733	♦	♦	23842	5D22	E	1	FIX32	VD	4	Ra/W	CINH
C0734	♦	♦	23841	5D21	E	1	FIX32	VD	4	Ra/Wa	
C0735	♦	♦	23840	5D20	E	1	FIX32	VD	4	Ra/Wa	
C0736	♦	♦	23839	5D1F	E	1	FIX32	VD	4	Ra/Wa	
C0737	♦	♦	23838	5D1E	E	1	FIX32	VD	4	Ra/Wa	
C0738	♦	♦	23837	5D1D	E	1	FIX32	VD	4	Ra/Wa	
C0739	♦	♦	23836	5D1C	E	1	FIX32	VD	4	Ra/Wa	
C0740	♦	♦	23835	5D1B	A	2	FIX32	VD	4	Ra/Wa	
C0741	♦	♦	23834	5D1A	A	4	FIX32	VD	4	Ra	
C0742	♦	♦	23833	5D19	E	1	FIX32	VD	4	Ra	
C0743	♦	♦	23832	5D18	E	1	FIX32	VD	4	Ra	
C0744	♦	♦	23831	5D17	E	1	FIX32	VD	4	Ra/Wa	
C0749	♦	♦	23826	5D12	A	3	FIX32	VD	4	Ra	
C0750	♦	♦	23825	5D11	E	1	FIX32	VD	4	Ra/Wa	
C0751	♦	♦	23824	5D10	E	1	FIX32	VD	4	Ra/Wa	
C0752	♦	♦	23823	5D0F	E	1	FIX32	VD	4	Ra/Wa	
C0753	♦	♦	23822	5D0E	E	1	FIX32	VD	4	Ra/Wa	
C0754	♦	♦	23821	5D0D	E	1	U32	VH	4	Ra/Wa	
C0755	♦	♦	23820	5D0C	E	1	FIX32	VD	4	Ra/Wa	
C0756	♦	♦	23819	5D0B	E	1	I32	VH	4	Ra/Wa	
C0757	♦	♦	23818	5D0A	E	1	FIX32	VD	4	Ra/Wa	
C0758	♦	♦	23817	5D09	E	1	FIX32	VD	4	Ra/W	CINH
C0759	♦	♦	23816	5D08	E	1	FIX32	VD	4	Ra/W	CINH
C0760	♦	♦	23815	5D07	E	1	FIX32	VD	4	Ra/W	CINH
C0761	♦	♦	23814	5D06	E	1	FIX32	VD	4	Ra/W	CINH
C0764	♦	♦	23811	5D03	A	3	FIX32	VD	4	Ra	
C0765	♦	♦	23810	5D02	E	1	FIX32	VD	4	Ra	
C0770	♦	♦	23805	5CFD	E	1	FIX32	VD	4	Ra/W	CINH
C0771	♦	♦	23804	5CFC	E	1	FIX32	VD	4	Ra/W	CINH

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0772	♦	♦	23803	5CFB	E	1	FIX32	VD	4	Ra/W	CINH
C0773	♦	♦	23802	5CFA	A	3	FIX32	VD	4	Ra	
C0775	♦	♦	23800	5CF8	E	1	FIX32	VD	4	Ra/W	CINH
C0776	♦	♦	23799	5CF7	E	1	FIX32	VD	4	Ra/W	CINH
C0777	♦	♦	23798	5CF6	E	1	FIX32	VD	4	Ra/W	CINH
C0778	♦	♦	23797	5CF5	A	3	FIX32	VD	4	Ra	
C0780	♦	♦	23795	5CF3	E	1	FIX32	VD	4	Ra/W	CINH
C0781	♦	♦	23794	5CF2	E	1	FIX32	VD	4	Ra/W	CINH
C0782	♦	♦	23793	5CF1	E	1	FIX32	VD	4	Ra/W	CINH
C0783	♦	♦	23792	5CF0	E	1	FIX32	VD	4	Ra/W	CINH
C0784	♦	♦	23791	5CEF	E	1	FIX32	VD	4	Ra/W	CINH
C0785	♦	♦	23790	5CEE	E	1	FIX32	VD	4	Ra/W	CINH
C0786	♦	♦	23789	5CED	E	1	FIX32	VD	4	Ra/W	CINH
C0787	♦	♦	23788	5CEC	A	4	FIX32	VD	4	Ra/W	CINH
C0788	♦	♦	23787	5CEB	A	4	FIX32	VD	4	Ra/W	CINH
C0789	♦	♦	23786	5CEA	E	1	FIX32	VD	4	Ra/W	CINH
C0790	♦	♦	23785	5CE9	E	1	FIX32	VD	4	Ra/W	CINH
C0798	♦	♦	23777	5CE1	A	2	FIX32	VD	4	Ra	
C0799	♦	♦	23776	5CE0	A	13	FIX32	VD	4	Ra	
C0800	♦	♦	23775	5CDF	E	1	FIX32	VD	4	Ra/W	CINH
C0801	♦	♦	23774	5CDE	E	1	FIX32	VD	4	Ra/W	CINH
C0802	♦	♦	23773	5CDD	E	1	FIX32	VD	4	Ra/W	CINH
C0803	♦	♦	23772	5CDC	E	1	FIX32	VD	4	Ra/W	CINH
C0804	♦	♦	23771	5CDB	E	1	FIX32	VD	4	Ra/W	CINH
C0805	♦	♦	23770	5CDA	E	1	FIX32	VD	4	Ra/W	CINH
C0808	♦	♦	23767	5CD7	A	4	FIX32	VD	4	Ra	
C0809	♦	♦	23766	5CD6	A	2	FIX32	VD	4	Ra	
C0810	♦	♦	23765	5CD5	A	2	FIX32	VD	4	Ra/W	CINH
C0811	♦	♦	23764	5CD4	E	1	FIX32	VD	4	Ra/W	CINH
C0812	♦	♦	23763	5CD3	A	2	FIX32	VD	4	Ra	
C0813	♦	♦	23762	5CD2	E	1	FIX32	VD	4	Ra	
C0815	♦	♦	23760	5CD0	A	2	FIX32	VD	4	Ra/W	CINH
C0816	♦	♦	23759	5CCF	E	1	FIX32	VD	4	Ra/W	CINH
C0817	♦	♦	23758	5CCE	A	2	FIX32	VD	4	Ra	
C0818	♦	♦	23757	5CCD	E	1	FIX32	VD	4	Ra	
C0820	♦	♦	23755	5CCB	A	3	FIX32	VD	4	Ra/W	CINH
C0821	♦	♦	23754	5CCA	A	3	FIX32	VD	4	Ra	
C0822	♦	♦	23753	5CC9	A	3	FIX32	VD	4	Ra/W	CINH
C0823	♦	♦	23752	5CC8	A	3	FIX32	VD	4	Ra	
C0824	♦	♦	23751	5CC7	A	3	FIX32	VD	4	Ra/W	CINH
C0825	♦	♦	23750	5CC6	A	3	FIX32	VD	4	Ra	
C0826	♦	♦	23749	5CC5	A	3	FIX32	VD	4	Ra/W	CINH
C0827	♦	♦	23748	5CC4	A	3	FIX32	VD	4	Ra	
C0828	♦	♦	23747	5CC3	A	3	FIX32	VD	4	Ra/W	CINH
C0829	♦	♦	23746	5CC2	A	3	FIX32	VD	4	Ra	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0830	♦	♦	23745	5CC1	A	3	FIX32	VD	4	Ra/W	CINH
C0831	♦	♦	23744	5CC0	A	3	FIX32	VD	4	Ra	
C0832	♦	♦	23743	5CBF	A	3	FIX32	VD	4	Ra/W	CINH
C0833	♦	♦	23742	5CBE	A	3	FIX32	VD	4	Ra	
C0834	♦	♦	23741	5CBD	A	3	FIX32	VD	4	Ra/W	CINH
C0835	♦	♦	23740	5CBC	A	3	FIX32	VD	4	Ra	
C0836	♦	♦	23739	5CBB	A	3	FIX32	VD	4	Ra/W	CINH
C0837	♦	♦	23738	5CBA	A	3	FIX32	VD	4	Ra	
C0838	♦	♦	23737	5CB9	A	3	FIX32	VD	4	Ra/W	CINH
C0839	♦	♦	23736	5CB8	A	3	FIX32	VD	4	Ra	
C0840	♦	♦	23735	5CB7	E	1	FIX32	VD	4	Ra/W	CINH
C0841	♦	♦	23734	5CB6	E	1	FIX32	VD	4	Ra	
C0842	♦	♦	23733	5CB5	E	1	FIX32	VD	4	Ra/W	CINH
C0843	♦	♦	23732	5CB4	E	1	FIX32	VD	4	Ra	
C0844	♦	♦	23731	5CB3	E	1	FIX32	VD	4	Ra/W	CINH
C0845	♦	♦	23730	5CB2	E	1	FIX32	VD	4	Ra	
C0846	♦	♦	23729	5CB1	E	1	FIX32	VD	4	Ra/W	CINH
C0847	♦	♦	23728	5CB0	E	1	FIX32	VD	4	Ra	
C0848	♦	♦	23727	5CAF	E	1	FIX32	VD	4	Ra/W	CINH
C0849	♦	♦	23726	5CAE	E	1	FIX32	VD	4	Ra	
C0850	♦	♦	23725	5CAD	A	3	FIX32	VD	4	Ra/W	CINH
C0851	♦	♦	23724	5CAC	E	1	FIX32	VD	4	Ra/W	CINH
C0852	♦	♦	23723	5CAB	E	1	FIX32	VD	4	Ra/Wa	
C0853	♦	♦	23722	5CAA	E	1	FIX32	VD	4	Ra/Wa	
C0855	♦	♦	23720	5CA8	A	2	B16	VH	2	Ra	
C0856	♦	♦	23719	5CA7	A	3	I32	VH	4	Ra	
C0857	♦	♦	23718	5CA6	E	1	I32	VH	4	Ra	
C0858	♦	♦	23717	5CA5	A	3	I32	VH	4	Ra	
C0859	♦	♦	23716	5CA4	E	1	I32	VH	4	Ra	
C0860	♦	♦	23715	5CA3	A	11	FIX32	VD	4	Ra/W	CINH
C0861	♦	♦	23714	5CA2	A	3	FIX32	VD	4	Ra/W	CINH
C0863	♦	♦	23712	5CA0	A	6	B32	VH	4	Ra	
C0864	♦	♦	23711	5C9F	A	3	FIX32	VD	4	Ra/Wa	
C0865	♦	♦	23710	5C9E	A	3	FIX32	VD	4	Ra/Wa	
C0866	♦	♦	23709	5C9D	A	11	I32	VH	4	Ra	
C0867	♦	♦	23708	5C9C	A	3	I32	VH	4	Ra	
C0868	♦	♦	23707	5C9B	A	11	I32	VH	4	Ra	
C0869	♦	♦	23706	5C9A	A	3	I32	VH	4	Ra	
C0870	♦	♦	23705	5C99	A	2	FIX32	VD	4	Ra/W	CINH
C0871	♦	♦	23704	5C98	E	1	FIX32	VD	4	Ra/W	CINH
C0876	♦	♦	23699	5C93	E	1	FIX32	VD	4	Ra/W	CINH
C0878	♦	♦	23697	5C91	A	4	FIX32	VD	4	Ra	
C0879	♦	♦	23696	5C90	A	3	FIX32	VD	4	Ra/Wa	
C0880	♦	♦	23695	5C8F	A	2	FIX32	VD	4	Ra/W	CINH
C0881	♦	♦	23694	5C8E	E	1	FIX32	VD	4	Ra/W	CINH

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0884	♦	♦	23691	5C8B	A	3	FIX32	VD	4	Ra	
C0885	♦	♦	23690	5C8A	E	1	FIX32	VD	4	Ra/W	CINH
C0886	♦	♦	23689	5C89	E	1	FIX32	VD	4	Ra/W	CINH
C0889	♦	♦	23686	5C86	A	2	FIX32	VD	4	Ra	
C0890	♦	♦	23685	5C85	E	1	FIX32	VD	4	Ra/W	CINH
C0891	♦	♦	23684	5C84	E	1	FIX32	VD	4	Ra/W	CINH
C0892	♦	♦	23683	5C83	E	1	FIX32	VD	4	Ra/W	CINH
C0893	♦	♦	23682	5C82	E	1	FIX32	VD	4	Ra/W	CINH
C0899	♦	♦	23676	5C7C	E	1	FIX32	VD	4	Ra/W	CINH
C0900	♦	♦	23675	5C7B	E	1	FIX32	VD	4	Ra/W	CINH
C0901	♦	♦	23674	5C7A	E	1	FIX32	VD	4	Ra/W	CINH
C0902	♦	♦	23673	5C79	E	1	FIX32	VD	4	Ra/W	CINH
C0903	♦	♦	23672	5C78	E	1	FIX32	VD	4	Ra/W	CINH
C0904	♦	♦	23671	5C77	E	1	FIX32	VD	4	Ra/W	CINH
C0905	♦	♦	23670	5C76	E	1	FIX32	VD	4	Ra	
C0906	♦	♦	23669	5C75	A	6	FIX32	VD	4	Ra	
C0907	♦	♦	23668	5C74	A	4	FIX32	VD	4	Ra	
C0909	♦	♦	23666	5C72	E	1	FIX32	VD	4	Ra/Wa	
C0910	♦	♦	23665	5C71	E	1	FIX32	VD	4	Ra/W	CINH
C0911	♦	♦	23664	5C70	E	1	FIX32	VD	4	Ra	
C0912	♦	♦	23663	5C6F	E	1	FIX32	VD	4	Ra	
C0913	♦	♦	23662	5C6E	E	1	FIX32	VD	4	Ra/Wa	
C0940	♦	♦	23635	5C53	E	1	FIX32	VD	4	Ra/Wa	
C0941	♦	♦	23634	5C52	E	1	FIX32	VD	4	Ra/Wa	
C0942	♦	♦	23633	5C51	E	1	FIX32	VD	4	Ra/W	CINH
C0943	♦	♦	23632	5C50	E	1	FIX32	VD	4	Ra	
C0945	♦	♦	23630	5C4E	E	1	FIX32	VD	4	Ra/Wa	
C0946	♦	♦	23629	5C4D	E	1	FIX32	VD	4	Ra/Wa	
C0947	♦	♦	23628	5C4C	E	1	FIX32	VD	4	Ra/W	CINH
C0948	♦	♦	23627	5C4B	E	1	FIX32	VD	4	Ra	
C0950	♦	♦	23625	5C49	E	1	FIX32	VD	4	Ra/Wa	
C0951	♦	♦	23624	5C48	E	1	FIX32	VD	4	Ra/Wa	
C0952	♦	♦	23623	5C47	E	1	FIX32	VD	4	Ra/W	CINH
C0953	♦	♦	23622	5C46	E	1	FIX32	VD	4	Ra	
C0955	♦	♦	23620	5C44	E	1	FIX32	VD	4	Ra/Wa	
C0956	♦	♦	23619	5C43	E	1	FIX32	VD	4	Ra/Wa	
C0957	♦	♦	23618	5C42	E	1	FIX32	VD	4	Ra/W	CINH
C0958	♦	♦	23617	5C41	E	1	FIX32	VD	4	Ra	
C0960	♦	♦	23615	5C3F	E	1	FIX32	VD	4	Ra/Wa	
C0961	♦	♦	23614	5C3E	E	1	FIX32	VD	4	Ra/Wa	
C0962	♦	♦	23613	5C3D	E	1	FIX32	VD	4	Ra/Wa	
C0963	♦	♦	23612	5C3C	E	1	FIX32	VD	4	Ra/Wa	
C0964	♦	♦	23611	5C3B	E	1	FIX32	VD	4	Ra/Wa	
C0965	♦	♦	23610	5C3A	E	1	FIX32	VD	4	Ra/Wa	
C0966	♦	♦	23609	5C39	E	1	FIX32	VD	4	Ra/Wa	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0967	♦	♦	23608	5C38	E	1	FIX32	VD	4	Ra/W	CINH
C0968	♦	♦	23607	5C37	E	1	FIX32	VD	4	Ra	
C0970	♦	♦	23605	5C35	E	1	FIX32	VD	4	Ra/W	CINH
C0971	♦	♦	23604	5C34	E	1	FIX32	VD	4	Ra/W	CINH
C0972	♦	♦	23603	5C33	E	1	FIX32	VD	4	Ra/W	CINH
C0973	♦	♦	23602	5C32	E	1	FIX32	VD	4	Ra/W	CINH
C0974	♦	♦	23601	5C31	E	1	FIX32	VD	4	Ra/W	CINH
C0975	♦	♦	23600	5C30	E	1	FIX32	VD	4	Ra/W	CINH
C0976	♦	♦	23599	5C2F	E	1	FIX32	VD	4	Ra/W	CINH
C0977	♦	♦	23598	5C2E	E	1	FIX32	VD	4	Ra/W	CINH
C0978	♦	♦	23597	5C2D	E	1	FIX32	VD	4	Ra/W	CINH
C0980	♦	♦	23595	5C2B	E	1	FIX32	VD	4	Ra/Wa	
C0981	♦	♦	23594	5C2A	E	1	FIX32	VD	4	Ra/Wa	
C0982	♦	♦	23593	5C29	E	1	FIX32	VD	4	Ra/Wa	
C0983	♦	♦	23592	5C28	E	1	FIX32	VD	4	Ra/Wa	
C0988	♦	♦	23587	5C23	A	7	FIX32	VD	4	Ra	
C0989	♦	♦	23586	5C22	A	2	FIX32	VD	4	Ra	
C1000	♦	♦	23575	5C17	E	1	FIX32	VD	4	Ra/Wa	
C1001	♦	♦	23574	5C16	E	1	FIX32	VD	4	Ra/W	CINH
C1002	♦	♦	23573	5C15	E	1	I32	VH	4	Ra/Wa	
C1040	♦	♦	23535	5BEF	E	1	FIX32	VD	4	Ra/Wa	
C1041	♦	♦	23534	5BEE	E	1	FIX32	VD	4	Ra/Wa	
C1042	♦	♦	23533	5BED	E	1	FIX32	VD	4	Ra/W	CINH
C1043	♦	♦	23532	5BEC	E	1	FIX32	VD	4	Ra/W	CINH
C1044	♦	♦	23531	5BEB	E	1	FIX32	VD	4	Ra/W	CINH
C1045	♦	♦	23530	5BEA	A	2	FIX32	VD	4	Ra	
C1046	♦	♦	23529	5BE9	E	1	FIX32	VD	4	Ra	
C1090	♦	♦	23485	5BBD	E	1	I32	VH	4	Ra	
C1091	♦	♦	23484	5BBC	E	1	FIX32	VD	4	Ra/Wa	
C1092	♦	♦	23483	5BBB	E	1	FIX32	VD	4	Ra/Wa	
C1093	♦	♦	23482	5BBA	E	1	FIX32	VD	4	Ra/Wa	
C1094	♦	♦	23481	5BB9	E	1	FIX32	VD	4	Ra/Wa	
C1095	♦	♦	23480	5BB8	E	1	FIX32	VD	4	Ra/Wa	
C1096	♦	♦	23479	5BB7	E	1	FIX32	VD	4	Ra/W	CINH
C1097	♦	♦	23478	5BB6	E	1	FIX32	VD	4	Ra/W	CINH
C1098	♦	♦	23477	5BB5	E	1	FIX32	VD	4	Ra	
C1099	♦	♦	23476	5BB4	E	1	FIX32	VD	4	Ra	
C1100	♦	♦	23475	5BB3	E	1	FIX32	VD	4	Ra/Wa	
C1101	♦	♦	23474	5BB2	A	2	FIX32	VD	4	Ra/W	CINH
C1102	♦	♦	23473	5BB1	A	3	FIX32	VD	4	Ra/W	CINH
C1103	♦	♦	23472	5BB0	A	2	FIX32	VD	4	Ra	
C1104	♦	♦	23471	5BAF	A	3	FIX32	VD	4	Ra	
C1160	♦	♦	23418	5B7A	E	1	FIX32	VD	4	Ra/W	CINH
C1161	♦	♦	23417	5B79	E	1	FIX32	VD	4	Ra/W	CINH
C1162	♦	♦	23416	5B78	E	1	FIX32	VD	4	Ra	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C1163	♦	♦	23415	5B77	E	1	FIX32	VD	4	Ra	
C1190	♦	♦	23388	5B5C	E	1	FIX32	VD	4	Ra/Wa	
C1191	♦	♦	23387	5B5B	A	2	FIX32	VD	4	Ra/Wa	
C1192	♦	♦	23386	5B5A	A	2	FIX32	VD	4	Ra/Wa	
C1300	♦	♦	23278	5AEE	E	1	FIX32	VD	4	Ra/Wa	
C1301	♦	♦	23277	5AED	E	1	FIX32	VD	4	Ra/Wa	
C1302	♦	♦	23276	5AEC	E	1	FIX32	VD	4	Ra/Wa	
C1303	♦	♦	23275	5AEB	E	1	FIX32	VD	4	Ra/Wa	
C1304	♦	♦	23274	5AEA	E	1	VS	VS	20	Ra	
C1305	♦	♦	23273	5AE9	E	1	VS	VS	20	Ra	
C1306	♦	♦	23272	5AE8	E	1	FIX32	VD	4	Ra/Wa	
C1307	♦	♦	23271	5AE7	E	1	FIX32	VD	4	Ra/Wa	
C1308	♦	♦	23270	5AE6	E	1	FIX32	VD	4	Ra/Wa	
C1309	♦	♦	23269	5AE5	E	1	FIX32	VD	4	Ra/Wa	
C1310	♦	♦	23268	5AE4	E	1	FIX32	VD	4	Ra/Wa	
C1311	♦	♦	23267	5AE3	E	1	FIX32	VD	4	Ra/Wa	
C1320	♦	♦	23258	5ADA	E	1	FIX32	VD	4	Ra/W	CINH
C1321	♦	♦	23257	5AD9	A	2	FIX32	VD	4	Ra/W	CINH
C1322	♦	♦	23256	5AD8	A	2	FIX32	VD	4	Ra	
C1325	♦	♦	23253	5AD5	E	1	FIX32	VD	4	Ra	
C1326	♦	♦	23252	5AD4	A	2	FIX32	VD	4	Ra	
C1327	♦	♦	23251	5AD3	A	2	FIX32	VD	4	Ra/W	CINH
C1328	♦	♦	23250	5AD2	E	1	FIX32	VD	4	Ra	
C1330	♦	♦	23248	5AD0	E	1	FIX32	VD	4	Ra/Wa	
C1331	♦	♦	23247	5ACF	E	1	FIX32	VD	4	Ra/Wa	
C1332	♦	♦	23246	5ACE	E	1	FIX32	VD	4	Ra/Wa	
C1333	♦	♦	23245	5ACD	E	1	FIX32	VD	4	Ra/Wa	
C1334	♦	♦	23244	5ACC	E	1	FIX32	VD	4	Ra/Wa	
C1335	♦	♦	23243	5ACB	E	1	FIX32	VD	4	Ra/Wa	
C1336	♦	♦	23242	5ACA	E	1	FIX32	VD	4	Ra/Wa	
C1337	♦	♦	23241	5AC9	E	1	FIX32	VD	4	Ra/Wa	
C1340	♦	♦	23238	5AC6	A	4	FIX32	VD	4	Ra/W	CINH
C1341	♦	♦	23237	5AC5	A	4	FIX32	VD	4	Ra/W	CINH
C1344	♦	♦	23234	5AC2	A	4	FIX32	VD	4	Ra	
C1345	♦	♦	23233	5AC1	A	4	FIX32	VD	4	Ra	
C1350	♦	♦	23228	5ABC	E	1	FIX32	VD	4	Ra/Wa	
C1351	♦	♦	23227	5ABB	E	1	FIX32	VD	4	Ra/Wa	
C1354	♦	♦	23224	5AB8	E	1	FIX32	VD	4	Ra/W	CINH
C1355	♦	♦	23223	5AB7	E	1	FIX32	VD	4	Ra/W	CINH
C1356	♦	♦	23222	5AB6	E	1	FIX32	VD	4	Ra/W	CINH
C1357	♦	♦	23221	5AB5	E	1	FIX32	VD	4	Ra	
C1358	♦	♦	23220	5AB4	E	1	FIX32	VD	4	Ra	
C1359	♦	♦	23219	5AB3	E	1	FIX32	VD	4	Ra	
C1360	♦	♦	23218	5AB2	E	1	FIX32	VD	4	Ra/Wa	
C1361	♦	♦	23217	5AB1	E	1	FIX32	VD	4	Ra/Wa	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C1364	♦	♦	23214	5AAE	E	1	FIX32	VD	4	Ra/W	CINH
C1365	♦	♦	23213	5AAD	E	1	FIX32	VD	4	Ra/W	CINH
C1366	♦	♦	23212	5AAC	E	1	FIX32	VD	4	Ra/W	CINH
C1367	♦	♦	23211	5AAB	E	1	FIX32	VD	4	Ra	
C1368	♦	♦	23210	5AAA	E	1	FIX32	VD	4	Ra	
C1369	♦	♦	23209	5AA9	E	1	FIX32	VD	4	Ra	
C1370	♦	♦	23208	5AA8	E	1	FIX32	VD	4	Ra/Wa	
C1371	♦	♦	23207	5AA7	E	1	FIX32	VD	4	Ra/Wa	
C1372	♦	♦	23206	5AA6	E	1	FIX32	VD	4	Ra/Wa	
C1373	♦	♦	23205	5AA5	E	1	FIX32	VD	4	Ra/Wa	
C1375	♦	♦	23203	5AA3	E	4	FIX32	VD	4	Ra/W	CINH
C1376	♦	♦	23202	5AA2	E	1	FIX32	VD	4	Ra/W	CINH
C1377	♦	♦	23201	5AA1	A	4	FIX32	VD	4	Ra	
C1378	♦	♦	23200	5AA0	E	1	FIX32	VD	4	Ra	
C1583	♦	♦	22995	59D3	E	1	FIX32	VD	4	Ra/Wa	
C1751	♦	♦	22827	592B	A	17	FIX32	VD	4	Ra/W	CINH
C1753	♦	♦	22825	5929	E	1	FIX32	VD	4	Ra/W	CINH
C1754	♦	♦	22824	5928	E	1	FIX32	VD	4	Ra/W	CINH
C1755	♦	♦	22823	5927	E	1	FIX32	VD	4	Ra/W	CINH

9 Troubleshooting and fault elimination

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9.1 Display of operating data, diagnostics

9.1.1 Display of operating data

Description

Important operating parameters are measured by the controller. They can be displayed with the keypad or PC.

Some operating data can be calibrated to be displayed or selected directly with the unit of the process quantity (e.g. pressure, temperature, speed).



Note!

The calibration always affects all specified codes simultaneously.

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0051	MCTRL-NACT		-36000 {1 rpm} 36000	Actual speed value, function block MCTRL • Read only 8.2-25 8.2-48
C0052	MCTRL-Umot		0 {1 V} 800	Motor voltage, function block MCTRL • Read only • MCTRL-VACT = 100 % = C0090 8.2-25 8.2-48
C0053	UG-VOLTAGE		0 {1 V} 900	DC-bus voltage, function block MCTRL • Read only • MCTRL-DCVOLT = 100 % = 1000 V 8.2-25 8.2-48
C0054	IMot		0.0 {0.1 A} 500.0	Current motor current, function block MCTRL • Read only • MCTRL-IACT = 100 % = C0022 8.2-25 8.2-48
C0061	Heatsink temp		0 {1 °C} 100	Heatsink temperature • Read only • If the temperature of the heatsink > 85 °C, the controller sets TRIP OH • Early warning is possible via OH4, temperature is set in C0122 See System Manual (extension)
C0063	Mot temp		0 {1 °C} 200	Motor temperature • Read only • Monitoring of the motor temperature must be activated. • KTY at X8/5, X8/8: – At 150 °C, TRIP OH3 is set – Early warning is possible via OH7, temperature is set in C0121 • PTC, thermal contact at T1, T2: – Release sets TRIP or warning OH8 8.2-25 8.2-48

9 Troubleshooting and fault elimination

9.1 Display of operating data, diagnostics

9.1.2 Diagnostics

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0064	Utilization		0	{1 %}	150	Device utilisation I×t ● Read only ● Device utilisation during the last 180 s of operating time ● C0064 > 100 % releases warning OC5 ● C0064 > 140 % limits the output current of the controller to 67 % of the maximum current in C0022	 8.2-25  8.2-48
C0150	Status word		Bit00 –	Bit08	Status code	Read only Decimal status word for networking via automation interface (AIF) ● Binary interpretation indicates the bit states	See System Manual (extension)
		Bit01 IMP	Bit09	Status code			
		Bit02 –	Bit10	Status code			
		Bit03 –	Bit11	Status code			
		Bit04 –	Bit12	Warning			
		Bit05 –	Bit13	Message			
		Bit06 n = 0	Bit14	–			
		Bit07 CINH	Bit15	–			

9.1.2 Diagnostics

Description Display codes for diagnostics

Codes for parameter setting

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0093	DRIVE IDENT					Controller identification	
			0	invalid		● Read only	
			1	none		Damaged power section	
			9321	9321VC		No power section	
			...	...		Display of the controller used	
			9333	9333VC			
C0099	S/W version		x.y			Software version	
			x	Main version		● Read only	
			y	Subversion			

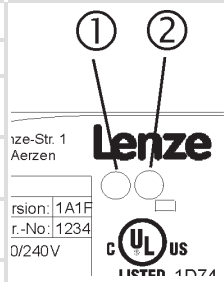
9.2 Troubleshooting

Detecting breakdowns A breakdown can be detected quickly via the LEDs at the controller or via the status information at the keypad.

Analysing errors Analyse the error using the history buffer. The list of fault messages gives you advice how to remove the fault. (📖 9.5-1)

9.2.1 Status display via controller LEDs

During operation the operating status of the controller is shown by 2 LEDs.

LED		Operating status	
Red ①	Green ②		
Off	On	Controller is enabled	
On	On	Mains is switched on and automatic start is inhibited	
Off	Blinking slowly	Controller is inhibited	
Off	On	Motor data identification is being performed	
Blinking quickly	Off	Undervoltage	
Blinking slowly	Off	Active fault	

9.2.2 Fault analysis with the history buffer

Retracing faults Faults can be retraced via the history buffer. Fault messages are stored in the 8 memory locations in the order of their appearance.

The memory locations can be retrieved via codes.

9 Troubleshooting and fault elimination

9.2 Troubleshooting

9.2.2 Fault analysis with the history buffer

Structure of the history buffer

Code			Memory unit	Entry	Note
C0168/1	C0169/1	C0170/1	Memory unit 1	Active fault	If the fault is not available anymore or has been acknowledged: • The contents of the memory locations 1 ... 7 are moved one memory location "higher". • The contents of memory location 8 is deleted from the history buffer and cannot be retrieved anymore. • Memory location 1 is deleted (= no active fault).
C0168/2	C0169/2	C0170/2	Memory unit 2	Last fault	
C0168/3	C0169/3	C0170/3	Memory unit 3	Second to last fault	
C0168/4	C0169/4	C0170/4	Memory unit 4	Third last fault	
C0168/5	C0169/5	C0170/5	Memory unit 5	Fourth-last fault	
C0168/6	C0169/6	C0170/6	Memory unit 6	Fifth-last fault	
C0168/7	C0169/7	C0170/7	Memory unit 7	Sixth-last fault	
C0168/8	C0169/8	C0170/8	Memory unit 8	Last but six fault	

Explanations regarding the codes

C0168	Fault recognition and response to the reaction • The entry is done as a LECOM error number • If several faults with different reactions occur at the same time: – Only the fault is entered the reaction of which has the highest priority (1. TRIP, 2. message, 3. warning). • If faults with the same reactions occur (e.g. 2 messages): – Only the fault which occurred first is entered. • Exception: An OH3 warning has a higher priority than an OH7 warning. – A pending OH7 warning is overwritten by the OH3 warning. – After the OH3 warning has been cancelled, a pending OH7 warning will be displayed again.
C0169	Time of the fault • Reference time is the status of the power-on time meter (C0179). • If a fault is immediately followed by another fault for several times, only the time of the last occurrence is stored.
C0170	Frequency of the fault • The time of the last occurrence is stored.

Delete history buffer

Set C0167 = 1 to delete the history buffer.

9.3 Drive behaviour in the event of faults

The controller responds differently to the three possible fault types TRIP, message, or warning:

TRIP

TRIP (display in keypad XT:)

- ▶ Switches the power outputs U, V, W to a high-resistance state until TRIP reset is executed.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ The drive coasts without any control!
- ▶ After TRIP reset ( 9.5-5):
 - The drive travels along the ramps to its setpoint.
 - The fault indication is moved to C0168/2 as "last fault".

Messages

Message (display in keypad XT:)

- ▶ Switches the power outputs U, V, W to a high-resistance state.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ In case of a fault ≤ 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint with maximum torque.
- ▶ In case of a fault > 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint along the adjusted ramps.
- ▶ If the message is not active anymore, the fault indication is moved to C0168/2 as "last fault".

Warnings

"Heatsink overtemperature" (keypad XT:)

- ▶ The drive continues to travel in a controlled way!
- ▶ The warning signal goes off when the fault is not active anymore.

"Error in motor phase" (keypad XT:)

"PTC monitoring" (keypad XT:)

- ▶ The drive continues to travel in a controlled way!
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ After TRIP reset, the fault indication is moved to C0168/2 as "last fault".

9.4 Fault elimination

9.4.1 Drive errors

Malfunction	Cause	Remedy
An asynchronous motor with feedback rotates in an uncontrolled manner and with low speed	The motor phases are reversed so that the rotating field of the motor is not identical with the rotating field of the feedback system. The drive shows the following behaviour: • V/f characteristic control (C0006 = 5) – The motor rotates faster than the speed setpoint by the value set in C0074 (influence of the speed controller, Lenze setting 10 % of n_{max}). After the controller is enabled, it does not stop at zero speed setpoint or quick stop (QSP). – The final motor current depends, among other things, on the set value of the V_{min} boost (C0016) and can rise to I_{max} (C0022). This may activate the fault message OC5. • Vector control (C0006 = 1) – The motor rotates slowly with maximum slip speed (depending on motor data and maximum current) and does not react to a speed setpoint. The direction of rotation, however, is determined by the sign of the speed setpoint. – The motor current rises up to I_{max} (C0022). This may activate the fault message OC5 with a time delay.	• Check motor cable for correct phase relation. • If possible, operate the motor with deactivated feedback (C0025 = 1) and check the direction of rotation of the motor.
Motor does not rotate although the controller is enabled (IMP is off) and a speed setpoint has been specified.	The two terminal strips X5 are reversed. Since X5/A1 and X5/28 face each other, the controller can be enabled if the control terminals are internally supplied. All other connections, however, are assigned incorrectly so that the motor cannot start.	Check the position of the terminal strips: • If you look at the connection unit in reading direction, the left terminal strip X5 must be connected with the input signals and the right terminal strip X5 must be connected with the output signals.
The monitoring of the motor phases (LP1) does not respond if a motor phase is interrupted, although C0597 = 0 or 2	The function block MLP1 is not entered into the processing table.	Enter the function block MLP1 into the processing table. The function block MLP1 requires 30 μ s of calculating time.
If during high speeds DC-injection braking (GSB) is activated, the fault OC1 (TRIP) or OU (TRIP) occurs	During DC-injection braking the controller sets pulse inhibit for a short time (DCTRL-IMP) to reduce the magnetisation in the motor before a DC voltage is injected into the motor. At high speeds (e. g. in case of mid-frequency motors) the residual voltage which develops from the residual magnetism and high speed can generate such a high motor current that OC1 or OU are activated.	Prolong the duration of the pulse inhibit: • Connect the output signal DCTRL-IMP to the function block TRANSx and adjust the desired switch-off time there (usually 500 ms). If DCTRL-CINH1 is set to HIGH, the duration of the pulse inhibit is prolonged by the time adjusted.

9.4.2 Controller in clamp operation

The clamp operation is a permissible operating mode. But since, however, pulse inhibit is set again and again, the controller cannot provide the optimum power.

If the output power is optimal, the output current mainly is right below the clamp threshold.

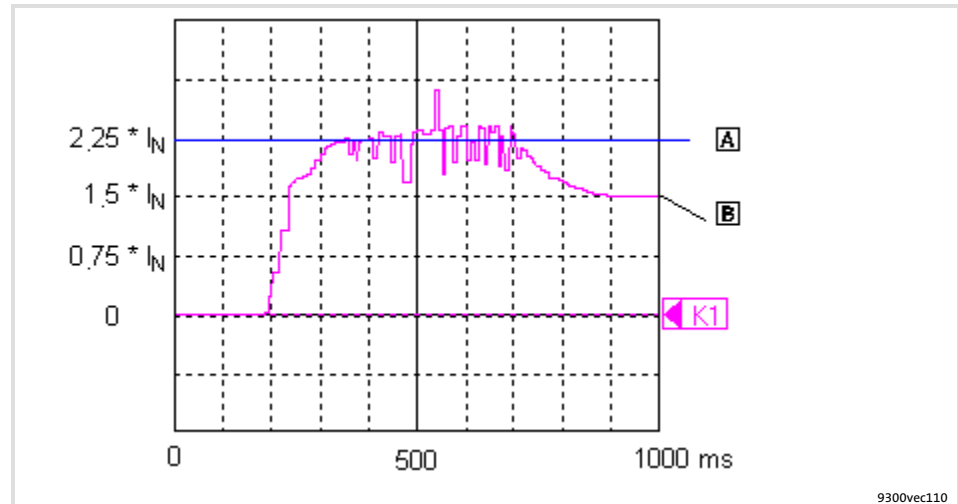


Fig. 9.4-1 Output current when starting a motor with high load (shown with the oscilloscope in GDC)

- A Clamp threshold
- B Output current

Function

1. When the output current reaches $2.25 \times I_r$, a software clamp is activated.
2. The controller sets pulse inhibit for a short time. The motor current decreases as a function of the inductance in the motor circuit.
 - An internal counter is increased by the value one.
3. After max. 250 μ s the pulse inhibit is deactivated.
4. If a software clamp reoccurs within 2 s, the internal counter is again increased by the value one. Otherwise the counter is set to zero.
 - If the counter reaches the value 4300, OC3 (TRIP) is activated.

9.4.3 Behaviour in case of overvoltage in the DC bus (OU message)

Description

If the DC-bus voltage (U_{DC}) exceeds the switch-off threshold OU, the pulse inhibit is set. At the same time, an internal timing element starts for a delay time (C0912).

The pulse inhibit is deactivated if the voltage falls below the switch-on threshold OU and the delay time has elapsed.

Switching thresholds in case of overvoltage in the DC bus (OU):

Mains voltage range		C0173	Switch-off threshold OU	Switch-on threshold OU
< 400 V	Operation with / without brake chopper	0	770 V	755 V
400 V	Operation with / without brake chopper	1 *	770 V	755 V
460 V	Operation with / without brake chopper	2	770 V	755 V
480 V	Operation without brake chopper	3	770 V	755 V
480 V	Operation with brake chopper	4	800 V	785 V

* Lenze setting

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0912	OV delay time	→	- {1 ms}	- Delay time of the pulse enable after an OU message → Depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 A change of one of the codes resets C0912 to the time of the selected motor The time is derived from the double rotor time constant 8.2-25 8.2-48 9.4-3

Adjustment

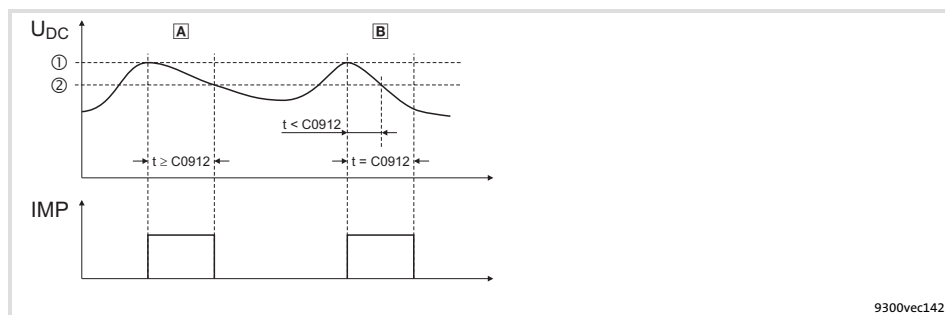


Fig. 9.4-2 Influence of the delay time (C0912)

① Switch-off threshold OU

② Switch-on threshold OU

A The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU equals or is higher than the delay time set in C0912.

After undershooting the switch-on threshold OU, the pulse inhibit is deactivated.

B The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU is lower than the delay time set in C0912.

The pulse inhibit is deactivated after the delay time in C0912 has elapsed.

- The delay time in [ms] is set under C0912. The Lenze setting can be changed by the factor 0.5 ... 2.

9.5 System error messages

9.5.1 General error messages



Note!

In the case of a query via system bus (CAN), the fault messages are represented as numbers (see first column of the table).

Fault message		Description	Cause	Remedy
No.	Display			
---	---	No fault	-	-
0011	OC1	Overcurrent in motor cable ($I_a > 2.25 \times I_N$; Hardware monitoring)	In the event of a short circuit	- Search for the cause of the short circuit. - Check the motor cable.
			Capacitive charging current of the motor cable is too high	Use motor cable which is shorter or of lower capacitance
			Too short acceleration or deceleration times in proportion to the load (C0012, C0013, C0105)	- Increase the gain (P component) of the I_{max} controller (C0075). - Reduce integral-action time (integral action component) of the I_{max} controller (C0076)
			The drive is connected to the coasting machine. The coasting is caused by a short-time pulse inhibit, e.g. at - OU (overvoltage in the DC bus) - external or internal controller inhibit	Activate flying restart circuit
			- Encoder error - Tracks during encoder feedback of the motor speed are interchanged	Check wiring of the encoder
			DC-injection braking at high speeds	See 9.4-1
			Missing mains phase	- Check the connections and the supply cable of the device - Check mains voltage
0012	OC2	Motor cable earth fault	One of the motor phases has earth contact.	- Search for cause of short circuit. - Check motor cable.
0013	OC3	Overload during acceleration.	Too short acceleration or deceleration times in proportion to the load (C0012, C0013, C0105).	- Increase the gain (P component) of the current controller (C0075). - Reduce the reset time (integral action component) of the I_{max} controller (C0076). - Increase ramp times. 9.4-2, "controller in clamp operation (fault OC3)"
0015	OC5	$I \times t$ overload	- Frequent and too long acceleration with overcurrent - Continuous overload with $I_{motor} > 1.05 \times I_{rx}$.	Check drive dimensioning.
0016	OC6	$I^2 \times t$ overload	- Frequent and too long acceleration processes with motor overcurrent. - Permanent motor overload with $I_{motor} > I_{rmotor}$	Check drive dimensioning.

Fault message		Description	Cause	Remedy
No.	Display			
x018	OC8	I ² t overload advance warning	- Frequent and too long acceleration processes with motor overcurrent. - Permanent motor overload with $I_{\text{motor}} > I_{\text{r motor}}$	Check drive dimensioning.
2020	OU	Overvoltage in the DC bus	Braking energy is too high. (DC-bus voltage is higher than set in C0173.)	- Use a braking unit or regenerative module. - Check dimensioning of the brake resistor.
1030	LU	Undervoltage in the DC bus	DC bus voltage is lower than specified in C0173.	- Check mains voltage - Check supply cable
x032	LP1	Motor phase failure	A current-carrying motor phase has failed.	- Check motor. - Check motor cable. - Switch off monitoring (C0597 = 3).
			The current limit value is set too low.	Set higher current limit value via C0599.
0050	OH	Heatsink temperature > +90 °C	Ambient temperature $T_u > +40\text{ °C}$ or > +50 °C	- Allow module to cool and ensure better ventilation. - Check ambient temperature in the control cabinet.
			Heatsink is very dirty.	Clean heatsink.
			Wrong mounting position	Change mounting position.
x053	OH3	Motor temperature > +150 °C threshold (temperature detection via resolver or incremental value encoder)	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0583 = 3).
			No PTC/temperature contact connected.	Correct wiring.
x054	OH4	Heatsink temperature > C0122	Ambient temperature $T_u > +40\text{ °C}$ or > +50 °C	- Allow module to cool and ensure better ventilation. - Check ambient temperature in the control cabinet. - Switch off monitoring (C0582 = 3).
			Heatsink is very dirty.	Clean heatsink
			Wrong mounting position	Change mounting position.
			The value specified under C0122 is set too low.	Enter a higher value under C0122.
x057	OH7	Motor temperature > C0121 (temperature detection via resolver or incremental value encoder)	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0584 = 3).
			No PTC/temperature contact connected.	Correct wiring.
			The value specified under C0121 is set too low.	Enter a higher value in C0121.
x058	OH8	Motor temperature via inputs T1 and T2 is too high.	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0585 = 3).
			Terminals T1 and T2 are not connected	Connect PTC/temperature contact.

Fault message		Description	Cause	Remedy
No.	Display			
x061	CE0	Automation interface (AIF) communication error	Faulty transfer of control commands via AIF.	- Plug in the communication module/keypad XT firmly, screw down, if necessary. - Switch off monitoring (C0126 = 3).
x062	CE1	Communication error on the process data input object CAN1_IN	CAN1_IN object receives faulty data or communication is interrupted.	- Check wiring at X4. - Check sender. - Increase monitoring time under C0357/1, if necessary. - Switch off monitoring (C0591 = 3).
x063	CE2	Communication error on the process data input object CAN2_IN	CAN2_IN object receives faulty data or communication is interrupted.	- Check wiring at X4. - Check sender. - Increase monitoring time under C0357/2, if necessary. - Switch off monitoring (C0592 = 3).
x064	CE3	Communication error on the process data input object CAN3_IN	CAN3_IN object receives faulty data or communication is interrupted.	- Check wiring at X4. - Check sender. - Increase monitoring time under C0357/3, if necessary. - Switch off monitoring (C0593 = 3).
x065	CE4	BUS-OFF state of system bus (CAN)	The controller has received too many faulty telegrams via the system bus (CAN) and has disconnected from the bus.	- Check wiring at X4: Is the bus correctly terminated? - Check shield connection of the cables. - Check PE connection. - Check bus load, reduce the baud rate if necessary. (Observe the cable length!) - Switch off the monitoring (C0595 = 3).
0071	CCr	System failure	Strong interference injection on the control cables	Screen control cables
			Ground or earth loops in the wiring	- Check wiring - Check PE connection
				After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0072	PR1	Checksum error in parameter set 1 CAUTION: The Lenze setting is loaded automatically!	- Fault when loading a parameter set. - Interruption while transmitting the parameter set via keypad.	- Set the required parameters and store them under C0003 = 1. - As to PLC devices, check the use of pointers.
			The stored parameters are incompatible with the loaded software version.	Store the parameter set under C0003 = 1 first to allow for a faults reset.
0073	PR2	Checksum error in parameter set 2 PLEASE NOTE: The Lenze setting is loaded automatically!	- Fault while loading a parameter set. - Interruption during the transfer of the parameter set via keypad.	Set the required parameters and save them with C0003 = 2.
			The parameters saved do not comply with the software version loaded.	In order to be able to acknowledge the error, first save the parameter set with C0003 = 2.

Fault message		Description	Cause	Remedy
No.	Display			
0074	PEr	Program error	Error in the program flow	Send the parameter set (on floppy disk/CD-ROM) with a detailed description of the problem to Lenze. After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0075	PR0	Error in parameter set.	The operating system software has been updated.	Storage of the Lenze setting C0003 = 1. After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0077	PR3	Checksum error in parameter set 3 PLEASE NOTE: The Lenze setting is loaded automatically!	- Fault while loading a parameter set. - Interruption during the transfer of the parameter set via keypad. The parameters saved do not comply with the software version loaded.	Set the required parameters and save them with C0003 = 3. In order to be able to acknowledge the error, first save the parameter set with C0003 = 3.
0078	PR4	Checksum error in parameter set 4 PLEASE NOTE: The Lenze setting is loaded automatically!	- Fault while loading a parameter set. - Interruption during the transfer of the parameter set via keypad. The parameters saved do not comply with the software version loaded.	Set the required parameters and save them with C0003 = 4. In order to be able to acknowledge the error, first save the parameter set with C0003 = 4.
0079	PI	Fault during parameter initialisation	- An error has been detected during the parameter set transfer between two devices. - The parameter set does not match the controller, e.g. if data has been transferred from a higher-power controller to a lower-power controller.	- Correct parameter set. - Send parameter set (on floppy disk/CD-ROM) and a detailed description of the problem to Lenze.
x083	Sd3	Encoder error at X9	Cable interrupted. Pin X9/8 not connected.	Check cable for open circuit. Apply 5 V to pin X9/8 or switch off monitoring (C0587 = 3).
x085	Sd5	Encoder error at X6/1 and X6/2 (C0034 = 1)	Current signal at X6/1 X6/2 < 2mA.	- Check cable for open circuit. - Check current signal encoder. - Switch off monitoring (C0598 = 3).
x086	Sd6	Motor temperature sensor error (X7 or X8)	Encoder for detecting the motor temperature at X7 or X8 indicates undefined values.	- Check cable for firm connection. - Switch off the monitoring (C0594 = 3).
x091	EEr	External monitoring has been triggered via DCTRL .	A digital signal assigned to the TRIP-SET function has been activated.	- Check external encoder. - Switch off the monitoring (C0581 = 3).
0105	H05	Internal fault (memory)		Contact Lenze.
0107	H07	Internal fault (power stage)	During initialisation of the controller, an incorrect power stage was detected.	Contact Lenze.
x110	H10	Heatsink temperature sensor error	Sensor for detecting the heatsink temperature indicates undefined values.	- Contact Lenze. - Switch off the monitoring (C0588 = 3).
x111	H11	Temperature sensor error: Temperature inside the controller	Sensor for detecting the internal temperature indicates undefined values.	- Contact Lenze. - Switch off the monitoring (C0588 = 3).

Fault message		Description	Cause	Remedy
No.	Display			
0140	ID1	Error during motor data identification.	No motor connected.	Check motor connection.
			Stator resistance too high.	Check entered motor data.
			Controller inhibited externally.	Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
0141	ID2	Error during motor data identification.	Motor too small.	- Check entered motor data. For parameterisation with Global Drive Control, use the input assistant for motor data. - The measurements for the inverter error characteristic and the stator resistance are correct (save measured values in C0003). For the operating mode V/f characteristic control the motor data identification can be completed.
			Controller inhibited externally.	Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
x200	NMAX	Maximum system speed (C0596) has been exceeded.	- Active load (e.g. for hoists) is too high. - Drive is not speed-controlled, torque is excessively limited.	- Check drive dimensioning. - Increase torque limit, if necessary. - Switch off monitoring (C0607 = 3).

Representation of the error number:

x 0 = TRIP, 1 = message, 2 = warning

E. g. "2091": An external monitoring function has triggered EEr warning

9.5.2 Resetting system error messages

Response	Measures for resetting the fault message
TRIP	 Note! If a TRIP source is still active, the pending TRIP cannot be reset. Resetting the TRIP can be effected by: - Pressing the keypad XT EMZ9371 BC ⇒ STOP. Then press RUN to re-enable the controller. - Setting code C0043 = 0. - Control word C0135, bit 11 - Control word AIF - Control word of system bus (CAN) After resetting the TRIP, the drive remains at standstill.
Message	 Danger! After elimination of the fault, the fault message is cancelled automatically and the drive restarts automatically.
Warning	After elimination of the fault, the fault message is cancelled automatically.

10 DC-bus operation

Contents

10.1	Function	10.1-1
10.2	Conditions for trouble-free DC-bus operation	10.2-1
10.3	Fuses and cable cross-sections	10.3-1
10.4	Distributed supply (several supply points)	10.4-1
10.5	Central supply (one supply point)	10.5-1

10.1 Function

- ▶ DC-bus connections of drive systems enable the exchange of energy between connected controllers.
- ▶ If one or more controllers operate in generator mode (braking operation), the energy will be fed into the shared DC-voltage bus. The energy will then be available to the controllers which operate in motor mode.
- ▶ The use of braking units and supply units can be reduced.
- ▶ The energy consumption from the three-phase AC mains can be reduced.
- ▶ The number of mains supplies and the related expenses (e.g. wiring) can be perfectly adapted to your application.

10.2 Conditions for trouble-free DC-bus operation

- ▶ Distributed supply (parallel mains supply):
 - Always use the prescribed mains choke when connecting a controller to the mains.
 - Controllers of the EVx9321 ... EVx9333, 8200 and 8200 vector series must not be connected to the mains if they are operated in a DC-bus connection with EVx9335 ... EVx9338 and EVx9381 ... EVx9383 controllers.
- ▶ Only controllers with identical mains voltage/DC bus voltage ranges can be operated in a DC-bus connection:
 - Set the mains voltage/DC-bus voltage under C0173.
- ▶ 9340 regenerative power supply modules and 9360 DC input modules cannot be used together in the DC-bus connection.
- ▶ Read the documentation for the other controllers connected to the DC bus with regard to "DC-bus operation".

10.3 Fuses and cable cross-sections



Note!

- ▶ All fuses specified here only have the purpose of **disconnection after a short circuit**. For cable protection specific fuses must be used.
- ▶ In the following tables the rated currents of the Lenze fuses are listed. If other fuses are used, other fuse currents and cable cross-sections may result.
- ▶ We recommend using fuse holders with a signalling contact. Like this, the entire drive system can be switched off (inhibited) when a fuse fails.
- ▶ Always fuse DC cables using 2 poles (+U_G, -U_G).

Installation in accordance with EN 60204-1

Supply conditions	
Range	Description
Mains	DC 460 ... 740 V
Fuses	- Only semiconductor fuses. - If you are using fuses other than those indicated, other fuse currents and cable cross-sections may result.
Cables	- DC cables (+U_G, -U_G) must always have two-pole insulation. - Laying systems B2 and C: Use of PVC-insulated copper cables, conductor temperature < 70 °C, ambient temperature < 40 °C, no bundling of cables or cores, three loaded cores. The information is a recommendation. Other designs/laying systems are possible (e.g. according to VDE 0298-4).
Observe all national and regional regulations!	

Inverter		DC fuse 14 × 51 (EFSGR0xx0AYHx)	DC fuse 22 × 58 (EFSGR0xx0AYIx)	Installation in accordance with EN 60204-1	
Type	Mains	Rated current of fuse [A]	Rated current of fuse [A]	+U _G , -U _G Laying system B2 [mm ²]	C [mm ²]
EVF9321-xV	3/PE 400 V	12	12	1.5	1.5
EVF9322-xV		12	12	1.5	1.5
EVF9323-xV		12	12	1.5	1.5
EVF9324-xV		20	20	1.5	1.5
EVF9325-xV		40	40	4	4
EVF9326-xV		50	50	6 ¹⁾	4

¹⁾ Pin-end connector required, since a maximum cable cross-section of 4 mm² can be connected to the inverter.

Inverter		DC fuse NH1 (EFSGRxxx0ANVx)	DC fuse 22 × 58 (EFSGR0xx0AYIx)	Installation in accordance with EN 60204-1	
Type	Mains	Rated current of fuse [A]	Rated current of fuse [A]	+U _G , -U _G Laying system B2 [mm ²]	C [mm ²]
EVF9327-xV	3/PE 400 V	100	100	-	25
EVF9328-xV		100	100	-	25
EVF9329-xV		200	-	-	25
EVF9330-xV		200	-	-	50

Inverter		DC fuse NH2 (EFSGRxxx0ANWx)	DC fuse 22 × 58 (EFSGR0xx0AYIx)	Installation in accordance with EN 60204-1	
Type	Mains	Rated fuse current [A]	Rated fuse current [A]	+U _G , -U _G Laying system F [mm ²]	C [mm ²]
EVF9331-xV	3/PE 400 V	250	-	-	95
EVF9332-xV		350	-	-	95
EVF9333-xV		350	-	95	-

10.4 Distributed supply (several supply points)

Basic circuit diagram

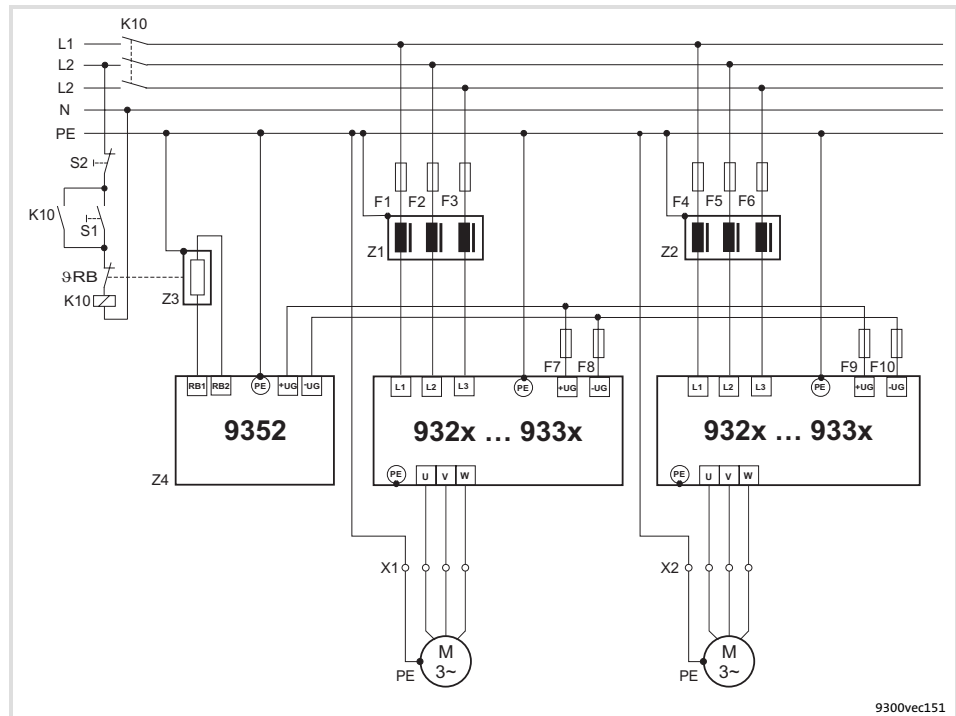


Fig. 10.4-1 Basic circuit diagram of a distributed supply with brake chopper

F1 ... F10	Fusing
K10	Mains contactor
Z1, Z2	Mains choke / mains filter
Z3	Brake resistor
Z4	Brake chopper
S1	Mains supply on
S2	Mains supply off

- Dimension the components according to the requirements of the DC-bus operation.



Stop!

Set the DC-bus voltage thresholds of the controller (C0173) and the brake chopper (see documentation of the brake chopper) to the same values.

10.5 Central supply (one supply point)

Basic circuit diagram

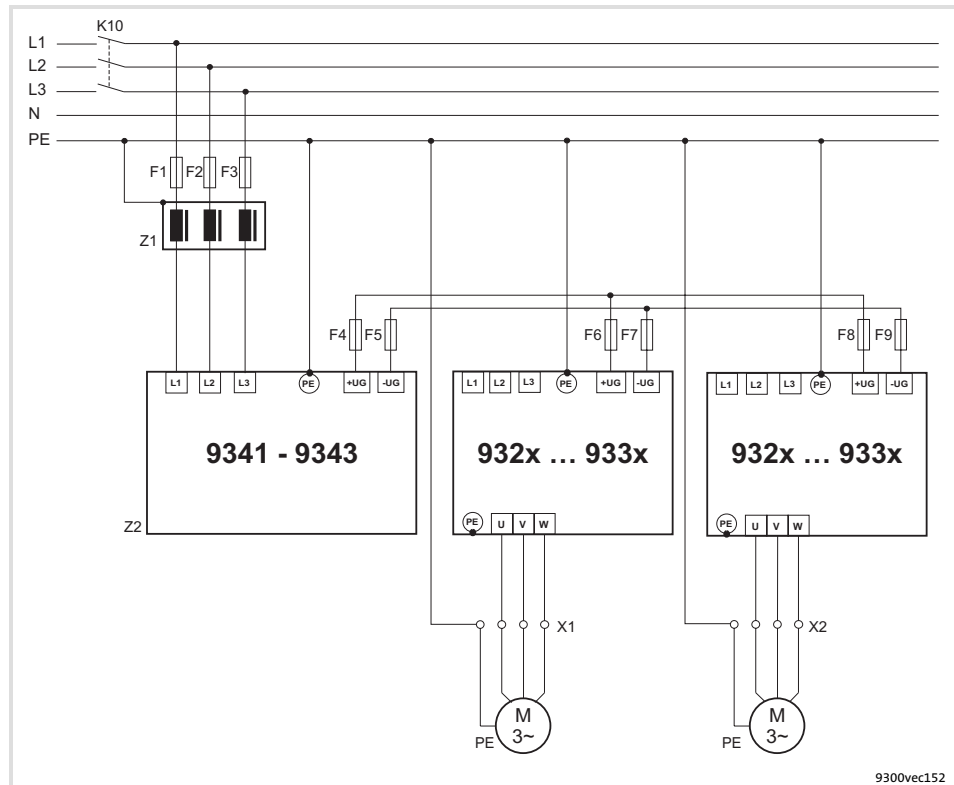


Fig. 10.5-1 Basic circuit diagram of a central supply with regenerative power supply module

F1 ... F9	Fusing
K10	Mains contactor
Z1	Mains choke / mains filter
Z2	Regenerative power supply module

- Dimension the components according to the requirements of the DC-bus operation.



Note!

- If the supply power of the regenerative power supply module is not sufficient, the system can be additionally supplied via the mains connection of further controllers.
- Before connecting the supply module and the controllers read the Operating Instructions of the regenerative power supply module.

11 Safety engineering

Contents

11.1	Important notes	11.1-1
11.2	Operating mode	11.2-1
11.3	Safety relay KSR	11.3-1
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11.1 Important notes



Stop!

In the case of the devices EVF9335 ... EVF9383 of variants V060, V110, V270, and V300, the integrated brake transistor is deactivated if the "Safe torque off" function is active.

The controllers of variants V004 and V024 support the safety functions "Safe torque off" (old designation "safe standstill"), "Protection against unexpected start-up", in accordance with the requirements of control category 3 of EN 954 Part 1 and Part 2. Depending on the external wiring, a standard up to category "3" in accordance with EN 954-1 is achieved.



Note!

In order to comply with control category 3 in accordance with EN 954-1, the two methods "Pulse inhibit via safety relay K_{SR}" and "Controller inhibit", which are independent of each other, have to be used.

- ▶ Only qualified personnel may install and commission the "Safe torque off" function.
- ▶ All control components (switches, relays, PLC, ...) and the control cabinet must comply with the requirements of EN ISO 13849-1 and EN ISO 13849-2. This includes among other things:
 - Control cabinet, switches, relays in enclosure IP54!
 - All other requirements can be found in EN ISO 13849-1 and EN ISO 13849-2!
- ▶ Wiring with insulated wire end ferrules or rigid cables is absolutely required.
- ▶ All safety-relevant cables (e.g. control cable for the safety relay, feedback contact) outside the control cabinet must be protected, e.g. by a cable duct. It must be ensured that short circuits between the individual cables cannot occur!
- ▶ With the "Safe torque off" function no emergency stop can be effected without additional measures:
 - There is neither an electrical isolation between motor and controller nor a service or repair switch!
 - An "Emergency stop" requires the electrical isolation of the conductor to the motor, e.g. by means of a central mains contactor with emergency stop wiring.
- ▶ If in the case of the "Safe torque off" a force effect is to be expected from outside, (e.g. sagging of hanging loads), additional measures are required (e.g. mechanical brakes).

- ▶ After the installation the operator has to check the function of the "Safe torque off" circuit.
 - The functional test must be repeated at regular intervals.
 - Basically, the inspection intervals depend on the application, the related risk analysis, and the overall system. The inspection intervals must not be longer than 1 year.

11.2 Operating mode

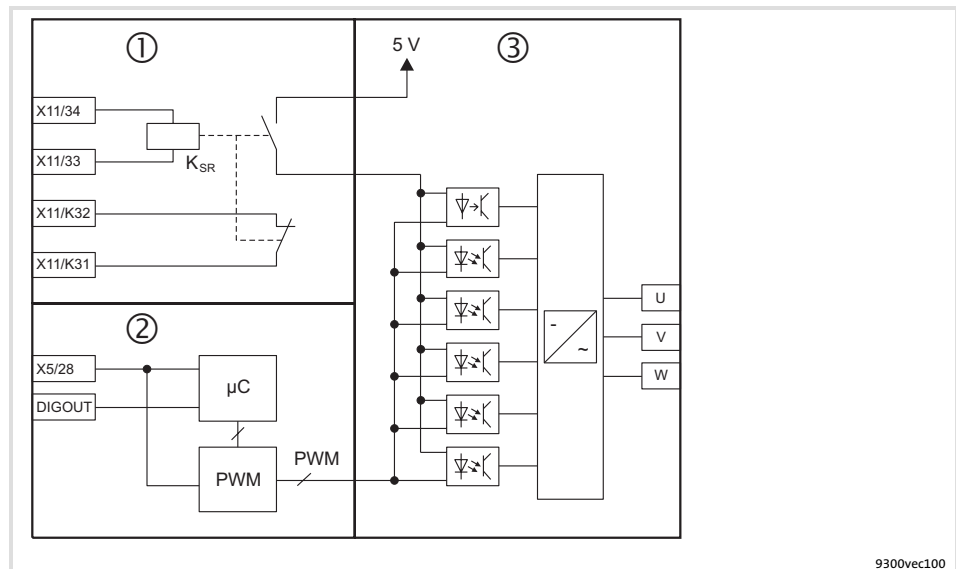


Fig. 11.2-1 Internal connection of the "Safe torque off" function with 3 electrically isolated circuits

- Area ①: Pulse inhibit via safety relay K_{SR} ; forcibly guided feedback for monitoring the safety relay
- Area ②: Controller inhibit (X5/28), optional feedback via a digital output (DIGOUT)
- Area ③: Power output stage

Activating "Safe torque off"

The "Safe torque off" status is activated via two different disconnecting paths which are independent of each other:

1. disconnecting path: Pulse inhibit via safety relay K_{SR} (terminal X11/33, X11/34)

- In the case of LOW level at terminals X11/33, X11/34, the safety relay K_{SR} is deactivated. The driver supply of the power section drivers is interrupted. The inverter no longer receives pulses.
- The disconnection of the safety relay K_{SR} has to be monitored externally, so that a failure of this disconnecting path can be detected. X11/K31, X11/K32 is a forcibly guided break contact, i. e. if the safety relay K_{SR} has been deactivated ("Safe torque off" activated), the contact is closed.

2. disconnecting path: Controller inhibit by input signal at terminal X5/28

- The input signal at X5/28 is fed to the microcontroller system and the PWM unit. In the case of LOW level at terminal X5/28, the output of pulses to the inverter is inhibited in the microcontroller system.
- The disconnecting path "Controller inhibit" can be evaluated optionally via a digital output. Further information can be gathered from the chapter "Functional test" (11.4-1).

"Safe torque off" is activated if **both disconnecting paths are on LOW level**.

Deactivating "Safe torque off"

An AND operation of the disconnecting paths prevents the drive from restarting if only one disconnecting path is enabled.

"Safe torque off" is deactivated if **both disconnecting paths are on HIGH level**.

11.3 Safety relay K_{SR}

Technical data

Terminal	Description	Field	Values
X11/K32 X11/K31 X11/33 X11/34	Safety relay K _{SR} 1st disconnecting path	Coil voltage at +20 °C	DC 24 V (20 ... 30 V)
		Coil resistance at +20 °C	823 Ω ±10 %
		Rated coil power	Approx. 700 mW
		Max. switching voltage	AC 250 V, DC 250 V (0.45 A)
		Max. AC switching capacity	1500 VA
		Max. switching current (ohmic load)	AC 6 A (250 V), DC 6 A (50 V)
		Recommended minimum load	> 50 mW
		Max. switching rate	6 switchings per minute
		Mechanical service life	10 ⁷ switching cycles
		Electrical service life	
		at 250 V AC (ohmic load)	10 ⁵ switching cycles at 6 A 10 ⁶ switching cycles at 1 A 10 ⁷ switching cycles at 0.25 A
		at 24 V DC (ohmic load)	6 × 10 ³ switching cycles at 6 A 10 ⁶ switching cycles at 3 A 1.5 × 10 ⁶ switching cycles at 1 A 10 ⁷ switching cycles at 0.1 A

Terminal data

Wiring of the terminals X11/34, X11/33, X11/K32, X11/K31, X5/28:

Leitungstyp	Wire end ferrule	Cable cross-section	Tightening torque	Stripping length
 Rigid	—	2,5 mm ² (AWG 14)	0,5 ... 0,6 Nm (4.4 ... 5.3 lb-in)	5 mm
 Flexible	With plastic sleeve	2,5 mm ² (AWG 14)		

Wiring

**Danger!****Faulty operation in case of earth faults possible**

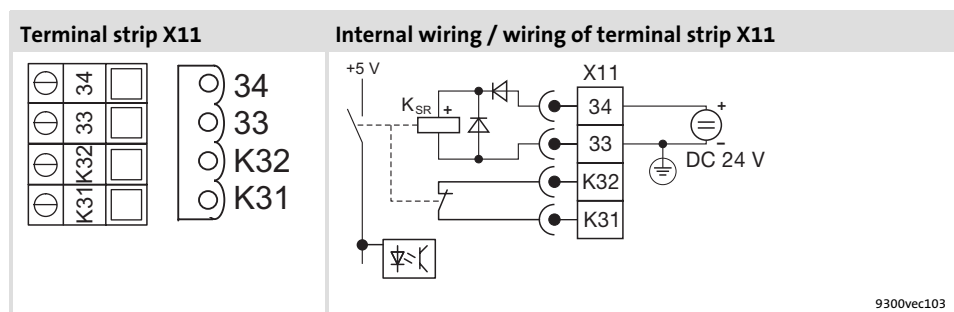
The correct functioning of the safety function is not ensured if an earth fault occurs.

Possible consequences:

- A failure of the safety function can lead to death, severe injuries or damage to material.

Protective measures:

The electrical reference point for the coil of the safety relay K_{SR} must be connected to the PE conductor system (EN 60204-1, paragraph 9.4.3)!

Fig. 11.3-1 Safety relay K_{SR}

Terminal	Function	Level / state	Electrical data
	Bold print = Lenze setting		
X11/K32 X11/K31	Safety relay K _{SR} 1st disconnecting path	Feedback - pulse inhibit Open contact: Pulse inhibit is inactive (operation) Closed contact: Pulse inhibit is active	See technical data of the safety relay K _{SR}
X11/33	– coil of safety relay K _{SR}	Coil is not carrying any current: pulse inhibit is active	
X11/34	+ coil of safety relay K _{SR}	Coil is carrying current: pulse inhibit is inactive (operation)	
X5/28	Controller inhibit (DCTRL-CINH) 2nd disconnecting path	LOW: Controller inhibited HIGH: Controller enabled	LOW: 0 ... +3 V HIGH: +12 ... +30 V Input current at +24 V: 8 mA Reading and processing the input signals - 1/ms (mean value)

11.4 Functional test

11.4.1 Important notes



Danger!

Unexpected start-up of the machine possible

The "Safe torque off" safety function provides protection against an unexpected start-up of the drive and therefore is an important item within the safety concept for a machine. It has to be ensured that this function works correctly.

Possible consequences:

- ▶ Death, severe injury, or damage to material assets, when the safety function fails.

Protective measures:

After the installation and at regular intervals, the operator has to check the function of the "Safe torque off" circuit.

- ▶ When doing this, check both disconnecting paths separately with regard to their disconnection capability.
- ▶ The functional test can be carried out manually or automatically via the PLC.
- ▶ Basically the inspection interval depends on the application and the corresponding risk analysis, as well as on the system as a whole. It should not exceed 1 year.
- ▶ If the functional test shows impermissible states,
 - the drive or the machine has to be shut down immediately.
 - commissioning is not permitted until the safety function operates correctly.

11.4.2 Manual safety function check

For the functional test, check both disconnecting paths **separately**.

1. disconnecting path: Pulse inhibit via safety relay K_{SR}

How to proceed during the test:

1. Alternately apply LOW and HIGH level to input X11/34 and check the states given in the table below.

	Specification	Correct status
Individual test	Input relay activation (X11/34)	Output feedback (X11/K31)
Pulse inhibit	LOW	HIGH
Pulse enable	HIGH	LOW

The individual tests are passed if the correct states given in the table result.

2. disconnecting path: Controller inhibit

Requirement for the test:

- ▶ "Quickstop" (QSP) function deactivated
- ▶ "Automatic DC injection brake" deactivated (C0019 = 0)
- ▶ Pulses enabled by the safety relay K_{SR} (X11/34 = HIGH)

How to proceed during the test:

1. Set controller inhibit (X5/28 = LOW).
2. Define a setpoint $n_{\text{set}} > 0$.
3. Check that the motor is not rotating.

The individual test is passed if the motor does not rotate.

Functional test not passed

If an individual test results in an impermissible status, the functional test is not passed.

- ▶ The drive or machine has to be shut down immediately.
- ▶ Commissioning is not permitted until the safety function operates correctly.

11.4.3 Monitoring the safety function with a PLC

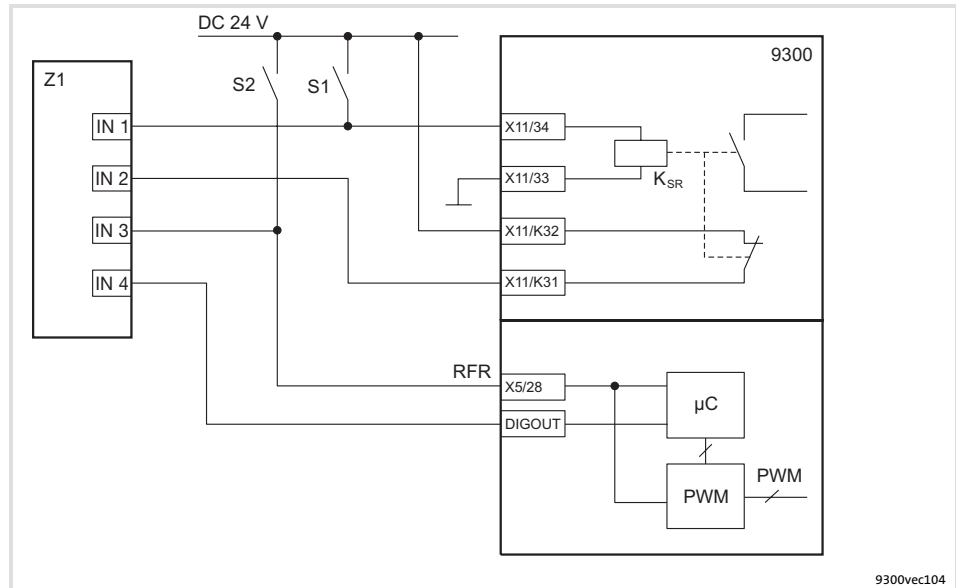


Fig. 11.4-1 Circuit diagram for monitoring the safety function with a PLC

S1, S2	Separate disconnection options of the two disconnecting paths
K _{SR}	Safety relay
X11/34	Safety relay control
X11/33	Safety relay control (GND)
X11/K32	Forcibly guided feedback contact (24 V)
X11/K31	Forcibly guided feedback contact
DIGOUT	Digital output for evaluating the motor current
X5/28	Controller inhibit
Z1	Programmable logic controller (PLC)
IN 1 - 4	Digital inputs

Requirements

The following conditions must be met:

- The PLC must be programmed such that the complete system is set to a safe state immediately when the function check leads to an impermissible state.
- The parameter setting of a digital output must be such that you can conclude to the output current I_{motor} of the drive (see parameterisation example).

Example: Parameterising a digital output

In the following we will show you a possibility of parameterising a digital output, so that a conclusion with regard to the motor current is provided.

Sequence	Parameter	Note
1.	Configure function block CMP3 (comparator)	
	Connect CMP3-IN1 to MCTRL-IACT	C0693/1 = 5004
	Connect CMP3-IN2 to FCODE-472/1	C0693/2 = 19521
	Configure the function IN1 < IN2	C0690 = 3
2.	Configure output signal of CMP3	C0117/4 = 10660
	Connect DIGOUT4 to CMP3-OUT	
3.	Enter function block CMP3 in the processing table	
	Select a free space in the processing table In the Lenze setting, for instance space 2 of the processing table is free	C0465/2 = 10660
4.	Set the current threshold	C0472/1 = 2.00
	Set the current threshold for $I_{rated\ FI}$ to 2 %	$I_{Motor} = 0 \rightarrow DIGOUT4 = HIGH$ $I_{Motor} \neq 0 \rightarrow DIGOUT4 = LOW$

Functional test within the inspection interval

For the functional test, check both disconnecting paths **separately**.

1. disconnecting path: Pulse inhibit via safety relay K_{SR}

The individual tests are passed if the correct states given in the table result.

Individual test	Specification	Correct status
	Input relay activation (X11/34)	Output feedback (X11/K31)
Pulse inhibit	LOW	HIGH
Pulse enable	HIGH	LOW

2. disconnecting path: Controller inhibit

Requirement for the test:

- ▶ "Quickstop" (QSP) function deactivated
- ▶ "Automatic DC injection brake" deactivated (C0019 = 0)
- ▶ Pulses enabled by the safety relay K_{SR} (X11/34 = HIGH)

The individual tests are passed if the correct states given in the table result.

Individual test	Specification		Correct status
	X5/28	Setpoint	Output DIGOUT
Controller inhibit	LOW	n _{set} > 0	HIGH
Controller enable	HIGH		LOW

Functional test not passed

If an individual test results in an impermissible status, the functional test is not passed.

- ▶ The drive or machine has to be shut down immediately.
- ▶ Commissioning is not permitted until the safety function operates correctly.

12 Accessories (overview)

Contents

12.1	General accessories	12.1-1
12.2	Type-specific accessories	12.2-1
12.2.1	Operation with rated power	12.2-1
12.2.2	Operation with increased rated power	12.2-3

12.1 General accessories

Accessories	Designation	Order number
Communication modules	LECOM-LI (optical fibre)	EMF2102IBCV003
	LECOM-B (RS485)	EMF2102IBCV002
	LECOM-A/B (RS232/485)	EMF2102IBCV001
	LON	EMF2141IB
	INTERBUS	EMF2113IB
	INTERBUS-Loop	EMF2112IB
	PROFIBUS-DP	EMF2133IB
	DeviceNet/CANopen	EMF2175IB
	Operating module keypad XT	EMZ9371BC
	Diagnosis terminal (keypad XT in handheld design, IP20) ¹⁾	E82ZBBXC
Other	Connecting cable	2.5 m E82ZWL025 5 m E82ZWL050 10 m E82ZWL100
	Parameterisation/operating software »Global Drive Control« (GDC)	ESP-GDC2
	PC system bus adapter (Voltage supply via DIN connection)	EMF2173IB
	PC system bus adapter (Voltage supply via PS2 connection)	EMF2173IB-V002
	PC system bus adapter (Voltage supply via PS2 connection, electrical isolation)	EMF2173IB-V003
	PC system bus adapter USB	EMF2177IB
	CAN repeater	EMF2176IB
	PC system cable RS232	5 m EWL0020 10 m EWL0021
	Optical fibre adapter (standard output power)	EMF2125IB
	Optical fibre adapter (increased output power)	EMF2126IB
	Power supply unit for optical fibre adapter	EJ0013
	Optical fibre, single-core, black PE sheath (basic protection), sold by the meter	EWZ0007
	Optical fibre, single-core, red PUR sheath (reinforced protection), sold by the meter	EWZ0006
	Setpoint potentiometer	ERPD0010k0001W
	Rotary knob for setpoint potentiometer	ERZ0001
	Scale for setpoint potentiometer	ERZ0002
	Digital display	EPD203
	Encoder cable	2.5 m EWLE002GX-T 5.0 m EWLE005GX-T 10.0 m EWLE010GX-T 15.0 m EWLE015GX-T 20.0 m EWLE020GX-T 25.0 m EWLE025GX-T 30.0 m EWLE030GX-T 35.0 m EWLE035GX-T 40.0 m EWLE040GX-T 45.0 m EWLE045GX-T 50.0 m EWLE050GX-T

Accessories	Designation	Order number
	Connecting cable for digital frequency coupling 2.5 m	EWLD002GGBS93

¹⁾ Additional connecting cable required

**Tip!**

Information and auxiliary devices related to the Lenze products can be found in the download area at

<http://www.Lenze.com>

12.2 Type-specific accessories

12.2.1 Operation with rated power

9300 vector	EVF9321	EVF9322	EVF9323
Accessories	Order No.		
Mains choke	EZN3A2400H002	EZN3A1500H003	EZN3A0900H004
Mains filter			
Category C2 EN 61800-3	EZN3A2400H002	EZN3A1500H003	EZN3A0900H004
Category C1 EN 61800-3	EZN3B2400H002	EZN3B1500H003	EZN3B0900H004
Motor filter	ELM3-030H004	ELM3-030H004	ELM3-030H004
Sinusoidal filter	EZS3-002A001	EZS3-002A001	EZS3-004A001
Brake chopper	EMB9352-E	EMB9352-E	EMB9352-E
Brake resistor	ERBM470R050W	ERBM470R100W	ERBM370R150W
Shield connection			
Steuerleitung	EZZ0015	EZZ0015	EZZ0015
Motor cable	EZZ0016	EZZ0016	EZZ0016
Mounting set for push-through technique	EJ0036	EJ0036	EJ0037

9300 vector	EVF9324	EVF9325	EVF9326
Accessories	Order No.		
Mains choke	EZN3A0500H007	EZN3A0300H013	ELN3-0150H024-001
Mains filter			
Category C2 EN 61800-3	EZN3A0500H007	EZN3A0300H013	EZN3A0150H024
Category C1 EN 61800-3	EZN3B0500H007	EZN3B0300H013	EZN3B0150H024
Motor filter	ELM3-014H010	ELM3-007H025	ELM3-007H025
Sinusoidal filter	EZS3-007A002	EZS3-013A001	EZS3-024A001
Brake chopper	EMB9352-E	EMB9352-E	EMB9352-E
Brake resistor	ERBD180R300W	ERBD100R600W	ERBD047R01K2
Shield connection			
Control cable	EZZ0015	EZZ0015	EZZ0015
Motor cable	EZZ0016	EZZ0016	EZZ0016
Mounting set for push-through technique	EJ0037	EJ0038	EJ0038

12 Accessories (overview)

12.2 Type-specific accessories

12.2.1 Operation with rated power

9300 vector	EVF9327	EVF9328	EVF9329
Accessories	Order No.		
Mains choke	ELN3-0075H045	ELN3-0055H055	—
Mains filter			
Category C2 EN 61800-3	EZN3A0080H042 E82ZN22334B230	EZN3A0055H060 E82ZN30334B230	EZN3B0055H060N003
Category C1 EN 61800-3	EZN3B0080H042 E82ZN22334B230	EZN3B0055H060 E82ZN30334B230	EZN3B0055H060N003
Motor filter	ELM3-004H055	ELM3-004H055	—
Brake chopper	EMB9352-E	EMB9352-E	EMB9352-E
Brake resistor	ERBD033R02K0	ERBD022R03K0	ERBD018R03K0
Shield connection			
Control cable	EZZ0015	EZZ0015	EZZ0015
Motor cable	EZZ0017	EZZ0017	EZZ0017
Mounting set for push-through technique	EJ0011	EJ0011	EJ0011

9300 vector	EVF9330	EVF9331	EVF9332	EVF9333
Accessories	Order No.			
Mains choke	ELN3-0027H105-001	ELN3-0027H105-001	ELN3-0017H170	ELN3-0014H200
Mains filter				
Category C2 EN 61800-3	EZN3A0030H110 E82ZN55334B230	EZN3A0030H110 EZN3A0030H110N001 ³⁾	EZN3A0017H200 E82ZN90334B230	EZN3A0015H230 EZN3A0017H200
Category C1 EN 61800-3	E82ZN55334B230 EZN3B0030H110N001 ³⁾	EZN3B0030H110	EZN3B0017H200 E82ZN90334B230	EZN3B0015H230 EZN3B0017H200
Brake chopper	2 × EMB9352-E	2 × EMB9352-E	3 × EMB9352-E	3 × EMB9352-E
Brake resistor	2 × ERBD022R03K0	2 × ERBD018R03K0	3 × ERBD022R03K0	3 × ERBD018R03K0
Shield connection control cable	EZZ0015	EZZ0015	EZZ0015	EZZ0015
Mounting set for push-through technique	EJ0010	EJ0010	EJ0009	EJ0009

³⁾ For controllers with thermal separation

12.2.2 Operation with increased rated power

9300 vector	EVF9321	EVF9322	EVF9323	EVF9324
Accessories	Order No.			
Mains choke	EZN3A2400H002	EZN3A1500H003	EZN3A0750H005	EZN3A0400H009
Mains filter				
Category C2 EN 61800-3	EZN3A2400H002	EZN3A1500H003	EZN3A0750H005	EZN3A0400H009
Category C1 EN 61800-3	EZN3B2400H002	EZN3B1500H003	EZN3B0750H005	EZN3B0400H009
Motorfilter	ELM3-030H004	ELM3-030H004	ELM3-014H010	ELM3-007H025
Sinusfilter	EZS3-002A001	EZS3-004A001	EZS3-006A001	EZS3-009A002
Brake chopper	EMB9352-E	EMB9352-E	EMB9352-E	EMB9352-E
Brake resistor	ERBM470R050W	ERBM470R100W	ERBM370R150W	ERBD180R300W
Shield connection				
Control cable	EZZ0015	EZZ0015	EZZ0015	EZZ0015
Motor cable	EZZ0016	EZZ0016	EZZ0016	EZZ0016
Mounting set for push-through technique	EJ0036	EJ0036	EJ0037	EJ0037

9300 vector	EVF9325	EVF9327	EVF9328	EVF9329
Accessories	Order No.			
Mains choke	EZN3A0300H013	ELN3-0075H045	ELN3-0055H055	—
Mains filter				
Category C2 EN 61800-3	EZN3A0300H013	EZN3A0080H042 E82ZN22334B230	EZN3A0060H054 E82ZN30334B230	EZN3B0055H060N003
Category C1 EN 61800-3	EZN3B0250H015	EZN3B0080H042 E82ZN22334B230	EZN3B0055H060 E82ZN30334B230	EZN3B0055H060N003
Motorfilter	ELM3-007H025	ELM3-004H055	—	—
Sinusfilter	EZS3-017A001	—	—	—
Brake chopper	EMB9352-E	EMB9352-E	EMB9352-E	EMB9352-E
Brake resistor	ERBD100R600W	ERBD033R02K0	ERBD022R03K0	ERBD018R03K0
Shield connection				
Control cable	EZZ0015	EZZ0015	EZZ0015	EZZ0015
Motor cable	EZZ0016	EZZ0017	EZZ0017	EZZ0017
Mounting set for push-through technique	EJ0038	EJ0011	EJ0011	EJ0011

12 Accessories (overview)

12.2 Type-specific accessories

12.2.2 Operation with increased rated power

9300 vector	EVF9330	EVF9331	EVF9332	EVF9333
Accessories	Order No.			
Mains choke	ELN3-0027H105	ELN3-0027H105-001	ELN3-0017H170	ELN3-0014H200
Mains filter				
Category C2 EN 61800-3	EZN3A0030H110 E82ZN55334B230	EZN3A0030H110 EZN3A0030H110N001 ³⁾	EZN3A0017H200 E82ZN90334B230	EZN3A0015H230 EZN3A0017H200
Category C1 EN 61800-3	E82ZN55334B230 EZN3B0030H110 EZN3B0030H110N001 ³⁾	EZN3B0030H110	EZN3B0017H200 E82ZN90334B230	EZN3B0015H230 EZN3B0017H200
Brake chopper	2 × EMB9352-E	2 × EMB9352-E	3 × EMB9352-E	3 × EMB9352-E
Brake resistor	2 × ERBD022R03K0	2 × ERBD018R03K0	3 × ERBD022R03K0	3 × ERBD018R03K0
Shield connection control cable	EZZ0015	EZZ0015	EZZ0015	EZZ0015
Mounting set for push-through technique	EJ0010	EJ0010	EJ0009	EJ0009

³⁾ For controllers with thermal separation

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13.1 Glossary

13.1.1 Terminology and abbreviations used



Cross-reference to a chapter with the corresponding page number

AC

AC current or AC voltage

AIF

Automation interface

AIF interface, interface for communication modules

CE

Communauté Européenne

Controller

Any frequency inverter, servo inverter, or DC speed controller

Cxxxx/y

Subcode y of code Cxxxx
(e. g. C0404/2 = subcode 2 of code C0404)

DC

DC current or DC voltage

DIN

Deutsches Institut für Normung (German Institute for Standardization)

Drive

Lenze controller in combination with a geared motor, a three-phase AC motor, and other Lenze drive components

EMC

Electromagnetic compatibility

EN

European standard

f_r [Hz]

Rated motor frequency

I_a [A]

Current output current

IEC

International Electrotechnical Commission

I_{mains} [A]

Mains current

I_{max} [A]

Maximum output current

IP

International Protection Code

IPC

Industrial PC

I_{PE} [mA]

Discharge current

I_r [A]

Rated output current

L [mH]

Inductance

M_r [Nm]

Rated motor torque

NEMA

National Electrical Manufacturers Association

P_{DC} [kW]

Power that can be additionally taken from the DC bus if a power-adapted motor is used for operation

PLC

Programmable control system

P_{loss} [W]

Power loss of inverter

P_r [kW]	Rated motor power
R [Ω]	Resistance
S_N [kVA]	Controller output power
U_{DC} [V]	DC supply voltage
UL	Underwriters Laboratories
U_M [V]	Output voltage
U_{mains} [V]	Mains voltage
VDE	Verband deutscher Elektrotechniker (Association of German Electrical Engineers)
Xk/y	Terminal y on terminal strip Xk (e. g. X5/28 = terminal 28 on terminal strip X5)

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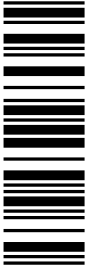


Service@Lenze.de

EDSVF9333V ■ 13347725 ■ EN ■ 6.2-04/2012 ■ TD23

10 9 8 7 6 5 4 3 2 1

EDSVF9383V
13405788



System Manual

9300 vector 110 ... 400 kW



EVF9335 ... EVF9338, EVF9381 ... EVF9383

Frequency inverter

Lenze

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1

Preface

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1.1 How to use this System Manual

1.1.1 Information provided by the System Manual

Target group This System Manual is intended for all persons who design, install, commission, and adjust the 9300 vector frequency inverter.

Together with the System Manual (extension), document number EDSV9383V-EXT and the catalog it forms the basis for project planning for the manufacturer of plants and machinery.

Contents The System Manual is the basis for the description of the 9300 vector frequency inverter. Together with the System Manual (extension), document number EDSVF9383V-EXT, a complete System Manual is available:

- The features and functions are described in detail.
- Examples describe how to set the parameters for typical applications.
- In case of doubt, the Operating Instructions enclosed with the 9300 vector frequency inverter always apply.

Contents of the System Manual	Contents of the System Manual (extension)
1 Preface	1 Preface
2 Safety	–
3 Technical data	–
4 Installing the basic device	–
5 Wiring the basic device	–
6 Commissioning	–
7 Parameter setting	–
8 Configuration	2 Configuration
8.1 Description of the function blocks	2.1 Configuration with Global Drive Control
Diameter calculator (DCALC)	
Digital frequency input (DFIN)	
Digital frequency output (DFOUT)	2.2 Basic configurations
Digital frequency ramp function generator (DFRFG)	2.3 How to use function blocks
Digital frequency processing (DFSET)	2.4 Function blocks (description of the other function blocks)
Internal motor control with V/f characteristic control (MCTRL1)	
Internal motor control with vector control (MCTRL2)	2.5 Monitoring
8.2 Code table	
8.3 Selection lists	
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10 DC-bus operation	–
11 Safety engineering	–
12 Braking operation	–
–	3 Application examples
–	4 Signal flow diagrams
13 Accessories	–
14 Appendix	5 Appendix

1 Preface and general information

1.1 How to use this System Manual

1.1.2 Document history

How to find information

Use the System Manual as the basis. It contains references to the corresponding chapters in the System Manual Supplement:

- Each chapter is a complete unit and comprehensively informs about a subject.
- The Table of Contents and Index help you to find all information about a certain topic.
- Descriptions and data of other Lenze products (Drive PLC, Lenze geared motors, Lenze motors, ...) can be found in the corresponding catalogs, Operating Instructions and manuals. The required documentation can be ordered at your Lenze sales partner or downloaded as PDF file from the Internet.



Tip!

Information and auxiliary devices related to the Lenze products can be found in the download area at

<http://www.Lenze.com>

1.1.2 Document history

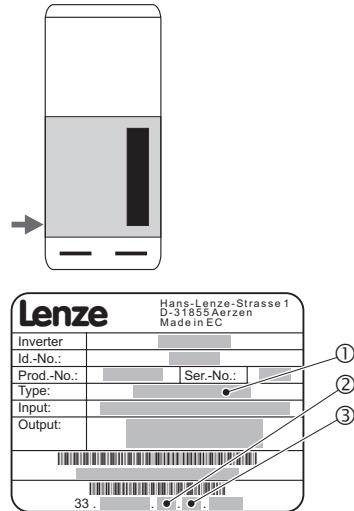
What is new / what has changed?

Material number	Version			Description
13405788	7.1	04/2012	TD23	Error corrections.
13260707	5.0	08/2008	TD23	Revision for software version 8.0 and error corrections.
13154762	3.0	09/2006	TD23	Complete revision for software version 7.0. The System Manual also comprises the System Manual (extension), document no. EDSVF9383V-EXT.
00476715	1.0	10/2003	TD23	Documentation for hardware version 1.x and software version 6.x.

1.1.3 Products to which the System Manual applies

This documentation applies to 9300 frequency inverters as of version:

		①				②		③		Nameplate	
		EVF	93xx	—	E	V	Vxxx	1x	8x		
Controller type											
EVF	Frequency inverter										
Type no. / power											
	400 V	500 V									
9335	110 kW	132 kW									
9336	132 kW	160 kW									
9337	162 kW	200 kW									
9338	200 kW	250 kW									
Design											
E	Built-in unit										
Version											
V	Vector-controlled frequency inverter										
Variant											
		Integrated RFI filter A									
		Integrated brake transistor									
—	400 V	—	—								
V030	400 V	•	—								
V060	400 V	—	•								
V110	400 V	•	•								
V210	400 V / 500 V	—	—								
V240	400 V / 500 V	•	—								
V270	400 V / 500 V	—	•								
V300	400 V / 500 V	•	•								
Hardware version											
Software version											



1 Preface and general information

1.1 How to use this System Manual

1.1.3 Products to which the System Manual applies

		①				②		③		Nameplate	
		EVF	93xx	—	E	V	Vxxx	1x	8x		
Product series											
EVF	Frequency inverter										
	EVM: Master of EVF										
	EVL: Slave of EVF										
Type no. / power											
	400 V	500 V									
9381	250 kW	315 kW									
9382	315 kW	400 kW									
9383	400 kW	500 kW									
Type											
E	Built-in unit										
Design											
V	Vector-controlled frequency inverter										
X:	Slave										
Variant											
		Integrated RFI filter		Integrated brake transistor							
		A									
—	400 V	—	—								
V030	400 V	•	—								
V060	400 V	—	•								
V110	400 V	•	•								
V210	400 V / 500 V	—	—								
V240	400 V / 500 V	•	—								
V270	400 V / 500 V	—	•								
V300	400 V / 500 V	•	•								
Hardware version											
Software version											
—	Slave (no software version)										

EVM...

B

A

EVL...

B

Lenze

Hans-Lenze-Strasse 1
D-31855 Aerzen
Made in EC

Inverter

Type:

Input:

Output:

EVF

Master

EVM

Slave

EVL

①

②

③

Lenze

Hans-Lenze-Strasse 1
D-31855 Aerzen
Made in EC

Id.-No.:

Prod.-No.:

Type:

Input:

Output:

Ser.-No.:

33.

①

②

③

1.2 Legal regulations

Labelling	Lenze controllers are unambiguously designated by the contents of the nameplate.
Manufacturer	Lenze Automation GmbH, Hans-Lenze-Str. 1, D-31855 Aerzen, Germany
CE conformity	Conforms to the EC Low-Voltage Directive
Application as directed	9300 vector frequency inverter and accessories ▶ must only be operated under the conditions prescribed in this System Manual. ▶ are components – for open and closed loop control of variable speed drives with asynchronous standard motor or asynchronous servo motors – for installation in a machine – for assembly with other components to form a machine. ▶ comply with the requirements of the Low-Voltage Directive. ▶ are not machines for the purpose of the Machinery Directive. ▶ are not to be used as domestic appliances, but only for industrial purposes. Drives with 9300 vector frequency inverters ▶ comply with the EMC Directive if they are installed according to the guidelines of CE-typical drive systems. ▶ can be used – for operation on public and non-public mains – for operation in industrial premises and residential areas. ▶ The user is responsible for the compliance of his application with the EC directives. Any other use shall be deemed as inappropriate!

Liability

The information, data, and notes in this System Manual met the state of the art at the time of printing. Claims on modifications referring to controllers and components which have already been supplied cannot be derived from the information, illustrations, and descriptions.

The specifications, processes, and circuitry described in this System Manual are for guidance only and must be adapted to your own specific application. Lenze does not take responsibility for the suitability of the process and circuit proposals.

The specifications in this System Manual describe the product features without guaranteeing them.

Lenze does not accept any liability for damage and operating interference caused by:

- ▶ Disregarding the System Manual
- ▶ Unauthorised modifications to the controller
- ▶ Operating errors
- ▶ Improper working on and with the controller

Warranty

See terms of sales and delivery of the Lenze Automation GmbH.

Warranty claims must be made to Lenze immediately after detecting the deficiency or fault.

The warranty is void in all cases where liability claims cannot be made.

1.3 Conventions used

This documentation uses the following conventions to distinguish between different types of information:

Type of information	Identification	Examples/notes
Spelling of numbers		
Decimal separator	language-dependent	In each case, the signs typical for the target language are used as decimal separators. For example: 1234.56 or 1234,56
Warnings		
UL warnings		Are only given in English.
UR warnings		
Text		
Program name	» «	PC software For example: »Engineer«, »Global Drive Control« (GDC)
Icons		
Page reference		Reference to another page with additional information For instance:  16 = see page 16

1.4 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:

**Danger!**

(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
Danger!	Danger of personal injury through dangerous electrical voltage. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
Danger!	Danger of personal injury through a general source of danger. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
Stop!	Danger of property damage. Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
Note!	Important note to ensure troublefree operation
Tip!	Useful tip for simple handling
	Reference to another documentation

Special safety instructions and application notes for UL and UR

Pictograph and signal word	Meaning
Warnings!	Safety or application note for the operation of a UL-approved device in UL-approved systems. Possibly the drive system is not operated in compliance with UL if the corresponding measures are not taken.
Warnings!	Safety or application note for the operation of a UR-approved device in UL-approved systems. Possibly the drive system is not operated in compliance with UL if the corresponding measures are not taken.

2

Safety instructions

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2.1 General safety information

Scope

The following general safety instructions apply to all Lenze drive and automation components.

The product-specific safety and application notes given in this documentation must be observed!

Note for UL-approved systems: UL warnings are notes which only apply to UL systems. The documentation contains specific notes with regard to UL.

For your own safety



Danger!

Disregarding the following basic safety measures may lead to severe personal injury and damage to material assets!

- ▶ Lenze drive and automation components ...
 - ... must only be used for the intended purpose.
 - ... must never be operated if damaged.
 - ... must never be subjected to technical modifications.
 - ... must never be operated unless completely assembled.
 - ... must never be operated without the covers/guards.
 - ... can - depending on their degree of protection - have live, movable or rotating parts during or after operation. Surfaces can be hot.
- ▶ All specifications of the corresponding enclosed documentation must be observed.

This is vital for a safe and trouble-free operation and for achieving the specified product features.

The procedural notes and circuit details provided in this document are proposals which the user must check for suitability for his application. The manufacturer does not accept any liability for the suitability of the specified procedures and circuit proposals.
- ▶ Only qualified skilled personnel are permitted to work with or on Lenze drive and automation components.

According to IEC 60364 or CENELEC HD 384, these are persons ...

 - ... who are familiar with the installation, assembly, commissioning and operation of the product,
 - ... possess the appropriate qualifications for their work,
 - ... and are acquainted with and can apply all the accident prevent regulations, directives and laws applicable at the place of use.
- ▶ Transport and storage in a dry, low-vibration environment without aggressive atmosphere; preferably in the packaging provided by the manufacturer.
 - Protect against dust and shocks.
 - Comply with climatic conditions according to the technical data.

Transport, storage

Mechanical installation

- ▶ Install the product according to the regulations of the corresponding documentation. In particular observe the section "Operating conditions" in the chapter "Technical data".
- ▶ Provide for a careful handling and avoid mechanical overload. During handling neither bend components, nor change the insulation distances.
- ▶ The product contains electrostatic sensitive devices which can easily be damaged by short circuit or static discharge (ESD). Thus, electronic components and contacts must not be touched unless ESD measures are taken beforehand.

Electrical installation

- ▶ Carry out the electrical installation according to the relevant regulations (e. g. cable cross-sections, fusing, connection to the PE conductor). Additional notes are included in the documentation.
- ▶ When working on live products, observe the applicable national regulations for the prevention of accidents (e.g. BGV 3).
- ▶ The documentation contains information about EMC-compliant installation (shielding, earthing, arrangement of filters and laying cables). The system or machine manufacturer is responsible for compliance with the limit values required by EMC legislation.
Warning: The controllers are products which can be used in category C2 drive systems as per EN 61800-3. These products may cause radio interference in residential areas. If this happens, the operator may need to take appropriate action.
- ▶ For compliance with the limit values for radio interference emission at the site of installation, the components - if specified in the technical data - have to be mounted in housings (e. g. control cabinets). The housings have to enable an EMC-compliant installation. In particular observe that for example control cabinet doors preferably have a circumferential metallic connection to the housing. Reduce openings or cutouts through the housing to a minimum.
- ▶ Only plug in or remove pluggable terminals in the deenergised state!

Commissioning

- ▶ If required, you have to equip the system with additional monitoring and protective devices in accordance with the respective valid safety regulations (e. g. law on technical equipment, regulations for the prevention of accidents).
- ▶ Before commissioning remove transport locking devices and keep them for later transports.

Operation

- ▶ Keep all protective covers and doors closed during operation.

Safety functions

- ▶ Without a higher-level safety system, the described product must neither be used for the protection of machines nor persons.
- ▶ Certain controller versions support safety functions (e.g. "Safe torque off", formerly "Safe standstill").
The notes on the safety functions provided in the documentation of the versions must be observed.

Maintenance and servicing

- ▶ The components are maintenance-free if the required operating conditions are observed.
- ▶ If the cooling air is polluted, the cooling surfaces may be contaminated or the air vents may be blocked. Under these operating conditions, the cooling surfaces and air vents must be cleaned at regular intervals. Never use sharp objects for this purpose!
- ▶ Only replace defective fuses in the deenergised state to the type specified.
- ▶ After the system has been disconnected from the supply voltage, live components and power connections must not be touched immediately because capacitors may be charged. Please observe the corresponding notes on the device.

Disposal

- ▶ Recycle metals and plastic materials. Ensure professional disposal of assembled PCBs.

2.2 Thermal motor monitoring

2.2.1 Description



Note!

From software version 8.1 onwards, the 9300 vector controllers are provided with an I²t function for sensorless thermal monitoring of the connected motor.

- ▶ I²t monitoring is based on a mathematical model which calculates a thermal motor utilisation from the detected motor currents.
- ▶ The calculated motor utilisation is saved when the mains is switched off.
- ▶ Nevertheless, I²t monitoring does **not** provide full motor protection because other influences on the motor utilisation such as changes in the cooling conditions (e.g. cooling air flow interrupted or too warm) cannot be detected.

The I² × t-load of the motor is constantly calculated by the drive controller and displayed in C0066.

The I² × t-monitoring is designed in a way, that a motor with a thermal motor time factor of 5 min, a motor current of 1.5 × I_r and a trigger threshold of 100 % releases the monitoring after 179 s.

You can set different reactions with two adjustable trigger thresholds.

- ▶ Adjustable reaction OC8 (TRIP, Warning, Off).
 - The reaction is set in C0606.
 - The trigger threshold is set in C0127.
 - The reaction OC8 can be used for example for an advance warning.
- ▶ Fixed reaction OC6-TRIP.
 - The trigger threshold is set in C0120.

Response of the I ² × t-monitoring	Condition
The I ² × t-monitoring is deactivated. C0066 = 0 % and MCTRL-LOAD-I2XT = 0,00 % is set.	Set the controller inhibit at C0120 = 0 % and C0127 = 0 %.
The I ² × t-monitoring is stopped. The actual value in C0066 and at the MCTRL-LOAD-I2XT output is held.	Allow controller release at C0120 = 0 % and C0127 = 0 %.
The I ² × t-monitoring is deactivated. The motor load is displayed in C0066.	Set C0606 = 3 (Off) and C0127 > 0 %.



Note!

An OC6 or OC8 error message can only be reset if the I² × t-monitoring has fallen below the set trigger threshold by 5 %.

2.2.2 Parameter setting

Parameter setting			
Code	Meaning	Value range	Lenze setting
C0066	Display of the I ² t utilisation of the motor	0 ... 250 %	-
C0120	Threshold: Triggering of an "OC6" error	0 ... 120 %	0 %
C0127	Threshold: Triggering of an "OC8" error	0 ... 120 %	0 %
C0128	Thermal time constant of the motor	0.1 ... 50.0 min	5.0 min
C0606	Response to "OC8" error	Trip, warning, off	Warning

Calculating the release time

$$t = - (C0128) \cdot \ln \left[1 - \frac{y + 1}{\left(\frac{I_M}{I_r} \right)^2 \cdot 100} \right]$$

I_M Actual motor current
 I_r Rated motor current
 y C0120 or C0127

- The thermal capacity of the motor is expressed by the thermal motor time factor (C0128). Please see the rated data of the motor for the value or ask the manufacturer of the motor.

Reading the release time off the diagram

Diagram for the determination of the release times of a motor with a thermal motor time factor of 5 min:

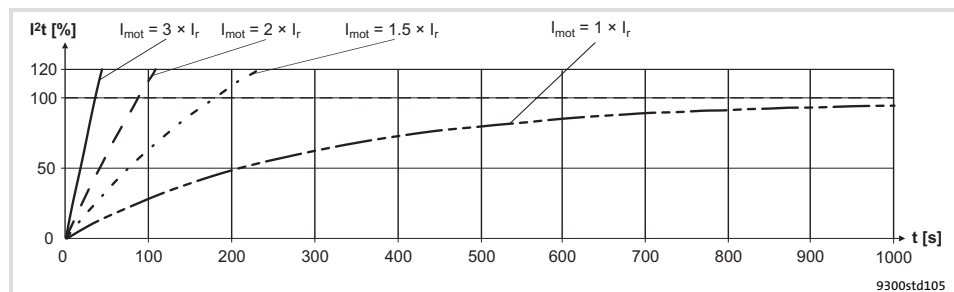


Fig. 2.2-1 I² × t-monitoring: Release times for different motor currents and trigger thresholds

I_{mot}	Motor current
I_r	Rated motor current
I^2t	I^2t load
T	Time

2.3 Residual hazards

Protection of persons

- ▶ According to their enclosure, Lenze controllers (frequency inverters, servo inverters, DC speed controllers) and their components can carry a voltage, or parts of the controllers can move or rotate during operation. Surfaces can be hot.
 - If the required cover is removed, the controllers are used inappropriately or installed or operated incorrectly, severe damage to persons or material assets can occur.
 - For more detailed information please see the documentation.
- ▶ There is a high amount of energy within the controller. Therefore always wear personal protective equipment (body protection, headgear, eye protection, ear protection, hand guard) when working on the controller when it is live.
- ▶ Before working on the controller, check if no voltage is applied to the power terminals.
 - the power terminals U, V, W, +U_G, -U_G, BR1, BR2 and 101 ... 104 still carry dangerous voltage for at least 5 minutes after power-off.
 - the power terminals L1, L2, L3, U, V, W, +U_G, -U_G, BR1, BR2 and 101 ... 104 carry dangerous voltage when the motor is stopped.
- ▶ Before power-off during DC-bus operation, all controllers must be inhibited and disconnected from the mains.
- ▶ The discharge current to PE potential is > 3.5 mA. In accordance with EN 61800-5-1
 - a fixed installation is required.
 - the design of the PE conductor has to be double or, in the case of a single design, must have a cable cross-section of at least 10 mm².
- ▶ The controller can only be safely disconnected from the mains via a contactor on the input side.
- ▶ During parameter set transfer the control terminals of the controller can have undefined states.
 - Therefore the connectors X5 and X6 must be disconnected from the controller before the transfer takes place. This ensures that the controller is inhibited and all control terminals have the defined state "LOW".

Device protection

- ▶ Frequent mains switching (e.g. inching mode via mains contactor) can overload and destroy the input current limitation of the controller.
 - Thus, at least five minutes have to pass between two switch-on processes.
 - In case of frequent, safety-related disconnections use the "safe torque off" safety function (STO).

Motor protection

- ▶ For some controller settings, the connected motor may overheat (e.g. when operating the DC injection brake or a self-ventilated motor at low speed for longer periods).
 - Using an overcurrent relay or a temperature monitoring device provides a large degree of protection against overload.
 - We recommend to use PTC thermistors or thermal contacts for motor temperature monitoring. (Lenze three-phase AC motors are equipped with thermal contacts (NC contacts) as standard)
 - PTC thermistors or thermal contacts can be connected to the controller.
- ▶ Drives can attain dangerous overspeeds (e.g. setting of high output frequencies with motors and machines not qualified for this purpose).

3 Technical data

Contents

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3.1 General data and operating conditions

General data

Conformity and approval			
Conformity			
CE	2006/95/EC	Low-Voltage Directive	
Protection of persons and equipment			
Type of protection	EN 60529	IP20	
	NEMA 250	Protection against accidental contact according to type 1	
Earth leakage current	IEC/EN 61800-5-1	> 3.5 mA	Observe regulations and safety instructions!
Insulation of control circuits	IEC/EN 61800-5-1	Safe mains isolation by double (reinforced) insulation for the terminals X1 and X5. Basic insulation (single isolating distance) for the terminals X3, X4, X6, X8, X9, X10 and X11.	
Insulation resistance	EN 61800-5-1	< 2000 m site altitude: Overvoltage category III	
		> 2000 m site altitude: Overvoltage category II	
Protective measures		Against short circuit, earth fault (earth-fault protected during operation, limited earth-fault protection during mains power-up), overvoltage, motor stalling, motor overtemperature (input for PTC or thermal contact)	
EMC			
Noise emission	EN 61800-3	Cable-guided, up to 50 m motor cable length with RFI filter: Category C2.	
		Radiation, with RFI filter and installation in control cabinet: Category C2	
Interference immunity	IEC/EN 61800-3	Category C3	

Operating conditions

Ambient conditions			
Climatic			
Storage	IEC/EN 60721-3-1	1K3 (-20 ... +60 °C)	< 6 months
		1K3 (-25 ... +40 °C)	> 6 months > 2 years: form DC bus capacitors
Transport	IEC/EN 60721-3-2	2K3 (-25 ... +70 °C)	
Operation	IEC/EN 60721-3-3		
EVF9335		3K3 (0 ... +50 °C)	
EVF9336 ...		3K3 (0 ... +50 °C)	
EVF9338		> +40 °C: reduce the rated output current by 2.5 %/°C.	
EVF9381 ...			
EVF9383			
Pollution	EN 61800-5-1	Degree of pollution 2	
Site altitude		< 4000 m amsl > 1000 m amsl: reduce the rated output current by 5 %/ 1000 m.	
Internal fan		975 m³/h volume flow	
Mechanical			
Vibration resistance	EN 61800-5-1		
Electrical			
Mains connection			
Power system			
TT, TN (with earthed neutral)		Operation is permitted without restrictions.	
DC-bus operation		Possible for the variants V210, V240, V270, V300	
Motor connection			
Length of the motor cable		At rated mains voltage and a switching frequency of ≤ 2 kHz without additional output filter. For compliance with EMC regulations, the permissible cable lengths may change.	
shielded		100 m	
unshielded		200 m	
Mounting conditions			
Mounting place		In the control cabinet	
Mounting position		Vertical	
Free spaces		📖 4-1	
Dimensions			
Weights			

3.2 Weights

9300	Without RFI filter A	With integrated RFI filter A
Type	[kg]	[kg]
EVF9335-EV	160	175
EVF9336-EV	160	175
EVF9337-EV	160	175
EVF9338-EV	200	215
EVF9381-EV	320	350
EVF9382-EV	320	350
EVF9383-EV	400	430

3.3 Open and closed loop control

Field	Values	
Control methods	V/f characteristic control (linear, square), vector control	
Switching frequency	1 kHz, 2 kHz or 4 kHz	
Torque behaviour in case of vector control		
Maximum torque	$1.5 \times M_r$ for 60 s if rated motor power = rated 9300 vector power	
Setting range	to 1:10 (1 : 20 with feedback)	in the range of 6 ... 100 % f_r
Speed control without feedback		
Min. mechanical motor frequency	1 % f_r	Torque 0 ... M_N
Setting range	1 : 100	relating to f_r and M_r
Accuracy	± 0.5 % f_N	in the range of 6 ... 100 % f_N
Speed control without feedback		
Min. mechanical motor frequency	0.1 % f_N	Torque 0 ... M_N
Setting range	1 : 1000	relating to f_r and M_r
Accuracy	± 0.1 % of f_r	
Output frequency		
Field	- 300 Hz ... + 300 Hz	
Absolute resolution	0.06 Hz	
Standardised resolution	Parameter data: 0.01 %, Process data: 0.006 % (= 2^{14})	
Digital setpoint selection		
Accuracy	± 0.005 Hz (= ± 100 ppm)	
Analog setpoint selection		
Linearity	± 0.15 %	signal level: 5 V or 10 V
Temperature sensitivity	± 0.1 %	0 ... 50 °C
Offset	± 0.1 %	
Analog inputs/outputs	2 inputs (bipolar) 2 outputs (bipolar)	
Digital inputs/outputs	6 inputs (freely assignable) 1 input for controller inhibit 4 outputs freely assignable 1 incremental encoder input (500 kHz, TTL level); Design: 9-pole Sub-D socket 1 digital frequency input (500 kHz, TTL level or 200 kHz, HTL level); type: 9-pole Sub-D socket; can be alternatively used as incremental encoder input (200 kHz, HTL level) 1 master frequency output (500 kHz, TTL level); Design: 9-pole Sub-D socket	
Cycle times		
Digital inputs	1 ms	
Digital outputs	1 ms	
Analog inputs	1 ms	
Analog outputs	1 ms (smoothing time: $\tau\tau = 2$ ms)	
Operation in generator mode	Integrated brake transistor (optional)	

f_r rated motor frequency
 M_r rated motor torque

3.4 Safety relay K_{SR}

Terminal	Description	Field	Values
X11/K32 X11/K31 X11/33 X11/34	Safety relay K _{SR} 1st disconnecting path	Coil voltage at +20 °C	DC 24 V (20 ... 30 V)
		Coil resistance at +20 °C	823 Ω ±10 %
		Rated coil power	Approx. 700 mW
		Max. switching voltage	AC 250 V, DC 250 V (0.45 A)
		Max. AC switching capacity	1500 VA
		Max. switching current (ohmic load)	AC 6 A (250 V), DC 6 A (50 V)
		Recommended minimum load	> 50 mW
		Max. switching rate	6 switchings per minute
		Mechanical service life	10 ⁷ switching cycles
		Electrical service life	
		at 250 V AC (ohmic load)	10 ⁵ switching cycles at 6 A 10 ⁶ switching cycles at 1 A 10 ⁷ switching cycles at 0.25 A
		at 24 V DC (ohmic load)	6 × 10 ³ switching cycles at 6 A 10 ⁶ switching cycles at 3 A 1.5 × 10 ⁶ switching cycles at 1 A 10 ⁷ switching cycles at 0.1 A

3.5 Rated data (devices in 400V design)

Basis of the data			
		Voltage	Frequency
Supply			
3/PE AC 400 V	[U _N]	340 V - 0 % ... 456 V + 0 %	45 Hz - 0 % ... 65 Hz + 0 %
DC (alternatively)	[U _{DC}]	Not possible	
Output voltage	[U _{OUT}]	3 ~ 0 ... U _N	0 ... 300 Hz

9300	Mains current ¹⁾	Typical motor power ASM (4-pole)		Power loss
Type	I _r [A]	P _N [kW]	P _N [hp]	P _V [kW]
EVF9335-EV EVF9335-EVVxxx ²⁾	200	110	150	2.8
EVF9336-EV EVF9336-EVVxxx ²⁾	238	132	200	3.3
EVF9337-EV EVF9337-EVVxxx ²⁾	285	160	250	4.0
EVF9338-EV EVF9338-EVVxxx ²⁾	356	200	300	5.0
EVF9381-EV EVF9381-EVVxxx ²⁾	475	250	350	6.6
EVF9382-EV EVF9382-EVVxxx ²⁾	570	315	450	8.0
EVF9383-EV EVF9384-EVVxxx ²⁾	713	400	550	10.0

The currents for EVF9381 ... EVF9383 are to be considered as total currents of master and slave

¹⁾ For a controller switching frequency of 2 kHz

²⁾ Device in variant V030, V060 or V110

9300	Output currents					
	Rated current			Maximum current ²⁾		
	1 kHz ¹⁾	2 kHz ¹⁾	4 kHz ¹⁾	1 kHz ¹⁾	2 kHz ¹⁾	4 kHz ¹⁾
Type	I _{N1} [A]	I _{N2} [A]	I _{N4} [A]	I _{M1} [A]	I _{M2} [A]	I _{M4} [A]
EVF9335-EV EVF9335-EVVxxx ³⁾	210	210	210	315	315	315
EVF9336-EV EVF9336-EVVxxx ³⁾	250	250	250	375	375	375
EVF9337-EV EVF9337-EVVxxx ³⁾	300	300	270	450	450	405
EVF9338-EV EVF9338-EVVxxx ³⁾	375	375	330	560	560	495
EVF9381-EV EVF9381-EVVxxx ³⁾	500	500	500	750	750	750
EVF9382-EV EVF9382-EVVxxx ³⁾	600	600	540	900	900	810
EVF9383-EV EVF9384-EVVxxx ³⁾	750	750	660	1125	1125	990

The currents for EVF9381 ... EVF9383 are to be considered as total currents of master and slave

Bold print = Lenze setting

¹⁾ Switching frequency of the inverter

²⁾ The currents apply to a periodic load change with an overcurrent time of 1 minute at a maximum and a base load time of 2 minutes with maximally 75 % I_{Nx}

³⁾ Device in variant V030, V060 or V110

3.6 Rated data (devices for 400/500V mains)



Note!

Types EVF9335 ... EVF9383 for 400 V/500 V mains voltage are suitable for DC supply or DC-bus operation together with controllers of the 9300 series.

3.6.1 Rated data for 400 V mains voltage

Basis of the data			
		Voltage	Frequency
Supply			
3/PE AC 400 V	[U _N]	340 V - 0 % ... 577 V + 0 %	45 Hz - 0 % ... 65 Hz + 0 %
DC 565 V (alternatively)	[U _{DC}]	DC 480 V - 0 % ... 800 V + 0 %	–
Output voltage	[U _{OUT}]	3 ~ 0 ... U _N	0 ... 300 Hz

9300	Mains current ¹⁾	Typical motor power ASM (4-pole)		Power loss
Type	I _r [A]	P _N [kW]	P _N [hp]	P _V [kW]
EVF9335-EVVxxx ²⁾	200	110	150	2.8
EVF9336-EVVxxx ²⁾	238	132	200	3.3
EVF9337-EVVxxx ²⁾	285	160	250	4.0
EVF9338-EVVxxx ²⁾	356	200	300	5.0
EVF9381-EVVxxx ²⁾	475	250	350	6.6
EVF9382-EVVxxx ²⁾	570	315	450	8.0
EVF9384-EVVxxx ²⁾	713	400	550	10.0

The currents for EVF9381 ... EVF9383 are to be considered as total currents of master and slave

¹⁾ For a controller switching frequency of 2 kHz

²⁾ Device in variant V210, V240, V270 or V300

9300	Output currents					
	Rated current			Maximum current ²⁾		
	1 kHz ¹⁾	2 kHz ¹⁾	4 kHz ¹⁾	1 kHz ¹⁾	2 kHz ¹⁾	4 kHz ¹⁾
Type	I _{N1} [A]	I _{N2} [A]	I _{N4} [A]	I _{M1} [A]	I _{M2} [A]	I _{M4} [A]
EVF9335-EVVxxx ³⁾	210	210	210	315	315	315
EVF9336-EVVxxx ³⁾	250	250	250	375	375	375
EVF9337-EVVxxx ³⁾	300	300	270	450	450	405
EVF9338-EVVxxx ³⁾	375	375	330	560	560	495
EVF9381-EVVxxx ³⁾	500	500	500	750	750	750
EVF9382-EVVxxx ³⁾	600	600	540	900	900	810
EVF9384-EVVxxx ³⁾	750	750	660	1125	1125	990

The currents for EVF9381 ... EVF9383 are to be considered as total currents of master and slave

Bold print = Lenze setting

¹⁾ Switching frequency of the inverter

²⁾ The currents apply to a periodic load change with an overcurrent time of 1 minute at a maximum and a base load time of 2 minutes with maximally 75 % I_{Nx}

³⁾ Device in variant V210, V240, V270 or V300

3 Technical data

3.6 Rated data (devices for 400/500V mains)

3.6.2 Rated data for 500 V mains voltage

3.6.2 Rated data for 500 V mains voltage

Basis of the data			
		Voltage	Frequency
Supply			
3/PE AC 500 V	[U _N]	340 V - 0 % ... 577 V + 0 %	45 Hz - 0 % ... 65 Hz + 0 %
DC 705 V (alternatively)	[U _{DC}]	DC 480 V - 0 % ... 800 V + 0 %	—
Output voltage	[U _{OUT}]	3 ~ 0 ... U _N	0 ... 300 Hz

9300	Mains current ¹⁾	Typical motor power ASM (4-pole)		Power loss
Type	I _r [A]	P _N [kW]	P _N [hp]	P _V [kW]
EVF9335-EVVxxx ²⁾	200	132	200	3.0
EVF9336-EVVxxx ²⁾	238	160	250	3.5
EVF9337-EVVxxx ²⁾	285	200	300	4.3
EVF9338-EVVxxx ²⁾	356	250	350	5.3
EVF9381-EVVxxx ²⁾	475	315	450	7.0
EVF9382-EVVxxx ²⁾	570	400	550	8.6
EVF9383-EVVxxx ²⁾	713	500	??? 700 ???	10.6

The currents for EVF9381 ... EVF9383 are to be considered as total currents of master and slave

¹⁾ For a controller switching frequency of 2 kHz

²⁾ Device in variant V210, V240, V270 or V300

9300	Output currents					
	Rated current			Maximum current ²⁾		
	1 kHz ¹⁾	2 kHz ¹⁾	4 kHz ¹⁾	1 kHz ¹⁾	2 kHz ¹⁾	4 kHz ¹⁾
Type	I _{N1} [A]	I _{N2} [A]	I _{N4} [A]	I _{M1} [A]	I _{M2} [A]	I _{M4} [A]
EVF9335-EVVxxx ³⁾	210	210	210	315	315	315
EVF9336-EVVxxx ³⁾	250	250	250	375	375	375
EVF9337-EVVxxx ³⁾	300	300	270	450	450	405
EVF9338-EVVxxx ³⁾	375	375	330	560	560	495
EVF9381-EVVxxx ³⁾	500	500	500	750	750	750
EVF9382-EVVxxx ³⁾	600	600	540	900	900	810
EVF9384-EVVxxx ³⁾	750	750	660	1125	1125	990

The currents for EVF9381 ... EVF9383 are to be considered as total currents of master and slave

Bold print = Lenze setting

¹⁾ Switching frequency of the inverter

²⁾ The currents apply to a periodic load change with an overcurrent time of 1 minute at a maximum and a base load time of 2 minutes with maximally 75 % I_{Nx}

³⁾ Device in variant V210, V240, V270 or V300

4 Installation of the standard device

Contents

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4.2.3	Fasten the mounting rails on the mounting plate	4.2-3
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4.3	Basic devices in the power range 250 ... 400 kW	4.3-1
4.3.1	Dimensions	4.3-1
4.3.2	Drilling the holes into the mounting plate	4.3-2
4.3.3	Fasten the mounting rails on the mounting plate	4.3-3
4.3.4	Fasten controller on mounting plate	4.3-4

4.1 Important notes

Transport

- ▶ Manual lifting is only permitted up to the following weight limitations:
 - max. 30 kg [max. 66 lbs] for men
 - max. 10 kg [max. 22 lbs] for women
 - max. 5 kg [max. 11 lbs] for pregnant womenAbove these limits, use appropriate hoists or conveyors! Weights of the devices: (📖 3.2-1)
- ▶ For transport with hoists, observe the following basic rules:
 - The payload of the hoists and load handling devices at least has to correspond to the weight of the device. Weight of the devices: (📖 3.2-1)
 - Secure the device so that it cannot topple over or fall down.
 - Stay out from suspended loads!
 - Avoid heavy impacts during transport.
- ▶ The devices are equipped with an eye bolt. The load hook can be attached directly to the eye bolt.
- ▶ Alternatively the devices can be transported with lifting straps.
 - Attach the lifting straps so that the device is balanced and cannot slip from the lifting straps.

Mounting

- ▶ Controller must only be used as built-in unit.
- ▶ Possible mounting position: Vertically at the rear panel of the control cabinet.
- ▶ Observe free mounting spaces.
- ▶ Do not exceed the permissible operating and ambient temperatures:
 - Please ensure unimpeded ventilation of cooling air.
 - If the cooling air contains pollutants (dust, lint, grease, aggressive gases), which may impair the function of the controller take measures against it, such as separate air flow, filters, regular cleaning, etc..

4.2 Basic devices in the power range 110 ... 200 kW



Tip!

- Lenze recommends to install an air lock. It serves to dissipate the heated cooling air directly from the control cabinet.
– Order no. E93ZWL
- A drilling jig for marking the bore holes is available as dxf-file on the Internet in the "Download" area under www.Lenze.de.

4.2.1 Dimensions

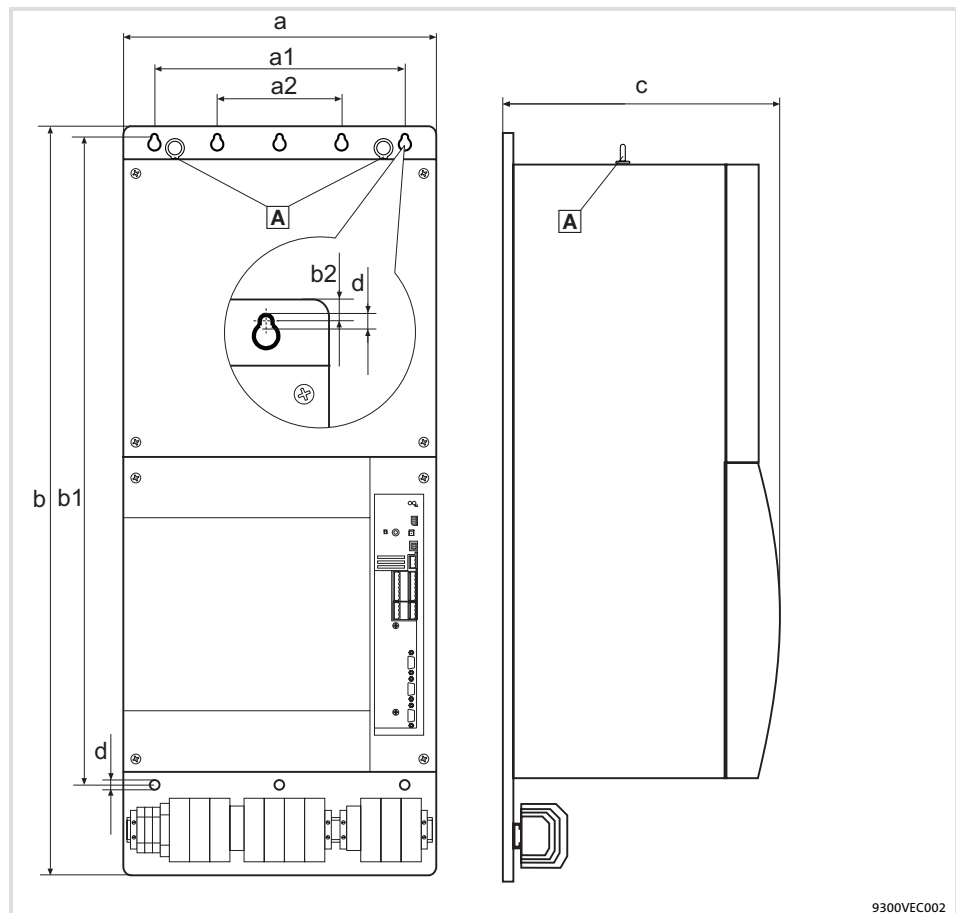


Fig. 4.2-1 Dimensions

A Eyebolts

Type	a [mm]	a1 [mm]	a2 [mm]	b [mm]	b1 [mm]	b2 [mm]	c [mm]	d [mm]
EVF9335-EV	500	450	225	1145	1005	15	436	9 (8×)
EVF9335-EVVxxx								
EVF9336-EV								
EVF9336-EVVxxx								
EVF9337-EV								
EVF9337-EVVxxx								
EVF9338-EV	500	450	225	1145	1005	15	436	9 (8×)
EVF9338-EVVxxx								

4.2.2 Drilling the holes into the mounting plate

Assembly space	Minimum clearance
Left/right of other controllers	30 mm
Left/right of a non-heat-conducting wall	100 mm
Top/bottom	200 mm

Comply with the clearances given to ensure a sufficient cooling of the controller. When using an air lock, different clearances apply (see Mounting Instructions for the air lock).

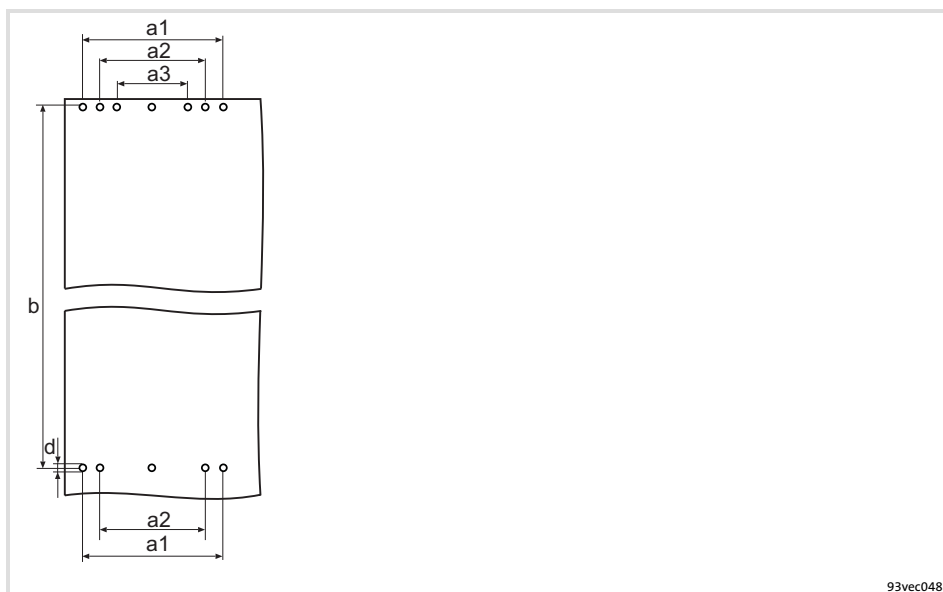


Fig. 4.2-2 Bore holes in the mounting plate for fixing the controller

a1	a2	a3	b	d
450 mm	340 mm	225 mm	1005 mm	9 mm (12x)

1. Mark the bore holes on the mounting plate according to the figure.
2. Drill the holes into the mounting plate.

4.2.3 Fasten the mounting rails on the mounting plate

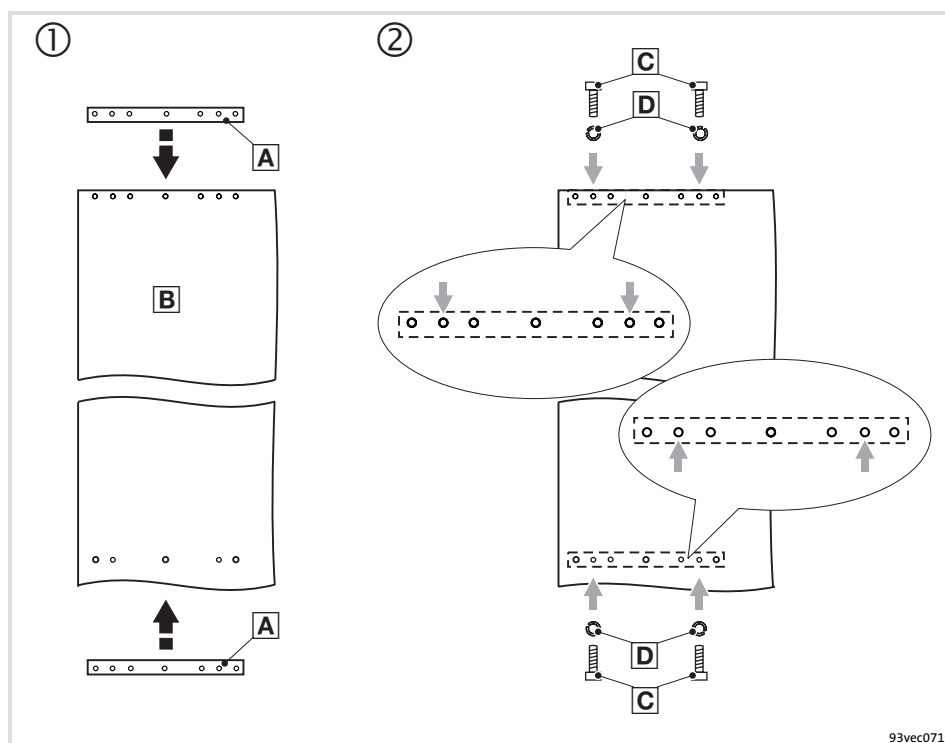


Fig. 4.2-3 Fastening the mounting rails on the mounting plate

- Ⓐ Mounting rail
- Ⓑ Mounting plate
- Ⓒ Hexagon socket screw M8 × 25 mm
- Ⓓ Spring washer M8

1. Hold the mounting rails behind the mounting plate.
2. Fasten the mounting rails exactly at the illustrated points using 2 hexagon socket screws and spring washers on each side.

4.2.4

Fasten controller on mounting plate

**Danger!**

Risk of injury due to the high weight of the controller.

The controller has to be carried using the eyebolts and an adequate lifting tool.

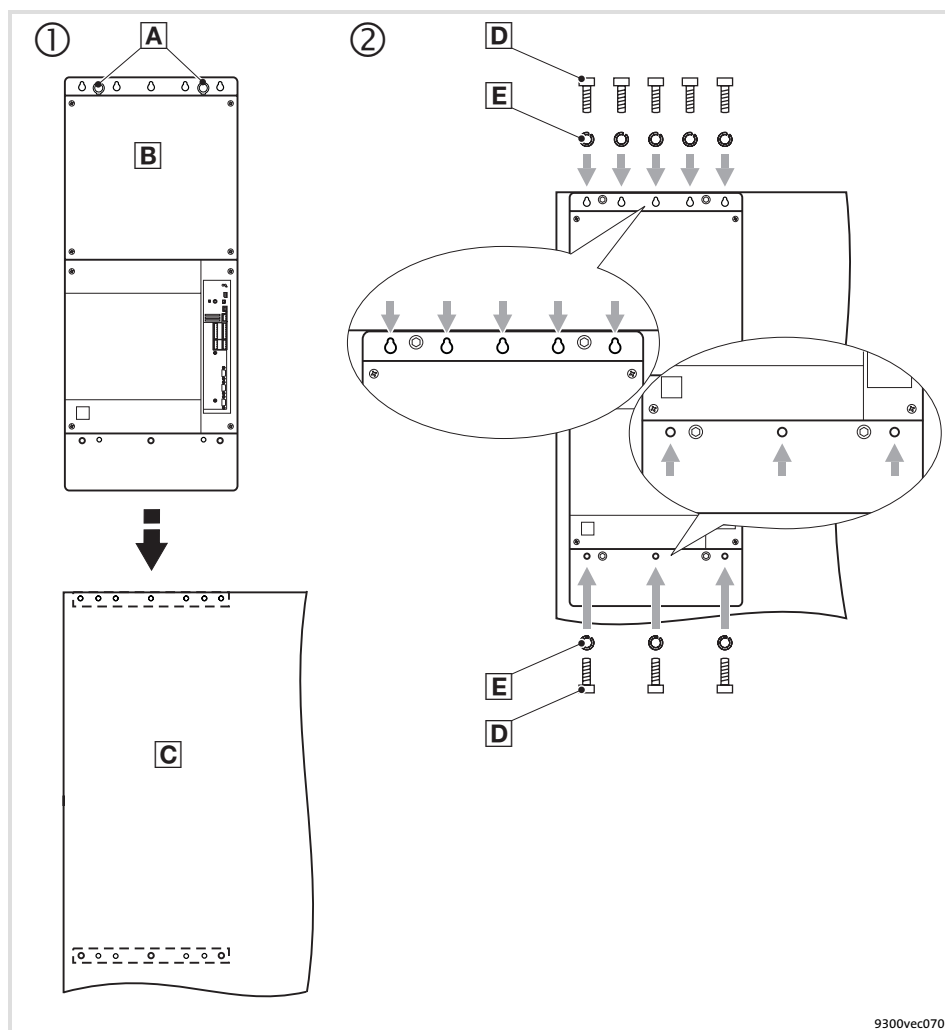


Fig. 4.2-4 Fastening the controller on mounting plate

A Eye bolts	D 8 hexagon socket screws M8 × 25 mm
B Controller	E 8 spring washers M8
C Mounting plate	

1. Put the controller on the mounting plate.
2. Fasten the controller exactly at the illustrated points using 5 hexagon socket screws and spring washers at the top and 3 hexagon socket screws and spring washers at the bottom.

4.3 Basic devices in the power range 250 ... 400 kW



Tip!

- Lenze recommends to install an air lock. The air lock serves to dissipate the heated cooling air directly from the control cabinet.
– Order no. E93ZWL2
- A drilling jig for marking the bore holes is available as dxf-file in the Internet in the "Download" area under www.Lenze.de.

4.3.1 Dimensions

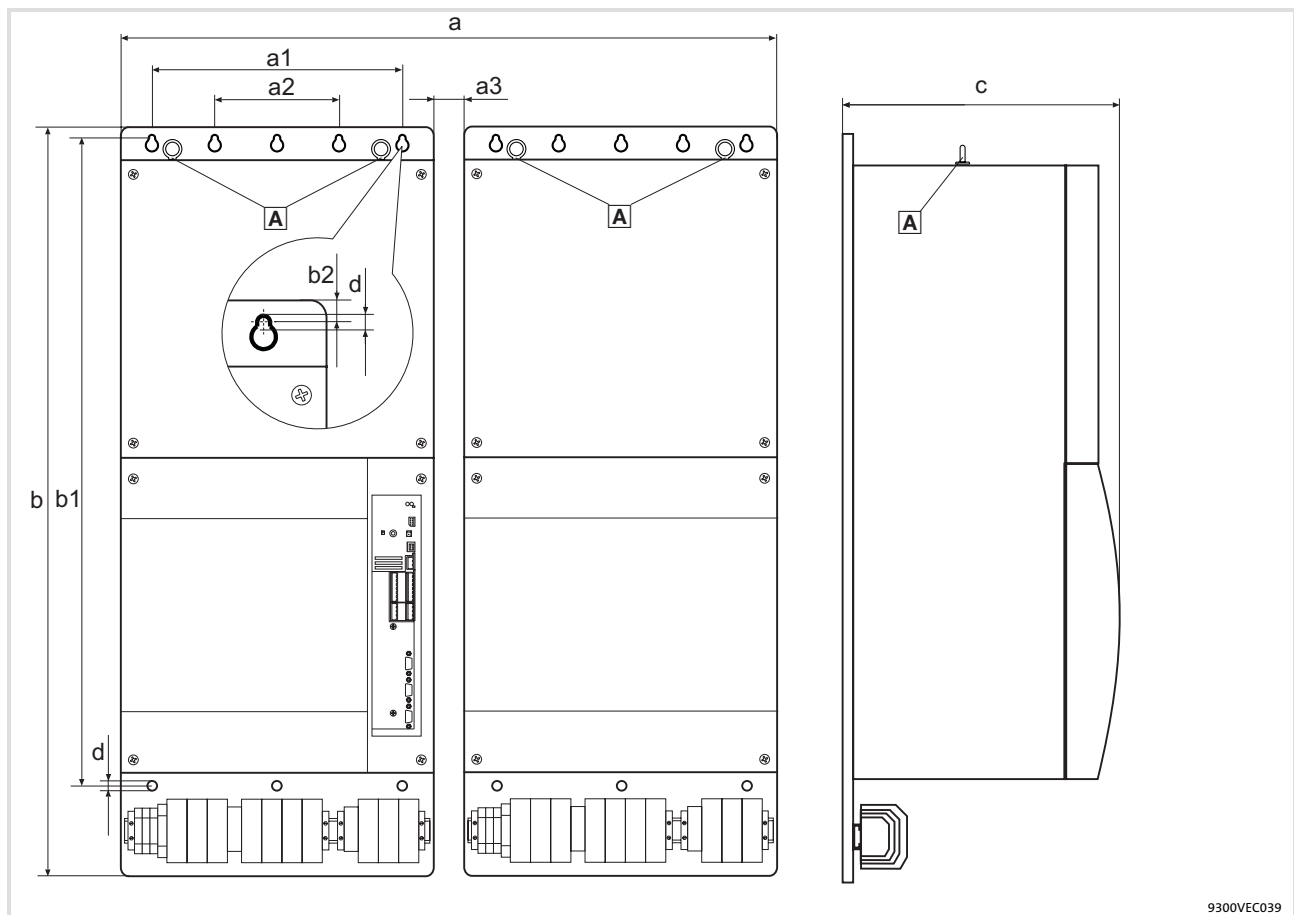


Fig. 4.3-1 Dimensions
Ⓐ Eyebolts

Type	a [mm]	a1 [mm]	a2 [mm]	a3 [mm]	b [mm]	b1 [mm]	b2 [mm]	c [mm]	d [mm]
EVF9381-EV EVF9381-EVVxxx EVF9382-EV EVF9382-EVVxxx EVF9383-EV EVF9383-EVVxxx	1050	450	225	50	1145	1005	15	436	9 (16x)

4.3.2 Drilling the holes into the mounting plate

Assembly space	Minimum clearance
Left/right of other controllers	30 mm
Left/right of a non-heat-conducting wall	100 mm
Top/bottom	200 mm

Comply with the clearances given to ensure a sufficient cooling of the controller. When using an air lock, different clearances apply (see Mounting Instructions for the air lock).

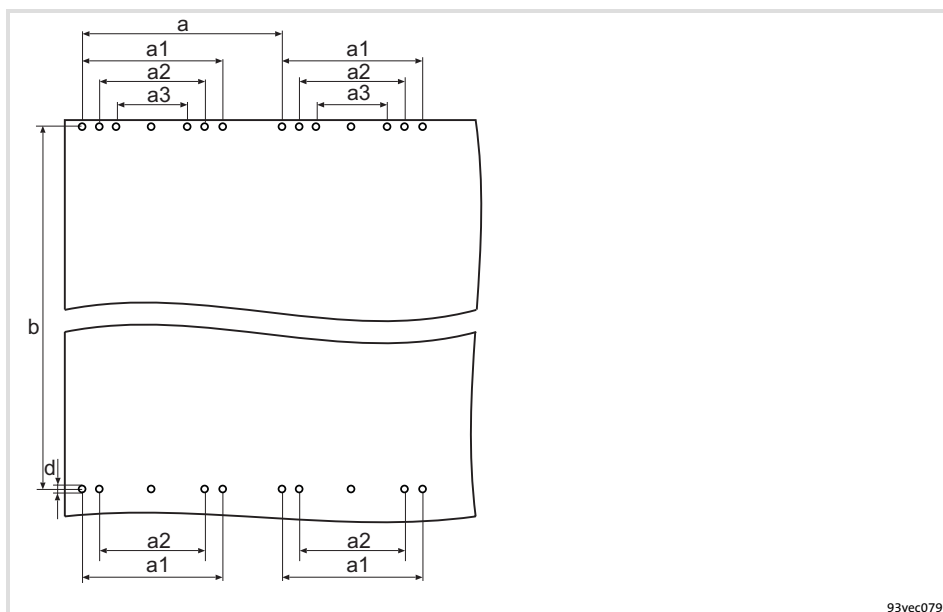


Fig. 4.3-2 Bore holes in the mounting plate for fixing the controller

a	a1	a2	a3	b	d
550 mm	450 mm	340 mm	225 mm	1005 mm	9 mm (24x)

1. Mark the bore holes on the mounting plate according to the figure.
2. Drill the holes into the mounting plate.

4.3.3 Fasten the mounting rails on the mounting plate

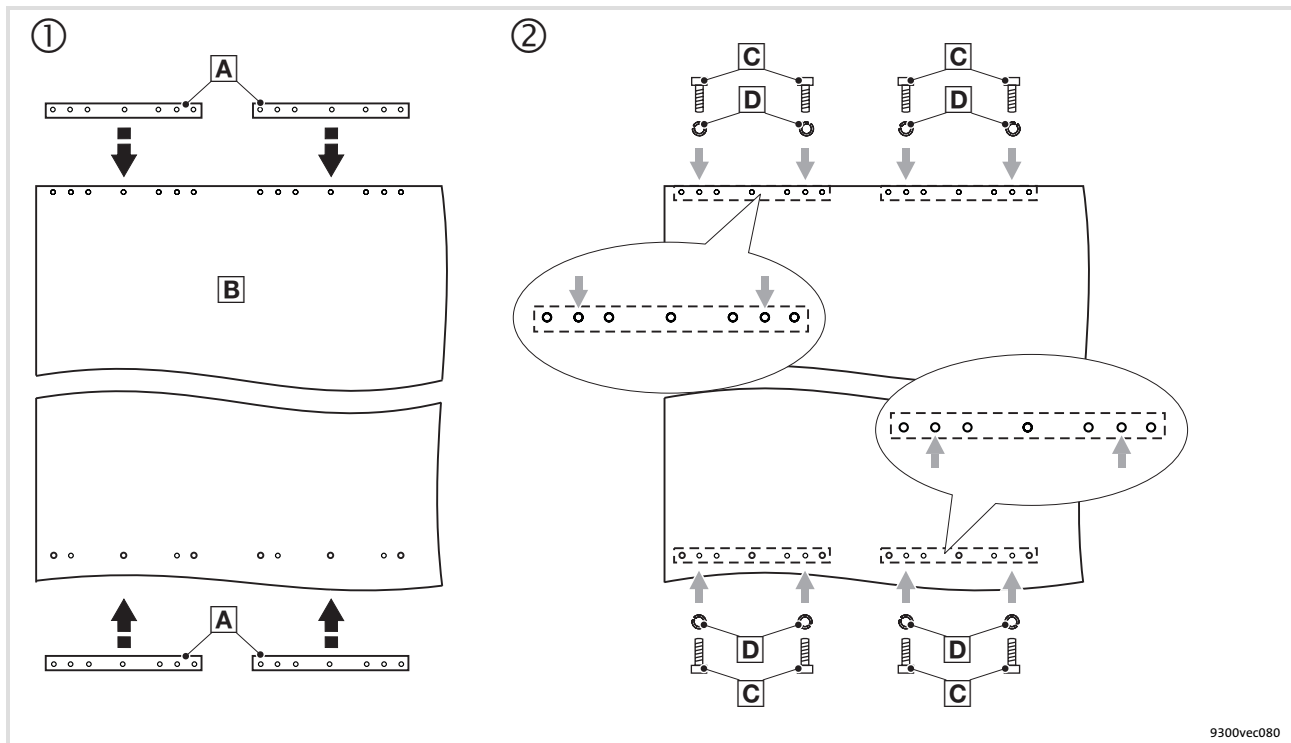


Fig. 4.3-3 Fastening the mounting rails on the mounting plate

- Ⓐ Mounting rail
- Ⓑ Mounting plate
- Ⓒ Hexagon socket screw M8 × 25 mm
- Ⓓ Spring washer M8

1. Hold the mounting rails behind the mounting plate.
2. Fasten the mounting rails exactly at the illustrated points using 2 hexagon socket screws and spring washers on each side.

4.3.4 Fasten controller on mounting plate



Danger!

Risk of injury due to the high weight of the controller.
 The controller has to be carried using the eyebolts and an adequate lifting tool.

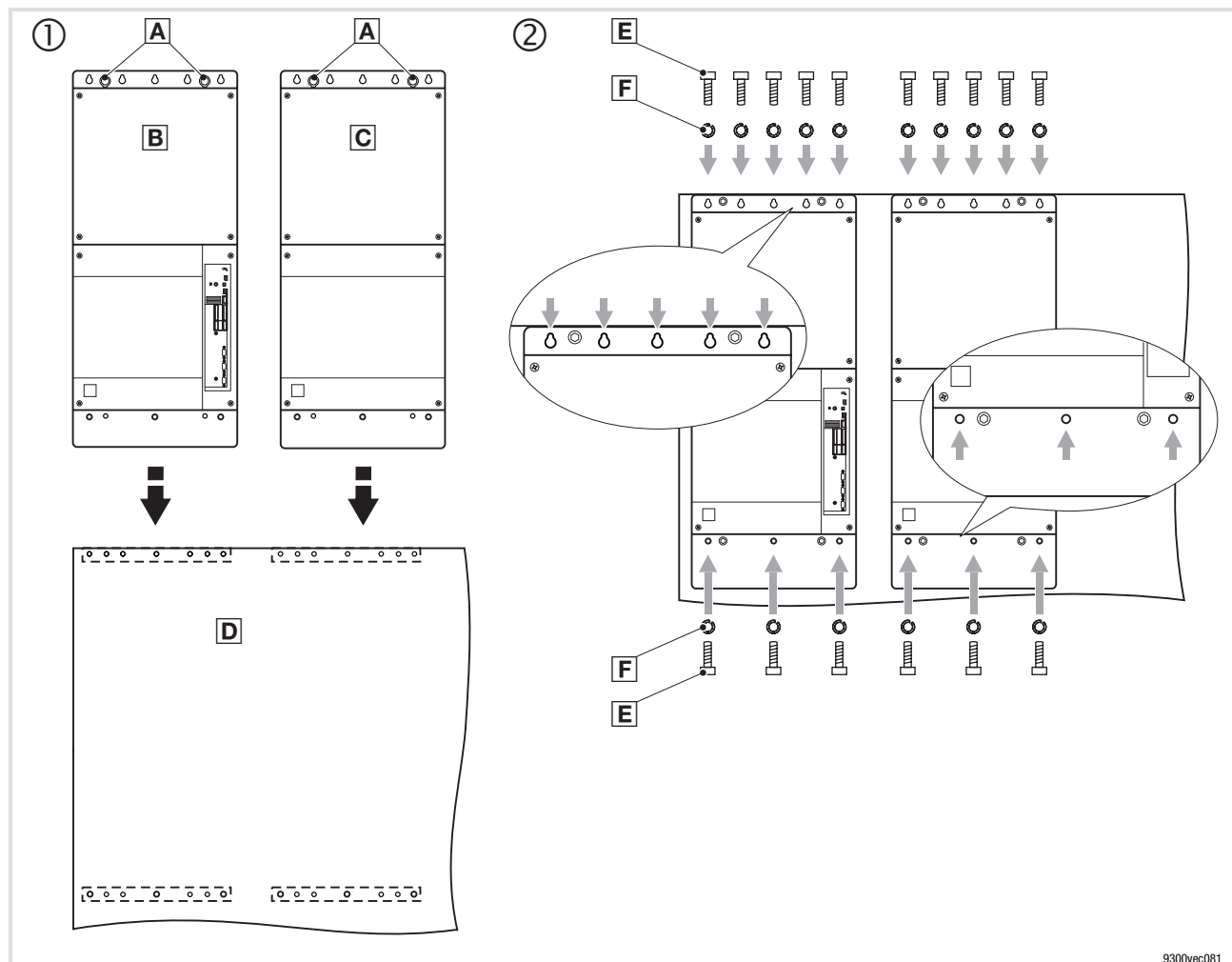


Fig. 4.3-4 Fastening the controller on mounting plate

A Eyebolts	D Mounting plate
B Master	E 16 hexagon socket screws M8 × 25 mm
C Slave	F 16 spring washers M8

1. Put master and slave on the mounting plate.
2. Fasten the master and slave each with five hexagon socket screws and spring washers at the top and 3 hexagon socket screws and spring washers at the bottom exactly at the marked point.

5 Wiring of the standard device

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5.1 Important notes



Stop!

The drive controller contains electrostatically sensitive components.

The personnel must be free of electrostatic charge when carrying out assembly and service operations.

5.1.1 Protection of persons



Danger!

Before working on the controller, check that no voltage is applied to the power terminals:

- ▶ The power terminals U, V, W, +U_G, -U_G, BR1, BR2 and 101 ... 104 remain live for at least five minutes after disconnecting the mains.
- ▶ The power terminals L1, L2, L3, U, V, W, +U_G, -U_G, BR1, BR2 and 101 ... 104 remain live when the motor is stopped.

Pluggable terminal strips

All pluggable terminals must only be connected or disconnected when no voltage is applied!

Electrical isolation

The terminals X1 and X5 have a double (reinforced) insulation in accordance with EN 61800-5-1. The protection against accidental contact is ensured without any further measures.



Danger!

- ▶ Terminals X3, X4, X6, X8, X9, X10, X11 have a single basic insulation (single isolating distance).
- ▶ Protection against accidental contact in case of a defective isolating distance is only guaranteed through external measures, e.g. double insulation.
- ▶ If an external DC 24 V voltage source is used, the insulation level of the controller depends on the insulation level of the voltage source.

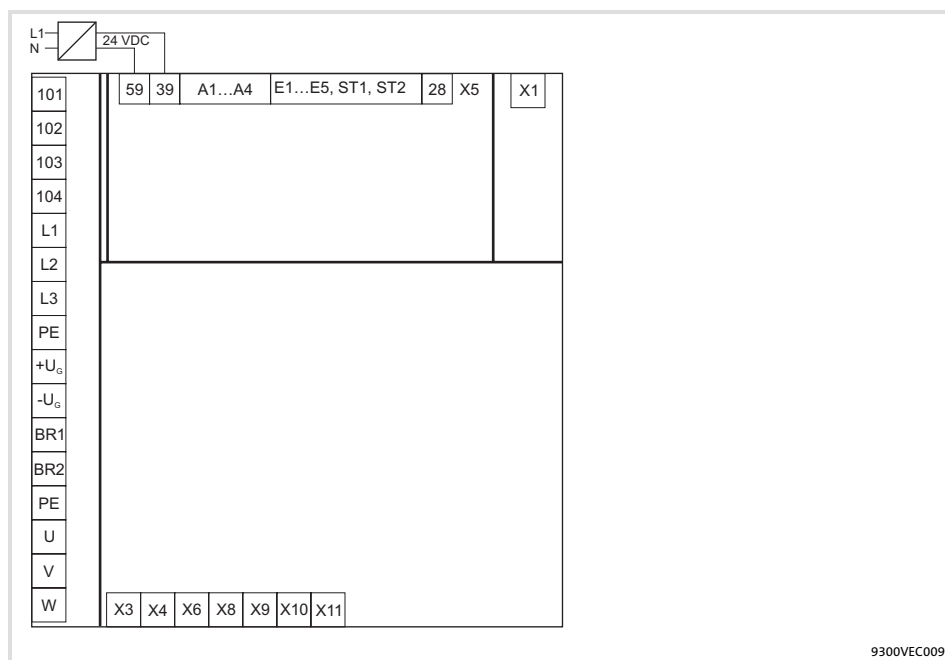


Fig. 5.1-1 Electrical isolation between power terminals, control terminals and housing



Double (reinforced) insulation
Basic insulation

Replacing defective fuses

Only replace defective fuses in the deenergised state to the type specified.

Disconnecting the controller from the mains

Only carry out the safety-related disconnection of the controller from the mains via a contactor on the input side or a manually operated toggle switch.

5.1.2 Device protection

- ▶ In the event of condensation, connect the controller to the mains voltage only after the humidity has evaporated.
- ▶ The controller is protected by external fuses.
- ▶ Length of the screws for connecting the shield sheet for the control cables: **12 mm**.
- ▶ Cyclic connection and disconnection of the supply voltage can overload and destroy the input current limitation of the controller. In case of cyclic mains switching over a longer period of time, the controller must not be switched on more frequently than every 5 minutes!
- ▶ Switching on the motor side of the controller is only permitted for emergency switch-off.
- ▶ Provide unused control inputs and outputs with terminal strips. Cover unused Sub-D sockets with protective covers included in the scope of supply.

5.1.3 Motor protection

- ▶ Extensive protection against overload:
 - By overcurrent relays or temperature monitoring.
 - We recommend the use of PTC thermistors or thermostats to monitor the motor temperature.
 - PTC thermistors or thermostats can be connected to the controller.
 - For monitoring the motor, we recommend the use of the I^2t monitoring.
- ▶ Only use motors with an insulation suitable for the inverter operation:
 - Insulation resistance: min. $\hat{u} = 1.5 \text{ kV}$, min. $du/dt = 5 \text{ kV}/\mu\text{s}$
 - When using motors with an unknown insulation resistance, please contact your motor supplier.



Note!

To avoid bearing currents, Lenze recommends to use motors with insulated non-drive end bearings. Optionally, motor chokes can be used to reduce bearing currents.

5.2 Notes on project planning

5.2.1 Supply forms / electrical supply conditions

Please observe the restrictions of each mains type!

Mains	Controller operation	Notes
With insulated neutral point (TT/TN systems)	No restrictions	Comply with controller ratings. • Effective mains current: See chapter "Technical data"
With insulated neutral point (IT systems)	Not permitted.	—
DC-supply via $+U_G/-U_G$	Permitted if the DC voltage is symmetrical to PE	The controller will be destroyed when grounding $+U_G$ conductor or $-U_G$ conductor.

5.2.2 Operation on public supply systems (compliance with EN 61000-3-2)

European standard EN 61000-3-2 defines limit values for the limitation of harmonic currents in the supply system. Non-linear consumers (e.g. frequency inverters) generate harmonic currents which "pollute" the supplying mains and may therefore interfere with other consumers. The standard aims at assuring the quality of public supply systems and reducing the mains load.



Note!

The standard only applies to public systems. Mains which are provided with a transformer substation of their own as in industrial plants are not public and not included in the application range of the standard.

If a device or machine consists of several components, the limit values of the standard apply to the entire unit.

Measures for compliance with the standard

With the measures described, the controllers comply with the limit values according to EN 61000-3-2.

Operation on public supply systems	EN 61000-3-2	Limitation of harmonic currents
	Total power on the mains	Compliance with the requirements ¹⁾
	< 1 kW	With mains choke
	> 1 kW	No measures required

¹⁾ The additional measures mentioned have the effect that solely the controllers meet the requirements of EN 61000-3-2. The machine/system manufacturer is responsible for the compliance with the requirements for the machine/system!

5.2.3 Operation at earth-leakage circuit breaker (e.l.c.b.)



Danger!

The controllers are internally fitted with a mains rectifier. In case of a short circuit to frame a pulsating DC residual current can prevent the AC sensitive or pulse current sensitive earth-leakage circuit breakers from being activated, thus cancelling the protective function for the entire equipment being operated on this earth-leakage circuit breaker.

- ▶ For the protection of persons and farm animals (DIN VDE 0100), we recommend
 - pulse current sensitive earth-leakage circuit breakers for plants including controllers with a single-phase mains connection (L1/N).
 - universal-current sensitive earth-leakage circuit breakers for plants including controllers with a three-phase mains connection (L1/L2/L3).
- ▶ Only install the earth-leakage circuit breaker between supplying mains and drive controller.
- ▶ Earth-leakage circuit breakers may trigger a false alarm due to
 - capacitive compensation currents flowing in the cable shields during operation (particularly with long, shielded motor cables),
 - simultaneous connection of several inverters to the mains
 - the use of additional interference filters.

5.2.4 Interaction with compensation equipment

- ▶ Controllers only consume very little reactive power of the fundamental wave from the AC supply mains. Therefore, a compensation is not required.
- ▶ If the controllers are connected to a supply system with compensation equipment, this equipment must comprise chokes.
 - For this, contact the supplier of the compensation equipment.

5.2.5 Discharge current for mobile systems

Frequency inverters with internal or external RFI filters usually have a discharge current to PE potential that is higher than 3.5 mA AC or 10 mA DC. Therefore, fixed installation as protection is required (see EN 61800-5-1). This must be indicated in the operational documents.

If a fixed installation is not possible for a mobile consumer although the discharge current to PE potential is higher than 3.5 mA AC or 10 mA DC, an additional two-winding transformer (isolating transformer) can be included in the current supply as a suitable countermeasure. Here, the PE conductor is connected to the PE of the drive (filter, inverter, motor, shieldings) and also to one of the poles of the secondary winding of the isolating transformer.

Devices with a three-phase supply must have a corresponding isolating transformer with a secondary star connection, the star point being connected to the PE conductor.

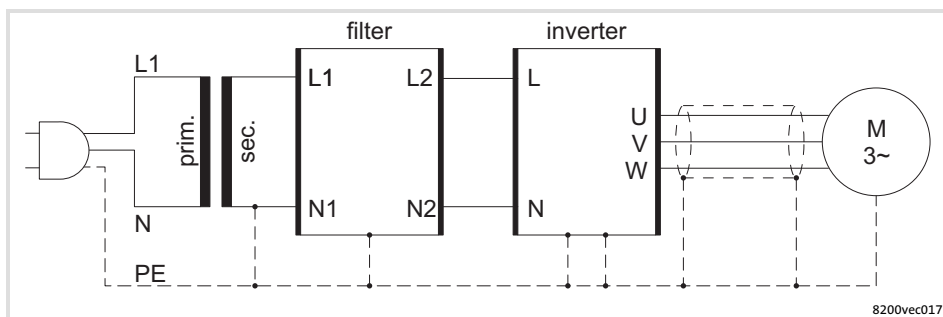


Fig. 5.2-1 Installation of a two-winding transformer (isolating transformer)

5.2.6 Dimensioning of mains and motor cables



Danger!

Observe all national and regional regulations for the cables.

You can use single and multi-core cables. If a cable consists of several cores per phase, it can be necessary to connect the controller by means of common cable glands.

Maximum cable cross-section for power connections (screw terminals):

9300 vector	Maximum cable cross-section					
Type	L1, L2, L3 U, V, W, BR1, BR2 [mm ²]		+U _G , -U _G [mm ²]		PE [mm ²]	
EVF9335-EV EVF9335-EVxxx	150 (2 × 50) ¹⁾		150 (2 × 50) ¹⁾		95	
EVF9336-EV EVF9336-EVxxx	150 (2 × 50) ¹⁾		150 (2 × 50) ¹⁾		95	
EVF9337-EV EVF9337-EVxxx	150 (2 × 50) ¹⁾		240 (2 × 95) ¹⁾		95	
EVF9338-EV EVF9338-EVxxx	240 (2 × 95) ¹⁾		240 (2 × 95) ¹⁾		150	
	Master	Slave	Master	Slave	Master	Slave
EVF9381-EV EVF9381-EVxxx	150 (2 × 50) ¹⁾	150 (2 × 50) ¹⁾	150 (2 × 50) ¹⁾	150 (2 × 50) ¹⁾	95	95
EVF9382-EV EVF9382-EVxxx	150 (2 × 50) ¹⁾	150 (2 × 50) ¹⁾	240 (2 × 95) ¹⁾	240 (2 × 95) ¹⁾	95	95
EVF9383-EV EVF9383-EVxxx	240 (2 × 95) ¹⁾	240 (2 × 95) ¹⁾	240 (2 × 95) ¹⁾	240 (2 × 95) ¹⁾	150	150

¹⁾ Two conductors per path; both conductors must have the same cross-section

The effectively required cable cross-section depends e.g. on the application and environmental conditions and the cable type used. It is not required that mains and motor cable have the same cable cross-section.

Mains cable, DC cable

It is not necessary to shield the mains cable. In DC-bus operation or with DC supply we recommend shielded cables.

Motor cable

It is not necessary to fuse the motor cable. For EMC reasons we recommend shielded motor cables. You can use common metal clamps to connect the shield.

5.3 Basics for wiring according to EMC

5.3.1 Shielding

The shielding quality is determined by a good shield connection:

- ▶ Connect the shield with a surface as large as possible.
- ▶ Use a conductive clamp to connect the shield to the conductive and grounded mounting plate with a surface as large as possible.
- ▶ Unshielded cable ends must always be as short as possible.

5.3.2 Mains connection, DC supply

- ▶ You can use unshielded single cores or unshielded cables to connect the controller and the mains choke to the mains.
- ▶ For DC-bus operation or DC supply, use shielded cables.
- ▶ The cable cross-section must be dimensioned for the assigned fuse protection (national and regional regulations).

5.3.3 Motor cable

- ▶ Use only shielded motor cables with braid made of tinned or nickel-plated copper. Shields made of steel braid are not suitable.
 - The overlap rate of the braid must be at least 70 % with an overlap angle of 90 °.
- ▶ The cables used must meet the requirements of the application (e.g. EN 60204-1).
- ▶ The cable for the motor temperature monitoring (PTC or thermal contact) must be shielded and separated from the motor cable.
 - With Lenze system cables, the cable for the motor temperature monitoring is integrated into the motor cable.
- ▶ Always place the shield of the motor cable at both sides - at the drive controller and at the motor.
 - Always connect the shields to the conductive and grounded mounting plate with a surface as large as possible.
- ▶ The motor cable is perfectly installed if
 - it is routed separately of mains cables and control cables,
 - crosses mains cables and control cables only at a right angle,
 - is not interrupted.
- ▶ If it is inevitable to have an interruption (e.g. through chokes, contactors or terminals):
 - The unshielded cable must not be longer than 100 mm (depending on the cable cross-section).
 - Chokes, contactors, terminals, etc. must be separated from other components (min. distance = 100 mm).
 - The motor cable shield must be connected to the mounting plate with a surface as large as possible directly before and after the point of interruption.
- ▶ Connect the shield in the motor terminal box or at the motor housing to PE with a surface as large as possible.
 - Metal cable glands at the motor terminal box ensure that the shield is connected to the motor housing with a surface as large as possible.

5.3.4 Control cables

- ▶ Control cables must be shielded to minimise interference injections.
- ▶ For lengths of 200 mm and more, use only shielded cables for analog and digital inputs and outputs. Under 200 mm, unshielded but twisted cables may be used.
- ▶ Connect the shield correctly:
 - The shield connections of the control cables must be at a distance of at least 50 mm from the shield connections of the motor cables and DC cables.
 - Connect the shield of digital input and output cables at both ends.
 - Connect the shield of analog input and output cables at one end (at the drive controller).
- ▶ To achieve an optimum shielding effect (in case of very long cables, with high interference) one shield end of analog input and output cables can be connected to PE potential via a capacitor (e.g. 10 nF/250 V) (see sketch).

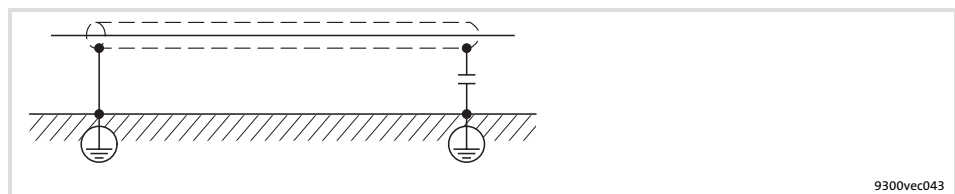


Fig. 5.3-1 Shielding of long, analog control cables

5.3.5 Installation in the control cabinet

Mounting plate requirements	▶ Only use mounting plates with conductive surfaces (zinc-coated or V2A-steel). ▶ Painted mounting plates are not suitable even if the paint is removed from the contact surfaces. ▶ If several mounting plates are used, ensure a large-surface connection between the mounting plates (e.g. by using earthing strips).
Mounting of the components	▶ Connect the controller and the chokes to the grounded mounting plate with a surface as large as possible.
Optimum cable routing	▶ The motor cable is optimally installed if – it is separated from mains cables and control cables, – it crosses mains cables and control cables at right angles. ▶ Always install cables close to the mounting plate (reference potential), as freely suspended cables act like aerials. ▶ Lead the cables to the terminals in a straight line (avoid tangles of cables). ▶ Use separated cable channels for motor cables and control cables. Do not mix up different cable types in one cable channel. ▶ Minimise coupling capacities and coupling inductances by avoiding unnecessary cable lengths and reserve loops. ▶ Short-circuit unused cores to the reference potential. ▶ Install the positive and negative wires for DC 24 V close to each other over the entire length to avoid loops.
Earth connections	▶ Connect all components (controller, chokes) to a central earthing point (PE rail). ▶ Set up a star-shape earthing system. ▶ Comply with the corresponding minimum cable cross-sections.

5.3.6 Wiring outside of the control cabinet

Notes for cable routing outside the control cabinet:

- The longer the cables the greater the space between the cables must be.
- If cables for different signal types are routed in parallel, the interferences can be minimized by means of a metal barrier or separated cable ducts.

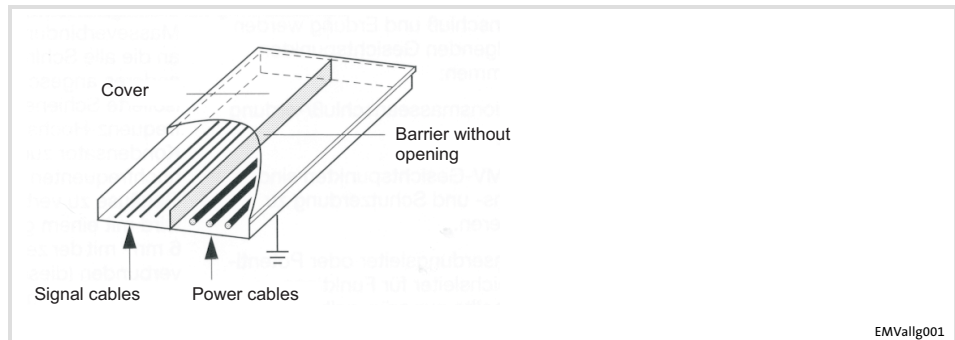


Fig. 5.3-2 Cable routing in the cable duct with barrier

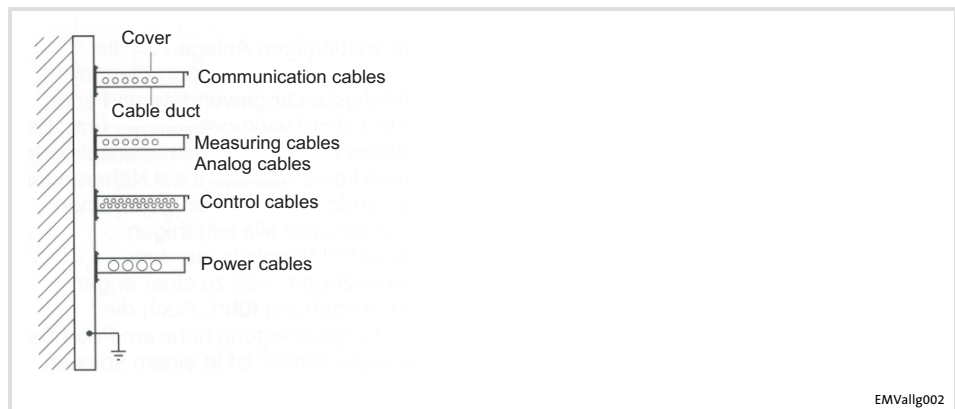


Fig. 5.3-3 Cable routing in separated cable ducts

5.3.7 Detecting and eliminating EMC interferences

Fault	Cause	Remedy
Interferences of analog setpoints of your own or other devices and measuring systems	Unshielded motor cable	Use shielded motor cable
	Shield contact is not extensive enough	Carry out optimal shielding as specified
	Shield of the motor cable is interrupted by terminal strips, switched, etc.	• Separate components from other component part with a minimum distance of 100 mm • Use motor choke/motor filter
	Install additional unshielded cables inside the motor cable (e.g. for motor temperature monitoring)	Install and shield additional cables separately
	Too long and unshielded cable ends of the motor cable	Shorten unshielded cable ends to maximally 40 mm
Conducted interference level is exceeded on the supply side	Terminal strips for the motor cable are directly located next to the mains terminals	Spatially separate the terminal strips for the motor cable from main terminals and other control terminals with a minimum distance of 100 mm
	Mounting plate varnished	Optimise PE connection: • Remove varnish • Use zinc-coated mounting plate
	HF short circuit	Check cable routing

5.4 Basic devices in the power range 110 ... 200 kW

5.4.1 Wiring according to EMC (CE-typical drive system)

The drives comply with the EC Directive on "Electromagnetic Compatibility" if they are installed in accordance with the specifications for the CE-typical drive system. The user is responsible for the compliance of the machine application with the EC Directive.

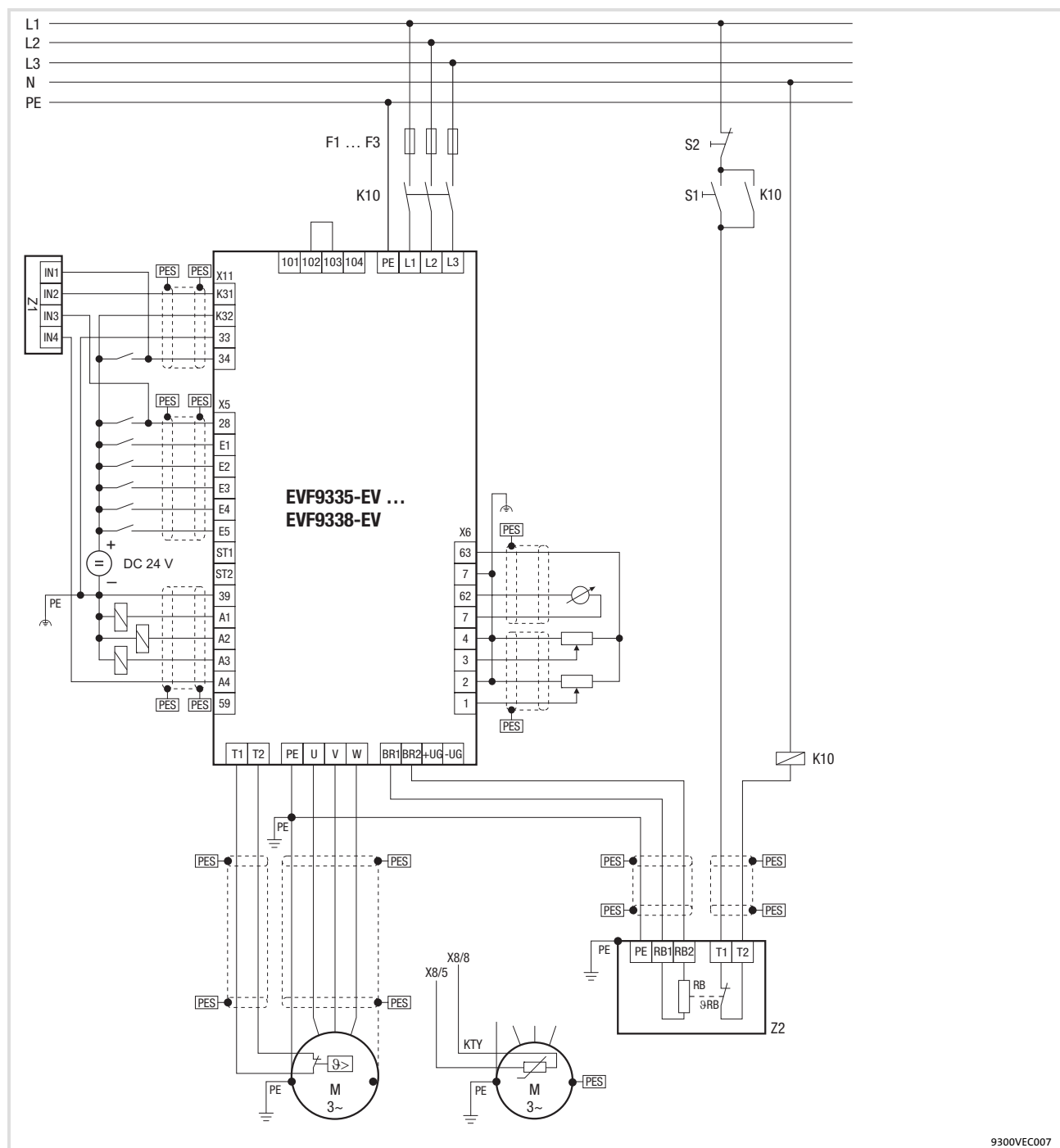


Note!

Observe the notes given in the chapter "Basics for wiring according to EMC"!

5.4
5.4.1

Basic devices in the power range 110 ... 200 kW
Wiring according to EMC (CE-typical drive system)



9300VEC007

Fig. 5.4-1 Example for wiring in accordance with EMC regulations

F1 ... F3	Fuses
K10	Mains contactor
Z1	Programmable logic controller (PLC)
Z2	Brake resistor
S1	Mains contactor on
S2	Mains contactor off
+U _G , -U _G	DC-bus connection
PES	HF shield termination through large-surface connection to PE

5.4.2 Mains connection 400 V devices



Stop!

The user is responsible for sufficient strain relief!

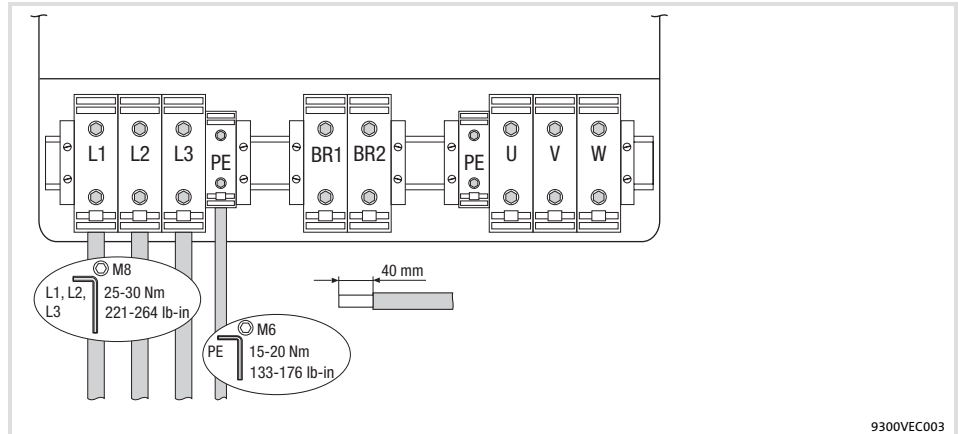


Fig. 5.4-2 Mains connection example

BR1, BR2 Brake resistors can only be operated with variants V060 and V110

5.4.3 Mains connection 400/500 V devices



Stop!

The user is responsible for sufficient strain relief!

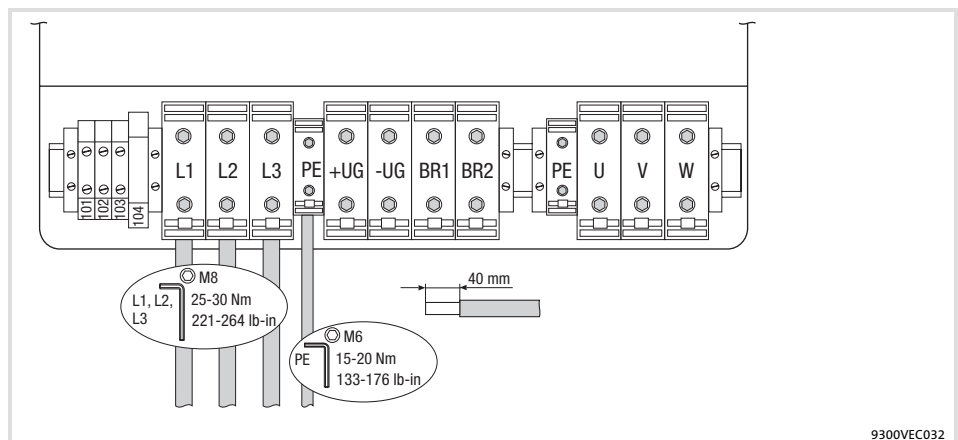


Fig. 5.4-3 Mains connection example

BR1, BR2 Brake resistors can only be operated with variants V270 and V300

5.4.4 DC supply 400/500 V devices



Stop!

The user is responsible for sufficient strain relief!

- For compliance with EMC requirements, Lenze recommends to use shielded DC-bus cables.
- Shield clamps are not included in the scope of supply.

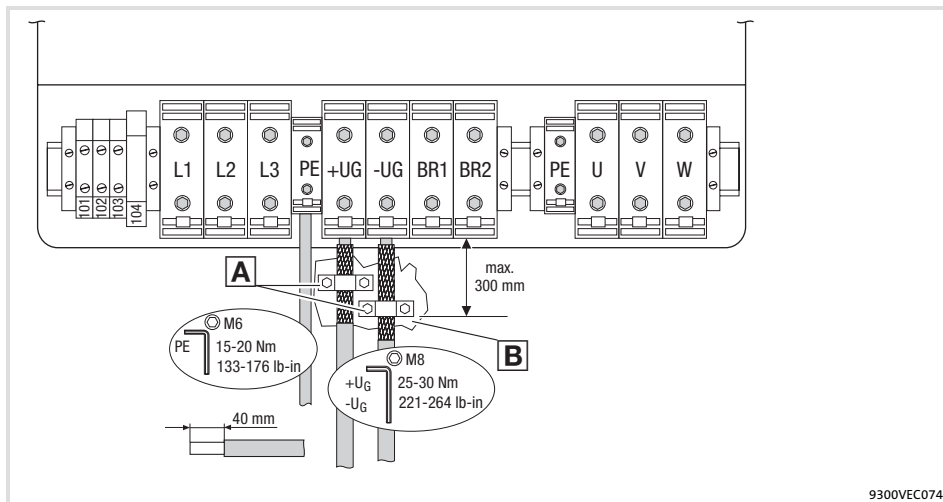


Fig. 5.4-4 Connection example to $+U_G$ and $-U_G$

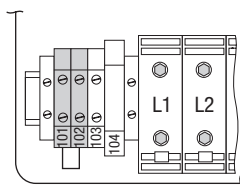
- BR1, BR2 Brake resistors can only be operated with variants V270 and V300
- A** Connect the DC-bus cable shield to the conductive control cabinet mounting plate with a contact surface as large as possible by using the shield clamps.
- B** Conductive surface
Ensure to have the poles right!

5.4.5 Fan connection 400/500 V devices

Fan connection when controller is supplied with mains voltage

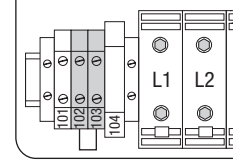
Lay a bridge between the terminals when a controller is operated on a mains.

AC 340 ... 440 V



9300vec044

AC 440 ... 577 V
(when being delivered)



9300vec045

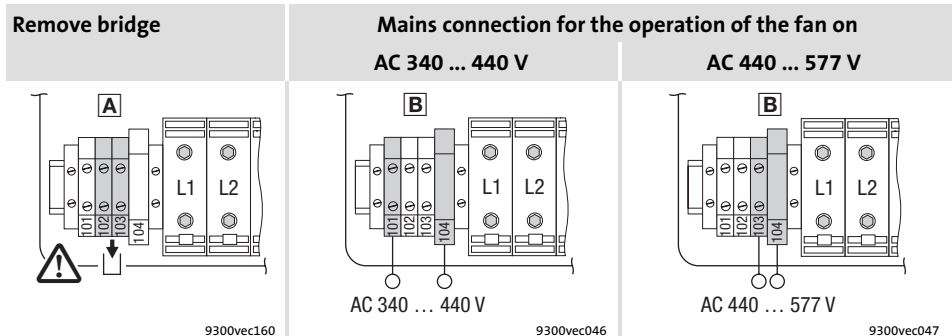
Fan connection when
controller is supplied via the
DC bus



Danger!

When the fan is externally supplied with voltage, the terminal L2 carries dangerous mains voltage!

When the controller is supplied via the DC bus, the fan must be separately supplied with mains voltage (see [B]). In this case, the bridge between the terminals 102 and 103 must be removed (see [A]).



Exchange defect fuse

In case of an external voltage supply the fan is protected by a fuse integrated in terminal 104.

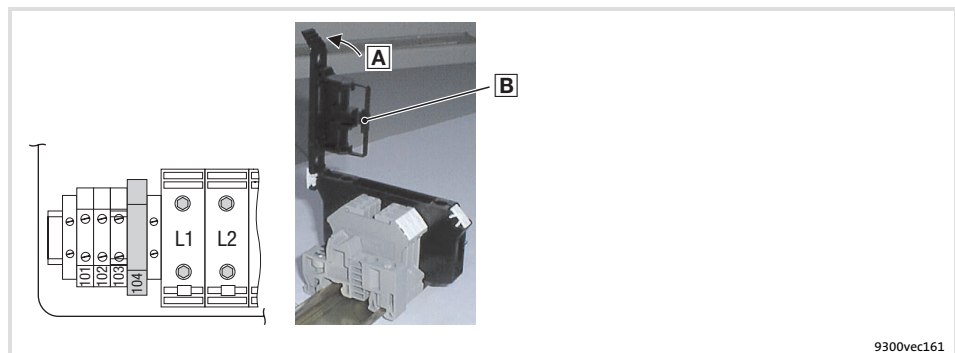


Fig. 5.4-5 Fusing of the fan

- [A] Open the fuse holder.
- [B] Remove the defect fuse from the support and replace it by the following type:
 - Type: 500V SA 2A 6.32
 - Ref. no.: P098131
 - Manufacturer: Ferraz Shawmut

5.4.6 Fuses and cable cross-sections

Installation in accordance
with EN 60204-1

Supply conditions	
Range	Description
Fuses	Utilisation category: only gG/gL or gRL
Cables	Laying systems B2 and C: Use of PVC-insulated copper cables, conductor temperature < 70 °C, ambient temperature < 40 °C, no bundling of the cables or cores, three loaded cores. The data are recommendations. Other dimensionings/laying systems are possible (e.g. in accordance with VDE 0298-4).
RCCB	- Controllers can cause a DC current in the PE conductor. If a residual current device (RCD) or a fault current monitoring unit (RCM) is used for protection in the case of direct or indirect contact, only one RCD/RCM of the following type can be used on the current supply side: - Type B (universal-current sensitive) for connection to a three-phase system - Type A (pulse-current sensitive) or type B (universal-current sensitive) for connection to a 1-phase system Alternatively another protective measure can be used, like for instance isolation from the environment by means of double or reinforced insulation, or isolation from the supply system by using a transformer. - Earth-leakage circuit breakers must only be installed between mains supply and controller.

Observe all national and regional regulations!

Fuses and cable cross-sections
for the mains connection

9300	Fuse	Cable cross-section		FI ¹⁾
	Rated fuse current	Laying system F		
Type	[A]	L1, L2, L3 [mm ²]	PE [mm ²]	[mA]
EVF9335-EVV EVF9335-EVVxxx	250	150 2 × 50 ¹⁾	95	300
EVF9336-EVV EVF9336-EVxxx	315	150 2 × 50 ¹⁾	95	300
EVF9337-EVV EVF9337-EVVxxx	315	150 2 × 50 ¹⁾	95	300
EVF9338-EVV EVF9338-EVVxxx	400	240 2 × 95 ¹⁾	150	300

¹⁾ Two conductors per path; both conductors must have the same cross-section

²⁾ Universal current-sensitive earth-leakage circuit breaker

Fuses and cable cross-sections
for DC-bus connection

9300	Fuse		Cable cross-section	
	Quantity	Rated fuse current	Laying system F	
Type		[A]	+U _G , -U _G [mm ²]	PE [mm ²]
EVF9335-EVV2xx EVF9335-EVV300	1	400	2 × 50 ¹⁾	95
EVF9336-EVV2xx EVF9336-EVV300	1	400	2 × 50 ¹⁾	95
EVF9337-EVV2xx EVF9337-EVV300	2	350	2 × 95 ¹⁾	95
EVF9338-EVV2xx EVF9338-EVV300	2	400	2 × 95 ¹⁾	150

¹⁾ Two conductors per path; both conductors must have the same cross-section

5.4.7 Motor connection

- To comply with the EMC regulations, Lenze recommends to use shielded motor cables.
- Shield clamps are not included in the scope of supply.



Stop!

The user is responsible for sufficient strain relief!

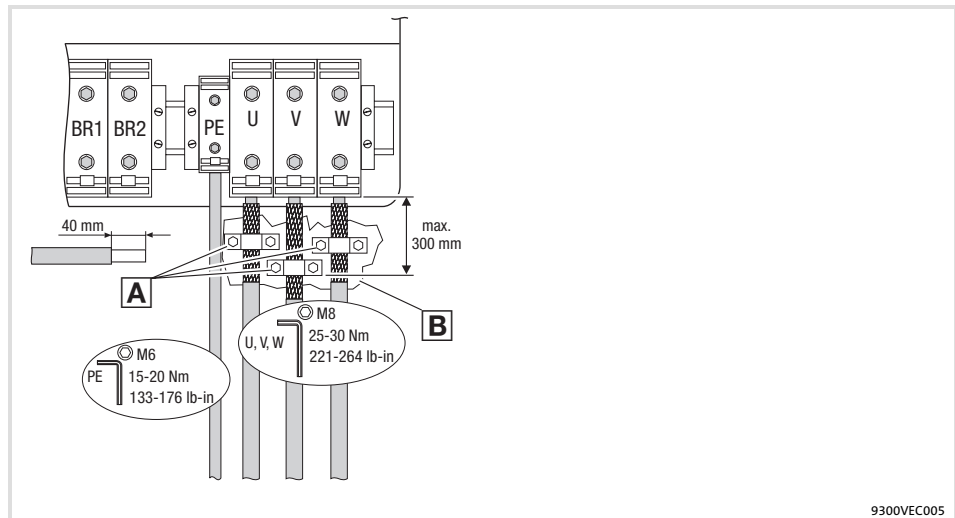


Fig. 5.4-6 Motor connection example

BR1, BR2 Brake resistors can only be operated with variants V060, V110, V270 and V300

A Connect the motor cable shield with a surface as large as possible to the control cabinet mounting plate by using the clamps.

B Conductive surface

Ensure to have the poles right!

Do not exceed the maximum motor cable length!

Cable cross-section

9300 vector	Installation in accordance with EN 60204-1	
	U, V, W [mm ²]	PE [mm ²]
Type		
EVF9335-EV	150	95
EVF9335-EVVxxx	2 × 50 ¹⁾	
EVF9336-EV	150	95
EVF9336-EVVxxx	2 × 50 ¹⁾	
EVF9337-EV	150	95
EVF9337-EVVxxx	2 × 50 ¹⁾	
EVF9338-EV	240	150
EVF9338-EVVxxx	2 × 95 ¹⁾	

¹⁾ Two conductors per path; both conductors must have the same cross-section

Observe the national and regional legislation

5.4.8 Wiring of motor temperature monitoring

The drive controller features 2 connections for motor temperature monitoring:

- ▶ Terminals T1, T2 for connecting a PTC thermistor or thermal contact (NC contact).
- ▶ Pin X8/5 and X8/8 of the incremental encoder input (X8) for connecting a KTY thermal sensor.

Motor with PTC thermistor or thermal contact (NC contact)

Wire T1, T2 only if the motor is equipped with a PTC thermistor or thermal contact (NC contact).

- An "open" cable acts like an antenna and can cause faults on the drive controller.



Danger!

- All control terminals only have basic insulation (single isolating distance) after connecting a PTC thermistor or a thermal contact.
- Protection against accidental contact in case of a defective isolating distance is only guaranteed through external measures, e.g. double insulation.

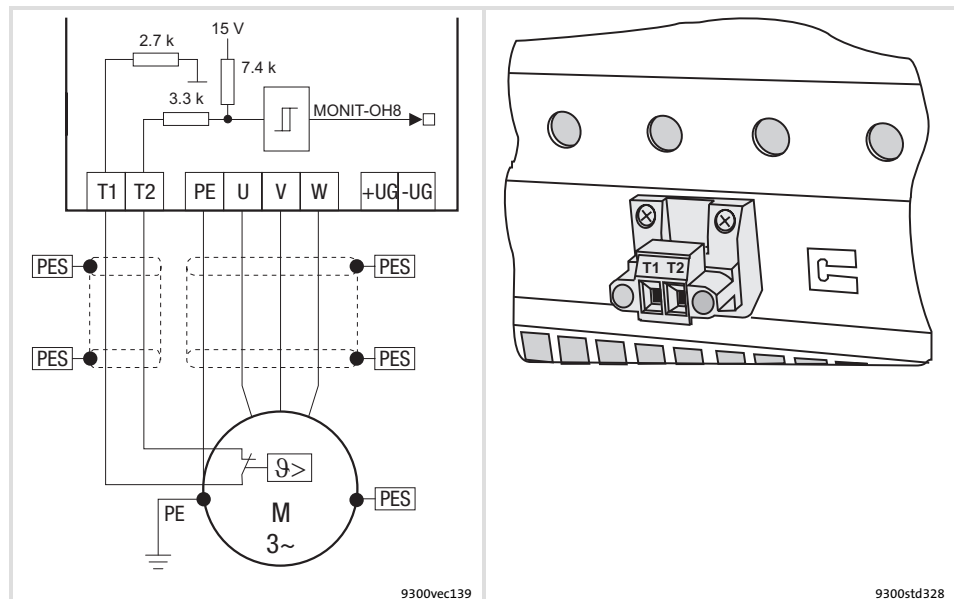


Fig. 5.4-7 Connection of PTC thermistor or thermal contact (NC contact) at T1, T2

Characteristics of the connection for motor temperature monitoring:

Terminals T1, T2	
Connection	• PTC thermistor – PTC thermistor with defined tripping temperature (acc. to DIN 44081 and DIN 44082) • Thermal contact (NC contact) – Thermostat as NC contact
Tripping point	• Fixed (depending on the PTC/thermal contact) • PTC: $R_{\theta} > 1600 \Omega$ • Configurable as warning or error (TRIP)
Notes	• Monitoring is not active in the Lenze setting. • If you do not use a Lenze motor, we recommend the use of a PTC thermistor up to 150°C.

Motor with KTY thermal sensor



Note!

- We recommend to use Lenze system cables for wiring.
- For self-made cables only use cables with shielded cores twisted in pairs.

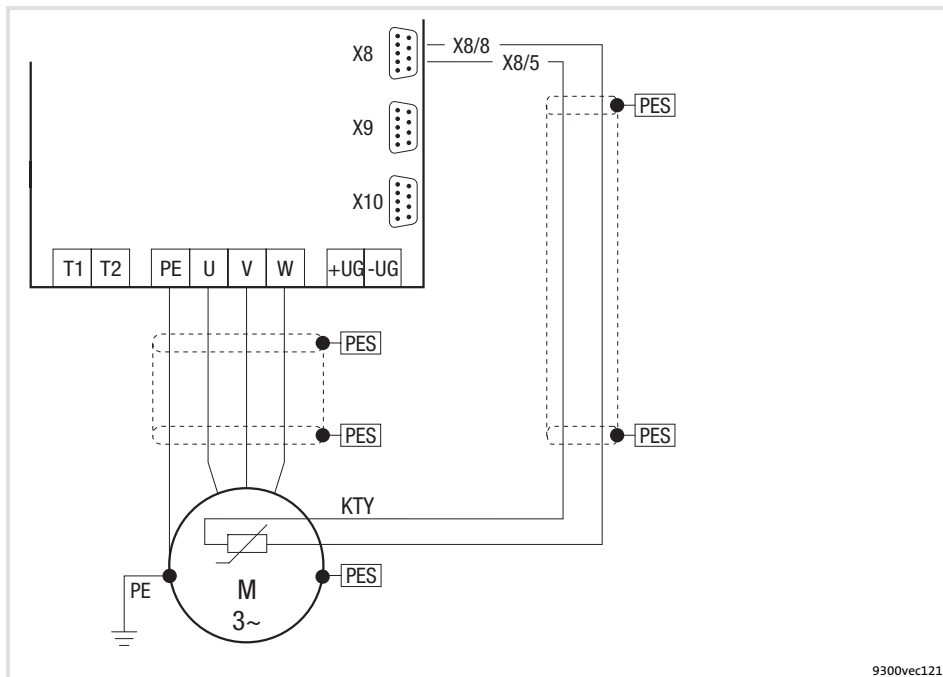


Fig. 5.4-8 Connection of KTY thermal sensor at incremental encoder input X8

Characteristics of the connection for motor temperature monitoring:

Pins X8/5, X8/8 of incremental encoder input (X8)

Connection	Linear KTY thermal sensor
Tripping point	• Warning: Adjustable • Error (TRIP): Fixed at 150 °C
Notes	• Monitoring is not active in the Lenze setting. • The KTY thermal sensor is monitored with regard to interruption and short circuit.

5.5 Basic devices in the power range 250 ... 400 kW

5.5.1 Wiring according to EMC (CE-typical drive system)

The drives comply with the EC Directive on "Electromagnetic Compatibility" if they are installed in accordance with the specifications for the CE-typical drive system. The user is responsible for the compliance of the machine application with the EC Directive.



Note!

Observe the notes given in the chapter "Basics for wiring according to EMC"!

5.5
5.5.1



Fig. 5.5-1

F1 ... F3, F4 ... F6	Fuses
K10	Mains contactor
Z1, Z2	Motor choke
Z3, Z4	Brake resistor
Z5	Programmable logic controller (PLC)
S1	Mains contactor on
S2	Mains contactor off
+U _G , -U _G	DC-bus connection
PES	HF shield termination through large-surface connection to PE

5.5.2 Master and slave connection

Important notes



Danger!

Danger of personal injury! Destruction of the controller!

Damaged control cables in the controller (master and slave) may cause a faulty control of the output stage.

Possible consequences:

- ▶ When switching on the mains voltage, high energies may discharge like an explosion.
- ▶ Explosive noises may damage your hearing. A shock by an unexpected and loud explosion may cause distress.
- ▶ The controller will be destroyed.

Protective measures:

- ▶ When working with the DC busbars, make sure that you do not damage any internal connectors and cables.
- ▶ Before attaching the cover again:
 - Check all plugs selected in Fig. 5.5-5 for damage and correct fit.
 - Check all cables involved for damages.
 - If the plugs do not fit correctly, or the plugs or cables are damaged, commissioning is prohibited. Contact the Lenze service.

Preliminary work

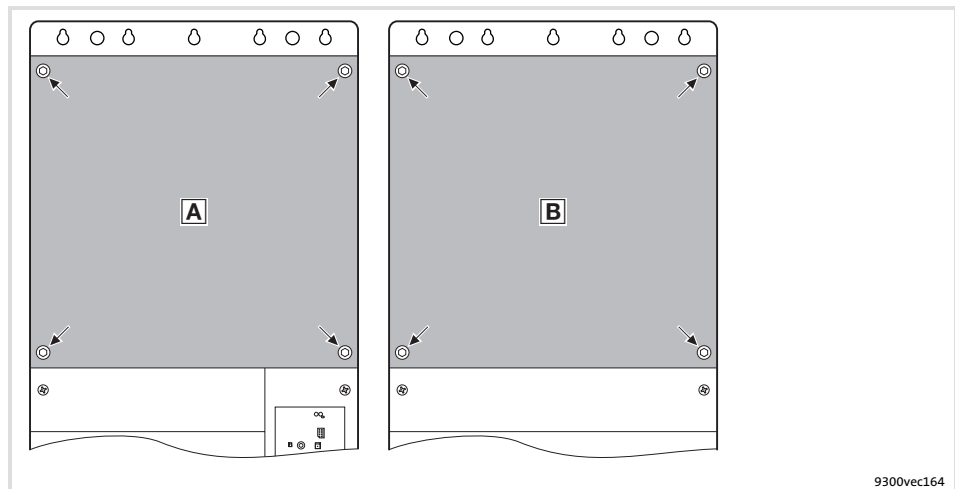


Fig. 5.5-2 Fastening the covers to the master and slave

- ▶ Remove the upper cover from the master **A** and the slave **B** to access the power sections. Each cover is fastened with 4 screws.

Installation of the DC busbars

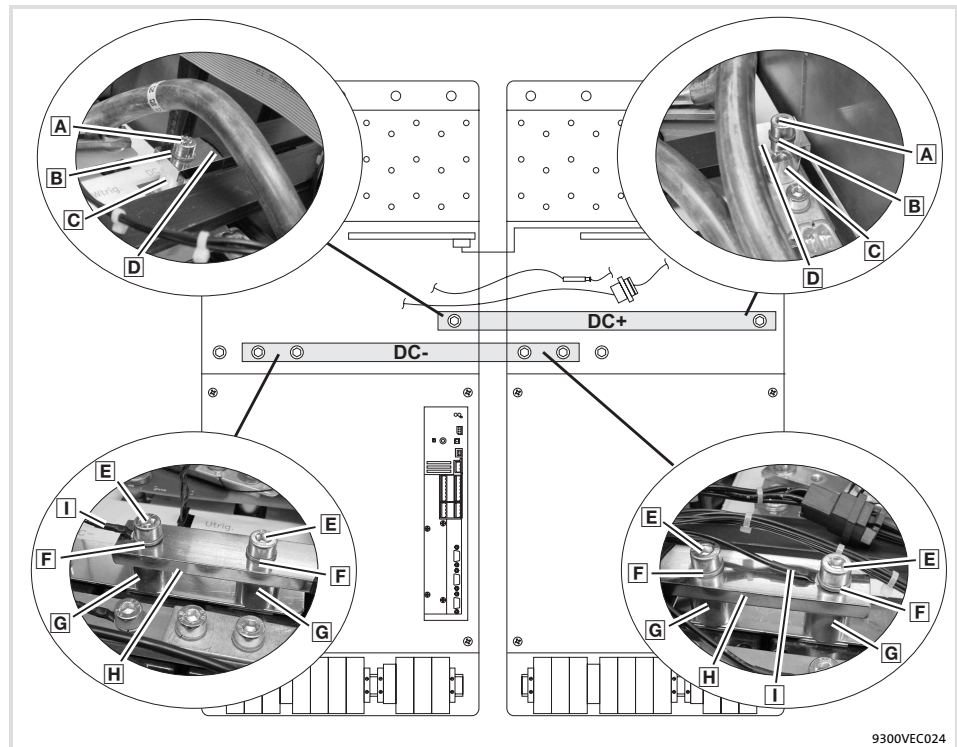


Fig. 5.5-3 Mounting of +DC/-DC busbars

How to mount the DC busbars

1. Mount +DC busbar **D** :
 - Remove hexagon socket screws M8 **A**.
 - Position the DC busbar in the master and the slave.
 - Fasten the DC busbar in the master and the slave with 1 hexagon socket screw M8 × 45 mm **A**, 1 plain washer **B** and 1 distance sleeve **C** each.
 - Tighten the hexagon socket screws **A** (tightening torque: 10.9 Nm).
2. Mount -DC busbar **H** :
 - Remove hexagon socket screws M8 **E**.
 - Put both connecting cables **I** aside.
 - Position the DC busbar in the master and the slave.
 - Insert 2 hexagon socket screws M8 × 45 mm **E** each with plain washers **F** into the bore holes of the DC busbar, finally passing them through the distance sleeves **G**.
 - Screw the hexagon socket screws **E** into the threaded holes in the master and slave.
 - Lay the connecting cable **I** in the master and slave with cable lug between the busbar **H** and plain washer **F**.
 - Tighten the hexagon socket screws **E** (tightening torque: 10.9 Nm).

Connection of the control cables between master and slave

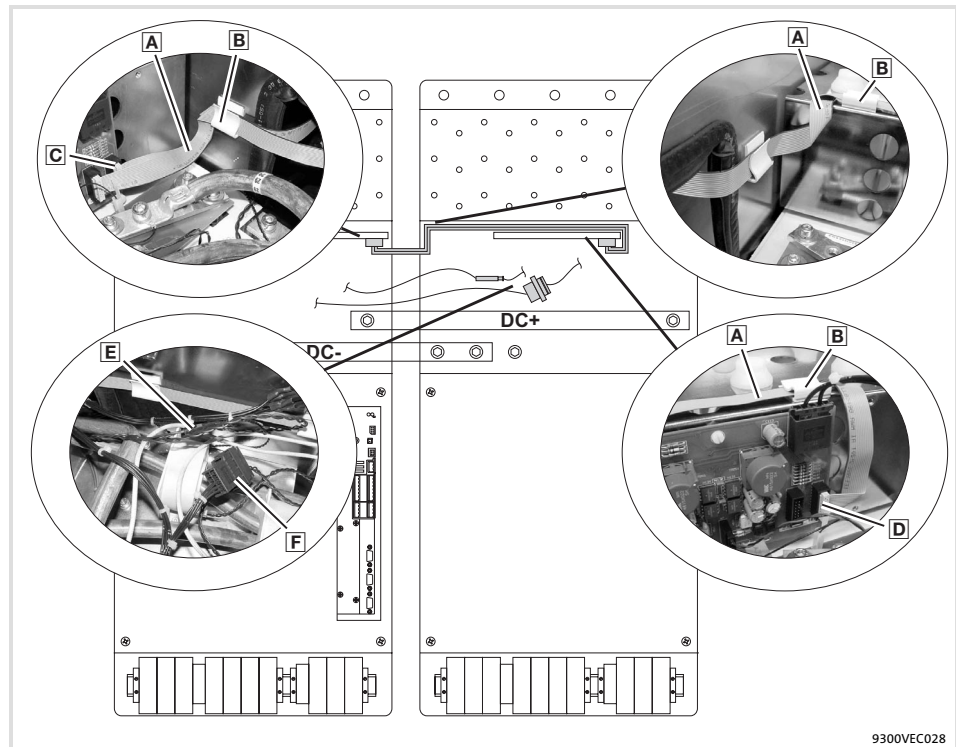


Fig. 5.5-4 Connection of the control cables between master and slave

How to connect the control cables

1. Installation and connection of the ribbon cable **A**:
By default the ribbon cable is inside the master. The plug **C** is already attached to the Drive Board.
 - Route the ribbon cable from the master to the Drive Board connection in the slave, inserting the ribbon cable into the cable ducts **B**.
 - Plug the ribbon cable plug **A** into the socket **D** at the Drive Board.
2. Laying and connecting 2-core cables with plugs **E**:
By default the cable is inside the master. The corresponding cable with socket is in the slave.
 - Lay the two-core cable from the master to the socket in the slave.
 - Connect the 2-pole plug with the 2-pole socket in the slave.
3. Laying and connecting 10-core cables with plugs **F**:
By default the cable is inside the master. The corresponding cable with socket is in the slave.
 - Lay the two-core cable from the master to the socket in the slave.
 - Connect the 10-pole plug with the 10-pole socket in the slave.

Final works

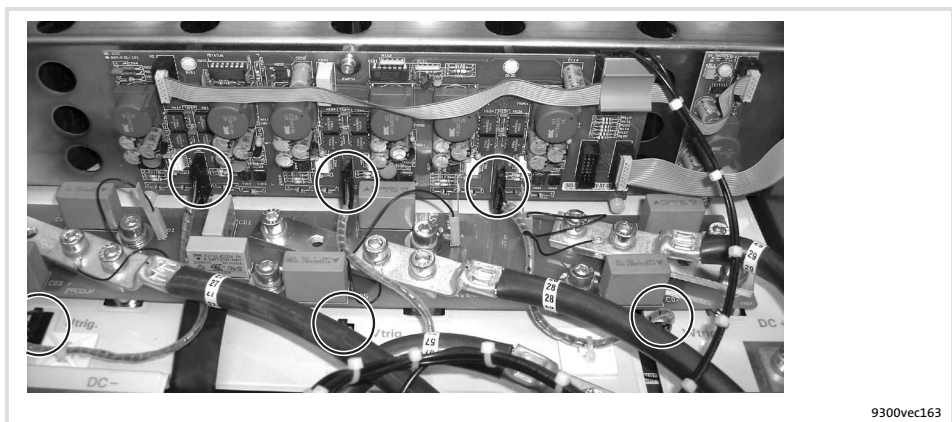


Fig. 5.5-5 Control cables in the master and slave

1. Check the control cables (plugs and cables) for correct fit and possible damages. (O)
 - If the plugs do not fit correctly, or the plugs or cables are damaged, commissioning is prohibited. Contact the Lenze service.

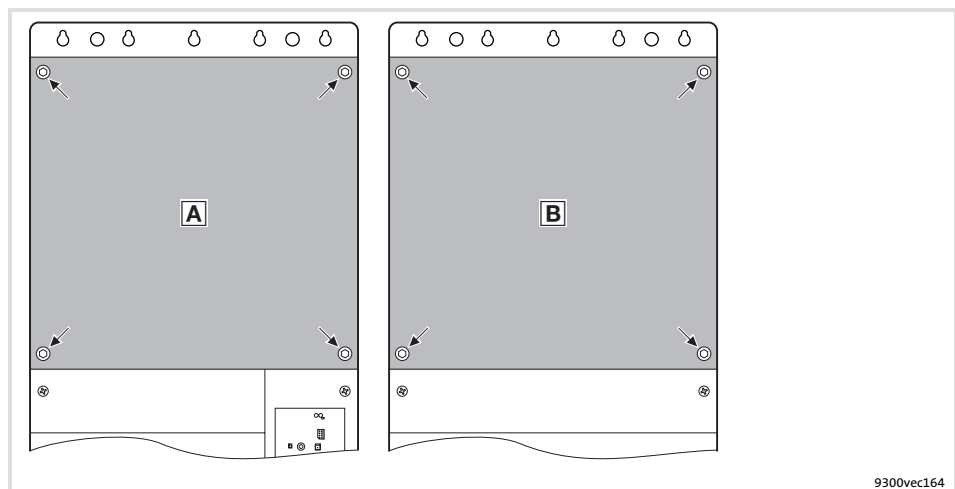


Fig. 5.5-6 Fastening the covers to the master and slave

2. Close the housings using the covers **A** **B**. Fasten the covers with 4 screws each.

5.5.3 Mains connection 400 V devices



Stop!

The user is responsible for sufficient strain relief!

► Both, the master **and** the slave must be supplied!

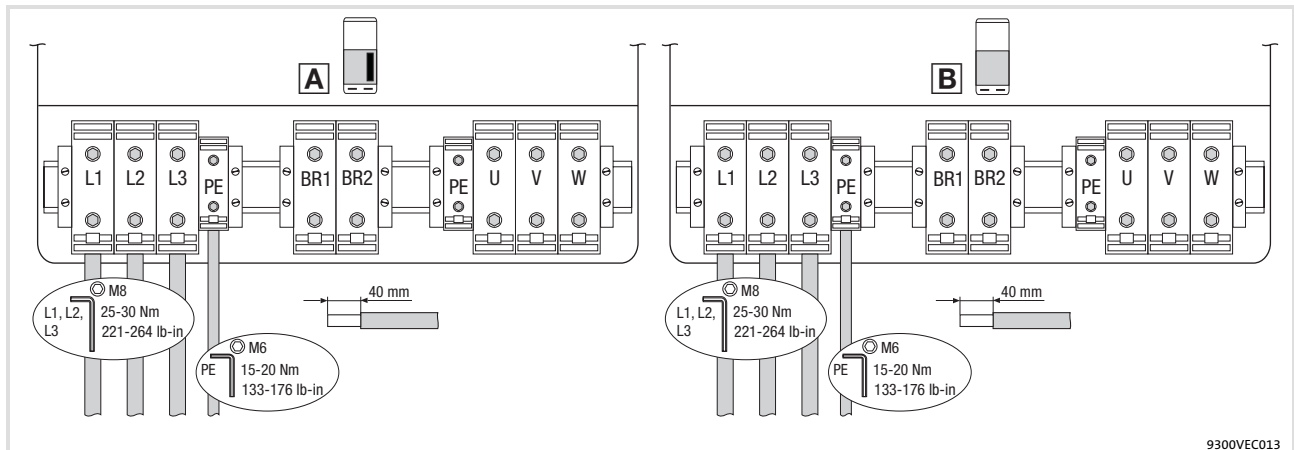


Fig. 5.5-7

Mains connection example

BR1, BR2

Brake resistors can only be operated with variants V060 and V110

A

Master terminals

B

Slave terminals

5.5.4 Mains connection 400/500 V devices



Stop!

The user is responsible for sufficient strain relief!

► Both, the master **and** the slave must be supplied!

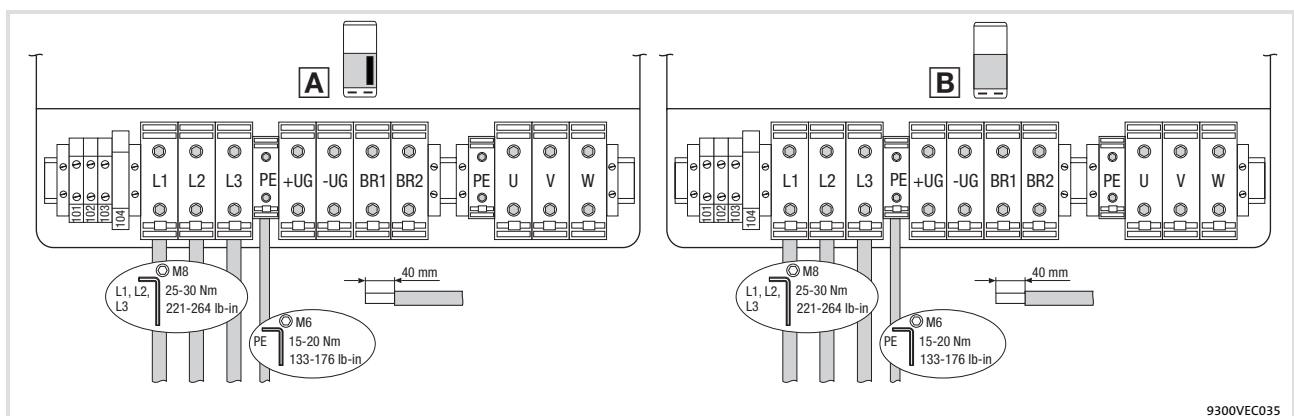


Fig. 5.5-8

Mains connection example

BR1, BR2

Brake resistors can only be operated with variants V270 and V300

A

Master terminals

B

Slave terminals

5.5.5 DC supply 400/500 V devices



Stop!

The user is responsible for sufficient strain relief!

- For compliance with EMC requirements, Lenze recommends to use shielded DC-bus cables.
- Shield clamps are not included in the scope of supply.
- Both, the master **and** the slave must be supplied!

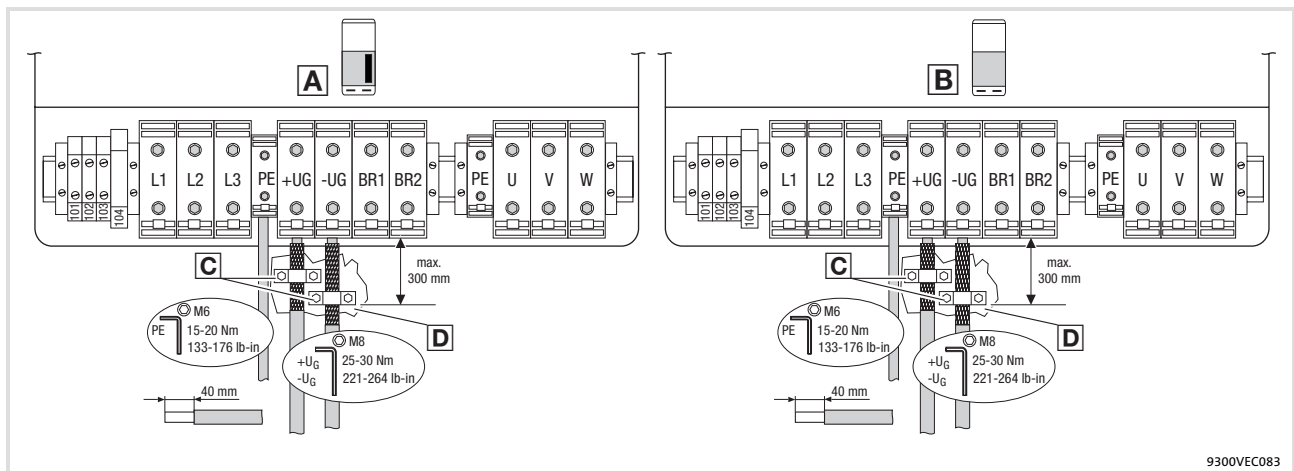


Fig. 5.5-9 Connection example to +UG and -UG

- BR1, BR2 Brake resistors can only be operated with variants V270 and V300
- A** Master terminals
 - B** Slave terminals
 - C** Connect the DC-bus cable shield to the conductive control cabinet mounting plate with a contact surface as large as possible by using the shield clamps.
 - D** Conductive surface
Ensure to have the poles right!

5.5.6 Fan connection 400/500 V devices



Note!

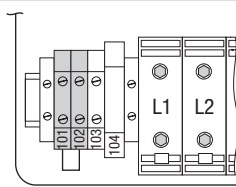
Connect the fan to the master **and** the slave.

Fan connection when controller is supplied with mains voltage

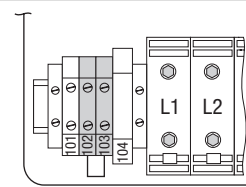
Lay a bridge between the terminals when a controller is operated on a mains.

AC 340 ... 440 V

AC 440 ... 577 V
(when being delivered)



9300vec044



9300vec045

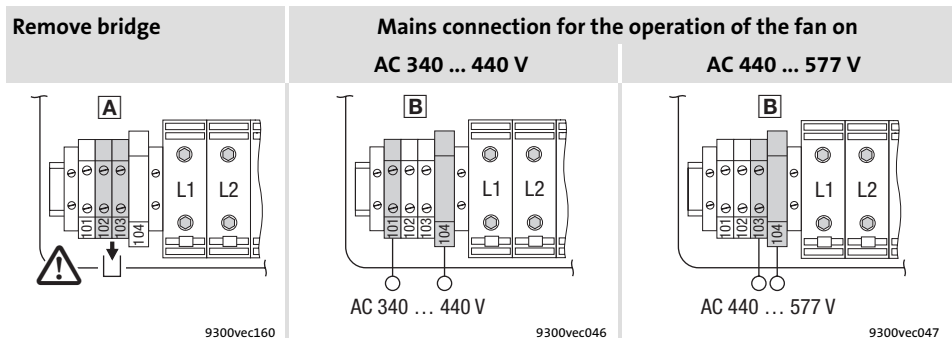
Fan connection when controller is supplied via the DC bus



Danger!

When the fan is externally supplied with voltage, the terminal L2 carries dangerous mains voltage!

When the controller is supplied via the DC bus, the fan must be separately supplied with mains voltage (see [B]). In this case, the bridge between the terminals 102 and 103 must be removed (see [A]).



Exchange defect fuse

In case of an external voltage supply the fan is protected by a fuse integrated in terminal 104.

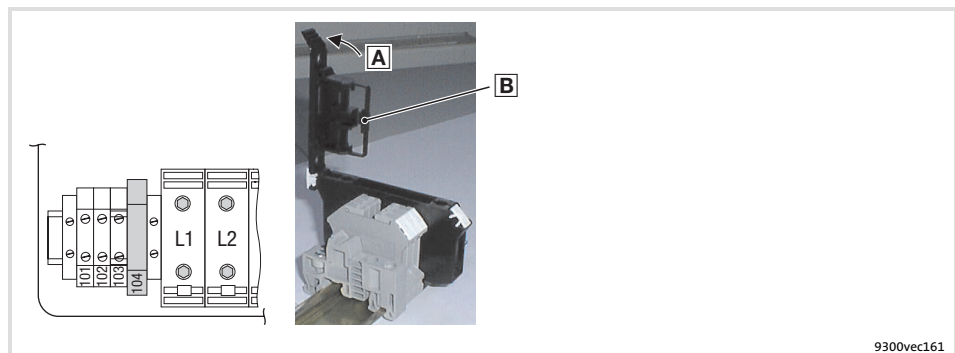


Fig. 5.5-10 Fusing of the fan

- [A] Open the fuse holder.
- [B] Remove the defect fuse from the support and replace it by the following type:
 Type: 500V SA 2A 6.32
 Ref. no.: P098131
 Manufacturer: Ferraz Shawmut

5.5.7 Fuses and cable cross-sections

Installation in accordance
with EN 60204-1

Supply conditions	
Range	Description
Fuses	Utilisation category: only gG/gL or gRL
Cables	Laying systems B2 and C: Use of PVC-insulated copper cables, conductor temperature < 70 °C, ambient temperature < 40 °C, no bundling of the cables or cores, three loaded cores. The data are recommendations. Other dimensionings/laying systems are possible (e.g. in accordance with VDE 0298-4).
RCCB	- Controllers can cause a DC current in the PE conductor. If a residual current device (RCD) or a fault current monitoring unit (RCM) is used for protection in the case of direct or indirect contact, only one RCD/RCM of the following type can be used on the current supply side: - Type B (universal-current sensitive) for connection to a three-phase system - Type A (pulse-current sensitive) or type B (universal-current sensitive) for connection to a 1-phase system Alternatively another protective measure can be used, like for instance isolation from the environment by means of double or reinforced insulation, or isolation from the supply system by using a transformer. - Earth-leakage circuit breakers must only be installed between mains supply and controller.

Observe all national and regional regulations!

Fuses and cable cross-sections
for the mains connection

9300		Fuse	Cable cross-section		FI ¹⁾
		Rated fuse current	Laying system F		
Type		[A]	L1, L2, L3 [mm ²]	PE [mm ²]	[mA]
EVF9381-EV EVF9381-EVVxxx	Slave	315	150 2 × 50 ¹⁾	95	300
EVF9382-EV EVF9382-EVVxxx	Master	315	150 2 × 50 ¹⁾	95	300
	Slave	315	150 2 × 50 ¹⁾	95	300
EVF9383-EV EVF9383-EVVxxx	Master	400	240 2 × 95 ¹⁾	150	300
	Slave	400	240 2 × 95 ¹⁾	150	300

¹⁾ Two conductors per path; both conductors must have the same cross-section

²⁾ Universal current-sensitive earth-leakage circuit breaker

Fuses and cable cross-sections
for DC-bus connection

9300		Fuse		Cable cross-section	
		Quantity	Rated fuse current	Laying system F	
Type			[A]	+U _G , -U _G [mm ²]	PE [mm ²]
EVF9381-EVV2xx	Master	1	400	2 × 50 ¹⁾	95
EVF9381-EVV300	Slave	1	400	2 × 50 ¹⁾	95
EVF9382-EVV2xx	Master	2	350	2 × 95 ¹⁾	95
EVF9382-EVV300	Slave	2	350	2 × 95 ¹⁾	95
EVF9383-EVV2xx	Master	2	400	2 × 95 ¹⁾	150
EVF9383-EVV300	Slave	2	400	2 × 95 ¹⁾	150

¹⁾ Two conductors per path; both conductors must have the same cross-section

5.5.8 Motor connection

- To comply with the EMC regulations, Lenze recommends to use shielded motor cables.
- Shield clamps are not included in the scope of supply.



Stop!

The user is responsible for sufficient strain relief!

Parallel connection of master and slave (motor side)

In order to connect the motor cables of master and slave to the motor, the outputs must be connected in parallel.

It is important for the parallel connection of the inverter outputs that the outputs are decoupled by means of an inductance between master and slave. The length of the motor cables determine whether the inductance of the cables is sufficient for a decoupling.

2 motor connections ensure sufficient decoupling.

► Decoupling via motor chokes

If the single motor cable length is ≤ 10 m, master and slave must be connected in parallel via chokes on the motor side to achieve a sufficient decoupling between master and slave.

► Decoupling via motor cables

If the single motor cable length is > 10 m, the motor cables of master and slave can be connected in parallel at the motor to achieve a sufficient decoupling between master and slave.

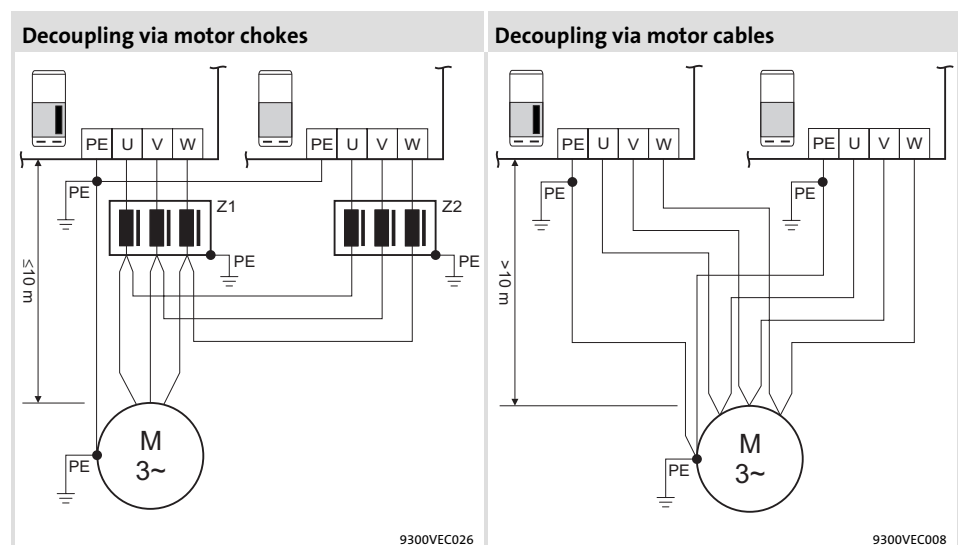


Fig. 5.5-11 Variants for parallel connection of master and slave (motor side)

Z1, Z2 Motor choke
ELM3-0003H275
ELM3-0002H320
ELM3-0002H410

for controller
EVF9381
EVF9382
EVF9383

Motor connection

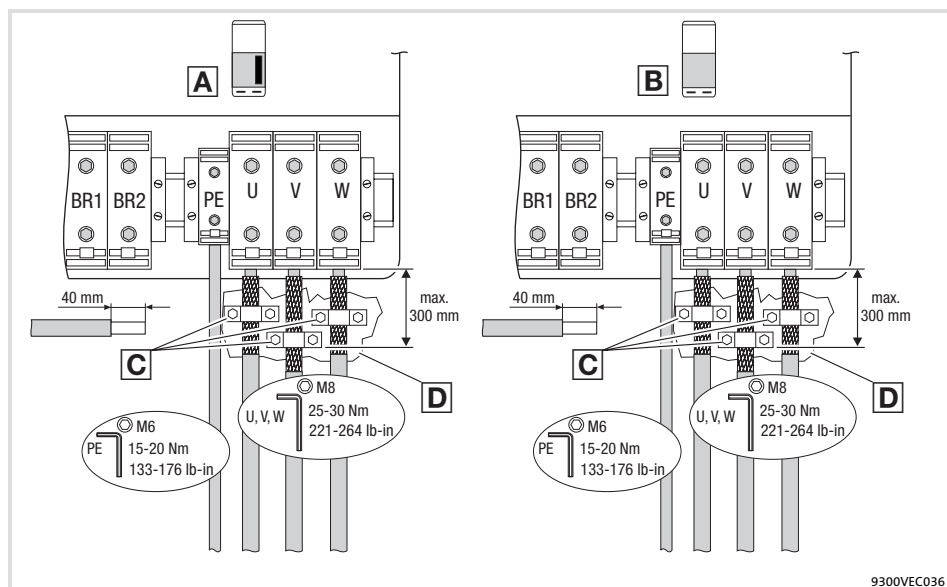


Fig. 5.5-12 Motor connection example

BR1, BR2 Brake resistors can only be operated with variants V060, V110, V270 and V300

- A** Master terminals
 - B** Slave terminals
 - C** Connect the motor cable shield with a surface as large as possible to the control cabinet mounting plate by using the clamps.
 - D** Conductive surface
- Ensure to have the poles right!
Do not exceed the maximum motor cable length!

Cable cross-section

9300 vector	Installation in accordance with EN 60204-1			
	U, V, W		PE	
	[mm ²]		[mm ²]	
Type	Master	Slave	Master	Slave
EVF9381-EV	150	150	95	95
EVF9381-EVVxxx	2 × 50 ¹⁾	2 × 50 ¹⁾		
EVF9382-EV	150	150	95	95
EVF9382-EVVxxx	2 × 50 ¹⁾	2 × 50 ¹⁾		
EVF9383-EV	240	240	150	150
EVF9383-EVVxxx	2 × 95 ¹⁾	2 × 95 ¹⁾		

¹⁾ Two conductors per path; both conductors must have the same cross-section

Observe the national and regional legislation

5.5.9 Wiring of motor temperature monitoring

The drive controller features 2 connections for motor temperature monitoring:

- ▶ Terminals T1, T2 for connecting a PTC thermistor or thermal contact (NC contact).
- ▶ Pin X8/5 and X8/8 of the incremental encoder input (X8) for connecting a KTY thermal sensor.

Motor with PTC thermistor or thermal contact (NC contact)

Wire T1, T2 only if the motor is equipped with a PTC thermistor or thermal contact (NC contact).

- An "open" cable acts like an antenna and can cause faults on the drive controller.



Danger!

- All control terminals only have basic insulation (single isolating distance) after connecting a PTC thermistor or a thermal contact.
- Protection against accidental contact in case of a defective isolating distance is only guaranteed through external measures, e.g. double insulation.

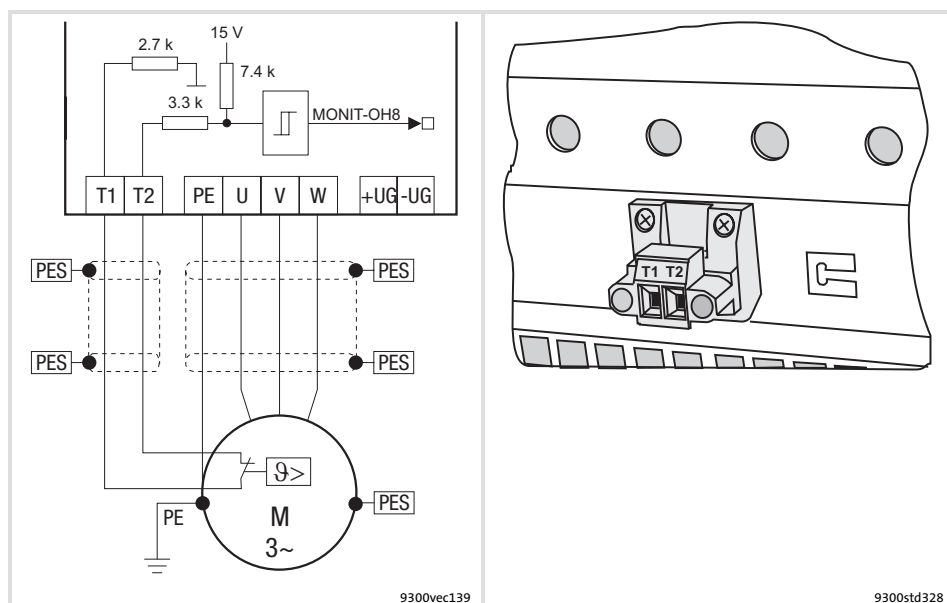


Fig. 5.5-13 Connection of PTC thermistor or thermal contact (NC contact) at T1, T2

Characteristics of the connection for motor temperature monitoring:

Terminals T1, T2	
Connection	• PTC thermistor – PTC thermistor with defined tripping temperature (acc. to DIN 44081 and DIN 44082) • Thermal contact (NC contact) – Thermostat as NC contact
Tripping point	• Fixed (depending on the PTC/thermal contact) • PTC: $R_{\theta} > 1600 \Omega$ • Configurable as warning or error (TRIP)
Notes	• Monitoring is not active in the Lenze setting. • If you do not use a Lenze motor, we recommend the use of a PTC thermistor up to 150°C.

Motor with KTY thermal sensor



Note!

- We recommend to use Lenze system cables for wiring.
- For self-made cables only use cables with shielded cores twisted in pairs.

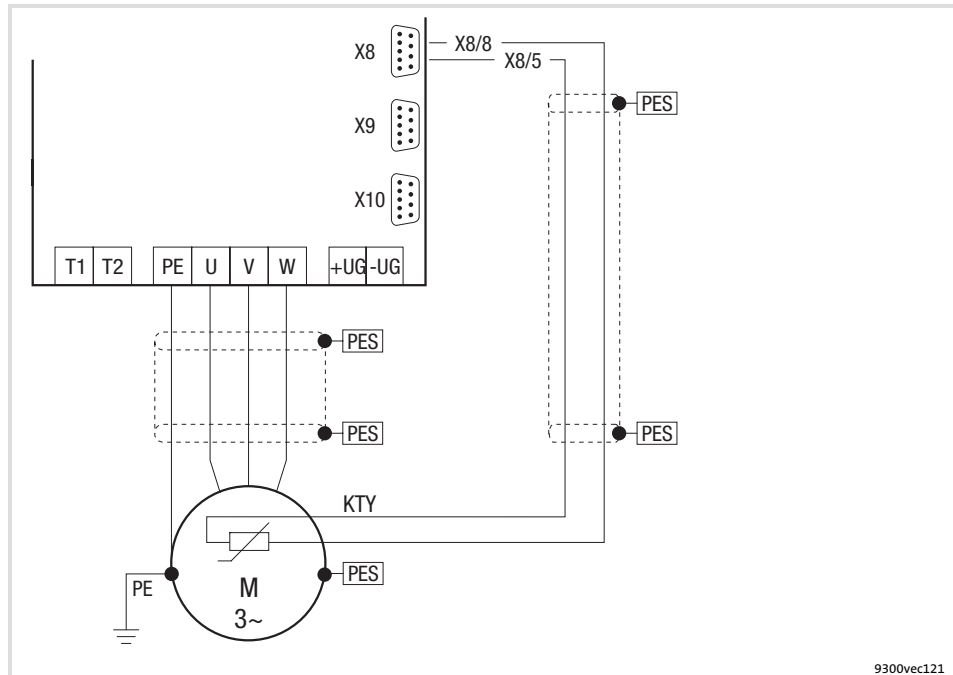


Fig. 5.5-14 Connection of KTY thermal sensor at incremental encoder input X8

Characteristics of the connection for motor temperature monitoring:

Pins X8/5, X8/8 of incremental encoder input (X8)

Connection	Linear KTY thermal sensor
Tripping point	• Warning: Adjustable • Error (TRIP): Fixed at 150 °C
Notes	• Monitoring is not active in the Lenze setting. • The KTY thermal sensor is monitored with regard to interruption and short circuit.

5.6 Control terminals

5.6.1 Important notes



Stop!

The control card will be damaged if

- ▶ the voltage between X5/39 and PE or X6/7 and PE is greater than 50 V,
- ▶ the voltage between voltage source and X6/7 exceeds 10 V (common mode) in case of supply via external voltage source.

Limit the voltage before switching on the drive controller:

- ▶ Connect X5/39, X6/2, X6/4 and X6/7 directly to PE or
- ▶ use voltage-limiting components.

- ▶ For trouble-free operation, the control cables must be shielded:
 - Connect the shield of digital input and output cables at both ends.
 - Connect the shield of analog input and output cables at one end (at the drive controller).
 - For lengths of 200 mm and more, use only shielded cables for analog and digital inputs and outputs. Under 200 mm, unshielded but twisted cables may be used.

How to connect the shield

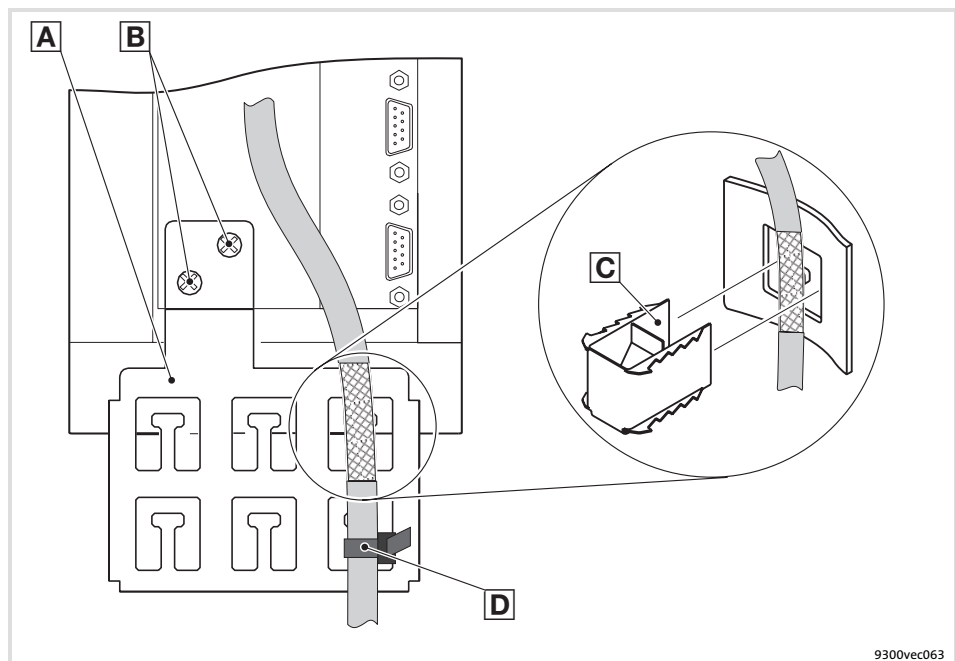


Fig. 5.6-1 Connection of the cable shield with shield clip and strain relief with cable binder

- A** Shield sheet
- B** Fasten shield sheet with two screws M4 × 12 mm at the bottom of the control card
- C** Connect cable shield with shield clip to the shield sheet
- D** Provide a strain relief of the control cable at the shield sheet by means of a cable binder

Terminal data



Stop!

- ▶ Connect or disconnect the terminal strips only if the controller is disconnected from the mains!
- ▶ Wire the terminal strips before connecting them!
- ▶ Unused terminal strips must also be plugged on to protect the contacts.

Cable type	Wire end ferrule	Maximum cable cross-section	Tightening torque	Stripping length
 Rigid	—	2.5 mm ² (AWG 14)	0.5 ... 0.6 Nm (4.4 ... 5.3 lb-in)	5 mm
 Flexible	Without wire end ferrule	2.5 mm ² (AWG 14)		
 Flexible	Wire end ferrule without plastic sleeve	2.5 mm ² (AWG 14)		
 Flexible	Wire end ferrule with plastic sleeve	2.5 mm ² (AWG 14)		

5.6.2 Connection terminal of the control card

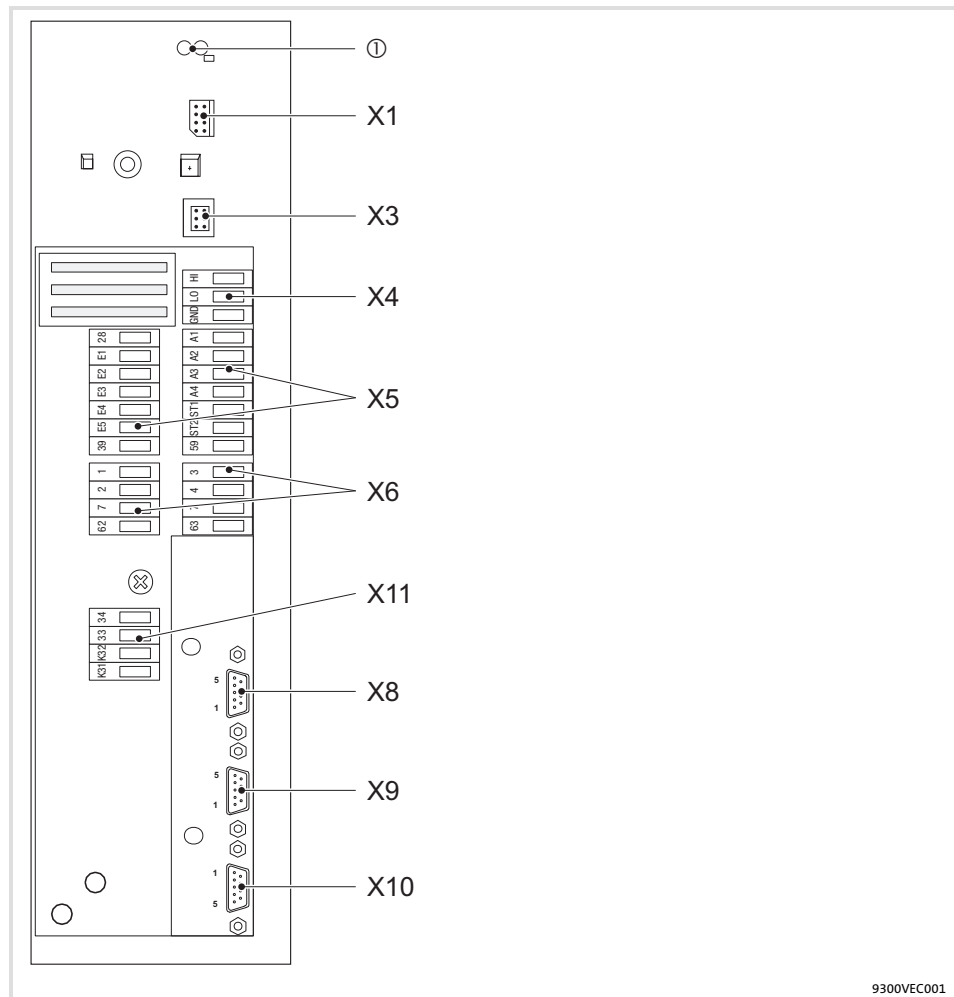


Fig. 5.6-2 Connection terminal of the control card

- ① 2 light-emitting diodes (red, green) for status display
- X1 Automation interface (AIF)
- X3 Slot for communication modules (e.g. keypad XT)
- X4 Preselection of signal type with jumper for input signal at X6/1, X6/2
- X5 Connection for system bus (CAN), terminal strip
- X6 Connection for digital inputs and outputs, terminal strips
- X6 Connection for analog inputs and outputs, terminal strips
- X8 Connection for incremental encoder connector: male, 9-pole, Sub-D
- X9 Connection for digital frequency input signal connector: male, 9-pole, Sub-D
- X10 Connection for digital frequency output signal connector: female, 9-pole, Sub-D
- X11 Connection for safety relay K_{SR} , terminal strip

5.6.3 With function "Safe torque off" active

Safety instructions for the installation of the "Safe torque off" function

- ▶ The installation and commissioning of the "Safe torque off" function must be carried out by skilled personnel only.
- ▶ All safety-relevant cables (e.g. control cable for the safety relay, feedback contact) outside the control cabinet must be protected, for instance by a cable duct. Short circuits between the single cables must be ruled out!
- ▶ Wiring of the safety relay K_{SR} with insulated wire end ferrules or rigid cables is absolutely vital.
- ▶ The electrical reference point for the coil of the safety relay K_{SR} must be connected with the protective conductor system (DIN EN 60204-1 paragraph 9.4.3). Only this measure guarantees that the operation is protected against earth faults.



Tip!

A complete description can be found in the chapter "Safe torque off".

Supply via internal voltage source

- If a freely assignable digital output (e.g. X5/A1) is assigned permanently to HIGH level, it serves as an internal voltage source. Every output has a maximum load capacity of 50 mA.
 - The relay K_{SR} and two digital inputs (X5/28 and e.g. X5/E1) can be supplied with voltage via a digital output.
 - Two digital outputs must be connected in parallel and assigned permanently to HIGH level in order to obtain the maximum wiring (relays K_{SR} and X5/E1 ... X5/E5, X5/ST1).
- For the supply of the analog inputs (X6/1, X6/2 and X6/3, X6/4) you have to set a freely assignable analog output (e.g. X6/63) permanently to HIGH level.

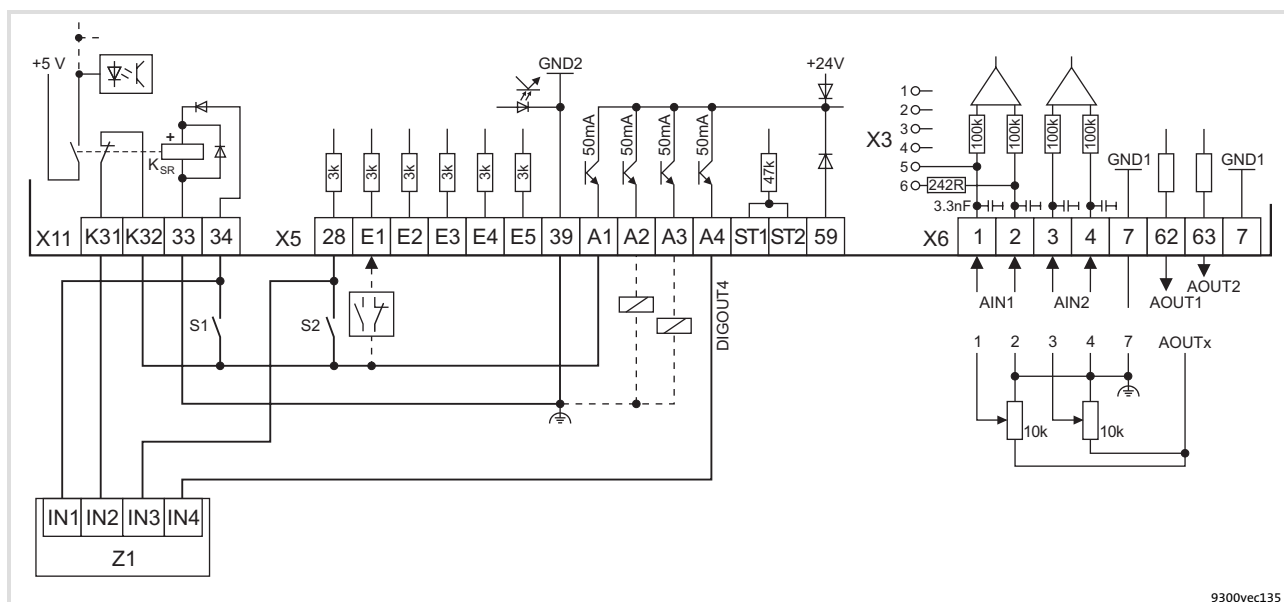


Fig. 5.6-3 Wiring of digital and analog inputs/outputs with active "Safe torque off" function and internal voltage source

- S1 Deactivate pulse inhibit (1st disconnecting path)
- S2 Enable controller (2nd disconnecting path)
- Z1 Programmable logic controller (PLC)
The PLC monitors the "Safe torque off" function
- X5/A4 Feedback via a digital output (e.g. DIGOUT4)
- NO contact or NC contact
- Load
- Minimum wiring required for operation
- Terminal assignment in the Lenze setting: 5.6-9



Note!

If you load a basic configuration C0005 = xx1x (e.g. 1010 for speed control with control via terminals), the following terminals are switched to a fixed signal level:

- Terminal X5/A1 to FIXED1 (corresponds to DC 24 V).
- Terminal X6/63 to FIXED100% (corresponds to 10 V).

5.6 Control terminals

5.6.3 With function "Safe torque off" active

Supply via external voltage source

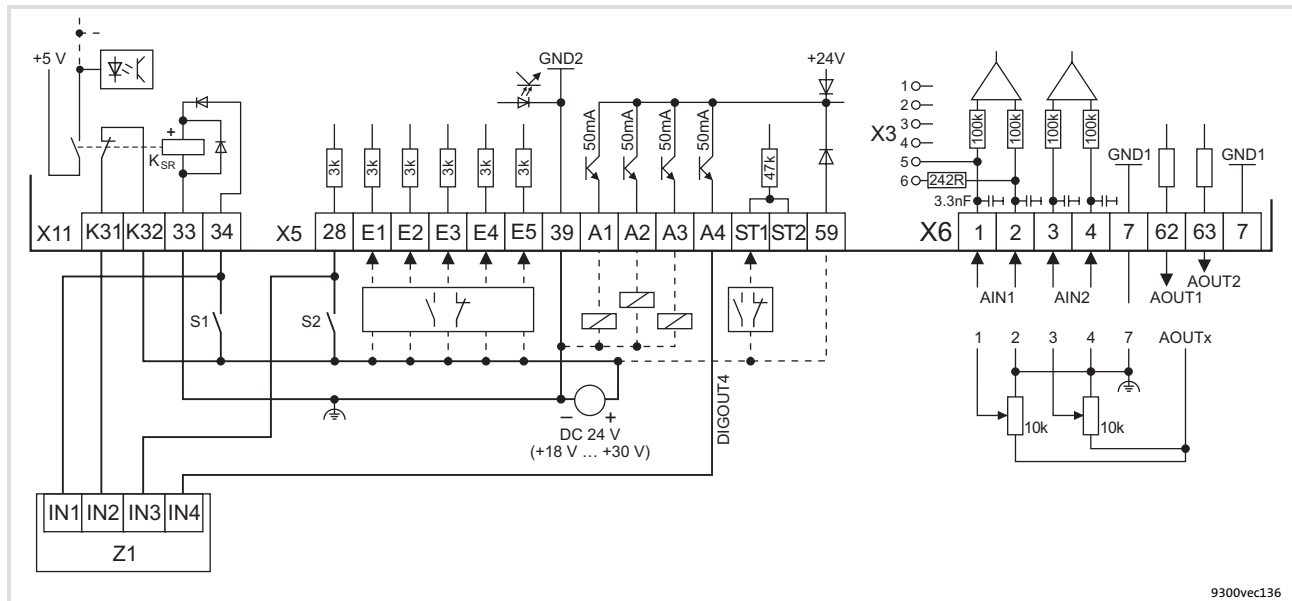


Fig. 5.6-4 Wiring of digital and analog inputs/outputs with active "Safe torque off" function and external voltage source

- S1 Deactivate pulse inhibit (1st disconnecting path)
- S2 Enable controller (2nd disconnecting path)
- Z1 Programmable logic controller (PLC)
The PLC monitors the "Safe torque off" function
- X5/A4 Feedback via a digital output (e. g. DIGOUT4)
- NO contact or NC contact
- Load
- Minimum wiring required for operation
- Terminal assignment in the Lenze setting: 5.6-9



Note!

Supplying the digital inputs via an external voltage source enables a **backup operation in the case of mains failure**. After switching off the mains voltage, all actual values are continued to be detected and processed.

- Connect the positive pole of the external voltage source with X5/59 to establish the backup operation in the event of mains failure.
- The external voltage source must be able to supply a current ≥ 1 A.
- The starting current of the external voltage source is not limited by the controller. Lenze recommends the use of voltage sources with current limitation or with an internal impedance of $Z > 1 \Omega$.

5.6.4 With function "Safe torque off" deactivated



Note!

If the function "Safe torque off" is not made use of, the safety relay K_{SR} must be energised permanently to ensure the tension supply of the power output stage.

Supply via internal voltage source

- If a freely assignable digital output (e.g. X5/A1) is assigned permanently to HIGH level, it serves as an internal voltage source. Every output has a maximum load capacity of 50 mA.
 - The relay K_{SR} and two digital inputs (X5/28 and e.g. X5/E1) can be supplied with voltage via a digital output.
 - Two digital outputs must be connected in parallel and assigned permanently to HIGH level in order to obtain the maximum wiring (relays K_{SR} and X5/E1 ... X5/E5, X5/ST1).
- For the supply of the analog inputs (X6/1, X6/2 and X6/3, X6/4) you have to set a freely assignable analog output (e. g. X6/63) permanently to HIGH level.

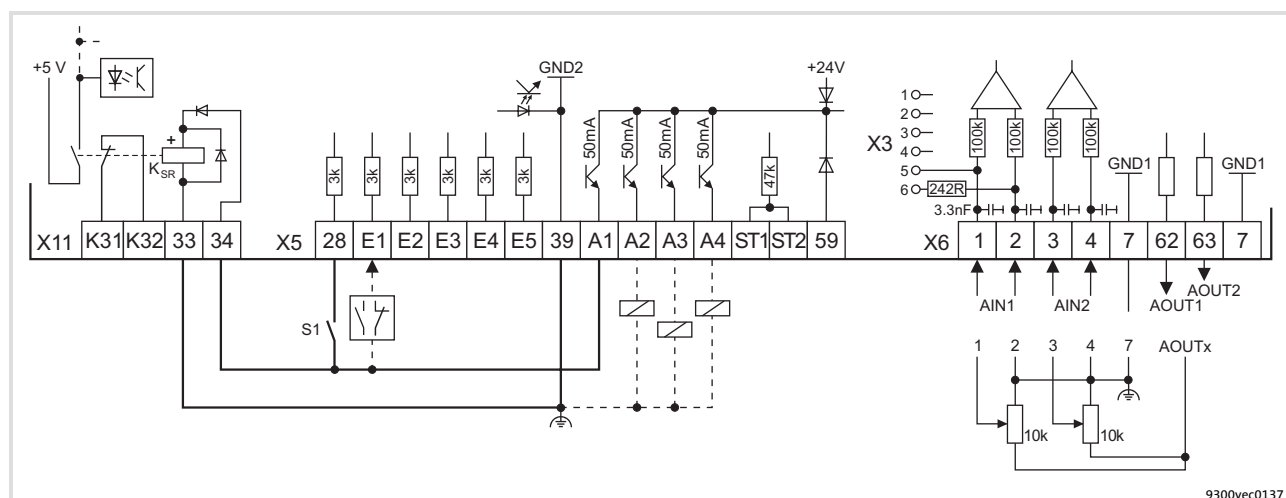


Fig. 5.6-5 Wiring of digital and analog inputs/outputs with function "Safe torque off" deactivated, given an internal voltage source

S1 Controller enable



NO contact or NC contact



Load

Minimum wiring required for operation

Terminal assignment in the Lenze setting: 5.6-9



Note!

If you load a basic configuration C0005 = xx1x (e.g. 1010 for speed control with control via terminals), the following terminals are switched to a fixed signal level:

- Terminal X5/A1 to FIXED1 (corresponds to DC 24 V).
- Terminal X6/63 to FIXED100% (corresponds to 10 V).

5.6 Control terminals
 5.6.4 With function "Safe torque off" deactivated

Supply via external voltage source

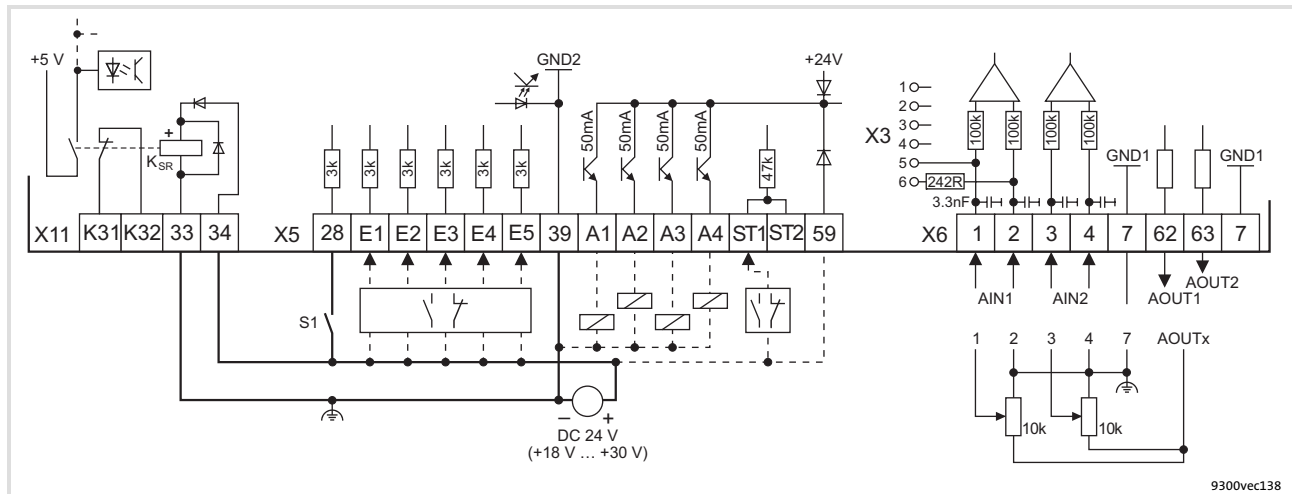


Fig. 5.6-6 Wiring of digital and analog inputs/outputs with function "Safe torque off" deactivated, given an external voltage source

- S1 Controller enable
 NO contact or NC contact
 Load
 — Minimum wiring required for operation
 Terminal assignment in the Lenze setting: 5.6-9

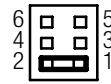


Note!

Supplying the digital inputs via an external voltage source enables a **backup operation in the case of mains failure**. After switching off the mains voltage, all actual values are continued to be detected and processed.

- Connect the positive pole of the external voltage source with X5/59 to establish the backup operation in the event of mains failure.
- The external voltage source must be able to supply a current ≥ 1 A.
- The starting current of the external voltage source is not limited by the controller. Lenze recommends the use of voltage sources with current limitation or with an internal impedance of $Z > 1 \Omega$.

5.6.5 Terminal assignment

Terminal		Function Bold print = Lenze setting		Level / state	Technical data
X11/K32 X11/K31	Safety relay K _{SR} 1st disconnecting path	Feedback - pulse inhibit		Open contact: Pulse inhibit is inactive (operation) Closed contact: Pulse inhibit is active	See chapter "Technical data"
X11/33		– coil of safety relay K _{SR}		Coil is not carrying any current: Active pulse inhibit	
X11/34		+ coil of safety relay K _{SR}		Coil is carrying current: Inactive pulse inhibit (operation)	
X5/28	Controller inhibit (DCTRL-CINH) 2nd disconnecting path	Controller enable/inhibit		LOW: Controller inhibited HIGH: Controller enabled	LOW: 0 ... +3 V HIGH: +12 ... +30 V Input current at +24 V: 8 mA per input
X5/E1	Digital inputs (freely assignable)	Deactivate CW rotation / quick stop		HIGH	Reading and processing the input signals - 1/ms (mean value)
X5/E2		Deactivate CCW rotation / quick stop		HIGH	
X5/E3		Activate fixed frequency 1 (JOG1)		HIGH	
X5/E4		Set error message (TRIP SET)		LOW	
X5/E5		Reset error message (TRIP RESET)		LOW-HIGH edge	
X5/ST1 X5/ST2		Additional digital input (E6)		HIGH	
X5/A1	Digital outputs (freely assignable)	Error message present		LOW	LOW: 0 ... +3 V HIGH: +12 ... +30 V
X5/A2		Switching threshold Q_{MIN}: Actual speed < setpoint speed in C0017		LOW	Load capacity: Max. 50 mA per output (load resistance at least 480 Ω at +24 V)
X5/A3		Ready for operation (DCTRL-RDY)		HIGH	
X5/A4		Maximum current reached (DCTRL-IMAX)		HIGH	Update of the output signals - 1/ms
X5/39	–	GND2, reference potential for digital signals		–	Isolated against GND1
X5/59	–	Connection of external voltage source for backup operation of the drive controller in case of mains failure		DC 24 V (+18 ... +30 V)	Current consumption: Max. 1 A at 24 V
X6/1 X6/2	Analog input 1	Voltage input range Main setpoint	 Jumper X3	-10 V ... +10 V	Resolution: 5 mV (11 bits + sign)
		Current input range	 Jumper X3	-20 mA ... +20 mA	Resolution: 20 µA (10 bits + sign)
X6/3 X6/4	Analog input 2	Voltage input range Not active	Jumper X3 has no effect	-10 V ... +10 V	Resolution: 5 mV (11 bits + sign)
X6/62	Analog output 1	Monitor 1 Actual speed value		-10 V ... +10 V max. 2 mA	Resolution: 20 mV (9 bits + sign)
X6/63	Analog output 2	Monitor 2 Actual motor current value		-10 V ... +10 V max. 2 mA	Resolution: 20 mV (9 bits + sign)
X6/7	–	GND1, reference potential for analog signals		–	–

5.7

Wiring of the system bus (CAN)

Wiring

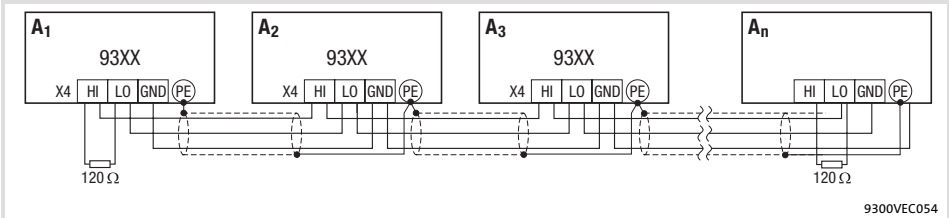


Fig. 5.7-1 System bus (CAN) wiring

A₁

Bus device 1 (controller)

A₂

Bus device 2 (controller)

A₃

Bus device 3 (controller)

A_n

Bus device n (e. g. PLC), n = max. 63

X4/GND

CAN-GND: System bus reference potential

X4/LO

CAN-LOW: System bus LOW (data line)

X4/HI

CAN-HIGH: System bus HIGH (data line)



Stop!

Connect a 120 Ω terminating resistor to the first and last bus device.

We recommend the use of CAN cables in accordance with ISO 11898-2:

CAN cable in accordance with ISO 11898-2	
Cable type	Paired with shielding
Impedance	120 Ω (95 ... 140 Ω)
Cable resistance/cross-section	
Cable length ≤ 300 m	
≤ 70 mΩ/m / 0.25 ... 0.34 mm ² (AWG22)	
Cable length 301 ... 1000 m	
≤ 40 mΩ/m / 0.5 mm ² (AWG20)	
Signal propagation delay	≤ 5 ns/m

5.8 Wiring of the feedback system

5.8.1 Important notes

- ▶ An incremental encoder can be connected to input X8 or input X9:
 - Incremental encoders with TTL level are connected to X8.
 - Incremental encoders with HTL level are connected to X9.
- ▶ The incremental encoder signal can be output for slave drives at the digital frequency output X10.



Note!

- ▶ We recommend to use Lenze system cables for wiring.
- ▶ For self-made cables only use cables with shielded cores twisted in pairs.

Installation material required from the scope of supply:

Description	Use	Quantity
Protective cover	Protection for unused Sub-D connections	4

5.8.2
Incremental encoder with TTL level at X8

Technical data

Field	Values
Connection at drive controller	Connector: Pin, 9-pole, Sub-D
Connectable incremental encoder	Incremental encoder with TTL level - Encoder with two 5 V complementary signals electrically offset by 90° - Connection of zero track is possible (optional)
Input frequency	0 ... 500 kHz
Current consumption	6 mA per channel
Internal voltage source (X8/4, X8/5)	5 V DC / max. 200 mA

Wiring

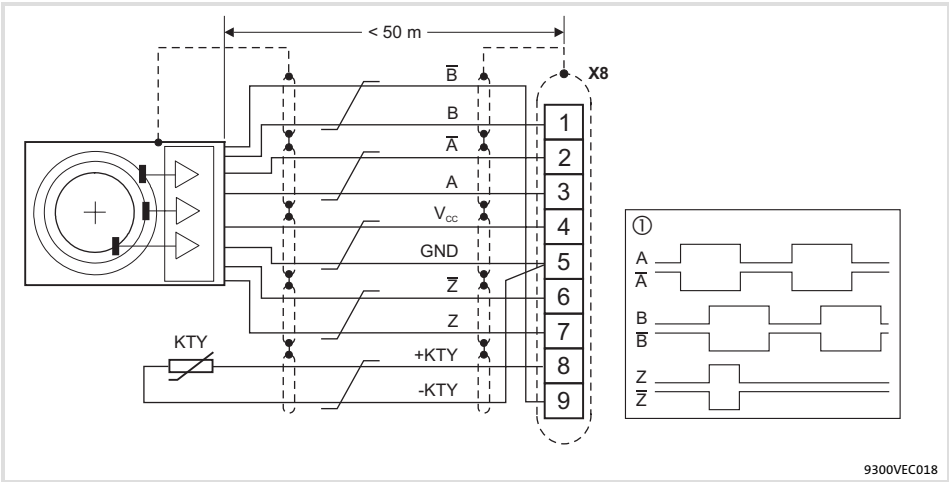


Fig. 5.8-1
Connection of incremental encoder with TTL level (RS-422)

- ① Signals for CW rotation
- / Cores twisted in pairs

X8 - Incremental encoder with TTL level									
Connector: Pin, 9-pole, Sub-D									
Pin	1	2	3	4	5	6	7	8	9
Signal	B	$\bar{A}$	A	V _{CC}	GND (-KTY)	$\bar{Z}$	Z	+KTY	$\bar{B}$
	0.14 mm ² (AWG 26)			1 mm ² (AWG 18)		0.14 mm ² (AWG 26)			

5.8.3 Incremental encoder with HTL level at X9

Technical data

Field	Values
Connection at drive controller	Connector: Pin, 9-pole, Sub-D
Connectable incremental encoder	Incremental encoder with HTL-level - Two-track with inverse signals and zero track - Two-track without inverse signals and zero track
Input frequency	0 ... 200 kHz
Current consumption	5 mA per channel
Supply of incremental encoder	External voltage source
Internal voltage source (X9/4, X9/5)	5 V DC / max. 200 mA Total current at X9/4, X9/5 and X10/4, X10/5: max. 200 mA

Wiring

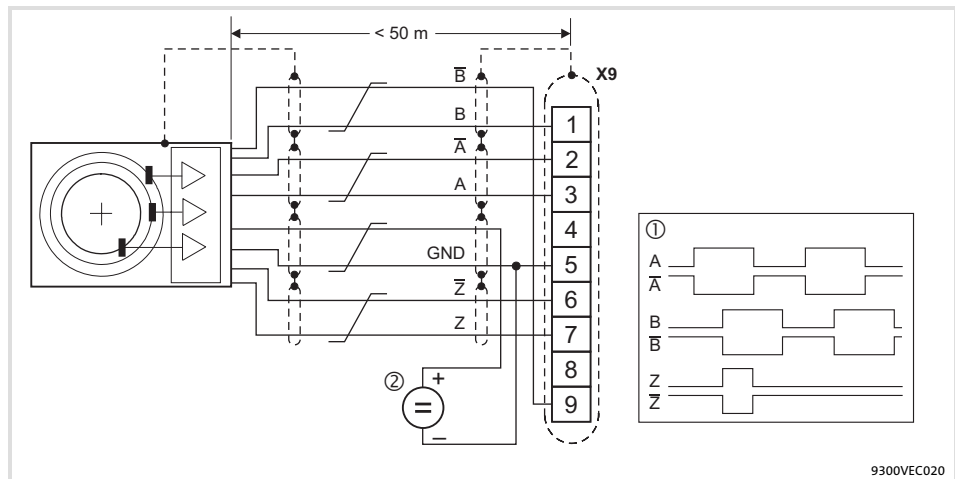


Fig. 5.8-2 Connection of incremental encoder with HTL level

- ① Signals for CW rotation
- ② External voltage source for the incremental encoder
- ⎓ Cores twisted in pairs

X9 - Incremental encoder with HTL level

Connector: Pin, 9-pole, Sub-D

Pin	1	2	3	4	5	6	7	8	9
Signal	B	$\bar{A}$	A	+5 V	GND	$\bar{Z}$	Z	-	$\bar{B}$
	0.14 mm ² (AWG 26)			1 mm ² (AWG 18)		0.14 mm ² (AWG 26)			



Note!

Connecting the two-track incremental encoder without inverse signals (at HTL level):

- Set signal A on pin X9/2 ($\bar{A}$) and signal B on pin X9/9 ($\bar{B}$).
- Wire pin X9/3 (A) and X9/1 (B) with the positive pole of the external voltage source for the incremental encoder.

5.9 Wiring of digital frequency input / digital frequency output

Installation material required from the scope of supply:

Description	Use	Quantity
Protective cover	Protection for unused Sub-D connections	4

Technical data

Field	Digital frequency output X10
Connection at drive controller	Connector: female, 9-pole, Sub-D
Pin assignment	Dependent on the selected basic configuration
Output frequency	0 ... 500 kHz
Signal	Two-track with inverse 5 V signals (RS422) and zero track
Load capacity	Max. 20 mA per channel (up to 3 slave drives can be connected)
Special features	The "Enable" output signal at X10/8 switches to LOW if the drive controller is not ready for operation (e.g. disconnected from mains). This may trip SD3 monitoring on the slave drive.
Internal voltage source (X10/4, X10/5)	DC 5 V / max. 50 mA Total current at X9/4, X9/5 and X10/4, X10/5: max. 200 mA
Field	Digital frequency input X9
Connection at drive controller	Connector: male, 9-pole, Sub-D
Input frequency	TTL level: 0 ... 500 kHz HTL level: 0 ... 200 kHz
Signal	Two-track with inverse signals and zero track Two-track without inverse signals and zero track (only for HTL level)
Signal evaluation	Via code C0427
Current consumption	Max. 5 mA
Special features	With activated SD3 monitoring, TRIP or warning is tripped if the "Lamp Control" input signal at X9/8 switches to LOW. Due to this the drive controller may respond if the master drive is not ready for operation.

Wiring

**Note!**

- We recommend to use Lenze system cables for wiring.
- For self-made cables only use cables with shielded cores twisted in pairs.

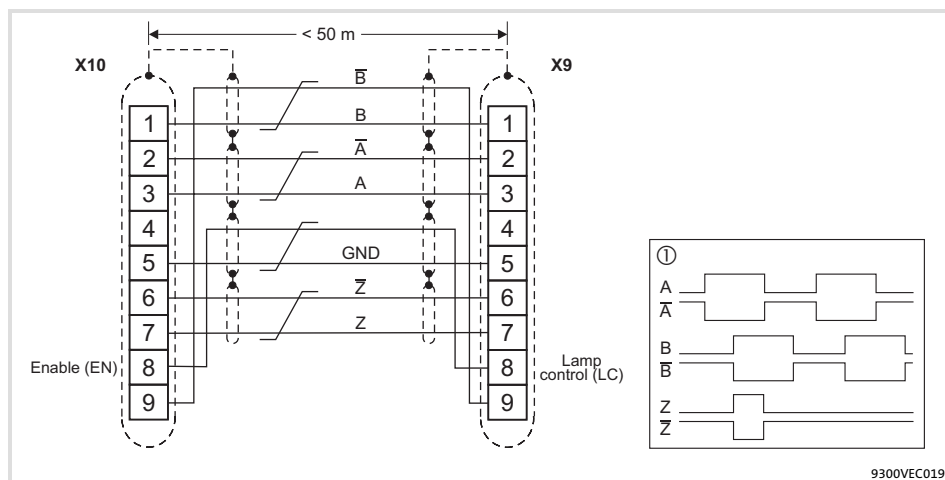


Fig. 5.9-1 Connection of digital frequency input (X9) / digital frequency output (X10)

X9 Slave drive
X10 Master drive

① Signals for CW rotation
Cores twisted in pairs

X9 - Digital frequency input
Connector: Pin, 9-pole, Sub-D

Pin	1	2	3	4	5	6	7	8	9
Signal	B	$\bar{A}$	A	+5 V	GND	$\bar{Z}$	Z	LC	$\bar{B}$
	0.14 mm ² (AWG 26)			0.5 mm ² (AWG 20)		0.14 mm ² (AWG 26)		0.5 mm ² (AWG 20)	0.14 mm ² (AWG 26)

X10 - Digital frequency output
Connector: Socket, 9-pole, Sub-D

Pin	1	2	3	4	5	6	7	8	9
Signal	B	$\bar{A}$	A	+5 V	GND	$\bar{Z}$	Z	EN	$\bar{B}$
	0.14 mm ² (AWG 26)			0.5 mm ² (AWG 20)		0.14 mm ² (AWG 26)		0.5 mm ² (AWG 20)	0.14 mm ² (AWG 26)

Adjustment

Evaluation of the input signals at X9

Code	Function	
C0427 = 0	CW rotation	Track A leads track B by 90 ° (positive value at DFIN-OUT)
	CCW rotation	Track A lags track B by 90 ° (negative value at DFIN-OUT)
C0427 = 1	CW rotation	Track A transmits the speed Track B = LOW (positive value at DFIN-OUT)
	CCW rotation	Track A transmits the speed Track B = HIGH (negative value at DFIN-OUT)
C0427 = 2	CW rotation	Track A transmits the speed and direction of rotation (positive value at DFIN-OUT) Track B = LOW
	CCW rotation	Track B transmits the speed and direction of rotation (negative value at DFIN-OUT) Track A = LOW

5.10 Communication modules



Further information

on wiring and application of communication modules can be found in the corresponding Mounting Instructions and Communication Manuals.

Possible communication modules

Communication module	Type/order number
Keypad XT	EMZ9371BC
LECOM-A/B (RS232/485)	EMF2102IBV001
LECOM-B (RS485)	EMF2102IBV002
LECOM-LI (optical fibre)	EMF2102IBV003
LON	EMF2141IB
INTERBUS	EMF2113IB
INTERBUS Loop	EMF2112IB
PROFIBUS-DP	EMF2133IB
DeviceNet/CANopen	EMF2175IB

Handling

Plug the communication module onto the AIF interface (X1) or pull it off from the interface. The communication module can also be connected/disconnected during operation.

6 Commissioning

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6.1 Before switching on



Note!

- ▶ Observe the corresponding switch-on sequence.
- ▶ In the event of faults or errors during commissioning, see chapter "Troubleshooting and fault elimination".

To avoid injury to persons and damage to material, check ...

... before connecting the mains voltage:

- ▶ Wiring for completeness, short-circuit, and earth fault
- ▶ The supply of the internal fan in case of the variants V210, V240, V270 and V300.
 - The bridge position depends on the mains voltage applied
- ▶ The function "emergency-off" of the total system.
- ▶ The motor circuit configuration (star/delta) must be adapted to the output voltage of the controller.
 - E. g. the in-phase connection of the motor.
- ▶ The direction of rotation of the incremental encoder

... the setting of the main drive parameters before enabling the controller:



Stop!

Only the variants V210, V240, V270, V300:

- ▶ Adapt the DC bus voltage threshold to the mains voltage via C0173.
 - The Lenze setting of C0173 = 1 (OU = 770 V) is only permissible for controller operation with a mains voltage of 400 V.
- ▶ Only the variants V210, V240, V270, V300:

Adapt the brake transistor threshold to the mains voltage via C0174. The Lenze setting of code C0174 = 3 ($U_{Br} = 885 \text{ V}$) is valid for operating the controller on a 500 V mains voltage.
- ▶ Is the V/f rated frequency adapted to the motor connection?
- ▶ Are the drive parameters relevant for your application set correctly?
- ▶ Is the configuration of the analog and digital inputs and outputs adapted to the wiring?

6.2 Selection of the correct operating mode

Description

The control mode of the controller can be selected via the operating mode. You can select between the following modes:

- V/f characteristic control
- Vector control

Selection of the correct operating mode

The V/f characteristic control is the classic operating mode for standard applications.

When using the vector control you will achieve improved drive features compared to the V/f characteristic control due to:

- Higher torque via the complete speed range
- Higher speed accuracy and higher concentricity factor
- Higher efficiency

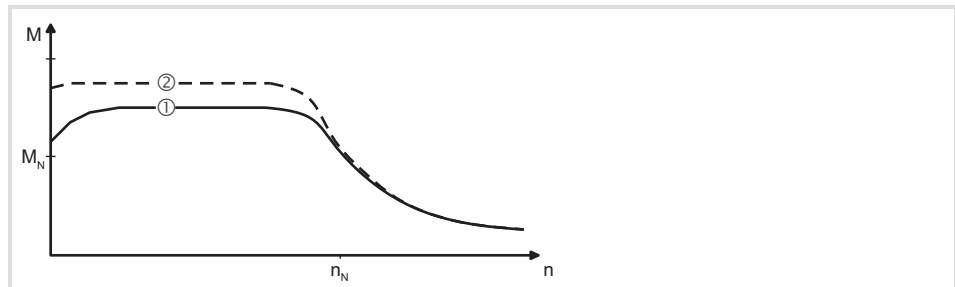


Fig. 6.2-1 Comparison of V/f characteristic control and vector control

- ① V/f characteristic control
- ② Vector control

8200vec524

Recommended operating modes

The frequency inverter is mainly designed for the applications listed in the below table.

The table helps you to select the correct operating mode for your application:

- C0006 = 5: V/f characteristic control with constant $V_{\min}$ boost
- C0006 = 1: Vector control

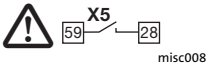
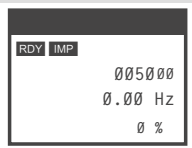
Power range 110 ... 400 kW	Selection of the operating mode in C0006			
	Motor cable shielded ≤ 100 m unshielded ≤ 200 m		Motor cable shielded > 100 m unshielded > 200 m	
	recommended	alternatively	recommended	alternatively
Applications with asynchronous motors				
Single drives				
Drives with constant load	5	1	5	-
Drives with heavy start conditions	1	5	5	-
Travelling drives, conveyor belts	5	1	5	-
Pump drives, fan drives ¹⁾	5	-	5	-
Extruder drives	5	1	5	-
Drives for wire drawing machines	5	1	5	-
Drives for rolling machines	5	1	5	-
Drives for rewinders with dancer (speed-controlled)	1	5	-	-
Group drives (the resulting motor cable length is decisive I_{res})	5	-	5	-
$I_{\text{res}} = \sqrt{i \cdot (I_1 + I_2 + \dots + I_i)}$				

¹⁾ A square voltage characteristic (C0014 = 1) is recommended for this application

6.3 Parameter setting with the XT EMZ9371BC keypad

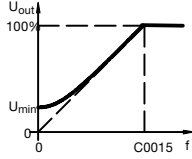
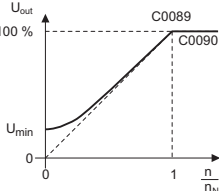
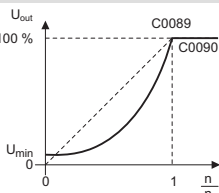
6.3.1 Commissioning example in V/f characteristic control mode

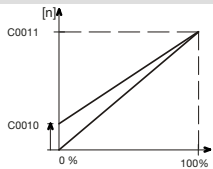
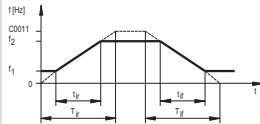
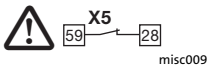
The example describes how to commission a speed control for the controller with power-related three-phase asynchronous motor.

Switch-on sequence		Note
1.	Insert the keypad	
2.	Ensure that the controller is inhibited after switching on the mains	 misc008
3.	Ensure that no external error is active	Terminal X5/E4 = HIGH
4.	Switch on	
A	The control card is supplied via an external voltage: Switch on the external DC 24 V supply voltage	 misc002
B	The control card is supplied via the internal voltage: Switch on the mains. The controller provides the DC 24 V supply.	
5.	After approx. 2 s the controller is initialised and the keypad is in the operating level and displays the current speed (C0051)	 9371BC004
6.	Change to the "Terminal I/O" menu and configure the function of the control terminals to adapt them to your application. Lenze setting: C0005 = 1000 (basic configuration "speed control")	Use C0002 = 0 to restore the Lenze setting (see chapter "Commissioning" → "Change assignment of the control terminal X5 and X6")
7.	For quick commissioning select the menu "Short setup"	 9371BC007
A	Use PRG to change to the menu level	
B	Use ▲ ▶ ▶ ▶ to change to the menu "Short setup" and then to the submenu "Setup V/f"	
C	Use ▶ to change to the code level to parameterise your drive	  9371BC008
8.	Adapt the controller to the mains (C0173) Lenze setting: 1 (400 V mains voltage)	
9.	Only for the variants V060, V110, V270, V300 in the power range of 110 ... 400 kW: Adapt the brake transistor threshold (C0174) Lenze setting: 3 (500 V mains voltage, 885 V brake voltage)	See code table
10.	Enter the motor data	 See motor nameplate and chapter "Commissioning" → "Adapt motor data"
A	If you use a Lenze motor: Select the motor type connected under C0086.	The data of the Lenze motors are saved under C0086.
B	If you do not use a Lenze motor: Enter the data of the motor nameplate	
	- Rated motor power (C0081) – Lenze setting: device-dependent	

6.3 Parameter setting with the XT EMZ9371BC keypad

6.3.1 Commissioning example in V/f characteristic control mode

Switch-on sequence		Note
	Rated motor speed (C0087) – Lenze setting: device-dependent	
	Rated motor current (C0088) – Lenze setting: device-dependent	Enter value for the selected motor connection method (star/delta)!
	Rated motor frequency (C0089) – Lenze setting: device-dependent	
	Rated motor voltage (C0090) – Lenze setting: device-dependent	Enter value for the selected motor connection method (star/delta)!
	Motor $\cos\varphi$ (C0091) – Lenze setting: device-dependent	
11.	If required, set a base frequency which differs from the rated motor frequency (C0015) Lenze setting: C0015 = C0089	 Changes in C0086 and C0089 overwrite the setting in C0015 (see chapter "Commissioning" → "Operating mode" → "V/f characteristic control")
12.	If required, adapt the slip compensation (C0021) Lenze setting: Rated slip in [%] with regard to $N_{\max}$ in C0011. The value is calculated from the data of the nameplate and is thus suitable for the majority of applications.	Due to changes in C0086, C0087, C0089 the rated slip is recalculated and automatically entered into C0021 (see chapter "Commissioning" → "Slip compensation")
13.	For protecting the motor, set the current limit values " $I_{\max}$ current" (C0022, C0023) Guide value ≤ 2 -fold rated motor current	Power range 0.37 ... 90 kW: For dissipating the regenerative energy, use a brake chopper or feedback module, if necessary Power range 110 ... 400 kW: For dissipating regenerative energy, use a brake resistor, if necessary (see chapter "Commissioning" → "Motor adjustment" → "Current limit values")
A	In motor mode and generator mode (C0022)	
B	Additional limitation in generator mode (C0023) Condition: C0023 < C0022	
14.	Set the operating mode "V/f" (C0006) Lenze setting: 5 (V/f characteristic control)	(see chapter "Commissioning" → "Operating mode" → "V/f characteristic control")
15.	Set the V/f characteristic (C0014) Lenze setting: 0 (linear characteristic)	
A	Linear characteristic (C0014 = 0)	
B	Square-law characteristic (C0014 = 1)	 For applications with e. g. pumps or fans
16.	If required, set $U_{\min}$ boost (C0016) Lenze setting: 0 %	C0016 = 1 % corresponds to a boost of 1 % of the rated voltage "Mot voltage" (C0090) (see chapter "Commissioning" → "Operating mode" → "V/f characteristic control")
17.	Set the switching frequency "fchop" (C0018) Lenze setting: Power range 0.37 ... 90 kW: 6 (8/2 kHz sin) Power range 110 ... 400 kW: 6 (4/2 kHz sin)	See chapter "Commissioning" → "Switching frequency of the inverter"

Switch-on sequence		Note
18.	Set your type of the speed feedback system "Feedback type" (C0025) Lenze setting: 1 (no feedback)	See chapter "Commissioning" → "Setting of speed feedback"
A	When using a TTL encoder: Select the encoder used under C0025	
B	When using a TTL encoder with a number of increments which cannot be set under C0025: Set C0025 = 100 Enter the number of increments under C0420	
C	If required, compensate a voltage drop in the incremental encoder cable. Use C0421 to adjust the supply voltage for the TTL encoder.	
D	When using a HTL encoder: Set C0025 = 101 Enter the number of increments under C0420	
19.	Set the maximum speed (C0011) Lenze setting: 3000 rpm	 See chapter "Commissioning" → "Acceleration, deceleration, braking, stopping"
20.	Set the acceleration time T_{ir} (C0012) Lenze setting: 5.00 s	$T_{ir} = t_{ir} \cdot \frac{C0011}{f_2 - f_1}$ (see chapter "Commissioning" → "Acceleration, deceleration, braking, stopping")
21.	Set the deceleration time T_{if} (C0013) Lenze setting: 5.00 s	 $T_{if} = t_{if} \cdot \frac{C0011}{f_2 - f_1}$ (see chapter "Commissioning" → "Acceleration, deceleration, braking, stopping")
22.	If required, set the quick stop deceleration ramp (C0105) Lenze setting: 5.00 s	See chapter "Commissioning" → "Acceleration, deceleration, braking, stopping"
23.	If required, adapt the fixed setpoints JOG.	See code table
A	JOG 1 (C0039/1) Lenze setting: 1500 rpm	Activation: X5/E3 = HIGH
B	Further fixed setpoints: JOG 2 (C0039/2) ... JOG 15 (C0039/15)	
24.	Ensure a powerfail-proof saving of the settings in one of the four parameter sets (C0003) Use C0003 = 1 to save the settings in parameter set 1.	Code C0003 is the first code in the menu "Setup V/f". After switching on the DC 24 V supply or mains connection, parameter set 1 is automatically activated. (see chapter "Parameter setting")
25.	Switch on the mains if the external DC 24 V supply voltage is switched on only.	
26.	Enable controller	 Terminal X5/28 = HIGH (see chapter "Commissioning" → "controller inhibit")
27.	Enter the setpoint	Analog setpoint selection: -10 ... +10 V via potentiometer at X6/1 and X6/2 Fixed speed: Activate JOG 1 with X5/E3 = HIGH JOG 1 is parameterised in C0039/1

Switch-on sequence		Note
28.	The drive is running now	CW rotation: X5/E1 = HIGH and X5/E2 = LOW CCW rotation: X5/E1 = LOW and X5/E2 = HIGH If the drive does not start, press RUN in addition (see chapter "Commissioning" → "Acceleration, deceleration, braking, stopping")

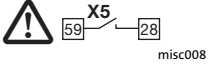
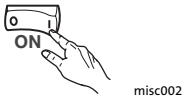
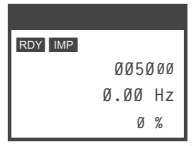
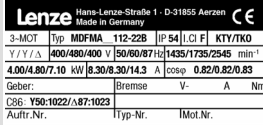


Note!

In the "Diagnostic" menu you can monitor the most important drive parameters

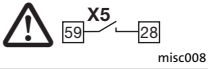
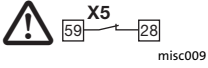
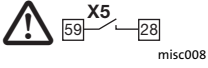
6.3.2 Commissioning example in vector control mode

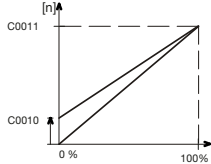
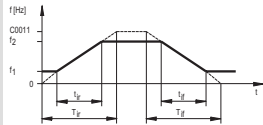
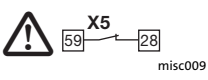
The example describes how to commission a speed control for the controller with power-related three-phase asynchronous motor.

Switch-on sequence		Note
1.	Insert the keypad	
2.	Ensure that the controller is inhibited after switching on the mains	 Terminal X5/28 = LOW (see chapter "Commissioning" → "controller inhibit")
3.	Ensure that no external error is active	Terminal X5/E4 = HIGH
4.	Switch on	
A	The control card is supplied via an external voltage: Switch on the external DC 24 V supply voltage	 misc02
B	The control card is supplied via the internal voltage: Switch on the mains. The controller provides the DC 24 V supply.	
5.	After approx. 2 s the controller is initialised and the keypad is in the operating level and displays the current speed (C0051)	 9371BC004
6.	Change to the "Terminal I/O" menu and configure the function of the control terminals to adapt them to your application. Lenze setting: C0005 = 1000 (basic configuration "speed control")	Use C0002 = 0 to restore the Lenze setting (see chapter "Commissioning" → "Change assignment of the control terminal X5 and X6")
7.	For quick commissioning select the menu "Short setup"	 9371BC007 The submenu "Setup vector" contains the codes that are required for commissioning a standard application. The digital inputs are configured in the Lenze setting: X5/E1: Deactivate CW rotation/quick stop X5/E2: Deactivate CCW rotation/quick stop X5/E3: Activate fixed setpoint 1 (JOG1) X5/E4: Set error message (TRIP SET) X5/E5: Reset error message (TRIP RESET) (see chapter "Parameter setting")  9371BC008
A	Use PRG to change to the menu level	
B	Use ▲ ▶ ▶ ▶ to change to the menu "Short setup" and then to the submenu "Setup vector"	
C	Use ▶ to change to the code level to parameterise your drive	
8.	Adapt the controller to the mains (C0173) Lenze setting: 1 (400 V mains voltage)	
9.	Only for the variants V060, V110, V270, V300 in the power range of 110 ... 400 kW: Adapt the brake transistor threshold (C0174) Lenze setting: 3 (500 V mains voltage, 885 V brake voltage)	See code table
10.	Enter the motor data	 See motor nameplate and chapter "Commissioning" → "Adapt motor data" The data of the Lenze motors are saved under C0086.
A	If you use a Lenze motor: Select the motor type connected under C0086.	
B	If you do not use a Lenze motor: Enter the data of the motor nameplate	
	- Rated motor power (C0081) – Lenze setting: device-dependent - Rated motor speed (C0087) – Lenze setting: device-dependent	

6.3 Parameter setting with the XT EMZ9371BC keypad

6.3.2 Commissioning example in vector control mode

Switch-on sequence		Note
	Rated motor current (C0088) – Lenze setting: device-dependent	Enter value for the selected motor connection method (star/delta)!
	Rated motor frequency (C0089) – Lenze setting: device-dependent	
	Rated motor voltage (C0090) – Lenze setting: device-dependent	Enter value for the selected motor connection method (star/delta)!
	Motor $\cos\phi$ (C0091) – Lenze setting: device-dependent	
11.	For protecting the motor, set the current limit values " $I_{\max}$ current" (C0022, C0023) Guide value ≤ 2 -fold rated motor current	Power range 0.37 ... 90 kW: For dissipating the regenerative energy, use a brake chopper or feedback module, if necessary
A	In motor mode and generator mode (C0022)	Power range 110 ... 400 kW: For dissipating regenerative energy, use a brake resistor, if necessary
B	Additional limitation in generator mode (C0023) Condition: C0023 < C0022	(see chapter "Commissioning" → "Motor adjustment" → "Current limit values")
12.	If the motor temperature is monitored with a thermal sensor KTY: Activate the temperature feedback with C0594 (fault SD6) Lenze setting: 3 (switched off)	A temperature feedback with KTY has a positive effect on the vector control, since the motor data identification considers the temperature influence in the motor model. (see chapter "Commissioning" → "Motor adjustment")
13.	Start the motor data identification "ident run" (C0148)	(see chapter "Commissioning" → "Adjusting the motor")
A	Ensure that the controller inhibit is active	 Terminal X5/28 = LOW
B	Switch on the mains	
C	Set C0148 = 1	
D	Enable controller	 Terminal X5/28 = HIGH The identification starts: - The segment IMP goes off "WRK run" is displayed - The motor is energised and "whistles" - The motor does not rotate
E	If after approx. 1 ... 2 min the segment IMP is active again, inhibit the controller	 Terminal X5/28 = LOW The identification is completed. The following values have been detected and entered into the codes: - Inverter error characteristic (C1753/xx) - Rotor resistance "Mot Rr" (C0082) - Stator resistance "Mot Rs" (C0084) - Leakage inductance "Mot Lss" (C0085) - Stator inductance "Mot Ls" (C0092)
14.	Set the operating mode "vector ctrl" (C0006) Lenze setting: 5 (V/f characteristic control)	(see chapter "Commissioning" → "Operating mode" → "Vector control")
15.	Set the switching frequency "fchop" (C0018) Lenze setting: Power range 0.37 ... 90 kW: 6 (8/2 kHz sin) Power range 110 ... 400 kW: 6 (4/2 kHz sin)	See chapter "Commissioning" → "Switching frequency of the inverter"
16.	Set your type of the speed feedback system "Feedback type" (C0025) Lenze setting: 1 (no feedback)	See chapter "Commissioning" → "Setting of speed feedback"
A	When using a TTL encoder: Select the encoder used under C0025	

Switch-on sequence		Note
B	When using a TTL encoder with a number of increments which cannot be set under C0025: Set C0025 = 100 Enter the number of increments under C0420	
C	If required, compensate a voltage drop in the incremental encoder cable. Use C0421 to adjust the supply voltage for the TTL encoder.	
D	When using a HTL encoder: Set C0025 = 101 Enter the number of increments under C0420	
17.	Set the maximum speed (C0011) Lenze setting: 3000 rpm	 See chapter "Commissioning" → "Acceleration, deceleration, braking, stopping"
18.	Set the acceleration time T_{ir} (C0012) Lenze setting: 5.00 s	$T_{ir} = t_{ir} \cdot \frac{C0011}{f_2 - f_1}$ (see chapter "Commissioning" → "Acceleration, deceleration, braking, stopping")
19.	Set the deceleration time T_{if} (C0013) Lenze setting: 5.00 s	 $T_{if} = t_{if} \cdot \frac{C0011}{f_2 - f_1}$ (see chapter "Commissioning" → "Acceleration, deceleration, braking, stopping")
20.	If required, set the quick stop deceleration ramp (C0105) Lenze setting: 5.00 s	See chapter "Commissioning" → "Acceleration, deceleration, braking, stopping"
21.	If required, adapt the fixed setpoints JOG.	See code table
A	JOG 1 (C0039/1) Lenze setting: 1500 rpm	Activation: X5/E3 = HIGH
B	Further fixed setpoints: JOG 2 (C0039/2) ... JOG 15 (C0039/15)	
22.	Ensure a powerfail-proof saving of the settings in one of the four parameter sets (C0003) Use C0003 = 1 to save the settings in parameter set 1.	Code C0003 is the first code in the menu "Setup V/f". After switching on the DC 24 V supply or mains connection, parameter set 1 is automatically activated. (see chapter "Parameter setting")
23.	Switch on the mains if the external DC 24 V supply voltage is switched on only.	
24.	Enable controller	 Terminal X5/28 = HIGH (see chapter "Commissioning" → "controller inhibit")
25.	Enter the setpoint	Analog setpoint selection: -10 ... +10 V via potentiometer at X6/1 and X6/2 Fixed speed: Activate JOG 1 with X5/E3 = HIGH JOG 1 is parameterised in C0039/1

Switch-on sequence		Note
26.	The drive is running now	CW rotation: X5/E1 = HIGH and X5/E2 = LOW CCW rotation: X5/E1 = LOW and X5/E2 = HIGH If the drive does not start, press RUN in addition (see chapter "Commissioning" → "Acceleration, deceleration, braking, stopping")



Note!

In the "Diagnostic" menu you can monitor the most important drive parameters

6.4 Controller inhibit

Description

If the controller inhibit is active, the power outputs are inhibited.

- ▶ The drive coasts in zero-torque mode.
- ▶ Status display of keypad: Pulse inhibit **IMP**
- ▶ Status display at the controller: The green LED is blinking.



Danger!

Do not use the "controller inhibit" function (DCTRL1-CINH) for emergency-off. The controller inhibit only inhibits the power outputs and does **not** disconnect the controller from the mains! The drive could start again any time.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0040	Ctrl enable	0		Controller enable	6.4-1
			0 Ctrl inhibit	Controller inhibited	
			1 Ctrl enable	Controller enabled	

Activation

Via terminal X5/28:

- ▶ A LOW level at the terminal inhibits the controller (cannot be inverted)
- ▶ A HIGH level re-enables the controller

Via the keys of the keypad (if C0469 = 1):

- ▶ **STOP** inhibits the controller
- ▶ **RUN** re-enables the controller

Via code C0040:

- ▶ C0040 = 0 inhibits the controller
- ▶ C0040 = 1 re-enables the controller



Note!

- ▶ The sources for controller inhibit are ANDed, i.e. the drive only restarts if the controller inhibit signals of all signal sources have been eliminated.
- ▶ The restart starts with zero speed. If centrifugal masses are still rotating, this can lead to an overcurrent.

6.5 Changing the assignment of the control terminals X5 and X6



Danger!

If you select a configuration in C0005, the signal assignment of the inputs and outputs will be overwritten with the corresponding basic assignment!

► Adapt the signal assignment to your wiring!

6.5.1 Free configuration of digital input signals

Description

- Internal digital signals can be freely linked with external digital signal sources. This serves to establish a freely configurable control of the drive controller.
 - Digital inputs X5/E1 ... X5/E5
- A signal source can be linked with several targets. Ensure reasonable linkages for not activating functions that are mutually exclusive (e. g. linking a digital input with quick stop and DC injection braking at the same time).

Codes for parameter setting

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0114			0	High active	HIGH level is active	Inversion of digital input signals at X5, function block DIGIN	 6.5-1 See System Manual (extension)
			1	LOW active	LOW level is active		
1	DIGIN1 pol	0				Terminal X5/E1	
2	DIGIN2 pol	0				Terminal X5/E2	
3	DIGIN3 pol	0				Terminal X5/E3	
4	DIGIN4 pol	1				Terminal X5/E4	
5	DIGIN5 pol	0				Terminal X5/E5	
5	DIGIN6 (ST) pol	0				Terminal X5/ST	

Linking signals

The internal digital signal can be linked with an external signal source by entering the selection figure of the external signal into the configuration code of the internal digital signal.

Example

- C0787/2 = 53 ⇒ signal source for JOG2 is terminal X5/E3

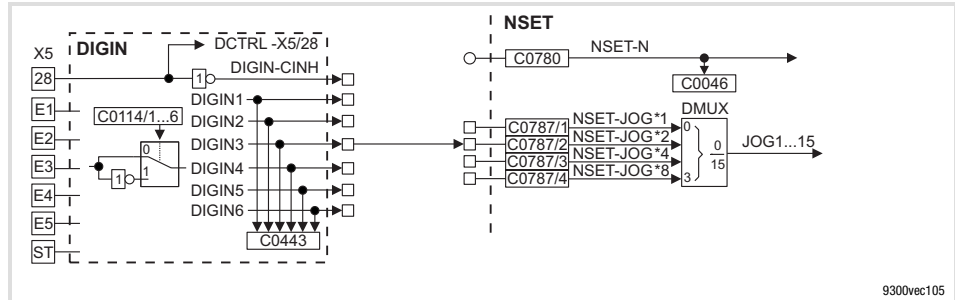


Fig. 6.5-1 Connecting digital signal JOG2 with terminal X5/E3



Tip!

- A list with all selection figures is included in the chapter "Configuration" → "Selection lists".
- For signal linkage we recommend the function block editor in GDC (ESP-GDC2).

Signal level

- Terminals (X5/E1 ... X5/E5):
 - HIGH = +12 V ... +30 V
 - LOW = 0 V ... +3 V
- Response times: 1 ms

Inverting the signal level

In C0114 you can define the active signal level (HIGH level active or LOW level active) for the terminals X5/E1 ... X5/E5.

Example

- C0114/3 = 1 ⇒ LOW level at X5/E3 activates JOG2

6.5.2 Free configuration of digital outputs

- Description**
- The digital outputs X5/A1 ... X5/A4 can be freely linked with internal digital signals.
 - One signal source can be linked with several targets.

Codes for parameter setting

Code		Possible settings			IMPORTANT			
No.	Name	Lenze	Selection					
C0117 			📖 Selection list 2		Configuration of digital inputs signals, function block DIGOUT A change of the basic configuration in C0005 changes the signal assignment! 📖 6.5-3 See System Manual (extension)			
	1	CFG: DIGOUT1	15000	DCTRL-TRIP		Terminal X5/A1		
	2	CFG: DIGOUT2	10650	CMP1-OUT		Terminal X5/A2		
	3	CFG: DIGOUT3	500	DCTRL-RDY		Terminal X5/A3		
	4	CFG: DIGOUT4	5003	MCTRL-MMAX		Terminal X5/A4		
C0118			0	High active		HIGH level is active	Inversion of digital output signals, function block DIGOUT	
			1	LOW active		LOW level is active		
	1	DIGOUT1 pol	1			Terminal X5/A1		
	2	DIGOUT2 pol	1			Terminal X5/A2		
	3	DIGOUT3 pol	0			Terminal X5/A3		
	4	DIGOUT4 pol	0			Terminal X5/A4		

Linking signals

The digital outputs can be linked with internal digital signals by entering the selection figure of the internal signal into corresponding subcode of C0117.

Example

- C0117/2 = 505 ⇒ signal source for X5/A2 is the status message "direction of rotation" (DCTRL-CW/CCW)

Signal level

- Terminals (X5/A1 ... X5/A4):
 - HIGH = +12 V ... +30 V
 - LOW = 0 V ... +3 V
- Response times: 1 ms

Inverting the signal level

In C0118 you can define the active signal level (HIGH level active or LOW level active) for the terminals X5/A1 ... X5/A4.

Example

- C0118/2 = 1 ⇒ With LOW level at X5/A2 the motor rotates in CW direction (with in-phase motor connection)

6.5.3 Free configuration of analog input signals

Description

- Internal analog signals can be freely linked with external analog signal sources:
 - Analog inputs X3/1, X3/2 and X3/3, X3/4
- One signal source can be linked with several targets.

Codes for parameter setting

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0026			-199.99	{0.01 %}	199.99	Free control code FCODE 26/1 and FCODE26/2	 6.5-4 See System Manual (extension)
1	FCODE (offset)	0.00				Offset of AIN1 (X6/1, X6/2)	
2	FCODE (offset)	0.00				Offset of AIN2 (X6/3, X6/4)	
C0027			-199.99	{0.01 %}	199.99	Free control code FCODE 27/1 and FCODE27/2	
1	FCODE (gain)	100.0 0				Gain AIN1 (X6/1, X6/2) ● 100 % = gain 1	
2	FCODE (gain)	100.0 0				Gain AIN2 (X6/3, X6/4) ● 100 % = gain 1	
C0034	Mst current	0	0	-10 V ... +10 V		Voltage / current range for analog signals at input X6/1, X6/2	 5.6-9
			1	4 mA ... 20 mA		● Observe jumper position of X3	 6.5-4
			2	-20 mA ... +20 mA			

Linking signals

The internal analog signals can be linked with an external signal source by entering the selection figure of the external signal into the configuration code of the internal analog signal.

Example

- C0780 = 50 ⇒ signal source for the main setpoint (NSET-N) is terminal X6/1, X6/2

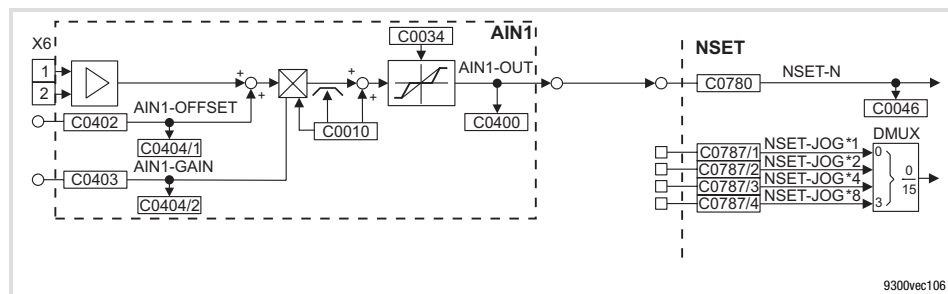


Fig. 6.5-2 Linking analog signal NSET-N with terminal X6/1, X6/2



Tip!

- A list with all selection figures is included in the chapter "Configuration" → "Selection lists".
- For signal linkage we recommend the function block editor in GDC (ESP-GDC2).

Adjustment

Gain and offset

Set gain (C0027) and offset (C0026) to adapt the input signal to the application.

Input range of X6/1, X6/2

Input range	C0034	Position of jumper at X3
-10 V ... +10 V	C0034 = 0	
+4 mA ... +20 mA	C0034 = 1	
-20 mA ... +20 mA	C0034 = 2	



Note!

Different settings in C0034 and of X3 result in a wrong input signal.

6.5.4 Free configuration of analog outputs

Description

- The analog outputs (X6/62, X6/63) can be freely linked with internal analog process or monitoring signals. The controller outputs a voltage proportional to the internal signal at the analog outputs.
- One signal source can be linked with several targets.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0108			-199.99	{0.01 %}	199.99	Free control code FCODE108/1 and FCODE108/2
1	FCODE (gain)	100.0 0				Gain of analog output signal AOUT1 (X6/62) ● 100 % = gain 1
2	FCODE (gain)	100.0 0				Gain of analog output signal AOUT2 (X6/63) ● 100 % = gain 1
C0109			-199.99	{0.01 %}	199.99	Free control code FCODE109/1 and FCODE109/2
1	FCODE (offset)	0.00				Offset of analog output signal AOUT1 (X6/62)
2	FCODE (offset)	0.00				Offset of analog output signal AOUT2 (X6/63)

 6.5-6
See System Manual (extension)

Linking signals

Analog outputs can be linked with internal analog signals by entering the selection figure of the internal signal into the code of C0431 (AOUT1, X6/62) or C0436 (AOUT2, X6/63).

Example

- C0436 = 5006 ⇒ signal source for X6/63 is the actual motor voltage



Tip!

- A list with all selection figures is included in the chapter "Configuration" → "Selection lists".
- For signal linkage we recommend the function block editor in GDC (ESP-GDC2).

Adjustment

Set gain (C0108) and offset (C0109) to adapt the output signal to the application.

With an internal signal of 100 % and a gain of 1, a voltage of 10 V is output at the terminal.

6.6 Adjusting the motor

6.6.1 Entry of motor data

Description The vector control mode requires considerably more motor data than the V/f characteristic control mode.

Basically all motor data should be entered independent of the operating mode. This enables the controller to detect further data as e.g. slip compensation (C0021), maximum torque (C0057), number of motor pole pairs (C0059) always conclusively and enter them into the corresponding codes.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0081 	Mot power	→	0.01	{0.01 kW}	500.00	Rated motor power → Change of C0086 resets value to factory setting ● Change of C0081 sets C0086 = 0
C0086 	Mot type	→	 Motor selection list			Motor type selection → depending on the controller used ● Motor selection in C0086 sets the corresponding parameters in C0021, C0022, C0081, C0087, C0088, C0089, C0090, C0091  6.6-1
C0087 	Mot speed	→	50	{1 rpm}	36000	Rated motor speed → depending on C0086 ● Motor selection in C0086 set the corresponding rated motor speed in C0087 ● Change of C0087 sets C0086 = 0  6.6-1
C0088 	Mot current	→	0.5	{0.1 A}	1000.0	Rated motor current → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor current in C0088 ● Change of C0088 sets C0086 = 0  6.6-1
C0089 	Mot frequency	→	10	{1 Hz}	5000	Rated motor frequency → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor frequency in C0089 ● Change of C0089 sets C0086 = 0  6.6-1

6.6 Adjusting the motor

6.6.1 Entry of motor data

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0090 STOP	Mot voltage	→	0 {1 V} 1000		Rated motor voltage → depending on C0086 • Motor selection in C0086 sets the corresponding rated motor voltage in C0090 • Change of C0090 sets C0086 = 0
C0091 STOP	Mot cos phi	→	0.50 {0.01} 1.00		Motor cos φ → depending on C0086 • Motor selection in C0086 sets the corresponding motor cos φ in C0091 • Change of C0091 sets C0086 = 0

Sequence of the motor data entry

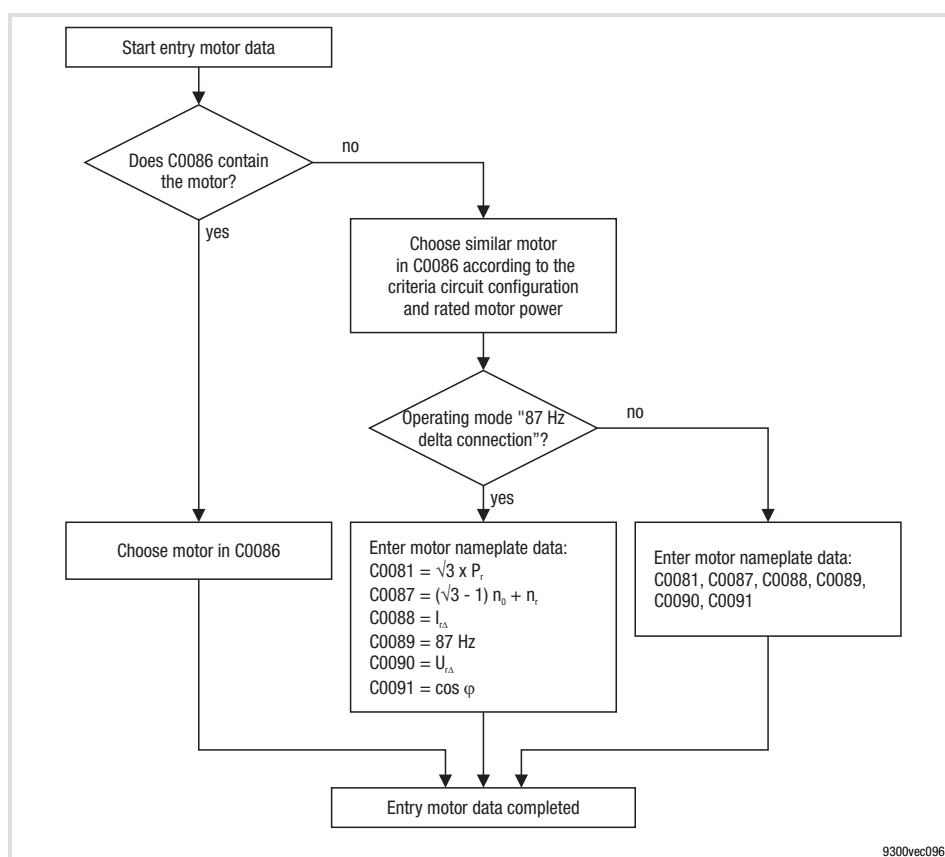


Fig. 6.6-1 Sequence diagram for motor data entry

P_N Rated motor power
 n_0 Synchronous speed
 n_N Rated motor speed
 $I_{N\Delta}$ Rated motor current for delta connection
 $U_{N\Delta}$ Rated motor voltage for delta connection

Lenze motor which is included in C0086

By selecting the motor in C0086 all required motor data are automatically entered into the following codes.

Code	Description	Code	Description
C0022	Limit current for operation in motor mode	C0087	Rated motor speed
C0023	Limit current for operation in generator mode	C0088	Rated motor current
C0081	Rated motor power	C0089	Rated motor frequency
C0082	Motor rotor resistance	C0090	Rated motor voltage
C0084	Motor stator resistance	C0091	Power factor $\cos \varphi$
C0085	Motor leakage inductance	C0092	Motor stator inductance

Motor of another manufacturer or a Lenze motor which is not included in C0086

1. Select a similar motor in C0086.
– Selection criteria: Connection method, rated motor power, rated motor frequency
2. Enter the motor data of the motor nameplate or data sheet into C0081, C0087, C0088, C0089, C0090 and C0091.

Operating mode "87 Hz delta connection"

By changing from star to delta connection and changing the base frequency ($f_{\text{base}} = 87 \text{ Hz}$), the induction machine ($f_N = 50 \text{ Hz}$) develops $\sqrt{3}$ times the power with a frequency of 87 Hz. In the total range the machine runs with a $\sqrt{3}$ times higher delta current, which must be provided by the controller.

Example

A motor with the following data is to be connected in delta connection:

► DSM 50 Hz; Δ/Y 230/400 V; 18.5 kW; 62/35 A, 1450 min^{-1} , $\cos \varphi = 0.88$

Sequence	Note
1. Enter C0086 = 263 (DXRAXX 180-12-87; 32.4 kW; 87 Hz)	Select a motor in C0086, which has a $\sqrt{3}$ times higher rated motor power with delta connection.
2. Enter C0087 = 2548 min^{-1}	Consider the slip speed. With a rated motor torque the slip speed of an asynchronous motor is nearly constant over the total speed range. Calculation of the rated motor speed: $C0087 = (\sqrt{3} - 1) \cdot n_0 + n_N$ $C0087 = (\sqrt{3} - 1) \cdot 1500 \text{ min}^{-1} + 1450 \text{ min}^{-1}$ n_0 = synchronous speed n_N = rated motor speed at 50 Hz
3. Enter C0088 = 62 A	Rated motor current for delta connection
4. Enter C0090 = 400 V	Rated motor voltage for star connection
5. Enter C0089 = 87 Hz	Rated motor frequency
6. Enter C0091 = 0.88	Power factor $\cos \varphi$

6.6 Adjusting the motor

6.6.2 Motor selection list

Three-phase asynchronous motors

The following table contains all asynchronous motors, which can be selected via C0086.

The "reference list of asynchronous motors" contains the asynchronous motors, the data of which must be entered manually. (6.6-6)

Lenze Hans-Lenze-Straße 1 · D-31855 Aerzen CE Made in Germany									
3~MOT	Typ MDSKSBS56-33				Id. Nr. 00XXXXXX				
3.6 A	200 Hz	4000 min ⁻¹	cosφ 1		I.L.C. F				
4.2 Nm	1.8 kW	325 V~	M₀	4.7 Nm	KTY	IP 54			
Bremse	24 V~	0.5 A	2.5 Nm		Geber RS00000000				
C86:	161	MDSKS56-33-200			Motor Nr. 0301077				

A

B

9300VEC0508

Fig. 6.6-2 Nameplate of a Lenze motor

A	B	Lenze type	C0081 P _N [kW]	C0087 n _N [rpm]	C0088 I _r [A]	C0089 f _N [Hz]	C0090 U _N [V]	Motor type	Temperature sensor
9	DSGA56-22-100	SDSGA056-22-100	0.24	2790	0.8	100	390	Asynchronous inverter - motor (Star connection)	KTY
10	MDSKA56-140	MDSKAXX056-22	0.80	3950	2.4	140	390	Asynchronous servo motor	KTY
11	MDFKA71-120	MDFKAXX071-22	2.20	3410	6.0	120			
12	MDSKA71-140	MDSKAXX071-22	1.70	4050	4.4	140			
13	MDFKA80-60	MDFKAXX080-22	2.10	1635	4.8	60			
14	MDSKA80-70	MDSKAXX080-22	1.40	2000	3.3	70			
15	MDFKA80-120	MDFKAXX080-22	3.90	3455	9.1	120			
16	MDSKA80-140	MDSKAXX080-22	2.30	4100	5.8	140			
17	MDFKA90-60	MDFKAXX090-22	3.80	1680	8.5	60			
18	MDSKA90-80	MDSKAXX090-22	2.60	2300	5.5	80			
19	MDFKA90-120	MDFKAXX090-22	6.90	3480	15.8	120			
20	MDSKA90-140	MDSKAXX090-22	4.10	4110	10.2	140	350		
21	MDFKA100-60	MDFKAXX100-22	6.40	1700	13.9	60	390		
22	MDSKA100-80	MDSKAXX100-22	4.00	2340	8.2	80			
23	MDFKA100-120	MDFKAXX100-22	13.20	3510	28.7	120			
24	MDSKA100-140	MDSKAXX100-22	5.20	4150	14.0	140	330		
25	MDFKA112-60	MDFKAXX112-22	11.00	1710	22.5	60	390		
26	MDSKA112-85	MDSKAXX112-22	6.40	2490	13.5	85			
27	MDFKA112-120	MDFKAXX112-22	20.30	3520	42.5	120			
28	MDSKA112-140	MDSKAXX112-22	7.40	4160	19.8	140	320		
30	DFQA100-50	MDFQAXX100-22	10.60	1420	26.5	50	360		
31	DFQA100-100	MDFQAXX100-22	20.30	2930	46.9	100			
32	DFQA112-28	MDFQAXX112-22	11.50	760	27.2	28			
33	DFQA112-58	MDFQAXX112-22	22.70	1670	49.1	58			
34	DFQA132-20	MDFQAXX132-32	17.00	555	45.2	20			
35	DFQA132-42	MDFQAXX132-32	35.40	1200	88.8	42			
40	DFQA112-50	MDFQAXX112-22	20.10	1425	43.7	50			
41	DFQA112-100	MDFQAXX112-22	38.40	2935	81.9	100			
42	DFQA132-36	MDFQAXX132-32	31.10	1035	77.4	36			
43	DFQA132-76	MDFQAXX132-32	60.10	2235	144.8	76				340

A	B	Lenze type	C0081 P _N [kW]	C0087 n _N [rpm]	C0088 I _r [A]	C0089 f _N [Hz]	C0090 U _N [V]	Motor type	Temperature sensor
210	DXRAXX071-12-50	DXRAXX071-12	0.25	1410	0.9	50	400	Asynchronous inverter - motor (Star connection)	Thermal contact
211	DXRAXX071-22-50	DXRAXX071-22	0.37	1398	1.2				
212	DXRAXX080-12-50	DXRAXX080-12	0.55	1400	1.7				
213	DXRAXX080-22-50	DXRAXX080-22	0.75	1410	2.3				
214	DXRAXX090-12-50	DXRAXX090-12	1.10	1420	2.7				
215	DXRAXX090-32-50	DXRAXX090-32	1.50	1415	3.6				
216	DXRAXX100-22-50	DXRAXX100-22	2.20	1425	4.8				
217	DXRAXX100-32-50	DXRAXX100-32	3.00	1415	6.6				
218	DXRAXX112-12-50	DXRAXX112-12	4.00	1435	8.3				
219	DXRAXX132-12-50	DXRAXX132-12	5.50	1450	11.0				
220	DXRAXX132-22-50	DXRAXX132-22	7.50	1450	14.6				
221	DXRAXX160-12-50	DXRAXX160-12	11.00	1460	21.0				
222	DXRAXX160-22-50	DXRAXX160-22	15.00	1460	27.8				
223	DXRAXX180-12-50	DXRAXX180-12	18.50	1470	32.8				
224	DXRAXX180-22-50	DXRAXX180-22	22.00	1456	38.8				
225	30kW-ASM-50	—	30.00	1470	52.0	50	400	Asynchronous inverter - motor (Star connection)	—
226	37kW-ASM-50	—	37.00	1470	66.0				
227	45kW-ASM-50	—	45.00	1480	82.0				
228	55kW-ASM-50	—	55.00	1480	93.0				
229	75kW-ASM-50	—	75.00	1480	132.0				
230	75kW-ASM-50	—	90.00	1480	132.0				
250	DXRAXX071-12-87	DXRAXX071-12	0.43	2525	1.5	87	400	Asynchronous inverter - motor (Delta connection)	Thermal contact
251	DXRAXX071-22-87	DXRAXX071-22	0.64	2515	2.0				
252	DXRAXX080-12-87	DXRAXX080-12	0.95	2515	2.9				
253	DXRAXX080-22-87	DXRAXX080-22	1.3	2525	4.0				
254	DXRAXX090-12-87	DXRAXX090-12	2.0	2535	4.7				
255	DXRAXX090-32-87	DXRAXX090-32	2.7	2530	6.2				
256	DXRAXX100-22-87	DXRAXX100-22	3.9	2535	8.3				
257	DXRAXX100-32-87	DXRAXX100-32	5.35	2530	11.4				
258	DXRAXX112-12-87	DXRAXX112-12	7.10	2545	14.3				
259	DXRAXX132-12-87	DXRAXX132-12	9.7	2555	19.1				
260	DXRAXX132-22-87	DXRAXX132-22	13.2	2555	25.4				
261	DXRAXX160-12-87	DXRAXX160-12	19.3	2565	36.5				
262	DXRAXX160-22-87	DXRAXX160-22	26.4	2565	48.4				
263	DXRAXX180-12-87	DXRAXX180-12	32.4	2575	57.8				
264	DXRAXX180-22-87	DXRAXX180-22	38.7	2560	67.4				
265	30kW-ASM-87	—	52.00	2546	90.0	87	400	Asynchronous inverter - motor (Delta connection)	—
266	37kW-ASM-87	—	64.00	2546	114.0				
267	45kW-ASM-87	—	78.00	2563	142.0				
268	55kW-ASM-87	—	95.00	2563	161.0				
269	75kW-ASM-87	—	130.00	2563	228.0				
270	90kW-ASM-87	—	156.00	2590	277.0				
410	MDXMAXM-071-12-50	MDXMAXM-071-12	0.25	1400	0.82	50	400	Asynchronous inverter - motor (Star connection)	Thermal contact
411	MDXMAXM-071-32-50	MDXMAXM-071-32	0.37	1400	1.20	50	400		
412	MDXMAXM-080-12-50	MDXMAXM-080-12	0.55	1400	1.60	50	400		
413	MDXMAXM-080-32-50	MDXMAXM-080-32	0.75	1380	2.00	50	400		
414	MDXMAXM-090-12-50	MDXMAXM-090-12	1.10	1410	2.60	50	400		
415	MDXMAXM-090-32-50	MDXMAXM-090-32	1.50	1420	3.50	50	400		
416	MDXMAXM-100-12-50	MDXMAXM-100-12	2.20	1400	5.60	50	400		
417	MDXMAXM-100-32-50	MDXMAXM-100-32	3.00	1400	7.30	50	400		
418	MDXMAXM-112-22-50	MDXMAXM-112-22	4.00	1430	8.50	50	400		

6.6 Adjusting the motor

6.6.2 Motor selection list

A	B	Lenze type	C0081 P _N [kW]	C0087 n _N [rpm]	C0088 I _r [A]	C0089 f _N [Hz]	C0090 U _N [V]	Motor type	Temperature sensor
440	MDXMAXM-071-12-87	MDXMAXM-071-12	0.43	2510	1.40	87	400	Asynchronous inverter - motor (Delta connection)	Thermal contact
441	MDXMAXM-071-32-87	MDXMAXM-071-32	0.64	2510	2.10	87	400		
442	MDXMAXM-080-12-87	MDXMAXM-080-12	0.95	2510	2.80	87	400		
443	MDXMAXM-080-32-87	MDXMAXM-080-32	1.30	2490	3.50	87	400		
444	MDXMAXM-090-12-87	MDXMAXM-090-12	2.00	2520	4.50	87	400		
445	MDXMAXM-090-32-87	MDXMAXM-090-32	2.70	2530	6.10	87	400		
446	MDXMAXM-100-12-87	MDXMAXM-100-12	3.90	2510	9.70	87	400		
447	MDXMAXM-100-32-87	MDXMAXM-100-32	5.40	2510	12.70	87	400		
448	MDXMAXM-112-22-87	MDXMAXM-112-22	7.10	2540	14.80	87	400		
449	MDXMAXM-112-32-50	MDXMAXM-112-32	5.50	1440	12.50	50	400		
450	MDXMAXM-132-22-50	MDXMAXM-132-22	7.50	1460	16.80	50	400		
451	MDXMAXM-132-32-50	MDXMAXM-132-32	9.20	1450	19.50	50	400		

Reference list of asynchronous motors

The motors listed under "motor nameplate" are not available in Global Drive Control (GDC) and the device software.

1. Enter the corresponding value listed under C0086 into the code C0086.
2. Compare the codes for the motor data with the values in the table.
– If necessary, adapt the values in the controller to the values in the table.
3. If necessary, optimise the dynamic behaviour of your machine via the codes C0070 and C0071.

Information on the motor nameplate		Motor data													
C86	Field Type	C0086	C0022 I _{max} [A]	C0081 P _r [kW]	C0084 R _s [Ω]	C0085 L _σ [mH]	C0087 n _N [rpm]	C0088 I _N [A]	C0089 f _r [Hz]	C0090 U _r [V]	C0091 cos φ	C0070 V _{pn}	C0071 T _{nn}	C0075 V _{pi}	C0076 T _{ni}
1006	MDXMAxx-071-12	210	1.28	0.25	39.90	157.20	1355	0.85	50	400	0.70	6	300	3.6	2
1007	MDXMAxx-071-12	250	2.25	0.47	39.90	157.20	2475	1.50	87	400	0.66	6	300	2	2
1008	MDXMAxx-071-32	211	1.73	0.37	25.03	122.60	1345	1.15	50	400	0.74	6	300	3.4	2
1009	MDXMAxx-071-32	251	3.00	0.67	25.03	122.60	2470	2.00	87	400	0.70	6	300	2.5	2
1010	MDXMAxx-080-12	212	2.40	0.55	20.69	89.00	1370	1.60	50	400	0.78	6	300	3.2	2
1011	MDXMAxx-080-12	252	3.90	1.00	20.69	89.00	2480	2.60	87	400	0.73	6	300	1.6	2
1012	MDXMAxx-080-32	213	2.85	0.75	11.69	65.20	1390	1.90	50	400	0.80	6	300	3.5	2
1013	MDXMAxx-080-32	253	4.95	1.35	11.69	65.20	2510	3.30	87	400	0.77	6	300	1.9	3
1014	MDXMAxx-090-12	214	3.90	1.10	10.01	40.20	1405	2.60	50	400	0.80	6	300	2.5	2
1015	MDXMAxx-090-12	254	6.75	2.00	10.01	40.20	2520	4.50	87	400	0.77	6	300	2	2
1016	MDXMAxx-090-32	215	5.25	1.50	5.85	28.80	1410	3.50	50	400	0.78	6	300	2	2
1017	MDXMAxx-090-32	255	9.15	2.70	5.85	28.80	2525	6.10	87	400	0.76	6	300	1	2
1018	MDXMAxx-100-12	216	7.20	2.20	2.90	20.00	1425	4.80	50	400	0.80	6	300	1	1.5
1019	MDXMAxx-100-12	256	12.45	3.90	2.90	20.00	2535	8.30	87	400	0.76	6	300	0.8	1.5
1020	MDXMAxx-100-32	217	9.75	3.00	2.10	17.00	1415	6.50	50	400	0.81	6	300	2.5	1.5
1021	MDXMAxx-100-32	257	17.10	5.40	2.10	17.00	2530	11.40	87	400	0.78	6	300	1.4	1.8
1022	MDXMAxx-112-22	218	12.45	4.00	1.50	11.00	1435	8.30	50	400	0.82	6	300	2	2
1023	MDXMAxx-112-22	258	21.45	7.10	1.50	11.00	2545	14.30	87	400	0.83	6	300	1	2
1024	MDXMAxx-132-12	219	16.50	5.50	0.86	13.00	1450	11.00	50	400	0.84	6	300	1.5	2
1025	MDXMAxx-132-12	259	28.65	9.70	0.86	13.00	2555	19.10	87	400	0.83	6	300	1.3	2
1026	MDXMAxx-132-22	220	21.90	7.50	0.80	11.00	1450	14.60	50	400	0.85	6	300	1.5	2
1027	MDXMAxx-132-22	260	38.10	13.20	0.80	11.00	2555	25.40	87	400	0.84	6	300	0.95	1.8
1028	MDXMAxx-160-22	221	31.50	11.00	0.50	7.00	1460	21.00	50	400	0.85	6	300	1.9	2.2
1029	MDXMAxx-160-22	261	54.75	19.30	0.50	7.00	2565	36.50	87	400	0.85	6	300	1	2
1030	MDXMAxx-160-32	222	41.70	15.00	0.40	5.50	1460	27.80	50	400	0.87	6	300	1.7	2.5
1031	MDXMAxx-160-32	262	72.60	26.40	0.40	5.50	2565	48.40	87	400	0.86	6	300	1	1.8

Information on the motor nameplate		Motor data													
C86	Field	C0086	C0022	C0081	C0084	C0085	C0087	C0088	C0089	C0090	C0091	C0070	C0071	C0075	C0076
	Type		I _{max} [A]	P _r [kW]	R _s [Ω]	L _σ [mH]	n _N [rpm]	I _N [A]	f _r [Hz]	U _r [V]	cos φ	V _{pn}	T _{nn}	V _{pi}	T _{ni}
1032	MDXMAxx-180-12	223	49.20	18.50	0.40	4.00	1470	32.80	50	400	0.90	6	300	1.4	1.7
1033	MDXMAxx-180-12	263	86.70	32.40	0.40	4.00	2575	57.80	87	400	0.89	6	300	1	1.7
1034	MDXMAxx-180-22	224	58.20	22.00	0.20	3.80	1456	38.80	50	400	0.90	6	300	1	1.5
1035	MDXMAxx-180-22	264	101.1	38.70	0.20	3.80	2560	67.40	87	400	0.89	6	300	1	1.5
1036	MDXMAXM-63-12	210	0.68	0.12	87.58	610.53	1390	0.45	50	400	0.65	6	300	1.5	10
1037	MDXMAXM-63-12	250	1.17	0.21	87.58	610.53	2500	0.78	87	400	0.65	6	300	1.5	10
1038	MDXMAXM-63-32	210	0.98	0.18	56.90	342.11	1400	0.65	50	400	0.65	6	300	1.5	10
1039	MDXMAXM-63-32	250	1.70	0.31	56.90	342.11	2510	1.13	87	400	0.65	6	300	1.5	10
1040	MDXMAXM-112-32	219	18.75	5.50	0.86	7.20	1440	12.50	50	400	0.78	6	300	1.5	10
1041	MDXMAXM-112-32	259	32.55	9.60	0.86	7.20	2550	21.70	87	400	0.78	6	300	1.5	10
1042	MDXMAXM-132-22	220	25.20	7.50	0.54	4.80	1460	16.80	50	400	0.77	6	300	1.5	10
1043	MDXMAXM-132-22	260	43.80	13.10	0.54	4.80	2570	29.20	87	400	0.77	6	300	1.5	10
1044	MDXMAXM-132-32	221	29.25	9.20	0.46	4.70	1450	19.50	50	400	0.85	6	300	1.5	10
1045	MDXMAXM-132-32	261	50.70	16.00	0.46	4.70	2560	33.80	87	400	0.85	6	300	1.5	10
1046	MDXMAXM-160-22	260	31.50	11.00	1.27	18.97	1466	21.00	50	400	0.86	6	300	1.5	10
1047	MDXMAXM-160-32	260	42.30	15.00	0.87	14.28	1466	28.20	50	400	0.87	6	300	1.5	10
1048	MDXMAXM-180-22	260	54.60	18.50	0.40	4.00	1440	36.40	50	400	0.87	6	300	1.5	10
1049	MDXMAXM-180-32	260	66.15	22.00	0.20	3.80	1465	44.10	50	400	0.85	6	300	1.5	10
1050	MDXMAXM-200-32	260	90.00	30.00	0.17	3.50	1455	60.00	50	400	0.85	6	300	1.5	10
1051	MDXMAXM-225-12	260	108.0	37.00	0.15	2.00	1460	72.00	50	400	0.86	6	300	1.5	10
1052	MDXMAXM-225-22	260	128.25	45.00	0.15	2.00	1475	85.50	50	400	0.84	6	300	1.5	10
1053	MDXMAXM-063-11	210	1.43	0.18	51.00	273.7	2760	0.95	50	400	0.80	6	300	1.5	10
1054	MDXMAXM-063-31	210	1.65	0.25	33.00	93.4	2760	1.10	50	400	0.83	6	300	1.5	10
1055	MDXMAXM-071-11	211	1.50	0.37	22.50	90.2	2840	1.00	50	400	0.78	6	300	1.5	10
1056	MDXMAXM-071-31	212	2.25	0.55	16.90	62.9	2840	1.50	50	400	0.82	6	300	1.5	10
1057	MDXMAXM-080-11	213	2.85	0.75	11.36	47.4	2850	1.90	50	400	0.80	6	300	1.5	10
1058	MDXMAXM-080-31	214	4.20	1.10	6.86	33.4	2810	2.80	50	400	0.82	6	300	1.5	10
1059	MDXMAXM-090-11	215	4.80	1.50	5.10	22.2	2840	3.20	50	400	0.85	6	300	1.5	10
1060	MDXMAXM-090-31	216	7.20	2.20	3.20	14.5	2840	4.80	50	400	0.86	6	300	1.5	10
1061	MDXMAXM-100-31	217	9.30	3.00	1.81	10.7	2850	6.20	50	400	0.88	6	300	1.5	10
1062	MDXMAXM-100-41	218	12.75	4.00	1.45	8.6	2830	8.50	50	400	0.85	6	300	1.5	10
1063	MDXMAXM-112-31	250	18.30	5.50	3.10	17	2890	12.20	50	400	0.83	6	300	1.5	10
1064	MDXMAXM-112-41	250	23.25	7.50	1.96	12	2900	15.50	50	400	0.87	6	300	1.5	10
1065	MDXMAXM-132-21	250	28.05	9.00	1.41	11.292	2925	18.70	50	400	0.89	6	300	1.5	10
1066	MDXMAXM-071-13	210	1.13	0.18	58.93	342	870	0.75	50	400	0.71	6	300	1.5	10
1067	MDXMAXM-071-13	250	1.95	0.31	58.93	342	1610	1.30	87	400	0.71	6	300	1.5	10
1068	MDXMAXM-071-33	210	1.50	0.25	37.90	116.8	920	1.00	50	400	0.63	6	300	1.5	10
1069	MDXMAXM-071-33	250	2.55	0.43	37.90	116.8	1660	1.70	87	400	0.63	6	300	1.5	10
1070	MDXMAXM-080-13	211	2.10	0.37	28.00	112.7	900	1.40	50	400	0.67	6	300	1.5	10
1071	MDXMAXM-080-13	251	3.60	0.64	28.00	112.7	1640	2.40	87	400	0.67	6	300	1.5	10
1072	MDXMAXM-080-33	212	2.85	0.55	16.60	78.6	900	1.90	50	400	0.68	6	300	1.5	10
1073	MDXMAXM-080-33	252	4.95	0.95	16.60	78.6	1640	3.30	87	400	0.68	6	300	1.5	10
1078	MDFMAxx-250-22	224	147.75	55.00	0.04	1.92	1475	98.50	50	400	0.86	6	300	1	2
1079	MDFMAxx-250-22	264	255.90	95.00	0.04	1.92	2585	170.60	87	400	0.86	6	300	1	2
1080	MDEBAXM-063-12	210	0.68	0.12	87.58	610.53	1390	0.45	50	400	0.65	6	300	1.5	10
1081	MDEBAXM-063-12	250	1.17	0.21	87.58	610.53	2500	0.78	87	400	0.65	6	300	1.5	10
1082	MDEBAXM-063-32	210	0.98	0.18	56.90	342.11	1400	0.65	50	400	0.65	6	300	1.5	10
1083	MDEBAXM-063-32	250	1.70	0.31	56.90	342.11	2510	1.13	87	400	0.65	6	300	1.5	10
1084	MDEBAXM-071-12	210	1.35	0.25	39.90	157.20	1390	0.90	50	400	0.64	6	300	3.6	2
1085	MDEBAXM-071-12	250	2.34	0.43	39.90	157.20	2500	1.56	87	400	0.64	6	300	2	2
1086	MDEBAXM-071-32	211	1.95	0.37	25.03	122.60	1380	1.30	50	400	0.64	6	300	3.4	2
1087	MDEBAXM-071-32	251	3.38	0.64	25.03	122.60	2490	2.25	87	400	0.64	6	300	2.5	2
1088	MDEBAXM-080-12	212	2.40	0.55	20.69	89.00	1400	1.60	50	400	0.68	6	300	3.2	2

6.6 Adjusting the motor

6.6.3 Motor temperature monitoring with PTC or thermal contact

Information on the motor nameplate		Motor data													
C86	Field	C0086	C0022	C0081	C0084	C0085	C0087	C0088	C0089	C0090	C0091	C0070	C0071	C0075	C0076
	Type		I _{max} [A]	P _r [kW]	R _s [Ω]	L _σ [mH]	n _N [rpm]	I _N [A]	f _r [Hz]	U _r [V]	cos φ	V _{pn}	T _{nn}	V _{pi}	T _{ni}
1089	MDEBAXM-080-12	252	4.16	0.95	20.69	89.00	2510	2.77	87	400	0.68	6	300	1.6	2
1090	MDEBAXM-080-32	213	3.00	0.75	11.69	65.20	1400	2.00	50	400	0.72	6	300	3.5	2
1091	MDEBAXM-080-32	253	5.20	1.30	11.69	65.20	2510	3.46	87	400	0.72	6	300	1.9	3
1092	MDEBAXM-090-12	214	4.05	1.10	6.40	37.00	1420	2.70	50	400	0.77	6	300	2.5	2
1093	MDEBAXM-090-12	254	7.05	2.00	6.40	37.00	2535	4.70	87	400	0.77	6	300	2	2
1094	MDEBAXM-090-32	215	5.40	1.50	4.80	26.00	1415	3.60	50	400	0.77	6	300	2	2
1095	MDEBAXM-090-32	255	9.30	2.70	4.80	26.00	2530	6.20	87	400	0.77	6	300	1	2
1096	MDEBAXM-100-12	216	7.20	2.20	2.90	20.00	1425	4.80	50	400	0.80	6	300	1	1.5
1097	MDEBAXM-100-12	256	12.45	3.90	2.90	20.00	2535	8.30	87	400	0.80	6	300	0.8	1.5
1098	MDEBAXM-100-32	217	9.90	3.00	2.10	17.00	1415	6.60	50	400	0.81	6	300	2.5	1.5
1099	MDEBAXM-100-32	257	17.10	5.35	2.10	17.00	2530	11.40	87	400	0.81	6	300	1.4	1.8
1100	MDEBAXM-112-22	218	12.45	4.00	1.50	11.00	1435	8.30	50	400	0.82	6	300	2	2
1101	MDEBAXM-112-22	258	21.45	7.10	1.50	11.00	2545	14.30	87	400	0.82	6	300	1	2
1102	MDEBAXM-112-32	219	17.85	5.50	2.71	21.40	1425	11.90	50	400	0.84	6	300	1.5	10
1114	MDFMAxx-200-32	224	83.25	30.00	–	–	1465	55.50	50	400	0.85	6	300	1	2
1115	MDFMAxx-200-32	264	145.50	52.00	–	–	2575	97.00	87	400	0.85	6	300	1	2

6.6.3 Motor temperature monitoring with PTC or thermal contact

Description

PTC resistors according to DIN 44081 and DIN 44082 can be connected via the terminal inputs T1 and T2. The motor temperature is measured and integrated into the drive monitoring.

A thermal contact (NC contact) can also be connected to T1 and T2. Lenze three-phase AC motors provide thermal contacts as default.

When using motors equipped with PTC resistors or thermostats, we recommend to always activate the PTC input. This prevents the motor from being destroyed by overheating.



Stop!

- The motor temperature monitoring may only be connected to T1, T2 if the cable is terminated with a PTC or thermal contact (NC contact) on the motor side.
 - An "open" cable acts like an antenna and can cause faults on the drive controller.
 - Input signals at T1, T2 are processed with a delay of 2 s.
- The drive controller can only evaluate one PTC resistor! Do not connect several PTC resistors in series or in parallel:
 - The motor temperature would be measured incorrectly.
 - The motors could be destroyed by overheating.
- If you operate several motors on a drive controller, use thermal contacts (NC contacts) for motor temperature monitoring and connect these in series.
- To achieve full motor protection, an additional temperature monitoring with separate evaluation must be installed.

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0585	MONIT OH8	3	0 TRIP	Configuration of motor temperature monitoring • Temperature monitoring via PTC input (T1, T2)
			2 Warning	
			3 Off	

6.6-8
See System Manual
(extension)

Activation



Note!

- In the Lenze setting the motor temperature monitoring is switched off!
- If you work with several parameter sets, the monitoring must be activated separately in each parameter set!

1. Connect the monitoring circuit of the motor to T1 and T2.
 - With $1.6\text{ k}\Omega < R < 4\text{ k}\Omega$, the monitoring responds.
2. Set the controller reaction:
 - C0585 = 3: Temperature monitoring of the motor is switched off.
 - C0585 = 0: TRIP error message (display of keypad: OH8 **Trip**)
 - C0585 = 2: Warning signal (display of keypad: OH8 **Warn**)

Function test

Connect the PTC input with a fixed resistor:

- $R > 4\text{ k}\Omega$: The fault message OH8 must be activated.
- $R < 1\text{ k}\Omega$: Fault message must not be activated.

6.6.4 Motor temperature monitoring with KTY

Description

Via the incremental encoder connection X8 a KTY resistor can be connected to pin X8/5 and X8/8. The motor temperature is detected and integrated in the drive monitoring.

The KTY resistor is monitored with regard to interruption and short circuit.

We recommend to always activate the KTY input when using motors which are equipped with KTY resistors. This serves to prevent the motor from being destroyed by overheating.



Stop!

- ▶ The controller can only evaluate one KTY resistor! Do not connect several KTY resistors in series or parallel:
 - The motor temperature would be measured incorrectly.
 - The motors could be destroyed by overheating.
- ▶ If several motors are operated on one controller, use thermal contacts (NC contacts) connected in series for motor temperature monitoring.
- ▶ To achieve full motor protection, an additional temperature monitoring with separate evaluation must be installed.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0121	OH7 limit	150	45	{1 °C}		150	Setting of the operating temperature for monitoring OH7 - Only for KTY at X8 - Monitoring OH7 is configured in C0584 
C0583	MONIT OH3	3	0	TRIP		Configuration of motor temperature monitoring with fixed operating temperature - Only for KTY at X8 - The operating temperature is fixed at 150 °C	 6.6-10 See System Manual (extension)
			2	Warning			
			3	Off			
C0584	MONIT OH7	3	2	Warning		Configuration of monitoring motor temperature with variable operating temperature - Only for KTY at X8 - When reaching the temperature set in C0121 the warning OH7 is activated	 6.6-10 See System Manual (extension)
			3	Off			

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0594	MONIT SD6	3	0 TRIP	Activation of the motor temperature monitoring with KTY at X8 • Use C0594 = 0 or 2 to activate monitoring • In case of a short circuit or interruption at X8/5 and X8/8 the fault message SD6 is activated • Configuration of the response when exceeding the motor temperature – Fixed operating temperature in C0583 – Variable operating temperature in C0584
			2 Warning	
			3 Off	
C1190	Motor PTC selection	0		Temperature characteristic for PTC thermistors • Selection of the characteristic for PTC thermistors at X7 or X8 for detecting the motor temperature
			0 Standard	Characteristic for PTC thermistors in Lenze motors
			1 Characteristic	Characteristic for application-specific PTC thermistors
C1191	Temperature characteristic		0 {1 °C} 255	Temperature range for PTC thermistors • Define temperature points on the characteristic for PTC thermistors
1	Temperature 1	100		Temperature point 1
2	Temperature 2	150		Temperature point 2
C1192	Resistance characteristic	0	{1 Ω} 3000	Resistance characteristic for PTC thermistors • Define resistance points on the characteristic for PTC thermistors
1	Resistance 1	1670		Resistance point 1
2	Resistance 2	2225		Resistance point 2

Activation



Note!

- ▶ In the Lenze setting, the motor temperature monitoring is switched off!
- ▶ If you work with several parameter sets, the monitoring must be activated separately in each parameter set!

Use C0594 = 0 or C0594 = 2 to activate the motor temperature monitoring via X8. In addition, the connection is monitored for short circuit and interruption.

1. Connecting the monitoring circuit of the motor to X8/5 and X8/8.
2. Setting controller reaction to short circuit or interruption of the connection:
 - C0594 = 3: Monitoring is switched off.
 - C0594 = 0: TRIP error message (display of keypad: Sd6 **Trip**)
 - C0594 = 2: Warning signal (display of keypad: Sd6 **Warn**)

Adjustment

Monitoring with a fixed operating temperature (150 °C)

1. Set response of the controller:
 - C0583 = 3: temperature monitoring of the motor switched off.
 - C0583 = 0: TRIP error message (keypad display: OH3 **Trip**)
 - C0583 = 2: warning signal (keypad display: OH3 **Warn**)

Monitoring with a variable operating temperature (45...150 °C)

1. Set the operating temperature in C0121.
2. Set response of the controller:
 - C0584 = 3: temperature monitoring of the motor switched off.
 - C0584 = 2: warning signal (keypad display: OH7 **Warn**)

Adjustment of KTY operating range

The temperature and resistance range can be adapted to the KTY used.

- C1190 = 0: Fixed operating range for KTY in Lenze motors (Lenze setting)
- C1190 = 1: Adjustable operating range

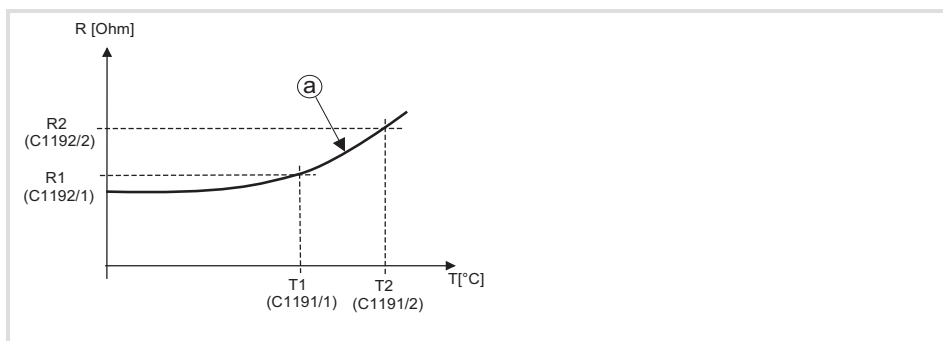


Fig. 6.6-3 Setting of the operating range for the KTY (C1190 = 1)

The operating range is specified by means of limit values and is in the almost linear section of the graph (a). The operating values are determined by interpolation.

C1191/1	Setting of the lower and upper temperature value (T_1 , T_2)
C1191/2	corresponding to the KTY used.
C1192/1	Setting of the lower and upper resistance value corresponding to
C1192/2	the KTY used.

6.6.5 Current limits

Description

The controllers are provided with a current limit value control which determines the dynamic behaviour under load. The resulting utilisation is compared to the current limit value set under C0022 for motor load and under C0023 for generator load. If the current limit values are exceeded, the controller changes its dynamic behaviour.

Controller performance when a limit value is reached

Motor overload during acceleration:

The controller extends the acceleration ramp.

Generator overload during deceleration:

The controller extends the deceleration ramp.

With increasing load and constant speed:

- ▶ When the current limit of the motor mode is reached:
 - The controller reduces the speed up to 0 min^{-1} .
 - The controller cancels the change of the speed if the load falls below the limit value again.
- ▶ When the current limit in the generator mode is reached:
 - The controller increases the speed up to the maximum speed (C0011).
 - The controller cancels the change of the speed if the load falls below the limit value again.
- ▶ If a sudden load is built up at the motor shaft (e. g. the drive is blocked), the overcurrent disconnection can respond (fault message OCx).

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0022	I _{max} current	→	0 {0.1 A}	- I _{max} limit in motor mode → depending on C0086	 6.6-14
C0023	I _{max} gen.	→	0 {0.1 A}	- I _{max} limit in generator mode → depending on C0086	 6.6-14

Adjustment

- ▶ Set the acceleration and deceleration times so that the drive can follow the speed profile without reaching $I_{\max}$ of the controller.
- ▶ A correct current control during operation in generator mode is only possible with an external brake resistor.
- ▶ Drive behaviour with motor or generator overload ($C0054 > C0022$ or $C0023$):
 - The controller reduces the speed up to 0 min^{-1} .
 - The controller cancels the change of the speed if the load falls below the limit value again.
- ▶ When operating with switching frequency $> 2 \text{ kHz}$, $C0022$ and $C0023$ must be adapted to the permissible output currents (derating).
- ▶ A correct current control ($C0075$, $C0076$) in generator mode is only possible with a connected brake resistor or in DC bus connection with energy exchange.

6.6.6 Automatic collection of motor data

Description

The motor data identification serves to detect the required motor data and influences of the motor cable.

Before executing the identification you must manually enter the motor data from the motor nameplate into the corresponding codes.

Vector control ($C0006 = 1$)

In the vector control mode the motor data identification must be executed before initial commissioning.

- ▶ In case of vector control without temperature feedback, the heating of the motor in the motor model is not taken into consideration.
- ▶ In case of vector control with thermal sensor KTY a motor temperature of $20 \text{ }^{\circ}\text{C}$ in the motor model is considered.

Important: The temperature feedback must be activated ($C0594 = 0$ or $C0594 = 2$) before you execute the motor data identification.

V/f characteristic control ($C0006 = 5$)

In the Lenze setting, the controllers are defined for a power-adapted motor with 10 m of motor cable. Therefore the motor data identification is not essential.

- ▶ The identification of the motor data also influences the smooth running behaviour. When identifying the motor data for this operating mode, you can optimise the smooth running behaviour at low speeds.

Codes for parameter setting

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0084 	Mot Rs	→	0.00	{0.01 mΩ}	100000.00	Motor stator resistance → Value is determined by motor parameter identification (C0148, C0149)	 6.6-1  6.6-15
C0087 	Mot speed	→	50	{1 rpm}	36000	Rated motor speed → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor speed in C0087 ● Change of C0087 sets C0086 = 0	 6.6-1
C0088 	Mot current	→	0.5	{0.1 A}	1000.0	Rated motor current → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor current in C0088 ● Change of C0088 sets C0086 = 0	 6.6-1
C0089 	Mot frequency	→	10	{1 Hz}	5000	Rated motor frequency → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor frequency in C0089 ● Change of C0089 sets C0086 = 0	 6.6-1
C0090 	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor voltage in C0090 ● Change of C0090 sets C0086 = 0	 6.6-1
C0091 	Mot cos phi	→	0.50	{0.01 }	1.00	Motor cos φ → depending on C0086 ● Motor selection in C0086 sets the corresponding motor cos φ in C0091 ● Change of C0091 sets C0086 = 0	 6.6-1
C0092 	Mot Ls	→	0.00	{0.01 mH}	6553.50	Motor stator inductance → Value is determined by motor parameter identification from C0088, C0089, C0090 and C0091 → Motor selection in C0086 sets corresponding stator inductance value in C0092	 6.6-1

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0148 	ident run	0	0	WRK stop	Ready	Motor data identification 1. Inhibit controller, wait until drive has stopped 2. Enter the correct values of the motor nameplate into C0087, C0088, C0089, C0090, C0091 3. Set C0148 = 1, confirm with  4. Enable controller The identification – starts,  goes off. The motor "whistles" but does not rotate! – lasts approx. 1 ... 2 min – is completed when  is lit again 5. Inhibit controller:	 6.6-15
			1	WRK run	Start identification		
C0149 	Auto ident	0	0	Id inactive	Automatic identification is inactive	Automatic motor data identification 1. Inhibit controller, wait until drive has stopped 2. Enter the correct values of the motor nameplate into C0087, C0088, C0089, C0090, C0091 3. Set C0149 = 1, confirm with  4. Enable controller The identification – starts,  goes off. The motor "whistles" but does not rotate! – lasts approx. 1 ... 2 min – is completed when  is lit again 5. Inhibit controller:	 6.6-15
			1	Id active	Automatic identification is active • The identification starts automatically after controller enable • After a faulty identification, the process is restarted after TRIP RESET or mains switching and subsequent controller enable		

Adjustment

The identification is only executed for the parameter set which is activated at the moment:

- ▶ If you want to identify the motor data for another parameter set, you must switch to this parameter set and restart the identification.



Note!

- ▶ During the identification the motor is supplied with current. The motor does not rotate.
- ▶ The load machine can remain to be connected. Existing holding brakes can be kept in the braking position.
- ▶ If the motor is idling, a small phase offset may occur at the motor shaft.

1. Enter C0087, C0088, C0089, C0090 and C0091 of your motor (see nameplate):
 - It is vital to enter the correct values since these entries influence important parameters such as slip compensation and no-load current.
 - Enter the values according to the connection method (star or delta) for the rated motor current (C0088) and rated motor voltage (C0090).

Manual motor data identification (C0148)

1. Inhibit the controller. Wait until drive stands still.
2. Select C0148 = 1, confirm with **ENTER**.
3. Enable the controller. The identification starts.
 - The green LED at the controller is blinking very fast.
 - "WRK run" is displayed at the keypad.
 - The rotor resistance is calculated and saved in C0082.
 - The motor stator resistance is detected and saved in C0084.
 - The motor leakage inductance is measured and saved in C0085.
 - The inverter compensation characteristic is calculated from the measured motor stator resistance and saved in C1751/1 ... C1751/17.
 - The motor stator inductance is calculated from the entered data and saved in C0092.
 - The identification takes approx. 1 ... 2 min (dependent on the rated motor power).
 - The identification is completed when the green LED at the controller is lit (keypad, GDC: **IMP** is active).
4. Inhibit the controller.

If the motor data identification has been completed incorrectly

If the identification is incorrect, the fault ID1 or ID2 is displayed.

- ▶ If the motor data identification is incorrect, the process must be repeated from step 2.

Automatic motor data identification (C0149)

The automatic motor data identification is suitable for standard and replacement devices which are pre-parameterised in the workshop and commissioned on site:

- ▶ Enter the motor data of the motor nameplate, set C0149 = 1 and save the settings.
- ▶ The motor data identification is started with the first controller enable. After a successful identification the settings are automatically saved in the parameter set 1.

1. Inhibit controller (X5/28 = LOW).
2. Switch on the mains.
3. Select a Lenze motor under C0086 or enter motor data of the nameplate.
4. If required, select C0149 = 1 and confirm with **ENTER**.
5. Enable the controller. The identification starts.
 - The green LED at the controller is blinking very fast.
 - "WRK run" is displayed at the keypad.
 - The rotor resistance is calculated and saved in C0082.
 - The motor stator resistance is detected and saved in C0084.
 - The motor leakage inductance is measured and saved in C0085.
 - The inverter compensation characteristic is calculated from the measured motor stator resistance and saved in C1751/1 ... C1751/17.
 - The motor stator inductance is calculated from the entered data and saved in C0092.
 - The identification takes approx. 1 ... 2 min (dependent on the rated motor power).
 - The identification is completed when the green LED at the controller is lit (keypad, GDC: **IMP** is active).
 - Controller is inhibited.
 - If required, select C0149 = 0 and confirm with **ENTER**. The automatic motor data identification is deactivated.
6. Inhibit the controller.

If the motor data identification has been completed incorrectly

If the identification is incorrect, the fault ID or ID is displayed.

1. Acknowledge fault with TRIP RESET or switch the mains.
2. Enable the controller. The identification restarts.

6.7 Setting the speed feedback

Description

For speed monitoring, the feedback signal via incremental encoder can either be supplied via input X8 or X9.

- At input X8 you can only attach an incremental encoder with TTL-levels.
- Incremental encoders with HTL-level can only be connected to input X9.

The incremental encoder signal can be output for slaves at the digital frequency output X10.

The master frequency input (DFIN) and master frequency output (DFOUT) are described in the chapter "Function library".



Note!

You can use maximally two of the three interfaces X8, X9, X10 at the same time. This may lead to the fact that the incremental encoder input cannot be activated or the master frequency input or master frequency output does not work.

- This does not apply if the input signal at X8 or X9 is directly output to master frequency output X10 (C0540 = 4 or 5).
- To deactivate the master frequency input, the internal signal connection of function block DFIN to the following function block must be removed. Remove the function block DFIN from the processing table.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0025 STOP	Feedback type	1		Speed feedback	6.7-1
			1 no feedback No feedback		
			100 IT (C420) - X8 Input of the number of increments in C0420	Incremental encoder at X8 Incremental encoders with TTL level can only be connected to X8.	
			101 IT (C420) - X9 Input of the number of increments in C0420	Incremental encoder at X9 Connect incremental encoders with HTL-level on X9 only	
				Incremental encoder at X8 Incremental encoders with TTL level can only be connected to X8.	
			110 IT512-5V 512 inc		
			111 IT1024-5V 1024 inc		
			112 IT2048-5V 2048 inc		
			113 IT4096-5V 4096 inc		

6.7 Setting the speed feedback

6.7.1 Incremental encoder with TTL level at X8

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0420 STOP	Encoder const	512	1	{1 inc/rev}	8192	Number of increments for incremental encoder at X8 or X9 Connect incremental encoders with HTL-level on X9 only	6.7-1
C0421 STOP	Enc voltage	5.00	5.00	{0.1 V}	8.00	Supply voltage for the incremental encoder at X8 CAUTION! A wrong entry can destroy the incremental encoder!	

6.7.1 Incremental encoder with TTL level at X8

On X8, only incremental encoders with TTL level can be operated. Wiring diagram and pin assignment of X8 are described in chapter "Wiring of the standard device" → "Wiring of the feedback system".

Activation

- C0025 = 100. In addition, you have to set the number of increments in C0420.
- C0025 = 110, 111, 112 or 113. The number of increments (512, 1024, 2048 or 4096) is automatically set.

Adjustment

The incremental encoder is supplied with voltage by the drive controller.



Stop!

If the supply voltage is too high, it may destroy the incremental encoder.

Under C0421 you can adjust the supply voltage V_{CC} (5 V) of the incremental encoder in order to compensate for the voltage drop along the incremental encoder cable (if required).

Calculation of the voltage drop

$\Delta U \approx l [m] \cdot \frac{R [\Omega]}{[m]} \cdot I_{inc} [A]$	l	Length of the incremental encoder cable
	R	Resistance of the incremental encoder cable
	I_{inc}	Current consumption of the incremental encoder

6.7.2 Incremental encoder with HTL level at X9

On X9, incremental encoders with HTL level can be operated. Wiring diagram and pin assignment of X9 are described in chapter "Wiring of the standard device" → "Wiring of the feedback system".

Activation

- C0025 = 101. In addition, you have to set the number of increments in C0420.

Adjustment

The incremental encoder must be operated with an external supply voltage. C0421 has no influence.

- Incremental encoders with HTL level require DC 8 ... 30 V supply voltage. Please observe the information by the manufacturer.

6.8 Operating mode

Description	The control mode of the controller can be selected via the operating mode. You can select between the following modes: ▶ V/f characteristic control ▶ Vector control
Selection of the correct operating mode	The V/f characteristic control is the classic operating mode for standard applications. When using the vector control you will achieve improved drive features compared to the V/f characteristic control due to: ▶ Higher torque via the complete speed range ▶ Higher speed accuracy and higher concentricity factor ▶ Higher efficiency

Speed/ torque characteristics

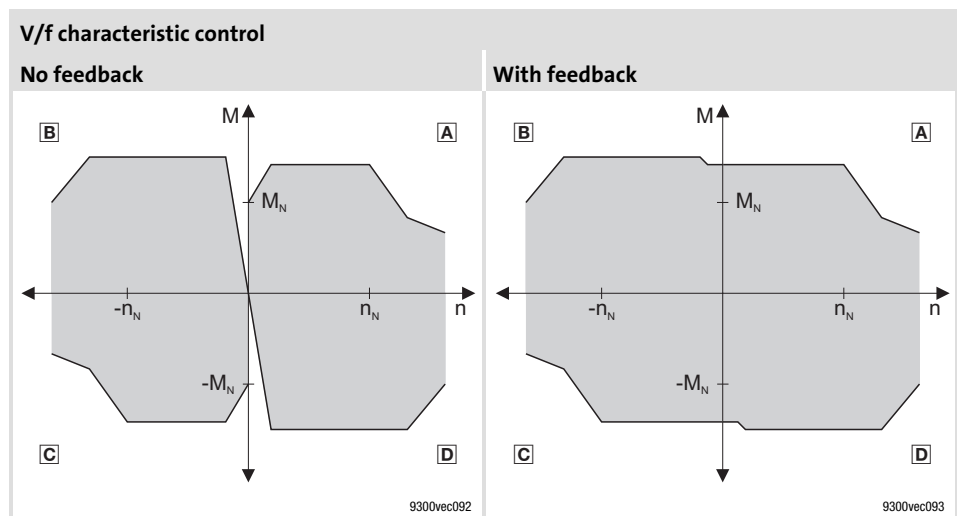


Fig. 6.8-1 Speed/ torque characteristics

- A** Operation in motor mode (CW rotation)
- B** Operation in generator mode (CCW rotation)
- C** Operation in motor mode (CCW rotation)
- D** Operation in generator mode (CW rotation)

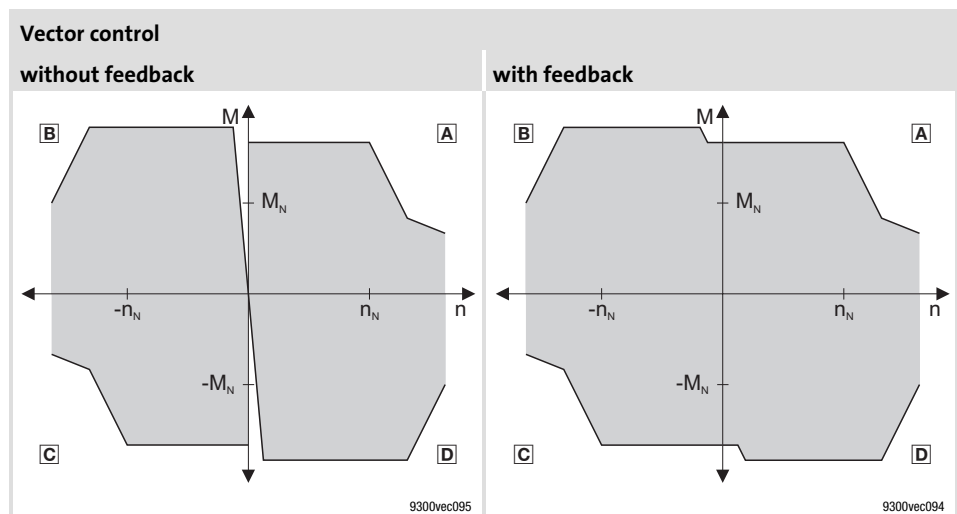


Fig. 6.8-2 Speed/ torque characteristics

- A** Operation in motor mode (CW rotation)
- B** Operation in generator mode (CCW rotation)
- C** Operation in motor mode (CCW rotation)
- D** Operation in generator mode (CW rotation)

Recommended operating modes

The frequency inverter is mainly designed for the applications listed in the below table.

The table helps you to select the correct operating mode for your application:

- C0006 = 5: V/f characteristic control with constant $V_{\min}$ boost
- C0006 = 1: Vector control

Power range 110 ... 400 kW	Selection of the operating mode in C0006			
	Motor cable shielded ≤ 100 m unshielded ≤ 200 m		Motor cable shielded > 100 m unshielded > 200 m	
	recommended	alternatively	recommended	alternatively
Applications with asynchronous motors				
Single drives				
Drives with constant load	5	1	5	-
Drives with heavy start conditions	1	5	5	-
Travelling drives, conveyor belts	5	1	5	-
Pump drives, fan drives ¹⁾	5	-	5	-
Extruder drives	5	1	5	-
Drives for wire drawing machines	5	1	5	-
Drives for rolling machines	5	1	5	-
Drives for rewinders with dancer (speed-controlled)	1	5	-	-
Group drives (the resulting motor cable length is decisive I_{res})	5	-	5	-
$I_{\text{res}} = \sqrt{i \cdot (I_1 + I_2 + \dots + I_i)}$				

¹⁾ A square voltage characteristic (C0014 = 1) is recommended for this application

**Note!**

Only switch between the operating modes if the controller is inhibited!

6.8.1 V/f characteristic control

Description

The output voltage of the controller follows a defined characteristic. At low output frequencies, the characteristic can be boosted. It can be adapted to different load profiles.

- Linear characteristic for drives with constant load torque over the speed.
- Quadratic characteristic for drives with quadratic load torque over the speed:
 - Quadratic V/f characteristics are preferably used in centrifugal pump and fan drives. However, it must be checked whether your pump or fan drive can be operated in this operating mode!
 - If your pump or fan drive cannot be used for the operation with a quadratic V/f characteristic, the linear V/f characteristic or vector control mode must be used.

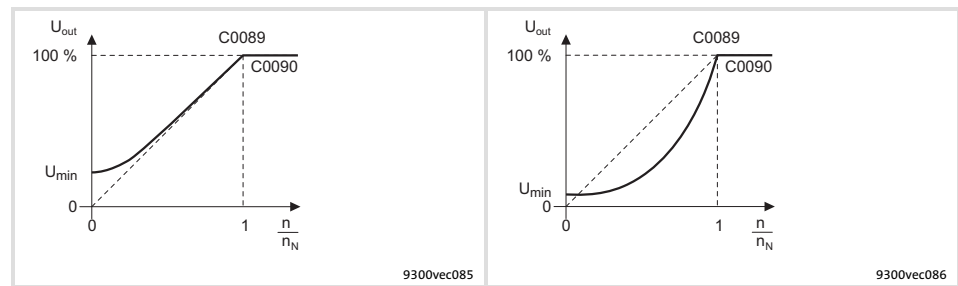


Fig. 6.8-3 Linear and square-law V/f characteristic

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0006 	Op mode	5		Selection of the operating mode for the motor control	
			1 vector ctrl	Vector control without or with speed feedback	In case of the first selection enter the motor data and identify them with C0148. 6.8-8
			5 V / f	V/f characteristic control	Commissioning without identification of the motor data is possible • Advantage of identification with C0148: Improved smooth running at low speeds 6.8-4
C0014	V/f charact.	0		Characteristic in the V/f characteristic control mode	8.2-25
			0 Linear	Linear V/f characteristic	
			1 square	Square V/f characteristic	
C0015	Rated freq	50	10 {1 Hz}	5000 V/f-rated frequency In C0015 you can set a base frequency which differs from the rated motor frequency (C0089) • Lenze setting: C0015 = C0089 • Changing C0086 or C0089 overwrites the value in C0015	8.2-25

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0016	Umin boost	0.00	0.00	{0.01 %}	100.00	U _{min} boost (FCODE) ● C0016 = 1 % corresponds to a boost of 1 % of the rated motor voltage (C0090) ● Code is freely configurable  6.8-4
C0021	slipcomp	→	-20.00	{0.01 %}	20.00	Slip compensation → Change of C0086, C0087 or C0089 sets C0021 to the calculated rated slip of the motor ● When changing over to the vector control mode, C0021 is set to 0  6.11-1  8.2-25  8.2-40
C0090 	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 ● Motor selection in C0086 sets the corresponding rated motor voltage in C0090 ● Change of C0090 sets C0086 = 0  6.6-1

Adjustment

1. Select "V/f characteristic control" mode (C0006 = 5, factory adjustment).
2. Select V/f characteristic (C0014) if necessary
3. Enter the data of the motor nameplate.
4. If required, you can set a base frequency in C0015 which differs from the rated motor frequency (C0089).

Set $U_{\min}$ boost

Load-independent boost of the motor voltage for output frequencies below the V/f rated frequency. This serves to optimise the torque behaviour.

C0016 must be adapted to the asynchronous motor used. Otherwise the motor may be destroyed by overtemperature or the controller may be operated with overcurrent:

1. Operate the motor in idle state at 5 ... 10 % of the rated speed (n_N):
2. Increase $V_{\min}$ until you reach the following motor current:
 - A Motor in short-time operation up to $0.5 \cdot n_N$:
 - For self-ventilated motors: $I_{\text{motor}} \approx I_{N \text{ motor}}$
 - For forced ventilated motors: $I_{\text{motor}} \approx I_{N \text{ motor}}$
 - B Motor in continuous operation up to $0.5 \cdot n_N$:
 - For self-ventilated motors: $I_{\text{motor}} \approx 0.8 \cdot I_{N \text{ motor}}$
 - For forced ventilated motors: $I_{\text{motor}} \approx I_{N \text{ motor}}$



Note!

Observe for all adjusting processes the thermal behaviour of the connected asynchronous motor at low speeds:

- Usually, standard asynchronous motors with insulation class B can be driven for a short time with its rated current in the speed range up to $0.5 \cdot n_N$.
- Contact the motor manufacturer for getting the exact setting values for the max. permissible motor current of self-ventilated motors in the lower speed range.

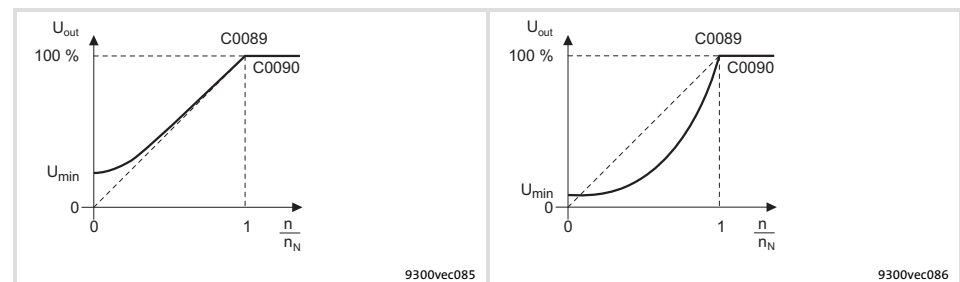


Fig. 6.8-4 $U_{\min}$ boost at linear and square-law V/f characteristic

Optimising V/f characteristic control

In general the V/f characteristic control can be operated without any further measures. The V/f characteristic control must only be optimised in case of the following drive behaviour:

Drive behaviour	Remedy
Does not rotate concentrically at low speeds, especially when operating with long motor cables	Executing motor identification
Problems in case of high starting duty (high mass inertia), in extreme cases, the error message OC1 occurs	Adjusting the voltage increase (C0016). - Set C0016 so that with an enabled controller and 5 ... 10 % of the rated speed an approx. 0.8-fold ... single rated motor current flows ▢ 6.8-6
The set voltage increase (C0016) does not result in the desired current flow (controller has problems at high starting duty, error message OC1 during acceleration).	Adapting the voltage increase with boost correction (▢ 6.11-5)
Drive does not follow the speed setpoint. Reason: The current controller intervenes in the rated field frequency to limit the controller output current to the maximum current (C0022, C0023)	- Increasing acceleration / deceleration time - Consider sufficient magnetising time of the motor. the magnetising time amounts to 0.1 ... 2 s depending on the motor power - Increase permissible maximum current (C0022, C0023)
For operation without speed feedback (C0025 = 1): Lack of speed stability at high load (setpoint and motor speed are not proportional anymore)	- Increase slip compensation (C0021). Important: unstable drive due to overcompensation! - In case of cyclic load impulses (e.g. centrifugal pump) a smoother motor characteristic can be achieved by smaller values in C0021 (maybe negative values) Note: The slip compensation is only active for operation without speed feedback.
Error messages OC1 or OC3 with short acceleration times (C0012) compared with the load (controller cannot follow the dynamic processes)	- Increase gain of the $I_{\max}$ controller (C0075) - Reduce integral-action time of the $I_{\max}$ controller (C0076) - Increase acceleration time (C0012)
Mechanical resonances at certain speeds	The function block NLIM1 serves to suppress those speed ranges in which resonances occur (see chapter "Function library").
Speed oscillations in no-load operation at speeds $> \frac{1}{3}$ rated speed	The oscillation damping minimises speed oscillations (see "Optimising operational performance" in chapter "Commissioning")

6.8.2 Vector control

Description

Compared to the V/f characteristic control, the vector control serves to achieve a considerably higher torque and lower current consumption in idle state.



Note!

- ▶ The connected motor may be maximally two power classes smaller than the motor assigned to the drive controller.
- ▶ The motor data identification is essential.

Codes for parameter setting

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0006 	Op mode	5				Selection of the operating mode for the motor control	
			1	vector ctrl	Vector control without or with speed feedback	In case of the first selection enter the motor data and identify them with C0148.	6.8-8
			5	V / f	V/f characteristic control	Commissioning without identification of the motor data is possible Advantage of identification with C0148: Improved smooth running at low speeds	6.8-4
C0021	slipcomp	→	-20.00	{0.01 %}	20.00	Slip compensation → Change of C0086, C0087 or C0089 sets C0021 to the calculated rated slip of the motor When changing over to the vector control mode, C0021 is set to 0	6.11-1 8.2-25 8.2-40
C0075	Vp curr CTRL	0.04	0.00	{0.01 }	0.99	Gain of current controller - Vector control: Gain of current controller - V/f characteristic control: Maximum current controller	8.2-25 8.2-40
C0076	Tn curr CTRL	10.0	0.1	{0.1 ms}	2000.0	Integral-action time of current controller - Vector control: integral-action time of current controller - V/f characteristic control: maximum current controller - C0076 = 2000 ms: current controller is switched off	8.2-25 8.2-40
C0077	Ti field CTRL	4.0	0.3	{0.1 ms}	6000.0	Integral-action time of field controller Only active in case of vector control with feedback	
C0081 	Mot power	→	0.01	{0.01 kW}	500.00	Rated motor power → Change of C0086 resets value to factory setting Change of C0081 sets C0086 = 0	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0087 	Mot speed	→	50	{1 rpm}	36000	Rated motor speed → depending on C0086 - Motor selection in C0086 set the corresponding rated motor speed in C0087 - Change of C0087 sets C0086 = 0	 6.6-1
C0088 	Mot current	→	0.5	{0.1 A}	1000.0	Rated motor current → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor current in C0088 - Change of C0088 sets C0086 = 0	 6.6-1
C0089 	Mot frequency	→	10	{1 Hz}	5000	Rated motor frequency → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor frequency in C0089 - Change of C0089 sets C0086 = 0	 6.6-1
C0090 	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor voltage in C0090 - Change of C0090 sets C0086 = 0	 6.6-1
C0091 	Mot cos phi	→	0.50	{0.01 }	1.00	Motor cos φ → depending on C0086 - Motor selection in C0086 sets the corresponding motor cos φ in C0091 - Change of C0091 sets C0086 = 0	 6.6-1
C0092 	Mot Ls	→	0.00	{0.01 mH}	6553.50	Motor stator inductance → Value is determined by motor parameter identification from C0088, C0089, C0090 and C0091 → Motor selection in C0086 sets corresponding stator inductance value in C0092	 6.6-1
C0148 	ident run	0	0	WRK stop	Ready	Motor data identification 1. Inhibit controller, wait until drive has stopped 2. Enter the correct values of the motor nameplate into C0087, C0088, C0089, C0090, C0091 3. Set C0148 = 1, confirm with  4. Enable controller The identification - starts,  goes off. The motor "whistles" but does not rotate! - lasts approx. 1 ... 2 min - is completed when  is lit again 5. Inhibit controller:	 6.6-15
			1	WRK run	Start identification		

Set vector control

C0006 = 1 set the vector control mode.



Note!

When setting the vector control mode, the slip compensation (C0021) is automatically set to 0.0 %.

- ▶ When you switch back to the V/f characteristic control mode, the slip compensation must be re-adapted.

Prepare the motor data
identification

The motor data of the motor nameplate must be entered:

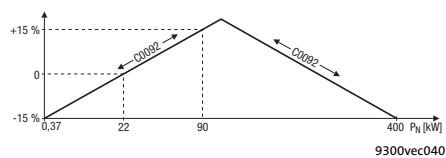
- ▶ Rated motor speed (C0087)
- ▶ Rated motor current (C0088)
- ▶ Rated motor frequency (C0089)
- ▶ Rated motor voltage (C0090)
- ▶ Motor $\cos \varphi$ (C0091)

Executing the motor data
identification

Execute the motor data identification. (📖 6.6-15)

Optimising vector control

In general the vector control can be operated without any further measures. The vector control must only be optimised in case of the following drive behaviour:

Drive behaviour	Remedy
Operation without feedback: - The current consumption in idle state differs widely from the rated magnetising current ($I_{mR} \approx I_N \times \sin \varphi$). Calculate $\sin \varphi$ from the $\cos \varphi$ of the motor nameplate. - The drive has an uneven starting performance	- Optimise setpoint for the motor magnetising current. (□ 6.11-9) - Stator inductance (C0092) must be adapted after motor parameter identification. The calculation of the stator inductance by the motor data identification is based on the motor data entered before and does not consider the physical leakage of the motor and the inductive reactance of the motor cable.  Tendency of the correction of C0092 PN: rated motor power
Lack of speed stability at high load (setpoint and motor speed are not proportional anymore)	Use C0021 (slip compensation) to change the influence of the rotor resistance (C0082) proportionally: - Reduce the value in C0021 at an increasing speed (negative values) - Increase the value in C0021 at a decreasing speed Note: If you activate the vector control (C0006 = 1), C0021 is automatically set to 0 %.
Unstable control at higher speeds	- Reduce the gain of the speed controller (C0070) (if required, speed-dependent adaptation via function block CURVE1 and MCTRL-VP-ADAPT) - Control value in C0092 by comparing the current consumption in no-load operation with the rated magnetising current ($I_{mR} \approx I_N \times \sin \varphi$). - Optimise oscillation damping (C0234 ... C0236)
Unstable control at higher speeds and high torque at high power (> 55 kW)	- Reduce gain of the I_{max} controller (C0075) or reduce gain and influence of the oscillation damping (at a power of 55 ... 90 kW). - For operation with feedback, deactivate oscillation damping with C0234 = 0.
Unstable control in field weakening range for operation with speed feedback	- Reduce integral-action time of the field controller via C0077 - Increase gain of the I_{max} controller (C0075)
Error messages OC1 or OC3 with short acceleration times (C0012) compared with the load (controller cannot follow the dynamic processes).	- Increase gain of the I_{max} controller (C0075) - Reduce integral-action time of the I_{max} controller (C0076) - Increase acceleration time (C0012)
Mechanical resonances at certain speeds	The function block NLIM1 serves to suppress those speed ranges in which resonances occur (see chapter "Function library").
Speed oscillations in no-load operation at speeds > 1/3 rated speed	The oscillation damping minimises speed oscillations (see "Optimising operational performance" in chapter "Commissioning")

6.9 Switching frequency of the inverter

Description

The switching frequency of the inverter influences the smooth running behaviour, the power loss in the controller and the noise generation in the connected motor. The Lenze setting is the optimal value for standard applications. The following general rule applies:

The lower the switching frequency, the

- ▶ lower the power loss.
- ▶ higher the noise generation.
- ▶ better the concentricity factor.

You can select between two switching frequency modes:

Code	sine-wave modulated (sin)	flat-top modulated (f_top)
C0018	1, 2, 4, 6	3



Note!

- ▶ The concentricity factor at low speeds is lower with flat top modulation than with sine-wave modulation. For standard application a sine-wave modulated switching frequency is optimal.
- ▶ The maximum output frequency of the controller depends on the selected switching frequency (see C0018).
- ▶ With C0018 = 6, the switching frequency will be automatically changed depending on the output current of the controller.
- ▶ Please observe that the output current must be reduced when operating with high switching frequencies to prevent an impermissible heating of the controller (derating).
- ▶ Adapt the current limit values (C0022 and C0023) so that the currents specified in the technical data are not exceeded.

Moreover, you can adjust whether it is switched to a lower switching frequency when the heatsink temperature reaches an adjustable limit value. This prevents the drive from being inhibited by the error "overtemperature" and the motor coasts without torque.

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0018	fchop	6		Switching frequency of the inverter  6.9-1 - General rule: The lower the switching frequency the – lower the power loss – higher the noise generation – better the concentricity factor - Observe derating indications for high switching frequencies - The max. output frequency (f_{max}) is: – fchop = 4 kHz $\Rightarrow$ f_{max} = 300 Hz – fchop = 2 kHz $\Rightarrow$ f_{max} = 150 Hz – fchop = 1 kHz $\Rightarrow$ f_{max} = 150 Hz
			1 1 kHz sin loss-optimised	
			2 2 kHz sin concentricity-optimised	
			3 4 kHz f_top power-optimised	
			4 4 kHz sin noise-optimised	
			6 4/2 kHz sin noise/concentricity-optimised with automatic change-over to low switching frequency	
C0144 	OH switch	1	0 Switch off Switch-over is not active	Temperature-dependent switching frequency reduction If the heatsink temperature set in C0122 is reached (warning OH4), the controller switches to 2 kHz
			1 Switch on Switch-over is active	

Function of automatic switching frequency reduction

C0144 = 0 (no temperature-dependent switching frequency reduction)

If the maximum permissible heatsink temperature (ϑ_{max}) is exceeded when operating with automatic switching frequency reduction, the inverter is inhibited, TRIP "OH" (overtemperature) is set and the motor coasts without torque.

C0144 = 1 (temperature-dependent switching frequency reduction is active):

- If the heatsink temperature set in C0122 (overtemperature OH4) is reached when operating with automatic switching frequency reduction, the controller automatically reduces the switching frequency to 2 kHz, thus keeping the operation running.
- After the heatsink has cooled down, the controller automatically switches to the set switching frequency again.

6.10 Acceleration, deceleration, braking, stopping

6.10.1 Speed range

Description

The speed range required for the application is set in the codes C0010 and C0011:

- The minimum speed (C0010) corresponds to a speed setpoint selection of 0 %.
- The minimum speed (C0011) corresponds to a speed setpoint selection of 100 %.

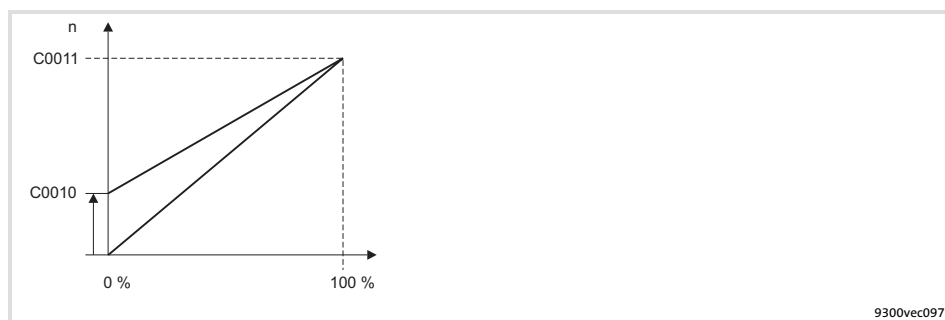


Fig. 6.10-1 Relation between setpoint and minimum and maximum output frequency

Codes for parameter setting

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C0010	N _{min}	0	0	{1 rpm}	36000	- Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times - C0059 must be set correctly - Set C0010 < C0011		
C0011	N _{max}	3000	0	{1 rpm}	36000	C0010 is only effective in case of analog setpoint selection via AIN1 Important: For parameter setting via interface, major changes in one step should only be made when the controller is inhibited.	Maximum speed	

C0010

Features "minimum speed" (n_{min}):

- C0010 is approached via the acceleration ramp.
- C0010 is only effective with analog setpoint selection via AIN1 (terminal X6/1 and X6/2).

C0011

Features "maximum output frequency" ($n_{\max}$):

- For defining fixed setpoints (JOG) C0011 acts as limitation.
- C0011 is an internal scaling value! Therefore, changes must only be made when the controller is inhibited!



Stop!

Set C0011 so that the maximum motor speed is not exceeded. Otherwise the motor can be destroyed.

Adjusting tips

Observe the internal speed limits (p = number of motor pole pairs):

- Switching frequency 2/4 kHz: $n_{\max} = 36000/4p \text{ min}^{-1}$
- Switching frequency 1 kHz: $n_{\max} = 36000/4p \text{ min}^{-1}$

6.10.2 Setting acceleration times and deceleration times in speed mode

Description The acceleration and deceleration times determine the controller response time after a setpoint change.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0012	Tir (acc)	5.00	0.00	{0.01 s}	9999.90	Acceleration time T _{ir} of the main setpoint ● Refers to speed change 0 ... C0011	 6.10-3
C0013	Tif (dec)	5.00	0.00	{0.01 s}	9999.90	Deceleration time T _{if} of the main setpoint ● Refers to speed change 0 ... C0011	

Adjustment

- The acceleration and deceleration times refer to a speed change from 0 min⁻¹ to the max. speed set in C0011.
- Calculate the times T_{ir} and T_{if}, which you can set under C0012 and C0013.

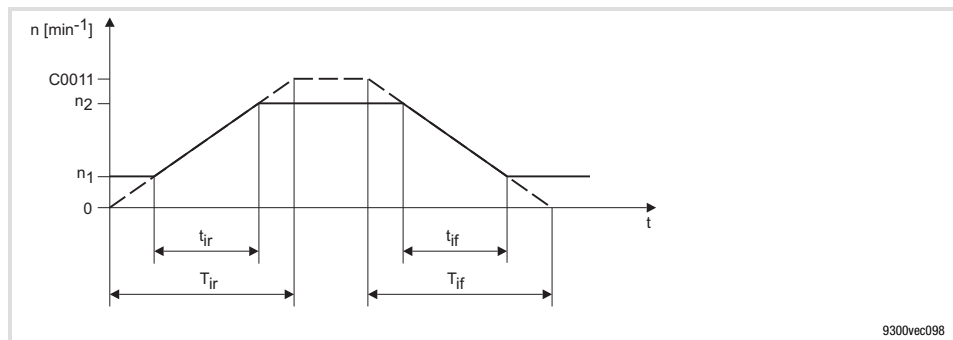


Fig. 6.10-2 Acceleration and deceleration times

$$T_{ir} = t_{ir} \cdot \frac{C0011}{n_2 - n_1}$$

t_{ir} and t_{if} are the desired times for the change between n₁ and n₂

$$T_{if} = t_{if} \cdot \frac{C0011}{n_2 - n_1}$$



Note!

If the acceleration and deceleration times are set too short and under unfavourable operating conditions the controller can be switched off with TRIP OC1 or OC3. In these cases, the acceleration and deceleration times must be set so that the drive can follow the speed profile without I_{max} reaching a drive system.

6.10.3 Quick stop

Description Quick stop brakes the drive to standstill with the deceleration time set in C0105.

► DC-injection braking (GSB) has priority over quick stop.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0105	QSP Tif	5.00	0.00	{0.01 s}	999.90	Quick stop deceleration time ● The deceleration time refers to a speed variation of C0011 ... 0
						 8.2-25  8.2-40

Activation

Via digital signal:

- MCTRL-QSP = HIGH.
- Activating signal DCTRL-QSP. The signal can be activated via 3 OR'd inputs:
 - Control word CAN-CTRL.B3 from CAN-IN1
 - Control word AIF-CTRL.B 3 from AIF-IN
 - Control word C0135.B3

Via keyboard of the keypad:

For this the key must be assigned with the quick stop function (C0469 = 2):

-  activates quick stop
-  restarts the drive

6.10.4 Changing the direction of rotation

Description

In the basic configurations (C0005) the direction of rotation of the motor is reversed in a fail-safe way via the X5/E1 and X5/E2 and the function block R/L/Q. Thus, only the main setpoint is changed.

The reversing time depends on the ramp times set for the main setpoint or quick stop.

When the direction of rotation is changed, the drive brakes along the deceleration ramp (C0013) and accelerates along the acceleration ramp (C0012) into the other direction of rotation.

Direction of rotation with in-phase connection:

Direction of rotation	Signal level at		Notes
	X5/E1	X5/E2	
CCW rotation	LOW	HIGH	- During operation: The direction of rotation results from the signal which was active first. - At mains connection: The controller activates quick stop (QSP).
CW rotation	HIGH	LOW	
Quick stop	LOW	LOW	
Unchanged	HIGH	HIGH	

6.11 Optimising the operating behaviour

6.11.1 Slip compensation

Description

The speed of an asynchronous machine decreases when being loaded. This load-dependent speed drop is called slip. By setting C0021 the slip can be partly compensated.

In the V/f characteristic control mode the slip compensation is only active at operation without feedback (C0025 = 1).

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0021	slipcomp	→	-20.00	{0.01 %}	20.00	Slip compensation → Change of C0086, C0087 or C0089 sets C0021 to the calculated rated slip of the motor ● When changing over to the vector control mode, C0021 is set to 0  6.11-1  8.2-25  8.2-40
C0078	Tn slip CTRL	100	1	{1 ms}	6000	Integral-action time of slip controller ● Filter time for slip compensation (C0021) ● Only active with V/f characteristic control  8.2-25

Adjustment

V/f characteristic control

The slip compensation (C0021) is automatically calculated from the rated motor speed (C0087) and the rated motor frequency (C0089). The entered slip constant [%] is the rated slip of the motor in [%] relating to the synchronous speed of the motor.

- Calculating the slip compensation and entering it into C0021:

$s = \frac{n_{rsyn} - n_r}{n_{rsyn}} \cdot 100 \%$ $n_{rsyn} = \frac{f_r \cdot 60}{p}$	E	Slip constant (C0021) [%]
	n_{rsyn}	Synchronous motor speed [min^{-1}]
	n_r	Rated motor speed according to motor nameplate [min^{-1}]
	f_r	Rated motor frequency according to motor nameplate [Hz]
	p	Number of motor pole pairs (1, 2, 3, ...)

- If required, the slip compensation can be adapted manually:
- If C0021 is set too high, the drive may get unstable.
 - With cyclic load impulses (e. g. centrifugal pump) a smooth motor characteristic is achieved by smaller values in C0021 (possibly negative values)
 - Parameterise C0078 (filter time for the slip compensation) if you want to change the motor response time to load changes (dynamic ↔ slow).
- The actual speed is output as an analog signal (in [%] of $n_{\max}$ (C0011)) to MCTRL-NACT.

**Note!**

When operating synchronous or reluctance motors, C0021 must be set to 0.

Vector control

Use C0021 to change the influence of the rotor resistance (C0082) proportionally:

- Reduce the value in C0021 at an increasing speed (negative values)
- Increase the value in C0021 at a decreasing speed

**Note!**

When setting the vector control mode, the slip compensation (C0021) is automatically set to 0.0 %.

- When you switch back to the V/f characteristic control mode, the slip compensation must be re-adapted.

6.11.2 Oscillation damping

Description

Suppressing no-load oscillations in case of:

- Drives with different rated power of controller and motor, e. g. when operating with high switching frequency and the power derating involved.
- Operation of higher-pole motors.
- Operation of three-phase AC drives > 10 kW.

Compensation of resonances in the drive kit:

- Certain asynchronous motors may show this behaviour above $\frac{1}{3}$ of the rated speed ($\frac{1}{3} \cdot n_n$). This may result in an unstable operation (current and speed variations).

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0234	damp value	20	-100	{1 %}	100	Influence of the oscillation damping, function block MCTRL ● Minimising a tendency to oscillation of the drive ● Influences the tendency to oscillation of the drive ● When C0025 >1 and C0006 = 1, C0234 is set to 0
C0235	damping	2	1	{1 ms}	600	Filter time of the oscillation damping, function block MCTRL ● Filter time for the internal signal for oscillation damping
C0236	damp limit	1.0	0.0	{0.1 Hz}	20.0	Limit value of oscillation damping, function block MCTRL ● Limit value for the internal signal of oscillation damping

Adjustment

The Lenze setting is designed for power-adapted motors.

Usually, the speed oscillations can be reduced by changing the Lenze setting of the codes C0234 oder C0236 by the factor 2 ... 5.

1. Approach the range with speed oscillations.
 2. Change the influence of the oscillation damping in C0234 (generally, increase it).
 3. Increase the limitation of the oscillation damping in C0236.
 4. Change filter time in C0235 in the range of 1 ... 20 ms, if necessary.
- These can be indicators for smooth running:
- Constant motor current characteristic
 - Reduction of the mechanical oscillations in the bearing seat



Note!

Restricted effect with vector control

- The oscillation damping has no influence on the drive behaviour at low tendency to oscillation of the speed controller.
- Especially for drives > 55 kW with a tendency to oscillation it may be necessary to deactivate the oscillation damping (C0234 = 0 %).
- For operation with feedback the oscillation damping has no influence.

6.11.3 Boost correction with V/f characteristic control

Description

In the V/f characteristic control mode (C0006 = 5), a constant voltage boost (in [%] von C0090) can be preset in code C0016 at low speeds or motor standstill.

If due to the setting in C0016 no current or a nonuniform current flows, the voltage boost can be further increased via the boost correction to inject a sufficiently high and uniform current into the motor.

If the voltage boost is insufficient, the following drive behaviour occurs:

- The required torque is not achieved at standstill.
- When the load is accelerated from standstill, the current overshoots as the motor had not been magnetised sufficiently before. OC1 can trip.



Note!

If the motor magnetising current is too low, Lenze recommends to operate the controller with sine-wave modulated switching frequency (C0018 = 0, 1, 4, 5 oder 6) only.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0080	Vp field CTRL	0.50	0.00	{0.01 }	0.99	Influence on the motor magnetising current selected under C0095 ● Not effective with C0006 = 1 and C0025 > 1 at the same time ● Influence is effective from 0 Hz to the frequency selected under C1583	6.6-1
C0095 	Mot lo	→	0.0	{0.1 A}	1000.0	Motor magnetising current → dependent on C0086, C0088 and C0091 ● Change of C0086 sets C0095 to the Lenze setting ● Change of C0095 sets C0086 = 0	6.6-1
C1583	fset high	100.0 0	0.00	{0.01 %}	199.99	Alterations by Lenze service only! Adaptation of the motor magnetising current set in C0095 (with V/f characteristic control: influence limit of the boost correction; with vector control: influence limit of the field precontrol) ● The output frequency is set up to which the motor magnetising current set in C0095 is to have an effect. ● C1583 = 100 % $\triangle$ half the rated motor frequency in C0089	6.11-5

Adjustment



Stop!

A longer operation of the motor in standstill may destroy the motor by overheating, especially in case of small motors.

- ▶ Connect the thermal contact (NC contact), PTC, or KTY of the motor and activate the motor temperature monitoring of the controller.
- ▶ Operate self-ventilated motors with a blower, if required.

Setting voltage boost

1. Set a voltage boost in C0016. (📖 6.8-6)
 - When C0016 = 0 % no boost is possible.
2. For magnetising the motor, consider enough time from controller enable to the start of the speed ramp-function generator.
 - The bigger the motor the longer the time for magnetisation. A motor with the power of 90 kW requires up to 2 s.
 - If the desired continuous current does not flow, correct the boost using the codes C0080, C0095 and C1583.

Carry out a boost correction

3. If required, set the desired motor magnetising current (standstill current) in C0095 which is to be achieved by the boost correction.
 - The value in the Lenze setting has been evaluated by the controller from the entered motor data of the motor nameplate.
 - When C0095 = 0, the boost correction is deactivated.
4. Set the influence of the boost correction in C0080.

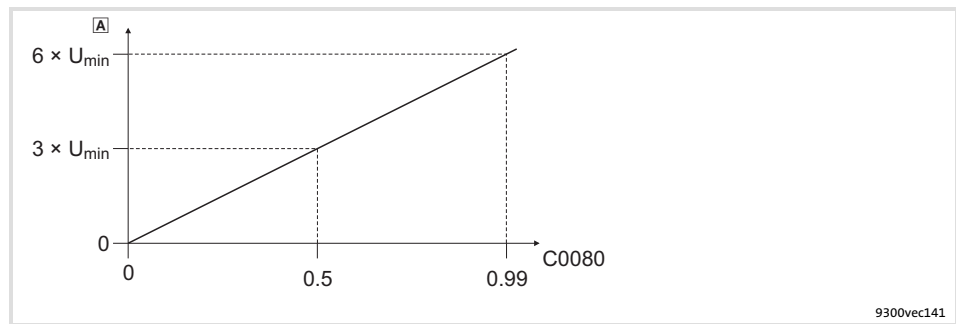


Fig. 6.11-1 Influence of boost correction

- A** Maximum height of the correction value when the field frequency is 0
- C0080 = 0.99 Maximum correction value. The voltage boost $U_{\min}$ achieved by C0016 is increased sixfold.
- C0080 = 0 No correction value. The voltage boost $U_{\min}$ achieved by C0016 is not increased, the boost correction is deactivated.

Increase the value in C0080 step by step and observe the effect on the current injection with an oscilloscope, if required.

– If the boost correction is too high, this can cause current overshoots when the current injection starts.

5. Set the adaptation of the boost correction in C1583.

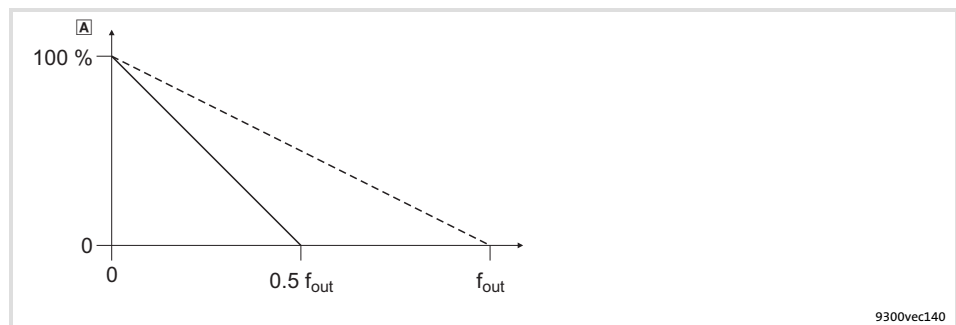


Fig. 6.11-2 Adaptation of boost correction

- A** Adaptation of boost correction
- Characteristic when C1583 = 100 % (Lenze setting). The output frequency corresponds to half the rated motor frequency in C0089.
- - - - Characteristic when C1583 = 199.99 %. The output frequency corresponds to the rated motor frequency in C0089.
- When C1583 = 0 % the boost correction is deactivated

Enter the output frequency in C1583 until which the boost correction is to have an effect.

– At an output frequency of 0 Hz the boost correction has the influence defined in C0080 and is 100 percent efficient. An increasing output frequency reduces the influence linearly to 0.

Example

A motor connected to a controller has a rated motor voltage of 400 V (C0090 = 400 V). The voltage boost $U_{\min}$ is set to 2 % (C0016 = 2 %).

- At a voltage boost of 2 % and a rated motor voltage of 400 V,
 $U_{\min} = 8 \text{ V}$.

The voltage boost $U_{\min}$ is to be optimised via C0080:

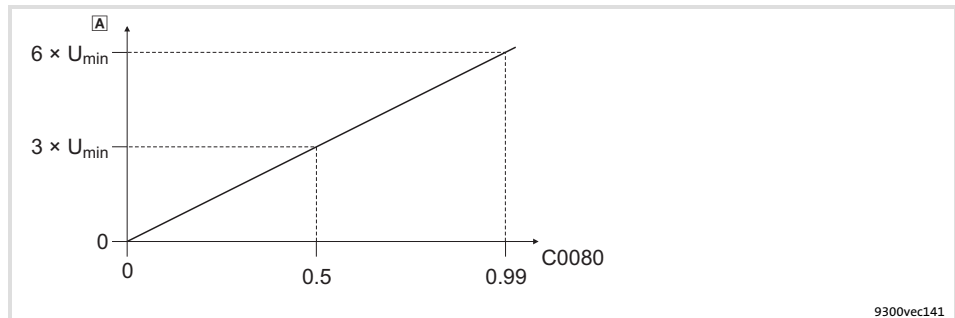


Fig. 6.11-3 Influence of boost correction

A Maximum correction value when the output frequency is 0 Hz

- When $C0080 = 0.5$, the maximum correction value is:

$$3 \times U_{\min} = 3 \times 8 \text{ V} = 24 \text{ V}$$

- The maximum voltage boost is:

$$U_{\min} + \text{correction value} = 8 \text{ V} + 24 \text{ V} = 32 \text{ V}$$

6.11.4 Motor magnetising current with vector control

This chapter describes how to optimise the setpoint for the motor magnetising current (C0095) via the codes C0080 and C1583 in case of vector control **without** feedback.

- In case of vector control **with** feedback the setpoint for the motor magnetising current is only determined by C0095. An optimisation is not required. The codes C0080 and C1583 have no effect.

The motor current consists of the exciting and active part. The magnetisation of the motor is determined by the excitation current (magnetising current). To create a torque the motor needs active current.

In the vector control mode (C0006 = 1) a magnetising current is injected into the motor after controller enable. The current level is detected by the controller from the motor data.

If a too low motor magnetising current is injected after controller enable, the following drive behaviour occurs:

- The required torque is not achieved at standstill.
- When a high load is accelerated from standstill, the current overshoots. OC1 can be activated.
- The machine runs irregularly as the motor is underexcited.



Note!

If the motor magnetising current is too low, Lenze recommends to operate the controller with sine-wave modulated switching frequency (C0018 = 0, 1, 4, 5 oder 6) only.

6.11 Optimising the operating behaviour
6.11.4 Motor magnetising current with vector control

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0080	Vp field CTRL	0.50	0.00	{0.01 }	0.99	Influence on the motor magnetising current selected under C0095 - Not effective with C0006 = 1 and C0025 > 1 at the same time - Influence is effective from 0 Hz to the frequency selected under C1583	6.6-1
C0095 STOP	Mot lo	→	0.0	{0.1 A}	1000.0	Motor magnetising current → dependent on C0086, C0088 and C0091 - Change of C0086 sets C0095 to the Lenze setting - Change of C0095 sets C0086 = 0	6.6-1
C1583	fset high	100.0 0	0.00	{0.01 %}	199.99	Alterations by Lenze service only! Adaptation of the motor magnetising current set in C0095 (with V/f characteristic control: influence limit of the boost correction; with vector control: influence limit of the field precontrol) - The output frequency is set up to which the motor magnetising current set in C0095 is to have an effect. - C1583 = 100 % $\triangle$ half the rated motor frequency in C0089	6.11-5

Adjustment



Stop!

A longer operation of the motor in standstill may destroy the motor by overheating, especially in case of small motors.

- ▶ Connect the thermal contact (NC contact), PTC, or KTY of the motor and activate the motor temperature monitoring of the controller.
- ▶ Operate self-ventilated motors with a blower, if required.

Basic setting

1. Enter the motor data of the motor nameplate and execute the motor identification. (📖 6.6-15)
2. For magnetising the motor, consider enough time. The motor is being magnetised between controller enable and motor start.
A delayed start of the motor can be achieved using e.g. the quick stop function:
 - Activate quick stop. Enable the controller and wait until the motor is magnetised sufficiently. Deactivate quick stop for the motor to start.The bigger the motor the longer the time for magnetisation. A motor with the power of 90 kW requires up to 2 s.
If the desired continuous current does not flow, the magnetisation of the motor can be optimised using the codes C0080, C0095 and C1583.

Optimisation

3. If required, select a setpoint for the motor magnetising current in C0095.
 - The value in the Lenze setting has been evaluated by the controller from the entered motor data of the motor nameplate.
4. The influence, the setpoint of the motor magnetising current is to have, can be set in C0080.
 - A P controller which increases or reduces the setpoint can be parameterised via C0080.
 - Increase the value in C0080 step by step and observe the effect on the current injection with an oscilloscope, if required.
 - When C0080 = 0 the P controller is deactivated. No setpoint is selected for the motor magnetising current.
5. Set the adaptation of the setpoint for the motor magnetising current in C1583.

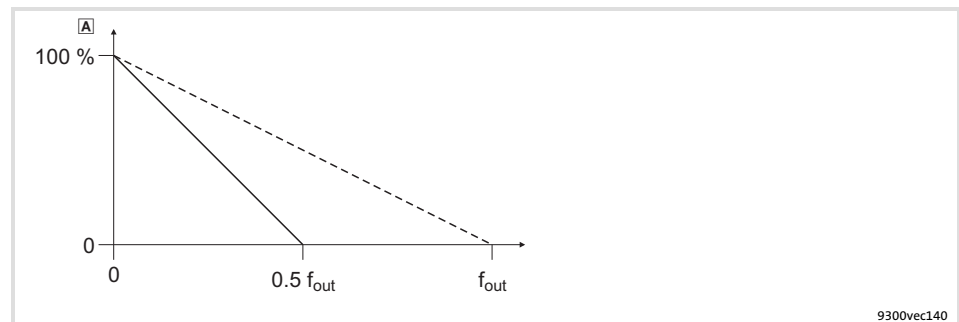


Fig. 6.11-4 Adaptation of the setpoint for the motor magnetising current

A Adaptation of the setpoint

— Characteristic when C1583 = 100 % (Lenze setting). The output frequency corresponds to half the rated motor frequency in C0089.

- - - - Characteristic when C1583 = 199.99 %. The output frequency corresponds to the rated motor frequency in C0089.

When C1583 = 0 % the adaptation is deactivated. No setpoint is selected for the motor magnetising current.

Select the output frequency in C1583, up to which the setpoint of the motor magnetising current is to have an effect.

- At an output frequency of 0 Hz the setpoint has the influence defined in C0080 and is 100 percent efficient. An increasing output frequency reduces the influence linearly to 0.

7 **Parameter setting**

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7.1 Important notes

Adapting the controller functions to the application

The controller functions can be adapted to your applications by means of parameterisation. You can either parameterise via keypad, PC or via the parameter channel of a bus system.

The function library contains a detailed description of the functions, the signal flow diagrams contain all configurable signals.

Parameters and codes

The parameters for the functions are stored in numbered codes:

- Codes are marked in the text with a "C" (e.g. C0002).
- The code table provides a quick overview of all codes. The codes are sorted according to their numbers and can be used as reference.
(📖 8.5-1)

Parameter setting via keypad

A quick parameter setting is provided by the keypad XT. Moreover, it serves as status display, error diagnosis and transfer of parameters to other drive controllers.

	Keypad XT EMZ9371BC
Can be used with	8200 vector, 8200 motec, starttec, Drive PLC, 9300 vector, 9300 servo
Operator buttons	8
Plain text display	yes
Menu structure	yes
Configurable menu ("user menu")	yes
Predefined basic configurations	yes
Non-volatile memory for parameter transfer	yes
Password protection	yes
Diagnosis terminal	Keypad XT in handheld design, IP 20 (E82ZBBXC)
Installation in control cabinet	no
Type of protection	IP 20
Detailed description	(📖 7.2-1)

Parameter setting via PC

You need the parameter setting / operating software »Global Drive Control« (GDC) or »Global Drive Control easy« (GDC easy) and an interface for communication:

- Interface for system bus (CAN) (preset in GDC):
 - PC system bus adapter
- Serial interface for LECOM:
 - Communication module LECOM-A/B (RS232/RS485)
EMF2102IB-V001

The parameter setting /operating software of the Global Drive Control family are easy-to-understand and tools for the operation, parameter setting and diagnostics or Lenze drive controllers.

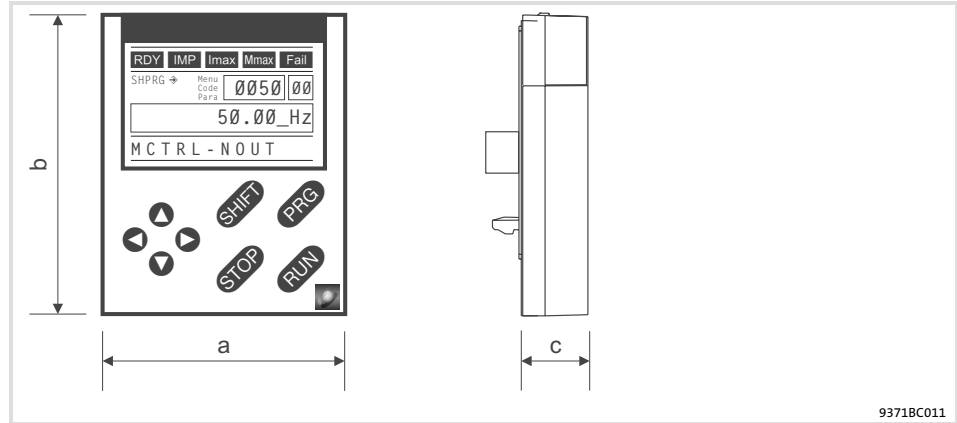
	GDC easy ESP-GDC2-E	GDC ESP-GDC2
Supply	Free download from the internet at www.lenze.com	Program package must be charged for
Operation in interactive mode	yes	yes
Comprehensive help functions	yes	yes
Menu "Short setup"	yes	yes
Monitor windows for displaying operating parameters and for diagnostic purposes	yes	yes
Saving and printing of parameter settings as code list	yes	yes
Loading of parameter files from the controller to the PC	yes	yes
Storing of parameter files from the PC in the controller	yes	yes
Function block editor	no	yes
Technology functions for 9300 Servo	no	yes
Oscilloscope function for 9300 Servo and 9300 vector	no	yes
Detailed description	Online help of the program	Online help of the program

Parameter setting via bus system

Detailed information can be found in the documentation of the corresponding bus system.

7.2 Parameter setting with the XT EMZ9371BC keypad

7.2.1 General data and operating conditions



Feature		Values
Dimensions		
Width	a	60 mm
Height	b	73.5 mm
Depth	c	15 mm
Environmental conditions		
Climate		
Storage	IEC/EN 60721-3-1	1K3 (-25 ... +60 °C)
Transport	IEC/EN 60721-3-2	2K3 (-25 ... +70 °C)
Operation	IEC/EN 60721-3-3	3K3 (-10 ... +60 °C)
Enclosure		IP 20

7.2.2 Installation and commissioning

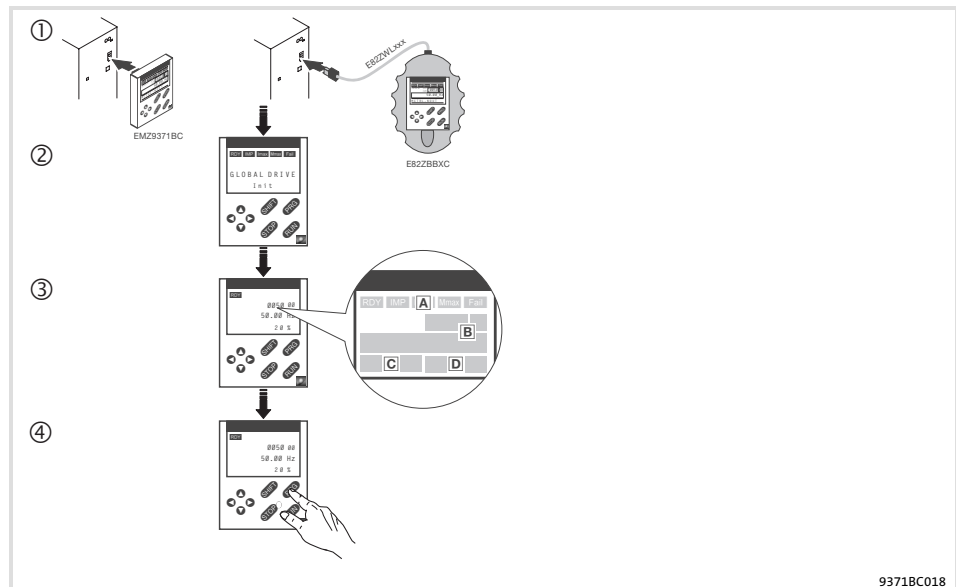


Fig. 7.2-1 Installation and commissioning of XT EMZ9371BC keypad or E82ZBBXC diagnosis terminal

- ① Connect keypad to the AIF interface on the front of the standard device. The keypad can be connected/disconnected during operation.
- ② As soon as the keypad is supplied with voltage, it carries out a short self-test.
- ③ The operation level indicates when the keypad is ready for operation:
 - A Current state of the standard device
 - B Memory location 1 of the user menu (C0517): Code number, subcode number, and current value
 - C Active fault message or additional status message
 - D Actual value in % of the status display defined in C0004
- ④ **PRG** must be pressed to leave the operation level

7.2.3 Display elements and function keys

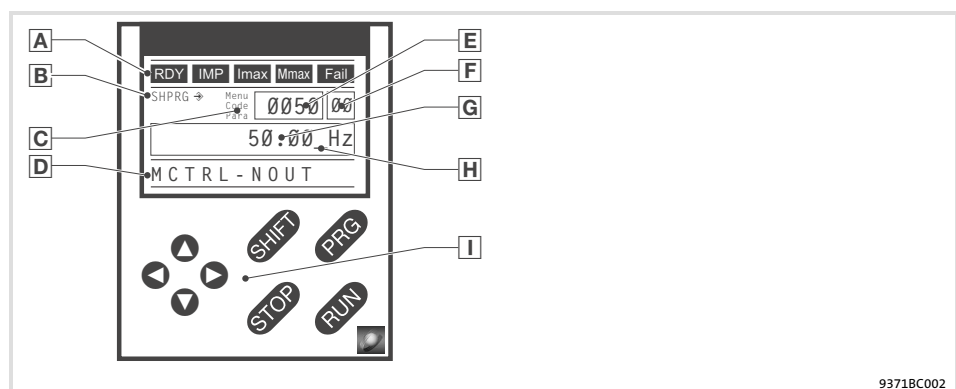


Fig. 7.2-2 Display elements and function keys of the XT EMZ9371BC keypad

Displays

A Status displays of standard device		
Display	Meaning	Explanation
RDY	Ready for operation	
IMP	Pulse inhibit is active	Power outputs are inhibited
Imax	The set current limit is exceeded in motor or generator mode	

	Menu	Speed controller 1 in the limitation	Drive is torque-controlled (Only active for operation with standard devices of the 9300 series)
	Fault	Active fault	
B	Acceptance of the parameters		
	Display	Meaning	Explanation
	→	Parameter is accepted immediately	Standard device operates immediately with the new parameter value
	SHPRG →	Parameter must be acknowledged with SHIFT PRG	Standard device operates with the new parameter value after being acknowledged
	SHPRG	Parameter must be acknowledged in case of controller inhibit SHIFT PRG	Standard device operates with the new parameter value after the controller is enabled again
	None	Display parameter	Change is not possible
C	Active level		
	Display	Meaning	Explanation
	Menu	Menu level is active	Select main menu and submenus
	Code	Code level is active	Select codes and subcodes
	Para	Parameter level is active	Change parameters in the codes or subcodes
	None	Operating level is active	Display operating parameters
D	Short text		
	Display	Meaning	Explanation
	alphanumeric	Contents of the menus, meaning of the codes and parameters	
		In the operating level display of C0004 in % and the active fault	
E	Number		
	Active level	Meaning	Explanation
	Menu level	Menu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
	Code level	Four-digit code number	
F	Number		
	Active level	Meaning	Explanation
	Menu level	Submenu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
	Code level	Two-digit subcode number	
G	Parameter value		
		Parameter value with unit	
H	Cursor		
		In the parameter level, the digit above the cursor can be directly changed	
I	Function keys		
		For description see the following table	

Parameter setting

Parameter setting with the XT EMZ9371BC keypad

Changing and saving parameters

Function keys



Note!

Shortcuts with **SHIFT**:

Press and hold **SHIFT**, then press the second key in addition.

Key	Function			
	Menu level	Code level	Parameter level	Operating level
PRG		Change to the parameter level	Change to the operating level	Change to the code level
SHIFT PRG	Go to the "Short setup" menu and load predefined configurations ¹⁾		Accept parameters when SHPRG → or SHPRG is displayed	
↶ ↷	Change between menu items	Change of code number	Change of digit via cursor	
SHIFT ↶ SHIFT ↷	Quick change between menu items	Quick change of code number	Quick change of digit via cursor	
→ ←	Change between main menu, submenu and code level		Cursor to the right Cursor to the left	
RUN	Deactivate the function of the key STOP , the LED in the key goes off			
STOP	Inhibit the controller, the LED in the key is lit.			
	Reset fault (TRIP-Reset):	1. Remove the cause of malfunction 2. Press STOP 3. Press RUN		

¹⁾ Only active for operation with standard devices of the 8200 vector or 8200 motec series

7.2.4

Changing and saving parameters



Note!

Your settings have an effect on the current parameters in the main memory. You must save your settings in a parameter set so that they are not lost when the mains are connected.

If you only need one parameter set, save your settings as parameter set 1, since parameter set 1 is loaded automatically after mains connection.

Step	Key sequence	Action
1. Select the menu	↶ ↷ ↶ ↷	Use the arrow keys to select the desired menu
2. Change to the code level	→	Display of the first code in the menu
3. Select code or subcode	↶ ↷	Display of the current parameter value
4. Change to the parameter level	PRG	
5. When SHPRG is displayed, inhibit the controller	STOP ¹⁾	The drive coasts
6. Change parameter		
	A → ↶	Move cursor below the digit to be changed
	B ↶ ↷	Change of digit

Step		Key sequence	Action
		 	Quick change of digit
7.	Accept the changed parameter		
	Display of SHPRG or SHPRG ⇨	 	Confirm change to accept the parameter Display "OK"
	Display ⇨	-	The parameter has been accepted immediately
8.	Enable the controller, if required	 1)	The drive runs again
9.	Change to the code level		
	A		Display of the operating level
	B		Display of the code with changed parameter
10.	Change further parameters		Restart the "loop" with step 1. or 3.
11.	Save changed parameters		
	A	   	Select the code C0003 "PAR SAVE" in the menu "Load/Store"
	B		Change to the parameter level Display "0" and "READY"
	Select the parameter set in which the parameters are to be saved permanently C		Save as parameter set 1: ⇒ Set "1" "Save PS1"
			Save as parameter set 2: ⇒ Set "2" "Save PS2"
			Save as parameter set 3: ⇒ Set "3" "Save PS3"
			Save as parameter set 4: ⇒ Set "4" "Save PS4"
	D	 	When "OK" is displayed, the settings are permanently saved in the selected parameter set.
12.	Change to the code level		
	A		Display of the operating level
	B		Display of C0003 "PAR SAVE"
13.	Set parameters for another parameter set		Restart the "loop" with step 1. or 3.

- 1) The function of the  key can be programmed:
C0469 = 1: Controller inhibit
C0469 = 2: Quick stop (Lenze setting)

7.2.5 Loading a parameter set

The keypad serves to load a saved parameter set into the main memory when the controller is inhibited. After the controller is enabled, it operates with the new parameters.



Danger!

- ▶ When a new parameter set is loaded, the controller is reinitialised and acts as if it had been connected to the mains:
 - System configurations and terminal assignments can be changed. Make sure that your wiring and drive configuration comply with the settings of the parameter set.
- ▶ Only use terminal X5/28 as source for the controller inhibit! Otherwise the drive may start in an uncontrolled way when switching over to another parameter set.



Note!

- ▶ After switching on the supply voltage, the controller always loads parameter set 1 into the main memory.
- ▶ It is also possible to load other parameter sets into the main memory via the digital inputs or bus commands.

Step		Key sequence	Action
1.	Inhibit controller		Terminal X5/28 = LOW
2.	Load the saved parameter set into the main memory		
	A	▲ ▼ ◀ ▶	Select the code C0002 "PAR LOAD" in the menu "Load/Store"
	B	PRG	Change to the parameter level The active parameter set is displayed, e. g. display "0" and "Load Default" If you want to restore the delivery status, proceed with D
	Select the parameter set to be loaded	C	▲
			Load parameter set 1: ⇒ Set "1" "Load PS1"
			Load parameter set 2: ⇒ Set "2" "Load PS2"
			Load parameter set 3: ⇒ Set "3" "Load PS3"
			Load parameter set 4: ⇒ Set "4" "Load PS4"
	D	SHIFT PRG	"RDY" goes off. The parameter set is loaded completely into the main memory if "RDY" is displayed again.
3.	Change to the code level		
	A	PRG	Display of the operating level
	B	PRG	Display of C0002 "PAR LOAD"
4.	Enable controller		Terminal X5/28 = HIGH The drive is running with the settings of the loaded parameter set

7.2.6 Transferring parameters to other standard devices

Parameter settings can be easily copied from one standard device to another by using the keypad.

For this purpose use the "Load/Store" menu



Danger!

During the parameter transfer from the keypad to the standard device the control terminals can adopt undefined states! Therefore the plugs X5 and X6 must be disconnected from the standard device before the transfer takes place. This ensures that the controller is inhibited and all control terminals have the defined state "LOW".

Copying parameter sets from the standard device into the keypad



Note!

After copying the parameter sets into the XT keypad (C0003 = 11), always the parameter set that was loaded last via C0002 is activated.

Like this the current parameters also remain active after copying:

- Save the current parameters in the parameter set before copying and load this parameter set in the controller via C0002.

Step	Key sequence	Action
1. Connect the keypad to standard device 1		
2. Inhibit controller		Terminal X5/28 = LOW The drive coasts.
3. Select C0003 in the "Load/Store" menu	◀ ▶ ◀ ▶	Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys.
4. Change to the parameter level	PRG	Display "0" and "READY"
5. Copy all parameter set into the keypad		The settings saved in the keypad are overwritten.
	▲	Set "11" "Save extern"
6. Start copying	SHIFT PRG	The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off after approx. one minute, all parameter sets were copied into the keypad. The "RDY" status display is lit.
7. Change to the code level	A PRG	Display of the operating level
	B PRG	Display C0003 and "PAR SAVE"
8. Enable controller		Terminal X5/28 = HIGH
9. Remove keypad from standard device 1		

Copying parameter sets from keypad into the standard device

Step	Key sequence	Action
1.	Connect the keypad to standard device 2	
2.	Inhibit controller	Terminal X5/28 = LOW The "IMP" status display is lit. The drive coasts
3.	Pull the plugs X5 and X6	All control terminals have the defined "LOW" status.
4.	Select C0002 in the "Load/Store" menu	▲ ▼ ◀ ▶ Select code C0002 "PAR LOAD" in the "Load/Store" menu using the arrow keys.
5.	Change to the parameter level	PRG The active parameter set is shown, e. g. display "0" and "Load Default"
6.	Select the correct copy function	The settings saved in the standard device are overwritten.
	Copy all parameter sets available into the EEPROM of the standard device and save them permanently.	- The parameter set that was active before copying is overwritten. - The parameters are not yet active after copying. Select parameter set and load it in the main memory. 7.2-6
	▲	Set "20" "ext -> EEPROM"
	Copy individual parameter sets into the main memory of the standard device.	
	▲	Copy parameter set 1 into the main memory: Set ⇨ "11" "Load ext PS1"
		Copy parameter set 2 into the main memory: Set ⇨ "12" "Load ext PS2"
		Copy parameter set 3 into the main memory: Set ⇨ "13" "Load ext PS3"
		Copy parameter set 4 into the main memory: Set ⇨ "14" "Load ext PS4"
7.	Start copying	SHIFT PRG The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off, the parameter sets selected were copied into the standard device. The "RDY" status display is lit.
8.	Change to the code level	
	A PRG	Display of the operating level
	B PRG	Display C0002 and "PAR LOAD"
9.	- If the function "Copy all parameter sets into the EEPROM" (C0002 = 20) is selected, they might have to be loaded in the main memory manually. - If the function "Copy individual parameter sets into the main memory" (C0002 = 1x) is selected, they might have to be saved permanently in the EEPROM manually.	▲ ▼ ◀ ▶ Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys and store the contents of the main memory permanently.
10.	Plug in plugs X5 and X6	
11.	Enable controller	Terminal X5/28 = HIGH The drive is running with the new settings.

7.2.7 Activating password protection



Note!

- If the password protection is activated (C0094 = 1 ... 9999), you only have free access to the user menu.
- To access the other menus, you must enter the password. By this, the password protection is annulled until you enter a new password.
- Please observe that the password-protected parameters can be overwritten as well when transferring the parameter sets to other standard devices. The password is not transferred.
- Do not forget your password! If you have forgotten your password, it can only be reset via a PC or a bus system!

Activate password protection

Step	Key sequence	Action
1. Select the "USER menu"	▲ ▼ ◀ ▶	Change to the user menu using the arrow keys
2. Change to the code level	▶	Display of code C0051 "MCTRL-NACT"
3. Select C0094	▲	Display of code C0094 "Password"
4. Change to the parameter level	PRG	Display "0" = no password protection
5. Set password		
	A ▲	Select password (1 ... 9999)
	B SHIFT PRG	Confirm password
6. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"
7. Change to the "USER menu"	◀ ▶ ▲ ▼	

The password protection is active now.

You can only quit the user menu if you re-enter the password and confirm it with SHIFT PRG.

Remove password protection

Step	Key sequence	Action
1. Change to the code level in the user menu	▶	
2. Select C0094	▲	Display of code C0094 "Password"
3. Change to the parameter level	PRG	Display "9999" = password protection is active
4. Enter password		
	A ▼	Set valid password
	B SHIFT PRG	Confirm The password protection is deactivated by entering the password once again.
5. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"

The password protection is deactivated now. All menus can be freely accessed again.

7.2.8

Diagnostics

In the "Diagnostic" menu the two submenus "Actual info" and "History" contain all codes for

- monitoring the drive
- fault/error diagnosis

In the operating level, more status messages are displayed. If several status messages are active, the message with the highest priority is displayed.

Priority	Display	Meaning	
1	GLOBAL DRIVE INIT	Initialisation or communication error between keypad and controller	
2	XXX - TRIP	Active TRIP (contents of C0168/1)	
3	XXX - MESSAGE	Active message (contents of C0168/1)	
4	Special device states:		
		Switch-on inhibit	
5	Source for controller inhibit (the value of C0004 is displayed simultaneously):		
	STP1	9300 servo:	Terminal X5/28
		ECSxS/P/M/A:	Terminal X6/SI1
	STP3	Operating module or LECOM A/B/LI	
	STP4	INTERBUS or PROFIBUS-DP	
	STP5	9300 servo, ECSxA/E:	System bus (CAN)
		ECSxS/P/M:	MotionBus (CAN)
	STP6	C0040	
6	Source for quick stop (QSP):		
	QSP-term-Ext	The MCTRL-QSP input of the MCTRL function block is on HIGH signal.	
	QSP-C0135	Operating module or LECOM A/B/LI	
	QSP-AIF	INTERBUS or PROFIBUS-DP	
	QSP-CAN	9300 servo, ECSxA:	System bus (CAN)
		ECSxS/P/M:	MotionBus (CAN)
7	XXX - WARNING	Active warning (contents of C0168/1)	
8	xxxx	Value below C0004	

7.2.9 Menu structure

For simple, user-friendly operation, the codes are clearly arranged in function-related menus:

Main menu	Submenus	Description
Display	Display	
User-Menu		Codes defined in C0517
Code list		All available codes
	ALL	All available codes listed in ascending order (C0001 ... C7999)
	PS 1	Codes in parameter set 1 (C0001 ... C1999)
	PS 2	Codes in parameter set 2 (C2001 ... C3999)
	PS 3	Codes in parameter set 3 (C4001 ... C5999)
	PS 4	Codes in parameter set 4 (C6001 ... C7999)
Load/Store		Parameter set management Parameter set transfer, restore delivery status
Diagnostic		Diagnostic
	Actual info	Display codes to monitor the drive
	History	Fault analysis with history buffer
Short setup		Quick configuration of predefined applications Configuration of the user menu The predefined applications depend on the type of the standard device (frequency inverter, servo inverter, position controller, ...)
Main FB		Configuration of the main function blocks
	NSET	Setpoint processing
	NSET-JOG	Fixed setpoints
	NSET-RAMP1	Ramp function generator
	MCTRL	Motor control
	DFSET	Digital frequency processing
	DCTRL	Internal control
Terminal I/O		Connection of inputs and outputs with internal signals
	AIN1 X6.1/2	Analog input 1
	AIN2 X6.3/4	Analog input 2
	AOUT1 X6.62	Analog output 1
	AOUT2 X6.63	Analog output 2
	DIGIN	Digital inputs
	DIGOUT	Digital outputs
	DFIN	Digital frequency input
	DFOUT	Digital frequency output
	State bus	State bus (not with 9300 frequency inverter)
Controller		Configuration of internal control parameters
	Speed	Speed controller
	Current	Current controller or torque controller
	Phase	Phase controller (not with 9300 frequency inverter)
Motor/Feedb.		Input of motor data, configuration of speed feedback
	Motor adj	Motor data
	Feedback	Configuration of feedback systems
Monitoring		Configuration of monitoring functions

Parameter setting

Parameter setting with the XT EMZ9371BC keypad

Menu structure

Main menu	Submenus	Description
Display	Display	
LECOM/AIF		Configuration of operation with communication modules
	LECOM A/B	Serial interface
	AIF interface	Process data
	Status word	Display of status words
System bus		Configuration of system bus (CAN)
	Management	CAN communication parameters
	CAN-IN1	CAN object 1
	CAN-OUT1	
	CAN-IN2	CAN object 2
	CAN-OUT2	
	CAN-IN3	CAN object 3
	CAN-OUT3	
	Status word	Display of status words
	FDO	Free digital outputs
	Diagnostic	CAN diagnostic
FB config		Configuration of function blocks
Func blocks		Parameterisation of function blocks The submenus contain all available function blocks
FCODE		Configuration of free codes
Identify		Identification
	Drive	Software version of standard device
	Op Keypad	Software version of keypad

8 Configuration

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8.1 Important notes

The "Configuration" chapter consists of two parts.

System Manual

The "Configuration" chapter in the System Manual contains the following:

- ▶ Monitoring
- ▶ Monitoring functions
- ▶ Description of the following function blocks:
 - Diameter calculator (DCALC)
 - Digital frequency input (DFIN)
 - Digital frequency output (DFOUT)
 - Digital frequency ramp function generator (DFRFG)
 - Digital frequency processing (DFSET)
 - Internal motor control with V/f characteristic control (MCTRL1)
 - Internal motor control with vector control (MCTRL2)
- ▶ Code table
- ▶ Selection lists
- ▶ Table of attributes

System Manual (extension)

The "Configuration" chapter in the System Manual (extension) contains the following:

- ▶ Notes on the configuration with Global Drive Control
- ▶ Description of the basic configuration
- ▶ Use of function blocks
- ▶ Description of the other function blocks for the 9300 vector frequency inverter

8.2 Function blocks

8.2.1 Diameter calculator (DCALC)

Description

The function block calculates the current reel diameter in winding drives.

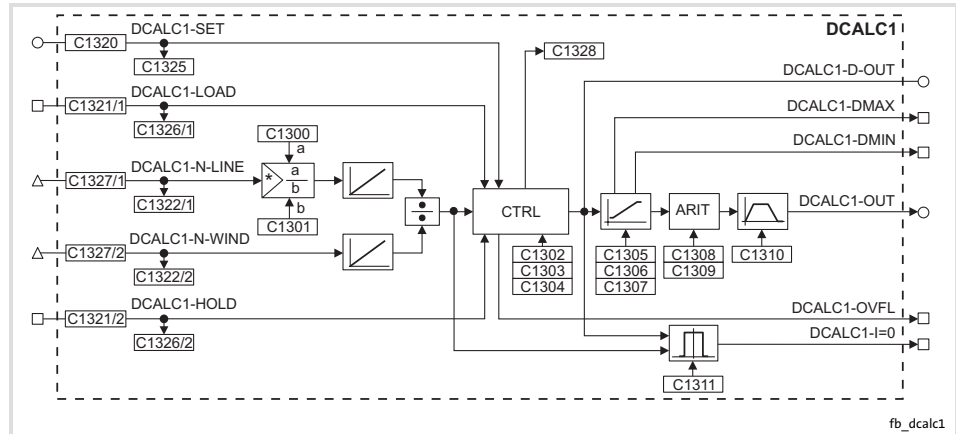


Fig. 8.2-1 Diameter calculator (DCALC1)

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C1300 STOP	N-motor/ Dmax	300	-32767	{1 rpm}	32767	Motor speed at D_{max} , function block DCALC1 ● Nominal speed of the winding drive	8.2-1
C1301 STOP	N-line max	3000	1	{1 rpm}	32767	Maximum line speed, function block DCALC1 ● Nominal speed of the line drive	
C1302	calc cycle	0.1	0.1	{0.1 rev}	100.0	Calculation cycle, function block DCALC1	8.2-1
C1303	time const	0.10	0.01	{0.01 s}	50.00	Filter time constant, function block DCALC1	
C1304 STOP	Dmax	500	1	{1 mm}	10000	Maximum diameter, function block DCALC1 ● Nominal winding diameter	8.2-1
C1305	lower D-limit	50	1	{1 mm}	10000	Lower diameter limit, function block DCALC1 ● Minimum winding diameter	
C1306	upper D-limit	500	1	{1 mm}	10000	Upper diameter limit, function block DCALC1 ● Maximum winding diameter	8.2-1
C1307	hyst D-limit	1.00	0.00	{0.01 %}	100.0	Hysteresis - diameter limitation, function block DCALC1 ● Hysteresis for D_{min}/D_{max} output	
C1308 STOP	arit function	1	0	DCALC1-OUT=D	DCALC1-OUT = diameter	Selection of the arithmetic function, function block DCALC1	8.2-1
			1	DCALC1-OUT=1/D	DCALC1-OUT = 1/diameter		

8 Configuration

8.2 Function blocks

8.2.1 Diameter calculator (DCALC)

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C1309 	Dmin	50	1	{1 mm}	10000	Minimum diameter, function block DCALC1	8.2-1
C1310	DCALC1-Titime	0.000	0.000	{0.001 s}	999.900	Acceleration and deceleration time, function block DCALC1	
C1311	window D-calc	1.00	0.00	{0.01 %}	100.00	Window - diameter calculation, function block DCALC1 Window setting for permissible diameter deviation	
C1320 	CFG: SET	1000	FIXED0%	Selection list 1		Configuration of analog input signal, function block DCALC1 The signal is scaled to the value in C1304 (100 % $\triangle$ C1304)	8.2-1
C1321 				Selection list 2		Configuration of digital input signals, function block DCALC1	
1	CFG: LOAD	1000	FIXED0			- HIGH: initial value at DCALC1-SET is accepted - DCALC1-LOAD has a higher priority than DCALC1-HOLD	
2	CFG: HOLD	1000	FIXED0			HIGH = holds the diameter value reached and resets the integrators.	
C1322			-36000	{1 rpm}	36000	Function block DCALC1 Display of the signals linked in C1327	8.2-1
1	DIS: N-Line						
2	DIS: N-WIND						
C1325	DIS: SET		-199,99	{0.01 %}	199,99	Function block DCALC1 Display of the signal linked in C1320	
C1326			0		1	Function block DCALC1 Display of the signals linked in C1321	
1	DIS: LOAD						
2	DIS: HOLD						
C1327 				Selection list 3		Configuration of input signals, function block DCALC1	8.2-1
1	CFG: N-Line	1000	FIXED0INC			Speed signal of the line drive	
2	CFG: N-WIND	1000	FIXED0INC			Speed signal of the winding drive	
C1328	DIS: D-ACT		-200	{1 mm}	200	Function block DCALC1 Display of the current diameter	

Setting the initial value

The signal at DCALC1-Set is set as initial value.

- With DCALC1-LOAD = 1 the initial value is accepted.
- The initial value is accepted unfiltered.

Calculating the diameter

By division of the speed signals at DCALC1-N-LINE and DCALC1-N-WIND, the current diameter is calculated.

- ▶ The signal at DCALC1-N-LINE has to correspond to the circumferential speed of the reel.
- ▶ The signal at DCALC1-N-WIND has to be proportional to the reel speed.
- ▶ You have to adapt the signal at DCALC1-N-LINE in C1300 and C1301, so that the value calculated corresponds to the actual diameter. The nominal reel diameter $d_{\max}$ is entered in C1304.
 - For operation with the nominal reel diameter $d_{\max}$ you have to enter the value at input DCALC1-N-WIND in C1300 and the value at input DCALC1-N-LINE in C1301.
- ▶ The input signals are integrated cyclically. In C1302 you alter the integration interval (calculation cycle):
 - Great value in C1302 $\Rightarrow$ high resolution
 - Low value in C1302 $\Rightarrow$ low resolution
- ▶ If the integrator overflows, DCALC1-OVFL is set to HIGH. The integrator is reset internally and starts again with the calculation of the last correct value.
- ▶ A first-order low pass filters the values calculated. The filter time constant is set via C1303.

Displaying the diameter

In C1328 the current diameter is displayed.

- ▶ For the conversion of the scaled calculated value to the absolute value [mm], the reference diameter $d_{\max}$ has to be entered via C1304.
- ▶ At DCALC1-D-OUT the current diameter is output. The signal is scaled to the value in C1304.

Maintaining/saving the current value

With DCALC1-HOLD = HIGH the last diameter value calculated is maintained and the integrators are reset.

- ▶ When the controller is switched off, the current diameter value is saved. When it is switched on, the last value saved is loaded.

Setting/displaying the diameter

In C1305 the minimum diameter ($d_{\min}$) in [mm] is entered. $d_{\min}$ is reached when DCALC1-DMIN switches to HIGH.

In C1306 the maximum diameter ($d_{\max}$) in [mm] is entered. $d_{\max}$ is reached when DCALC1-DMAX switches to HIGH.

In C1307 a hysteresis for resetting the display signal is set. The entry in [%] relates to the absolute values in C1305 and C1306.

Converting the diameter (d) to 1/d

In configurations with a speed forward control it is common to multiply the precontrol signal with the reciprocal value of the diameter (d). This value is output at DCALC1-OUT.

► C1308 = 0: DCALC1-OUT = d

► C1308 = 1: DCALC1-OUT = 1/d

For the conversion to 1/d the reference value for the diameter has to be defined in C1309, for which the signal at DCALC1-OUT is to be 100 %.

► Normally C1309 corresponds to the minimum diameter in C1305 ($d_{\min}$).

In order to ensure a continuous transition when setting new diameter values, a ramp function generator is activated if C1310 > 0 s.

Web break monitoring

A window comparator compares the corresponding newly calculated value to the value last filtered.

► In C1311 the maximum difference in [%] between the two values is defined.

► DCALC1-l=0 is set to LOW if the maximum difference is exceeded.

Formulas for calculation**Current diameter (C1328)**

$$C1328 \text{ [mm]} = \frac{DCALC1-N-LINE \text{ [inc]}}{DCALC1-N-WIND \text{ [inc]}} \cdot \frac{C1300 \text{ [rpm]}}{C1301 \text{ [rpm]}} \cdot C1304 \text{ [mm]}$$

Output signal at DCALC1-OUT

For C1308 = 0 (DCALC1-OUT = d):

$$DCALC1-OUT \text{ [%]} = \frac{C1328 \text{ [mm]}}{C1304 \text{ [mm]}} \cdot 100 \text{ %}$$

For C1308 = 1 (DCALC1-OUT = 1/d):

$$DCALC1-OUT \text{ [%]} = \frac{C1304 \text{ [mm]}}{C1328 \text{ [mm]}} \cdot \frac{C1309 \text{ [mm]}}{C1304 \text{ [mm]}} \cdot 100 \text{ %}$$

**Note!**

The value at DCALC1-OUT is limited by the maximum reel diameter (C1306) and the minimum reel diameter (C1305).

8.2.2 Master frequency input (DFIN)

Description

The function block calculates a speed signal from the rectangular signals at X9. TTL signals and HTL signals can be connected. The zero track can be selected as an option.

The edge changes are detected every 1 ms and result directly in the output value.

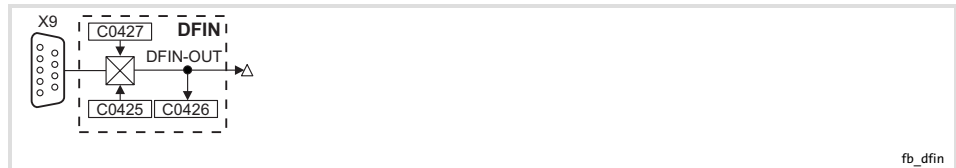


Fig. 8.2-2 Digital frequency input (DFIN)

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0425	DFIN const	3	0 256 inc/rev	Constant of the master frequency input, function block DFIN Output signal at the connected encoder or at the upstream controller in the event of a master frequency cascade/master frequency bus 8.2-5
			1 512 inc/rev	
			2 1024 inc/rev	
			3 2048 inc/rev	
			4 4096 inc/rev	
			5 8192 inc/rev	
			6 16384 inc/rev	
C0426	DIS: OUT		-36000 {1 rpm} 36000	Output signal of the master frequency input, function block DFIN Display only
C0427	DFIN function	0		Function of the master frequency input, function block DFIN
			0 2-phase	Phase-displaced signal sequence
			1 A pulse/B dir	Control of direction of rotation via track B
			2 Pulse A or B	Control of speed and direction of rotation via track A or track B

Evaluating input signals

In C0427 the different modes for the evaluation of the input signals can be selected.

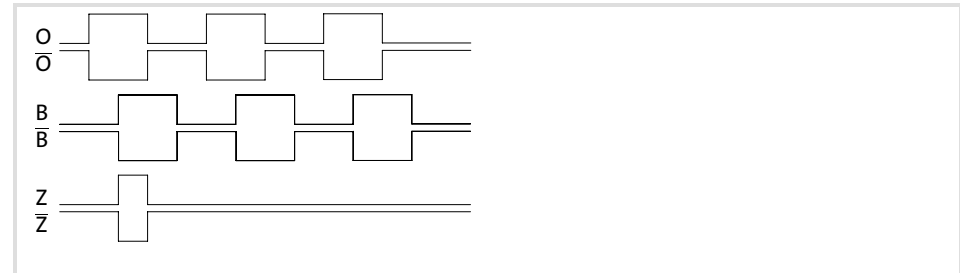
C0427 = 0 (phase-displaced signal sequence)

Fig. 8.2-3 Phase-displaced signal sequence (CW rotation)

Clockwise rotation Track A leads track B by 90 ° (positive value at DFIN-OUT)
 Counter-clockwise rotation Track A lags track B by 90 ° (negative value at DFIN-OUT)

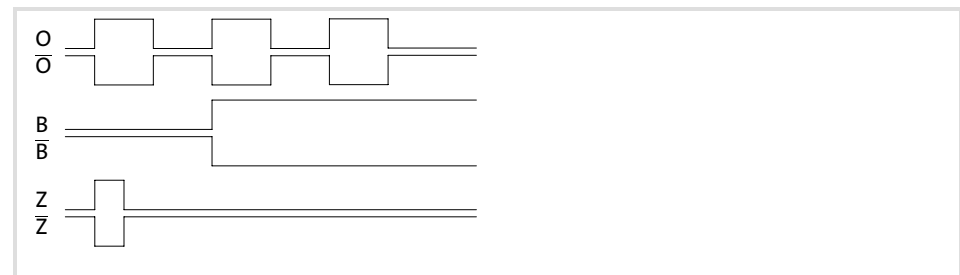
C0427 = 1 (control of the direction of rotation via track B)

Fig. 8.2-4 Control of direction of rotation via track B

Clockwise rotation Track A transmits the speed
 Track B = LOW (positive value at DFIN-OUT)
 Counter-clockwise rotation Track A transmits the speed
 Track B = HIGH (negative value at DFIN-OUT)

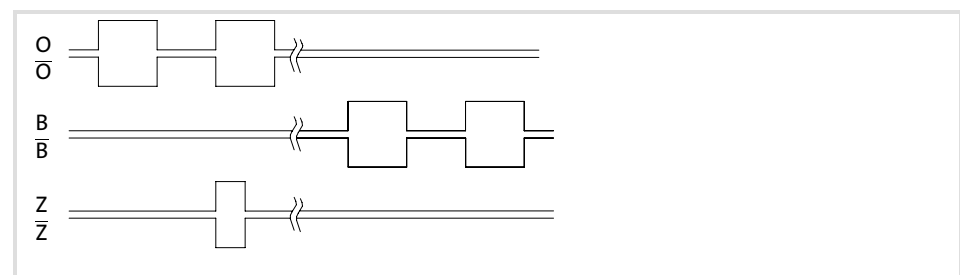
C0427 = 2 (control of speed and direction of rotation via track A or track B)

Fig. 8.2-5 Control of speed and direction of rotation via track A or track B

Clockwise rotation Track A transmits the speed and direction of rotation (positive value at DFIN-OUT)
 Track B = LOW
 Counter-clockwise rotation Track B transmits the speed and direction of rotation (negative value at DFIN-OUT)
 Track A = LOW

Adjusting the output signal

In C0425 the output signal can be adapted:

- To the encoder at X9 or
- To the upstream controller with master frequency cascade/master frequency bus.

Transfer function

Calculating the output signal:

$$\text{DFIN-OUT [rpm]} = f [\text{Hz}] \cdot \frac{60}{C0425}$$

Example:

The input frequency amounts to 200 kHz, the number of increments corresponds to 2048 inc/rev. (C0425 = 3).

$$\text{DFIN-OUT [rpm]} = 200000 \text{ Hz} \cdot \frac{60}{2048} = 5859 \text{ rpm}$$

Signal adaptation

Signal adaptations other than by squaring in C0425 can be achieved by connecting a function block.

Example:

The function block CONV3 shall convert the speed signal into a quasi analog signal.

Calculating the output signal at CONV3:

$$\text{CONV3-OUT [\%]} = f [\text{Hz}] \cdot \frac{0.4}{C0425} \cdot \frac{C0950}{C0951}$$

Interconnecting function blocks:

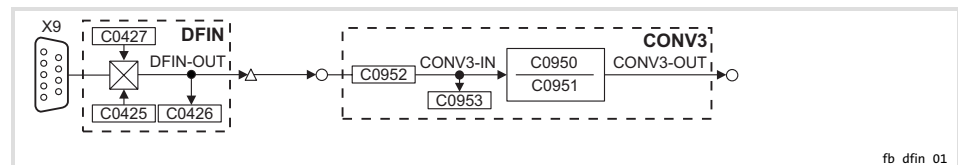


Fig. 8.2-6 Digital frequency input (DFIN) with connected converter



Note!

If a master frequency is output to DFOUT-AN-IN or DFOUT-DF (C0540 = 0 or C0540 = 1) **and** an incremental encoder is evaluated via X8, the function block DFIN cannot be used anymore.

If the input signals at X8 or X9 are output to X10, (C0540 = 4 or C0540 = 5), this restriction does not exist.

8.2.3 Master frequency output (DFOUT)

Description

The function block creates rectangular signals from an analog signal or speed signal, which are output via X10. Alternatively, you can set the master frequency output to a signal output at X8 or X9.

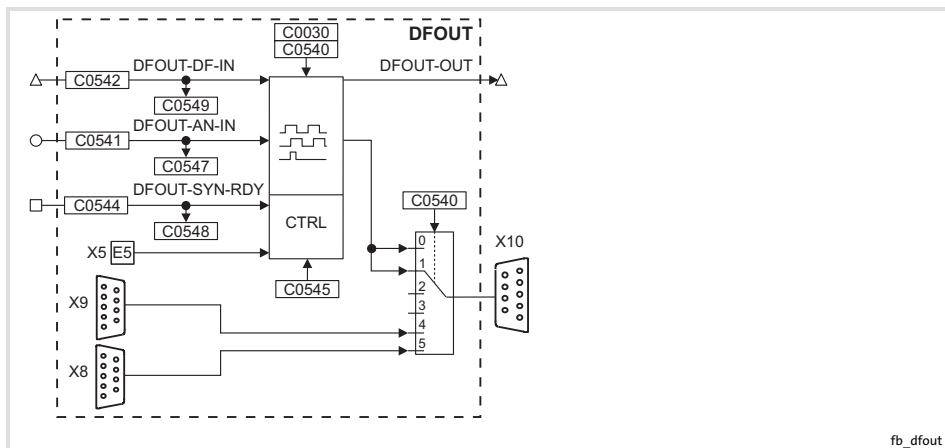


Fig. 8.2-7 Digital frequency output (DFOUT)

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0030	DFOUT const	3	0	256 inc/rev	Function block DFOUT • Setting of the constant (increments per revolution) for the master frequency output X10 8.2-8
			1	512 inc/rev	
			2	1024 inc/rev	
			3	2048 inc/rev	
			4	4096 inc/rev	
			5	8192 inc/rev	
			6	16384 inc/rev	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0540 	Function	0		Function selection, function block DFOUT ● Output signal at X10
			0 Analog input Analog input	Signal at DFOUT-AN-IN is output. Zero track can be input externally.
			1 PH diff input Phase difference input	Signal at DFOUT-DF-IN is output. Zero track can be input externally.
			2 Not assigned	
			3 Not assigned	
			4 X10 = X9 X9 is output on X10	The input signals are buffered C0030 is without function
			5 X10 = X8 X8 is output on X10	
C0541 	CFG: AN-IN	5001	MCTRL-NACT  Selection list 1	Configuration of analog input signal, function block DFOUT ● Signal in [%] of C0011
C0542 	CFG: DF-IN	1000	FIXEDPHI-0  Selection list 4	Configuration of input signal, function block DFOUT ● Speed signal
C0544 	CFG: SYN-RDY	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block DFOUT ● DFOUT-SYN-RDY = HIGH: Generating a zero pulse
C0545	PH offset	0	0 {1 inc.} 65535	Phase offset, function block DFOUT ● Displacing the zero pulse generated via DFOUT-SYN-RDY by up to 360 ° ● 1 rev. = 65535 inc (360 °)

Output signals at X10

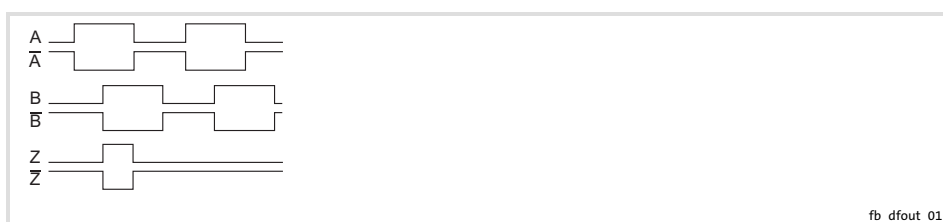


Fig. 8.2-8 Signal sequence for CW rotation (definition)

- The output signals correspond to the simulation of an incremental encoder:
 - Track A and track B and, if required, the zero track and the corresponding inverted tracks are output. The levels are TTL-compatible.
 - Positive input values (CW rotation) result in the represented signal sequence.
 - With negative input values (CCW rotation) track B leads track A by 90 °.
 - The encoder constant of the encoder simulation is set in C0030.
- C0540 serves to define which input signal or signal source shall be active. The zero track is output according to the selected setting.

C0540	Signal at X10
0	DFOUT-AN-IN is output to X10. Zero track can be selected externally.
1	DFOUT-DF-IN is output to X10. Zero track can be selected externally.
2	No function
3	No function
4	The signal at input X9 is electrically amplified and directly output (C0030 is without function)
5	The signal at input X8 is electrically amplified and directly output (C0030 is without function)



Note!

The settings C0540 = 0 and C0540 = 1 are not possible when a connection to the master frequency input X9 (DFIN) was established and an incremental encoder was connected via X8 (C0025 = 100, 110 ... 113).

Output of analog signal as frequency

Setting: C0540 = 0

- The analog signal at the input DFOUT-AN-IN is converted into a frequency and output to X10.
- Frequency calculation:

$$f [\text{Hz}] = \text{DFOUT-AN-IN} [\%] \cdot \frac{\text{C0030}}{100} \cdot \frac{\text{C0011}}{60}$$

Example:

The input signal at DFOUT-AN-IN amounts to 50 %, the number of increments corresponds to 2048 inc/rev. (C0030 = 3) and the maximum speed (C0011) is set to 3000 rpm.

$$f [\text{Hz}] = 50 \% \cdot \frac{2048}{100} \cdot \frac{3000}{60} = 51200 \text{ Hz}$$

Generating an index pulse

An artificial index signal can be generated for the output frequency.

1. Set the input DFOUT-SYN-RDY = HIGH.
 - 360° later, a LOW-HIGH edge generates the index pulse.
 - Then a zero pulse is generated every 360 ° according to C0030.
2. If necessary, shift the zero pulse by up to 360 ° (65536 inc = 360 °) via C0545.

Output of the speed signal as frequency

Setting: C0540 = 1

- The speed signal at the input DFOUT-DF-IN is converted into a frequency and output to X10.
- Frequency calculation:

$$f [\text{Hz}] = \text{DFOUT-DF-IN} [\text{rpm}] \cdot \frac{\text{C0030}}{60}$$

Example:

The input signal at DFOUT-DF-IN amounts to 3000 rpm, the number of increments corresponds to 2048 inc/revolution (C0030 = 3).

$$f [\text{Hz}] = 3000 \text{ rpm} \cdot \frac{2048}{60} = 102400 \text{ Hz}$$

Generating a zero pulse

An artificial zero pulse can be generated for the output frequency.

1. Set the input DFOUT-SYN-RDY = HIGH.
 - 360° later, a LOW-HIGH edge generates the zero pulse.
 - Then a zero pulse is generated every 360 ° according to C0030.
2. If necessary, shift the zero pulse by up to 360 ° (65536 inc = 360 °) via C0545.

Signal at X8 is directly output
at X10

- ▶ The input signals at X8 are amplified electrically and output directly.
- ▶ The signals depend on the assignment of the input X8.
- ▶ The codes C0030, C0545 and the output DFOUT-OUT have no function.
- ▶ The zero track is only output if it is connected to X8.

Signal at X9 is directly output
at X10

- ▶ The input signals at X9 are amplified electrically and output directly.
- ▶ The signals depend on the assignment of the input X9.
- ▶ The codes C0030, C0545 and the output DFOUT-OUT have no function.
- ▶ The zero track is output if it is connected to X9.

8.2.4 Master frequency ramp-function generator (DFRFG)

Description

The function block creates acceleration and deceleration ramps for the operation with master frequency, thus leading the drive to the master frequency with angular synchronism.

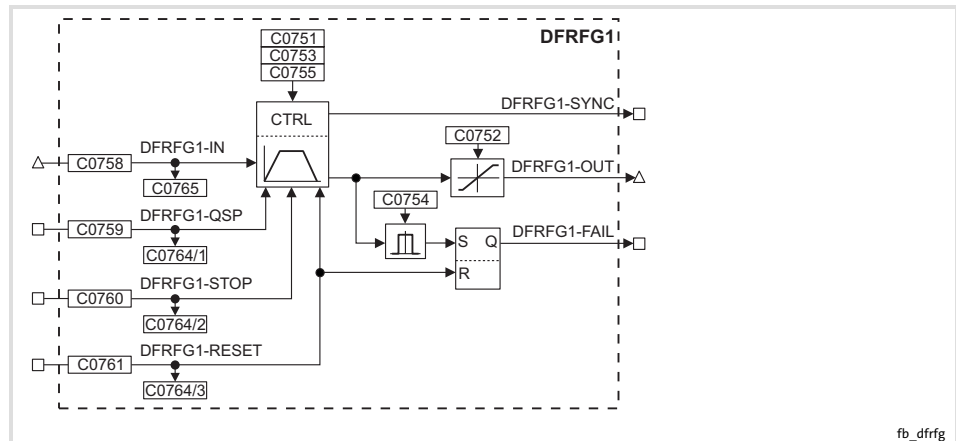


Fig. 8.2-9 Digital frequency ramp function generator (DFRFG1)

Codes for parameter setting

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0751	DFRFG1 Tir	1.000	0.001	{0.001 s}	999.999	Acceleration time T_{ir} , function block DFRFG1
C0752	Max speed	3000	1	{1 rpm}	16000	Maximum speed, function block DFRFG1 Maximum speed-up (speed)
C0753	DFRFG1 QSP	0.000	0.000	{0.001 s}	999.900	Deceleration time T_{if} for quick stop, function block DFRFG1
C0754	PH error	$2 \cdot 10^9$	10	{1}	$2 \cdot 10^9$	Following error, function block DFRFG1 - Maximum permissible phase difference between setpoint and actual phase 1 rev. = 65535 inc
C0755	Syn window	100	0	{1 inc.}	65535	Synchronisation window, function block DFRFG1 1 rev. = 65535 inc

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0758 STOP	CFG: IN	1000	FIXEDPHI-0	 Selection list 4	Configuration of input signal, function block DFRFG1 - Speed/phase setpoint signal Configuration of digital input signal, function block DFRFG1 - HIGH = quick stop active Configuration of input signal, function block DFRFG1 - HIGH = Status of the profile generator is maintained, setpoint is saved Configuration of input signal, function block DFRFG1 - HIGH = resetting the integrators	 8.2-13	
C0759 STOP	CFG: QSP	1000	FIXED0	 Selection list 2			
C0760 STOP	CFG: STOP	1000	FIXED0	 Selection list 2			
C0761 STOP	CFG: RESET	1000	FIXED0	 Selection list 2			
C0764			0	1			
	1 DIS: QSP				Function block DFRFG1 Display of the signals linked in C0759, C0760 and C0761		
	2 DIS: STOP						
	3 DIS: RESET						
C0765	DIS: IN		-32767	{1 rpm}	32767	Function block DFRFG1 Display of the signal linked in C0758	

Profile generator



Stop!

Do not operate the drive with this function at the torque limitation $M_{\max}$, $I_{\max}$.

The profile generator creates ramps which automatically compensate the resulting phase displacement. If you do not need this compensation, set DFRFG-RESET = HIGH.

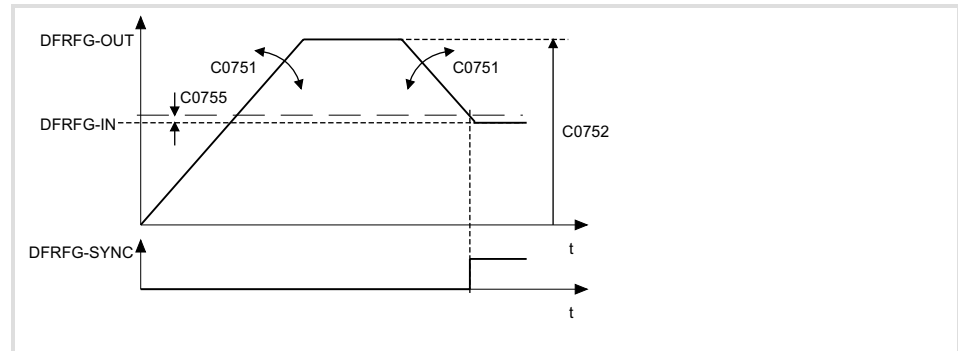


Fig. 8.2-10 Synchronisation on DFRFG

C0751	Setting the deceleration and acceleration time
C0752	Setting the maximum speed
C0755	Setting the switching point

When the actual angle has reached its setpoint and the output signal corresponds to the input signal, the drive runs in synchronism and the output DFRFG1-SYNC is set to HIGH. At the same time the profile generator is switched to the inactive state.

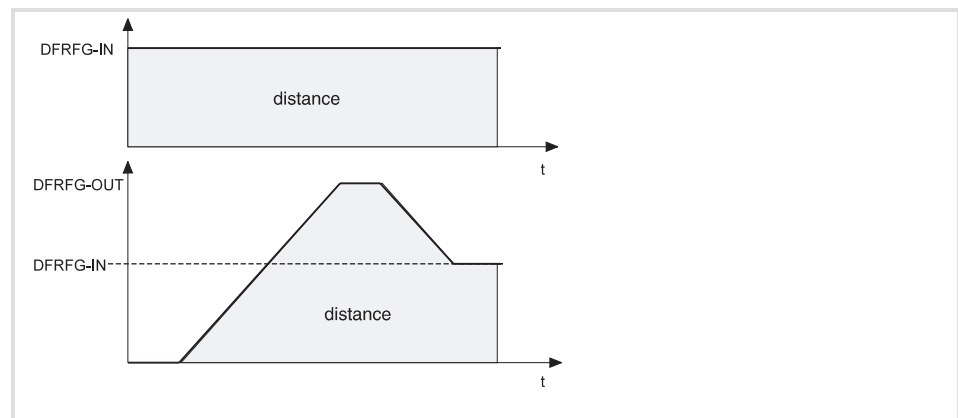


Fig. 8.2-11 Speed-time diagram DFRFG

The number of increments at DFRFG1-IN (master drive) defines the set phase. The set phase can be displayed as a path. The speed-time diagram shows the distance covered (angle) as the area below the speed profile. When synchronisation is reached, master and slave have covered the same distance (phase).

Quick stop (QSP)

Quick stop takes the drive out of the system and brings it to standstill. Setpoints and actual values are continued to be detected.

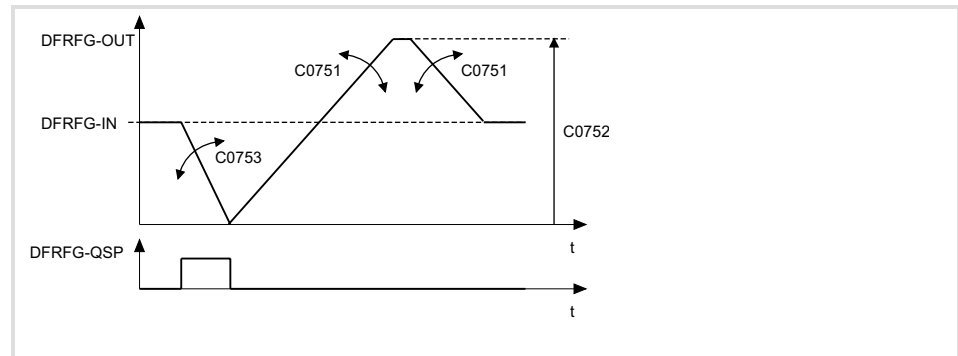


Fig. 8.2-12 Quick stop DFRFG

C0751	Acceleration and deceleration time of the profile generator
C0752	Maximum speed
C0753	Setting the deceleration time T_{if} for QSP

- QSP is activated using DFRFG1-QSP = HIGH.
- With DFRFG1-QSP = LOW, QSP is deactivated. The setpoint is approached via the profile generator.

Ramp function generator stop

The function “ramp-function generator stop” keeps the state of the profile generator during operation. Setpoints and actual values are continued to be detected.

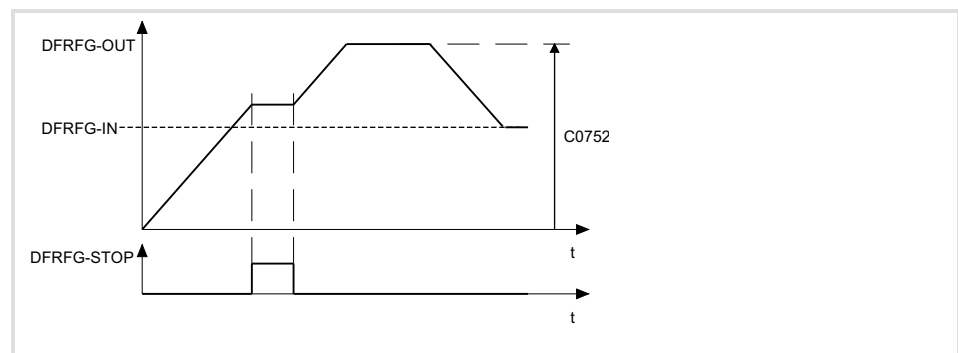


Fig. 8.2-13 Ramp function generator stop

C0752	Maximum speed

- The function “ramp-function generator stop” is activated with DFRFG1-STOP = HIGH.
 - The last status is output at DFRFG1-OUT.
- With DFRFG1-STOP = LOW the function “ramp-function generator stop” is reset. The setpoint is approached via the profile generator.

Reset ramp generator

- With DFRFG1-RESET = HIGH, the profile generator is activated. Internally added-up set phases and actual phases are reset.
- The set phase is detected using a HIGH-LOW signal at DFRFG1-RESET.

Monitoring the phase difference

The profile generator can accept a phase difference between the set phase and the actual phase of up to ± 2140000000 inc (= 32000 revolutions).

- ▶ A limit value can be set for the permissible phase difference via C0754.
- ▶ If the limit value is reached, DFRFG1-FAIL is set to HIGH and the value is saved.
- ▶ DFRFG1-FAIL is only set to LOW with DFRFG1-RESET = HIGH.

8.2.5 Master frequency processing (DFSET)

Description

The function block prepares the master frequency for the controller. You can select values for the stretching and gearbox factor and carry out a speed or phase trimming.

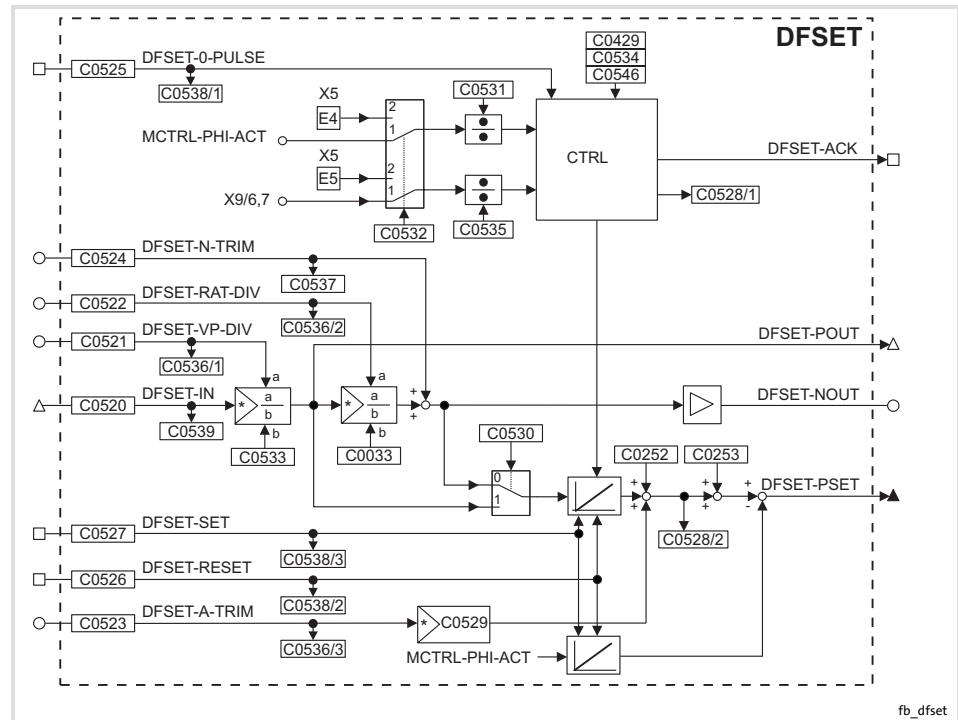


Fig. 8.2-14 Digital frequency processing (DFSET)

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0033	Gearbox denom	1	1	{1}	32767	Gearbox factor - denominator of the function block DFSET	 8.2-18
C0252	Angle offset	0	-245760000	{1 inc.}	245760000	Phase offset for master frequency processing, function block DFSET ● Fixed phase offset for digital frequency configuration ● 1 rev. = 65536 inc	 8.2-18
C0253	Angle n-trim	→	-32767	{1 inc.}	32767	Speed-dependent phase trimming for the master frequency processing, function block DFSET → depending on C0005, C0025, C0490 ● Change of C0005, C0025 or C0490 resets C0253 to the corresponding Lenze setting ● 1 rev. = 65536 inc ● Value in C0253 is reached at 15000 rpm	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0520 	CFG: IN	1000	FIXEDPHI-0  Selection list 4	Configuration of input signal, function block DFSET ● Input of speed / phase setpoint signal Configuration of analog input signal, function block DFSET ● Signal for numerator of stretching factor ● 100 % = 16384 inc Configuration of analog input signal, function block DFSET ● Signal for numerator of gearbox factor ● 100 % = 16384 inc Configuration of analog input signal, function block DFSET ● Signal for phase trimming via offset multiplier (C0529) ● 100 % = 16384 inc Configuration of analog input signal, function block DFSET ● Signal for speed trimming ● Signal in [%] of C0011 Configuration of digital input signal, function block DFSET ● Signal for one-time zero pulse activation ● HIGH = release for zero pulse synchronisation Configuration of digital input signal, function block DFSET ● Signal for reset of integrators ● HIGH sets – Position difference = 0 – DFSET-PSET = 0 – DFSET-PSET2 = 0 Configuration of digital input signal, function block DFSET ● HIGH = Set phase integrators to equal values ● LOW-HIGH edge sets DFSET-PSET = 0 ● HIGH-LOW edge sets DFSET-PSET to the current value of MCTRL-PHI-SET ● DFSET-SET has a higher priority than DFSET-RESET
C0521 	CFG: VP-DIV	1000	FIXED0%  Selection list 1	
C0522 	CFG: RAT-DIV	1000	FIXED0%  Selection list 1	
C0523 	CFG: A-TRIM	1000	FIXED0%  Selection list 1	
C0524 	CFG: N-TRIM	1000	FIXED0%  Selection list 1	
C0525 	CFG: 0-PULSE	1000	FIXED0  Selection list 2	
C0526 	CFG: RESET	1000	FIXED0  Selection list 2	
C0527 	CFG: SET	1000	FIXED0  Selection list 2	
C0528			-2·10 ⁹ {1} 2·10 ⁹	Function block DFSET ● Display only Phase difference between two zero pulses Offset = C0523 × C0529 + C0252
1	DIS: 0-pulse A			
2	DIS: Offset			

8 Configuration

8.2 Function blocks

8.2.5 Master frequency processing (DFSET)

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0529	Multip offset	1	-20000 {1} 20000			Offset multiplier, function block DFSET ● Multiplier for the phase offset (C0252)	 8.2-18
C0530	DF evaluation	0	0	with factor	With gearbox factor	Master frequency evaluation, function block DFSET ● Evaluation of the setpoint integrator	
			1	no factor	Without gearbox factor		
C0531	Act 0 div	1	1 {1} 16384			Actual zero pulse divisor, function block DFSET	
C0532	0-pulse/TP	1	1	0-pulse	Index pulse	Zero pulse / touch probe, function block DFSET ● Zero pulse of the feedback system or touch probe	 8.2-18
			2	Touch probe	Touch probe		
C0533	Vp denom	1	1 {1} 32767			Gain factor of denominator V _p , function block DFSET	
C0534	0 pulse fct	0				Zero pulse function, function block DFSET ● Synchronising the drive	
			0	inactive	Inactive		
			1	Continuous	Continuous synchronisation, correction in the shortest possible way		
			2	Cont. switch	Continuous synchronisation, correction in the shortest possible way	After a LOW-HIGH signal to DFSET-0-pulse, the zero track is synchronised once	
			10	Once, fast way	One-time synchronisation, correction in the shortest possible way		
			11	Once, CW	One-time synchronisation, correction in direction of rotation to the right		
			12	Once, CCW	One-time synchronisation, correction in direction of rotation to the left		
			13	Once, 2*0-pulse	One-time synchronisation, correction is detected from setpoint pulse and actual pulse and corrected to the corresponding direction		
C0535	Set 0 div	1	1 {1} 16384			Desired zero pulse divisor, function block DFSET	 8.2-18

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0536			-32767	{1}	32767	Function block DFSET ● Display of the signals linked in C0521, C0522 and C0523 8.2-18
1	DIS: VP-DIV					
2	DIS: RAT-DIV					
3	DIS: A-TRIM					
C0537	DIS: N-TRIM		-199.99	{0.01 %}	199.99	Function block DFSET ● Display of the signal linked in C0524
C0538			0		1	Function block DFSET ● Display of the signals linked in C0525, C0526 and C0527
1	DIS: 0-pulse					
2	DIS: RESET					
3	DIS: SET					
C0539	DIS: IN		-6000	{1 rpm}	6000	Function block DFSET ● Display of the signal linked in C0520
C0546	Min inc/rev	1000	1	{1 inc.}	2147483647	Masking of the touch probe signal, function block DFSET ● Suppressing interference pulses at X5/E4 (actual pulse of touch probe signal) ● The size of the masking window between two actual pulses is set 8.2-18

Setpoint conditioning with stretching and gearbox factor

Stretching factor

The stretching factor defines the ratio with which the drive is to run faster or slower than the setpoint.

The setpoint at DFSET-IN is evaluated. The result is output to DFSET-POUT.

$$\text{DFSET-POUT} = \text{DFSET-IN} \cdot \frac{\text{DFSET-VP-DIV}}{\text{C0533}}$$

The stretching factor results from numerator and denominator.

- The numerator (DFSET-VP-DIV) can be defined as a variable from the analog signal source or as a fixed value from a code.
- Enter the denominator under C0533.

**Note!**

When calculating the stretching factor, the input signal at DFSET-VP-DIV is not processed in a scaled mode. A signal of 100 % corresponds to a count value of 16384.

Gearbox factor

The gearbox factor defines the ratio by means of which the drive speed can be changed additionally.

The setpoint at DFSET-IN, multiplied by the stretching factor, is evaluated. The result is output at DFSET-NOUT [in % of $n_{\max}$ (C0011)].

$$\text{DFSET-NOUT} = \text{DFSET-IN} \cdot \frac{\text{DFSET-VP-DIV}}{\text{C0533}} \cdot \frac{\text{DFSET-RAT-DIV}}{\text{C0033}}$$

The gearbox factor results from numerator and denominator.

- The numerator (DFSET-RAT-DIV) can be defined as a variable from the analog signal source or as a fixed value from a code.
- Enter the denominator under C0033.

**Note!**

When calculating the gearbox factor, the input signal at DFSET-RAT-DIV is not processed in a scaled mode. A signal of 100 % corresponds to a count value of 16384.

Processing of correction values

Speed trimming

The speed trimming serves to add correction values, e. g. by a superimposed control loop. This enables the drive to accelerate or decelerate.

- At the speed trimming, an analog value at DFSET-N-TRIM is added to the speed setpoint.

Phase trimming

The phase trimming adds a setpoint at DFSET-A-TRIM to the phase setpoint and changes the rotor position to the setpoint with the number of increments provided in either direction (drive is leading or lagging). The phase is trimmed within a range of ± 32767 increments (corresponds to $\pm \frac{1}{2}$ revolution). Every analog signal can be used as a source.

- The input is done in increments (1 revolution $\triangleq$ 65536 increments).
- An analog input signal at DFSET-A-TRIM of 100 % $\triangleq$ 1/4 revolution $\triangleq$ 16384 increments.
- You can extend the setting range with a multiplier (C0529).

Phase offset

The phase offset (C0252) adds a fixed phase offset to the setpoint of the drive.

Phase adjustment proportional to speed

With a phase adjustment proportional to speed, the phase leads or lags with increasing speed.

- Enter the offset in increments under C0253.
- The set phase offset is reached at 15000 rpm of the drive (linear relationship).



Note!

Phase corrections are only reasonable if the controller is operated with incremental encoder feedback and the calculated following error is used for correcting the speed setpoint. The following error is output to DFSET-PSET.

Synchronising to zero track or touch probe



Stop!

When the synchronisation via the terminals X5/E4 and X5/E5 (C0532 = 2) is activated, these terminals must not contain any other signal connections.
When selecting a basic configuration via C0005, the terminals contain a basic setting.

Selection of synchronisation

C0532 = 1 (zero pulse)	The synchronisation is performed on the zero track of the digital frequency input X9 and the zero track of the feedback system set under C0490.
C0532 = 2 (touch probe)	The synchronisation is performed using the terminals X5/E4 (actual pulse) and X5/E5 (setpoint pulse).

Touch probe initiators can have delay times which cause a speed-dependent phase offset.

Set the correction for the phase offset under C0429.

$$C0429 = 16384 \cdot \text{Correction value}$$

The correction value for the phase offset can be obtained from the data sheet of the initiator, or contact the manufacturer.

Synchronisation modes

C0534	Synchronisation mode	Note
0	Inactive	Function inactive
1	Continuous synchronisation with correction in the shortest possible way	
2	Continuous synchronisation with correction in the shortest possible way	After a LOW-HIGH signal to DFSET-0-pulse, the zero track is synchronised once
10	One synchronisation. A phase deviation is corrected in the shortest possible way.	
11	One synchronisation. A phase deviation is corrected in CW direction.	
12	One synchronisation. A phase deviation is corrected in CCW direction.	
13	Single synchronisation. A phase difference is determined between setpoint pulse and actual pulse and is corrected to the corresponding direction of rotation according to the sign.	

► During synchronisation, DFSET-ACK is set to HIGH.



Note!

Drive synchronisation is only reasonable if the controller is operated with incremental encoder feedback and the calculated following error is used for correcting the speed setpoint. The following error is output to DFSET-PSET.

8.2.6 Internal motor control with V/f characteristic control (MCTRL1)

Description

The function block MCTRL1 controls the motor. It is always carried out so that it does not need to be entered into the processing table.

In the Lenze setting, the controller is set to V/f characteristic control (C0006 = 5). Without other settings and with analog setpoint selection via X6/1, X6/2 and connected asynchronous standard motor (50 Hz/400 V) commissioning can be executed immediately.

The V/f characteristic control is suitable for single drives, multi-motor drives, synchronous motors, reluctance motors and asynchronous motors.

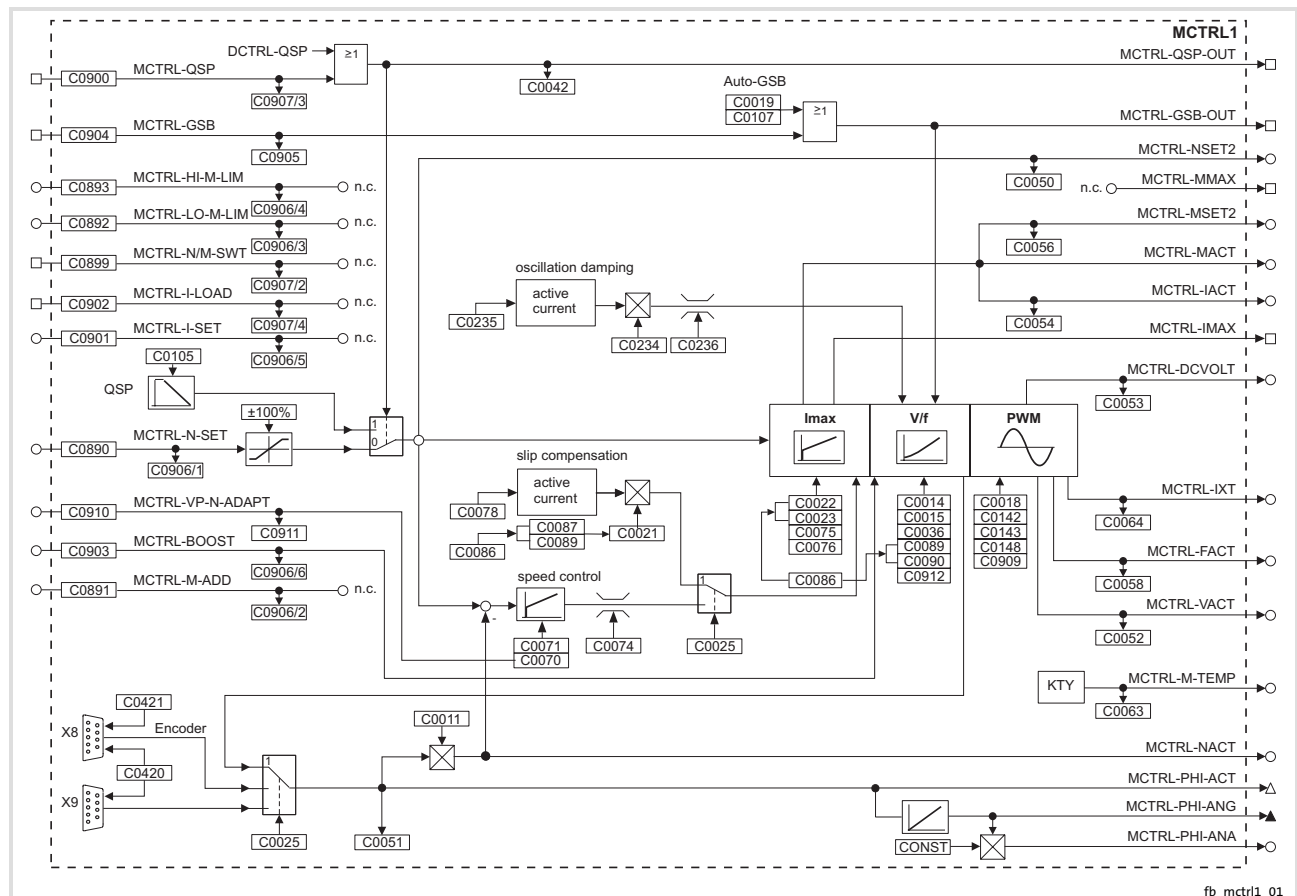


Fig. 8.2-15 Internal motor control with V/f characteristic control (MCTRL1)

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0006 STOP	Op mode	5				Selection of the operating mode for the motor control
			1	vector ctrl	Vector control without or with speed feedback	In case of the first selection enter the motor data and identify them with C0148.  6.8-8
			5	V / f	V/f characteristic control	Commissioning without identification of the motor data is possible Advantage of identification with C0148: Improved smooth running at low speeds  6.8-4
C0010	N _{min}	0	0	{1 rpm}	36000	- Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times - C0059 must be set correctly - Set C0010 < C0011 - C0010 is only effective in case of analog setpoint selection via AIN1 Important: For parameter setting via interface, major changes in one step should only be made when the controller is inhibited. Minimum speed  6.10-1
C0011	N _{max}	3000	0	{1 rpm}	36000	Maximum speed
C0014	V/f charact.	0				Characteristic in the V/f characteristic control mode  8.2-25
			0	Linear		Linear V/f characteristic
			1	square		Square V/f characteristic
C0015	Rated freq	50	10	{1 Hz}	5000	V/f-rated frequency In C0015 you can set a base frequency which differs from the rated motor frequency (C0089) - Lenze setting: C0015 = C0089 - Changing C0086 or C0089 overwrites the value in C0015  8.2-25
C0016	U _{min} boost	0.00	0.00	{0.01 %}	100.00	U _{min} boost (FCODE) - C0016 = 1 % corresponds to a boost of 1 % of the rated motor voltage (C0090) - Code is freely configurable  6.8-4

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0018	fchop	6			Switching frequency of the inverter	6.9-1
			1	1 kHz sin loss-optimised	- General rule: The lower the switching frequency the – lower the power loss – higher the noise generation – better the concentricity factor - Observe derating indications for high switching frequencies - The max. output frequency ($f_{\max}$) is: – fchop = 4 kHz $\Rightarrow$ $f_{\max}$ = 300 Hz – fchop = 2 kHz $\Rightarrow$ $f_{\max}$ = 150 Hz – fchop = 1 kHz $\Rightarrow$ $f_{\max}$ = 150 Hz	
			2	2 kHz sin concentricity-optimised		
			3	4 kHz f_top power-optimised		
			4	4 kHz sin noise-optimised		
			6	4/2 kHz sin noise/concentricity-optimised with automatic change-over to low switching frequency		
C0021	slipcomp	→	-20.00	{0.01 %}	20.00	Slip compensation → Change of C0086, C0087 or C0089 sets C0021 to the calculated rated slip of the motor When changing over to the vector control mode, C0021 is set to 0 6.11-1 8.2-25 8.2-40
C0022	Imax current	→	0	{0.1 A}	-	$I_{\max}$ limit in motor mode → depending on C0086 6.6-14
C0023	Imax gen.	→	0	{0.1 A}	-	$I_{\max}$ limit in generator mode → depending on C0086 6.6-14
C0036	DC brk value	0.0	0.0	{0.1 A}	-	Set DC braking current → depends on the controller 8.2-25 8.2-40
C0042	DIS: QSP				Quick stop Display only 8.2-25	8.2-40
			0	QSP inactive	Quick stop is not active 8.2-40	
			1	QSP active	Quick stop is active	
C0050	MCTRL-NSET2		-100.00	{0.01 %}	100.00	Speed setpoint, function block MCTRL Display of the speed in [%] of C0011 8.2-25 8.2-40
C0051	MCTRL-NACT		-36000	{1 rpm}	36000	Actual speed value, function block MCTRL Read only 8.2-25 8.2-40
C0052	MCTRL-Umot		0	{1 V}	800	Motor voltage, function block MCTRL - Read only - MCTRL-VACT = 100 % = C0090 8.2-25 8.2-40
C0053	UG-VOLTAGE		0	{1 V}	900	DC-bus voltage, function block MCTRL - Read only - MCTRL-DCVOLT = 100 % = 1000 V 8.2-25 8.2-40
C0054	Imot		0.0	{0.1 A}	5000.0	Actual motor current, function block MCTRL - Read only - MCTRL-IACT = 100 % = C0022 8.2-25 8.2-40

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0056	MCTRL-MSET2		-100.00	{0.01 %}	100.00	Read only. The output signal depends on the operating mode: • Current motor current in case of V/f characteristic control, function block MCTRL1 • Torque setpoint in case of vector control, function block MCTRL2  8.2-25  8.2-40
C0058	MCTRL-FACT		-600.0	{0.1 Hz}	600.0	Output frequency • Display only • MCTRL-FACT = 100.0 % = 1000.0 Hz  8.2-25  8.2-40
C0063	Mot temp		0	{1 °C}	200	Motor temperature • Read only • Monitoring of the motor temperature must be activated. • KTY at X8/5, X8/8: – At 150 °C, TRIP OH3 is set – Early warning is possible via OH7, temperature is set in C0121 • PTC, thermal contact at T1, T2: – Release sets TRIP or warning OH8  8.2-25  8.2-40
C0064	Utilization		0	{1 %}	150	Device utilisation Ixt • Read only • Device utilisation of the last 180 s operating time • C0064 > 100 % triggers warning OC5 • C0064 > 110 % limits the ouput current of the controller to 67 % of the maximum current in C0022  8.2-25  8.2-40
C0070	Vp speed CTRL	10.0	0.0	{0.1 }	255.9	Gain of speed controller  8.2-25
C0071	Tn speed CTRL	50	1	{1 ms}	6000	Integral-action time of speed controller C0071 = 6000 ms: No integral-action time  8.2-40
C0074	limit N	10.00	0.00	{0.01 %}	100.00	Limitation of the speed controller • Influence of the speed controller for V/f characteristic control with feedback • max. setpoint difference in percent  8.2-25  8.2-40
C0075	Vp curr CTRL	0.04	0.00	{0.01 }	0.99	Gain of current controller • Vector control: Gain of current controller • V/f characteristic control: Maximum current controller  8.2-25  8.2-40
C0076	Tn curr CTRL	10.0	0.1	{0.1 ms}	2000.0	Integral-action time of current controller • Vector control: integral-action time of current controller • V/f characteristic control: maximum current controller • C0076 = 2000 ms: current controller is switched off  8.2-25  8.2-40

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0078	Tn slip CTRL	100	1	{1 ms}	6000	Integral-action time of slip controller - Filter time for slip compensation (C0021) - Only active with V/f characteristic control  8.2-25
C0086 	Mot type	→	 Motor selection list			Motor type selection → depending on the controller used Motor selection in C0086 sets the corresponding parameters in C0021, C0022, C0081, C0087, C0088, C0089, C0090, C0091  6.6-1
C0087 	Mot speed	→	50	{1 rpm}	36000	Rated motor speed → depending on C0086 - Motor selection in C0086 set the corresponding rated motor speed in C0087 - Change of C0087 sets C0086 = 0  6.6-1
C0089 	Mot frequency	→	10	{1 Hz}	5000	Rated motor frequency → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor frequency in C0089 - Change of C0089 sets C0086 = 0  6.6-1
C0090 	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor voltage in C0090 - Change of C0090 sets C0086 = 0  6.6-1
C0095 	Mot Io	→	0.0	{0.1 A}	1000.0	Motor magnetising current → dependent on C0086, C0088 and C0091 - Change of C0086 sets C0095 to the Lenze setting - Change of C0095 sets C0086 = 0  6.6-1
C0105	QSP Tif	5.00	0.00	{0.01 s}	999.90	Quick stop deceleration time The deceleration time refers to a speed variation of C0011 ... 0  8.2-25  8.2-40
C0107	holding time	0.00	0.00	{0.01 s}	9999.90	Hold time for automatic DC injection braking (Auto-GSB)  8.2-25  8.2-40
C0143	limit 2 kHz	0.0	0.0	{0.1 Hz}	20.0	Speed-dependent switching threshold - Threshold for automatic switching frequency reduction - The controller changes automatically to 2 kHz when this value falls below the threshold  8.2-25  8.2-40

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0234	damp value	20	-100	{1 %}	100	Influence of the oscillation damping, function block MCTRL - Minimising a tendency to oscillation of the drive - Influences the tendency to oscillation of the drive - When C0025 >1 and C0006 = 1, C0234 is set to 0  8.2-25  8.2-40
C0235	damping	2	1	{1 ms}	600	Filter time of the oscillation damping, function block MCTRL Filter time for the internal signal for oscillation damping  8.2-25  8.2-40
C0236	damp limit	1.0	0.0	{0.1 Hz}	20.0	Limit value of oscillation damping, function block MCTRL Limit value for the internal signal of oscillation damping
C0890 	CFG: N-SET	5050	NSET-NOUT		 Selection list 1	Configuration of analog input signal, function block MCTRL Speed setpoint  8.2-25  8.2-40
C0900 	CFG: QSP	10250	R/L/Q-QSP		 Selection list 2	Configuration of digital input signal, function block MCTRL HIGH = drive performs quick stop  8.2-25  8.2-40
C0903 	CFG: BOOST	5015	MCTRL-BOOST		 Selection list 1	Configuration of analog input signal, function block MCTRL Boost of the motor voltage  8.2-25
C0904 	CFG: DC-BREAK	1000	FIXED0		 Selection list 2	Configuration of digital input signal, function block MCTRL HIGH = Motor is braked  8.2-25  8.2-40
C0905	DIS: DC-BREAK		0		1	Function block MCTRL Display of the signal linked in C0904
C0906			-199.99	{0.01 %}	199.99	Function block MCTRL Display of the signals linked in C0890, C0891, C0892, C0893, C0901 and C0903  8.2-25  8.2-40
	1 DIS: N-SET					
	2 DIS: M-ADD					
	3 DIS: LO-M-LIM					
	4 DIS: HI-M-LIM					
	5 DIS: I-SET					
	6 DIS: BOOST					
C0907			0		1	Function block MCTRL Display of the signals linked in C0899, C0900 and C0902
	1 reserved					
	2 DIS: N/M-SWT					
	3 DIS: QSP					
	4 DIS: I-LOAD					
C0909	speed limit	1	1	+/- 175 %		Speed limitation, function block MCTRL Limitation of direction of rotation for the speed setpoint  8.2-25  8.2-40
			2	0 ... 175 %		
			3	-175 ... 0 %		
C0910 	CFG: VP-ADAPT	1006	FIXED100%		 Selection list 1	Configuration of analog input signal, function block MCTRL - Gain adaptation of the speed controller - If the gain is varying, join to CURVE-OUT of FB CURVE  8.2-25  8.2-40
C0911	DIS: VP-ADAPT		-199.99	{0.01 %}	199.99	Function block MCTRL Display of the signal linked in C0910

- Speed setpoint selection**
- The signal at the input MCTRL-N-SET is the setpoint speed in [%] and always refers to the maximum speed (C0011).
 - In most basic configurations, MCTRL-N-SET is connected to the function block NSET (speed setpoint conditioning).
 - You can also connect MCTRL-N-SET to any other analog output signal of a function block.

- Speed setpoint limitation**
- The speed setpoint at MCTRL-N-SET is always limited to $\pm 100\%$ of the maximum speed $n_{\max}$ (C0011).
 - The motor control converts the speed setpoint into a frequency setpoint, which is limited to a maximum output frequency, depending on the switching frequency f_{chop}

Switching frequency f_{chop}	Maximum output frequency
2 kHz	150 Hz
4 kHz	300 Hz

Setting of the V/f characteristic

- The motor voltage characteristic is set via the input of the motor ratings.
- Via the input MCTRL-BOOST the motor voltage can be raised. The input is connected to C0016 (freely configurable) in all basic configurations.
- To adapt the motor voltage boost to your application, you can also connect the input with other function blocks.

Speed control

With feedback operation, a PI controller will control the slip.

Activating the speed control

The speed control is activated when you select an incremental encoder in C0025.

Parameter setting

Code	Function
C0070	Gain V_p
C0071	Integral-action time T_n
C0074	Influence of the speed controller at operation with incremental encoder. Reference is $n_{\max}$ (C0011).



Note!

If the speed controller influence is adapted to the motor slip to be expected, the motor cannot accelerate in an uncontrolled way when the incremental encoder fails.

Adaptation of the speed controller

The gain of the speed controller can be changed online via the input MCTRL-VP-N-ADAPT. The set gain in C0070 is the reference value for an input signal of 100 %.

- You can influence the gain (C0070) by adapting a function block (e.g. CURVE) to MCTRL-VP-N-ADAPT.
- The adaptation is switched off in the Lenze default setting.

Limitation of the output current

The limitation of the output current is mainly used for the protection of the controller and the stabilisation of the control.

When the maximum permissible motor load is exceeded, you can adapt the max. output current of the controller accordingly.

Parameter setting

Code	Function
C0022	Maximum current in motor mode
C0023	Maximum current in generator mode

If you select a motor (via C0086), the maximum current of which is clearly lower than the output current of the controller, the maximum motor current (C0022) is limited automatically to 200% of the rated motor current.

Mode of operation

In the V/f characteristic control mode, a PI controller ($V_p = C0075$, $T_n = C0076$) prevents an excess of the max. permissible motor current by reducing (motor overload) or increasing (generator overload) of the output frequency.

The N controller is not active in the V/f characteristic control mode without feedback.

Consequences

- ▶ The motor cannot follow the speed setpoint.
- ▶ MCTRL-IMAX is set to HIGH
- ▶ When selecting the automatic switching frequency setting (C0018 = 0 or 6), the controller switches to a lower switching frequency so that a disconnection is not required.

Automatic speed detection after controller enable - flying restart circuit**Note!**

Due to physical regularities, the operability of the flying restart circuit depends on the application, the motor and the motor power.

- ▶ With EVF9335 ... EVF9338 and EVF9381 ... EVF9383 devices, the operability of the flying restart circuit can therefore not be guaranteed.

Quick stop (QSP) After a signal request, the motor is decelerated to standstill when an internal ramp function generator has been activated.

Mode of operation

- ▶ Quick stop is active
 - MCTRL-QSP = HIGH
 - The control word DCTRL-QSP is applied
 - DC injection braking (GSB) is not active (GSB has priority over quick stop)
- ▶ If quick stop is active, the motor brakes to standstill with the deceleration time set in C0105. MCTRL-QSP-OUT is set to HIGH.

Manual DC injection braking

- ▶ After a signal, the motor is braked by injecting a DC current.
- ▶ Braking in generator mode must be used for controlled brake ramps.
- ▶ The hold time (C0107) has no influence. The motor remains braked until MCTRL-GSB is set to LOW.



Note!

Manual DC injection braking has priority over quick stop.

Setting

Selection	Code	Description
DC braking current	C0036	DC braking current with which the motor is braked



Stop!

An excessive DC braking current and braking time can thermally overload the motor. Special care must be taken when using self-ventilated motors.

Activation

The input MCTRL-GSB in the function block MCTRL is triggered with HIGH level.

- ▶ MCTRL-GSB = HIGH: Function is activated
- ▶ MCTRL-GSB = LOW: Function is not activated

Function procedure

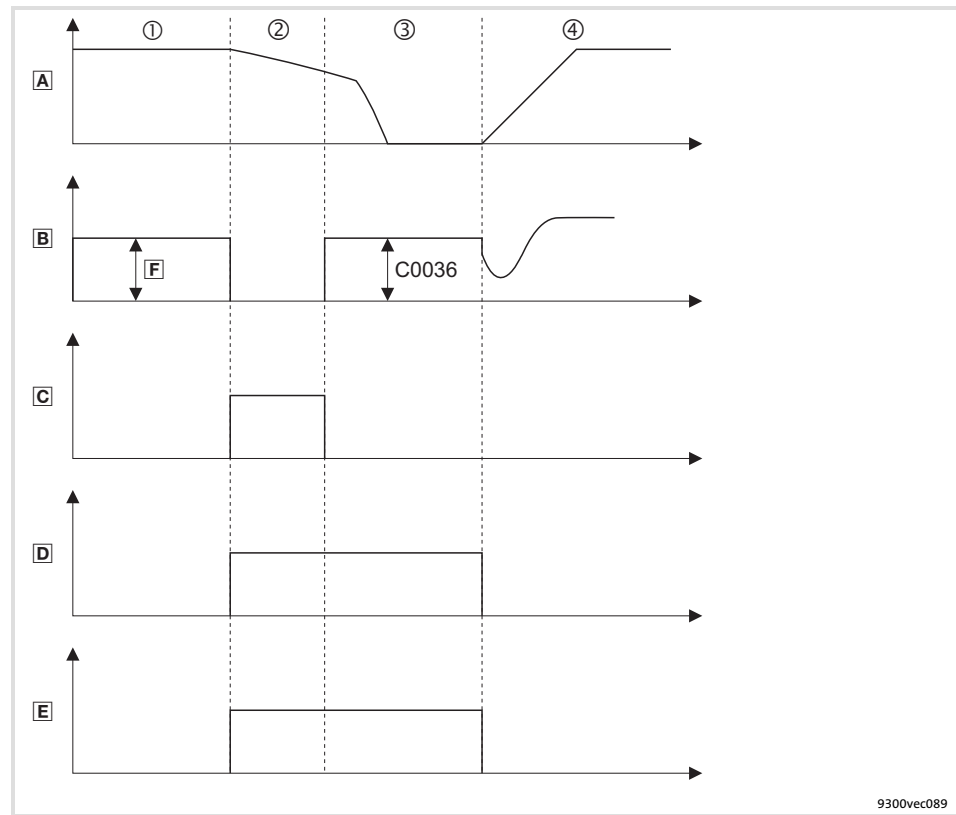


Fig. 8.2-16 Signal sequence with DC injection braking

- Ⓐ Actual speed value of the motor (e. g. MCTRL-NACT)
 - Ⓑ Controller output current (e. g. MCTRL-IACT)
 - Ⓒ Pulse inhibit (e. g. DCTRL-IMP)
 - Ⓓ Activating DC injection braking (MCTRL-GSB)
 - Ⓔ DC injection braking is active (MCTRL-GSB-OUT)
MCTRL-GSB-OUT = HIGH: Function is active
MCTRL-GSB-OUT = LOW: Function is not active
- ① The motor rotates with the preset speed. The current adjusts itself as a function of the load **F**.
 - ② DC injection braking is activated with MCTRL-GSB = HIGH. Pulse inhibit **IMP** is set. The motor coasts.
 - ③ The pulse inhibit is deactivated and the DC braking current set in C0036 is injected
 - ④ DC injection braking is deactivated with MCTRL-GSB = LOW
The motor is accelerated to speed setpoint at the set acceleration ramp and is kept there.

Automatic DC injection braking

When the speed falls below a settable speed setpoint threshold, the function "DC injection braking" is activated.



Note!

Automatic DC-injection braking has priority over quick stop.

Setting

Selection	Code	Description
DC braking current	C0036	DC braking current with which the motor is braked
Speed setpoint threshold	C0019	If the values fall below the threshold, DC-injection braking is released
Hold time	C0107	Duration of DC-injection braking. After the hold time, pulse inhibit is set.



Stop!

An excessive DC braking current and braking time can thermally overload the motor. Special care must be taken when using self-ventilated motors.

Function procedure

Automatic DC injection braking provides two function procedures, each with a different reaction of the controller. The parameter setting is identical for both function procedures.

Function procedure 1:

- After the hold time has elapsed (C0107), the controller automatically sets pulse inhibit **IMP**.

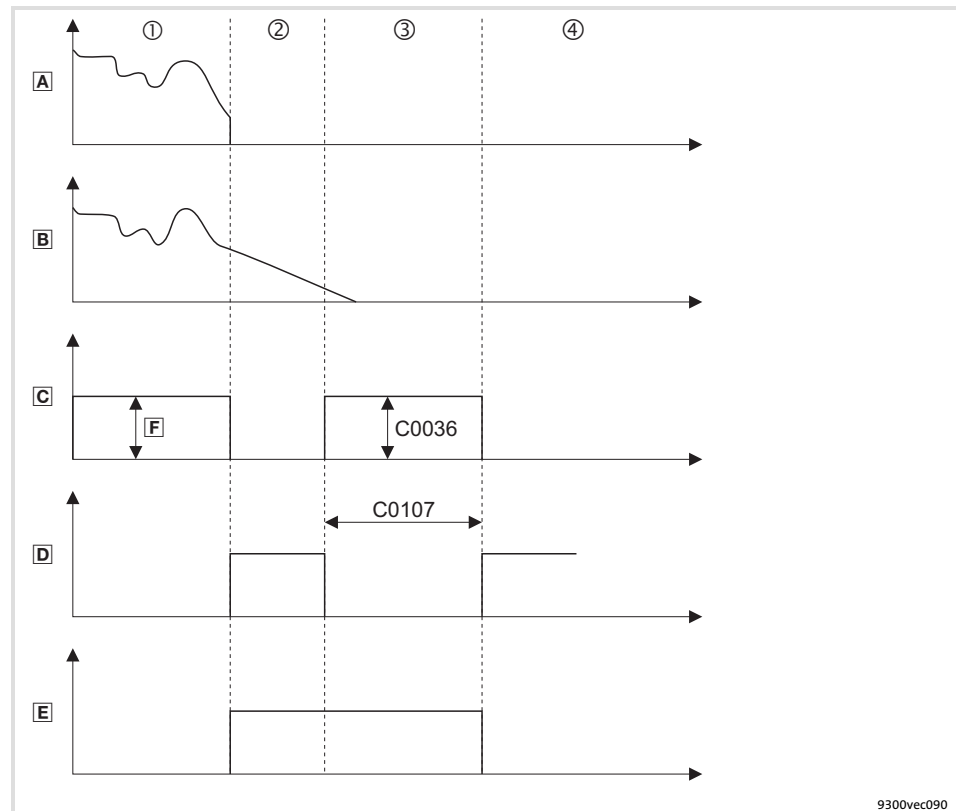


Fig. 8.2-17 Signal characteristic with automatic DC injection braking

- A Speed setpoint (e. g. AIN-OUT)
 - B Actual speed value of the motor (e. g. MCTRL-NACT)
 - C Controller output current (e. g. MCTRL-IACT)
 - D Pulse inhibit (e. g. DCTRL-IMP)
 - E DC injection braking is active (MCTRL-GSB-OUT)
MCTRL-GSB-OUT = HIGH: Function is active
MCTRL-GSB-OUT = LOW: Function is not active
- ① The motor rotates with the preset speed. The current adjusts itself as a function of the load F.
 - ② With a speed setpoint < speed threshold (C0019), DC injection braking is activated. Pulse inhibit **IMP** is set. The motor coasts.
 - ③ The pulse inhibit is deactivated and the DC braking current set in C0036 is injected
 - ④ After the hold time (C0107) pulse inhibit **IMP** is set

Function procedure 2:

- If you define a speed setpoint > speed threshold (C0019) before the hold time elapses, DC-injection braking is deactivated and the drive follows the speed setpoint. If the speed falls below the threshold again, DC-injection braking is reactivated and the hold time is restarted.

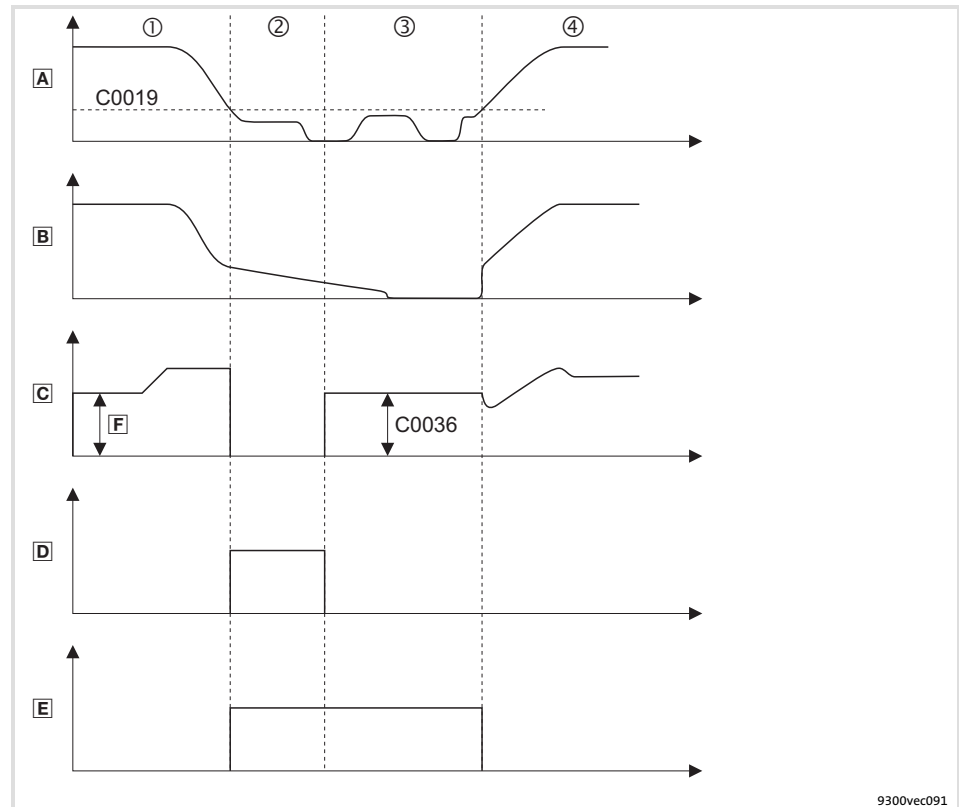


Fig. 8.2-18 Signal characteristic with automatic DC injection braking

- Ⓐ Speed setpoint (e. g. AIN-OUT)
 - Ⓑ Actual speed value of the motor (e. g. MCTRL-NACT)
 - Ⓒ Controller output current (e. g. MCTRL-IACT)
 - Ⓓ Pulse inhibit (e. g. DCTRL-IMP)
 - Ⓔ DC injection braking is active (MCTRL-GSB-OUT)
MCTRL-GSB-OUT = HIGH: Function is active
MCTRL-GSB-OUT = LOW: Function is not active
- ① The motor rotates with the preset speed. The current adjusts itself as a function of the load Ⓔ.
 - ② With a speed setpoint < speed threshold (C0019), DC injection braking is activated. Pulse inhibit **IMP** is set. The motor coasts.
 - ③ The pulse inhibit is deactivated and the DC braking current set in C0036 is injected
 - ④ DC-injection braking is deactivated as soon as the speed setpoint exceeds the speed threshold (C0019). The motor is accelerated to the defined speed setpoint and kept there.

Oscillation damping

Suppressing no-load oscillations in case of:

- ▶ Drives with different rated power of controller and motor, e. g. when operating with high switching frequency and the power derating involved.
- ▶ Operation of higher-pole motors.
- ▶ Operation of three-phase AC drives > 10 kW.

Compensation of resonances in the drive kit:

- ▶ Certain asynchronous motors may show this behaviour above $\frac{1}{3}$ of the rated speed ($\frac{1}{3} \cdot n_n$). This may result in an unstable operation (current and speed variations).

Adjustment

The Lenze setting is designed for power-adapted motors.

Usually, the speed oscillations can be reduced by changing the Lenze setting of the codes C0234 oder C0236 by the factor 2 ... 5.

1. Approach the range with speed oscillations.
 2. Change the influence of the oscillation damping in C0234 (generally, increase it).
 3. Increase the limitation of the oscillation damping in C0236.
 4. Change filter time in C0235 in the range of 1 ... 20 ms, if necessary.
- ▶ These can be indicators for smooth running:
 - Constant motor current characteristic
 - Reduction of the mechanical oscillations in the bearing seat

Slip compensation

The speed of an asynchronous machine decreases when being loaded. This load-dependent speed drop is called slip. By setting C0021 the slip can be partly compensated.

In the V/f characteristic control mode the slip compensation is only active at operation without feedback (C0025 = 1).

V/f characteristic control

The slip compensation (C0021) is automatically calculated from the rated motor speed (C0087) and the rated motor frequency (C0089). The entered slip constant [%] is the rated slip of the motor in [%] relating to the synchronous speed of the motor.

► Calculating the slip compensation and entering it into C0021:

$s = \frac{n_{rsyn} - n_r}{n_{rsyn}} \cdot 100 \%$ $n_{rsyn} = \frac{f_r \cdot 60}{p}$	E	Slip constant (C0021) [%]
	n_{rsyn}	Synchronous motor speed [min^{-1}]
	n_r	Rated motor speed according to motor nameplate [min^{-1}]
	f_r	Rated motor frequency according to motor nameplate [Hz]
	p	Number of motor pole pairs (1, 2, 3, ...)

► If required, the slip compensation can be adapted manually:

- If C0021 is set too high, the drive may get unstable.
- With cyclic load impulses (e. g. centrifugal pump) a smooth motor characteristic is achieved by smaller values in C0021 (possibly negative values)
- Parameterise C0078 (filter time for the slip compensation) if you want to change the motor response time to load changes (dynamic ↔ slow).

► The actual speed is output as an analog signal (in [%] of $n_{\max}$ (C0011)) to MCTRL-NACT.



Note!

When operating synchronous or reluctance motors, C0021 must be set to 0.

Inhibiting the direction of rotation

If the motor may only rotate in one direction, you can limit the output voltage generation to one direction of rotation via C0909.

Code	Description
C0909 = 1	The motor rotates in both directions
C0909 = 2	Motor rotates clockwise, "positive direction of rotation" (View of the motor shaft)
C0909 = 3	Motor rotates counter-clockwise, "negative direction of rotation" (View of the motor shaft)

8.2.7

Internal motor control with vector control (MCTRL2)

Description

The function block MCTRL2 controls the motor. Since it is always executed, it does not need to be entered into the processing table.

Compared with the V/f characteristic control the vector control (C0006 = 1) has a much higher torque efficiency at the same motor current. The motor is monitored and controlled via an internal motor model. This serves to achieve an optimum operating behaviour of the motor at any time.

The vector control can be used for single drives, asynchronous motors and multi-motor drives of the same type with rigid coupling.

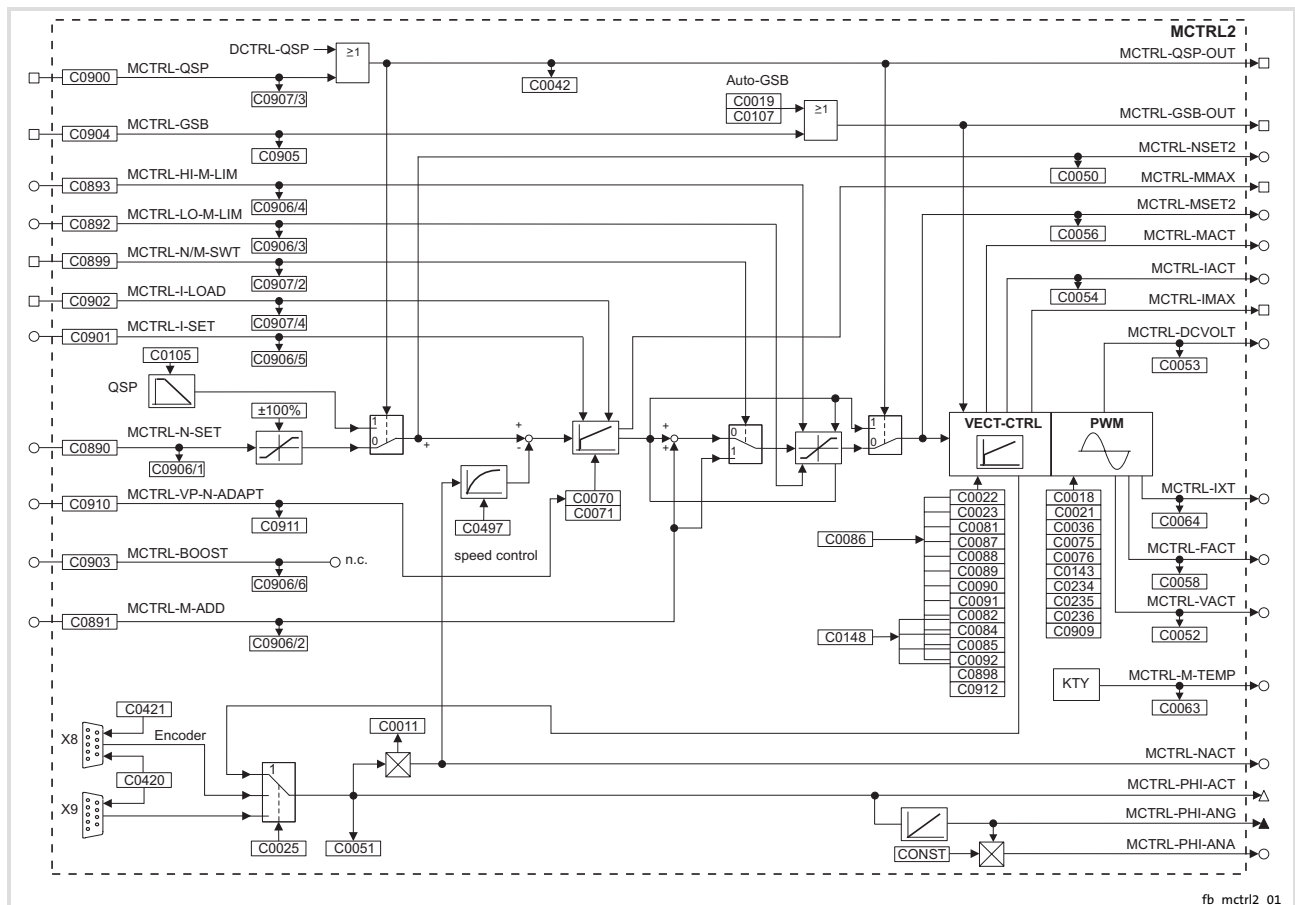


Fig. 8.2-19 Internal motor control with vector control (MCTRL2)

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0006 STOP	Op mode	5			Selection of the operating mode for the motor control	
			1	vector ctrl	Vector control without or with speed feedback	In case of the first selection enter the motor data and identify them with C0148. 6.8-8
			5	V / f	V/f characteristic control	Commissioning without identification of the motor data is possible Advantage of identification with C0148: Improved smooth running at low speeds 6.8-4
C0010	N _{min}	0	0	{1 rpm}	36000	- Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times - C0059 must be set correctly - Set C0010 < C0011 - C0010 is only effective in case of analog setpoint selection via AIN1 Important: For parameter setting via interface, major changes in one step should only be made when the controller is inhibited. Minimum speed 6.10-1
C0011	N _{max}	3000	0	{1 rpm}	36000	C0010 is only effective in case of analog setpoint selection via AIN1 Important: For parameter setting via interface, major changes in one step should only be made when the controller is inhibited. Maximum speed
C0018	fchop	6			Switching frequency of the inverter	6.9-1
			1	1 kHz sin	loss-optimised	
			2	2 kHz sin	concentricity-optimised	
			3	4 kHz f _{top}	power-optimised	
			4	4 kHz sin	noise-optimised	
			6	4/2 kHz sin	noise/concentricity-optimised with automatic change-over to low switching frequency	
C0019	Thresh nact=0	0	-36000	{1 rpm}	36000	Operating threshold - automatic DC injection brake (Auto-GSB) Falling below the threshold in C0019 activates automatic DC injection braking when the holding time set under C0107 > 0 8.2-25 8.2-40

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0021	slipcomp	→	-20.00	{0.01 %}	20.00	Slip compensation → Change of C0086, C0087 or C0089 sets C0021 to the calculated rated slip of the motor ● When changing over to the vector control mode, C0021 is set to 0	6.11-1 8.2-25 8.2-40
C0022	I _{max} current	→	0	{0.1 A}	-	I _{max} limit in motor mode → depending on C0086	6.6-14
C0023	I _{max} gen.	→	0	{0.1 A}	-	I _{max} limit in generator mode → depending on C0086	6.6-14
C0025 	Feedback type	1				Speed feedback	6.7-1
			1	no feedback	No feedback		
			100	IT (C420) - X8	Input of the number of increments in C0420	Incremental encoder at X8 ● Incremental encoders with TTL level can only be connected to X8.	
			101	IT (C420) - X9	Input of the number of increments in C0420	Incremental encoder at X9 ● Connect incremental encoders with HTL-level on X9 only	
					Number of increments:	Incremental encoder at X8 ● Incremental encoders with TTL level can only be connected to X8.	
			110	IT512-5V	512 inc		
			111	IT1024-5V	1024 inc		
			112	IT2048-5V	2048 inc		
113	IT4096-5V	4096 inc					
C0036	DC brk value	0.0	0.0	{0.1 A}	-	Set DC braking current → depends on the controller	8.2-25 8.2-40
C0042	DIS: QSP					Quick stop ● Display only	8.2-25
		0	QSP inactive			Quick stop is not active	8.2-40
		1	QSP active			Quick stop is active	
C0050	MCTRL-NSET2		-100.00	{0.01 %}	100.00	Speed setpoint, function block MCTRL ● Display of the speed in [%] of C0011	8.2-25 8.2-40
C0051	MCTRL-NACT		-36000	{1 rpm}	36000	Actual speed value, function block MCTRL ● Read only	8.2-25 8.2-40
C0052	MCTRL-Umot		0	{1 V}	800	Motor voltage, function block MCTRL ● Read only ● MCTRL-VACT = 100 % = C0090	8.2-25 8.2-40
C0053	UG-VOLTAGE		0	{1 V}	900	DC-bus voltage, function block MCTRL ● Read only ● MCTRL-DCVOLT = 100 % = 1000 V	8.2-25 8.2-40
C0054	I _{mot}		0.0	{0.1 A}	5000.0	Actual motor current, function block MCTRL ● Read only ● MCTRL-IACT = 100 % = C0022	8.2-25 8.2-40

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0056	MCTRL-MSET2		-100.00	{0.01 %}	100.00	Read only. The output signal depends on the operating mode: - Current motor current in case of V/f characteristic control, function block MCTRL1 - Torque setpoint in case of vector control, function block MCTRL2	 8.2-25  8.2-40
C0058	MCTRL-FACT		-600.0	{0.1 Hz}	600.0	Output frequency - Display only - MCTRL-FACT = 100.0 % = 1000.0 Hz	 8.2-25  8.2-40
C0063	Mot temp		0	{1 °C}	200	Motor temperature - Read only - Monitoring of the motor temperature must be activated. - KTY at X8/5, X8/8: - At 150 °C, TRIP OH3 is set - Early warning is possible via OH7, temperature is set in C0121 - PTC, thermal contact at T1, T2: - Release sets TRIP or warning OH8	 8.2-25  8.2-40
C0064	Utilization		0	{1 %}	150	Device utilisation Ixt - Read only - Device utilisation of the last 180 s operating time - C0064 > 100 % triggers warning OC5 - C0064 > 110 % limits the ouput current of the controller to 67 % of the maximum current in C0022	 8.2-25  8.2-40
C0070	Vp speed CTRL	10.0	0.0	{0.1 }	255.9	Gain of speed controller	 8.2-25  8.2-40
C0071	Tn speed CTRL	50	1	{1 ms}	6000	Integral-action time of speed controller C0071 = 6000 ms: No integral-action time	
C0075	Vp curr CTRL	0.04	0.00	{0.01 }	0.99	Gain of current controller - Vector control: Gain of current controller - V/f characteristic control: Maximum current controller	 8.2-25  8.2-40
C0076	Tn curr CTRL	10.0	0.1	{0.1 ms}	2000.0	Integral-action time of current controller - Vector control: integral-action time of current controller - V/f characteristic control: maximum current controller - C0076 = 2000 ms: current controller is switched off	 8.2-25  8.2-40
C0082 	Mot Rr	→	0.0000	{0.0001 Ω}	65.5350	Motor rotor resistance → Value is determined by motor parameter identification from C0087, C0088, C0089, C0090 and C0091 Selection of a motor in C0086 sets the corresponding rotor resistance value	 6.6-1  6.6-15

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0084 STOP	Mot Rs	→	0.00	{0.01 mΩ}	100000.00	Motor stator resistance → Value is determined by motor parameter identification (C0148, C0149) 6.6-1 6.6-15
C0086 STOP	Mot type	→	Motor selection list			Motor type selection → depending on the controller used Motor selection in C0086 sets the corresponding parameters in C0021, C0022, C0081, C0087, C0088, C0089, C0090, C0091 6.6-1
C0087 STOP	Mot speed	→	50	{1 rpm}	36000	Rated motor speed → depending on C0086 - Motor selection in C0086 set the corresponding rated motor speed in C0087 - Change of C0087 sets C0086 = 0 6.6-1
C0088 STOP	Mot current	→	0.5	{0.1 A}	1000.0	Rated motor current → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor current in C0088 - Change of C0088 sets C0086 = 0 6.6-1
C0089 STOP	Mot frequency	→	10	{1 Hz}	5000	Rated motor frequency → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor frequency in C0089 - Change of C0089 sets C0086 = 0 6.6-1
C0090 STOP	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor voltage in C0090 - Change of C0090 sets C0086 = 0 6.6-1
C0091 STOP	Mot cos phi	→	0.50	{0.01 }	1.00	Motor cos φ → depending on C0086 - Motor selection in C0086 sets the corresponding motor cos φ in C0091 - Change of C0091 sets C0086 = 0 6.6-1
C0092 STOP	Mot Ls	→	0.00	{0.01 mH}	6553.50	Motor stator inductance → Value is determined by motor parameter identification from C0088, C0089, C0090 and C0091 → Motor selection in C0086 sets corresponding stator inductance value in C0092 6.6-1

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0093	Drive ident			Controller identification	
				● Read only	
			0 Invalid	Defective power section	
			1 None	No power section	
			14 9335VC 400V	Display of the controller used	
					
			20 9383VC 400V		
			21 9334VC 500V		
					
			28 9383VC 500V		
			9321 9321 VC		
					
			9333 9333VC		
C0094	Password	0	0 {1}	9999 Password	7.2-9
				● C0094 = 1 ... 9999: Free access to the user menu only	
C0095	Mot lo	→	0.0 {0.1 A}	1000.0 Motor magnetising current	6.6-1
				→ dependent on C0086, C0088 and C0091	
				● Change of C0086 sets C0095 to the Lenze setting	
				● Change of C0095 sets C0086 = 0	
C0105	QSP Tif	5.00	0.00 {0.01 s}	999.90 Quick stop deceleration time	8.2-25
				● The deceleration time refers to a speed variation of C0011 ... 0	8.2-40
C0107	holding time	0.00	0.00 {0.01 s}	9999.90 Hold time for automatic DC injection braking (Auto-GSB)	8.2-25
					8.2-40
C0143	limit 2 kHz	0.0	0.0 {0.1 Hz}	20.0 Speed-dependent switching threshold	8.2-25
				● Threshold for automatic switching frequency reduction	8.2-40
				● The controller changes automatically to 2 kHz when this value falls below the threshold	
C0234	damp value	20	-100 {1 %}	100 Influence of the oscillation damping, function block MCTRL	8.2-25
				● Minimising a tendency to oscillation of the drive	8.2-40
				● Influences the tendency to oscillation of the drive	
				● When C0025 >1 and C0006 = 1, C0234 is set to 0	
C0235	damping	2	1 {1 ms}	600 Filter time of the oscillation damping, function block MCTRL	8.2-25
				● Filter time for the internal signal for oscillation damping	8.2-40
C0236	damp limit	1.0	0.0 {0.1 Hz}	20.0 Limit value of oscillation damping, function block MCTRL	
				● Limit value for the internal signal of oscillation damping	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0420 	Encoder const	512	1	{1 inc/rev}	8192	Number of increments for incremental encoder at X8 or X9 Connect incremental encoders with HTL-level on X9 only	 6.7-1
C0421 	Enc voltage	5.00	5.00	{0.1 V}	8.00	Supply voltage for the incremental encoder at X8 CAUTION! A wrong entry can destroy the incremental encoder!	
C0497	Nact filter	2.0	0.0	{0.1 ms}	50.0	Filter time constant N _{act} for actual speed value, function block MCTRL2 - Internal filtering of the speed signal for control - C0497 = 0 ms: Switched off	 8.2-40
C0890 	CFG: N-SET	5050	NSET-NOUT  Selection list 1			Configuration of analog input signal, function block MCTRL Speed setpoint	 8.2-25  8.2-40
C0891 	CFG: M-Add	1000	FIXED0%  Selection list 1			Configuration of analog input signal, function block MCTRL Additional torque setpoint or torque setpoint	 8.2-40
C0892 	CFG: Lo-M-LIM	5700	ANEG1-OUT  Selection list 1			Configuration of analog input signal, function block MCTRL Lower torque limit in [%] of C0057	
C0893 	CFG: HI-M-LIM	19523	FCODE-472/3  Selection list 1			Configuration of analog input signal, function block MCTRL Upper torque limit in [%] of C0057	
C0898 	CFG: M-LIM switch	0	0	M-LIM ON	Reduced torque limit is active	Torque limitation in the field weakening range, function block MCTRL If the torque limit is reduced, the maximum possible torque in the field weakening range is lowered with 1/f. This provides a higher motor stability in the field weakening range	 8.2-40
			1	M-LIM OFF	Reduced torque limit is inactive		
C0899 	CFG: N/M-SWT	1000	FIXED0  Selection list 2			Configuration of digital input signal, function block MCTRL - LOW = active speed control - HIGH = active torque control	 8.2-40
C0900 	CFG: QSP	10250	R/L/Q-QSP  Selection list 2			Configuration of digital input signal, function block MCTRL HIGH = drive performs quick stop	 8.2-25  8.2-40
C0901 	CFG: I-SET	1000	FIXED0%  Selection list 1			Configuration of analog input signal, function block MCTRL Setting of integral action component of the speed controller	 8.2-40
C0902 	CFG: I-LOAD	1000	FIXED0  Selection list 2			Configuration of digital input signal, function block MCTRL HIGH = the integral action component at MCTRL-I-SET is accepted by the speed controller	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0904 	CFG: DC-BREAK	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block MCTRL • HIGH = Motor is braked  8.2-25  8.2-40
C0905	DIS: DC-BREAK		0 1	Function block MCTRL • Display of the signal linked in C0904  8.2-40
C0906			-199.99 {0.01 %} 199.99	Function block MCTRL • Display of the signals linked in C0890, C0891, C0892, C0893, C0901 and C0903  8.2-25  8.2-40
	1 DIS: N-SET			
	2 DIS: M-ADD			
	3 DIS: LO-M-LIM			
	4 DIS: HI-M-LIM			
	5 DIS: I-SET			
	6 DIS: BOOST			
C0907			0 1	Function block MCTRL • Display of the signals linked in C0899, C0900 and C0902
	1 reserved			
	2 DIS: N/M-SWT			
	3 DIS: QSP			
	4 DIS: I-LOAD			
C0909	speed limit	1	1 +/- 175 % 2 0 ... 175 % 3 -175 ... 0 %	Speed limitation, function block MCTRL • Limitation of direction of rotation for the speed setpoint  8.2-25  8.2-40
C0910 	CFG: VP-ADAPT	1006	FIXED100%  Selection list 1	Configuration of analog input signal, function block MCTRL • Gain adaptation of the speed controller • If the gain is varying, join to CURVE-OUT of FB CURVE  8.2-25  8.2-40
C0911	DIS: VP-ADAPT		-199.99 {0.01 %} 199.99	Function block MCTRL • Display of the signal linked in C0910

Speed setpoint selection

- The signal at the input MCTRL-N-SET is the setpoint speed in [%] and always refers to the maximum speed (C0011).
- In most basic configurations, MCTRL-N-SET is connected to the function block NSET (speed setpoint conditioning).
 - You can also connect MCTRL-N-SET to any other analog output signal of a function block.

Speed setpoint limitation

- The speed setpoint at MCTRL-N-SET is always limited to ± 100 % of the maximum speed $n_{\max}$ (C0011).
- The motor control converts the speed setpoint into a frequency setpoint, which is limited to a maximum output frequency, depending on the switching frequency f_{chop}

Switching frequency f_{chop}	Maximum output frequency
2 kHz	150 Hz
4 kHz	300 Hz

Speed control

A PI controller compares the speed setpoint with the actual speed of the motor model and creates a torque setpoint from the speed variation.

- the actual speed is output as an analog signal (in [%] of $n_{\max}$ (C0011)) to MCTRL-NACT.

Parameter setting

Code	Function
C0070	Gain V_p
C0071	Integral-action time T_n

Operation with speed feedback

To change over to operation with external speed feedback, the incremental encoder must be selected via C0025. The external speed feedback serves to operate the motor in all of the four torque/speed quadrants.

Adaptation of the speed controller

Use the input MCTRL-VP-N-ADAPT to change the gain of the speed controller online. The set gain in C0070 is the reference value for an input signal of 100 %.

- By adapting a function block (e.g. CURVE) to MCTRL-VP-N-ADAPT you can influence the gain (C0070).
- In the Lenze setting the adaptation is deactivated.

Behaviour when speed setpoint = 0

If the speed setpoint = 0 (MCTRL-N-SET = 0) and actual speed value ≈ 0 (MCTRL-NACT ≈ 0), the speed controller is switched off. The motor merely receives its magnetising current.

Behaviour in braking operation at very low speed**Stop!**

A longer-lasting braking operation with very low speed can lead to an unstable vector control. Remedy:

- Passing through the critical speed range more quickly.
- Using speed feedback.

Temperature detection

For motors with temperature detection (KTY83-110) the controller can consider temperature changes in its motor model. The accuracy and stability of the vector control are improved considerably.

- ▶ Sensor connection:
 - X8/5 = -KTY (rt/ws/bl)
 - X8/8 = +KTY (br/gr/sw)



Note!

You can also use the thermal sensor (KTY) without speed feedback.

- ▶ When monitoring SD6 (C0594) is activated, temperature feedback is activated at the same time.
- ▶ First, activate the temperature feedback and then start the motor identification to consider the motor temperature.
- ▶ In addition, you can activate and parameterise the monitoring functions OH3 (C0583) and OH7 (C0584).
- ▶ The current motor temperature can be displayed via C0063.

Setting integral action component

To initialise the speed controller with a starting torque, the integral action component of the speed controller can be described via MCTRL-I-SET (starting value) and MCTRL-I-LOAD (control signal).

Input signal	Effect
MCTRL-I-LOAD = HIGH	• The speed controller transmits the value at MCTRL-I-SET to its integral action component • The P component is switched off
MCTRL-I-LOAD = LOW	The speed controller is active

Torque limitation in the field weakening range

The function is suitable for applications which also require a constant torque in the field weakening range.

- ▶ With quick stop (QSP) the torque limitation becomes inactive.
- ▶ When the motor torque reaches the defined limit, the drive cannot follow the speed setpoint anymore and the output MCTRL-MMAX is set to HIGH.

External setting of torque limits

If the maximum torque reached in the field weakening operation is too low, the torque limits can be changed via the inputs MCTRL-HI-M-LIM and MCTRL-LO-M-LIM.

- ▶ MCTRL-HI-M-LIM defines the upper torque limit in [%] of the maximum torque displayed in C0057.
Maximum possible input value: 199.99 %
- ▶ MCTRL-LO-M-LIM defines the lower torque limit in [%] of the maximum torque displayed in C0057.
Minimum possible input value: -199.99 %

**Note!**

The maximum possible torque displayed under C0057 refers to the basic speed range (zero speed to rated speed of the motor) and is calculated from the nameplate data and the setting of the maximum motor current under C0022.

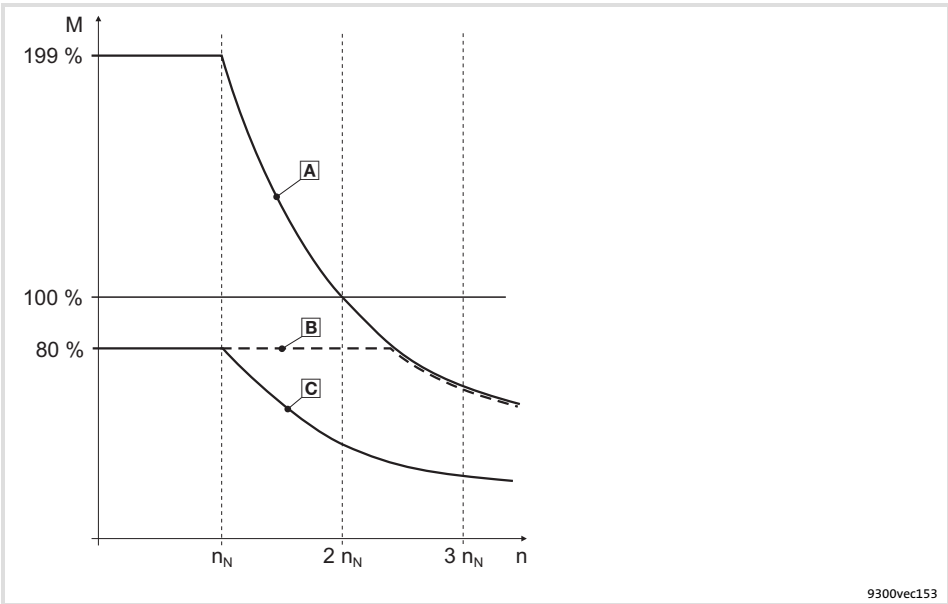


Fig. 8.2-20 Torque characteristics when being evaluated with C0898

- A** "Internal limit characteristic" when C0898 = 1 and MCTRL-HI-M-LIM = 199 %
Boost of the upper torque limit when MCTRL-HI-M-LIM = 199 % and C0898 = 0
- B** Torque characteristic when C0898 = 1 and MCTRL-HI-M-LIM = 80 %
- C** Torque characteristic when C0898 = 0 and MCTRL-HI-M-LIM = 80 %

Evaluating torque limits using C0898

Code C0898 serves to evaluate the defined torque limits at the inputs MCTRL-LO-M-LIM and MCTRL-HI-M-LIM using the function $1/f_{act}$. This serves to reduce the torque.

Selection	Code	Description
Evaluation of the torque limit in the field weakening range	C0898 = 0	Lenze setting The input signals at MCTRL-LO-M-LIM and MCTRL-HI-M-LIM are evaluated with $1/f_{act}$.
	C0898 = 1	An "internal limit characteristic" which corresponds to a maximum torque limit of $\pm 199,99\%$ is evaluated with $1/f_{act}$. - The torque remains constant until the limit characteristic is reached. This requires that the controller provides a sufficient amount of current and the motor is stable within the required speed range. - The input signals at MCTRL-LO-M-LIM and MCTRL-HI-M-LIM are not evaluated with $1/f_{act}$.

Limitation of the output current

The output current is mainly limited for protecting the controller and stabilising the drive control.

If the maximum permissible motor load is exceeded, the maximum output current of the controller must be adjusted accordingly.

Parameter setting

Code	Function
C0022	Maximum current in motor mode
C0023	Maximum current in generator mode

If you select a motor via C0086 the maximum current of which is much lower than the output current of the controller, the maximum current in motor mode (C0022) is automatically limited to the double rated motor current.

Mode of functioning

In the vector control mode the limit values are complied with by means of the automatic limitation of the speed controller.

The speed controller is limited if the motor current has reached the limit set under C0022 or C0023 (the controller supplies the max. output current). In this status

Consequences

- ▶ The motor cannot follow the speed setpoint.
- ▶ MCTRL-IMAX is set to HIGH.
- ▶ When selecting the automatic chopper frequency setting (C0018 = 0 or 6) a switch-over to a lower chopper frequency is carried out, so that the unit will not be switched off.

Torque control with speed limitation

As an alternative to the speed control, the vector control can be switched to torque control with speed limitation.



Note!

In the basic configurations C0005 = 4xxx the torque control with speed limitation is already set.

- ▶ When MCTRL-N/M-SWT = HIGH, the torque control with speed limitation is active.
 - The torque control with torque setpoint selection via MCTRL-M-ADD is active.
 - MCTRL-M-ADD acts as a bipolar torque setpoint.
 - The sign of the speed limitation value at MCTRL-N-SET is automatically created from the sign of the torque setpoint at MCTRL-M-ADD. Thus, the speed limitation value acts in both directions of rotation.
 - The actual torque is output as analog signal (in [%] of M_{max} (C0057)) to MCTRL-MACT.



Stop!

If the motor is to create a holding torque at standstill, the torque setpoint must not fall below a certain limit.

- ▶ Depending on the motor type and accuracy of the identified motor parameters, the vector control can become unstable if the torque setpoint < 10 % ... 20 %.
- ▶ Operate the motor with speed feedback when the required holding torque is within the critical region.

Automatic speed detection after controller enable - flying restart circuit



Note!

Due to physical regularities, the operability of the flying restart circuit depends on the application, the motor and the motor power.

- ▶ With EVF9335 ... EVF9338 and EVF9381 ... EVF9383 devices, the operability of the flying restart circuit can therefore not be guaranteed.

Quick stop (QSP)

After a signal, the motor is decelerated to standstill when an internal ramp function generator has been activated.

Mode of operation

- ▶ Quick stop is active
 - MCTRL-QSP = HIGH
 - The control word DCTRL-QSP is applied
 - DC injection braking (GSB) is not active (GSB has priority over quick stop)
- ▶ When quick stop is active:
 - the motor decelerates to standstill with the deceleration time set in C0105,
 - A torque control is deactivated and the motor is controlled by the speed controller.
 - The torque limitations MCTRL-LO-M-LIM and MCTRL-HI-M-LIM are deactivated.
 - MCTRL-QSP-OUT is set to HIGH.

**Note!**

When the motor is at standstill, the field current is injected into the motor.

Manual DC injection braking

- After a signal, the motor is braked by injecting a DC current.
- Braking in generator mode must be used for controlled brake ramps.
- The hold time (C0107) has no influence. The motor remains braked until MCTRL-GSB is set to LOW.



Note!

Manual DC injection braking has priority over quick stop.

Special features of vector control with feedback

- If the DC braking current (C0036) $\leq$ than the motor magnetising current, the motor magnetising current is injected.
- If the DC braking current (C0036) $>$ than the motor magnetising current, the DC braking current is injected.

Setting

Selection	Code	Description
DC braking current	C0036	DC braking current with which the motor is braked



Stop!

An excessive DC braking current and braking time can thermally overload the motor. Special care must be taken when using self-ventilated motors.

Activation

The input MCTRL-GSB in the function block MCTRL is triggered with HIGH level.

- MCTRL-GSB = HIGH: Function is activated
- MCTRL-GSB = LOW: Function is not activated

Function procedure

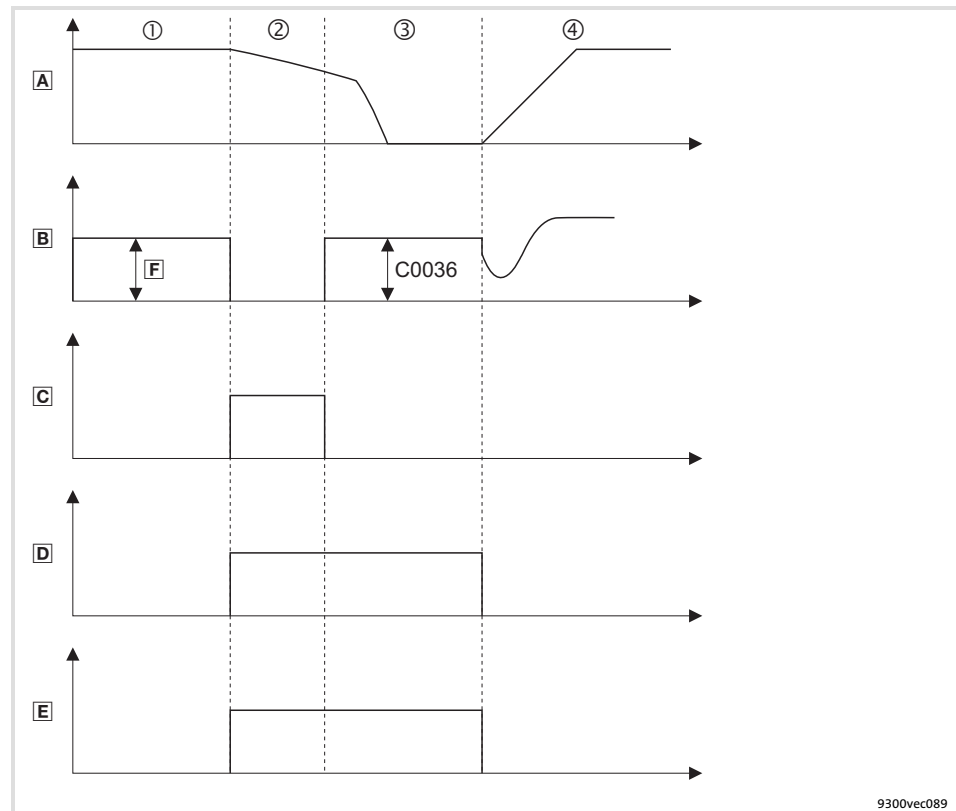


Fig. 8.2-21 Signal sequence with DC injection braking

- A** Actual speed value of the motor (e. g. MCTRL-NACT)
 - B** Controller output current (e. g. MCTRL-IACT)
 - C** Pulse inhibit (e. g. DCTRL-IMP)
 - D** Activating DC injection braking (MCTRL-GSB)
 - E** DC injection braking is active (MCTRL-GSB-OUT)
MCTRL-GSB-OUT = HIGH: Function is active
MCTRL-GSB-OUT = LOW: Function is not active
- ① The motor rotates with the preset speed. The current adjusts itself as a function of the load **F**.
 - ② DC injection braking is activated with MCTRL-GSB = HIGH. Pulse inhibit **IMP** is set. The motor coasts.
 - ③ The pulse inhibit is deactivated and the DC braking current set in C0036 is injected
 - ④ DC injection braking is deactivated with MCTRL-GSB = LOW
The motor is accelerated to speed setpoint at the set acceleration ramp and is kept there.

Automatic DC injection braking

When the speed falls below a settable speed setpoint threshold, the function "DC injection braking" is activated.



Note!

Automatic DC-injection braking has priority over quick stop.

Special features of vector control with feedback

- ▶ If the DC braking current (C0036) $\leq$ than the motor magnetising current, the motor magnetising current is injected.
- ▶ If the DC braking current (C0036) $>$ than the motor magnetising current, the DC braking current is injected.

Setting

Selection	Code	Description
DC braking current	C0036	DC braking current with which the motor is braked
Speed setpoint threshold	C0019	If the values fall below the threshold, DC-injection braking is released
Hold time	C0107	Duration of DC-injection braking. After the hold time, pulse inhibit is set.



Stop!

An excessive DC braking current and braking time can thermally overload the motor. Special care must be taken when using self-ventilated motors.

Function procedure

Automatic DC injection braking provides two function procedures, each with a different reaction of the controller. The parameter setting is identical for both function procedures.

Function procedure 1:

- After the hold time has elapsed (C0107), the controller automatically sets pulse inhibit **IMP**.

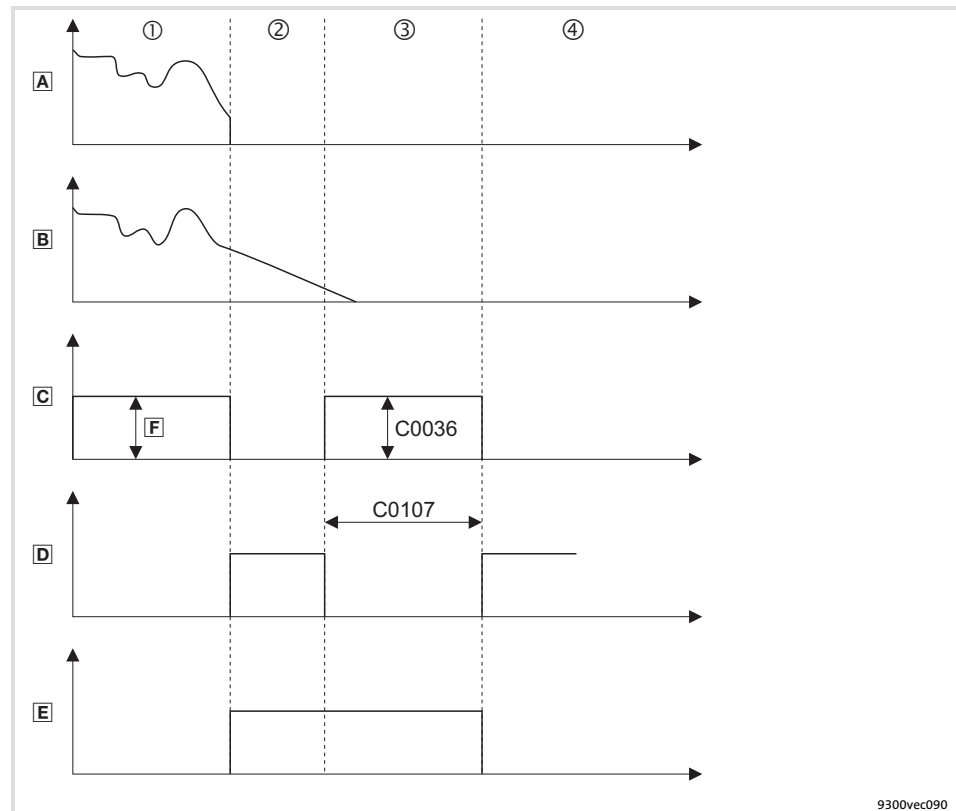


Fig. 8.2-22 Signal characteristic with automatic DC injection braking

- A Speed setpoint (e. g. AIN-OUT)
 - B Actual speed value of the motor (e. g. MCTRL-NACT)
 - C Controller output current (e. g. MCTRL-IACT)
 - D Pulse inhibit (e. g. DCTRL-IMP)
 - E DC injection braking is active (MCTRL-GSB-OUT)
MCTRL-GSB-OUT = HIGH: Function is active
MCTRL-GSB-OUT = LOW: Function is not active
- ① The motor rotates with the preset speed. The current adjusts itself as a function of the load F.
 - ② With a speed setpoint < speed threshold (C0019), DC injection braking is activated. Pulse inhibit **IMP** is set. The motor coasts.
 - ③ The pulse inhibit is deactivated and the DC braking current set in C0036 is injected
 - ④ After the hold time (C0107) pulse inhibit **IMP** is set

Function procedure 2:

- If you define a speed setpoint > speed threshold (C0019) before the hold time elapses, DC-injection braking is deactivated and the drive follows the speed setpoint. If the speed falls below the threshold again, DC-injection braking is reactivated and the hold time is restarted.

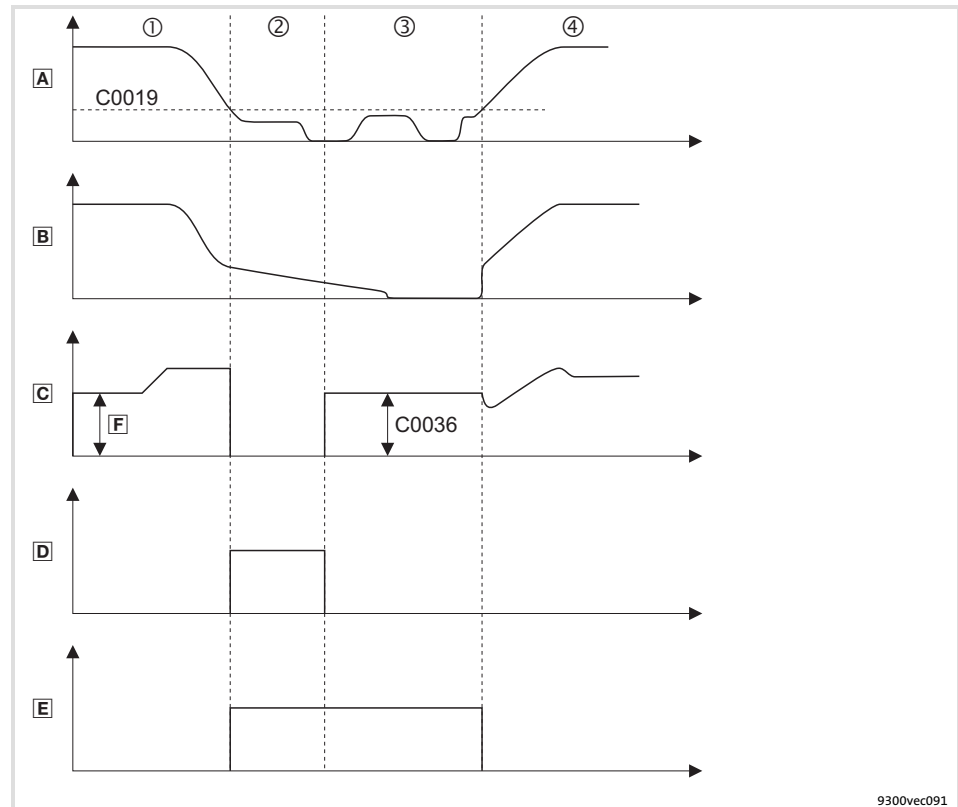


Fig. 8.2-23 Signal characteristic with automatic DC injection braking

- Ⓐ Speed setpoint (e. g. AIN-OUT)
 - Ⓑ Actual speed value of the motor (e. g. MCTRL-NACT)
 - Ⓒ Controller output current (e. g. MCTRL-IACT)
 - Ⓓ Pulse inhibit (e. g. DCTRL-IMP)
 - Ⓔ DC injection braking is active (MCTRL-GSB-OUT)
MCTRL-GSB-OUT = HIGH: Function is active
MCTRL-GSB-OUT = LOW: Function is not active
- ① The motor rotates with the preset speed. The current adjusts itself as a function of the load Ⓔ.
 - ② With a speed setpoint < speed threshold (C0019), DC injection braking is activated. Pulse inhibit **IMP** is set. The motor coasts.
 - ③ The pulse inhibit is deactivated and the DC braking current set in C0036 is injected
 - ④ DC-injection braking is deactivated as soon as the speed setpoint exceeds the speed threshold (C0019). The motor is accelerated to the defined speed setpoint and kept there.

Oscillation damping

Suppressing no-load oscillations in case of:

- ▶ Drives with different rated power of controller and motor, e. g. when operating with high switching frequency and the power derating involved.
- ▶ Operation of higher-pole motors.
- ▶ Operation of three-phase AC drives > 10 kW.

Compensation of resonances in the drive kit:

- ▶ Certain asynchronous motors may show this behaviour above $\frac{1}{3}$ of the rated speed ($\frac{1}{3} \cdot n_n$). This may result in an unstable operation (current and speed variations).

Adjustment

The Lenze setting is designed for power-adapted motors.

Usually, the speed oscillations can be reduced by changing the Lenze setting of the codes C0234 oder C0236 by the factor 2 ... 5.

1. Approach the range with speed oscillations.
 2. Change the influence of the oscillation damping in C0234 (generally, increase it).
 3. Increase the limitation of the oscillation damping in C0236.
 4. Change filter time in C0235 in the range of 1 ... 20 ms, if necessary.
- ▶ These can be indicators for smooth running:
 - Constant motor current characteristic
 - Reduction of the mechanical oscillations in the bearing seat

**Note!****Restricted effect with vector control**

- ▶ The oscillation damping has no influence on the drive behaviour at low tendency to oscillation of the speed controller.
- ▶ Especially for drives > 55 kW with a tendency to oscillation it may be necessary to deactivate the oscillation damping (C0234 = 0 %).
- ▶ For operation with feedback the oscillation damping has no influence.

Slip compensation

Vector control

Use C0021 to change the influence of the rotor resistance (C0082) proportionally:

- Reduce the value in C0021 at an increasing speed (negative values)
- Increase the value in C0021 at a decreasing speed



Note!

When setting the vector control mode, the slip compensation (C0021) is automatically set to 0.0 %.

- When you switch back to the V/f characteristic control mode, the slip compensation must be re-adapted.

Inhibiting the direction of rotation

If the motor may only rotate in one direction, you can limit the output voltage generation to one direction of rotation via C0909.

Code	Description
C0909 = 1	The motor rotates in both directions
C0909 = 2	Motor rotates clockwise, "positive direction of rotation" (View of the motor shaft)
C0909 = 3	Motor rotates counter-clockwise, "negative direction of rotation" (View of the motor shaft)

8.3 Monitoring

Various monitoring functions (📖 8.4-1) protect the drive system against impermissible operating conditions.

If a monitoring function responds,

- ▶ the set fault response is triggered to protect the drive and
- ▶ the fault message is entered at position 1 in the fault history buffer (C4168/x) (📖 9.2-1).

8.3.1 Fault responses

Depending on the failure, one or more of the following responses are possible:

Response	Effects on the drive and controller	Danger warnings				
TRIP (highest priority)	• Switches the power outputs U, V, W to a high resistance until TRIP is reset • The drive coasts (no control!). • After TRIP reset, the drive accelerates to its setpoint on the ramps set.					
Message	Switches the power outputs U, V, W to a high resistance as long as the message is active. <table><tr><td> • Short-time message ≤ 0.5 s </td><td> The drive coasts (no control) as long as the message is active. If the message is no longer available, the drive accelerates to its setpoint with maximum torque. </td></tr><tr><td> • Longer message > 0.5 s </td><td> The drive coasts (due to internal controller inhibit) as long as the message is active. If required, restart the drive. </td></tr></table>	• Short-time message ≤ 0.5 s	The drive coasts (no control) as long as the message is active. If the message is no longer available, the drive accelerates to its setpoint with maximum torque.	• Longer message > 0.5 s	The drive coasts (due to internal controller inhibit) as long as the message is active. If required, restart the drive.	Danger! The drive restarts automatically if the message is no longer available.
• Short-time message ≤ 0.5 s	The drive coasts (no control) as long as the message is active. If the message is no longer available, the drive accelerates to its setpoint with maximum torque.					
• Longer message > 0.5 s	The drive coasts (due to internal controller inhibit) as long as the message is active. If required, restart the drive.					
Warning	• Only display of the failure. • The drive operates in a controlled manner.	Stop!				
Off	• No response on failures! Monitoring is deactivated.	As these responses have no effect on the drive behaviour, the drive can be destroyed.				

8.3.2 Monitoring times for process data input objects

Each process data input object can monitor whether a telegram has been received within a time set. As soon as a telegram arrives, the corresponding monitoring time (C0357) is restarted ("retriggerable monoflop" function).

The following assignments are valid:

Setting the response to the monitoring:

- ▶ C0591 for CAN1_IN ("CE1")
- ▶ C0592 for CAN2_IN ("CE2")
- ▶ C0593 for CAN3_IN ("CE3")

The following can be set:

- ▶ 0 = error (TRIP) - controller sets controller inhibit (CINH)
- ▶ 2 = warning
- ▶ 3 = monitoring is switched off

You can also use the signals as binary output signals, e. g. for the assignment of the output terminal.

Bus off

If the controller disconnects from the CAN bus due to faulty telegrams, the "BusOffState" (CE4) signal is set.

"BusOffState" can trigger an error (TRIP) or warning (like CE1, CE2, CE3). You can also switch the signal off. The response is set via C0595. You can also assign the terminal output.

Reset node

Changes with regard to the baud rates, the CAN node addresses, or the addresses of process data objects are only valid after a reset node.

The reset node can be effected by:

- ▶ A reconnection of the low-voltage supply
- ▶ Reset node via the bus system
- ▶ Reset node via C0358

8.3.3 Maximum speed



Stop!

Destruction of the drive!

- ▶ If the fault is triggered, the drive is without torque.
- ▶ In the event of an actual speed value encoder failure it is not guaranteed that the monitoring responds.

Protective measures:

- ▶ Use a mechanical brake if necessary.
- ▶ Special, system-specific measures are to be taken.

The NMAX fault is triggered if the system speed (MCTRL-NACT)

- ▶ exceeds the value set under C0596 or
- ▶ exceeds the maximum speed $n_{\max}$ (C0011) by twice the max. speed value.

A fault initiates TRIP NMAX. Other responses cannot be set.

8.3.4 Motor

Overcurrent in the motor cable (OC1)

Fault OC1 is triggered if the motor current exceeds the 2.25-fold rated controller current.

If a fault occurs, TRIP OC1 is triggered. Other responses cannot be set.

Earth fault in the motor cable (OC2)

The OC2 fault is triggered if

- ▶ the motor has a short circuit to the frame,
- ▶ one of the phases has a short circuit to the shield,
- ▶ one of the phases has a short circuit to PE,
- ▶ the capacitive charging current of the motor cable is too high.

A fault initiates TRIP OC2. Other responses cannot be set.

Overload during acceleration or deceleration (OC3)

Fault OC3 is activated in the case of a too great load during acceleration. The acceleration times or deceleration times (C0012, C0013, C0105) are set too short in proportion to the load.

If a fault occurs, TRIP OC3 is activated. Other responses cannot be set.

Failure of a motor phase (LP1)

If a current-carrying motor phase fails, a motor winding is broken or the current limit value set in C0599 is too high, the LP1 fault is triggered.

The monitoring is not appropriate for field frequencies > 480 Hz and when synchronous servo motors are used. Deactivate the monitoring at these conditions.

The response to exceeding the thresholds can be set under C0597.

**Note!**

The monitoring can only be activated if the function block MLP1 is entered in the processing table (C0465).

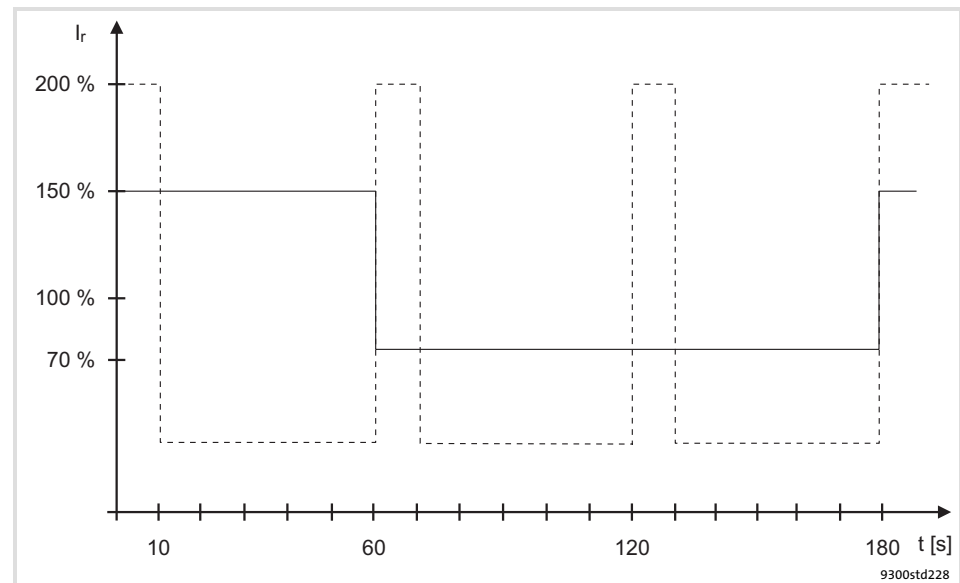
8.3.5**Controller current load (I x t monitoring)**

Fig. 8.3-1 I x t diagram

I_r	Device output current
—	100 % continuous thermal current at $C0022 \leq 1.5 I_r$
- - - -	70 % continuous thermal current at $C0022 > 1.5 I_r$

The I x t monitoring monitors the current load of the controller. The current load is calculated from the mean value of the motor current over the acquisition period of 180 s.

The monitoring is set in such a way that the following operation modes are possible:

- Continuously with device output current = I_r .
- ≤ 60 s with device output current $\leq 1.5 \times I_r$.

A fault initiates TRIP OC5. Other responses cannot be set.

8.3.6 Motor temperature

KTY at X7 or X8

The motor temperature is monitored by means of a KTY. Connect the thermal sensor to the resolver cable at X7 or the encoder cable at X8.

- ▶ Warning threshold (OH7) can be set via C0121
 - The switch-on point is 5 °C below the threshold set.
- ▶ Fixed warning threshold (OH3) = 150 °C
 - The switch-on point is 135 °C.

The response for the case when the thresholds are exceeded can be defined in:

- ▶ C0584 (adjustable threshold)
- ▶ C0583 (fixed threshold)



Stop!

With the setting C0583 = 3, monitoring is deactivated. The motor temperature in C0063 shows 0 °C, even if C0584 = 2 (warning) is set.

Monitoring of the KTY at X7 or X8

The SD6 fault is triggered if there is a short or open circuit between X7/8 and X7/9 or X8/5 and X8/8.

The response can be set under C0594.

PTC thermistor or thermal contact (NC contact) at T1, T2

The motor temperature is monitored with a PTC thermistor or thermal contact. Wire the temperature sensor to T1, T2.

- ▶ Fixed warning threshold (OH8)
 - The switch-off threshold and the hysteresis depend on the temperature sensor (DIN 44081).

The response to exceeding the threshold can be set under C0585.



Stop!

Motor could be destroyed!

- ▶ If the responses "Warning" or "Off" are set, the motor could be destroyed by overload.

Protective measure:

- ▶ Set the response "TRIP".

8.3.7

Current load of motor ($I^2 \times t$ monitoring: OC6, OC8)

The $I^2 \times t$ -load of the motor is constantly calculated by the drive controller and displayed in C0066.

The $I^2 \times t$ -monitoring is designed in a way, that a motor with a thermal motor time factor of 5 min, a motor current of $1.5 \times I_r$ and a trigger threshold of 100 % releases the monitoring after 179 s.

You can set different reactions with two adjustable trigger thresholds.

- Adjustable reaction OC8 (TRIP, Warning, Off).
 - The reaction is set in C0606.
 - The trigger threshold is set in C0127.
 - The reaction OC8 can be used for example for an advance warning.
- Fixed reaction OC6-TRIP.
 - The trigger threshold is set in C0120.

Response of the $I^2 \times t$ -monitoring	Condition
The $I^2 \times t$ -monitoring is deactivated. C0066 = 0 % and MCTRL-LOAD-I2XT = 0,00 % is set.	Set the controller inhibit at C0120 = 0 % and C0127 = 0 %.
The $I^2 \times t$ -monitoring is stopped. The actual value in C0066 and at the MCTRL-LOAD-I2XT output is held.	Allow controller release at C0120 = 0 % and C0127 = 0 %.
The $I^2 \times t$ -monitoring is deactivated. The motor load is displayed in C0066.	Set C0606 = 3 (Off) and C0127 > 0 %.

**Note!**

An OC6 or OC8 error message can only be reset if the $I^2 \times t$ -monitoring has fallen below the set trigger threshold by 5 %.

Calculating the release time

$$t = - (C0128) \cdot \ln \left[1 - \frac{y + 1}{\left(\frac{I_M}{I_r} \right)^2 \cdot 100} \right]$$

I_M Actual motor current

I_r Rated motor current

y C0120 or C0127

- The thermal capacity of the motor is expressed by the thermal motor time factor (C0128). Please see the rated data of the motor for the value or ask the manufacturer of the motor.

Reading the release time off the diagram

Diagram for the determination of the release times of a motor with a thermal motor time factor of 5 min:

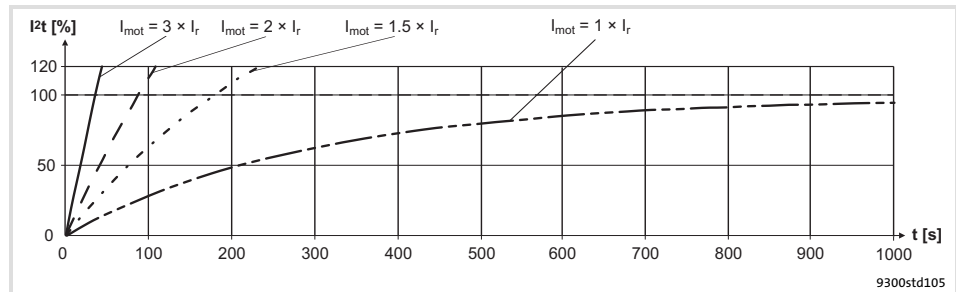


Fig. 8.3-2 $I^2t \times t$ -monitoring: Release times for different motor currents and trigger thresholds

I_{mot}	Motor current
I_r	Rated motor current
I^2t	I^2t load
T	Time

8.3.8 Heatsink temperature

Via a temperature threshold, the heatsink temperature of the controller can be monitored:

- Adjustable threshold (OH4) under C0122
 - The reset point is 5° C below the adjusted threshold.
- Fixed threshold (OH) = 85° C
 - The reset point is at 80° C.

The response for exceeding the adjustable threshold can be set under C0582.

8 Configuration

8.3 Monitoring

8.3.9 DC-bus voltage

In C0173 the mains voltage and DC-bus voltage are set. From this the switching thresholds for overvoltage and undervoltage result.

EVF9335 ... EVF9338 EVF9381 ... EVF9383	Selection C0173	Mains voltage [V AC]	Operation with brake transistor	Message LU (undervoltage)		Message OU (overvoltage)	
				set [V DC]	reset [V DC]	set [V DC]	reset [V DC]
ExV210 ExV240 ExV270 ExV300	0	< 400	yes / no	285	430	770	755
	1	400	yes / no	285	430	770	755
	2	460	yes / no	328	473	770	755
	3	480	no	342	487	770	755
	4	480	yes	342	487	800	785
	5	500	yes / no	342	487	900	885
Ex ExV060 ExV110	read only	400	yes / no	285	430	700	685

C0173 = 1: Lenze setting

Overvoltage

If the DC-bus voltage exceeds the upper switch-off threshold set in C0173, warning OU is activated.

Undervoltage

If the DC-bus voltage falls below the lower switch-off threshold set in C0173, the LU message is triggered.

- An undervoltage message > 3 seconds is interpreted as an operating state (e.g. mains switched off) and entered in the history buffer. The entry is, however, deleted as soon as the cause has been eliminated (e.g. mains switched on again).

This operating state can occur if the control module is already supplied externally via terminals X5/39 and X5/59, but the mains voltage is not yet switched on.

- An undervoltage message < 3 seconds is interpreted as a fault (e.g. mains fault), entered in the history buffer and saved.

8.3.10 External error (EEr)

A HIGH signal at DCTRL-TRIP-SET triggers the EEr fault.

You can, for example, connect the digital input DCTRL-TRIP-SET with an input terminal (X5/Ex). In this way an external encoder can trigger the EEr fault.

The response can be set under C0581.

8.4 Overview of monitoring functions

The responses of monitoring functions can be partly parameterised via codes – in GDC in the parameter menu under **Monitoring** –.

Monitoring				Possible responses				
				● Lenze setting ✓ Setting possible				
Error message		Description	Source	CoDe	TRIP	Message	Warning	Off
0071	CCr	System fault	Internal		●			
x091	EEr	External monitoring (activated via DCTRL)	FWM	C0581	●	✓	✓	✓
Voltage supply								
2020	OU	Overvoltage in the DC bus (C0173)	MCTRL				●	
1030	LU	Undervoltage in the DC bus (C0173)	MCTRL			●		
0107	H07	Internal fault (power section)	Internal		●			
Communication								
x061	CE0	Communication error on the automation interface (AIF)	AIF	C0126	✓		✓	●
x062	CE1	Communication error at process data input object CAN1_IN (monitoring time can be set with C0357/1)	CAN1_IN	C0591	✓		✓	●
x063	CE2	Communication error at process data input object CAN2_IN (monitoring time can be set with C0357/2)	CAN2_IN	C0592	✓		✓	●
x064	CE3	Communication error at process data input object CAN3_IN (monitoring time can be set with C0357/3)	CAN3_IN	C0593	✓		✓	●
x065	CE4	BUS-OFF state of the system bus (CAN) (too many faulty telegrams)	CAN	C0595	✓		✓	●
Temperatures / sensors								
0050	OH	Heatsink temperature > 85° C	MCTRL		●			
x053	OH3	Motor temperature > 150° C	MCTRL	C0583	✓		✓	●
x054	OH4	Heatsink temperature > C0122	MCTRL	C0582			●	✓
x057	OH7	Motor temperature > C0121	MCTRL	C0584			●	✓
x058	OH8	Motor temperature across inputs T1 and T2 is too high. Please note: In the case of "Warning" (C0585 = 2) or "Off" (C0585 = 3), the drive can be destroyed if the fault is not eliminated in time!	MCTRL	C0585	✓		✓	●
x086	Sd6	Thermal sensor error at motor (X7 or X8)	MCTRL	C0594	✓		✓	●
x110	H10	Thermal sensor error at heatsink	FWM	C0588	●		1)	1)
x111	H11	Thermal sensor error in the device interior	FWM	C0588	●		1)	1)
Motor / feedback system								
0011	OC1	Motor cable overcurrent	MCTRL		●			
0012	OC2	Motor cable earth fault	MCTRL		●			
0013	OC3	Overload at acceleration or deceleration	MCTRL		●			

Monitoring				Possible responses				
				● Lenze setting ✓ Setting possible				
Error message		Description	Source	CoDe	TRIP	Message	Warning	Off
0015	OC5	I x t overload	MCTRL		●			
0016	OC6	I ² x t overload	MCTRL		●			
0018	OC8	I ² x t overload advance warning	MCTRL	C0606	✓		●	✓
x032	LP1	Motor phase failure (current limit can be set in C0599) Please note: Can only be used for asynchronous motors. The function block MLP1 has to be entered in C0465.	MCTRL	C0597	✓		✓	●
x083	Sd3	Interruption of the digital frequency coupling. The input signal "Lamp Control" at X9/8 is LOW Please note: In the case of "Warning" (C0587 = 2), the drive can be destroyed if the fault is not eliminated in time!	MCTRL	C0587	●		✓	✓
x085	Sd5	At analog input X6/1, X6/2, the input current is < 2 mA Monitoring only possible if C0034 = 1	MCTRL	C0598	✓		✓	●
0140	ID1	Motor data identification - characteristic	MCTRL		●			
0141	ID2	Motor data identification - motor data	MCTRL		●			
Speed								
0200	NMAX	Maximum speed (C0596) has been exceeded.	MCTRL		●			
Time-out / overflow								
0105	H05	Intern fault (memory)	Internal		●			
Parameter setting								
0072	PR1	Checksum error in parameter set 1	Internal		●			
0073	PR2	Checksum error in parameter set 2	Internal		●			
0074	PEr	Program error	Internal		●			
0075	PR0	Error in the parameter sets	Internal		●			
0077	PR3	Checksum error in parameter set 3	Internal		●			
0078	PR4	Checksum error in parameter set 4	Internal		●			
0079	PI	Fault during the parameter initialisation	Internal		●			

Representation of the error number:

x 0 = TRIP, 1 = message, 2 = warning

E. g. "2091": An external monitoring has triggered EEr warning

1) Setting only permitted by Lenze service

8.5 Code table

How to read the code table:

Column	Abbreviation	Meaning
Code	Cxxxx	Code Cxxxx
	1	Subcode 1 of Cxxxx
	2	Subcode 2 of Cxxxx
	*	Parameter value of the code is the same in all parameter sets
	ENTER	Changed parameter or the code or subcode is accepted after pressing SHIFT PRG
	STOP	Changed parameter of the code or subcode is accepted after pressing SHIFT PRG , if the controller is inhibited
Name		Name of the code
Lenze		Lenze setting (value on delivery or after restoring the delivery status with C0002)
	→	The column "IMPORTANT" contains further information
Selection	1 { % } 99	min. value {unit} max. value
IMPORTANT	-	Short, important explanations

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0002 STOP	Par load	1		Loading a parameter set
			0 Load default	Restore the delivery status
			1 Load PS1	- Load parameter set saved in the controller and activate it - Parameter set 1 is loaded automatically after every mains connection
			2 Load PS2	
			3 Load PS3	Load parameter set from the keypad into the controller and activate it
			4 Load PS4	
			11 Load ext PS1	
			12 Load ext PS2	
			13 Load ext PS3	Load all parameter sets from the keypad into the controller
			14 Load ext PS4	
			20 ext -> EEPROM	
C0003 ENTER	Par save	0		Save parameter set
			0 Ready	Saving is completed
			1 Save PS1	Save the parameters loaded in the controller into a parameter set (PS1 PS4)
			2 Save PS2	
			3 Save PS3	
			4 Save PS4	All parameter sets (PS1 PS4) must be transferred from the controller to the keypad XT
			11 Save extern	
C0004 ENTER	Op display	56	0 {1} 1999	Operating display
				Keypad shows selected code in the operating level if no other status messages of C0183 are active

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0005 	Signal CFG	1000	0	Common	Modified basic configuration	Selection of the basic configuration
			100	CFG: emty	All internal connections are removed	The first two digits indicate the predefined basic function, e. g.: ● 01xxx: Speed control
			1000	Speed mode	Speed control	The third digit indicates additional functions: ● xx0xx: No additional function ● xx1xx: Brake control ● xx2xx: Setpoint selection via motor potentiometer ● xx3xx: PID controller ● xx4xx: Mains failure control ● xx5xx: Setpoint selection via master frequency ● xx6xx: Gearbox factor - analog trimming ● xx7xx: Gearbox factor - digital trimming ● xx8xx: Master frequency ramp function generator
			2000	Step mode	Step control	
			3000	Lead screw	Traversing control	
			4000	Torque mode	Torque control	
			5000	DF master	Digital frequency master	
			6000	DF slv bus	Master frequency slave (bar)	
			7000	DF slv cas	Digital frequency slave (cascade)	The fourth digit indicates the predefined voltage source for the control terminals: ● xxx0x: External supply voltage ● xxx1x: Internal supply voltage
			8000	Dancer ctrl e	Dancer position control with external diameter measurement	The fifth digit indicates the predefined device control ● xxxx0: Terminal control ● xxxx1: RS232, RS485 or optical fibre ● xxxx3: INTERBUS or PROFIBUS-DP ● xxxx5: System bus (CAN)
C0006 	Op mode	5				Selection of the operating mode for the motor control
			1	vector ctrl	Vector control without or with speed feedback	In case of the first selection enter the motor data and identify them with C0148.  6.8-8
			5	V / f	V/f characteristic control	Commissioning without identification of the motor data is possible ● Advantage of identification with C0148: Improved smooth running at low speeds  6.8-4
C0009	LECOM address	1	1	{1}	99	LECOM controller address ● Bus device number when operated via interface ● 10, 20 ... 90 reserved for broadcast to device groups with RS232, RS485, optical fibre

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C0010	N _{min}	0	0	{1 rpm}	36000	- Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times - C0059 must be set correctly - Set C0010 < C0011 - C0010 is only effective in case of analog setpoint selection via AIN1 Important: For parameter setting via interface, major changes in one step should only be made when the controller is inhibited.	Minimum speed	 6.10-1
C0011	N _{max}	3000	0	{1 rpm}	36000		Maximum speed	
C0012	T _{ir} (acc)	5.00	0.00	{0.01 s}	9999.90	Acceleration time T _{ir} of the main setpoint Refers to speed change 0 ... C0011		 6.10-3
C0013	T _{if} (dec)	5.00	0.00	{0.01 s}	9999.90	Deceleration time T _{if} of the main setpoint Refers to speed change 0 ... C0011		
C0014	V/f charact.	0				Characteristic in the V/f characteristic control mode		 8.2-25
			0	Linear		Linear V/f characteristic		
			1	square		Square V/f characteristic		
C0015	Rated freq	50	10	{1 Hz}	5000	V/f-rated frequency In C0015 you can set a base frequency which differs from the rated motor frequency (C0089) - Lenze setting: C0015 = C0089 - Changing C0086 or C0089 overwrites the value in C0015		 8.2-25
C0016	U _{min} boost	0.00	0.00	{0.01 %}	100.00	U _{min} boost (FCODE) - C0016 = 1 % corresponds to a boost of 1 % of the rated motor voltage (C0090) - Code is freely configurable		 6.8-4
C0017	FCODE (Q _{min})	50	-36000	{1 rpm}	36000	Q _{min} -switching threshold (FCODE) - Programmable speed threshold - If the current speed is < C0017, CMP1-OUT is activated. - Freely configurable code		

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0018	fchop	6				Switching frequency of the inverter	6.9-1
			1	1 kHz sin	loss-optimised	● General rule: The lower the switching frequency the – lower the power loss – higher the noise generation – better the concentricity factor ● Observe derating indications for high switching frequencies ● The max. output frequency ($f_{\max}$) is: – fchop = 4 kHz $\Rightarrow$ $f_{\max}$ = 300 Hz – fchop = 2 kHz $\Rightarrow$ $f_{\max}$ = 150 Hz – fchop = 1 kHz $\Rightarrow$ $f_{\max}$ = 150 Hz	
			2	2 kHz sin	concentricity-opti mised		
			3	4 kHz f_top	power-optimised		
			4	4 kHz sin	noise-optimised		
			6	4/2 kHz sin	noise/concentricit y-optimised with automatic change-over to low switching frequency		
C0019	Thresh nact=0	0	-36000	{1 rpm}	36000	Operating threshold - automatic DC injection brake (Auto-GSB) ● Falling below the threshold in C0019 activates automatic DC injection braking when the holding time set under C0107 > 0	8.2-25 8.2-40
C0020	turn value	100	0	{1 %}	200	Influence on concentricity factor ● Manual influence on the concentricity factor of the motor	
C0021	slipcomp	→	-20.00	{0.01 %}	20.00	Slip compensation → Change of C0086, C0087 or C0089 sets C0021 to the calculated rated slip of the motor ● When changing over to the vector control mode, C0021 is set to 0	6.11-1 8.2-25 8.2-40
C0022	I _{max} current	→	0	{0.1 A}	-	I _{max} limit in motor mode → depending on C0086	6.6-14
C0023	I _{max} gen.	→	0	{0.1 A}	-	I _{max} limit in generator mode → depending on C0086	6.6-14
C0025 	Feedback type	1				Speed feedback	6.7-1
			1	no feedback	No feedback		
			100	IT (C420) - X8	Input of the number of increments in C0420	Incremental encoder at X8 ● Incremental encoders with TTL level can only be connected to X8.	
			101	IT (C420) - X9	Input of the number of increments in C0420	Incremental encoder at X9 ● Connect incremental encoders with HTL-level on X9 only	
					Number of increments:	Incremental encoder at X8 ● Incremental encoders with TTL level can only be connected to X8.	
			110	IT512-5V	512 inc		
			111	IT1024-5V	1024 inc		
			112	IT2048-5V	2048 inc		
			113	IT4096-5V	4096 inc		

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0026			-199.99	{0.01 %}	199.99	Free control code FCODE 26/1 and FCODE26/2 Offset of AIN1 (X6/1, X6/2) Offset of AIN2 (X6/3, X6/4) 6.5-4 See System Manual (extension)	
1	FCODE (offset)	0.00					
2	FCODE (offset)	0.00					
C0027			-199.99	{0.01 %}	199.99	Free control code FCODE 27/1 and FCODE27/2 Gain AIN1 (X6/1, X6/2) • 100 % = gain 1 Gain AIN2 (X6/3, X6/4) • 100 % = gain 1	
1	FCODE (gain)	100.0 0					
2	FCODE (gain)	100.0 0					
C0030	DFOUT const	3	0	256 inc/rev		Function block DFOUT • Setting of the constant (increments per revolution) for the master frequency output X10 8.2-8	
			1	512 inc/rev			
			2	1024 inc/rev			
			3	2048 inc/rev			
			4	4096 inc/rev			
			5	8192 inc/rev			
			6	16384 inc/rev			
C0032	FCODE Gearbox	1	-32767	{1}	32767	Gearbox factor - numerator of the function block DFSET • Freely configurable code 8.2-18	
C0033	Gearbox denom	1	1	{1}	32767	Gearbox factor - denominator of the function block DFSET 8.2-18	
C0034	Mst current	0	0	-10 V ... +10 V		Voltage / current range for analog signals at input X6/1, X6/2 • Observe jumper position of X3 5.6-9 6.5-4	
			1	4 mA ... 20 mA			
			2	-20 mA ... +20 mA			
C0036	DC brk value	0.0	0.0	{0.1 A}	-	Set DC braking current → depends on the controller 8.2-25 8.2-40	
C0037	Set-value rpm	0	-36000	{1 rpm}	36000	Setpoint selection	
C0038			0	{1 rpm}	36000	Suppress speed ranges, function block NLIM1 • Speed ranges are only run through dynamically • Static behaviour in the inhibited range is suppressed See System Manual (extension)	
1	N 1 start	0					Suppress speed range 1
2	N 1 stop	0					
3	N 2 start	0					Suppress speed range 2
4	N 2 stop	0					
5	N 3 start	0					Suppress speed range 3
6	N 3 stop	0					

Code		Possible settings			IMPORTANT				
No.	Name	Lenze	Selection						
C0039			-36000	{1 rpm}	36000	JOG setpoints for the speed setpoint conditioning, function block NSET - Parameter setting of the fixed speeds (JOG setpoints) - Activation via binary coding of digital input signals in C0787/1 ... C0787/4 - For coding see description of function block NSET	See System Manual (extension)		
1	JOG set-value	1500							
2	JOG set-value	1000							
3	JOG set-value	500							
4	JOG set-value	200							
5	JOG set-value	100							
6	JOG set-value	50							
7	JOG set-value	25							
8	JOG set-value	10							
9	JOG set-value	5							
10	JOG set-value	0							
...	...	...							
15	JOG set-value	0							
C0040	Ctrl enable	0						Controller enable Controller can only be enabled if X5/28 = HIGH	📖 6.4-1
			0	Ctrl inhibit				Controller inhibited	
			1	Ctrl enable		Controller enabled			
C0042	DIS: QSP					Quick stop Display only	📖 8.2-25 📖 8.2-40		
			0	QSP inactive		Quick stop is not active			
			1	QSP active		Quick stop is active			
C0043	Trip reset	0	0	no/trip reset		Reset actual error			
			1	trip active		There is a TRIP error			
C0045	DIS: act JOG		0	Nset active	Nset is active	Active JOG setpoint for the speed setpoint conditioning, function block NSET Display of the activated fixed speed		See System Manual (extension)	
			1	JOG1	JOG setpoint 1				
			2	JOG2	JOG setpoint 2				
			...	...	...				
			15	JOG15	JOG setpoint 15				
C0046	DIS: N		-199.99	{0.01 %}	199.99	Main setpoint for the speed setpoint conditioning, function block NSET Read only			
C0049	DIS: NADD		-199.99	{0.01 %}	199.99	Additional setpoint, function block NSET Read only	See System Manual (extension)		
C0050	MCTRL-NSET2		-100.00	{0.01 %}	100.00	Speed setpoint, function block MCTRL Display of the speed in [%] of C0011	📖 8.2-25 📖 8.2-40		
C0051	MCTRL-NACT		-36000	{1 rpm}	36000	Actual speed value, function block MCTRL Read only	📖 8.2-25 📖 8.2-40		
C0052	MCTRL-Umot		0	{1 V}	800	Motor voltage, function block MCTRL - Read only - MCTRL-VACT = 100 % = C0090	📖 8.2-25 📖 8.2-40		
C0053	UG-VOLTAGE		0	{1 V}	900	DC-bus voltage, function block MCTRL - Read only - MCTRL-DCVOLT = 100 % = 1000 V	📖 8.2-25 📖 8.2-40		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0054	Imot		0.0	{0.1 A}	5000.0	Actual motor current, function block MCTRL - Read only - MCTRL-IACT = 100 % = C0022 8.2-25 8.2-40
C0056	MCTRL-MSET2		-100.00	{0.01 %}	100.00	Read only. The output signal depends on the operating mode: - Current motor current in case of V/f characteristic control, function block MCTRL1 - Torque setpoint in case of vector control, function block MCTRL2 8.2-25 8.2-40
C0057	Max Torque		0	{1 Nm}	5000	Maximum possible torque of the drive configuration - Display only - With V/f characteristic control depending on C0022, C0086, C0088 - With vector control depending on C0022, C0086, C0088, C0091
C0058	MCTRL-FACT		-600.0	{0.1 Hz}	600.0	Output frequency - Display only - MCTRL-FACT = 100.0 % = 1000.0 Hz 8.2-25 8.2-40
C0059	Mot pole no.		1	{1}	50	Pole pair number of the motor Display only
C0061	Heatsink temp		0	{1 °C}	100	Heatsink temperature - Read only - If the temperature of the heatsink > 85 °C, the controller sets TRIP OH - Early warning is possible via OH4, temperature is set in C0122 See System Manual (extension)
C0063	Mot temp		0	{1 °C}	200	Motor temperature - Read only - Monitoring of the motor temperature must be activated. - KTY at X8/5, X8/8: - At 150 °C, TRIP OH3 is set - Early warning is possible via OH7, temperature is set in C0121 - PTC, thermal contact at T1, T2: - Release sets TRIP or warning OH8 8.2-25 8.2-40
C0064	Utilization		0	{1 %}	150	Device utilisation I×t - Read only - Device utilisation of the last 180 s operating time - C0064 > 100 % triggers warning OC5 - C0064 > 110 % limits the ouput current of the controller to 67 % of the maximum current in C0022 8.2-25 8.2-40
C0066	MOTOR LOAD		0	{1 %}	250	Motor load I ² ×t 8.2-25 8.2-40

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0067	Act trip		☐ Selection list 10			Momentary fault message	
						Display only	
C0070	Vp speed CTRL	10.0	0.0	{0.1 }	255.9	Gain of speed controller	☐
C0071	Tn speed CTRL	50	1	{1 ms}	6000	Integral-action time of speed controller	8.2-25
						C0071 = 6000 ms: No integral-action time	8.2-40
C0074	limit N	10.00	0.00	{0.01 %}	100.00	Limitation of the speed controller	☐
						- Influence of the speed controller for V/f characteristic control with feedback - max. setpoint difference in percent	8.2-25 8.2-40
C0075	Vp curr CTRL	0.04	0.00	{0.01 }	0.99	Gain of current controller	☐
						- Vector control: Gain of current controller - V/f characteristic control: Maximum current controller	8.2-25 8.2-40
C0076	Tn curr CTRL	10.0	0.1	{0.1 ms}	2000.0	Integral-action time of current controller	☐
						- Vector control: integral-action time of current controller - V/f characteristic control: maximum current controller - C0076 = 2000 ms: current controller is switched off	8.2-25 8.2-40
C0077	Ti field CTRL	4.0	0.3	{0.1 ms}	6000.0	Integral-action time of field controller	
						Only active in case of vector control with feedback	
C0078	Tn slip CTRL	100	1	{1 ms}	6000	Integral-action time of slip controller	☐
						- Filter time for slip compensation (C0021) - Only active with V/f characteristic control	8.2-25
C0079	Adapt I-CTRL	100.0 0	10.00	{0.01 %}	100.00	Adaption of the current controller	☐
						- Evaluation for the reset time T_{ni} of the current controller - Effective for setpoint = 0 - Is increased automatically to 100 % up to rated speed - C0079 = 100 %: no adaption of the reset time - C0079 < 100 %: – evaluation of the reset time:	8.2-25 8.2-40
C0080	Vp field CTRL	0.50	0.00	{0.01 }	0.99	Influence on the motor magnetising current selected under C0095	☐ 6.6-1
						- Not effective with C0006 = 1 and C0025 > 1 at the same time - Influence is effective from 0 Hz to the frequency selected under C1583	
C0081	Mot power	→	0.01	{0.01 kW}	500.00	Rated motor power	
	STOP					→ Change of C0086 resets value to factory setting Change of C0081 sets C0086 = 0	

Code		Possible settings			IMPORTANT			
No.	Name	Lenze	Selection					
C0082 STOP	Mot Rr	→	0.0000	{0.0001 Ω}	65.5350	Motor rotor resistance → Value is determined by motor parameter identification from C0087, C0088, C0089, C0090 and C0091 Selection of a motor in C0086 sets the corresponding rotor resistance value	6.6-1 6.6-15	
C0084 STOP	Mot Rs	→	0.00	{0.01 mΩ}	100000.00	Motor stator resistance → Value is determined by motor parameter identification (C0148, C0149)	6.6-1 6.6-15	
C0085 STOP	Mot Lss	→	0.00	{0.01 mH}	6553.50	Motor leakage inductance → Value is determined by motor parameter identification (C0148, C0149)	6.6-1 6.6-15	
C0086 STOP	Mot type	→	Motor selection list				Motor type selection → depending on the controller used Motor selection in C0086 sets the corresponding parameters in C0021, C0022, C0081, C0087, C0088, C0089, C0090, C0091	6.6-1
C0087 STOP	Mot speed	→	50	{1 rpm}	36000	Rated motor speed → depending on C0086 - Motor selection in C0086 set the corresponding rated motor speed in C0087 - Change of C0087 sets C0086 = 0	6.6-1	
C0088 STOP	Mot current	→	0.5	{0.1 A}	1000.0	Rated motor current → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor current in C0088 - Change of C0088 sets C0086 = 0	6.6-1	
C0089 STOP	Mot frequency	→	10	{1 Hz}	5000	Rated motor frequency → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor frequency in C0089 - Change of C0089 sets C0086 = 0	6.6-1	
C0090 STOP	Mot voltage	→	0	{1 V}	1000	Rated motor voltage → depending on C0086 - Motor selection in C0086 sets the corresponding rated motor voltage in C0090 - Change of C0090 sets C0086 = 0	6.6-1	
C0091 STOP	Mot cos phi	→	0.50	{0.01 }	1.00	Motor cos φ → depending on C0086 - Motor selection in C0086 sets the corresponding motor cos φ in C0091 - Change of C0091 sets C0086 = 0	6.6-1	

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0092 	Mot Ls	→	0.00	{0.01 mH}	6553.50	Motor stator inductance → Value is determined by motor parameter identification from C0088, C0089, C0090 and C0091 → Motor selection in C0086 sets corresponding stator inductance value in C0092  6.6-1	
C0093	Drive ident					Controller identification ● Read only	
			0	Invalid		Defective power section	
			1	None		No power section	
			14	9335VC 400V		Display of the controller used	
			...	...			
			20	9383VC 400V			
			21	9334VC 500V			
			...	...			
			28	9383VC 500V			
9321	9321 VC						
...	...						
9333	9333VC						
C0094	Password	0	0	{1}	9999	Password ● C0094 = 1 ... 9999: Free access to the user menu only  7.2-9	
C0095 	Mot Io	→	0.0	{0.1 A}	1000.0	Motor magnetising current → dependent on C0086, C0088 and C0091 ● Change of C0086 sets C0095 to the Lenze setting ● Change of C0095 sets C0086 = 0  6.6-1	
C0096			0	no protection	No password protection	Parameter access protection ● Extension of the access protection for AIF bus systems and CAN with activated password in C0094 ● All codes in the user menu can continued to be accessed.	
			1	R protection	Read protection		
			2	W protection	Write protection		
			3	R/W protection	Read/write protection		
			1	AIF protect.	0			Parameter access protection AIF
2	CAN protect.	0			Parameter access protection CAN		
C0099	S/W version		x.y			Software version ● Read only	
			x	Main version			
			y	Subversion			

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0101			0.00	{0.01 s} 999.90	Additional acceleration times for speed setpoint conditioning, function block NSET • Additional acceleration and deceleration times for the main setpoint • Activation via binary coding of digital input signals in C0788/1 ... C0788/4 • For coding see description of function block NSET	See System Manual (extension)
1	add Tir	0.00				
2	add Tir	0.00				
...	...	...				
15	add Tir	0.00				
C0103			0.00	{0.01 s} 999.90	Additional deceleration times for speed setpoint conditioning, function block NSET • Additional acceleration and deceleration times for the main setpoint • Activation via binary coding of digital input signals in C0788/1 ... C0788/4 • For coding see description of function block NSET	
1	add Tif	0.00				
2	add Tif	0.00				
...	...	...				
15	add Tif	0.00				
C0104	select accel.	0			Selection of acceleration function of the linear ramp function generator of NSET	See System Manual (extension)
			0	a = const	Constant acceleration	
			1	t = const	Constant time	
			2	s = const	Constant path	
C0105	QSP Tif	5.00	0.00	{0.01 s} 999.90	Quick stop deceleration time • The deceleration time refers to a speed variation of C0011 ... 0	8.2-25 8.2-40
C0107	holding time	0.00	0.00	{0.01 s} 9999.90	Hold time for automatic DC injection braking (Auto-GSB)	8.2-25 8.2-40
C0108			-199.99	{0.01 %} 199.99	Free control code FCODE108/1 and FCODE108/2	6.5-6 See System Manual (extension)
1	FCODE (gain)	100.0 0			Gain of analog output signal AOUT1 (X6/62) • 100 % = gain 1	
2	FCODE (gain)	100.0 0			Gain of analog output signal AOUT2 (X6/63) • 100 % = gain 1	
C0109			-199.99	{0.01 %} 199.99	Free control code FCODE109/1 and FCODE109/2	
1	FCODE (offset)	0.00			Offset of analog output signal AOUT1 (X6/62)	
2	FCODE (offset)	0.00			Offset of analog output signal AOUT2 (X6/63)	
C0114			0	High active HIGH level is active	Inversion of digital input signals at X5, function block DIGIN	6.5-1 See System Manual (extension)
			1	LOW active LOW level is active		
1	DIGIN1 pol	0			Terminal X5/E1	
2	DIGIN2 pol	0			Terminal X5/E2	
3	DIGIN3 pol	0			Terminal X5/E3	
4	DIGIN4 pol	1			Terminal X5/E4	
5	DIGIN5 pol	0			Terminal X5/E5	
5	DIGIN6 (ST) pol	0			Terminal X5/ST	

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0116 STOP			📖 Selection list 2		Configuration of free digital outputs (FDO) ● Signals can only be evaluated when being networked with automation interfaced	See System Manual (extension)	
	1	CFG: FDO-0	1000	FIXED0			
	...	...	...	...			
	32	CFG: FDO-31	1000	FIXED0			
C0117 STOP			📖 Selection list 2		Configuration of digital inputs signals, function block DIGOUT A change of the basic configuration in C0005 changes the signal assignment!	📖 6.5-3 See System Manual (extension)	
	1	CFG: DIGOUT1	15000	DCTRL-TRIP			Terminal X5/A1
	2	CFG: DIGOUT2	10650	CMP1-OUT			Terminal X5/A2
	3	CFG: DIGOUT3	500	DCTRL-RDY			Terminal X5/A3
	4	CFG: DIGOUT4	5003	MCTRL-MMAX			Terminal X5/A4
C0118			0	High active	HIGH level is active	Inversion of digital output signals, function block DIGOUT	
			1	LOW active	LOW level is active		
	1	DIGOUT1 pol	1			Terminal X5/A1	
	2	DIGOUT2 pol	1			Terminal X5/A2	
	3	DIGOUT3 pol	0			Terminal X5/A3	
	4	DIGOUT4 pol	0			Terminal X5/A4	
C0120	OC6 LIMIT	0	00	{1 °C}	120	Threshold for I² × t monitoring (motor). ● 0 = I ² × t monitoring switched-off ● I ² × t > C0120 ⇒ trip OC6	
C0121	OH7 limit	150	45	{1 °C}	150	Setting of the operating temperature for monitoring OH7 ● Only for KTY at X8 ● Monitoring OH7 is configured in C0584	📖 6.6-10 See System Manual (extension)
C0122	OH4 limit	80	45	{1 °C}	85	Configuration of monitoring OH4 ● Monitoring of the heatsink temperature ● Activating monitoring with C0582 ● Temperature in C0122 reached: – Warning OH4 is initiated	See System Manual (extension)
C0125	Baudrate	0	0	9600 baud	LECOM baud rate ● Baud rate for accessory module 2102		
			1	4800 baud			
			2	2400 baud			
			3	1200 baud			
			4	19200 baud			
C0126	MONIT CE0	3	0	TRIP	Configuration of monitoring CE0 ● Error message in case of communication error AIF	See System Manual (extension)	
			2	Warning			
			3	Off			
C0127	OC8 LIMIT	0	0	{1 °C}	120	Threshold for I² × t advance warning (motor). ● 0 = I ² × t advance warning switched-off ● I ² × t > C0127 ⇒ fault message OC8 (response set in C606)	
C0128	TAU MOTOR	5.0	0.1	{0.1 min}	50.0	Thermal time constant of the motor The time constant is required for calculating the I ² × t disconnection.	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0130	DIS: act Ti		0	C12/C13	Active T _i times for the speed setpoint conditioning, function block NSET • Display of the additional acceleration and deceleration times for the main setpoint (C0101, C0103) • Activation via binary coding of C0788/1 ... C0788/4	See System Manual (extension)
			1	Tir1/Tif1		
			2	Tir2/Tif2		
			...	...		
			14	Tir14/Tif14		
			15	Tir15/Tif15		
C0132	RFG fly delay				May only be changed by Lenze service personnel!	
C0133	HLG fly delay				May only be changed by Lenze service personnel!	
C0134	RFG charac	0	0	Linear	Ramp function generator characteristic, function block NSET • Characteristic of the main setpoint	See System Manual (extension)
			1	S-shaped		
C0135	Control word	0	Bit	Assignment	Control word, function block AIF • Decimal control word when networked via automation interface AIF • 16-bit information, binary coded	See System Manual (extension)
			0	reserved		
			1	reserved		
			2	reserved		
			3	Quick stop		
			4	reserved		
			5	reserved		
			6	reserved		
			7	reserved		
			8	Operation inhibited		
			9	Controller inhibit		
			10	TRIP SET		
			11	Trip reset		
			12	reserved		
			13	reserved		
			14	reserved		
			15	reserved		
C0136					Display of the control words in C0135, AIF-IN and CAN-IN1	See System Manual (extension)
	1 Ctrl wrd C135				Control word C0135	
	2 Ctrl wrd CAN				Control word CAN	
	3 Ctrl wrd AIF				Control word AIF	
C0141	FCODE (setval)	0.00	-199.9	{0.01 }	199.99	Main setpoint, freely configurable code (FCODE) • Used as main setpoint in the basic configurations C0005 = xxx1
C0142	Start options					May only be changed by Lenze service personnel!
C0143	limit 2 kHz	0.0	0.0	{0.1 Hz}	20.0	Speed-dependent switching threshold • Threshold for automatic switching frequency reduction • The controller changes automatically to 2 kHz when this value falls below the threshold

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0144 	OH switch	1	0	Switch off	Switch-over is not active	Temperature-dependent switching frequency reduction	
			1	Switch on	Switch-over is active		
C0145 	select ref					May only be changed by Lenze service personnel!	
C0146	fly current					May only be changed by Lenze service personnel!	
C0147	fly dt-f					May only be changed by Lenze service personnel!	
C0148 	ident run	0	0	WRK stop	Ready	Motor data identification 1. Inhibit controller, wait until drive has stopped 2. Enter the correct values of the motor nameplate into C0087, C0088, C0089, C0090, C0091 3. Set C0148 = 1, confirm with 4. Enable controller The identification – starts, goes off. The motor "whistles" but does not rotate! – lasts approx. 1 ... 2 min – is completed when is lit again 5. Inhibit controller:	6.6-15
			1	WRK run	Start identification		
C0149 	Auto ident	0	0	Id inactive	Automatic identification is inactive	Automatic motor data identification 1. Inhibit controller, wait until drive has stopped 2. Enter the correct values of the motor nameplate into C0087, C0088, C0089, C0090, C0091 3. Set C0149 = 1, confirm with 4. Enable controller The identification – starts, goes off. The motor "whistles" but does not rotate! – lasts approx. 1 ... 2 min – is completed when is lit again 5. Inhibit controller:	6.6-15
			1	Id active	Automatic identification is active • The identification starts automatically after controller enable • After a faulty identification, the process is restarted after TRIP RESET or mains switching and subsequent controller enable		
C0150	Status word		Bit00	–	Bit08	Status code	Read only Decimal status word for networking via automation interface (AIF) • Binary interpretation indicates the bit states
			Bit01	IMP	Bit09	Status code	
			Bit02	–	Bit10	Status code	
			Bit03	–	Bit11	Status code	
			Bit04	–	Bit12	Warning	
			Bit05	–	Bit13	Message	
			Bit06	n = 0	Bit14	–	
			Bit07	CINH	Bit15	–	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0151	DIS: FDO (DW)			Read only - Free digital outputs (FDO) - Hexadecimal representation of the digital output signals configured in C0116 - Binary interpretation indicates the bit states	See System Manual (extension)
C0155	Status word 2		Bit00 Fail Bit08 R/L Bit01 M_{max} Bit09 – Bit02 I_{max} Bit10 – Bit03 IMP Bit11 – Bit04 RDY Bit12 – Bit05 CINH Bit13 – Bit06 TRIP Bit14 – Bit07 Init Bit15 –	Display only Binary interpretation indicates the bit states	
C0156			📖 Selection list 2	Configuration of digital input signals of function block STAT Input signals are output as status messages in C0150, AIF status word and CAN1 status word	See System Manual (extension)
	1 CFG: STAT.B0	2000	DCTRL-PAR*1-O		
	2 CFG: STAT.B2	5002	MCTRL-IMAX		
	3 CFG: STAT.B3	5003	MCTRL-MMAX		
	4 CFG: STAT.B4	5050	NSET-RFG I=O		
	5 CFG: STAT.B5	10650	CMP1-OUT		
	6 CFG: STAT.B14	505	DCTRL-CW/CCW		
	7 CFG: STAT.B15	500	DCTRL-RDY		
C0157			0 No status message 1 Status message is output	Digital status signal of function block STAT Display of the signals linked in C0156	
	1 DIS: STAT.B0				
	2 DIS: STAT.B2				
	3 DIS: STAT.B3				
	4 DIS: STAT.B4				
	5 DIS: STAT.B5				
	6 DIS: STAT.B14				
	7 DIS: STAT.B15				
C0161	Act trip			Display of history buffer "Active fault" Keypad: LECOM error number	See System Manual (extension)
C0167	Reset failmem	0	0 Ready	Clear history buffer Active fault messages are not cleared	See System Manual (extension)
			1 Clear history buffer		

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0168				Display of the fault messages in the history buffer	See System Manual (extension)
1	Fail no. act			● Keypad: LECOM error number	
2	Fail no. old1			Active fault	
3	Fail no. old2			Last fault	
4	Fail no. old3			Second to last fault	
5	Fail no. old4			Third last fault	
6	Fail no. old5			Fourth-last fault	
7	Fail no. old6			Fifth-last fault	
8	Fail no. old7			Sixth-last fault	
				Last but six fault	
C0169			Display in [s]	Displays at what time the fault (C0168) has occurred since mains connection (C0179)	
				● If a fault is followed by another fault for several times, only the time of the last occurrence is stored	
1	Failtime act			Active fault	
2	Failtime old1			Last fault	
3	Failtime old2			Second to last fault	
4	Failtime old3			Third last fault	
5	Failtime old4			Fourth-last fault	
6	Failtime old5			Fifth-last fault	
7	Failtime old6			Sixth-last fault	
8	Failtime old7			Last but six fault	
C0170				Displays how many times the fault (C0168) has occurred after the last mains connection	
1	Counter act			Active fault	
2	Counter old1			Last fault	
3	Counter old2			Second to last fault	
4	Counter old3			Third last fault	
5	Counter old4			Fourth-last fault	
6	Counter old5			Fifth-last fault	
7	Counter old6			Sixth-last fault	
8	Counter old7			Last but six fault	

Code		Possible settings			IMPORTANT			
No.	Name	Lenze	Selection					
C0173 	UG limit	1				Check during commissioning and adapt, if necessary! All controllers in the system must have the same threshold! - Adaptation of UG thresholds - Only display in case of the variants for 400 V mains (EVF93xx-EV, EVF93xx-EVV030, EVF93xx-EVV060, EVF93xx-EVV110): - C0173 = 1 - OU = 700 ... 685 V	 12-1 See System Manual (extension)	
			Mains	LU	OU			
			0	< 400 V	285 V	770 ... 755 V		Device with or without brake transistor
			1	400 V	285 V	770 ... 755 V		
			2	460 V	328 V	770 ... 755 V		
			3	480 V	342 V	770 ... 755 V		Device without brake transistor
			4	480 V	342 V	800 ... 785 V		Device with brake transistor
			5	500 V	342 V	900 ... 885 V		
C0174	BR Limit	3				Display of the brake transistor thresholds Check during commissioning and adapt, if necessary! All controllers connected to the bus must have the same threshold!	 12-1 See System Manual (extension)	
			Mains	U _{BR}	OU			
			0	400 V	685 V	700 V		Only display in case of the variants for 400 V mains (EVF93xx-EV, EVF93xx-EVV030, EVF93xx-EVV060, EVF93xx-EVV110)
			1	400 V / 460 V	755 V	770 V		Only in case of the variants for 400 V/500 V mains (EVF93xx-EVV210, EVF93xx-EVV240, EVF93xx-EVV270, EVF93xx-EVV300)
			2	480 V	785 V	800 V		
			3	500 V	885 V	900 V		
C0178	Op timer		{s}			Display only Total time of the controller enable (X5/28 = HIGH)		
C0179	mainstimer		{s}			Display only Total time of mains "ON"		
C0182	Ti S-shaped	20.00	0.01	{0.01 s}		50.00	Integration time of S-shaped ramp function generator, function block NSET - C0182 = 0.00: ramp function generator operates linearly - C0182 > 0.00: ramp function generator operates in an S-shape (without jerk)	See System Manual (extension)

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0183	Diagnostics			Diagnostics • Display only • If several items or fault or status information are to be shown, the information with the smallest number is displayed	 7.2-10
			0 No fault		
			101 Initialisation		
			102 TRIP/fault		
			103 Emergency stop		
			104 IMP message		
			105 Power OFF	Function is not supported	
			111 Operation inhibit via C0135		
			112 Operation inhibit via AIF		
			113 Operation inhibit via CAN		
			121 Controller inhibited via X5/28		
			122 Controller inhibited internally (DCTRL-CINH1)		
			123 Controller inhibited internally (DCTRL-CINH2)		
			124 Controller inhibited via  at the keypad		
			125 Controller inhibited via AIF		
			126 Controller inhibited via CAN		
			141 Switch-on inhibit		
			142 Pulse inhibit 		
			151 Quick stop via MCTRL-QSP		
			152 Quick stop via  at the keypad		
			153 Quick stop via AIF		
			154 Quick stop via CAN		
			161 DC injection braking via terminal		
			162 DC injection braking via C0135		
			163 DC injection braking via AIF		
			164 DC injection braking via CAN		
			170 Motor parameter identification is active		
			250 Warning is active (C0168)		
C0190	NSET arit	0	0 OUT = C46	Arithmetic function, function block NSET Connects main setpoint (C0046) and additional setpoint (C0040)	See System Manual (extension)
			1 C46 + C49		
			2 C46 - C49		
			3 C46 * C49		
			4 C46 / C49		
			5 C46/(100 - C49)		

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C0195	BRK1 T act	99.9	0.0	{0.1 s}		99.9	Brake closing time, function block BRK1 • C0195 = 99.9 s: infinite • After the time has elapsed in C0195, the status "brake applied" is reached	See System Manual (extension)
C0196	BRK1 T release	0.0	0.0	{0.1 s}		60.0	Brake opening time, function block BRK1 • Opening time can be obtained from the technical data of the brake • After the time has elapsed in C0196, the status "brake released" is reached	
C0200	S/W Id		x Main version		Software ID			
			y Subversion		• Display only			
			S9300MVxy000		9300 vector 0.37 ... 90 kW			
			S9300MVxy020		9300 vector 110 ... 400 kW			
C0201	S/W date		xxx yy zzzz	xxx = month yy = day zzzz = year		Software creation • Display only		
C0202						Internal identification • Display only		
C0203						Commission number • Display only		
C0204						Serial number • Display only		
C0206	Product date		xx/yy/zz			Date of production • Display only • xx = day, yy = month, zz = year		
C0207	DL info 1					Download info 1 • Display only		
C0208	DL info 2					Download info 2 • Display only		
C0209	DL info 3					Download info 3 • Display only		
C0220	NSET Tir add	2.00	0.00	{0.01 s}		9999.90	Acceleration time T_{ir} for additional setpoint, function block NSET • The acceleration time refers to a speed variation of 0 ... C0011	See System Manual (extension)
C0221	NSET Tif add	2.00	0.00	{0.01 s}		9999.90	Deceleration time T_{if} for additional setpoint, function block NSET • The deceleration time refers to a speed variation of C0011 ... 0	
C0222	PCTRL Vp	1.0	0.1	{0.1 }		500.0	Gain V_p , function block PCTRL1	See System Manual (extension)
C0223	PCTRL1 Tn	400	20	{1 ms}		99999	Integral action component T_n , function block PCTRL1 • C0223 = 99999 ms: no integral action component	
C0224	PCTRL1 Kd	0.0	0.0	{0.1 }		5.0	Differential component K_d , function block PCTRL1	
C0234	damp value	20	-100	{1 %}		100	Influence of the oscillation damping, function block MCTRL • Minimising a tendency to oscillation of the drive • Influences the tendency to oscillation of the drive • When C0025 >1 and C0006 = 1, C0234 is set to 0	 8.2-25  8.2-40

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0235	damping	2	1	{1 ms}	600	Filter time of the oscillation damping, function block MCTRL Filter time for the internal signal for oscillation damping	 8.2-25  8.2-40
C0236	damp limit	1.0	0.0	{0.1 Hz}	20.0	Limit value of oscillation damping, function block MCTRL Limit value for the internal signal of oscillation damping	
C0241	Cmp-RFG-I=0	1.00	0.00	{0.01 %}	100.00	Speed threshold in [%] for the digital output NSET-controller enable-I=0, function block NSET - The analog signals NSET-NOUT (without arithmetic and limiting functions) and NSET-controller enable-I are compared - NSET-controller enable-I=0 = HIGH: the differential signal between NSET-NOUT and NSET-controller enable-I falls below the value in C0241 - C0241 = 100 %: $n_{\max}$	See System Manual (extension)
C0244	BRK1 M set	0.00	0.00	{0.01 %}	100.00	Holding torque, function block BRK1 C0244 = 100 % = C0057	See System Manual (extension)
C0250	FCODE 1 Bit	0	0		1	Free control code FCODE250	
C0252	Angle offset	0	-245760000	{1 inc.}	245760000	Phase offset for master frequency processing, function block DFSET - Fixed phase offset for digital frequency configuration 1 rev. = 65536 inc	 8.2-18
C0253	Angle n-trim	→	-32767	{1 inc.}	32767	Speed-dependent phase trimming for the master frequency processing, function block DFSET → depending on C0005, C0025, C0490 - Change of C0005, C0025 or C0490 resets C0253 to the corresponding Lenze setting 1 rev. = 65536 inc - Value in C0253 is reached at 15000 rpm	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0260	MPOT1 high	100.0 0	-199.99	{0.01 %}	199.99	Upper limit, function block MPOT1 ● Condition: C0260 > C0261	See System Manual (extension)
C0261	MPOT1 low	-100.0	-199.99	{0.01 %}	199.99	Lower limit, function block MPOT1 ● Condition: C0261 < C0260	
C0262	MPOT1 TIR	10.0	0.1	{0.1 s}	6000.0	Acceleration time T _{ir} , function block MPOT1 ● The set time refers to a change of 0 ... 100 %	
C0263	MPOT1 Tif	10.0	0.1	{0.1 s}	6000.0	Deceleration time T _{if} , function block MPOT1 Motor potentiometer ● The set time refers to a change of 100 ... 0 %	
C0264	MPOT1 on/off	0	0	no change		Deactivation of motor potentiometer, function block MPOT1 ● Function is executed when MPOT1-INACT = HIGH	
			1	Deceleration with T _{if} to 0%			
			2	Deceleration with T _{if} to C0261			
			3	Jump with T _{if} = 0 to 0%			
			4	Jump with T _{if} = 0 to C0261			
			5	Acceleration with T _{ir} to C0260			
C0265	MPOT1 init	0	0	Value of MPOT1 when mains fails		Initialisation of motor potentiometer, function block MPOT1 ● Starting value which is to be accepted during mains switching and activated motor potentiometer	
			1	lower limit of C0261			
			2	0 %			
C0267			📖 Selection list 2			Configuration of digital input signals, function block MPOT	See System Manual (extension)
1	CFG: UP	1000	FIXED0			UP DOWN MPOT1-OUT 0 0 — 0 1 ↓ 1 0 ↑ 1 1 —	
2	CFG: DOWN	1000	FIXED0			↑: Output signal runs to the upper limit value ↓: Output signal runs to the lower limit value —: Output signal is unchanged	
C0268	CFG: INACT	1000	FIXED0			📖 Selection list 2	Configuration of digital input signal, function block MPOT ● HIGH: motor potentiometer is not active. Output signal runs to 0
C0269						Digital input signals, function block MPOT ● Display of the signals linked in C0267 and C0268	
1	DIS: UP						
2	DIS: DOWN						
3	DIS: INACT						

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C0325	Vp2 adapt	1.0	0.1	{0.1 }		500.0	Function block PTCTRL1 Adaptation of gain V_{p2}	See System Manual (extension)
C0326	Vp3 adapt	1.0	0.1	{0.1 }		500.0	Function block PTCTRL1 Adaptation of gain V_{p3}	
C0327	Set2 adapt	100.0 0	0.00	{0.01 %}		100.00	Function block PTCTRL1 - Adaptation of setpoint speed threshold n_{set2} - Condition: C0327 > C0328	
C0328	Set1 adapt	0.00	0.00	{0.01 %}		100.00	Function block PTCTRL1 - Adaptation of setpoint speed threshold n_{set1} - Condition: C0328 < C0327	
C0329	Adapt on/off	0	0	No adaptation of the process controller			Function block PTCTRL1 Adaptation On/Off	
			1	External adaptation via input				
			2	Adaptation via setpoint				
			3	Adaptation via control difference				
C0332	PCTRL Tir	0	0	{1 s}		10000	Acceleration time T_{ir} , function block PCTRL1 The acceleration time refers to a setpoint change of 0 ... 100 %	See System Manual (extension)
C0333	PCTRL1 Tif	0	0	{1 s}		10000	Deceleration time T_{if} , function block PCTRL1 The deceleration time refers to a setpoint change of 100 % ... 0	
C0336	DIS: act Up		0.0	{0.1 }		500.0	Current gain V_p , function block PCTRL1 Read only	See System Manual (extension)
C0337	Bi/unipolar	0				Sphere of action, function block PCTRL1 Output value is limited to -100 ... 100 %		
			0	Bipolar				
			1	Unipolar		Output value is limited to 0 ... 100 %		
C0338	ARIT1 funct	1	0	OUT = IN1			Selection of function, function block ARIT1	See System Manual (extension)
			1	OUT = IN1 + IN2				
			2	OUT = IN1 - IN2				
			3	OUT = IN1 * IN2				
			4	OUT = IN1 / IN2				
			5	OUT = IN1 / (100 - IN2)				
C0339			📖 Selection list 1			Configuration of analog input signals, function block ARIT1		
	1 CFG: IN	1000	FIXED0%			ARIT1-IN1		
	2 CFG: IN	1000	FIXED0%			ARIT1-IN2		
C0340			-199.99	{0.01 %}		199.99	Function block ARIT1 Display of the signals linked in C0339	
	1 DIS: IN					ARIT1-IN1		
	2 DIS: IN					ARIT1-IN2		
C0350	CAN address	1	1	{1}		63	System bus node address Change is effective after "Reset node" command	
C0351	CAN baudrate	0	0	500 kbit/s			System bus baud rate Change is effective after "Reset node" command	
			1	250 kbit/s				
			2	125 kbit/s				
			3	50 kbit/s				
			4	1000 kbit/s				

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0352	CAN mst	0	0 Slave	Configuration of the system bus nodes ● Change is effective after "Reset node" command	
			1 Master		
C0353			0 C0350 is the source	Source of the system bus address	
			1 C0354 is the source		
	1 CAN addr sel1	0		CAN IN1, CAN-OUT1	
	2 CAN addr sel2	0		CAN IN2, CAN-OUT2	
	3 CAN addr sel3	0		CAN IN3, CAN-OUT3	
C0354			1 {1} 512	Selective system bus address ● Individual addressing of the system bus process data objects	
	1 IN1 addr 2	129		CAN-IN1	
	2 OUT1 addr 2	1		CAN-OUT2	
	3 IN2 addr 2	257		CAN-IN2	
	4 OUT2 addr 2	258		CAN-OUT2	
	5 IN3 addr 2	385		CAN-IN3	
	6 OUT3 addr 2	386		CAN-OUT3	
C0355			0 {1} 2047	System bus identifier ● Read only	
	1 CAN-IN1 Id				
	2 CAN-OUT1 Id				
	3 CAN-IN2 Id				
	4 CAN-OUT2 Id				
	5 CAN-IN3 Id				
	6 CAN-OUT3 Id				
C0356			0 {1 ms} 65000	System bus time settings	
	1 CAN boot-up	3000		Required for CAN interconnection without master	
	2 OUT2 cycle	0		0 = event-controlled process data transfer	
	3 OUT3 cycle	0		>0 = cyclic process data transfer	
	4 CAN delay	20		When the NMT state "Operational" (after "Pre-operational" or "Stopped") has been reached, the delay time "CANdelay" is started. After the delay time has elapsed, the PDO's CAN-OUT2 and CAN-OUT3 are sent for the first time.	
C0357			0 {1 ms} 65000	System bus monitoring times ● After a fault message, the CAN objects remain in receive mode	
	1 CE1monit time	3000		CAN-IN1	
	2 CE2monit time	3000		CAN-IN2	
	3 CE3monit time	3000		CAN-IN3	
C0358	Reset node	0	0 No function	Set the nodal reset point of the system bus	
			1 CAN reset		
C0359	CAN state		0 Operational	System bus status ● Read only	
			1 Pre-operational		
			2 Warning		
			3 Bus off		

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0360			0 65535	Telegram counter - Read only - For count values > 65535 the counter starts at 0
1	Message OUT			All telegrams sent
2	Message IN			All telegrams received
3	Message OUT1			Telegrams sent on CAN-OUT1
4	Message OUT2			Telegrams sent on CAN-OUT2
5	Message OUT3			Telegrams sent on CAN-OUT3
6	Message POUT1			Telegrams sent on parameter channel1
7	Message POUT2			Telegrams sent on parameter channel2
8	Message IN1			Telegrams received from CAN-IN1
9	Message IN2			Telegrams received from CAN-IN2
10	Message IN3			Telegrams received from CAN-IN3
11	Message PIN1			Telegrams received from parameter channel1
12	Message PIN2			Telegrams received from parameter channel2
C0361			0 {1 %} 100	System bus load - Read only - For a perfect operation, the entire bus load (all nodes connected) should be less than 80 %
1	Load OUT			All telegrams sent
2	Load IN			All telegrams received
3	Load OUT1			Telegrams sent on CAN-OUT1
4	Load OUT2			Telegrams sent on CAN-OUT2
5	Load OUT3			Telegrams sent on CAN-OUT3
6	Load POUT1			Telegrams sent on parameter channel1
7	Load POUT2			Telegrams sent on parameter channel2
8	Load IN1			Telegrams received from CAN-IN1
9	Load IN2			Telegrams received from CAN-IN2
10	Load IN3			Telegrams received from CAN-IN3
11	Load PIN1			Telegrams received from parameter channel1
12	Load PIN2			Telegrams received from parameter channel2
C0364 	CFG: CAN activ	1000	FIXED0  Selection list 2	Configuration - digital input signal Switches the system bus via the external signal from "Pre-Operational" to "Operational"
C0365	DIS:CAN activ		0 Pre-Operational 1 Operational	System bus state Display only
C0366	Sync Response	1	0 No response 1 Response	Response to sync telegram of the master
C0367	Sync Rx ID	128	1 {1} 256	Receipt identifier (Rx) Sync Identifier for grouping for data transfer to CAN-IN1

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0368	Sync Tx ID	128	1	{1}	256	Transmission identifier (Tx) ● Identifier for generating a sync telegram	
C0369	Sync Tx Time	0	0	{1}	65000	Sync transmission time (Tx) ● Transmission interval for the object set in C0368	
C0400	DIS: OUT		-199.99	{0.01 %}	199.99	Analog output signal, function block AIN1 ● Read only	See System Manual (extension)
C0402	CFG: OFFSET	19502	FCODE-26/1 Selection list 1			Configuration offset, function block AIN1 ● The offset is added to the input signal at AIN1-IN	
C0403	CFG: GAIN	19504	FCODE-27/1 Selection list 1			Configuration of gain, function block AIN1 ● The gain is multiplied by the input signal at AIN1-IN	
C0404			-199.99	{0.01 %}	199.99	Function block AIN1 ● Display of the signals linked in C0402 and C0404	
	1 DIS: OFFSET						
	2 DIS: GAIN						
C0405	DIS: OUT		-199.99	{0.01 %}	199.99	Analog output signal, function block AIN2 ● Read only	See System Manual (extension)
C0407	CFG: OFFSET	19503	FCODE-26/2 Selection list 1			Configuration of offset, function block AIN2 ● The offset is added to the input signal at AIN2-IN	
C0408	CFG: GAIN	19505	FCODE-27/2 Selection list 1			Configuration of gain, function block AIN2 ● The gain is multiplied by the input signal at AIN2-IN	
C0409			-199.99	{0.01 %}	199.99	Function block AIN2 ● Display of the signals linked in C0407 and C0408	
	1 DIS: OFFSET						
	2 DIS: GAIN						
C0420	Encoder const	512	1	{1 inc/rev}	8192	Number of increments for incremental encoder at X8 or X9 ● Connect incremental encoders with HTL-level on X9 only	6.7-1
C0421	Enc voltage	5.00	5.00	{0.1 V}	8.00	Supply voltage for the incremental encoder at X8 CAUTION! A wrong entry can destroy the incremental encoder!	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0425	DFIN const	3	0 256 inc/rev 1 512 inc/rev 2 1024 inc/rev 3 2048 inc/rev 4 4096 inc/rev 5 8192 inc/rev 6 16384 inc/rev	Constant of the master frequency input, function block DFIN • Output signal at the connected encoder or at the upstream controller in the event of a master frequency cascade/master frequency bus
C0426	DIS: OUT		-36000 {1 rpm} 36000	Output signal of the master frequency input, function block DFIN • Display only
C0427	DFIN function	0	0 2-phase 1 A pulse/B dir 2 Pulse A or B	Function of the master frequency input, function block DFIN • Phase-displaced signal sequence • Control of direction of rotation via track B • Control of speed and direction of rotation via track A or track B
C0431 	CFG: IN	5001	MCTRL-NACT Selection list 1	Configuration of analog input signal, function block AOUT1 • Signal at AOUT1-IN is output to terminal X6/62
C0432 	CFG: OFFSET	19512	FCODE-109/1 Selection list 1	Configuration of offset, function block AOUT1 • the offset is added to the input signal at AOUT1-IN
C0433 	CFG: GAIN	19510	FCODE-108/1 Selection list 1	Configuration of gain, function block AOUT1 • The gain is multiplied by the input signal at AOUT1-IN
C0434	1 DIS: IN 2 DIS: OFFSET 3 DIS: GAIN		-199.99 {0.01 %} 199.99	Function block AOUT1 • Display of the signals linked in C0431, C0432 and C0433
C0436 	CFG: IN	5002	MCTRL-MSET2 Selection list 1	Configuration of analog input signal, function block AOUT2 • Signal at AOUT2-IN is output to terminal X6/63
C0437 	CFG: OFFSET	19513	FCODE-109/2 Selection list 1	Configuration of offset, function block AOUT2 • The offset is added to the input signal at AOUT2-IN
C0438 	CFG: GAIN	19511	FCODE-108/2 Selection list 1	Configuration of gain, function block AOUT2 • The gain is multiplied by the input signal at AOUT2-IN
C0439	1 DIS: IN 2 DIS: OFFSET 3 DIS: GAIN		-199.99 {0.01 %} 199.99	Function block AOUT2 • Display of the signals linked in C0436, C0437 and C0438

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0443	DIS: DIGIN-OUT		0 {1} 255	Terminal signals, function block DIGIN	See System Manual (extension)
				- Read only - Binary interpretation of the terminal signals at X5	
			Bit Assignment		
			0 DIGIN1	X5/E1	
			1 DIGIN2	X5/E2	
			2 DIGIN3	X5/E3	
			3 DIGIN4	X5/E4	
			4 DIGIN5	X5/E5	
			5 ST-DIGIN6	X5/ST	
			6 DIGIN-CINH	X5/28	
C0444			0 LOW signal	Terminal signals, function block DIGOUT	See System Manual (extension)
			1 HIGH signal		
	DIS: DIGOUT1		Bit Assignment	X5/A1	
	DIS: DIGOUT2		0 DIGIN1	X5/A2	
	DIS: DIGOUT3		1 DIGIN2	X5/A3	
	DIS: DIGOUT4		2 DIGIN3	X5/A4	
C0450 	CFG: NX	1000	FIXED0%  Selection list 1	Configuration of analog input signal, function block BRK1	See System Manual (extension)
				Speed threshold, from which the drive may output the signal "Close brake"	
C0451 	CFG: SET	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block BRK1	
				- HIGH = close brake - LOW = open brake	
C0452 	CFG: SIGN	1000	FIXED0%  Selection list 1	Configuration of analog input signal, function block BRK1	
				Direction of torque with which the drive is to create a torque against the brake	
C0458			-199.99 {0.01 %} 199.99	Function block BRK1	See System Manual (extension)
1	DIS: NX			Display of the signals linked in C0450 and C0452	
2	DIS: SIGN				
C0459	DIS: ON			Function block BRK1	
				Display of the signal linked in C0451	
C0464	Customer I/F		0 original	Customer interface indicates the status of the selected basic configuration	
			1 changed		
				- Reassignment of terminals in a basic configuration does not change C0005 and sets C0464 = 1 - Adding or removing function blocks or changing the signal flow among the function blocks in a basic configuration sets C0005 = 0 and C0464 = 1	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0465		→	📖 Selection list 5		Function block - processing list - Defining the sequence in which the function blocks are to be processed internally → Depending on C0005. Changing C0005 loads assigned processing list → The displayed values apply to C0005 = 1000 - After changing the signal flow, adapt the processing list in any case. Otherwise the controller may use the wrong signals! - The function blocks DIGIN, DIGOUT, AIF-IN, CAN-IN, and MCTRL are always processed and do not have to be entered in the list	
STOP	1 FB list	200	DFIN			
	2 FB list	0				
	3 FB list	50	AIN1			
	4 FB list	0				
	5 FB list	0				
	6 FB list	55	AIN2			
	7 FB list	0				
	8 FB list	0				
	9 FB list	10250	R/L/Q			
	10 FB list	0				
	... ..	0				
	14 FB list	0				
	15 FB list	5250	NLIM1			
	16 FB list	5050	NSET			
	... ..	0				
	19 FB list	5700	ANEG1			
	... ..	0				
	22 FB list	10650	CMP1			
	... ..	0				
	25 FB list	70	AOUT1			
	... ..	0				
	28 FB list	75	AOUT2			
	... ..	0				
	31 FB list	250	DFOUT			
	... ..	0				
	41 FB list	25000	AIF-OUT			
	42 FB list	20000	CAN-OUT			
		...				
	50 FB list	0				
C0466	CPU T remain				Remaining process time for processing the function blocks Display only	
C0469	Fct STP key	2	0	inactive	Inactive	Determines the function which is released when pressing STOP on the keypad Changes are only active after mains connection!
STOP			1	CINH	Inhibit controller:	
			2	qsp	Quick stop	
C0470			0	{1}	255	Configuration of free control codes for digital signals The data words C0470 and C0471 are in parallel and are identical.
	1 FCODE 8 Bit	0			FCODE bit 0-7	
	2 FCODE 8 Bit	0			FCODE bit 8-15	
	3 FCODE 8 Bit	0			FCODE bit 16-23	
	4 FCODE 8 Bit	0			FCODE bit 24-31	
C0471	Configuration of input FCODE 32 Bit	0	0	{1}	4294967296	Free control code for digital signals The data words C0470 and C0471 are in parallel and are identical.

Code		Possible settings			IMPORTANT			
No.	Name	Lenze	Selection					
C0472			-199.99	{0.01 %}	199.99	Configuration of free control codes for analog signals		
1	FCODE analog	0.00						
2	FCODE analog	0.00						
3	FCODE analog	100.0 0						
6	FCODE analog	0.00						
...	...	0.00						
20	FCODE analog	0.00						
C0473			-32767	{1}	32767	Configuration of free control codes for absolute analog signals		
1	FCODE abs	1						
2	FCODE abs	1						
3	FCODE abs	0						
...	...	0						
10	FCODE abs	0						
C0474			-2147483647	{1}	2147483647	Configuration of free control codes for phase signals ● 1 rev. = 65536 inc		
1	FCODE PH	0						
...	...	0						
5	FCODE PH	0						
C0475			-16000	{1}	16000	Configuration of free control codes for phase difference signals ● 1 rev. = 65536 inc		
1	FCODE DF	0						
2	FCODE DF	0						
C0497	Nact filter	2.0	0.0	{0.1 ms}	50.0	Filter time constant N _{act} for actual speed value, function block MCTRL2 ● Internal filtering of the speed signal for control ● C0497 = 0 ms: Switched off	8.2-40	
C0510	CFG: IN1	50	AIN1-OUT	Selection list 1		Configuration of analog input signal, function block NLIM1 ● Input for analog speed setpoint		See System Manual (extension)
C0511	DIS: IN1		-199.99	{0.01 %}	199.99	Function block NLIM1 ● Display of the input signal configured in C0510		

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0517 ENTER			0.00	{0.01 } 1999.00	• The user menu contains in the Lenze setting the most important codes for commissioning the operating mode "V/f characteristic control • With an active password protection only the codes entered in C0517 can be freely accessed • Enter the numbers of the required codes in the subcodes • The input is done in the format xxx.yy – xxx: Code number – yy: Subcode number • It is not checked whether the entered code exists.
1	User menu	51.00	Actual speed value (MCTRL-NACT)		
2	User menu	54.00	Actual motor current (MCTRL-IACT)		
3	User menu	56.00	Torque setpoint (MCTRL-MSET2)		
4	User menu	64.00	Device utilisation Ixt		
5	User menu	183.0 0	Diagnostics		
6	User menu	168.0 1	History buffer		
7	User menu	39.01	JOG-setpoints 1 (NSET)		
8	User menu	86.00	Motor type selection		
9	User menu	148.0 0	Identifying motor parameters		
10	User menu	22.00	I _{max} limit in motor mode		
11	User menu	23.00	I _{max} limit in generator mode		
12	User menu	11.00	Maximum speed N _{max}		
13	User menu	12.00	Acceleration time T _{ir} main setpoint		
14	User menu	13.00	Deceleration time T _{if} main setpoint		
15	User menu	16.00	U _{min} boost		
16	User menu	70.00	Gain V _p speed controller		
17	User menu	71.00	Integral-action time T _n speed controller		
18	User menu	75.00	Gain V _p current controller		
19	User menu	76.00	Integral-action time T _n current controller		
20	User menu	142.0 0	Starting condition		
21	User menu	92.00	Motor stator inductance		
22	User menu	36.00	DC braking current		
23	User menu	93.00	Controller identification		
24	User menu	99.00	Software version		
...	...	0	Not assigned		
31	User menu	94.00	Password		
32	User menu	3.00	Save parameter set		

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0520 STOP	CFG: IN	1000	FIXEDPHI-0 Selection list 4	Configuration of input signal, function block DFSET ● Input of speed / phase setpoint signal 8.2-18
C0521 STOP	CFG: VP-DIV	1000	FIXED0% Selection list 1	
C0522 STOP	CFG: RAT-DIV	1000	FIXED0% Selection list 1	
C0523 STOP	CFG: A-TRIM	1000	FIXED0% Selection list 1	
C0524 STOP	CFG: N-TRIM	1000	FIXED0% Selection list 1	
C0525 STOP	CFG: 0-PULSE	1000	FIXED0 Selection list 2	
C0526 STOP	CFG: RESET	1000	FIXED0 Selection list 2	
C0527 STOP	CFG: SET	1000	FIXED0 Selection list 2	Configuration of digital input signal, function block DFSET ● HIGH = Set phase integrators to equal values ● LOW-HIGH edge sets DFSET-PSET = 0 ● HIGH-LOW edge sets DFSET-PSET to the current value of MCTRL-PHI-SET ● DFSET-SET has a higher priority than DFSET-RESET
C0528			-2·10 ⁹ {1} 2·10 ⁹	Function block DFSET ● Display only 8.2-18 Phase difference between two zero pulses Offset = C0523 × C0529 + C0252
1	DIS: 0-pulse A			
2	DIS: Offset			

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0529	Multip offset	1	-20000 {1} 20000			Offset multiplier, function block DFSET ● Multiplier for the phase offset (C0252)	 8.2-18
C0530	DF evaluation	0	0	with factor	With gearbox factor	Master frequency evaluation, function block DFSET ● Evaluation of the setpoint integrator	
			1	no factor	Without gearbox factor		
C0531	Act 0 div	1	1 {1} 16384			Actual zero pulse divisor, function block DFSET	
C0532	0-pulse/TP	1	1	0-pulse	Index pulse	Zero pulse / touch probe, function block DFSET ● Zero pulse of the feedback system or touch probe	 8.2-18
			2	Touch probe	Touch probe		
C0533	Vp denom	1	1 {1} 32767			Gain factor of denominator V _p , function block DFSET	
C0534	0 pulse fct	0				Zero pulse function, function block DFSET ● Synchronising the drive	 8.2-18
			0	inactive	Inactive		
			1	Continuous	Continuous synchronisation, correction in the shortest possible way		
			2	Cont. switch	Continuous synchronisation, correction in the shortest possible way	After a LOW-HIGH signal to DFSET-0-pulse, the zero track is synchronised once	
			10	Once, fast way	One-time synchronisation, correction in the shortest possible way		
			11	Once, CW	One-time synchronisation, correction in direction of rotation to the right		
			12	Once, CCW	One-time synchronisation, correction in direction of rotation to the left		
			13	Once, 2*0-pulse	One-time synchronisation, correction is detected from setpoint pulse and actual pulse and corrected to the corresponding direction		
C0535	Set 0 div	1	1 {1} 16384			Desired zero pulse divisor, function block DFSET	 8.2-18

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0536			-32767	{1}	32767	Function block DFSET Display of the signals linked in C0521, C0522 and C0523  8.2-18	
1	DIS: VP-DIV						
2	DIS: RAT-DIV						
3	DIS: A-TRIM						
C0537	DIS: N-TRIM		-199.99	{0.01 %}	199.99	Function block DFSET Display of the signal linked in C0524	
C0538			0		1	Function block DFSET Display of the signals linked in C0525, C0526 and C0527	
1	DIS: 0-pulse						
2	DIS: RESET						
3	DIS: SET						
C0539	DIS: IN		-6000	{1 rpm}	6000	Function block DFSET Display of the signal linked in C0520	
C0540 	Function	0				 8.2-8	
			0	Analog input	Analog input		Signal at DFOUT-AN-IN is output. Zero track can be input externally.
			1	PH diff input	Phase difference input		Signal at DFOUT-DF-IN is output. Zero track can be input externally.
			2		Not assigned		
			3		Not assigned		
			4	X10 = X9	X9 is output on X10		The input signals are buffered C0030 is without function
			5	X10 = X8	X8 is output on X10		
C0541 	CFG: AN-IN	5001	MCTRL-NACT	 Selection list 1		Configuration of analog input signal, function block DFOUT Signal in [%] of C0011	
C0542 	CFG: DF-IN	1000	FIXEDPHI-0	 Selection list 4		Configuration of input signal, function block DFOUT Speed signal	
C0544 	CFG: SYN-RDY	1000	FIXED0	 Selection list 2		Configuration of digital input signal, function block DFOUT DFOUT-SYN-RDY = HIGH: Generating a zero pulse	
C0545	PH offset	0	0	{1 inc.}	65535	Phase offset, function block DFOUT - Displacing the zero pulse generated via DFOUT-SYN-RDY by up to 360 ° 1 rev. = 65535 inc (360 °)	
C0546	Min inc/rev	1000	1	{1 inc.}	2147483647	Masking of the touch probe signal, function block DFSET - Suppressing interference pulses at X5/E4 (actual pulse of touch probe signal) - The size of the masking window between two actual pulses is set  8.2-18	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0547	DIS: AN-IN		-199.99	{0.01 %} 199.99	Function block DFOUT ● Display of the signal linked in C0541	8.2-8
C0548	DIS: SYN-RDY		0	1	Function block DFOUT ● Display of the signal linked in C0544	
C0549	DIS: DF-IN		-32767	{1 rpm} 32767	Function block DFOUT ● Display of the signal linked in C0542	
C0560			-199.99	{0.01 %} 199.99	Configuration of fixed setpoints, function block FIXSET1 ● Output of the setpoints to FIXSET1-OUT via binary coding of the inputs FIXSET1-IN1 ... FIXST1-IN4	See System Manual (extension)
1	Fix set-value	100				
2	Fix set-value	75				
3	Fix set-value	50				
4	Fix set-value	25				
5	Fix set-value	0				
...	...	0				
15	Fix set-value	0				
C0561	CFG: AIN	1000	FIXED0%	📖 Selection list 1	Configuration of analog input signal, function block FIXSET1 ● The analog input signal is switched to FIXSET1-OUT if all inputs FIXSET-INx = LOW	
C0562				📖 Selection list 2	Configuration of digital input signals, function block FIXSET1 ● The number of inputs to be assigned depend on the number of the fixed setpoints required.	
1	CFG: IN	1000	FIXED0		FIXSET1-IN1	
2	CFG: IN	1000	FIXED0		FIXSET1-IN2	
3	CFG: IN	1000	FIXED0		FIXSET1-IN3	
4	CFG: IN	1000	FIXED0		FIXSET1-IN4	
C0563	DIS: AIN		-199.99	{0.01 %} 199.99	Function block FIXSET1 ● Display of the signal linked in C0561	
C0564			0	1	Function block FIXSET1 ● Display of the signals linked in C0562/1, C0562/2, C0562/3 and C0562/4	
1	DIS: IN				FIXSET1-IN1	
2	DIS: IN				FIXSET1-IN2	
3	DIS: IN				FIXSET1-IN3	
4	DIS: IN				FIXSET1-IN4	
C0570	CFG: IN	1000	FIXED0%	📖 Selection list 1	Configuration of analog input signal, function block S&H1	See System Manual (extension)
C0571	CFG: LOAD	1000	FIXED0	📖 Selection list 2	Configuration of digital input signal, function block S&H1	
C0572	DIS: IN		-199.99	{0.01 %} 199.99	Function block S&H1 ● Display of the signal linked in C0570	
C0573	DIS: LOAD		0	1	Function block S&H1 ● Display of the signal linked in C0571	
C0581	MONIT EEr	0	0	TRIP	Configuration monitoring EEr, external fault	See System Manual (extension)
			1	Message		
			2	Warning		
			3	Off		

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0582	MONIT OH4	2	2 Warning	Configuration monitoring OH4, heatsink temperature ● The operating temperature can be set in C0122	See System Manual (extension)
			3 Off		
C0583	MONIT OH3	3	0 TRIP	Configuration of motor temperature monitoring with fixed operating temperature ● Only for KTY at X8 ● The operating temperature is fixed at 150 °C	6.6-10 See System Manual (extension)
			2 Warning		
			3 Off		
C0584	MONIT OH7	3	2 Warning	Configuration of monitoring motor temperature with variable operating temperature ● Only for KTY at X8 ● When reaching the temperature set in C0121 the warning OH7 is activated	6.6-10 See System Manual (extension)
			3 Off		
C0585	MONIT OH8	3	0 TRIP	Configuration of motor temperature monitoring ● Temperature monitoring via PTC input (T1, T2)	6.6-8 See System Manual (extension)
			2 Warning		
			3 Off		
C0587	MONIT SD3	3	0 TRIP	Configuration of monitoring SD3, encoder at X9 ● Monitors the voltage supply at X9/pin 8	See System Manual (extension)
			2 Warning		
			3 Off		
C0588	MONIT H10/H11	0	0 TRIP	Configuration of monitoring H10 and H11, thermal sensors in the controller ● H10: Sensor error - heatsink temperature ● H11: Sensor error - interior temperature	See System Manual (extension)
			3 Off		
C0591	MONIT CE1	3	0 TRIP	Configuration of monitoring CE1, communication error at CAN-IN1	See System Manual (extension)
			2 Warning		
			3 Off		
C0592	MONIT CE2	3	0 TRIP	Configuration of monitoring CE2, communication error at CAN-IN2	
			2 Warning		
			3 Off		
C0593	MONIT CE3	3	0 TRIP	Configuration of monitoring CE3, communication error at CAN-IN3	
			2 Warning		
			3 Off		
C0594	MONIT SD6	3	0 TRIP	Activation of the motor temperature monitoring with KTY at X8 ● Use C0594 = 0 or 2 to activate monitoring ● In case of a short circuit or interruption at X8/5 and X8/8 the fault message SD6 is activated ● Configuration of the response when exceeding the motor temperature – Fixed operating temperature in C0583 – Variable operating temperature in C0584	6.6-10 See System Manual (extension)
			2 Warning		
			3 Off		

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C0595	MONIT CE4	3	0	TRIP		Configuration of monitoring CE4, BUS-OFF (system bus)	See System Manual (extension)	
			2	Warning				
			3	Off				
C0596	NMAX limit	4000	0	{1 rpm}		36000	Configuration of monitoring N _{max} , maximum system speed exceeded	See System Manual (extension)
C0597	MONIT LP1	3	0	TRIP		Configuration of monitoring the motor phases LP1	See System Manual (extension)	
			2	Warning				
			3	Off				
C0598	MONIT SD5	3	0	TRIP		Configuration of monitoring SD5, open circuit at analog input X6/1, X6/2	See System Manual (extension)	
			2	Warning				
			3	Off				
C0599	Limit LP1	5.0	1.0	{0.1 %}		10.0	Configuration of current limit LP1, current limit value for monitoring the motor phases in C0597	See System Manual (extension)
C0600	Function	1	0	OUT = IN1		Function selection, function block ARIT2	See System Manual (extension)	
			1	OUT = IN1 + IN2				
			2	OUT = IN1 - IN2				
			3	OUT = IN1 * IN2				
			4	OUT = IN1 / IN2				
			5	OUT = IN1 / (100 - IN2)				
C0601			📖 Selection list 1				Configuration of analog input signal, function block ARIT2	
1	CFG: IN	1000	FIXED0%				ARIT2-IN1	
2	CFG: IN	1000	FIXED0%				ARIT2-IN2	
C0602			-199.99	{0.01 %}	199.99	Function block ARIT2	See System Manual (extension)	
						• Display of the signals linked in C0601		
1	DIS: IN					ARIT2-IN1		
2	DIS: IN					ARIT2-IN2		
C0603	Function	1	0	OUT = IN1		Function selection, function block ARIT3	See System Manual (extension)	
			1	OUT = IN1 + IN2				
			2	OUT = IN1 - IN2				
			3	OUT = IN1 * IN2				
			4	OUT = IN1 / IN2				
			5	OUT = IN1 / (100 - IN2)				
C0604			📖 Selection list 1				Configuration of analog input signal, function block ARIT3	
1	CFG: IN	1000	FIXED0%				ARIT3-IN1	
2	CFG: IN	1000	FIXED0%				ARIT3-IN2	
C0605			-199.99	{0.01 %}	199.99	Function block ARIT3	See System Manual (extension)	
						• Display of the signals linked in C0604		
1	DIS: IN					ARIT3-IN1		
2	DIS: IN					ARIT3-IN2		
C0606	MONIT OC8	2	0	TRIP		Configuration of the I ² × t advance warning The threshold is set in C0127.		
			2	Warning				
			3	Off				
C0608	CFG: IN	1000	FIXED0%				📖 Selection list 1	See System Manual (extension)
							Configuration of analog input signal, function block SQRT1	
C0609	DIS: IN		-199.99	{0.01 %}	199.99	Function block SQRT1	See System Manual (extension)	
						• Display of the signal linked in C0608		

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0610 STOP			Selection list 1		Configuration of analog input signals, function block ADD1	See System Manual (extension)	
1	CFG: IN	1000	FIXED0%		Addition input ADD1-IN1		
2	CFG: IN	1000	FIXED0%		Addition input ADD1-IN2		
3	CFG: IN	1000	FIXED0%		Subtraction input ADD1-IN3		
C0611			-199.99	{0.01 %}	199.99	Function block ADD1	
1	DIS: IN					Display of the signals linked in C0610	
2	DIS: IN					ADD1-IN1	
3	DIS: IN					ADD1-IN2	
C0612 STOP			Selection list 1		Configuration of analog input signals, function block ADD2	See System Manual (extension)	
1	CFG: IN	1000	FIXED0%		Addition input ADD2-IN1		
2	CFG: IN	1000	FIXED0%		Addition input ADD2-IN2		
3	CFG: IN	1000	FIXED0%		Subtraction input ADD2-IN3		
C0613			-199.99	{0.01 %}	199.99	Function block ADD2	
1	DIS: IN					Display of the signals linked in C0612	
2	DIS: IN					ADD2-IN1	
3	DIS: IN					ADD2-IN2	
C0620	DB1 gain	1.00	-10.00	{0.01 }	10.00	Gain, function block DB1	See System Manual (extension)
C0621	DB1 value	1.00	0.00	{0.01 %}	100.00	Dead band, function block DB1	
C0622 STOP	CFG: IN	1000	FIXED0%		Selection list 1	Configuration of analog input signal, function block DB1	
C0623	DIS: IN		-199.99	{0.01 %}	199.99	Function block DB1	
C0630	Max limit	100.0 0	-199.99	{0.01 %}	199.99	Upper limit, function block LIM1	See System Manual (extension)
C0631	MiN limit	-100.0	-199.99	{0.01 %}	199.99	The analog input signal is limited to the set value	
C0632 STOP	CFG: IN	1000	FIXED0%		Selection list 1	Configuration of analog input signal, function block LIM1	
C0633	DIS: IN		-199.99	{0.01 %}	199.99	Function block LIM1	
						Display of the signal linked in C0632	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0640	Delay T	20.00	0.01	{0.01 s}	50.00	Time constant, function block PT1-1 Time period by which the output of analog signal is delayed	See System Manual (extension)
C0641	CFG: IN	1000	FIXED0%	📖 Selection list 1		Configuration of analog input signal, function block PT1-1	
C0642	DIS: IN		-199.99	{0.01 %}	199.99	Function block PT1-1 Display of the signal linked in C0641	
C0643	Delay T	20.00	0.01	{0.01 s}	50.00	Time constant, function block PT1-2 Time period by which the output of analog signal is delayed	
C0644	CFG: IN	1000	FIXED0%	📖 Selection list 1		Configuration of analog input signal, function block PT1-2	
C0645	DIS: IN		-199.99	{0.01 %}	199.99	Function block PT1-2 Display of the signal linked in C0644	See System Manual (extension)
C0650	DT1-1 gain	1.00	-320.00	{0.01 }	320.00	Gain, function block DT1-1 Gain of the analog input signal	
C0651	Delay T	1.000	0.005	{0.01 s}	5.000	Time constant, function block DT1-1 Time period by which the output of analog signal is delayed	
C0652	CFG: IN	1000	FIXED0%	📖 Selection list 1		Configuration of analog input signal, function block DT1-1	
C0653	Sensibility	1	1	15 bits		Input sensitivity, function block DT1-1 According to the setting only the indicated higher-order bits are evaluated	
			2	14 bits			
			3	13 bits			
			4	12 bits			
			5	11 bits			
			6	10 bits			
			7	9 bits			
C0654	DIS: IN		-199.99	{0.01 %}	199.99	Function block DT1-1 Display of the signal linked in C0652	See System Manual (extension)
C0655	Numerator	1	-32767	{1}	32767	Configuration of conversion factor with numerator and denominator, function block CONV5	
C0656	Denominator	1	1	{1}	32767	$\text{OUT [rpm]} = \text{IN [\%]} \cdot \frac{15000 \text{ rpm}}{100 \%} \cdot \frac{\text{C0655}}{\text{C0656}}$	
C0657	CFG: IN	1000	FIXED0%	📖 Selection list 1		Configuration of analog input signal, function block CONV5	See System Manual (extension)
C0658	DIS: IN		-199.99	{0.01 %}	199.99	Function block CONV5 Display of the signal linked in C0657	
C0661	CFG: IN	1000	FIXED0%	📖 Selection list 1		Configuration of analog input signal, function block ABS1 Converts bipolar signals into unipolar signals	
C0662	DIS: IN		-199.99	{0.01 %}	199.99	Function block ABS1 Display of the signal linked in C0661	

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C0671	RFG1 Tir	0.00	0.00	{0.01 s}	999.90	Acceleration time T _{ir} and deceleration time T _{if} , function block RFG1 Acceleration and deceleration ramp	See System Manual (extension)	
C0672	RFG1 Tif	0.00	0.00	{0.01 s}	999.90			
C0673 STOP	CFG: IN	1000	FIXED0% 📖 Selection list 1					Configuration of analog input signal, function block RFG1 Selection of a final value at RFG1-OUT
C0674 STOP	CFG: SET	1000	FIXED0% 📖 Selection list 1					Configuration of analog input signal, function block RFG1 Selection of a starting value at RFG1-OUT
C0675 STOP	CFG: LOAD	1000	FIXED0 📖 Selection list 2					Configuration of digital input signal, function block RFG1 - HIGH: RFG1-OUT is set to the value at RFG1-Set - LOW: The signal at RFG1-OUT travels along the ramps towards the input value at RFG1-IN
C0676			-199.99	{0.01 %}	199.99	Function block RFG1 Display of the signals linked in C0673 and C0674		
	1 DIS: RFG1					RFG1-IN		
	2 DIS: RFG1					RFG1-SET		
C0677	DIS: LOAD		0		1	Function block RFG1 Display of the signal linked in C0675		
C0680	Function	1	1 IN1 = IN 2			Function selection, function block CMP1 Compare input signals at CMP1-IN1 and CMP1-IN2	See System Manual (extension)	
			2 IN1 > IN2					
			3 IN1 < IN2					
			4 |IN1IN2|					
			5 |IN1IN2|					
			6 |IN1IN2|					
C0681	Hysteresis	1.00	0.00	{0.01 %}	100.00	Hysteresis, function block CMP1 Hysteresis for input signals which are not stable and hence the output oscillates		
C0682	Window	1.00	0.00	{0.01 %}	100.00	Window, function block CMP1 Set the range in which the signal comparison is to be apply		
C0683 STOP			📖 Selection list 1			Configuration of analog input signal, function block CMP1		
	1 CFG: IN	5001	MCTRL-NACT			CMP1-IN1		
	2 CFG: IN	19500	FCODE-17			CMP1-IN2		
C0684			-199.99	{0.01 %}	199.99	Function block CMP1 Display of the signals linked in C0683		
	1 DIS: IN					CMP1-IN1		
	2 DIS: IN					CMP1-IN2		

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0685	Function	1	1	IN1 = IN 2	Function selection, function block CMP2	See System Manual (extension)	
			2	IN1 > IN2			
			3	IN1 < IN2			
			4	|IN1IN2|			
			5	|IN1IN2|			
			6	|IN1IN2|			
C0686	Hysteresis	1.00	0.00	{0.01 %}	100.00	Hysteresis, function block CMP2	
C0687	Window	1.00	0.00	{0.01 %}	100.00	Window, function block CMP2	
C0688						📖 Selection list 1	Configuration of analog input signal, function block CMP2
1	CFG: IN	1000	FIXED0%		CMP2-IN1		
2	CFG: IN	1000	FIXED0%		CMP2-IN2		
C0689			-199.99	{0.01 %}	199.99	Function block CMP2	
	1	DIS: IN				CMP2-IN1	
	2	DIS: IN				CMP2-IN2	
C0690	Function	1	1	IN1 = IN 2	Function selection, function block CMP3	See System Manual (extension)	
			2	IN1 > IN2			
			3	IN1 < IN2			
			4	|IN1IN2|			
			5	|IN1IN2|			
			6	|IN1| < |IN2|			
C0691	Hysteresis	1.00	0.00	{0.01 %}	100.00	Hysteresis, function block CMP3	
C0692	Window	1.00	0.00	{0.01 %}	100.00	Window, function block CMP3	
C0693						📖 Selection list 1	Configuration of analog input signal, function block CMP3
1	CFG: IN	1000	FIXED0%		CMP3-IN1		
2	CFG: IN	1000	FIXED0%		CMP3-IN2		
C0694			-199.99	{0.01 %}	199.99	Function block CMP3	
	1	DIS: IN				CMP3-IN1	
	2	DIS: IN				CMP3-IN2	
C0700	CFG: IN	19523	FCODE-472/3		📖 Selection list 1	Configuration of analog input signal, function block ANEG1	See System Manual (extension)
						• The value at ANEG1-IN is multiplied by -1 and output	
C0701	DIS: IN		-199.99	{0.01 %}	199.99	Function block ANEG1	
						• Display of the signal linked in C0700	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0703 	CFG: IN	19523	FCODE-472/3  Selection list 1		Configuration of analog input signal, function block ANEG2 The value at ANEG2-IN is multiplied by -1 and output	See System Manual (extension)
C0704	DIS: IN		-199.99	{0.01 %} 199.99	Function block ANEG2 Display of the signal linked in C0703	
C0705	Function	1	1	IN1 = IN 2	Function selection, function block CMP4 Compare input signals at CMP4-IN1 and CMP4-IN2	See System Manual (extension)
			2	IN1 > IN2		
			3	IN1 < IN2		
			4	|IN1| = |IN2|		
			5	|IN1| > |IN2|		
			6	|IN1| < |IN2|		
C0706	Hysteresis	1.00	0.00	{0.01 %} 100.00	Hysteresis, function block CMP4 Hysteresis for input signals which are not stable and hence the output oscillates	
C0707	Window	1.00	0.00	{0.01 %} 100.00	Window, function block CMP4 Set the range in which the signal comparison is to be apply	
C0708 			 Selection list 1		Configuration of analog input signal, function block CMP4	
1	CFG: IN	1000	FIXED0%		CMP4-IN1	
2	CFG: IN	1000	FIXED0%		CMP4-IN2	
C0709			-199.99	{0.01 %} 199.99	Function block CMP4 Display of the signals linked in C0708	
1	DIS: IN				CMP4-IN1	
2	DIS: IN				CMP4-IN2	
C0710	Function	0			Function selection, function block TRANS1	See System Manual (extension)
			0	Rising trans Rising edge	1. LOW-HIGH edge at TRANS1-IN switches TRANS1-OUT = HIGH 2. After the time has elapsed (C0711), TRANS1-OUT switches to LOW	
			1	Falling trans Falling edge	1. HIGH-LOW edge at TRANS1-IN switches TRANS1-OUT = HIGH 2. After the time has elapsed (C0711), TRANS1-OUT switches to LOW	
			2	Both trans Both edges	1. LOW-HIGH- or HIGH-LOW edge at TRANS1-IN switches TRANS1-OUT = HIGH 2. After the time has elapsed (C0711), TRANS1-OUT switches to LOW	
C0711	Pulse T	0.001	0.001	{0.001 s} 60.000	Pulse duration, function block TRANS1 After the time has elapsed, TRANS1-OUT switches to LOW	
C0713 	CFG: IN	1000	FIXED0  Selection list 2		Configuration of digital input signal, function block TRANS1	
C0714	DIS: IN		0	1	Function block TRANS1 Display of the signal linked in C0713	

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0715	Function	0				Function selection, function block TRANS2	See System Manual (extension)
			0	Rising trans	Rising edge	1. LOW-HIGH edge at TRANS2-IN switches TRANS2-OUT = HIGH 2. After the time has elapsed (C0716), TRANS2-OUT switches to LOW	
			1	Falling trans	Falling edge	1. HIGH-LOW edge at TRANS2-IN switches TRANS2-OUT = HIGH 2. After the time has elapsed (C0716), TRANS2-OUT switches to LOW	
			2	Both trans	Both edges	1. LOW-HIGH or HIGH-LOW edge at TRANS2-IN switches TRANS2-OUT = HIGH 2. After the time has elapsed (C0716), TRANS2-OUT switches to LOW	
C0716	Pulse T	0.001	0.001	{0.001 s}	60.000	Pulse duration, function block TRANS2 After the time has elapsed, TRANS2-OUT switches to LOW	
C0718	CFG: IN	1000	FIXED0	Selection list 2		Configuration of digital input signal, function block TRANS2	
C0719	DIS: IN		0	1		Function block TRANS2 Display of the signal linked in C0718	
C0720	Function	2				Function selection, function block DIGDEL1	See System Manual (extension)
			0	On delay	On delay	1. LOW-HIGH edge at DIGDEL1-IN starts a timing element 2. After the time has elapsed (C0721), DIGDEL1-OUT switches to HIGH	
			1	Off delay	Off delay	1. LOW-HIGH edge at DIGDEL1-IN starts a timing element and sets DIGDEL1-OUT = HIGH 2. After the time has elapsed (C0721), DIGDEL1-OUT switches to LOW	
			2	ON/OFF delay	On/off delay	1. LOW-HIGH or HIGH-LOW edge at DIGDEL1-IN starts a timing element 2. After the time has elapsed (C0721), DIGDEL1-OUT = DIGDEL1-IN	
C0721	Delay T	1.000	0.001	{0.001 s}	60.000	Delay time, function block DIGDEL1	
C0723	CFG: IN	1000	FIXED0	Selection list 2		Configuration of digital input signal, function block DIGDEL1	
C0724	DIS: IN		0	1		Function block DIGDEL1 Display of the signal linked in C0723	

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0725	Function	2				Function selection, function block DIGDEL2	See System Manual (extension)
			0	On delay	On delay	1. LOW-HIGH edge at DIGDEL2-IN starts a timing element 2. After the time has elapsed (C0726), DIGDEL2-OUT switches to HIGH	
			1	Off delay	Off delay	1. LOW-HIGH edge at DIGDEL2-IN starts a timing element and sets DIGDEL2-OUT = HIGH 2. After the time has elapsed (C0726), DIGDEL2-OUT switches to LOW	
			2	ON/OFF delay	On/off delay	1. LOW-HIGH or HIGH-LOW edge at DIGDEL2-IN starts a timing element 2. After the time has elapsed (C0726), DIGDEL2-OUT = DIGDEL2-IN	
C0726	Delay T	1.000	0.001	{0.001 s}	60.000	Delay time, function block DIGDEL2	
C0728	CFG: IN	1000	FIXED0	📖 Selection list 2		Configuration of digital input signal, function block DIGDEL2	
C0729	DIS: IN		0	1		Function block DIGDEL2 Display of the signal linked in C0728	
C0730	Mode	0	0	Stop measurement	Function block OSZ Starting / stopping the measured value recording		See System Manual (extension)
			1	Start measurement			
C0731	Status		0	Measurement completed	Oscilloscope function - Read only - Current operating status		
			1	Measurement active			
			2	Trigger detected			
			3	Abort			
			4	Abort after trigger			
			5	Read memory			
C0732			📖 Selection list 1			Configuration of analog input signals, function block OSZ	See System Manual (extension)
1	OSZ channel 1	1000	FIXED0%			Function block OSZ	
2	OSZ channel 2	1000	FIXED0%				
3	OSZ channel 3	1000	FIXED0%				
4	OSZ channel 4	1000	FIXED0%				
C0733			📖 Selection list 2			Configuration of digital input signal, function block OSZ	
1	Trigger input	1000	FIXED0				
C0734	Trigger source	1	0	OSZ trigger input	Function block OSZ Configure digital input C0732 or C0733 with desired trigger signal		See System Manual (extension)
			1	OSZ channel 1			
			2	OSZ channel 2			
			3	OSZ channel 3			
			4	OSZ channel 4			
C0735	Trigger level	0	-32767	{1}	32767	Function block OSZ Trigger level OSZ channel 1 ... OSZ channel 4	
C0736	Trigger edge	0	0	LOW-HIGH edge	Oscilloscope function		
			1	HIGH-LOW edge			
C0737	Trigger Delay	0.0	-100.0	{0.1 %}	999.99	Function block OSZ Setting of pretriggering and posttriggering	

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0738	Sampling period	3	3	1 ms	Oscilloscope function	See System Manual (extension)	
			4	2 ms			
			5	5 ms			
			6	10 ms			
			7	20 ms			
			8	50 ms			
			9	100 ms			
			10	200 ms			
			11	500 ms			
			12	1 s			
			13	2 s			
			14	5 s			
			15	10 s			
			16	20 s			
			17	50 s			
			18	1 min			
			19	2 min			
			20	5 min			
			21	10 min			
			C0739	Number of channels			4	1	{1}	4	Function block OSZ	See System Manual (extension)
● Switching on/off the channels							
– 1 = channel 1							
– 2 = channel 1 + 2							
– 3 = channel 1 ... 3							
– 4 = channel 1 ... 4							
C0740		0			Oscilloscope function		
					● Reading data memory		
1	Read start position	0	0	{1}	65535	● Provides a pointed access to a storage block	
2	Enable/inhibit data reading	0	0	No data reading			
			1	Data reading			
C0741	STATUS		0	1000000000		Function block OSZ	See System Manual (extension)
1	Version				● Read only		
2	Memory size						
3	Data width						
4	Number of channels						
C0742	Data block length	8	0	{1}	65536	Function block OSZ	
C0743	Read data block length (OSZ)		0	65535		Function block OSZ	
● Read only							
● Reading an 8 byte data block							
C0744	Memory depth	3	0	512 measured values	Oscilloscope function		
● Adapt memory capacity to the measurement task							

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0749			065535		Information about storing the measured values, function block OSZ ● Read only	See System Manual (extension)
1	Abort index				Measured value no. of the abort time	
2	Trigger index				Measured value no. of the trigger time	
3	End index				Measured value no. of the end time	
C0750	Vp denom	16	1	1	Gain V_p of the position controller, function block DFRFG1	 8.2-13
			2	1/2		
			4	1/4		
			8	1/8		
			16	1/16		
			32	1/32		
			64	1/64		
			128	1/128		
			256	1/256		
			512	1/512		
			1024	1/1024		
			2048	1/2048		
			4096	1/4096		
			8192	1/8192		
			16384	1/16384		
C0751	DFRFG1 Tir	1.000	0.001	{0.001 s}	999.999	 8.2-13
C0752	Max speed	3000	1	{1 rpm}	16000	
C0753	DFRFG1 QSP	0.000	0.000	{0.001 s}	999.900	
C0754	PH error	2·10 ⁹	10	{1}	2·10 ⁹	
C0755	Syn window	100	0	{1 inc.}	65535	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0758 	CFG: IN	1000	FIXEDPHI-0 Selection list 4	Configuration of input signal, function block DFRFG1 • Speed/phase setpoint signal Configuration of digital input signal, function block DFRFG1 • HIGH = quick stop active Configuration of input signal, function block DFRFG1 • HIGH = Status of the profile generator is maintained, setpoint is saved Configuration of input signal, function block DFRFG1 • HIGH = resetting the integrators Function block DFRFG1 • Display of the signals linked in C0759, C0760 and C0761 Function block DFRFG1 • Display of the signal linked in C0758
C0759 	CFG: QSP	1000	FIXED0 Selection list 2	
C0760 	CFG: STOP	1000	FIXED0 Selection list 2	
C0761 	CFG: RESET	1000	FIXED0 Selection list 2	
C0764			0 1	
1	DIS: QSP			Configuration of digital input signal, function block FLIP1 Configuration of digital input signal, function block FLIP1 • Each LOW-HIGH edge at FLIP1-CLK switches the signal at FLIP1-D to FLIP1-OUT Configuration of digital input signal, function block FLIP1 • Resets the flip-flop • HIGH: Sets FLIP1-OUT = LOW • Input has highest priority Function block FLIP1 • Display of the signals linked in C0770, C0771 and C0773 Configuration of digital input signal, function block FLIP2 Configuration of digital input signal, function block FLIP2 • Each LOW-HIGH edge at FLIP2-CLK switches the signal at FLIP2-D to FLIP2-OUT Configuration of digital input signal, function block FLIP2 • Resets the flip-flop • HIGH: sets FLIP2-OUT = LOW • Input has highest priority Function block FLIP2 • Display of the signals linked in C0775, C0776 and C0777
2	DIS: STOP			
3	DIS: RESET			
C0765	DIS: IN		-32767 {1 rpm} 32767	
C0770 	CFG: D	1000	FIXED0 Selection list 2	
C0771 	CFG: CLK	1000	FIXED0 Selection list 2	See System Manual (extension) See System Manual (extension) See System Manual (extension)
C0772 	CFG: CLR	1000	FIXED0 Selection list 2	
C0773			0 1	
1	DIS: D			
2	DIS: CLK			
3	DIS: CLR			
C0775 	CFG: D	1000	FIXED0 Selection list 2	See System Manual (extension) See System Manual (extension) See System Manual (extension)
C0776 	CFG: CLK	1000	FIXED0 Selection list 2	
C0777 	CFG: CLR	1000	FIXED0 Selection list 2	
C0778			0 1	
1	DIS: D			
2	DIS: CLK			
3	DIS: CLR			

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0780 	CFG: N	5250	NLIM1-OUT  Selection list 1	Configuration of analog input signal, function block NSET • Main setpoint Configuration of digital input signal, function block NSET • HIGH: main setpoint (C0780) is inverted Configuration of analog input signal, function block NSET • Additional setpoint Configuration of digital input signal, function block NSET • HIGH: additional setpoint (C0783) is inverted Configuration of analog input signal, function block NSET • The signal is accepted by the main setpoint integrator when the controller is inhibited Configuration of analog input signal, function block NSET • When NSET-LOAD = HIGH, the signal is accepted by the main setpoint integrator Configuration of digital input signal, function block NSET • HIGH: The signal at NSET-SET is accepted by the mains setpoint integrator • Control of both ramp function generators in special situations, e.g. quick stop
C0781 	CFG: N-INV	10251	R/L/Q-R/L  Selection list 2	
C0782 	CFG: NADD	55	AIN2-OUT  Selection list 1	
C0783 	CFG: NADD-INV	1000	FIXED0  Selection list 2	
C0784 	CFG: CINH-VAL	5001	MCTRL-NACT  Selection list 1	
C0785 	CFG: SET	5000	MCTRL-nset2  Selection list 1	
C0786 	CFG: LOAD	5001	MCTRL-QSP-OUT  Selection list 2	
C0787 			 Selection list 2	Configuration of digital input signals, function block NSET • Activation of a fixed speed via binary coding of the digital input signals • For coding see description of function block NSET • Parameter setting of the fixed speeds (JOG setpoints) in C0039 NSET-JOG*1 NSET-JOG*2 NSET-JOG*4 NSET-JOG*8 Configuration of digital input signals, function block NSET • Activation of additional acceleration and deceleration times for the mains setpoint via binary coding of the digital input signals • For coding see description of function block NSET • Parameter setting of the times in C0101 and 103 NSET-Ti*1 NSET-Ti*2 NSET-Ti*4 NSET-Ti*8
1	CFG: JOG	53	DIGIN3	
2	CFG: JOG	1000	FIXED0	
3	CFG: JOG	1000	FIXED0	
4	CFG: JOG	1000	FIXED0	
C0788 			 Selection list 2	
1	CFG: TI	1000	FIXED0	
2	CFG: TI	1000	FIXED0	
3	CFG: TI	1000	FIXED0	
4	CFG: TI	1000	FIXED0	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0789 	CFG: RFG-0	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block NSET HIGH: Guides the main setpoint integrator to 0 via the current T_i times
C0790 	CFG: RFG-STOP	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block NSET HIGH: Keeps the main setpoint integrator on its current value
C0798			-199.99 {0.01 %} 199.99	Function block NSET Display of the signals linked in C0783 and C0785 Read only: analog input signals of NSET
	1 DIS: CINH-VAL			
	2 DIS: SET			
C0799	Input signals		0 1	Function block NSET Display of the signals linked in C0781, C0783, C0786, C0787, C0788, C0789 and C0790
	1 DIS: N-INV			
	2 DIS: NADD-INV			
	3 DIS: LOAD			
	4 DIS: JOG*1			
	5 DIS: JOG*2			
	6 DIS: JOG*4			
	7 DIS: JOG*8			
	8 DIS: TI*1			
	9 DIS: TI*2			
	10 DIS: TI*4			
	11 DIS: TI*8			
	12 DIS: RFG-0			
	13 DIS: RFG-STOP			
C0800 	CFG: SET	1000	FIXED0%  Selection list 1	Configuration of analog input signal, function block PCTRL - Input for the process setpoint - Value range: ± 200 %
C0801 	CFG: ACT	1000	FIXED0%  Selection list 1	Configuration of analog input signal, function block PCTRL Configuration of analog input signal of PCTRL1 - Input for the actual value - Value range: ± 200 %
C0802 	CFG: INFLU	1000	FIXED0%  Selection list 1	Configuration of analog input signal, function block PCTRL - Evaluation (influence) of the output signal - Value range: ± 200 %
C0803 	CFG: ADAPT	1000	FIXED0%  Selection list 1	Configuration of analog input signal, function block PCTRL - The gain V_p can be changed via the adaptation input - Value range: ± 200 %
C0804 	CFG: INACT	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block PCTRL HIGH = deactivates the process controller
C0805 	CFG: I-OFF	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block PCTRL - HIGH = Switching off integral action component - LOW = Switching on integral action component

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0808			-199.99	{0.01 %}	199.99	Function block PCTRL Display of the signals linked in C0801, C0802, C0803 and C0804 See System Manual (extension)	
1	DIS: SET						
2	DIS: ACT						
3	DIS: INFLU						
4	DIS: ADAPT						
C0809						Function block PCTRL Display of the signals linked in C0805 and C0806	
1	DIS: INACT						
2	DIS: I-OFF						
C0810		1000		 Selection list 1		Configuration of analog input signals, function block ASW1See System Manual (extension)	
1	CFG: IN		FIXED0%		ASW1-IN1		
2	CFG: IN		FIXED0%		ASW1-IN2		
C0811	CFG: SET	1000	FIXED0	 Selection list 2		Configuration of digital input signal, function block ASW1 - LOW: signal at ASW1-IN1 is output to ASW1-OUT - HIGH: signal at ASW1-IN2 is output to ASW1-OUT	
C0812			-199.99	{0.01 %}	199.99		Function block ASW1 Display of the signals linked in C0810 ASW1-IN1ASW1-IN2
1	DIS: IN						
2	DIS: IN						
C0813	DIS: SET		0		1	Function block ASW1 Display of the signal linked in C0811	
C0815		1000		 Selection list 1		Configuration of analog input signals, function block ASW2See System Manual (extension)	
1	CFG: IN		FIXED0%		ASW2-IN1		
2	CFG: IN		FIXED0%		ASW2-IN2		
C0816	CFG: SET	1000	FIXED0	 Selection list 2		Configuration of digital input signal, function block ASW2 - LOW: signal at ASW2-IN1 is output to ASW2-OUT - HIGH: signal at ASW2-IN2 is output to ASW2-OUT	
C0817			-199.99	{0.01 %}	199.99		Function block ASW2 Display of the signals linked in C0815 ASW2-IN1ASW2-IN2
1	DIS: IN						
2	DIS: IN						
C0818	DIS: SET		0		1	Function block ASW2 Display of the signal linked in C0816	
C0820		1000		 Selection list 2		Configuration of digital input signals, function block AND1See System Manual (extension)	
1	CFG: IN		FIXED0		AND1-IN1		
2	CFG: IN		FIXED0		AND1-IN2		
3	CFG: IN		FIXED0		AND1-IN3		
C0821			0		1	Function block AND1 Display of the signals linked in C0820 AND1-IN1AND1-IN2AND1-IN3	
1	DIS: IN						
2	DIS: IN						
3	DIS: IN						

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0822 STOP			Selection list 2	Configuration of digital input signals, function block AND2	See System Manual (extension)
1	CFG: IN	1000	FIXED0	AND2-IN1	
2	CFG: IN	1000	FIXED0	AND2-IN2	
3	CFG: IN	1000	FIXED0	AND2-IN3	
C0823			0 1	Function block AND2 ● Display of the signals linked in C0822	See System Manual (extension)
1	DIS: IN			AND2-IN1	
2	DIS: IN			AND2-IN2	
3	DIS: IN			AND2-IN3	
C0824 STOP			Selection list 2	Configuration of digital input signals, function block AND3	See System Manual (extension)
1	CFG: IN	1000	FIXED0	AND3-IN1	
2	CFG: IN	1000	FIXED0	AND3-IN2	
3	CFG: IN	1000	FIXED0	AND3-IN3	
C0825			0 1	Function block AND3 ● Display of the signals linked in C0824	See System Manual (extension)
1	DIS: IN			AND3-IN1	
2	DIS: IN			AND3-IN2	
3	DIS: IN			AND3-IN3	
C0826 STOP			Selection list 2	Configuration of digital input signals, function block AND4	See System Manual (extension)
1	CFG: IN	1000	FIXED0	AND4-IN1	
2	CFG: IN	1000	FIXED0	AND4-IN2	
3	CFG: IN	1000	FIXED0	AND4-IN3	
C0827			0 1	Function block AND4 ● Display of the signals linked in C0826	See System Manual (extension)
1	DIS: IN			AND4-IN1	
2	DIS: IN			AND4-IN2	
3	DIS: IN			AND4-IN3	
C0828 STOP			Selection list 2	Configuration of digital input signals, function block AND5	See System Manual (extension)
1	CFG: IN	1000	FIXED0	AND5-IN1	
2	CFG: IN	1000	FIXED0	AND5-IN2	
3	CFG: IN	1000	FIXED0	AND5-IN3	
C0829			0 1	Function block AND5 ● Display of the signals linked in C0828	See System Manual (extension)
1	DIS: IN			AND5-IN1	
2	DIS: IN			AND5-IN2	
3	DIS: IN			AND5-IN3	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0830 STOP			Selection list 2	Configuration of digital input signals, function block OR1	See System Manual (extension)
1	CFG: IN	1000	FIXED0	OR1-IN1	
2	CFG: IN	1000	FIXED0	OR1-IN2	
3	CFG: IN	1000	FIXED0	OR1-IN3	
C0831			0	1 Function block OR1 ● Display of the signals linked in C0830	
1	DIS: IN			OR1-IN1	
2	DIS: IN			OR1-IN2	
3	DIS: IN			OR1-IN3	
C0832 STOP			Selection list 2	Configuration of digital input signals, function block OR2	See System Manual (extension)
1	CFG: IN	1000	FIXED0	OR2-IN1	
2	CFG: IN	1000	FIXED0	OR2-IN2	
3	CFG: IN	1000	FIXED0	OR2-IN3	
C0833			0	1 Function block OR2 ● Display of the signals linked in C0832	
1	DIS: IN			OR2-IN1	
2	DIS: IN			OR2-IN2	
3	DIS: IN			OR2-IN3	
C0834 STOP			Selection list 2	Configuration of digital input signals, function block OR3	See System Manual (extension)
1	CFG: IN	1000	FIXED0	OR3-IN1	
2	CFG: IN	1000	FIXED0	OR3-IN2	
3	CFG: IN	1000	FIXED0	OR3-IN3	
C0835			0	1 Function block OR3 ● Display of the signals linked in C0834	
1	DIS: IN			OR3-IN1	
2	DIS: IN			OR3-IN2	
3	DIS: IN			OR3-IN3	
C0836 STOP			Selection list 2	Configuration of digital input signals, function block OR4	See System Manual (extension)
1	CFG: IN	1000	FIXED0	OR4-IN1	
2	CFG: IN	1000	FIXED0	OR4-IN2	
3	CFG: IN	1000	FIXED0	OR4-IN3	
C0837			0	1 Function block OR4 ● Display of the signals linked in C0836	
1	DIS: IN			OR4-IN1	
2	DIS: IN			OR4-IN2	
3	DIS: IN			OR4-IN3	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0838 			 Selection list 2	Configuration of digital input signals, function block OR5	See System Manual (extension)
1	CFG: IN	1000	FIXED0	OR5-IN1	
2	CFG: IN	1000	FIXED0	OR5-IN2	
3	CFG: IN	1000	FIXED0	OR5-IN3	
C0839			0	1 Function block OR5 ● Display of the signals linked in C0838	
1	DIS: IN			OR5-IN1	
2	DIS: IN			OR5-IN2	
3	DIS: IN			OR5-IN3	
C0840 	CFG: IN	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block NOT1	See System Manual (extension)
C0841	DIS: IN		0	1 Function block NOT1 ● Display of the signal linked in C0841	
C0842 	CFG: IN	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block NOT2	See System Manual (extension)
C0843	DIS: IN		0	1 Function block NOT2 ● Display of the signal linked in C0842	
C0844 	CFG: IN	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block NOT3	See System Manual (extension)
C0845	DIS: IN		0	1 Function block NOT3 ● Display of the signal linked in C0844	
C0846 	CFG: IN	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block NOT4	See System Manual (extension)
C0847	DIS: IN		0	1 Function block NOT4 ● Display of the signal linked in C0846	
C0848 	CFG: IN	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block NOT5	See System Manual (extension)
C0849	DIS: IN		0	1 Function block NOT5 ● Display of the signal linked in C0848	
C0850 			 Selection list 1	Configuration of analog input signals, function block AIF-OUT	See System Manual (extension)
1	CFG: OUT.W1	1000	FIXED0%	Process output word 1 ● 100% = 16384 ● Signal is output via byte 3 and byte 4 to X1	
2	CFG: OUT.W2	1000	FIXED0%	Process output word 2 ● 100% = 16384	
3	CFG: OUT.W3	1000	FIXED0%	Process output word 3 ● 100% = 16384	
C0851 	CFG: OUT.D1	1000	FIXED0INC  Selection list 3	Configuration of phase input signal, function block AIF ● 32-bit phase signal	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0852	Type OUT.W2	0		Output of the signal type, function block AIF	See System Manual (extension)
			0 analog Analog signal	AIF-OUT.W2 (C0850/2) is output to X1	
			1 digital 0-15 Digital signal via bit 0 ... bit 15	FDO-00 ... FDO-15 (LOW word, C0116/1 ... C0116/15) are output to X1	
			2 low phase Low phase	AIF-OUT.D1 (LOW word, C0851) is output to X1	
C0853	Type OUT.W3	0		Output of the signal type, function block AIF	
			0 analog Analog signal	AIF-OUT.W3 (C0850/3) is output to X1	
			1 digital 16-31 Digital signal via bit 16 ... bit 31	FDO-16 ... FDO-31 (HIGH word, C0116/16 ... C0116/31) are output to X1	
			2 high phase High phase	AIF-OUT.D1 (HIGH word, C0851) is output to X1	
C0855			0	FFFF Process input words, function block AIF-IN ● Read only	See System Manual (extension)
	1 DIS: IN (0 ... 15)			Bit 0 ... bit 15 (via byte 5 and byte 6)	
	2 DIS: IN (16 ... 31)			Bit 16 ... bit 31 (via byte 7 and byte 8)	
C0856			-199.99 {0.01 %} 199.99	Process input words, function block AIF-IN ● Read only ● 100% = 16384	See System Manual (extension)
	1 DIS: IN.W1			Input via byte 3 and byte 4	
	2 DIS: IN.W2			Input via byte 5 and byte 6	
	3 DIS: IN.W3			Input via byte 7 and byte 8	
C0857	DIS: IN.D1		-2147483648 {1} 2147483647	32-bit phase signal, function block AIF-IN ● Read only ● 65536 = 1 rev.	See System Manual (extension)
C0858			-199.99 {0.01 %} 199.99	Process output words, function block AIF-OUT ● Display of the signals linked in C0850 ● 100% = 16384	See System Manual (extension)
	1 DIS: OUT.W1				
	2 DIS: OUT.W2				
C0859	DIS: OUT.D1		-2147483648 {1} 2147483647	32-bit phase signal, function block AIF-OUT ● Display of the signal linked in C0851 ● 1 rev. = 65536	See System Manual (extension)

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0860 STOP			📖 Selection list 1			Configuration of analog input signals, function block CAN-OUT	See System Manual (extension)
1	CFG: OUT1.W1	1000	FIXED0%			CAN-OUT1	
2	CFG: OUT1.W2	1000	FIXED0%				
3	CFG: OUT1.W3	1000	FIXED0%				
4	CFG: OUT2.W1	1000	FIXED0%				
5	CFG: OUT2.W2	1000	FIXED0%			CAN-OUT2	
6	CFG: OUT2.W3	1000	FIXED0%				
7	CFG: OUT2.W4	1000	FIXED0%				
8	CFG: OUT3.W1	1000	FIXED0%			CAN-OUT3	
9	CFG: OUT3.W2	1000	FIXED0%				
10	CFG: OUT3.W3	1000	FIXED0%				
11	CFG: OUT3.W4	1000	FIXED0%				
C0861 STOP			📖 Selection list 3			Configuration of input signals, function block CAN-OUT	
1	CFG: OUT1.D1	1000	FIXED0INC			CAN-OUT1	
2	CFG: OUT2.D1	1000	FIXED0INC			CAN-OUT2	
3	CFG: OUT3.D1	1000	FIXED0INC			CAN-OUT3	
C0863			0		FFFF	Process input words, function block CAN-IN	See System Manual (extension)
						• Read only • Bit 0 ... bit 15 (via byte 5 and byte 6) • Bit 16 ... bit 31 (via byte 7 and byte 8)	
1	DIS: IN1 dig0					CAN-IN1, bit 0 ... bit 15	
2	DIS: IN1 dig16					CAN-IN1, bit 16 ... bit 31	
3	DIS: IN2 dig0					CAN-IN2, bit 0 ... bit 15	
4	DIS: IN2 dig16					CAN-IN2, bit 16 ... bit 31	
5	DIS: IN3 dig0					CAN-IN3, bit 0 ... bit 15	
6	DIS: IN3 dig16					CAN-IN3, bit 16 ... bit 31	
C0864						Output of the signal type, function block CAN-OUT	See System Manual (extension)
1	TYPEOUT1.W2	0	0	analog	Analog signal	CAN-OUTx.Wx (C0860) is output to X4	
2	TYPEOUT2.W1	0	1	digital 0-15	Digital signal bit 0 ... bit 15	FDO-00 ... FDO-15 (LOW word, C0116/1 ... C0116/15) are output to X4	
3	TypeOUT3.W1	0	2	low phase	Low phase	CAN-OUTx.D1 (LOW word, C0861) is output to X4	
C0865						Output of the signal type, function block CAN-OUT	
1	TYPEOUT1.W3	0	0	analog	Analog signal	CAN-OUTx.Wx (C0860) is output to X4	
2	TYPEOUT2.W2	0	1	digital 16-31	Digital signal bit 16 ... bit 31	FDO-16 ... FDO-31 (HIGH word, C0116/16 ... C0116/31) are output to X1	
3	TYPEOUT3.W2	0	2	high phase	High phase	CAN-OUTx.D1 (HIGH word, C0861) is output to X4	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0866			-32768.00	{0.01 %} 32767.00	Process input words, function block CAN-IN - Read only 100% = 16384	See System Manual (extension)
1	DIS: IN1.W1				CAN-IN1	
2	DIS: IN1.W2					
3	DIS: IN1.W3					
4	DIS: IN2.W1				CAN-IN2	
5	DIS: IN2.W2					
6	DIS: IN2.W3					
7	DIS: IN2.W4					
8	DIS: IN3.W1				CAN-IN3	
9	DIS: IN3.W2					
10	DIS: IN3.W3					
11	DIS: IN3.W4					
C0867			-2147483648	{1} 2147483647	32-bit phase signal, function block CAN-IN - Read only 1 rev. = 65536	
1	DIS: IN1.D1					
2	DIS: IN2.D1					
3	DIS: IN3.D1					
C0868			-199.99	{0.01 %} 199.99	Process output words, function block CAN-OUT - Display of the signals linked in C0860 100% = 16384	See System Manual (extension)
1	DIS: OUT1.W1					
2	DIS: OUT1.W2					
3	DIS: OUT1.W3					
4	DIS: OUT2.W1					
5	DIS: OUT2.W2					
6	DIS: OUT2.W3					
7	DIS: OUT2.W4					
8	DIS: OUT3.W1					
9	DIS: OUT3.W2					
10	DIS: OUT3.W3					
11	DIS: OUT3.W4					
C0869			-2147483648	{1} 2147483647	32-bit phase information, function block CAN-OUT - Display of the signals linked in C0861 1 rev. = 65536	
1	DIS: OUT1.D1					
2	DIS: OUT2.D1					
3	DIS: OUT3.D1					
C0870				 Selection list 2	Configuration of digital input signals, function block DCTRL	See System Manual (extension)
1	CFG: CINH	1000	FIXED0		DCTRL-CINH1 HIGH = Controller inhibit	
2	CFG: CINH	1000	FIXED0		DCTRL-CINH2 HIGH = Controller inhibit	
C0871	CFG: TRIP-SET	54	DIGIN4	 Selection list 2	Configuration of digital input signal, function block DCTRL HIGH = fault message EEr	
C0876	CFG: TRIP-RES	55	DIGIN5	 Selection list 2	Configuration of digital input signal, function block DCTRL LOW-HIGH edge = TRIP reset	
C0878					Function block DCTRL Display of the signals linked in C0870, C0871 and C0876	See System Manual (extension)
1	DIS: CINH1					
2	DIS: CINH2					
3	DIS: TRIP-SET					
4	DIS: TRIP-RES					

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C0879							Resetting control words ● C0879 = 1 performs one reset	
1	Reset C135	0	0	Ready				
2	Reset AIF	0	1	Reset				
3	Reset CAN	0						
C0880			📖 Selection list 2				Configuration of digital input signals, function block DCTRL ● Select parameter set ● Selection of a parameter set via binary coding of the digital input signals	
STOP	1	CFG: PAR*1	1000	FIXED0	C0880/1	C0880/2		Selected parameter set
	2	CFG: PAR*2	1000	FIXED0	0	0		Parameter set 1
					0	1		Parameter set 2
					1	0		Parameter set 3
					1	1	Parameter set 4	
C0881	CFG: PAR-LOAD	1000	FIXED0				📖 Selection list 2	Configuration of digital input signal, function block DCTRL ● LOW-HIGH edge = Load selected parameter set into C0880
STOP								See System Manual (extension)
C0884							Function block DCTRL ● Display of the signals linked in C0880 and C0881	
1	DIS: PAR*1							
2	DIS: PAR*2							
3	DIS: PAR-LOAD							
C0885	CFG: R	51	DIGIN1				📖 Selection list 2	Configuration of digital input signals, function block R/L/Q ● Truth table: Inputs Outputs R L R/L QSP 0 0 0/1 1 1 0 0 0 0 1 1 0 1 1 – – – State is unchanged
STOP								See System Manual (extension)
C0886	CFG: L	52	DIGIN2				📖 Selection list 2	
STOP								
C0889			0				1	Function block R/L/Q ● Display of the signals linked in C0885 and C0886
1	DIS: R							
2	DIS: L							
C0890	CFG: N-SET	5050	NSET-NOUT				📖 Selection list 1	Configuration of analog input signal, function block MCTRL ● Speed setpoint
STOP								📖 8.2-25 📖 8.2-40
C0891	CFG: M-Add	1000	FIXED0%				📖 Selection list 1	Configuration of analog input signal, function block MCTRL ● Additional torque setpoint or torque setpoint
STOP								📖 8.2-40
C0892	CFG: Lo-M-LIM	5700	ANEG1-OUT				📖 Selection list 1	Configuration of analog input signal, function block MCTRL ● Lower torque limit in [%] of C0057
STOP								
C0893	CFG: HI-M-LIM	19523	FCODE-472/3				📖 Selection list 1	Configuration of analog input signal, function block MCTRL ● Upper torque limit in [%] of C0057
STOP								
C0898	CFG: M-LIM switch	0	0	M-LIM ON		Reduced torque limit is active	Torque limitation in the field weakening range, function block MCTRL ● If the torque limit is reduced, the maximum possible torque in the field weakening range is lowered with 1/f. This provides a higher motor stability in the field weakening range	
STOP			1	M-LIM OFF		Reduced torque limit is inactive		
								📖 8.2-40

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0899 STOP	CFG: N/M-SWT	1000	FIXED0	📖 Selection list 2	Configuration of digital input signal, function block MCTRL ● LOW = active speed control ● HIGH = active torque control	📖 8.2-40	
C0900 STOP	CFG: QSP	10250	R/L/Q-QSP	📖 Selection list 2	Configuration of digital input signal, function block MCTRL ● HIGH = drive performs quick stop	📖 8.2-25 📖 8.2-40	
C0901 STOP	CFG: I-SET	1000	FIXED0%	📖 Selection list 1	Configuration of analog input signal, function block MCTRL ● Setting of integral action component of the speed controller	📖 8.2-40	
C0902 STOP	CFG: I-LOAD	1000	FIXED0	📖 Selection list 2	Configuration of digital input signal, function block MCTRL ● HIGH = the integral action component at MCTRL-I-SET is accepted by the speed controller		
C0903 STOP	CFG: BOOST	5015	MCTRL-BOOST	📖 Selection list 1	Configuration of analog input signal, function block MCTRL ● Boost of the motor voltage	📖 8.2-25	
C0904 STOP	CFG: DC-BREAK	1000	FIXED0	📖 Selection list 2	Configuration of digital input signal, function block MCTRL ● HIGH = Motor is braked	📖 8.2-25 📖 8.2-40	
C0905	DIS: DC-BREAK		0	1	Function block MCTRL ● Display of the signal linked in C0904		
C0906			-199.99	{0.01 %}	199.99	Function block MCTRL ● Display of the signals linked in C0890, C0891, C0892, C0893, C0901 and C0903	📖 8.2-25 📖 8.2-40
	1 DIS: N-SET						
	2 DIS: M-ADD						
	3 DIS: LO-M-LIM						
	4 DIS: HI-M-LIM						
	5 DIS: I-SET						
	6 DIS: BOOST						
C0907			0	1	Function block MCTRL ● Display of the signals linked in C0899, C0900 and C0902		
	1 reserved						
	2 DIS: N/M-SWT						
	3 DIS: QSP						
	4 DIS: I-LOAD						
C0909	speed limit	1	1	+/- 175 %	Speed limitation, function block MCTRL ● Limitation of direction of rotation for the speed setpoint	📖 8.2-25 📖 8.2-40	
			2	0 ... 175 %			
			3	-175 ... 0 %			
C0910 STOP	CFG: VP-ADAPT	1006	FIXED100%	📖 Selection list 1	Configuration of analog input signal, function block MCTRL ● Gain adaptation of the speed controller ● If the gain is varying, join to CURVE-OUT of FB CURVE	📖 8.2-25 📖 8.2-40	
C0911	DIS: VP-ADAPT		-199.99	{0.01 %}	199.99	Function block MCTRL ● Display of the signal linked in C0910	
C0912	OV delay time	→	-	{1 ms}	-	Delay time of the pulse release after an OU message The default value can be changed by the factor 0.5 ... 2 → depending on the type	📖 8.2-25 📖 8.2-40

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0940	Numerator	1	-32767	{1}	32767	Configuration of conversion factor with numerator and denominator, function block CONV1 OUT [%] = IN [%] · $\frac{C0940}{C0941}$	See System Manual (extension)
C0941	Denominator	1	1	{1}	32767		
C0942 STOP	CFG: IN	1000	FIXED0%	📖 Selection list 1			
C0943	DIS: IN		-199.99	{0.01 %}	199.99	Configuration of analog input signal, function block CONV1 ● Display of the signal linked in C0942	See System Manual (extension)
C0945	Numerator	1	-32767	{1}	32767	Function block CONV1	
C0946	Denominator	1	1	{1}	32767	● Display of the signal linked in C0942	
C0947 STOP	CFG: IN	1000	FIXED0%	📖 Selection list 1		Configuration of conversion factor with numerator and denominator, function block CONV2 OUT [%] = IN [%] · $\frac{C0945}{C0946}$	
C0948	DIS: IN		-199.99	{0.01 %}	199.99	Configuration of analog input signal, function block CONV2	
C0950	Numerator	1	-32767	{1}	32767	Function block CONV2 ● Display of the signal linked in C0947	See System Manual (extension)
C0951	Denominator	1	1	{1}	32767	Configuration of conversion factor with numerator and denominator, function block CONV3 OUT [%] = IN [rpm] · $\frac{100 \%}{15000 \text{ rpm}}$ · $\frac{C0950}{C0951}$	
C0952 STOP	CFG: IN	1000	FIXED0%	📖 Selection list 1			
C0953	DIS: IN		-199.99	{0.01 %}	199.99	Configuration of analog input signal, function block CONV3 ● Display of the signal linked in C0952	See System Manual (extension)
C0955	Numerator	1	-32767	{1}	32767	Function block CONV3	
C0956	Denominator	1	1	{1}	32767	● Display of the signal linked in C0952	
C0957 STOP	CFG: IN	1000	FIXED0%	📖 Selection list 1		Configuration of conversion factor with numerator and denominator, function block CONV4 OUT [%] = IN [rpm] · $\frac{100 \%}{15000 \text{ rpm}}$ · $\frac{C0955}{C0956}$	
C0958	DIS: IN		-199.99	{0.01 %}	199.99	Configuration of analog input signal, function block CONV4	
C0960	Function	1				Function block CONV4 ● Display of the signal linked in C0957	See System Manual (extension)
			1	Function 1		Function selection, function block CURVE1	
			2	Function 2		Characteristic with two base points	
			3	Function 3		Characteristic with three base points	
						Characteristic with four base points	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0961	y0	0.00	0.00	{0.01 %}	199.99	Configuration of base point y0, function block CURVE1 • Ordinate of the value pair (x = 0 % / y0)	See System Manual (extension)
C0962	y1	50.00	0.00	{0.01 %}	199.99	Configuration of base point y1, function block CURVE1 • Ordinate of the value pair (x1 / y1)	
C0963	y2	75.00	0.00	{0.01 %}	199.99	Configuration of base point y2, function block CURVE1 • Ordinate of the value pair (x2 / y2)	
C0964	y100	100.0	0.00	{0.01 %}	199.99	Configuration of base point y100, function block CURVE1 • Ordinate of the value pair (x 100 % / y100)	
C0965	x1	50.00	0.01	{0.01 %}	99.99	Configuration of base point x1, function block CURVE1 • Abscissa of the pair (x1 / y1)	
C0966	x2	75.00	0.01	{0.01 %}	99.99	Configuration of base point x2, function block CURVE1 • Abscissa of the pair (x2 / y2)	See System Manual (extension)
C0967 	CFG: IN	1000	FIXED0%	 Selection list 1		Configuration of analog input signal, function block CURVE1	
C0968	DIS: IN		-199.99	{0.01 %}	199.99	Function block CURVE1 • Display of the signal linked in C0967	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0970 	CFG: SET	1000	FIXED0%	 Selection list 1			Configuration of analog input signal, function block MFAIL Starting value for the controlled deceleration in [%] of C0011 See System Manual (extension)
C0971 	CFG: FAULT	1000	FIXED0	 Selection list 2			Configuration of digital input signal, function block MFAIL HIGH = activates mains failure control
C0972 	CFG: RESET	1000	FIXED0	 Selection list 2			Configuration of digital input signal, function block MFAIL HIGH = resets mains failure control
C0973 	CFG: ADAPT	1000	FIXED0%	 Selection list 1			Configuration of analog input signal, function block MFAIL Dynamic adaptation of the proportional gain of U_{Gsetl} controller in [%] of C0980
C0974 	CFG: CONST	1000	FIXED0%	 Selection list 1			Configuration of analog input signal, function block MFAIL Proportional gain of U_{Gset} controller in [%] of C0980
C0975 	CFG: THRESHLD	1000	FIXED0%	 Selection list 1			Configuration of analog input signal, function block MFAIL - Restart protection when the value falls below the speed threshold - Restart threshold in [%] of C0011
C0976 	CFG: NACT	1000	FIXED0%	 Selection list 1			Configuration of analog input signal, function block MFAIL - Comparison value for the restart threshold in [%] of C0011 - Start for V₂ controller
C0977 	CFG: SET	1000	FIXED0%	 Selection list 1			Configuration of analog input signal, function block MFAIL Speed starting value for the deceleration in [%] of C0011
C0978 	CFG: DC-SET	1000	FIXED0%	 Selection list 1			Configuration of analog input signal, function block MFAIL Setting of the voltage setpoint on which the DC-bus voltage is to be kept (100 % = 1000 V)
C0980	MFAIL V _p	0.500	0.001	{0.001}	31.000	Gain V _p , function block MFAIL	See System Manual (extension)
C0981	MFAIL T _n	100	20	{1 ms}	2000	Integral-action time T _n , function block MFAIL	
C0982	MFAIL T _{ir}	2.000	0.001	{0.001 s}	16.000	Acceleration time T _{ir} , function block MFAIL	
C0983	Retrigger T	1.000	0.001	{0.001 s}	60.000	Retrigger time, function block MFAIL After the time has elapsed, the mains failure control is terminated	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0988	Input signals		-199.99	{0.01 %}	199.99	Function block MFAIL Display of the signals linked in C0970, C0973, C0974, C0975, C0976, C0977 and C0978 See System Manual (extension)
1	DIS: N-SET					
2	DIS: ADAPT					
3	DIS: CONST					
4	DIS: THRESHLD					
5	DIS: NACT					
6	DIS: SET					
7	DIS: DC-SET					
C0989			0		1	Function block MFAIL Display of the signals linked in C0971 and C0972
1	DIS: FAULT					
2	DIS: RESET					
C1000	DIVISION	1	0	{1}	31	Part factor, function block CONVPHA1 Calculate output signal: $\text{OUT [\%]} = \text{IN [\%]} \cdot \frac{100 \%}{2^{14} \cdot 2^{C1000}}$ See System Manual (extension)
C1001	CFG: IN	1000	FIXED0INC	📖 Selection list 3		Configuration of input signal, function block CONVPHA1
C1002	DIS: IN		-2147483648	{1}	2147483647	Function block CONVPHA1 Display of the signal linked in C1001
C1040	Acceleration	100.000	0.001	{0.001 }	5000.000	Acceleration, function block SRFG1 Max. acceleration See System Manual (extension)
C1041	Jerk	0.200	0.001	{0.001 s}	999.999	Jerk, function block SRFG1 S-ramp time
C1042	CFG: IN	1000	FIXED0%	📖 Selection list 1		Configuration of analog input signal, function block SRFG1
C1043	CFG: SET	1000	FIXED0%	📖 Selection list 1		Configuration of analog input signal, function block SRFG1 - Starting value for the ramp function generator - Starting value is accepted when SRFG1-LOAD = HIGH
C1044	CFG: LOAD	1000	FIXED0	📖 Selection list 2		Configuration of digital input signal, function block SRFG1 HIGH = accepts the value at SRFG1-SET and outputs it to SRFG1-OUT. SRFG1-DIFF remains on 0 %
C1045			-199.99	{0.01 %}	199.99	Function block SRFG1 Display of the signals linked in C1042 and C1043
1	DIS: IN					
2	DIS: SET					
C1046	DIS: LOAD		0		1	Function block SRFG1 Display of the signal linked in C1044
C1090	Output signal		-2147483648	{1}	2147483647	Function block FEVAN1 Display of the converted signal See System Manual (extension)
C1091	Code	141	2	{1}	2000	Code, function block FEVAN1 Selection of the target code in which the calculated value is to be written
C1092	Subcode	0	0	{1}	255	Subcode, function block FEVAN1 Selection of the target subcode in which the calculated value is to be written

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C1093	Numerator	1.000 0	0.0001	{0.0001}	100000.0000	Numerator, function block FEVAN1	See System Manual (extension)
						Scaling of the input signal	
C1094	Denominator	0.000 1	0.0001	{0.0001}	100000.0000	Denominator, function block FEVAN1	
						Scaling of the input signal	
C1095	Offset	0	0	{1}	1000000000	Offset, function block FEVAN1	
						An offset can be added to the converted signal	
C1096	CFG: IN	1000	FIXED0%	📖 Selection list 1		Configuration of analog input signal, function block FEVAN1	See System Manual (extension)
C1097	CFG: LOAD	1000	FIXED0	📖 Selection list 2		Configuration of digital input signal, function block FEVAN1	
						A LOW-HIGH edge transmits the converted signal to the target code	
C1098	DIS: IN		-32768	{1}	32767	Function block FEVAN1	See System Manual (extension)
						Display of the signal linked in C1096	
C1099	DIS: LOAD					Function block FEVAN1	
						Display of the signal linked in C1097	
C1100	Function	1				Function selection, function block FCNT1	See System Manual (extension)
			1	Return		At |counter content| ≥ |FCNT1-CMP-Val| FCNT1-EQUAL is set to HIGH for 1 ms	
			2	Hold if >=		At |counter content| ≥ |FCNT1-CMP-Val| the counter stops	
			3	Hold if =		At |counter content| = |FCNT1-CMP-Val| the counter stops	
C1101					📖 Selection list 1	Configuration of analog input signals, function block FCNT1	See System Manual (extension)
						- Starting value - Comparison value	
C1102					📖 Selection list 2	Configuration of digital input signals, function block FCNT1	See System Manual (extension)
						LOW-HIGH edge counts upwards by one	
						LOW-HIGH edge counts downwards by one	
						- HIGH = accepts starting value - Input signal has highest priority	
C1103			-32768	{1}	32768	Function block FCNT1	See System Manual (extension)
						Display of the signals linked in C1101	
C1104			0		1	Function block FCNT1	
						Display of the signals linked in C1102	

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C1160 STOP			📖 Selection list 1		Configuration of analog input signals, function block ASW3	See System Manual (extension)	
1	CFG: IN	1000	FIXED0%		ASW3-IN1		
2	CFG: IN	1000	FIXED0%		ASW3-IN2		
C1161 STOP	CFG: SET	1000	FIXED0📖 Selection list 2		Configuration of digital input signal, function block ASW3 ● LOW: signal at ASW3-IN1 is output to ASW3-OUT ● HIGH: signal at ASW3-IN2 is output to ASW3-OUT		
C1162			-199.99	{0.01 %}	199.99	Function block ASW3 ● Display of the signals linked in C1060	
1	DIS: IN				ASW3-IN1		
2	DIS: IN				ASW3-IN2		
C1163	DIS: SET				Function block ASW3 ● Display of the signal linked in C1061		
C1190	Motor PTC selection	0			Temperature characteristic for PTC thermistors ● Selection of the characteristic for PTC thermistors at X7 or X8 for detecting the motor temperature	📖 6.6-10	
			0	Standard	Characteristic for PTC thermistors in Lenze motors		
			1	Characteristic	Characteristic for application-specific PTC thermistors		
C1191	Temperature characteristic		0	{1 °C}	255	Temperature range for PTC thermistors ● Define temperature points on the characteristic for PTC thermistors	
1	Temperature 1	100			Temperature point 1		
2	Temperature 2	150			Temperature point 2		
C1192	Resistance characteristic		0	{1 Ω}	3000	Resistance characteristic for PTC thermistors ● Define resistance points on the characteristic for PTC thermistors	
1	Resistance 1	1670			Resistance point 1		
2	Resistance 2	2225			Resistance point 2		
C1300 STOP	N-motor/ Dmax	300	-32767	{1 rpm}	32767	Motor speed at D _{max} , function block DCALC1 ● Nominal speed of the winding drive	📖 8.2-1
C1301 STOP	N-line max	3000	1	{1 rpm}	32767	Maximum line speed, function block DCALC1 ● Nominal speed of the line drive	
C1302	calc cycle	0.1	0.1	{0.1 rev}	100.0	Calculation cycle, function block DCALC1	📖 8.2-1
C1303	time const	0.10	0.01	{0.01 s}	50.00	Filter time constant, function block DCALC1	

Code		Possible settings				IMPORTANT		
No.	Name	Lenze	Selection					
C1304 	Dmax	500	1	{1 mm}		10000	Maximum diameter, function block DCALC1 ● Nominal winding diameter	 8.2-1
C1305	lower D-limit	50	1	{1 mm}		10000	Lower diameter limit, function block DCALC1 ● Minimum winding diameter	
C1306	upper D-limit	500	1	{1 mm}		10000	Upper diameter limit, function block DCALC1 ● Maximum winding diameter	
C1307	hyst D-limit	1.00	0.00	{0.01 %}		100.0	Hysteresis - diameter limitation, function block DCALC1 ● Hysteresis for D _{min} /D _{max} output	
C1308 	arit function	1	0	DCALC1-OUT=D	DCALC1-OUT = diameter		Selection of the arithmetic function, function block DCALC1	 8.2-1
			1	DCALC1-OUT=1/D	DCALC1-OUT = 1/diameter			
C1309 	Dmin	50	1	{1 mm}		10000	Minimum diameter, function block DCALC1	 8.2-1
C1310	DCALC1-Titime	0.000	0.000	{0.001 s}		999.900	Acceleration and deceleration time, function block DCALC1	
C1311	window D-calc	1.00	0.00	{0.01 %}		100.00	Window - diameter calculation, function block DCALC1 ● Window setting for permissible diameter deviation	
C1320 	CFG: SET	1000	FIXED0%			 Selection list 1	Configuration of analog input signal, function block DCALC1 ● The signal is scaled to the value in C1304 (100 % $\triangle$ C1304)	 8.2-1
C1321 						 Selection list 2	Configuration of digital input signals, function block DCALC1	
1	CFG: LOAD	1000	FIXED0				● HIGH: initial value at DCALC1-SET is accepted ● DCALC1-LOAD has a higher priority than DCALC1-HOLD	
2	CFG: HOLD	1000	FIXED0				● HIGH = holds the diameter value reached and resets the integrators.	
C1322			-36000	{1 rpm}		36000	Function block DCALC1 ● Display of the signals linked in C1327	 8.2-1
1	DIS: N-Line							
2	DIS: N-WIND							
C1325	DIS: SET		-199,99	{0.01 %}		199,99	Function block DCALC1 ● Display of the signal linked in C1320	 8.2-1
C1326			0			1	Function block DCALC1 ● Display of the signals linked in C1321	
1	DIS: LOAD							
2	DIS: HOLD							
C1327 						 Selection list 3	Configuration of input signals, function block DCALC1	 8.2-1
1	CFG: N-Line	1000	FIXED0INC				● Speed signal of the line drive	
2	CFG: N-WIND	1000	FIXED0INC				● Speed signal of the winding drive	
C1328	DIS: D-ACT		-200	{1 mm}		200	Function block DCALC1 ● Display of the current diameter	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C1330	PCTRL2 Tir	1.0	0.1	{0.1 s	6000.0	Acceleration time t_{ir} , function block PCTRL2	See System Manual (extension)
						- Acceleration time for the setpoint - The acceleration time refers to a setpoint change of 0 ... 100 %	
C1331	PCTRL2 Tif	1.0	0.1	{0.1 s}	6000.0	Deceleration time t_{if} , function block PCTRL2	See System Manual (extension)
						- Deceleration time for the setpoint - The deceleration time refers to a setpoint change of 100 % ... 0	
C1332	PCTRL2 Vp	1.0	0.1	{0.1 }	500.0	Gain V_p , function block PCTRL2	See System Manual (extension)
C1333	PCTRL2 Tn	400	20	{1 ms}	99999	Integral-action time T_n , function block PCTRL2	
						Setting of reset time T_n of PCTRL2	
C1334	PCTRL2 Kd	0.0	0.0	{0.1 }	5.0	Differential component K_d , function block PCTRL2	See System Manual (extension)
C1335	bipolar/unipolar	0				Sphere of action, function block PCTRL2	
			0	Bipolar		Output value is limited to -100 ... 100 %	
			1	Unipolar		Output value is limited to 0 ... 100 %	
C1336	Tir overlay	1.0	0.1	{0.1 s}	6000.0	Fade-in time, function block PCTRL2	See System Manual (extension)
						- Acceleration time of the ramp generator - Controls the influence of the process controller	
C1337	Tif overlay	1.0	0.1	{0.1 s}	6000.0	Fade-out time, function block PCTRL2	See System Manual (extension)
						- Deceleration time of the ramp generator - Controls the influence of the process controller	
C1340						 Selection list 1	See System Manual (extension)
	1 CFG: RFG-SET	1000	FIXED0%			- The process setpoint is shown at PCTRL2-SET with a starting value via a ramp generator - PCTRL-RFG-LOAD = HIGH activates the function	
	2 CFG: SET	1000	FIXED0%			- Input for process value - Value range: ± 200 %	
	3 CFG: ACT	1000	FIXED0%			- Input for actual value - Value range: ± 200 %	
	4 CFG: INFL	1000	FIXED0%			- Evaluation (influence) of the output signal - Value range: ± 200 %	

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C1341 			 Selection list 2	Configuration of digital input signals, function block PCTRL2
1	CFG: RFG-LOAD	1000	FIXED0	HIGH = function of PCTRL2-RFG-SET is active
2	CFG: I-OFF	1000	FIXED0	- HIGH = Switches of integral action component - LOW = switches on integral action component
3	CFG: INACT	1000	FIXED0	HIGH = deactivates process controller
4	CFG: OVERLAY	1000	FIXED0	- HIGH = Shows influence - LOW = hides influence
C1344			-199.99 {0.01 %} 199.99	Function block PCTRL2
1	DIS: RFG-SET			Display of the signals linked in C1340
2	DIS: SET			
3	DIS: ACT			
4	DIS: INFL			
C1345			0 1	Function block PCTRL2
1	DIS: RFG-LOAD			Display of the signals linked in C1341
2	DIS: I-OFF			
3	DIS: INACT			
4	DIS: OVERLAY			
C1350	INT1 function	0		Function selection, function block INT1
		0	PHI >= REF	If INT1-IN ≥ INT1-REF, INT1-DOUT is set to HIGH
		1	|PHI| >= |REF|	If |INT1-IN| ≥ |INT1-REF|, INT1-DOUT is set to HIGH
C1351	INT1 scaling	65536 00	65536 {1} 1000000000	Scaling factor, function block INT1
				$\text{INT1} - \text{AOUT} [\%] = \frac{\text{INT1} - \text{IN} [\text{inc}]}{\text{C1351}} \cdot 100 \%$
C1354 	CFG: REF	1000	FIXED0INC  Selection list 3	Input signal configuration
				Reference value
C1355 	CFG: IN	1000	FIXEDPHI-0  Selection list 4	Configuration of input signal, function block INT1
				Angle of rotation
C1356 	CFG: RESET	1000	FIXED0  Selection list 2	Configuration of digital input signal, function block INT1
				HIGH = Sets the integrator to 0
C1357	DIS: REF		-2000000000 {1 inc} 2000000000	Function block INT1
				Display of the signal linked in C1354
C1358	DIS: IN		-32767 {1 rpm} 32767	Function block INT1
				Display of the signal linked in C1355
C1359	DIS: RESET		0 1	Function block INT1
				Display of the signal linked in C1356
C1360	INT2 function	0		Function selection, function block INT2
		0	PHI >= REF	If INT2-IN ≥ INT2-REF, INT2-DOUT is set to HIGH
		1	|PHI| >= |REF|	If |INT2-IN| ≥ |INT2-REF|, INT2-DOUT is set to HIGH
C1361	INT2 scaling	65536 00	65536 {1} 1000000000	Scaling factor, function block INT2
				$\text{INT2} - \text{AOUT} [\%] = \frac{\text{INT2} - \text{IN} [\text{inc}]}{\text{C1361}} \cdot 100 \%$

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C1364 	CFG: REF	1000	FIXED0INC	 Selection list 3	Input signal configuration ● Reference value	See System Manual (extension)
C1365 	CFG: IN	1000	FIXEDPHI-0	 Selection list 4	Configuration of input signal, function block INT2 ● Angle of rotation	
C1366 	CFG: RESET	1000	FIXED0	 Selection list 2	Configuration of digital input signal, function block INT2 ● HIGH = Sets the integrator to 0	
C1367	DIS: REF		-2000000000 {1 inc} 2000000000		Function block INT2 ● Display of the signal linked in C13564	See System Manual (extension)
C1368	DIS: IN		-32767 {1 rpm} 32767		Function block INT2 ● Display of the signal linked in C1365	
C1369	DIS: RESET		0 1		Function block INT2 ● Display of the signal linked in C1366	
C1370	FOLL max	100.0 0	0.00 {0.01 %} 199.99		Upper limit, function block FOLL1 ● Upper limit of the ramp function generator	See System Manual (extension)
C1371	FOLL min	-100.0 0	-199.99 {0.01 %} 0.00		Lower limit, function block FOLL1 ● Lower limit of the ramp function generator	
C1372	FOLL Tir	10.0	0.1 {0.1 s} 6000.0		Acceleration time T_{ir} and deceleration time T_{if} of the ramp function generator, function block FOLL1	
C1373	FOLL Tif	10.0	0.1 {0.1 s} 6000.0			
C1375 				 Selection list 1	Configuration of analog input signals, function block FOLL1	See System Manual (extension)
1	CFG: SIGN	1000	FIXED0%		● Negative value: signal characteristic at FOLL1-OUT is opposed to the one at FOLL1-IN ● Positive value: signal characteristic at FOLL1-OUT is the same as at FOLL1-IN	
2	CFG: IN	1000	FIXED0%		If FOLL1-IN > FOLL1-REF, the ramp function generator starts	
3	CFG: REF	1000	FIXED0%		Reference value	
4	CFG: LOAD	1000	FIXED0%		Initial value for the ramp function generator	
C1376 	CFG: SET	1000	FIXED0	 Selection list 2	Configuration of digital input signal, function block FOLL1 ● HIGH: initial value at FOLL1-LOAD is accepted	See System Manual (extension)
C1377			-199.99 {0.01 %} 199.99		Function block FOLL1 ● Display of the signals linked in C1375	
1	DIS: SIGN					
2	DIS: IN					
3	DIS: REF					
4	DIS: LOAD					
C1378	DIS: SET		0 1		Function block FOLL1 ● Display of the signal linked in C1376	

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C1583	fset high	100.0 0	0.00 {0.01 %} 199.99	Alterations by Lenze service only! Adaptation of the motor magnetising current set in C0095 (with V/f characteristic control: influence limit of the boost correction; with vector control: influence limit of the field precontrol) - The output frequency is set up to which the motor magnetising current set in C0095 is to have an effect. - C1583 = 100 % $\triangle$ half the rated motor frequency in C0089	 6.11-5
C1751			0 {1} 65535		 6.6-15
	1	0			
	...	...			
	17	0			
C1753			0 Data are not o. k.	Internal data are o. k. Motor data identification for the inverter compensation characteristic has been completed successfully	
			1 Data are o. k.		
C1754			0 Data are not o. k.	Internal data are o. k. Motor data identification for the motor leakage inductance has been completed successfully	
			1 Data are o. k.		
C1755		100	0 {1} 65535	Image of inverter compensation characteristic (WRK) on the maximum current range	

8.6 Selection lists

8.6.1 Selection list 1: Analog output signals

Parameter	Analog output signal (O)
000050	AIN1-OUT
000055	AIN2-OUT
000100	DFSET-NOUT
001000	FIXED0%
001006	FIXED100%
001007	FIXED-100%
005000	MCTRL-nset2
005001	MCTRL-NACT
005002	MCTRL-MSET2
005003	MCTRL-MACT
005004	MCTRL-IACT
005005	MCTRL-DCVOLT
005006	MCTRL-VACT
005007	MCTRL-FACT
005008	MCTRL-IxT
005009	MCTRL-PHI-ACT
005010	MCTRL-M-TEMP
005015	MCTRL-BOOST
005050	NSET-NOUT
005051	NSET-RFG-I
005052	NSET-C10-C11
005100	MPOT1-OUT
005150	PCTRL1-OUT
005250	NLIM1-OUT
005500	ARIT1-OUT
005505	ARIT2-OUT
005510	ARIT3-OUT
005540	SQRT1-OUT
005550	ADD1-OUT
005555	ADD2-OUT
005600	RFG1-OUT
005610	SRFG1-OUT
005611	SRFG1-DIFF
005650	ASW1-OUT
005655	ASW2-OUT
005660	ASW3-OUT

Parameter	Analog output signal (O)
005700	ANEG1-OUT
005705	ANEG2-OUT
005750	FIXSET1-OUT
005800	LIM1-OUT
005850	ABS1-OUT
005900	PT1-1-OUT
005905	PT1-2-OUT
005950	DT1-1-OUT
006100	MFAIL-NOUT
006150	DB1-OUT
006200	CONV1-OUT
006205	CONV2-OUT
006210	CONV3-OUT
006215	CONV4-OUT
006230	CONVPHA1-OUT
006300	S&H1-OUT
006350	CURVE1-OUT
006400	FCNT1-OUT
010000	BRK1-M-SET
011000	DCALC1-D-OUT
011001	DCALC1-OUT
011050	PCTRL2-OUT
011100	INT1-AOUT
011105	INT2-AOUT
011150	FOLL1-OUT
015030	MCTRL-LOAD-I2XT
019500	FCODE-17
019502	FCODE-26/1
019503	FCODE-26/2
019504	FCODE-27/1
019505	FCODE-27/2
019506	FCODE-32
019507	FCODE-37
019510	FCODE-108/1
019511	FCODE-108/2
019512	FCODE-109/1

8

Configuration

8.6

Selection lists

8.6.1

Selection list 1: Analog output signals

Parameter	Analog output signal (O)
019513	FCODE-109/2
019515	FCODE-141
019521	FCODE-472/1
019522	FCODE-472/2
019523	FCODE-472/3
019524	FCODE-472/4
019525	FCODE-472/5
019526	FCODE-472/6
019527	FCODE-472/7
019528	FCODE-472/8
019529	FCODE-472/9
019530	FCODE-472/10
019531	FCODE-472/11
019532	FCODE-472/12
019533	FCODE-472/13
019534	FCODE-472/14
019535	FCODE-472/15
019536	FCODE-472/16
019537	FCODE-472/17
019538	FCODE-472/18
019539	FCODE-472/19
019540	FCODE-472/20
019551	FCODE-473/1

Parameter	Analog output signal (O)
019552	FCODE-473/2
019553	FCODE-473/3
019554	FCODE-473/4
019555	FCODE-473/5
019556	FCODE-473/6
019557	FCODE-473/7
019558	FCODE-473/8
019559	FCODE-473/9
019560	FCODE-473/10
020101	CAN-IN1.W1
020102	CAN-IN1.W2
020103	CAN-IN1.W3
020201	CAN-IN2.W1
020202	CAN-IN2.W2
020203	CAN-IN2.W3
020204	CAN-IN2.W4
020301	CAN-IN3.W1
020302	CAN-IN3.W2
020303	CAN-IN3.W3
020304	CAN-IN3.W4
025101	AIF-IN.W1
025102	AIF-IN.W2
025103	AIF-IN.W3

8.6.2 Selection list 2: Digital output signals

Parameter	Digital output signal (□)
000051	DIGIN1
000052	DIGIN2
000053	DIGIN3
000054	DIGIN4
000055	DIGIN5
000056	DIGIN6(ST)
000065	DIGIN-CINH
000100	DFSET-ACK
000500	DCTRL-RDY
000501	DCTRL-CINH
000502	DCTRL-INIT
000503	DCTRL-IMP
000504	DCTRL-NACT=0
000505	DCTRL-CW/CCW
001000	FIXED0
001001	FIXED1
002000	DCTRL-PAR*1
002001	DCTRL-PAR*2
002002	DCTRL-PAR-BUSY
005001	MCTRL-QSP-OUT
005002	MCTRL-IMAX
005003	MCTRL-MMAX
005006	MCTRL-GSB-OUT
005050	NSET-RFG-I=0
006000	DFRFG1-FAIL
006001	DFRFG1-SYNC
006100	MFAIL-STATUS
006101	MFAIL-I-RESET
006400	FCNT1-EQUAL
010000	BRK1-OUT
010001	BRK1-CINH
010002	BRK1-QSP
010003	BRK1-M-STORE
010250	R/L/Q-QSP
010251	R/L/Q-R/L
010500	AND1-OUT
010505	AND2-OUT
010510	AND3-OUT
010515	AND4-OUT

Parameter	Digital output signal (□)
010520	AND5-OUT
010550	OR1-OUT
010555	OR2-OUT
010560	OR3-OUT
010565	OR4-OUT
010570	OR5-OUT
010600	NOT1-OUT
010605	NOT2-OUT
010610	NOT3-OUT
010615	NOT4-OUT
010620	NOT5-OUT
010650	CMP1-OUT
010655	CMP2-OUT
010660	CMP3-OUT
010665	CMP4-OUT
010700	DIGDEL1-OUT
010705	DIGDEL2-OUT
010750	TRANS1-OUT
010755	TRANS2-OUT
010900	FLIP1-OUT
010905	FLIP2-OUT
011000	DCALC1-DMAX
011001	DCALC1-DMIN
011002	DCALC1-I=0
011003	DCALC1-OVFL
011100	INT1-DOUT
011105	INT2-DOUT
013000	FEVAN1-BUSY
013001	FEVAN1-FAIL
015000	DCTRL-TRIP
015001	DCTRL-MESS
015002	DCTRL-WARN
015003	DCTRL-FAIL
015010	MONIT-LU
015011	MONIT-OU
015012	MONIT-EEr
015013	MONIT-OC1
015014	MONIT-OC2
015015	MONIT-LP1
015016	MONIT-OH
015017	MONIT-OH3

Parameter	Digital output signal (□)
015018	MONIT-OH4
015019	MONIT-OH7
015020	MONIT-OH8
015022	MONIT-SD3
015026	MONIT-CE0
015027	MONIT-NMAX
015028	MONIT-OC5
015029	MONIT-SD5
015030	MONIT-SD6
015032	MONIT-H07
015033	MONIT-H10
015034	MONIT-H11
015040	MONIT-CE1
015041	MONIT-CE2
015042	MONIT-CE3
015043	MONIT-CE4
015044	MONIT-OC3
015045	MONIT-ID1
015046	MONIT-ID2
015047	MONIT-OC6
015048	MONIT-OC8
019500	FCODE-250
019521	FCODE-471.B0
019522	FCODE-471.B1
019523	FCODE-471.B2
019524	FCODE-471.B3
019525	FCODE-471.B4
019526	FCODE-471.B5
019527	FCODE-471.B6
019528	FCODE-471.B7
019529	FCODE-471.B8
019530	FCODE-471.B9
019531	FCODE-471.B10
019532	FCODE-471.B11
019533	FCODE-471.B12
019534	FCODE-471.B13
019535	FCODE-471.B14
019536	FCODE-471.B15
019537	FCODE-471.B16
019538	FCODE-471.B17
019539	FCODE-471.B18
019540	FCODE-471.B19
019541	FCODE-471.B20
019542	FCODE-471.B21
019543	FCODE-471.B22
019544	FCODE-471.B23

Parameter	Digital output signal (□)
019545	FCODE-471.B24
019546	FCODE-471.B25
019547	FCODE-471.B26
019548	FCODE-471.B27
019549	FCODE-471.B28
019550	FCODE-471.B29
019551	FCODE-471.B30
019552	FCODE-471.B31
019751	FCODE-135.B0
019752	FCODE-135.B1
019753	FCODE-135.B2
019755	FCODE-135.B4
019756	FCODE-135.B5
019757	FCODE-135.B6
019758	FCODE-135.B7
019763	FCODE-135.B12
019764	FCODE-135.B13
019765	FCODE-135.B14
019766	FCODE-135.B15
020001	CAN-CTRL.B0
020002	CAN-CTRL.B1
020003	CAN-CTRL.B2
020005	CAN-CTRL.B4
020006	CAN-CTRL.B5
020007	CAN-CTRL.B6
020008	CAN-CTRL.B7
020013	CAN-CTRL.B12
020014	CAN-CTRL.B13
020015	CAN-CTRL.B14
020016	CAN-CTRL.B15
020101	CAN-IN1.B0
020102	CAN-IN1.B1
020103	CAN-IN1.B2
020104	CAN-IN1.B3
020105	CAN-IN1.B4
020106	CAN-IN1.B5
020107	CAN-IN1.B6
020108	CAN-IN1.B7
020109	CAN-IN1.B8
020110	CAN-IN1.B9
020111	CAN-IN1.B10
020112	CAN-IN1.B11

Parameter	Digital output signal (□)
020113	CAN-IN1.B12
020114	CAN-IN1.B13
020115	CAN-IN1.B14
020116	CAN-IN1.B15
020117	CAN-IN1.B16
020118	CAN-IN1.B17
020119	CAN-IN1.B18
020120	CAN-IN1.B19
020121	CAN-IN1.B20
020122	CAN-IN1.B21
020123	CAN-IN1.B22
020124	CAN-IN1.B23
020125	CAN-IN1.B24
020126	CAN-IN1.B25
020127	CAN-IN1.B26
020128	CAN-IN1.B27
020129	CAN-IN1.B28
020130	CAN-IN1.B29
020131	CAN-IN1.B30
020132	CAN-IN1.B31
020201	CAN-IN2.B0
020202	CAN-IN2.B1
020203	CAN-IN2.B2
020204	CAN-IN2.B3
020205	CAN-IN2.B4
020206	CAN-IN2.B5
020207	CAN-IN2.B6
020208	CAN-IN2.B7
020209	CAN-IN2.B8
020210	CAN-IN2.B9
020211	CAN-IN2.B10
020212	CAN-IN2.B11
020213	CAN-IN2.B12
020214	CAN-IN2.B13
020215	CAN-IN2.B14
020216	CAN-IN2.B15
020217	CAN-IN2.B16
020218	CAN-IN2.B17
020219	CAN-IN2.B18
020220	CAN-IN2.B19
020221	CAN-IN2.B20
020222	CAN-IN2.B21

Parameter	Digital output signal (□)
020223	CAN-IN2.B22
020224	CAN-IN2.B23
020225	CAN-IN2.B24
020226	CAN-IN2.B25
020227	CAN-IN2.B26
020228	CAN-IN2.B27
020229	CAN-IN2.B28
020230	CAN-IN2.B29
020231	CAN-IN2.B30
020232	CAN-IN2.B31
020301	CAN-IN3.B0
020302	CAN-IN3.B1
020303	CAN-IN3.B2
020304	CAN-IN3.B3
020305	CAN-IN3.B4
020306	CAN-IN3.B5
020307	CAN-IN3.B6
020308	CAN-IN3.B7
020309	CAN-IN3.B8
020310	CAN-IN3.B9
020311	CAN-IN3.B10
020312	CAN-IN3.B11
020313	CAN-IN3.B12
020314	CAN-IN3.B13
020315	CAN-IN3.B14
020316	CAN-IN3.B15
020317	CAN-IN3.B16
020318	CAN-IN3.B17
020319	CAN-IN3.B18
020320	CAN-IN3.B19
020321	CAN-IN3.B20
020322	CAN-IN3.B21
020323	CAN-IN3.B22
020324	CAN-IN3.B23
020325	CAN-IN3.B24
020326	CAN-IN3.B25
020327	CAN-IN3.B26
020328	CAN-IN3.B27
020329	CAN-IN3.B28
020330	CAN-IN3.B29
020331	CAN-IN3.B30
020332	CAN-IN3.B31

Parameter	Digital output signal (□)
020400	CAN-SYNC-OUT
025001	AIF-CTRL.B0
025002	AIF-CTRL.B1
025003	AIF-CTRL.B2
025005	AIF-CTRL.B4
025006	AIF-CTRL.B5
025007	AIF-CTRL.B6
025008	AIF-CTRL.B7
025013	AIF-CTRL.B12
025014	AIF-CTRL.B13
025015	AIF-CTRL.B14
025016	AIF-CTRL.B15
025101	AIF-IN.B0
025102	AIF-IN.B1
025103	AIF-IN.B2
025104	AIF-IN.B3
025105	AIF-IN.B4
025106	AIF-IN.B5
025107	AIF-IN.B6
025108	AIF-IN.B7
025109	AIF-IN.B8
025110	AIF-IN.B9

Parameter	Digital output signal (□)
025111	AIF-IN.B10
025112	AIF-IN.B11
025113	AIF-IN.B12
025114	AIF-IN.B13
025115	AIF-IN.B14
025116	AIF-IN.B15
025117	AIF-IN.B16
025118	AIF-IN.B17
025119	AIF-IN.B18
025120	AIF-IN.B19
025121	AIF-IN.B20
025122	AIF-IN.B21
025123	AIF-IN.B22
025124	AIF-IN.B23
025125	AIF-IN.B24
025126	AIF-IN.B25
025127	AIF-IN.B26
025128	AIF-IN.B27
025129	AIF-IN.B28
025130	AIF-IN.B29
025131	AIF-IN.B30
025132	AIF-IN.B31

8.6.3 Selection list 3: Angle signals

Parameter	Phase signal (▲)
000100	DFSET-PSET
001000	FIXED0INC
005000	MCTRL-PHI-ANG
011100	INT1-POUT
011105	INT2-POUT

Parameter	Phase signal (▲)
019521	FCODE-474/1
019522	FCODE-474/2
020103	CAN-IN1.D1
020201	CAN-IN2.D1
020301	CAN-IN3.D1
025103	AIF-IN.D1

8.6.4 Selection list 4: Speed signals

Parameter	Speed signal (Δ)
000050	DFIN-OUT
000100	DFSET-POUT
000250	DFOUT-OUT
001000	FIXEDPHI-0

Parameter	Speed signal (Δ)
005000	MCTRL-PHI-ACT
006000	DFRFG-OUT
006220	CONV5-OUT
019521	FCODE-475/1
019522	FCODE-475/2

8.6.5 Selection list 5: Function blocks

Parameter	Function block
000000	empty
000050	AIN1
000055	AIN2
000070	AOUT1
000075	AOUT2
000100	DFSET
000200	DFIN
000250	DFOUT
005050	NSET
005100	MPOT1
005150	PCTRL1
005250	NLIM1
005500	ARIT1
005505	ARIT2
005510	ARIT3
005540	SQRT1
005550	ADD1
005555	ADD2
005600	RFG1
005610	SRFG1
005650	ASW1
005655	ASW2
005660	ASW3
005700	ANEG1
005705	ANEG2
005750	FIXSET1
005800	LIM1
005850	ABS1
005900	PT1-1
005905	PT1-2
005950	DT1-1
006000	DFRFG1
006100	MFAIL
006150	DB1
006200	CONV1
006205	CONV2
006210	CONV3
006215	CONV4
006220	CONV5
006230	CONVPHA1

Parameter	Function block
006300	S&H1
006350	CURVE1
006400	FCNT1
010000	BRK1
010250	R/L/Q
010500	AND1
010505	AND2
010510	AND3
010515	AND4
010520	AND5
010550	OR1
010555	OR2
010560	OR3
010565	OR4
010570	OR5
010600	NOT1
010605	NOT2
010610	NOT3
010615	NOT4
010620	NOT5
010650	CMP1
010655	CMP2
010660	CMP3
010665	CMP4
010700	DIGDEL1
010705	DIGDEL2
010750	TRANS1
010755	TRANS2
010900	FLIP1
010905	FLIP2
011000	DCALC1
011050	PCTRL2
011100	INT1
011105	INT2
011150	FOLL1
013000	FEVAN1
013100	OSZ
015100	MLP1
020000	CAN-OUT
025000	AIF-OUT

8.6.6 Selection list 10: Error messages

Parameter	Error message
000000	No fail
000011	OC1 TRIP
000012	OC2 TRIP
000013	OC3 TRIP
000015	OC5 TRIP
000016	OC6 TRIP
000018	OC8 TRIP
000032	LP1 TRIP
000050	OH TRIP
000053	OH3 TRIP
000057	OH7 TRIP
000058	OH8 TRIP
000061	CE0 TRIP
000062	CE1 TRIP
000063	CE2 TRIP
000064	CE3 TRIP
000065	CE4 TRIP
000070	U15 TRIP
000071	CCr TRIP
000072	PR1 TRIP
000073	PR2 TRIP
000074	PEr TRIP
000075	PR0 TRIP
000077	PR3 TRIP
000078	PR4 TRIP
000079	PI TRIP
000083	Sd3 TRIP

Parameter	Error message
000085	Sd5 TRIP
000086	Sd6 TRIP
000091	EEr TRIP
000105	H05 TRIP
000107	H07 TRIP
000110	H10 TRIP
000111	H11 TRIP
000140	Id1 TRIP
000141	Id2 TRIP
000200	NMAX TRIP
001030	LU Message
001091	EEr Message
002018	OC8 Warning
002020	OU Warning
002032	LP1 Warning
002053	OH3 Warning
002054	OH4 Warning
002057	OH7 Warning
002058	OH8 Warning
002061	CE0 Warning
002062	CE1 Warning
002063	CE2 Warning
002064	CE3 Warning
002065	CE4 Warning
002083	Sd3 Warning
002085	Sd5 Warning
002086	Sd6 Warning
002091	EER Warning

Parameter	Error message
00000	No error
00011	OC1-TRIP
00012	OC2-TRIP
00015	OC5-TRIP
00032	LP1-TRIP
00050	OH-TRIP
00053	OH3-TRIP
00057	OH7-TRIP
00058	OH8-TRIP
00061	CE0-TRIP
00062	CE1-TRIP
00063	CE2-TRIP
00064	CE3-TRIP
00065	CE4-TRIP
00070	U15-TRIP
00071	CCr-TRIP
00072	Pr1-TRIP
00073	Pr2-TRIP
00074	PEr-TRIP
00075	Pr0-TRIP
00077	Pr3-TRIP
00078	Pr4-TRIP
00079	PI-TRIP
00082	Sd2-TRIP
00083	Sd3-TRIP
00085	Sd5-TRIP
00086	Sd6-TRIP
00087	Sd7-TRIP
00088	Sd8-TRIP
00089	PL-TRIP
00091	EER-TRIP
00105	H05-TRIP
00107	H07-TRIP

Parameter	Error message
00110	H10-TRIP
00111	H11-TRIP
00153	P03-TRIP
00163	P13-TRIP
00166	P16-TRIP
00169	P19-TRIP
00190	nErr-TRIP
00200	NMAX-TRIP
00220	CDA-TRIP
00221	CDA-LOAD-TRIP
01020	OU message
01030	LU message
01091	EER message
02032	LP1 warning
02053	OH3 warning
02054	OH4 warning
02057	OH7 warning
02058	OH8 warning
02061	CEO warning
02062	CE1 warning
02063	CE2 warning
02064	CE3 warning
02065	CE4 warning
02082	Sd2 warning
02083	Sd3 warning
02085	Sd5 warning
02086	Sd6 warning
02091	EER warning
02153	P03 warning
02163	P13 warning
02166	P16 warning
02169	P19 warning
02220	CDA warning
02221	CDA-LOAD warning

8.7 Table of attributes

The attribute table describes the properties of the codes used. It enables you to create your own communication programs for the controller.

How to read the table of attributes

Column		Abbreviation	Meaning	
Code		Cxxxx	Name of the Lenze code	
Index	dec	24575 - Lenze code number	Index under which the parameter is addressed	Is only required for control via INTERBUS, PROFIBUS DP or system bus (CAN)
	hex	5FFFh - Lenze code number	The subindex of array variables corresponds to the Lenze subcode number	
Data	DS	E	Data structure	Single variable (only one parameter element)
		A		Array variable (several parameter elements)
	DA	xx	Number of array elements (subcodes)	
	DT	B8	Data type	1 byte bit-coded
		B16		2 bytes bit-coded
		B32		4 bytes bit-coded
		FIX32		32-bit value with sign; decimal with four decimal places
		I32		4 bytes with sign
		U32		4 bytes without sign
		VS		ASCII string
	Format	VD	LECOM format (see also Operating Instructions of the bus module)	ASCII decimal format
		VH		ASCII hexadecimal format
		VS		String format
		VO		Octet string format for data blocks
	DL		Data length in byte	The column "Important" contains further information
Access	LCM-R/W	Ra	Access authorisation for LECOM	Reading is always permitted
		Wa		Writing is always permitted
		W		Writing is restricted
	Condition	CINH	Condition for writing	Writing permitted only when controller is inhibited

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0002	♦	♦	24573	5FFD	E	1	FIX32	VD	4	Ra/W	CINH
C0003	♦	♦	24572	5FFC	E	1	FIX32	VD	4	Ra/Wa	
C0004	♦	♦	24571	5FFB	E	1	FIX32	VD	4	Ra/Wa	
C0005	♦	♦	24570	5FFA	E	1	FIX32	VD	4	Ra/W	CINH
C0006	♦	♦	24569	5FF9	E	1	FIX32	VD	4	Ra/W	CINH
C0009	♦	♦	24566	5FF6	E	1	FIX32	VD	4	Ra/Wa	
C0010	♦	♦	24565	5FF5	E	1	FIX32	VD	4	Ra/Wa	
C0011	♦	♦	24564	5FF4	E	1	FIX32	VD	4	Ra/Wa	
C0012	♦	♦	24563	5FF3	E	1	FIX32	VD	4	Ra/Wa	
C0013	♦	♦	24562	5FF2	E	1	FIX32	VD	4	Ra/Wa	
C0014	♦	♦	24561	5FF1	E	1	FIX32	VD	4	Ra/Wa	
C0015	♦	♦	24560	5FF0	E	1	FIX32	VD	4	Ra/Wa	
C0016	♦	♦	24559	5FfF	E	1	FIX32	VD	4	Ra/Wa	
C0017	♦	♦	24558	5FEE	E	1	FIX32	VD	4	Ra/Wa	
C0018	♦	♦	24557	5FED	E	1	FIX32	VD	4	Ra/Wa	
C0019	♦	♦	24556	5FEC	E	1	FIX32	VD	4	Ra/Wa	
C0020	♦	♦	24555	5FEB	E	1	FIX32	VD	4	Ra/Wa	
C0021	♦	♦	24554	5FEA	E	1	FIX32	VD	4	Ra/Wa	
C0022	♦	♦	24553	5FE9	E	1	FIX32	VD	4	Ra/Wa	
C0023	♦	♦	24552	5FE8	E	1	FIX32	VD	4	Ra/Wa	
C0025	♦	♦	24550	5FE6	E	1	FIX32	VD	4	Ra/W	CINH
C0026	♦	♦	24549	5FE5	A	2	FIX32	VD	4	Ra/Wa	
C0027	♦	♦	24548	5FE4	A	2	FIX32	VD	4	Ra/Wa	
C0030	♦	♦	24545	5FE1	E	1	FIX32	VD	4	Ra/Wa	
C0032	♦	♦	24543	5FDF	E	1	FIX32	VD	4	Ra/Wa	
C0033	♦	♦	24542	5FDE	E	1	FIX32	VD	4	Ra/Wa	
C0034	♦	♦	24541	5FDD	E	1	FIX32	VD	4	Ra/Wa	
C0036	♦	♦	24539	5FDB	E	1	FIX32	VD	4	Ra/Wa	
C0037	♦	♦	24538	5FDA	E	1	FIX32	VD	4	Ra/Wa	
C0038	♦	♦	24537	5FD9	A	6	FIX32	VD	4	Ra/Wa	
C0039	♦	♦	24536	5FD8	A	15	FIX32	VD	4	Ra/Wa	
C0040	♦	♦	24535	5FD7	E	1	FIX32	VD	4	Ra/Wa	
C0042	♦	♦	24533	5FD5	E	1	FIX32	VD	4	Ra	
C0043	♦	♦	24532	5FD4	E	1	FIX32	VD	4	Ra/Wa	
C0045	♦	♦	24530	5FD2	E	1	FIX32	VD	4	Ra	
C0046	♦	♦	24529	5FD1	E	1	FIX32	VD	4	Ra	
C0049	♦	♦	24526	5FCE	E	1	FIX32	VD	4	Ra	
C0050	♦	♦	24525	5FCD	E	1	FIX32	VD	4	Ra	
C0051	♦	♦	24524	5FCC	E	1	FIX32	VD	4	Ra	
C0052	♦	♦	24523	5FCB	E	1	FIX32	VD	4	Ra	
C0053	♦	♦	24522	5FCA	E	1	FIX32	VD	4	Ra	
C0054	♦	♦	24521	5FC9	E	1	FIX32	VD	4	Ra	
C0056	♦	♦	24519	5FC7	E	1	FIX32	VD	4	Ra	
C0057	♦	♦	24518	5FC6	E	1	FIX32	VD	4	Ra	
C0058	♦	♦	24517	5FC5	E	1	FIX32	VD	4	Ra	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0059	♦	♦	24516	5FC4	E	1	FIX32	VD	4	Ra	
C0061	♦	♦	24514	5FC2	E	1	FIX32	VD	4	Ra	
C0063	♦	♦	24512	5FC0	E	1	FIX32	VD	4	Ra	
C0064	♦	♦	24511	5FBF	E	1	FIX32	VD	4	Ra	
C0066	♦	♦	24509	5FBD	E	1	FIX32	VD	4	Ra	
C0067	♦	♦	24508	5FBC	E	1	FIX32	VD	4	Ra	
C0070	♦	♦	24505	5FB9	E	1	FIX32	VD	4	Ra/Wa	
C0071	♦	♦	24504	5FB8	E	1	FIX32	VD	4	Ra/Wa	
C0074	♦	♦	24501	5FB5	E	1	FIX32	VD	4	Ra/Wa	
C0075	♦	♦	24500	5FB4	E	1	FIX32	VD	4	Ra/Wa	
C0076	♦	♦	24499	5FB3	E	1	FIX32	VD	4	Ra/Wa	
C0077	♦	♦	24498	5FB2	E	1	FIX32	VD	4	Ra/Wa	
C0078	♦	♦	24497	5FB1	E	1	FIX32	VD	4	Ra/Wa	
C0079	♦	♦	24496	5FB0	E	1	FIX32	VD	4	Ra/Wa	
C0080	♦	♦	24495	5FAF	E	1	FIX32	VD	4	Ra/Wa	
C0081	♦	♦	24494	5FAE	E	1	FIX32	VD	4	Ra/W	CINH
C0082	♦	♦	24493	5FAD	E	1	FIX32	VD	4	Ra/W	CINH
C0084	♦	♦	24491	5FAB	E	1	FIX32	VD	4	Ra/W	CINH
C0085	♦	♦	24490	5FAA	E	1	FIX32	VD	4	Ra/W	CINH
C0086	♦	♦	24489	5FA9	E	1	FIX32	VD	4	Ra/W	CINH
C0087	♦	♦	24488	5FA8	E	1	FIX32	VD	4	Ra/W	CINH
C0088	♦	♦	24487	5FA7	E	1	FIX32	VD	4	Ra/W	CINH
C0089	♦	♦	24486	5FA6	E	1	FIX32	VD	4	Ra/W	CINH
C0090	♦	♦	24485	5FA5	E	1	FIX32	VD	4	Ra/W	CINH
C0091	♦	♦	24484	5FA4	E	1	FIX32	VD	4	Ra/W	CINH
C0092	♦	♦	24483	5FA3	E	1	FIX32	VD	4	Ra/W	CINH
C0093	♦	♦	24482	5FA2	E	1	FIX32	VD	4	Ra	
C0094	♦	♦	24481	5FA1	E	1	FIX32	VD	4	Ra/Wa	
C0095	♦	♦	24480	5FA0	E	1	FIX32	VD	4	Ra/W	CINH
C0096	♦	♦	24479	5F9F	A	2	FIX32	VD	4	Ra/Wa	
C0099	♦	♦	24476	5F9C	E	1	FIX32	VD	4	Ra	
C0101	♦	♦	24474	5F9A	A	15	FIX32	VD	4	Ra/Wa	
C0103	♦	♦	24472	5F98	A	15	FIX32	VD	4	Ra/Wa	
C0104	♦	♦	24471	5F97	E	1	FIX32	VD	4	Ra/W	CINH
C0105	♦	♦	24470	5F96	E	1	FIX32	VD	4	Ra/Wa	
C0107	♦	♦	24478	5F94	E	1	FIX32	VD	4	Ra/Wa	
C0108	♦	♦	24467	5F93	A	2	FIX32	VD	4	Ra/Wa	
C0109	♦	♦	24466	5F92	A	2	FIX32	VD	4	Ra/Wa	
C0114	♦	♦	24461	5F8D	A	6	FIX32	VD	4	Ra/Wa	
C0116	♦	♦	24459	5F8B	A	32	FIX32	VD	4	Ra/W	CINH
C0117	♦	♦	24458	5F8A	A	4	FIX32	VD	4	Ra/W	CINH
C0118	♦	♦	24457	5F89	A	4	FIX32	VD	4	Ra/Wa	
C0120	♦	♦	24455	5F87	E	1	FIX32	VD	4	Ra/Wa	
C0121	♦	♦	24454	5F86	E	1	FIX32	VD	4	Ra/Wa	
C0122	♦	♦	24453	5F85	E	1	FIX32	VD	4	Ra/Wa	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0125	♦	♦	24450	5F82	E	1	FIX32	VD	4	Ra/Wa	
C0126	♦	♦	24449	5F81	E	1	FIX32	VD	4	Ra/Wa	
C0127	♦	♦	24448	5F80	E	1	FIX32	VD	4	Ra/Wa	
C0128	♦	♦	24447	5F7F	E	1	FIX32	VD	4	Ra/Wa	
C0130	♦	♦	24445	5F7D	E	1	FIX32	VD	4	Ra	
C0132	♦	♦	24443	5F7B	E	1	FIX32	VD	4	Ra/W	CINH
C0133	♦	♦	24442	5F7A	E	1	FIX32	VD	4	Ra/W	CINH
C0134	♦	♦	24441	5F79	E	1	FIX32	VD	4	Ra/Wa	
C0135	♦	♦	24440	5F78	E	1	B16	VH	2		
C0136	♦	♦	24439	5F77	A	3	B16	VH	2	Ra	
C0140	♦		24435	5F73	E	1	FIX32	VD	4	Ra/Wa	
C0141	♦	♦	24434	5F72	E	1	FIX32	VD	4	Ra/Wa	
C0142	♦	♦	24433	5F71	E	1	FIX32	VD	4	Ra/Wa	
C0143	♦	♦	24432	5F70	E	1	FIX32	VD	4	Ra/Wa	
C0144	♦	♦	24431	5F6F	E	1	FIX32	VD	4	Ra/W	CINH
C0145	♦	♦	24430	5F6E	E	1	FIX32	VD	4	Ra/W	CINH
C0146	♦	♦	24429	5F6D	E	1	FIX32	VD	4	Ra/Wa	
C0147	♦	♦	24428	5F6C	E	1	FIX32	VD	4	Ra/Wa	
C0148	♦	♦	24427	5F6B	E	1	FIX32	VD	4	Ra/W	CINH
C0149	♦	♦	24426	5F6A	E	1	FIX32	VD	4	Ra/W	CINH
C0150	♦	♦	24425	5F69	E	1	B16	VH	2	Ra	
C0151	♦	♦	24424	5F68	E	1	B32	VH	4	Ra	
C0155	♦	♦	24420	5F64	E	1	B16	VH	2	Ra	
C0156	♦	♦	24419	5F63	A	7	FIX32	VD	4	Ra/W	CINH
C0157	♦	♦	24418	5F62	A	7	FIX32	VD	4	Ra	
C0161	♦	♦	24414	5F5E	E	1	FIX32	VD	4	Ra	
C0167	♦	♦	24408	5F58	E	1	FIX32	VD	4	Ra/Wa	
C0168	♦	♦	24407	5F57	A	8	FIX32	VD	4	Ra	
C0169	♦	♦	24406	5F56	A	8	U32	VH	4	Ra	
C0170	♦	♦	24405	5F55	A	8	FIX32	VD	4	Ra	
C0173	♦	♦	24402	5F52	E	1	FIX32	VD	4	Ra/Wa	
C0174		♦	24401	5F51	E	1	FIX32	VD	4	Ra/Wa	
C0178	♦	♦	24397	5F4D	E	1	U32	VH	4	Ra	
C0179	♦	♦	24396	5F4C	E	1	U32	VH	4	Ra	
C0182	♦	♦	24393	5F49	E	1	FIX32	VD	4	Ra/Wa	
C0183	♦	♦	24392	5F48	E	1	FIX32	VD	4	Ra	
C0190	♦	♦	24385	5F41	E	1	FIX32	VD	4	Ra/Wa	
C0195	♦	♦	24380	5F3C	E	1	FIX32	VD	4	Ra/Wa	
C0196	♦	♦	24379	5F3B	E	1	FIX32	VD	4	Ra/Wa	
C0200	♦	♦	24375	5F37	E	1	VS	VS	14	Ra	
C0201	♦	♦	24374	5F36	E	1	VS	VS	20	Ra	
C0202	♦	♦	24373	5F35	E	1	VS	VS	20	Ra	
C0203	♦	♦	24372	5F34	E	1	VS	VS	20	Ra	
C0204	♦	♦	24371	5F33	E	1	VS	VS	20	Ra	
C0206	♦	♦	24369	5F31	E	1	VS	VS	20	Ra	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0207	♦	♦	24368	5F30	E	1	VS	VS	20	Ra	
C0208	♦	♦	24367	5F2F	E	1	VS	VS	20	Ra	
C0209	♦	♦	24366	5F2E	E	1	VS	VS	20	Ra	
C0220	♦	♦	24355	5F23	E	1	FIX32	VD	4	Ra/Wa	
C0221	♦	♦	24354	5F22	E	1	FIX32	VD	4	Ra/Wa	
C0222	♦	♦	24353	5F21	E	1	FIX32	VD	4	Ra/Wa	
C0223	♦	♦	24352	5F20	E	1	FIX32	VD	4	Ra/Wa	
C0224	♦	♦	24351	5F1F	E	1	FIX32	VD	4	Ra/Wa	
C0234	♦	♦	24341	5F15	E	1	FIX32	VD	4	Ra/Wa	
C0235	♦	♦	24340	5F14	E	1	FIX32	VD	4	Ra/Wa	
C0236	♦	♦	24339	5F13	E	1	FIX32	VD	4	Ra/Wa	
C0241	♦	♦	24334	5F0E	E	1	FIX32	VD	4	Ra/Wa	
C0244	♦	♦	24331	5F0B	E	1	FIX32	VD	4	Ra/Wa	
C0250	♦	♦	24325	5F05	E	1	FIX32	VD	4	Ra/Wa	
C0252	♦	♦	24323	5F03	E	1	I32	VH	4	Ra/Wa	
C0253	♦	♦	24322	5F02	E	1	FIX32	VD	4	Ra/Wa	
C0260	♦	♦	24315	5EFB	E	1	FIX32	VD	4	Ra/Wa	
C0261	♦	♦	24314	5EFA	E	1	FIX32	VD	4	Ra/Wa	
C0262	♦	♦	24313	5EF9	E	1	FIX32	VD	4	Ra/Wa	
C0263	♦	♦	24312	5EF8	E	1	FIX32	VD	4	Ra/Wa	
C0264	♦	♦	24311	5EF7	E	1	FIX32	VD	4	Ra/Wa	
C0265	♦	♦	24310	5EF6	E	1	FIX32	VD	4	Ra/Wa	
C0267	♦	♦	24308	5EF4	A	2	FIX32	VD	4	Ra/W	CINH
C0268	♦	♦	24307	5EF3	E	1	FIX32	VD	4	Ra/W	CINH
C0269	♦	♦	24306	5EF2	A	3	FIX32	VD	4	Ra	
C0325	♦	♦	24250	5EBA	E	1	FIX32	VD	4	Ra/Wa	
C0326	♦	♦	24249	5EB9	E	1	FIX32	VD	4	Ra/Wa	
C0327	♦	♦	24248	5EB8	E	1	FIX32	VD	4	Ra/Wa	
C0328	♦	♦	24247	5EB7	E	1	FIX32	VD	4	Ra/Wa	
C0329	♦	♦	24246	5EB6	E	1	FIX32	VD	4	Ra/Wa	
C0332	♦	♦	24243	5EB3	E	1	FIX32	VD	4	Ra/Wa	
C0333	♦	♦	24242	5EB2	E	1	FIX32	VD	4	Ra/Wa	
C0336	♦	♦	24239	5EAF	E	1	FIX32	VD	4	Ra	
C0337	♦	♦	24238	5EAE	E	1	FIX32	VD	4	Ra/Wa	
C0338	♦	♦	24237	5EAD	E	1	FIX32	VD	4	Ra/Wa	
C0339	♦	♦	24236	5EAC	A	2	FIX32	VD	4	Ra/W	CINH
C0340	♦	♦	24235	5EAB	A	2	FIX32	VD	4	Ra	
C0350	♦	♦	24225	5EA1	E	1	FIX32	VD	4	Ra/Wa	
C0351	♦	♦	24224	5EA0	E	1	FIX32	VD	4	Ra/Wa	
C0352	♦	♦	24223	5E9F	E	1	FIX32	VD	4	Ra/Wa	
C0353	♦	♦	24222	5E9E	A	3	FIX32	VD	4	Ra/Wa	
C0354	♦	♦	24221	5E9D	A	6	FIX32	VD	4	Ra/Wa	
C0355	♦	♦	24220	5E9C	A	6	FIX32	VD	4	Ra	
C0356	♦	♦	24219	5E9B	A	4	FIX32	VD	4	Ra/Wa	
C0357	♦	♦	24218	5E9A	A	3	FIX32	VD	4	Ra/Wa	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0358	♦	♦	24217	5E99	E	1	FIX32	VD	4	Ra/Wa	
C0359	♦	♦	24216	5E98	E	1	FIX32	VD	4	Ra	
C0360	♦	♦	24215	5E97	A	12	FIX32	VD	4	Ra	
C0361	♦	♦	24214	5E96	A	12	FIX32	VD	4	Ra	
C0364	♦	♦	24211	5E93	E	1	FIX32	VD	4	Ra/W	CINH
C0365	♦	♦	24210	5E92	E	1	FIX32	VD	4	Ra	
C0366	♦	♦	24209	5E91	E	1	FIX32	VD	4	Ra/Wa	
C0367	♦	♦	24208	5E90	E	1	FIX32	VD	4	Ra/Wa	
C0368	♦	♦	24207	5E8F	E	1	FIX32	VD	4	Ra/Wa	
C0369	♦	♦	24206	5E8E	E	1	FIX32	VD	4	Ra/Wa	
C0400	♦	♦	24175	5E6F	E	1	FIX32	VD	4	Ra	
C0402	♦	♦	24173	5E6D	E	1	FIX32	VD	4	Ra/W	CINH
C0403	♦	♦	24172	5E6C	E	1	FIX32	VD	4	Ra/W	CINH
C0404	♦	♦	24171	5E6B	A	2	FIX32	VD	4	Ra	
C0405	♦	♦	24170	5E6A	E	1	FIX32	VD	4	Ra	
C0407	♦	♦	24168	5E68	E	1	FIX32	VD	4	Ra/W	CINH
C0408	♦	♦	24167	5E67	E	1	FIX32	VD	4	Ra/W	CINH
C0409	♦	♦	24166	5E66	A	2	FIX32	VD	4	Ra	
C0420	♦	♦	24155	5E5B	E	1	FIX32	VD	4	Ra/W	CINH
C0421	♦	♦	24154	5E5A	E	1	FIX32	VD	4	Ra/W	CINH
C0425	♦	♦	24150	5E56	E	1	FIX32	VD	4	Ra/Wa	
C0426	♦	♦	24149	5E55	E	1	FIX32	VD	4	Ra	
C0427	♦	♦	24148	5E54	E	1	FIX32	VD	4	Ra/Wa	
C0429	♦	♦	24146	5E52	E	1	FIX32	VD	4	Ra/Wa	
C0431	♦	♦	24144	5E50	E	1	FIX32	VD	4	Ra/W	CINH
C0432	♦	♦	24143	5E4F	E	1	FIX32	VD	4	Ra/W	CINH
C0433	♦	♦	24142	5E4E	E	1	FIX32	VD	4	Ra/W	CINH
C0434	♦	♦	24141	5E4D	A	3	FIX32	VD	4	Ra	
C0436	♦	♦	24139	5E4B	E	1	FIX32	VD	4	Ra/W	CINH
C0437	♦	♦	24138	5E4A	E	1	FIX32	VD	4	Ra/W	CINH
C0438	♦	♦	24137	5E49	E	1	FIX32	VD	4	Ra/W	CINH
C0439	♦	♦	24136	5E48	A	3	FIX32	VD	4	Ra	
C0443	♦	♦	24132	5E44	E	1	B8	VH	1	Ra	
C0444	♦	♦	24131	5E43	A	4	FIX32	VD	4	Ra	
C0450	♦	♦	24125	5E3D	E	1	FIX32	VD	4	Ra/W	CINH
C0451	♦	♦	24124	5E3C	E	1	FIX32	VD	4	Ra/W	CINH
C0452	♦	♦	24123	5E3B	E	1	FIX32	VD	4	Ra/W	CINH
C0458	♦	♦	24117	5E35	A	2	FIX32	VD	4	Ra	
C0459	♦	♦	24116	5E34	E	1	FIX32	VD	4	Ra	
C0464	♦	♦	24111	5E2F	E	1	FIX32	VD	4	Ra	
C0465	♦	♦	24110	5E2E	A	50	FIX32	VD	4	Ra/W	CINH
C0466	♦	♦	24109	5E2D	E	1	FIX32	VD	4	Ra	
C0469	♦	♦	24106	5E2A	E	1	FIX32	VD	4	Ra/W	CINH
C0470	♦	♦	24105	5E29	A	4	B8	VH	1	Ra/Wa	
C0471	♦	♦	24104	5E28	E	1	B32	VH	4	Ra/Wa	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0472	♦	♦	24103	5E27	A	20	FIX32	VD	4	Ra/Wa	
C0473	♦	♦	24102	5E26	A	10	FIX32	VD	4	Ra/Wa	
C0474	♦	♦	24101	5E25	A	2	I32	VH	4	Ra/Wa	
C0475	♦	♦	24100	5E24	A	2	FIX32	VD	4	Ra/Wa	
C0497	♦	♦	24078	5E0E	E	1	FIX32	VD	4	Ra/Wa	
C0510	♦	♦	24065	5E01	E	1	FIX32	VD	4	Ra/W	CINH
C0511	♦	♦	24064	5E00	E	1	FIX32	VD	4	Ra/Wa	
C0517	♦	♦	24058	5DFA	A	32	FIX32	VD	4	Ra/Wa	
C0520	♦	♦	24055	5DF7	E	1	FIX32	VD	4	Ra/W	CINH
C0521	♦	♦	24054	5DF6	E	1	FIX32	VD	4	Ra/W	CINH
C0522	♦	♦	24053	5DF5	E	1	FIX32	VD	4	Ra/W	CINH
C0523	♦	♦	24052	5DF4	E	1	FIX32	VD	4	Ra/W	CINH
C0524	♦	♦	24051	5DF3	E	1	FIX32	VD	4	Ra/W	CINH
C0525	♦	♦	24050	5DF2	E	1	FIX32	VD	4	Ra/W	CINH
C0526	♦	♦	24049	5DF1	E	1	FIX32	VD	4	Ra/W	CINH
C0527	♦	♦	24048	5DF0	E	1	FIX32	VD	4	Ra/W	CINH
C0528	♦	♦	24047	5DEF	A	2	I32	VH	4	Ra	
C0529	♦	♦	24046	5DEE	E	1	FIX32	VD	4	Ra/Wa	
C0530	♦	♦	24045	5DED	E	1	FIX32	VD	4	Ra/Wa	
C0531	♦	♦	24044	5DEC	E	1	FIX32	VD	4	Ra/Wa	
C0532	♦	♦	24043	5DEB	E	1	FIX32	VD	4	Ra/Wa	
C0533	♦	♦	24042	5DEA	E	1	FIX32	VD	4	Ra/Wa	
C0534	♦	♦	24041	5DE9	E	1	FIX32	VD	4	Ra/Wa	
C0535	♦	♦	24040	5DE8	E	1	FIX32	VD	4	Ra/Wa	
C0536	♦	♦	24039	5DE7	A	3	FIX32	VD	4	Ra	
C0537	♦	♦	24038	5DE6	E	1	FIX32	VD	4	Ra	
C0538	♦	♦	24037	5DE5	A	3	FIX32	VD	4	Ra	
C0539	♦	♦	24036	5DE4	E	1	FIX32	VD	4	Ra	
C0540	♦	♦	24035	5DE3	E	1	FIX32	VD	4	Ra/W	CINH
C0541	♦	♦	24034	5DE2	E	1	FIX32	VD	4	Ra/W	CINH
C0542	♦	♦	24033	5DE1	E	1	FIX32	VD	4	Ra/W	CINH
C0544	♦	♦	24031	5DDF	E	1	FIX32	VD	4	Ra/W	CINH
C0545	♦	♦	24030	5DDE	E	1	FIX32	VD	4	Ra/Wa	
C0546	♦	♦	24029	5DDD	E	1	U32	VH	4	Ra/Wa	
C0547	♦	♦	24028	5DDC	E	1	FIX32	VD	4	Ra	
C0548	♦	♦	24027	5ddb	E	1	FIX32	VD	4	Ra	
C0549	♦	♦	24026	5DDA	E	1	FIX32	VD	4	Ra	
C0560	♦	♦	24015	5DCF	A	15	FIX32	VD	4	Ra/Wa	
C0561	♦	♦	24014	5DCE	E	1	FIX32	VD	4	Ra/W	CINH
C0562	♦	♦	24013	5DCD	A	4	FIX32	VD	4	Ra/W	CINH
C0563	♦	♦	24012	5DCC	E	1	FIX32	VD	4	Ra	
C0564	♦	♦	24011	5DCB	A	4	FIX32	VD	4	Ra	
C0570	♦	♦	24005	5DC5	E	1	FIX32	VD	4	Ra/W	CINH
C0571	♦	♦	24004	5DC4	E	1	FIX32	VD	4	Ra/W	CINH
C0572	♦	♦	24003	5DC3	E	1	FIX32	VD	4	Ra	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0573	♦	♦	24002	5DC2	E	1	FIX32	VD	4	Ra	
C0574	♦		24001	5DC1	E	1	FIX32	VD	4	Ra/Wa	
C0581	♦	♦	23994	5DBA	E	1	FIX32	VD	4	Ra/Wa	
C0582	♦	♦	23993	5DB9	E	1	FIX32	VD	4	Ra/Wa	
C0583	♦	♦	23992	5DB8	E	1	FIX32	VD	4	Ra/Wa	
C0584	♦	♦	23991	5DB7	E	1	FIX32	VD	4	Ra/Wa	
C0585	♦	♦	23990	5DB6	E	1	FIX32	VD	4	Ra/Wa	
C0587	♦	♦	23988	5DB4	E	1	FIX32	VD	4	Ra/Wa	
C0588	♦	♦	23987	5DB3	E	1	FIX32	VD	4	Ra/Wa	
C0591	♦	♦	23984	5DB0	E	1	FIX32	VD	4	Ra/Wa	
C0592	♦	♦	23983	5DAF	E	1	FIX32	VD	4	Ra/Wa	
C0593	♦	♦	23982	5DAE	E	1	FIX32	VD	4	Ra/Wa	
C0594	♦	♦	23981	5DAD	E	1	FIX32	VD	4	Ra/Wa	
C0595	♦	♦	23980	5DAC	E	1	FIX32	VD	4	Ra/Wa	
C0596	♦	♦	23979	5DAB	E	1	FIX32	VD	4	Ra/Wa	
C0597	♦	♦	23978	5DAA	E	1	FIX32	VD	4	Ra/Wa	
C0598	♦	♦	23977	5DA9	E	1	FIX32	VD	4	Ra/Wa	
C0599	♦	♦	23976	5DA8	E	1	FIX32	VD	4	Ra/Wa	
C0600	♦	♦	23975	5DA7	E	1	FIX32	VD	4	Ra/Wa	
C0601	♦	♦	23974	5DA6	A	2	FIX32	VD	4	Ra/W	CINH
C0602	♦	♦	23973	5DA5	A	2	FIX32	VD	4	Ra	
C0603	♦	♦	23972	5DA4	E	1	FIX32	VD	4	Ra/Wa	
C0604	♦	♦	23971	5DA3	A	2	FIX32	VD	4	Ra/W	CINH
C0605	♦	♦	23970	5DA2	A	2	FIX32	VD	4	Ra	
C0606	♦	♦	23969	5DA1	E	1	FIX32	VD	4	Ra/Wa	
C0608	♦	♦	23967	5D9F	E	1	FIX32	VD	4	Ra/W	CINH
C0609	♦	♦	23966	5D9E	E	1	FIX32	VD	4	Ra	
C0610	♦	♦	23965	5D9D	A	3	FIX32	VD	4	Ra/W	CINH
C0611	♦	♦	23964	5D9C	A	3	FIX32	VD	4	Ra	
C0612	♦	♦	23963	5D9B	A	3	FIX32	VD	4	Ra/W	CINH
C0613	♦	♦	23962	5D9A	A	3	FIX32	VD	4	Ra	
C0620	♦	♦	23955	5D93	E	1	FIX32	VD	4	Ra/Wa	
C0621	♦	♦	23954	5D92	E	1	FIX32	VD	4	Ra/Wa	
C0622	♦	♦	23953	5D91	E	1	FIX32	VD	4	Ra/W	CINH
C0623	♦	♦	23952	5D90	E	1	FIX32	VD	4	Ra	
C0630	♦	♦	23945	5D89	E	1	FIX32	VD	4	Ra/Wa	
C0631	♦	♦	23944	5D88	E	1	FIX32	VD	4	Ra/Wa	
C0632	♦	♦	23943	5D87	E	1	FIX32	VD	4	Ra/W	CINH
C0633	♦	♦	23942	5D86	E	1	FIX32	VD	4	Ra	
C0640	♦	♦	23935	5D7F	E	1	FIX32	VD	4	Ra/Wa	
C0641	♦	♦	23934	5D7E	E	1	FIX32	VD	4	Ra/W	CINH
C0642	♦	♦	23933	5D7D	E	1	FIX32	VD	4	Ra	
C0643	♦	♦	23932	5D7C	E	1	FIX32	VD	4	Ra/Wa	
C0644	♦	♦	23931	5D7B	E	1	FIX32	VD	4	Ra/W	CINH
C0645	♦	♦	23930	5D7A	E	1	FIX32	VD	4	Ra	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0650	♦	♦	23925	5D75	E	1	FIX32	VD	4	Ra/Wa	
C0651	♦	♦	23924	5D74	E	1	FIX32	VD	4	Ra/Wa	
C0652	♦	♦	23923	5D73	E	1	FIX32	VD	4	Ra/W	CINH
C0653	♦	♦	23922	5D72	E	1	FIX32	VD	4	Ra/Wa	
C0654	♦	♦	23921	5D71	E	1	FIX32	VD	4	Ra	
C0655	♦	♦	23920	5D70	E	1	FIX32	VD	4	Ra/Wa	
C0656	♦	♦	23919	5D6F	E	1	FIX32	VD	4	Ra/Wa	
C0657	♦	♦	23918	5D6E	E	1	FIX32	VD	4	Ra/W	CINH
C0658	♦	♦	23917	5D6D	E	1	FIX32	VD	4	Ra	
C0661	♦	♦	23914	5D6A	E	1	FIX32	VD	4	Ra/W	CINH
C0662	♦	♦	23913	5D69	E	1	FIX32	VD	4	Ra	
C0671	♦	♦	23904	5D60	E	1	FIX32	VD	4	Ra/Wa	
C0672	♦	♦	23903	5D5F	E	1	FIX32	VD	4	Ra/Wa	
C0673	♦	♦	23902	5D5E	E	1	FIX32	VD	4	Ra/W	CINH
C0674	♦	♦	23901	5D5D	E	1	FIX32	VD	4	Ra/W	CINH
C0675	♦	♦	23900	5D5C	E	1	FIX32	VD	4	Ra/W	CINH
C0676	♦	♦	23899	5D5B	A	2	FIX32	VD	4	Ra	
C0677	♦	♦	23898	5D5A	E	1	FIX32	VD	4	Ra	
C0680	♦	♦	23895	5D57	E	1	FIX32	VD	4	Ra/Wa	
C0681	♦	♦	23894	5D56	E	1	FIX32	VD	4	Ra/Wa	
C0682	♦	♦	23893	5D55	E	1	FIX32	VD	4	Ra/Wa	
C0683	♦	♦	23892	5D54	A	2	FIX32	VD	4	Ra/W	CINH
C0684	♦	♦	23891	5D53	A	2	FIX32	VD	4	Ra	
C0685	♦	♦	23890	5D52	E	1	FIX32	VD	4	Ra/Wa	
C0686	♦	♦	23889	5D51	E	1	FIX32	VD	4	Ra/Wa	
C0687	♦	♦	23888	5D50	E	1	FIX32	VD	4	Ra/Wa	
C0688	♦	♦	23887	5D4F	A	2	FIX32	VD	4	Ra/W	CINH
C0689	♦	♦	23886	5D4E	A	2	FIX32	VD	4	Ra	
C0690	♦	♦	23885	5D4D	E	1	FIX32	VD	4	Ra/Wa	
C0691	♦	♦	23884	5D4C	E	1	FIX32	VD	4	Ra/Wa	
C0692	♦	♦	23883	5D4B	E	1	FIX32	VD	4	Ra/Wa	
C0693	♦	♦	23882	5D4A	A	2	FIX32	VD	4	Ra/W	CINH
C0694	♦	♦	23881	5D49	A	2	FIX32	VD	4	Ra	
C0700	♦	♦	23875	5D43	E	1	FIX32	VD	4	Ra/W	CINH
C0701	♦	♦	23874	5D42	E	1	FIX32	VD	4	Ra	
C0703	♦	♦	23872	5D40	E	1	FIX32	VD	4	Ra/W	CINH
C0704	♦	♦	23871	5D3F	E	1	FIX32	VD	4	Ra	
C0705	♦	♦	23870	5D3E	E	1	FIX32	VD	4	Ra/Wa	
C0706	♦	♦	23869	5D3D	E	1	FIX32	VD	4	Ra/Wa	
C0707	♦	♦	23868	5D3C	E	1	FIX32	VD	4	Ra/Wa	
C0708	♦	♦	23867	5D3B	A	2	FIX32	VD	4	Ra/W	CINH
C0709	♦	♦	23866	5D3A	A	2	FIX32	VD	4	Ra	
C0710	♦	♦	23865	5D39	E	1	FIX32	VD	4	Ra/Wa	
C0711	♦	♦	23864	5D38	E	1	FIX32	VD	4	Ra/Wa	
C0713	♦	♦	23862	5D36	E	1	FIX32	VD	4	Ra/W	CINH

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0714	♦	♦	23861	5D35	E	1	FIX32	VD	4	Ra	
C0715	♦	♦	23860	5D34	E	1	FIX32	VD	4	Ra/Wa	
C0716	♦	♦	23859	5D33	E	1	FIX32	VD	4	Ra/Wa	
C0718	♦	♦	23857	5D31	E	1	FIX32	VD	4	Ra/W	CINH
C0719	♦	♦	23856	5D30	E	1	FIX32	VD	4	Ra	
C0720	♦	♦	23855	5D2F	E	1	FIX32	VD	4	Ra/Wa	
C0721	♦	♦	23854	5D2E	E	1	FIX32	VD	4	Ra/Wa	
C0723	♦	♦	23852	5D2C	E	1	FIX32	VD	4	Ra/W	CINH
C0724	♦	♦	23851	5D2B	E	1	FIX32	VD	4	Ra	
C0725	♦	♦	23850	5D2A	E	1	FIX32	VD	4	Ra/Wa	
C0726	♦	♦	23849	5D29	E	1	FIX32	VD	4	Ra/Wa	
C0728	♦	♦	23847	5D27	E	1	FIX32	VD	4	Ra/W	CINH
C0729	♦	♦	23846	5D26	E	1	FIX32	VD	4	Ra	
C0730	♦	♦	23845	5D25	E	1	FIX32	VD	4	Ra/Wa	
C0731	♦	♦	23844	5D24	E	1	FIX32	VD	4	Ra	
C0732	♦	♦	23843	5D23	A	4	FIX32	VD	4	Ra/W	CINH
C0733	♦	♦	23842	5D22	E	1	FIX32	VD	4	Ra/W	CINH
C0734	♦	♦	23841	5D21	E	1	FIX32	VD	4	Ra/Wa	
C0735	♦	♦	23840	5D20	E	1	FIX32	VD	4	Ra/Wa	
C0736	♦	♦	23839	5D1F	E	1	FIX32	VD	4	Ra/Wa	
C0737	♦	♦	23838	5D1E	E	1	FIX32	VD	4	Ra/Wa	
C0738	♦	♦	23837	5D1D	E	1	FIX32	VD	4	Ra/Wa	
C0739	♦	♦	23836	5D1C	E	1	FIX32	VD	4	Ra/Wa	
C0740	♦	♦	23835	5D1B	A	2	FIX32	VD	4	Ra/Wa	
C0741	♦	♦	23834	5D1A	A	4	FIX32	VD	4	Ra	
C0742	♦	♦	23833	5D19	E	1	FIX32	VD	4	Ra	
C0743	♦	♦	23832	5D18	E	1	FIX32	VD	4	Ra	
C0744	♦	♦	23831	5D17	E	1	FIX32	VD	4	Ra/Wa	
C0749	♦	♦	23826	5D12	A	3	FIX32	VD	4	Ra	
C0750	♦	♦	23825	5D11	E	1	FIX32	VD	4	Ra/Wa	
C0751	♦	♦	23824	5D10	E	1	FIX32	VD	4	Ra/Wa	
C0752	♦	♦	23823	5D0F	E	1	FIX32	VD	4	Ra/Wa	
C0753	♦	♦	23822	5D0E	E	1	FIX32	VD	4	Ra/Wa	
C0754	♦	♦	23821	5D0D	E	1	U32	VH	4	Ra/Wa	
C0755	♦	♦	23820	5D0C	E	1	FIX32	VD	4	Ra/Wa	
C0756	♦	♦	23819	5D0B	E	1	I32	VH	4	Ra/Wa	
C0757	♦	♦	23818	5D0A	E	1	FIX32	VD	4	Ra/Wa	
C0758	♦	♦	23817	5D09	E	1	FIX32	VD	4	Ra/W	CINH
C0759	♦	♦	23816	5D08	E	1	FIX32	VD	4	Ra/W	CINH
C0760	♦	♦	23815	5D07	E	1	FIX32	VD	4	Ra/W	CINH
C0761	♦	♦	23814	5D06	E	1	FIX32	VD	4	Ra/W	CINH
C0764	♦	♦	23811	5D03	A	3	FIX32	VD	4	Ra	
C0765	♦	♦	23810	5D02	E	1	FIX32	VD	4	Ra	
C0770	♦	♦	23805	5CFD	E	1	FIX32	VD	4	Ra/W	CINH
C0771	♦	♦	23804	5CFC	E	1	FIX32	VD	4	Ra/W	CINH

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0772	♦	♦	23803	5CFB	E	1	FIX32	VD	4	Ra/W	CINH
C0773	♦	♦	23802	5CFA	A	3	FIX32	VD	4	Ra	
C0775	♦	♦	23800	5CF8	E	1	FIX32	VD	4	Ra/W	CINH
C0776	♦	♦	23799	5CF7	E	1	FIX32	VD	4	Ra/W	CINH
C0777	♦	♦	23798	5CF6	E	1	FIX32	VD	4	Ra/W	CINH
C0778	♦	♦	23797	5CF5	A	3	FIX32	VD	4	Ra	
C0780	♦	♦	23795	5CF3	E	1	FIX32	VD	4	Ra/W	CINH
C0781	♦	♦	23794	5CF2	E	1	FIX32	VD	4	Ra/W	CINH
C0782	♦	♦	23793	5CF1	E	1	FIX32	VD	4	Ra/W	CINH
C0783	♦	♦	23792	5CF0	E	1	FIX32	VD	4	Ra/W	CINH
C0784	♦	♦	23791	5CEF	E	1	FIX32	VD	4	Ra/W	CINH
C0785	♦	♦	23790	5CEE	E	1	FIX32	VD	4	Ra/W	CINH
C0786	♦	♦	23789	5CED	E	1	FIX32	VD	4	Ra/W	CINH
C0787	♦	♦	23788	5CEC	A	4	FIX32	VD	4	Ra/W	CINH
C0788	♦	♦	23787	5CEB	A	4	FIX32	VD	4	Ra/W	CINH
C0789	♦	♦	23786	5CEA	E	1	FIX32	VD	4	Ra/W	CINH
C0790	♦	♦	23785	5CE9	E	1	FIX32	VD	4	Ra/W	CINH
C0798	♦	♦	23777	5CE1	A	2	FIX32	VD	4	Ra	
C0799	♦	♦	23776	5CE0	A	13	FIX32	VD	4	Ra	
C0800	♦	♦	23775	5CDF	E	1	FIX32	VD	4	Ra/W	CINH
C0801	♦	♦	23774	5CDE	E	1	FIX32	VD	4	Ra/W	CINH
C0802	♦	♦	23773	5CDD	E	1	FIX32	VD	4	Ra/W	CINH
C0803	♦	♦	23772	5CDC	E	1	FIX32	VD	4	Ra/W	CINH
C0804	♦	♦	23771	5CDB	E	1	FIX32	VD	4	Ra/W	CINH
C0805	♦	♦	23770	5CDA	E	1	FIX32	VD	4	Ra/W	CINH
C0808	♦	♦	23767	5CD7	A	4	FIX32	VD	4	Ra	
C0809	♦	♦	23766	5CD6	A	2	FIX32	VD	4	Ra	
C0810	♦	♦	23765	5CD5	A	2	FIX32	VD	4	Ra/W	CINH
C0811	♦	♦	23764	5CD4	E	1	FIX32	VD	4	Ra/W	CINH
C0812	♦	♦	23763	5CD3	A	2	FIX32	VD	4	Ra	
C0813	♦	♦	23762	5CD2	E	1	FIX32	VD	4	Ra	
C0815	♦	♦	23760	5CD0	A	2	FIX32	VD	4	Ra/W	CINH
C0816	♦	♦	23759	5CCF	E	1	FIX32	VD	4	Ra/W	CINH
C0817	♦	♦	23758	5CCE	A	2	FIX32	VD	4	Ra	
C0818	♦	♦	23757	5CCD	E	1	FIX32	VD	4	Ra	
C0820	♦	♦	23755	5CCB	A	3	FIX32	VD	4	Ra/W	CINH
C0821	♦	♦	23754	5CCA	A	3	FIX32	VD	4	Ra	
C0822	♦	♦	23753	5CC9	A	3	FIX32	VD	4	Ra/W	CINH
C0823	♦	♦	23752	5CC8	A	3	FIX32	VD	4	Ra	
C0824	♦	♦	23751	5CC7	A	3	FIX32	VD	4	Ra/W	CINH
C0825	♦	♦	23750	5CC6	A	3	FIX32	VD	4	Ra	
C0826	♦	♦	23749	5CC5	A	3	FIX32	VD	4	Ra/W	CINH
C0827	♦	♦	23748	5CC4	A	3	FIX32	VD	4	Ra	
C0828	♦	♦	23747	5CC3	A	3	FIX32	VD	4	Ra/W	CINH
C0829	♦	♦	23746	5CC2	A	3	FIX32	VD	4	Ra	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0830	♦	♦	23745	5CC1	A	3	FIX32	VD	4	Ra/W	CINH
C0831	♦	♦	23744	5CC0	A	3	FIX32	VD	4	Ra	
C0832	♦	♦	23743	5CBF	A	3	FIX32	VD	4	Ra/W	CINH
C0833	♦	♦	23742	5CBE	A	3	FIX32	VD	4	Ra	
C0834	♦	♦	23741	5CBD	A	3	FIX32	VD	4	Ra/W	CINH
C0835	♦	♦	23740	5CBC	A	3	FIX32	VD	4	Ra	
C0836	♦	♦	23739	5CBB	A	3	FIX32	VD	4	Ra/W	CINH
C0837	♦	♦	23738	5CBA	A	3	FIX32	VD	4	Ra	
C0838	♦	♦	23737	5CB9	A	3	FIX32	VD	4	Ra/W	CINH
C0839	♦	♦	23736	5CB8	A	3	FIX32	VD	4	Ra	
C0840	♦	♦	23735	5CB7	E	1	FIX32	VD	4	Ra/W	CINH
C0841	♦	♦	23734	5CB6	E	1	FIX32	VD	4	Ra	
C0842	♦	♦	23733	5CB5	E	1	FIX32	VD	4	Ra/W	CINH
C0843	♦	♦	23732	5CB4	E	1	FIX32	VD	4	Ra	
C0844	♦	♦	23731	5CB3	E	1	FIX32	VD	4	Ra/W	CINH
C0845	♦	♦	23730	5CB2	E	1	FIX32	VD	4	Ra	
C0846	♦	♦	23729	5CB1	E	1	FIX32	VD	4	Ra/W	CINH
C0847	♦	♦	23728	5CB0	E	1	FIX32	VD	4	Ra	
C0848	♦	♦	23727	5CAF	E	1	FIX32	VD	4	Ra/W	CINH
C0849	♦	♦	23726	5CAE	E	1	FIX32	VD	4	Ra	
C0850	♦	♦	23725	5CAD	A	3	FIX32	VD	4	Ra/W	CINH
C0851	♦	♦	23724	5CAC	E	1	FIX32	VD	4	Ra/W	CINH
C0852	♦	♦	23723	5CAB	E	1	FIX32	VD	4	Ra/Wa	
C0853	♦	♦	23722	5CAA	E	1	FIX32	VD	4	Ra/Wa	
C0855	♦	♦	23720	5CA8	A	2	B16	VH	2	Ra	
C0856	♦	♦	23719	5CA7	A	3	I32	VH	4	Ra	
C0857	♦	♦	23718	5CA6	E	1	I32	VH	4	Ra	
C0858	♦	♦	23717	5CA5	A	3	I32	VH	4	Ra	
C0859	♦	♦	23716	5CA4	E	1	I32	VH	4	Ra	
C0860	♦	♦	23715	5CA3	A	11	FIX32	VD	4	Ra/W	CINH
C0861	♦	♦	23714	5CA2	A	3	FIX32	VD	4	Ra/W	CINH
C0863	♦	♦	23712	5CA0	A	6	B32	VH	4	Ra	
C0864	♦	♦	23711	5C9F	A	3	FIX32	VD	4	Ra/Wa	
C0865	♦	♦	23710	5C9E	A	3	FIX32	VD	4	Ra/Wa	
C0866	♦	♦	23709	5C9D	A	11	I32	VH	4	Ra	
C0867	♦	♦	23708	5C9C	A	3	I32	VH	4	Ra	
C0868	♦	♦	23707	5C9B	A	11	I32	VH	4	Ra	
C0869	♦	♦	23706	5C9A	A	3	I32	VH	4	Ra	
C0870	♦	♦	23705	5C99	A	2	FIX32	VD	4	Ra/W	CINH
C0871	♦	♦	23704	5C98	E	1	FIX32	VD	4	Ra/W	CINH
C0876	♦	♦	23699	5C93	E	1	FIX32	VD	4	Ra/W	CINH
C0878	♦	♦	23697	5C91	A	4	FIX32	VD	4	Ra	
C0879	♦	♦	23696	5C90	A	3	FIX32	VD	4	Ra/Wa	
C0880	♦	♦	23695	5C8F	A	2	FIX32	VD	4	Ra/W	CINH
C0881	♦	♦	23694	5C8E	E	1	FIX32	VD	4	Ra/W	CINH

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0884	♦	♦	23691	5C8B	A	3	FIX32	VD	4	Ra	
C0885	♦	♦	23690	5C8A	E	1	FIX32	VD	4	Ra/W	CINH
C0886	♦	♦	23689	5C89	E	1	FIX32	VD	4	Ra/W	CINH
C0889	♦	♦	23686	5C86	A	2	FIX32	VD	4	Ra	
C0890	♦	♦	23685	5C85	E	1	FIX32	VD	4	Ra/W	CINH
C0891	♦	♦	23684	5C84	E	1	FIX32	VD	4	Ra/W	CINH
C0892	♦	♦	23683	5C83	E	1	FIX32	VD	4	Ra/W	CINH
C0893	♦	♦	23682	5C82	E	1	FIX32	VD	4	Ra/W	CINH
C0899	♦	♦	23676	5C7C	E	1	FIX32	VD	4	Ra/W	CINH
C0900	♦	♦	23675	5C7B	E	1	FIX32	VD	4	Ra/W	CINH
C0901	♦	♦	23674	5C7A	E	1	FIX32	VD	4	Ra/W	CINH
C0902	♦	♦	23673	5C79	E	1	FIX32	VD	4	Ra/W	CINH
C0903	♦	♦	23672	5C78	E	1	FIX32	VD	4	Ra/W	CINH
C0904	♦	♦	23671	5C77	E	1	FIX32	VD	4	Ra/W	CINH
C0905	♦	♦	23670	5C76	E	1	FIX32	VD	4	Ra	
C0906	♦	♦	23669	5C75	A	6	FIX32	VD	4	Ra	
C0907	♦	♦	23668	5C74	A	4	FIX32	VD	4	Ra	
C0909	♦	♦	23666	5C72	E	1	FIX32	VD	4	Ra/Wa	
C0910	♦	♦	23665	5C71	E	1	FIX32	VD	4	Ra/W	CINH
C0911	♦	♦	23664	5C70	E	1	FIX32	VD	4	Ra	
C0912	♦	♦	23663	5C6F	E	1	FIX32	VD	4	Ra	
C0913	♦	♦	23662	5C6E	E	1	FIX32	VD	4	Ra/Wa	
C0940	♦	♦	23635	5C53	E	1	FIX32	VD	4	Ra/Wa	
C0941	♦	♦	23634	5C52	E	1	FIX32	VD	4	Ra/Wa	
C0942	♦	♦	23633	5C51	E	1	FIX32	VD	4	Ra/W	CINH
C0943	♦	♦	23632	5C50	E	1	FIX32	VD	4	Ra	
C0945	♦	♦	23630	5C4E	E	1	FIX32	VD	4	Ra/Wa	
C0946	♦	♦	23629	5C4D	E	1	FIX32	VD	4	Ra/Wa	
C0947	♦	♦	23628	5C4C	E	1	FIX32	VD	4	Ra/W	CINH
C0948	♦	♦	23627	5C4B	E	1	FIX32	VD	4	Ra	
C0950	♦	♦	23625	5C49	E	1	FIX32	VD	4	Ra/Wa	
C0951	♦	♦	23624	5C48	E	1	FIX32	VD	4	Ra/Wa	
C0952	♦	♦	23623	5C47	E	1	FIX32	VD	4	Ra/W	CINH
C0953	♦	♦	23622	5C46	E	1	FIX32	VD	4	Ra	
C0955	♦	♦	23620	5C44	E	1	FIX32	VD	4	Ra/Wa	
C0956	♦	♦	23619	5C43	E	1	FIX32	VD	4	Ra/Wa	
C0957	♦	♦	23618	5C42	E	1	FIX32	VD	4	Ra/W	CINH
C0958	♦	♦	23617	5C41	E	1	FIX32	VD	4	Ra	
C0960	♦	♦	23615	5C3F	E	1	FIX32	VD	4	Ra/Wa	
C0961	♦	♦	23614	5C3E	E	1	FIX32	VD	4	Ra/Wa	
C0962	♦	♦	23613	5C3D	E	1	FIX32	VD	4	Ra/Wa	
C0963	♦	♦	23612	5C3C	E	1	FIX32	VD	4	Ra/Wa	
C0964	♦	♦	23611	5C3B	E	1	FIX32	VD	4	Ra/Wa	
C0965	♦	♦	23610	5C3A	E	1	FIX32	VD	4	Ra/Wa	
C0966	♦	♦	23609	5C39	E	1	FIX32	VD	4	Ra/Wa	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0967	♦	♦	23608	5C38	E	1	FIX32	VD	4	Ra/W	CINH
C0968	♦	♦	23607	5C37	E	1	FIX32	VD	4	Ra	
C0970	♦	♦	23605	5C35	E	1	FIX32	VD	4	Ra/W	CINH
C0971	♦	♦	23604	5C34	E	1	FIX32	VD	4	Ra/W	CINH
C0972	♦	♦	23603	5C33	E	1	FIX32	VD	4	Ra/W	CINH
C0973	♦	♦	23602	5C32	E	1	FIX32	VD	4	Ra/W	CINH
C0974	♦	♦	23601	5C31	E	1	FIX32	VD	4	Ra/W	CINH
C0975	♦	♦	23600	5C30	E	1	FIX32	VD	4	Ra/W	CINH
C0976	♦	♦	23599	5C2F	E	1	FIX32	VD	4	Ra/W	CINH
C0977	♦	♦	23598	5C2E	E	1	FIX32	VD	4	Ra/W	CINH
C0978	♦	♦	23597	5C2D	E	1	FIX32	VD	4	Ra/W	CINH
C0980	♦	♦	23595	5C2B	E	1	FIX32	VD	4	Ra/Wa	
C0981	♦	♦	23594	5C2A	E	1	FIX32	VD	4	Ra/Wa	
C0982	♦	♦	23593	5C29	E	1	FIX32	VD	4	Ra/Wa	
C0983	♦	♦	23592	5C28	E	1	FIX32	VD	4	Ra/Wa	
C0988	♦	♦	23587	5C23	A	7	FIX32	VD	4	Ra	
C0989	♦	♦	23586	5C22	A	2	FIX32	VD	4	Ra	
C1000	♦	♦	23575	5C17	E	1	FIX32	VD	4	Ra/Wa	
C1001	♦	♦	23574	5C16	E	1	FIX32	VD	4	Ra/W	CINH
C1002	♦	♦	23573	5C15	E	1	I32	VH	4	Ra/Wa	
C1040	♦	♦	23535	5BEF	E	1	FIX32	VD	4	Ra/Wa	
C1041	♦	♦	23534	5BEE	E	1	FIX32	VD	4	Ra/Wa	
C1042	♦	♦	23533	5BED	E	1	FIX32	VD	4	Ra/W	CINH
C1043	♦	♦	23532	5BEC	E	1	FIX32	VD	4	Ra/W	CINH
C1044	♦	♦	23531	5BEB	E	1	FIX32	VD	4	Ra/W	CINH
C1045	♦	♦	23530	5BEA	A	2	FIX32	VD	4	Ra	
C1046	♦	♦	23529	5BE9	E	1	FIX32	VD	4	Ra	
C1090	♦	♦	23485	5BBD	E	1	I32	VH	4	Ra	
C1091	♦	♦	23484	5BBC	E	1	FIX32	VD	4	Ra/Wa	
C1092	♦	♦	23483	5BBB	E	1	FIX32	VD	4	Ra/Wa	
C1093	♦	♦	23482	5BBA	E	1	FIX32	VD	4	Ra/Wa	
C1094	♦	♦	23481	5BB9	E	1	FIX32	VD	4	Ra/Wa	
C1095	♦	♦	23480	5BB8	E	1	FIX32	VD	4	Ra/Wa	
C1096	♦	♦	23479	5BB7	E	1	FIX32	VD	4	Ra/W	CINH
C1097	♦	♦	23478	5BB6	E	1	FIX32	VD	4	Ra/W	CINH
C1098	♦	♦	23477	5BB5	E	1	FIX32	VD	4	Ra	
C1099	♦	♦	23476	5BB4	E	1	FIX32	VD	4	Ra	
C1100	♦	♦	23475	5BB3	E	1	FIX32	VD	4	Ra/Wa	
C1101	♦	♦	23474	5BB2	A	2	FIX32	VD	4	Ra/W	CINH
C1102	♦	♦	23473	5BB1	A	3	FIX32	VD	4	Ra/W	CINH
C1103	♦	♦	23472	5BB0	A	2	FIX32	VD	4	Ra	
C1104	♦	♦	23471	5BAF	A	3	FIX32	VD	4	Ra	
C1160	♦	♦	23418	5B7A	E	1	FIX32	VD	4	Ra/W	CINH
C1161	♦	♦	23417	5B79	E	1	FIX32	VD	4	Ra/W	CINH
C1162	♦	♦	23416	5B78	E	1	FIX32	VD	4	Ra	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C1163	♦	♦	23415	5B77	E	1	FIX32	VD	4	Ra	
C1190	♦	♦	23388	5B5C	E	1	FIX32	VD	4	Ra/Wa	
C1191	♦	♦	23387	5B5B	A	2	FIX32	VD	4	Ra/Wa	
C1192	♦	♦	23386	5B5A	A	2	FIX32	VD	4	Ra/Wa	
C1300	♦	♦	23278	5AEE	E	1	FIX32	VD	4	Ra/Wa	
C1301	♦	♦	23277	5AED	E	1	FIX32	VD	4	Ra/Wa	
C1302	♦	♦	23276	5AEC	E	1	FIX32	VD	4	Ra/Wa	
C1303	♦	♦	23275	5AEB	E	1	FIX32	VD	4	Ra/Wa	
C1304	♦	♦	23274	5AEA	E	1	VS	VS	20	Ra	
C1305	♦	♦	23273	5AE9	E	1	VS	VS	20	Ra	
C1306	♦	♦	23272	5AE8	E	1	FIX32	VD	4	Ra/Wa	
C1307	♦	♦	23271	5AE7	E	1	FIX32	VD	4	Ra/Wa	
C1308	♦	♦	23270	5AE6	E	1	FIX32	VD	4	Ra/Wa	
C1309	♦	♦	23269	5AE5	E	1	FIX32	VD	4	Ra/Wa	
C1310	♦	♦	23268	5AE4	E	1	FIX32	VD	4	Ra/Wa	
C1311	♦	♦	23267	5AE3	E	1	FIX32	VD	4	Ra/Wa	
C1320	♦	♦	23258	5ADA	E	1	FIX32	VD	4	Ra/W	CINH
C1321	♦	♦	23257	5AD9	A	2	FIX32	VD	4	Ra/W	CINH
C1322	♦	♦	23256	5AD8	A	2	FIX32	VD	4	Ra	
C1325	♦	♦	23253	5AD5	E	1	FIX32	VD	4	Ra	
C1326	♦	♦	23252	5AD4	A	2	FIX32	VD	4	Ra	
C1327	♦	♦	23251	5AD3	A	2	FIX32	VD	4	Ra/W	CINH
C1328	♦	♦	23250	5AD2	E	1	FIX32	VD	4	Ra	
C1330	♦	♦	23248	5AD0	E	1	FIX32	VD	4	Ra/Wa	
C1331	♦	♦	23247	5ACF	E	1	FIX32	VD	4	Ra/Wa	
C1332	♦	♦	23246	5ACE	E	1	FIX32	VD	4	Ra/Wa	
C1333	♦	♦	23245	5ACD	E	1	FIX32	VD	4	Ra/Wa	
C1334	♦	♦	23244	5ACC	E	1	FIX32	VD	4	Ra/Wa	
C1335	♦	♦	23243	5ACB	E	1	FIX32	VD	4	Ra/Wa	
C1336	♦	♦	23242	5ACA	E	1	FIX32	VD	4	Ra/Wa	
C1337	♦	♦	23241	5AC9	E	1	FIX32	VD	4	Ra/Wa	
C1340	♦	♦	23238	5AC6	A	4	FIX32	VD	4	Ra/W	CINH
C1341	♦	♦	23237	5AC5	A	4	FIX32	VD	4	Ra/W	CINH
C1344	♦	♦	23234	5AC2	A	4	FIX32	VD	4	Ra	
C1345	♦	♦	23233	5AC1	A	4	FIX32	VD	4	Ra	
C1350	♦	♦	23228	5ABC	E	1	FIX32	VD	4	Ra/Wa	
C1351	♦	♦	23227	5ABB	E	1	FIX32	VD	4	Ra/Wa	
C1354	♦	♦	23224	5AB8	E	1	FIX32	VD	4	Ra/W	CINH
C1355	♦	♦	23223	5AB7	E	1	FIX32	VD	4	Ra/W	CINH
C1356	♦	♦	23222	5AB6	E	1	FIX32	VD	4	Ra/W	CINH
C1357	♦	♦	23221	5AB5	E	1	FIX32	VD	4	Ra	
C1358	♦	♦	23220	5AB4	E	1	FIX32	VD	4	Ra	
C1359	♦	♦	23219	5AB3	E	1	FIX32	VD	4	Ra	
C1360	♦	♦	23218	5AB2	E	1	FIX32	VD	4	Ra/Wa	
C1361	♦	♦	23217	5AB1	E	1	FIX32	VD	4	Ra/Wa	

Code	Controller		Index		Data					Access	
	EVF9321 ... EVF9333	EVF9335 ... EVF9383	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C1364	♦	♦	23214	5AAE	E	1	FIX32	VD	4	Ra/W	CINH
C1365	♦	♦	23213	5AAD	E	1	FIX32	VD	4	Ra/W	CINH
C1366	♦	♦	23212	5AAC	E	1	FIX32	VD	4	Ra/W	CINH
C1367	♦	♦	23211	5AAB	E	1	FIX32	VD	4	Ra	
C1368	♦	♦	23210	5AAA	E	1	FIX32	VD	4	Ra	
C1369	♦	♦	23209	5AA9	E	1	FIX32	VD	4	Ra	
C1370	♦	♦	23208	5AA8	E	1	FIX32	VD	4	Ra/Wa	
C1371	♦	♦	23207	5AA7	E	1	FIX32	VD	4	Ra/Wa	
C1372	♦	♦	23206	5AA6	E	1	FIX32	VD	4	Ra/Wa	
C1373	♦	♦	23205	5AA5	E	1	FIX32	VD	4	Ra/Wa	
C1375	♦	♦	23203	5AA3	E	4	FIX32	VD	4	Ra/W	CINH
C1376	♦	♦	23202	5AA2	E	1	FIX32	VD	4	Ra/W	CINH
C1377	♦	♦	23201	5AA1	A	4	FIX32	VD	4	Ra	
C1378	♦	♦	23200	5AA0	E	1	FIX32	VD	4	Ra	
C1583	♦	♦	22995	59D3	E	1	FIX32	VD	4	Ra/Wa	
C1751	♦	♦	22827	592B	A	17	FIX32	VD	4	Ra/W	CINH
C1753	♦	♦	22825	5929	E	1	FIX32	VD	4	Ra/W	CINH
C1754	♦	♦	22824	5928	E	1	FIX32	VD	4	Ra/W	CINH
C1755	♦	♦	22823	5927	E	1	FIX32	VD	4	Ra/W	CINH

9 Troubleshooting and fault elimination

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9.1 Display of operating data, diagnostics

9.1.1 Display of operating data

Description

Important operating parameters are measured by the controller. They can be displayed with the keypad or PC.

Some operating data can be calibrated to be displayed or selected directly with the unit of the process quantity (e.g. pressure, temperature, speed).



Note!

The calibration always affects all specified codes simultaneously.

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0051	MCTRL-NACT		-36000 {1 rpm} 36000	Actual speed value, function block MCTRL • Read only 8.2-25 8.2-40
C0052	MCTRL-Umot		0 {1 V} 800	Motor voltage, function block MCTRL • Read only • MCTRL-VACT = 100 % = C0090 8.2-25 8.2-40
C0053	UG-VOLTAGE		0 {1 V} 900	DC-bus voltage, function block MCTRL • Read only • MCTRL-DCVOLT = 100 % = 1000 V 8.2-25 8.2-40
C0054	Imot		0.0 {0.1 A} 5000.0	Actual motor current, function block MCTRL • Read only • MCTRL-IACT = 100 % = C0022 8.2-25 8.2-40
C0061	Heatsink temp		0 {1 °C} 100	Heatsink temperature • Read only • If the temperature of the heatsink > 85 °C, the controller sets TRIP OH • Early warning is possible via OH4, temperature is set in C0122 See System Manual (extension)
C0063	Mot temp		0 {1 °C} 200	Motor temperature • Read only • Monitoring of the motor temperature must be activated. • KTY at X8/5, X8/8: – At 150 °C, TRIP OH3 is set – Early warning is possible via OH7, temperature is set in C0121 • PTC, thermal contact at T1, T2: – Release sets TRIP or warning OH8 8.2-25 8.2-40

9 Troubleshooting and fault elimination

9.1 Display of operating data, diagnostics

9.1.2 Diagnostics

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0064	Utilization		0	{1 %}	150	Device utilisation I×t • Read only • Device utilisation of the last 180 s operating time • C0064 > 100 % triggers warning OC5 • C0064 > 110 % limits the output current of the controller to 67 % of the maximum current in C0022
C0150	Status word		Bit00 – Bit08 Status code Bit01 IMP Bit09 Status code Bit02 – Bit10 Status code Bit03 – Bit11 Status code Bit04 – Bit12 Warning Bit05 – Bit13 Message Bit06 n = 0 Bit14 – Bit07 CINH Bit15 –	Read only Decimal status word for networking via automation interface (AIF) • Binary interpretation indicates the bit states		

9.1.2 Diagnostics

Description Display codes for diagnostics

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0093	Drive ident					Controller identification • Read only
			0	Invalid		Defective power section
			1	None		No power section
			14	9335VC 400V		Display of the controller used
			...	...		
			20	9383VC 400V		
			21	9334VC 500V		
			...	...		
			28	9383VC 500V		
			9321	9321 VC		
			...	...		
			9333	9333VC		
C0099	S/W version		x.y			Software version • Read only
			x	Main version		
			y	Subversion		

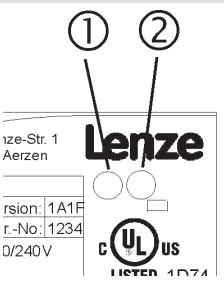
9.2 Troubleshooting

Detecting breakdowns A breakdown can be detected quickly via the LEDs at the controller or via the status information at the keypad.

Analysing errors Analyse the error using the history buffer. The list of fault messages gives you advice how to remove the fault. (📖 9.5-1)

9.2.1 Status display via controller LEDs

During operation the operating status of the controller is shown by 2 LEDs.

LED		Operating status	
Red ①	Green ②		
Off	On	Controller is enabled	
On	On	Mains is switched on and automatic start is inhibited	
Off	Blinking slowly	Controller is inhibited	
Off	On	Motor data identification is being performed	
Blinking quickly	Off	Undervoltage	
Blinking slowly	Off	Active fault	

9.2.2 Fault analysis with the history buffer

Retracing faults Faults can be retraced via the history buffer. Fault messages are stored in the 8 memory locations in the order of their appearance.

The memory locations can be retrieved via codes.

Structure of the history buffer

Code			Memory location	Entry	Note
C0168/1	C0169/1	C0170/1	Memory location 1	Active fault	If the fault is no longer pending or has been acknowledged: • The contents of the memory locations 1 ... 7 are shifted "up" to the next memory location. • The content of memory location 8 is deleted from the history buffer and cannot be retrieved anymore. • Memory location 1 is deleted (= no active fault).
C0168/2	C0169/2	C0170/2	Memory location 2	Last fault	
C0168/3	C0169/3	C0170/3	Memory location 3	Last but one fault	
C0168/4	C0169/4	C0170/4	Memory location 4	Last but two fault	
C0168/5	C0169/5	C0170/5	Memory location 5	Last but three fault	
C0168/6	C0169/6	C0170/6	Memory location 6	Last but four fault	
C0168/7	C0169/7	C0170/7	Memory location 7	Last but five fault	
C0168/8	C0169/8	C0170/8	Memory location 8	Last but six fault	

Explanations regarding the codes

C0168	Fault indication and response • The entry is effected as a LECOM error number • If several faults with different responses occur at the same time: – Only the fault with the highest priority response is entered (1. TRIP, 2. message, 3. warning). • If several faults with the same response (e.g. 2 messages) occur at the same time: – Only the fault which occurred first is entered.
C0169	Time of fault occurrence • The reference time is provided by the power-on time meter (C0179). • If the same fault occurs several times in succession, only the time of the last occurrence is stored.
C0170	Fault frequency • Only the time of the last occurrence is stored.

Clear history buffer

Set C0167 = 1 to clear the history buffer.

9.3 Drive behaviour in the event of faults

The controller responds differently to the three possible fault types TRIP, message, or warning:

TRIP

TRIP (display in keypad XT:)

- ▶ Switches the power outputs U, V, W to a high-resistance state until TRIP reset is executed.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ The drive coasts without any control!
- ▶ After TRIP reset ( 9.5-5):
 - The drive travels along the ramps to its setpoint.
 - The fault indication is moved to C0168/2 as "last fault".

Messages

Message (display in keypad XT:)

- ▶ Switches the power outputs U, V, W to a high-resistance state.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ In case of a fault ≤ 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint with maximum torque.
- ▶ In case of a fault > 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint along the adjusted ramps.
- ▶ If the message is not active anymore, the fault indication is moved to C0168/2 as "last fault".

Warnings

"Heatsink overtemperature" (keypad XT:)

- ▶ The drive continues to travel in a controlled way!
- ▶ The warning signal goes off when the fault is not active anymore.

"Error in motor phase" (keypad XT:)

"PTC monitoring" (keypad XT:)

- ▶ The drive continues to travel in a controlled way!
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ After TRIP reset, the fault indication is moved to C0168/2 as "last fault".

9.4 Fault elimination

9.4.1 Drive errors

Malfunction	Cause	Remedy
An asynchronous motor with feedback rotates in an uncontrolled manner and with low speed	The motor phases are reversed so that the rotating field of the motor is not identical with the rotating field of the feedback system. The drive shows the following behaviour: • V/f characteristic control (C0006 = 5) – The motor rotates faster than the speed setpoint by the value set in C0074 (influence of the speed controller, Lenze setting 10 % of n_{max}). After the controller is enabled, it does not stop at zero speed setpoint or quick stop (QSP). – The final motor current depends, among other things, on the set value of the V_{min} boost (C0016) and can rise to I_{max} (C0022). This may activate the fault message OC5. • Vector control (C0006 = 1) – The motor rotates slowly with maximum slip speed (depending on motor data and maximum current) and does not react to a speed setpoint. The direction of rotation, however, is determined by the sign of the speed setpoint. – The motor current rises up to I_{max} (C0022). This may activate the fault message OC5 with a time delay.	• Check motor cable for correct phase relation. • If possible, operate the motor with deactivated feedback (C0025 = 1) and check the direction of rotation of the motor.
Motor does not rotate although the controller is enabled (IMP is off) and a speed setpoint has been specified.	The two terminal strips X5 are reversed. Since X5/A1 and X5/28 face each other, the controller can be enabled if the control terminals are internally supplied. All other connections, however, are assigned incorrectly so that the motor cannot start.	Check the position of the terminal strips: • If you look at the connection unit in reading direction, the left terminal strip X5 must be connected with the input signals and the right terminal strip X5 must be connected with the output signals.
The monitoring of the motor phases (LP1) does not respond if a motor phase is interrupted, although C0597 = 0 or 2	The function block MLP1 is not entered into the processing table.	Enter the function block MLP1 into the processing table. The function block MLP1 requires 30 μ s of calculating time.
If during high speeds DC-injection braking (GSB) is activated, the fault OC1 (TRIP) or OU (TRIP) occurs	During DC-injection braking the controller sets pulse inhibit for a short time (DCTRL-IMP) to reduce the magnetisation in the motor before a DC voltage is injected into the motor. At high speeds (e. g. in case of mid-frequency motors) the residual voltage which develops from the residual magnetism and high speed can generate such a high motor current that OC1 or OU are activated.	Prolong the duration of the pulse inhibit: • Connect the output signal DCTRL-IMP to the function block TRANSx and adjust the desired switch-off time there (usually 500 ms). If DCTRL-CINH1 is set to HIGH, the duration of the pulse inhibit is prolonged by the time adjusted.

9.4.2 Controller in clamp operation

The clamp operation is a permissible operating mode. But since, however, pulse inhibit is set again and again, the controller cannot provide the optimum power.

If the output power is optimal, the output current mainly is right below the clamp threshold.

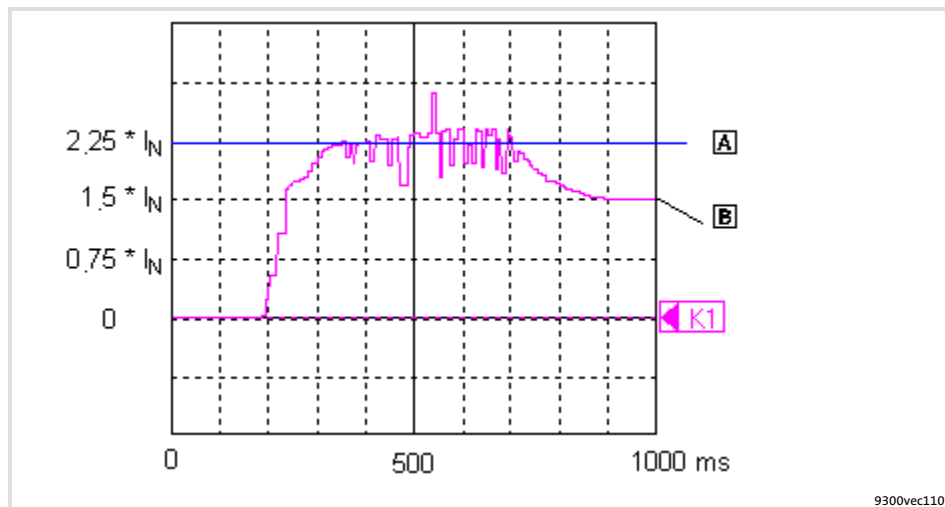


Fig. 9.4-1 Output current when starting a motor with high load (shown with the oscilloscope in GDC)

- Ⓐ Clamp threshold
- Ⓑ Output current

Function

1. When the output current reaches $2.25 \times I_r$, a software clamp is activated.
2. The controller sets pulse inhibit for a short time. The motor current decreases as a function of the inductance in the motor circuit.
 - An internal counter is increased by the value one.
3. After max. 250 μ s the pulse inhibit is deactivated.
4. If a software clamp reoccurs within 2 s, the internal counter is again increased by the value one. Otherwise the counter is set to zero.
 - If the counter reaches the value 4300, OC3 (TRIP) is activated.

9.4.3 Behaviour in case of overvoltage in the DC bus (OU message)

Description

If the DC-bus voltage (U_{DC}) exceeds the switch-off threshold OU, pulse inhibit will be set. At the same time, an internal timer for a delay time (C0912) will be started.

Pulse inhibit will be reset, if the voltage falls below the switch-on threshold OU and the delay time has elapsed.

Thresholds for DC-bus overvoltage (OU)

Types EVF93xx-EVV210, EVF93xx-EVV240, EVF93xx-EVV270 and EVF93xx-EVV300				
Mains voltage range		C0173	Switch-off threshold OU	Switch-on threshold OU
< 400 V	Operation with or without brake transistor	0	770 V	755 V
400 V	Operation with or without brake transistor	1 *	770 V	755 V
460 V	Operation with or without brake transistor	2	770 V	755 V
480 V	Brake transistor	3	770 V	755 V
480 V	Brake transistor	4	800 V	785 V
500 V	Operation with or without brake transistor	5	900 V	885 V

* Lenze setting

Types EVF93xx-EV, EVF93xx-EVV060 and EVF93xx-EVV110				
Mains voltage range		C0173	Switch-off threshold OU	Switch-on threshold OU
400 V	Operation with or without brake transistor	Read only	700 V	685 V

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0912	OV delay time	→	- {1 ms}	- Delay time of the pulse enable after an OU message → Depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 A change of one of the codes resets C0912 to the time of the selected motor • The time is derived from the double rotor time constant	8.2-25 8.2-40 9.4-3

Adjustment

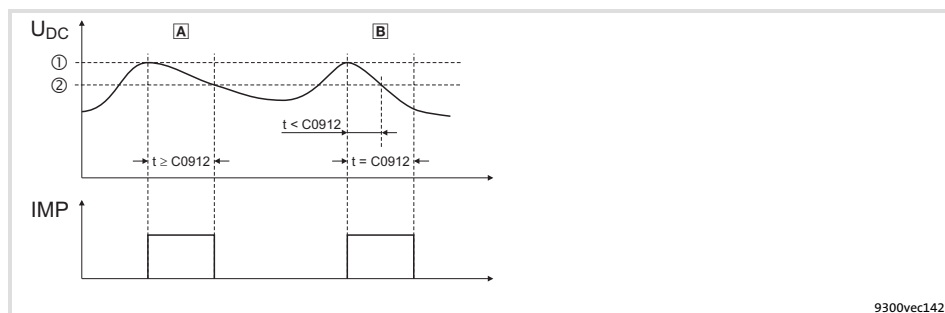


Fig. 9.4-2 Influence of the delay time (C0912)

① Switch-off threshold OU

② Switch-on threshold OU

A The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU equals or is higher than the delay time set in C0912.

After undershooting the switch-on threshold OU, the pulse inhibit is deactivated.

B The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU is lower than the delay time set in C0912.

The pulse inhibit is deactivated after the delay time in C0912 has elapsed.

- The delay time in [ms] is set under C0912. The Lenze setting can be changed by the factor 0.5 ... 2.

9.5 System error messages

9.5.1 General error messages



Note!

In the case of a query via system bus (CAN), the fault messages are represented as numbers (see first column of the table).

Fault message		Description	Cause	Remedy
No.	Display			
---	---	No fault	-	-
0011	OC1	Overcurrent in motor cable ($I_a > 2.25 \times I_N$; Hardware monitoring)	In the event of a short circuit.	- Search for the cause of the short circuit. - Check the motor cable.
			Capacitive charging current of the motor cable is too high.	Use motor cable which is shorter or of lower capacitance.
			Too short acceleration or deceleration times in proportion to the load (C0012, C0013, C0105).	- Increase the gain (P component) of the I_{max} controller (C0075). - Reduce integral-action time (integral action component) of the I_{max} controller (C0076).
			- Encoder error - Tracks during encoder feedback of the motor speed are interchanged.	Check wiring of the encoder.
			DC-injection braking at high speeds.	See 9.4-1
			Missing mains phase.	- Check the connections and the supply cable of the device. - Check mains voltage.
0012	OC2	Motor cable earth fault	One of the motor phases has earth contact.	- Search for cause of short circuit. - Check motor cable.
0013	OC3	Overload during acceleration.	Too short acceleration or deceleration times in proportion to the load (C0012, C0013, C0105).	- Increase the gain (P component) of the current controller (C0075). - Reduce the reset time (integral action component) of the I_{max} controller (C0076). - Increase ramp times. 9.4-2, "controller in clamp operation (fault OC3)"
0015	OC5	$I \times t$ overload	- Frequent and too long acceleration with overcurrent - Continuous overload with $I_{motor} > 1.05 \times I_{rx}$.	Check drive dimensioning.
0016	OC6	$I^2 \times t$ overload	- Frequent and too long acceleration processes with motor overcurrent. - Permanent motor overload with $I_{motor} > I_{rmotor}$	Check drive dimensioning.
x018	OC8	$I^2 \times t$ overload advance warning	- Frequent and too long acceleration processes with motor overcurrent. - Permanent motor overload with $I_{motor} > I_{rmotor}$	Check drive dimensioning.

Fault message		Description	Cause	Remedy
No.	Display			
2020	OU	Overvoltage in the DC bus	Braking energy is too high. (DC-bus voltage is higher than set in C0173.)	- Use a braking unit or regenerative module. - Check dimensioning of the brake resistor.
1030	LU	Undervoltage in the DC bus	DC bus voltage is lower than specified in C0173.	- Check mains voltage - Check supply cable
x032	LP1	Motor phase failure	A current-carrying motor phase has failed.	- Check motor. - Check motor cable. - Switch off monitoring (C0597 = 3).
			The current limit value is set too low.	Set higher current limit value via C0599.
0050	OH	Heatsink temperature > +90 °C	Ambient temperature $T_u > +40\text{ °C}$ or $> +50\text{ °C}$	- Allow module to cool and ensure better ventilation. - Check ambient temperature in the control cabinet.
			Heatsink is very dirty.	Clean heatsink.
			Wrong mounting position	Change mounting position.
x053	OH3	Motor temperature > +150 °C threshold (temperature detection via resolver or incremental value encoder)	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0583 = 3).
			No PTC/temperature contact connected.	Correct wiring.
x054	OH4	Heatsink temperature > C0122	Ambient temperature $T_u > +40\text{ °C}$ or $> +50\text{ °C}$	- Allow module to cool and ensure better ventilation. - Check ambient temperature in the control cabinet. - Switch off monitoring (C0582 = 3).
			Heatsink is very dirty.	Clean heatsink
			Wrong mounting position	Change mounting position.
			The value specified under C0122 is set too low.	Enter a higher value under C0122.
x057	OH7	Motor temperature > C0121 (temperature detection via resolver or incremental value encoder)	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0584 = 3).
			No PTC/temperature contact connected.	Correct wiring.
			The value specified under C0121 is set too low.	Enter a higher value in C0121.
x058	OH8	Motor temperature via inputs T1 and T2 is too high.	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0585 = 3).
			Terminals T1 and T2 are not connected	Connect PTC/temperature contact.
x061	CE0	Automation interface (AIF) communication error	Faulty transfer of control commands via AIF.	- Plug in the communication module/keypad XT firmly, screw down, if necessary. - Switch off monitoring (C0126 = 3).

Fault message		Description	Cause	Remedy
No.	Display			
x062	CE1	Communication error on the process data input object CAN1_IN	CAN1_IN object receives faulty data or communication is interrupted.	- Check wiring at X4. - Check sender. - Increase monitoring time under C0357/1, if necessary. - Switch off monitoring (C0591 = 3).
x063	CE2	Communication error on the process data input object CAN2_IN	CAN2_IN object receives faulty data or communication is interrupted.	- Check wiring at X4. - Check sender. - Increase monitoring time under C0357/2, if necessary. - Switch off monitoring (C0592 = 3).
x064	CE3	Communication error on the process data input object CAN3_IN	CAN3_IN object receives faulty data or communication is interrupted.	- Check wiring at X4. - Check sender. - Increase monitoring time under C0357/3, if necessary. - Switch off monitoring (C0593 = 3).
x065	CE4	BUS-OFF state of system bus (CAN)	The controller has received too many faulty telegrams via the system bus (CAN) and has disconnected from the bus.	- Check wiring at X4: Is the bus correctly terminated? - Check shield connection of the cables. - Check PE connection. - Check bus load, reduce the baud rate if necessary. (Observe the cable length!) - Switch off the monitoring (C0595 = 3).
0071	CCr	System failure	Strong interference injection on the control cables	Screen control cables
			Ground or earth loops in the wiring	- Check wiring - Check PE connection
				After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0072	PR1	Checksum error in parameter set 1 CAUTION: The Lenze setting is loaded automatically!	- Fault when loading a parameter set. - Interruption while transmitting the parameter set via keypad.	- Set the required parameters and store them under C0003 = 1. - As to PLC devices, check the use of pointers.
			The stored parameters are incompatible with the loaded software version.	Store the parameter set under C0003 = 1 first to allow for a faults reset.
0073	PR2	Checksum error in parameter set 2 PLEASE NOTE: The Lenze setting is loaded automatically!	- Fault while loading a parameter set. - Interruption during the transfer of the parameter set via keypad.	Set the required parameters and save them with C0003 = 2.
			The parameters saved do not comply with the software version loaded.	In order to be able to acknowledge the error, first save the parameter set with C0003 = 2.

Fault message		Description	Cause	Remedy
No.	Display			
0074	PEr	Program error	Error in the program flow	Send the parameter set (on floppy disk/CD-ROM) with a detailed description of the problem to Lenze. After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0075	PR0	Error in parameter set.	The operating system software has been updated.	Storage of the Lenze setting C0003 = 1. After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0077	PR3	Checksum error in parameter set 3 PLEASE NOTE: The Lenze setting is loaded automatically!	- Fault while loading a parameter set. - Interruption during the transfer of the parameter set via keypad. The parameters saved do not comply with the software version loaded.	Set the required parameters and save them with C0003 = 3. In order to be able to acknowledge the error, first save the parameter set with C0003 = 3.
0078	PR4	Checksum error in parameter set 4 PLEASE NOTE: The Lenze setting is loaded automatically!	- Fault while loading a parameter set. - Interruption during the transfer of the parameter set via keypad. The parameters saved do not comply with the software version loaded.	Set the required parameters and save them with C0003 = 4. In order to be able to acknowledge the error, first save the parameter set with C0003 = 4.
0079	PI	Fault during parameter initialisation	- An error has been detected during the parameter set transfer between two devices. - The parameter set does not match the controller, e.g. if data has been transferred from a higher-power controller to a lower-power controller.	- Correct parameter set. - Send parameter set (on floppy disk/CD-ROM) and a detailed description of the problem to Lenze.
x083	Sd3	Encoder error at X9	Cable interrupted. Pin X9/8 not connected.	Check cable for open circuit. Apply 5 V to pin X9/8 or switch off monitoring (C0587 = 3).
x085	Sd5	Encoder error at X6/1 and X6/2 (C0034 = 1)	Current signal at X6/1 X6/2 < 2mA.	- Check cable for open circuit. - Check current signal encoder. - Switch off monitoring (C0598 = 3).
x086	Sd6	Motor temperature sensor error (X7 or X8)	Encoder for detecting the motor temperature at X7 or X8 indicates undefined values.	- Check cable for firm connection. - Switch off the monitoring (C0594 = 3).
x091	EEr	External monitoring has been triggered via DCTRL.	A digital signal assigned to the TRIP-SET function has been activated.	- Check external encoder. - Switch off the monitoring (C0581 = 3).
0105	H05	Internal fault (memory)		Contact Lenze.
0107	H07	Internal fault (power stage)	During initialisation of the controller, an incorrect power stage was detected.	Contact Lenze.
x110	H10	Heatsink temperature sensor error	Sensor for detecting the heatsink temperature indicates undefined values.	- Contact Lenze. - Switch off the monitoring (C0588 = 3).
x111	H11	Temperature sensor error: Temperature inside the controller	Sensor for detecting the internal temperature indicates undefined values.	- Contact Lenze. - Switch off the monitoring (C0588 = 3).

Fault message		Description	Cause	Remedy
No.	Display			
0140	ID1	Error during motor data identification.	No motor connected.	Check motor connection.
			Stator resistance too high.	Check entered motor data.
			Controller inhibited externally.	Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
0141	ID2	Error during motor data identification.	Motor too small.	- Check entered motor data. For parameterisation with Global Drive Control, use the input assistant for motor data. - The measurements for the inverter error characteristic and the stator resistance are correct (save measured values in C0003). For the operating mode V/f characteristic control the motor data identification can be completed.
			Controller inhibited externally.	Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
x200	NMAX	Maximum system speed (C0596) has been exceeded.	- Active load (e.g. for hoists) is too high. - Drive is not speed-controlled, torque is excessively limited.	- Check drive dimensioning. - Increase torque limit, if necessary. - Switch off monitoring (C0607 = 3).

Representation of the error number:

x 0 = TRIP, 1 = message, 2 = warning

E. g. "2091": An external monitoring function has triggered EEr warning

9.5.2 Resetting system error messages

Response	Measures for resetting the fault message
TRIP	 Note! If a TRIP source is still active, the pending TRIP cannot be reset. Resetting the TRIP can be effected by: - Pressing the keypad XT EMZ9371 BC ⇒ STOP. Then press RUN to re-enable the controller. - Setting code C0043 = 0. - Control word C0135, bit 11 - Control word AIF - Control word of system bus (CAN) After resetting the TRIP, the drive remains at standstill.
Message	 Danger! After elimination of the fault, the fault message is cancelled automatically and the drive restarts automatically.
Warning	After elimination of the fault, the fault message is cancelled automatically.

10 DC-bus operation

Contents

10.1	Functional description	10.1-1
10.2	Fuses and cable cross-sections	10.2-1
10.3	Distributed supply (several supply points)	10.3-1
10.4	Braking operation in the network	10.4-1

10.1 Functional description

The energy of controllers connected in a DC-bus system can be exchanged on DC-bus level.

Energy exchange in a DC-bus system

If one or more controllers operate in generator mode (braking operation), the energy will be fed into the shared DC-voltage bus. The energy will then be available to the controllers which operate in motor mode.

The energy for the drive system can be supplied from the three-phase system via

- ▶ a 934X regenerative power supply module.
- ▶ a 936X power supply module.
- ▶ one or more controllers.
- ▶ a combination of a 934X regenerative module or 936X power supply module and a controller.

Advantages with the drive system

The number of braking units and power supply units may be reduced and the energy consumption from the mains can also be reduced at the same time.

The number of mains supply points can be optimally adapted to the application.



Note!

- ▶ Centralised supply (one input module):
 - Configure the multi-axis application using the Lenze »Drive Solution Designer« (DSD).
 - DSD provides support for the selection of suitable components and for the optimisation of the DC-bus system.
- ▶ Decentralised supply (several input modules):
 - Consult your Lenze contact person.

10.2 Fuses and cable cross-sections

A DC supply is only possible for the variants V210, V240, V270, V300.

Installation in accordance
with EN 60204-1

Supply conditions	
Range	Description
Mains	DC 480 ... 800 V
Fuses	- Only semiconductor fuses. - If you are using fuses other than those indicated, other fuse currents and cable cross-sections may result.
Cables	- DC cables (+U_G, -U_G) must always have two-pole insulation. - Laying systems B2 and C: Use of PVC-insulated copper cables, conductor temperature < 70 °C, ambient temperature < 40 °C, no bundling of cables or cores, three loaded cores. The information is a recommendation. Other designs/laying systems are possible (e.g. according to VDE 0298-4).

Observe all national and regional regulations!

9300		Fuse		Cable cross-section	
Type		Quantity	Rated fuse current [A]	Laying system F	
				+U _G , -U _G [mm ²]	PE [mm ²]
EVF9335-EVV2xx EVF9335-EVV300		1	400	2 × 50 ¹⁾	95
EVF9336-EVV2xx EVF9336-EVV300		1	400	2 × 50 ¹⁾	95
EVF9337-EVV2xx EVF9337-EVV300		2	350	2 × 95 ¹⁾	95
EVF9338-EVV2xx EVF9338-EVV300		2	400	2 × 95 ¹⁾	150
EVF9381-EVV2xx EVF9381-EVV300	Master Slave	1 1	400 400	2 × 50 ¹⁾ 2 × 50 ¹⁾	95 95
EVF9382-EVV2xx EVF9382-EVV300	Master Slave	2 2	350 350	2 × 95 ¹⁾ 2 × 95 ¹⁾	95 95
EVF9383-EVV2xx EVF9383-EVV300	Master Slave	2 2	400 400	2 × 95 ¹⁾ 2 × 95 ¹⁾	150 150

¹⁾ Two conductors per path; both conductors must have the same cross-section

10.3 Distributed supply (several supply points)

Block diagram

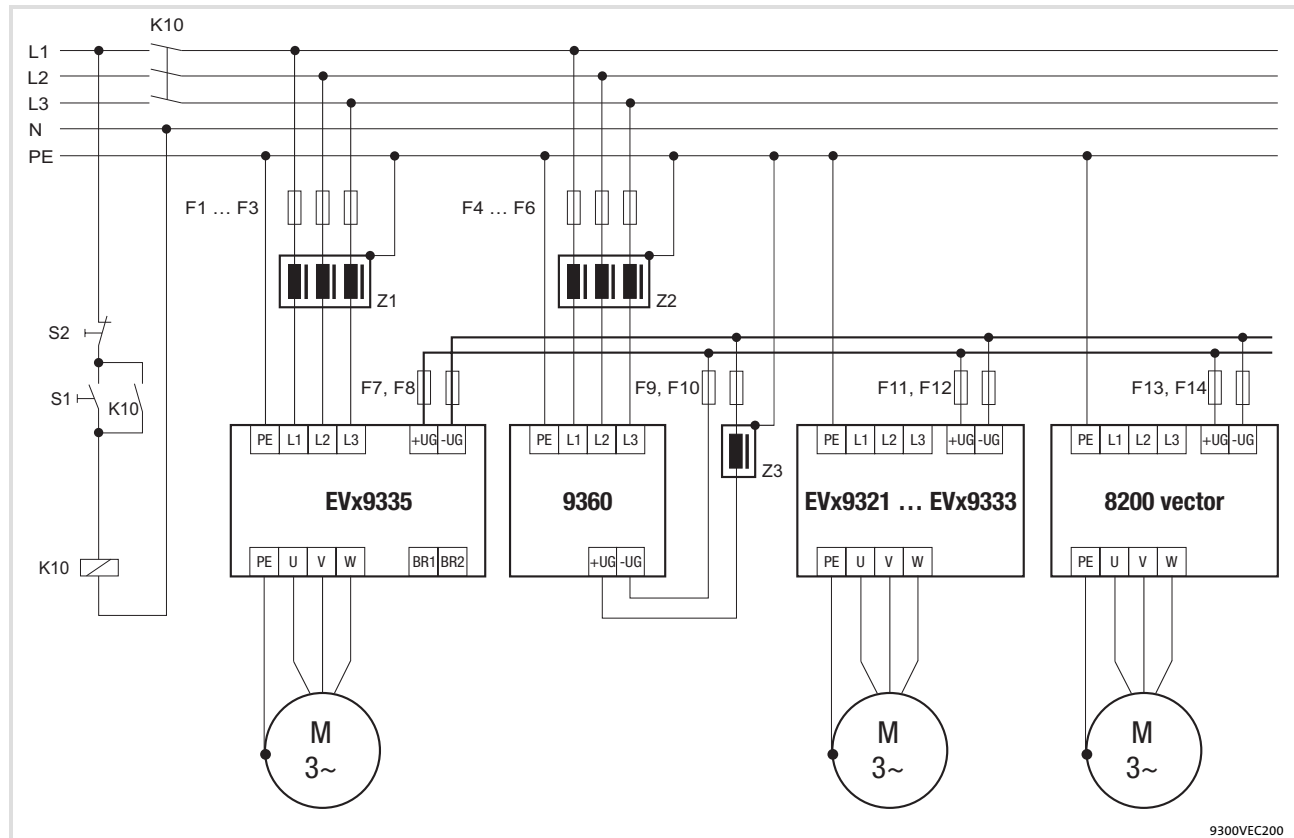


Fig. 10.3-1 Controller with decentralised supply in the drive system

F1...F6	Mains fuses
F7 ... F14	Fuses on DC level
Z1	Mains choke
Z2	Mains choke for 9360 DC power supply units 9364: ELN3-0038H085 9365: ELN3-0017H170
Z3	DC choke 9364: 0.75 mH, 90 A 9365: 2 × 0.75 mH, 90 A (switched parallel)
K10	Mains contactor
S1	Mains "ON"
S2	Mains "OFF"

10.4 Braking operation in the network

- ▶ Controllers EVF9335 ... EVF9383 in variants V270 and V300 are equipped with an integrated brake transistor.
- ▶ Controllers EVF9381 ... EVF9383 in variants V270 and V300 consist of a master and a slave. Both master and slave contain one brake transistor, respectively. The braking energy is normally dissipated in equal shares via master and slave.
- ▶ In the DC-bus connection you have to set the switching thresholds of the brake transistors for all controllers of variants V270 and V300 to the same value (C0174).
- ▶ When the braking energy is low (e. g. operation in generator mode), you can also use 9352 brake choppers. A simultaneous braking operation with a 9352 brake chopper and an integrated brake resistor is not possible due to the different switching thresholds.

11 Safety engineering

Contents

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11.1 Important notes



Stop!

In the case of the devices EVF9335 ... EVF9383 of variants V060, V110, V270, and V300, the integrated brake transistor is deactivated if the "Safe torque off" function is active.

The controllers support the safety functions "Safe torque off" (former designation "Safe standstill"), "Protection against unexpected start-up", in accordance with the requirements of control category 3 of ISO 13849-1 (former EN 954-1). Depending on the external interconnection, a standard up to "category 3" in accordance with ISO 13849-1 is achieved.



Note!

In order to comply with control category 3 in accordance with ISO 13849-1 (former EN 954-1), the two methods "Pulse inhibit via safety relay K_{SR} " and "Controller inhibit", which are independent of each other, have to be used.

- ▶ Only qualified personnel may install and commission the "Safe torque off" function.
- ▶ All control components (switches, relays, PLC, ...) and the control cabinet must comply with the requirements of EN ISO 13849-1 and EN ISO 13849-2. This includes among other things:
 - Control cabinet, switches, relays in enclosure IP54!
 - All other requirements can be found in EN ISO 13849-1 and EN ISO 13849-2!
- ▶ Wiring with insulated wire end ferrules or rigid cables is absolutely required.
- ▶ All safety-relevant cables (e.g. control cable for the safety relay, feedback contact) outside the control cabinet must be protected, e.g. by a cable duct. It must be ensured that short circuits between the individual cables cannot occur!
- ▶ With the "Safe torque off" function no emergency stop can be effected without additional measures:
 - There is neither an electrical isolation between motor and controller nor a service or repair switch!
 - An "Emergency stop" requires the electrical isolation of the conductor to the motor, e.g. by means of a central mains contactor with emergency stop wiring.
- ▶ If in the case of the "Safe torque off" a force effect is to be expected from outside, (e.g. sagging of hanging loads), additional measures are required (e.g. mechanical brakes).

- ▶ After the installation the operator has to check the function of the "Safe torque off" circuit.
 - The functional test must be repeated at regular intervals.
 - Basically, the inspection intervals depend on the application, the related risk analysis, and the overall system. The inspection intervals must not be longer than 1 year.

11.2 Operating mode

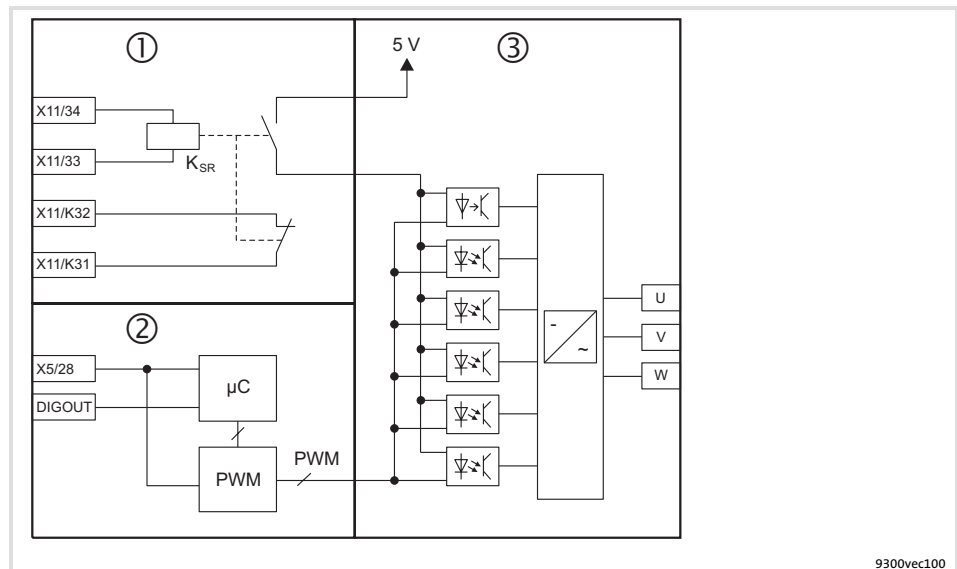


Fig. 11.2-1 Internal connection of the "Safe torque off" function with 3 electrically isolated circuits

- Area ①: Pulse inhibit via safety relay K_{SR}; forcibly guided feedback for monitoring the safety relay
- Area ②: Controller inhibit (X5/28), optional feedback via a digital output (DIGOUT)
- Area ③: Power output stage

Activating "Safe torque off"

The "Safe torque off" status is activated via two different disconnecting paths which are independent of each other:

1. disconnecting path: Pulse inhibit via safety relay K_{SR} (terminal X11/33, X11/34)

- ▶ In the case of LOW level at terminals X11/33, X11/34, the safety relay K_{SR} is deactivated. The driver supply of the power section drivers is interrupted. The inverter no longer receives pulses.
- ▶ The disconnection of the safety relay K_{SR} has to be monitored externally, so that a failure of this disconnecting path can be detected. X11/K31, X11/K32 is a forcibly guided break contact, i. e. if the safety relay K_{SR} has been deactivated ("Safe torque off" activated), the contact is closed.

2. disconnecting path: Controller inhibit by input signal at terminal X5/28

- ▶ The input signal at X5/28 is fed to the microcontroller system and the PWM unit. In the case of LOW level at terminal X5/28, the output of pulses to the inverter is inhibited in the microcontroller system.
- ▶ The disconnecting path "Controller inhibit" can be evaluated optionally via a digital output. Further information can be gathered from the chapter "Functional test" (📖 11.4-1).

"Safe torque off" is activated if **both disconnecting paths are on LOW level**.

Deactivating "Safe torque off"

An AND operation of the disconnecting paths prevents the drive from restarting if only one disconnecting path is enabled.

"Safe torque off" is deactivated if **both disconnecting paths are on HIGH level**.

11.3 Safety relay K_{SR}

Technical data

Terminal	Description	Field	Values
X11/K32 X11/K31 X11/33 X11/34	Safety relay K _{SR} 1st disconnecting path	Coil voltage at +20 °C	DC 24 V (20 ... 30 V)
		Coil resistance at +20 °C	823 Ω ±10 %
		Rated coil power	Approx. 700 mW
		Max. switching voltage	AC 250 V, DC 250 V (0.45 A)
		Max. AC switching capacity	1500 VA
		Max. switching current (ohmic load)	AC 6 A (250 V), DC 6 A (50 V)
		Recommended minimum load	> 50 mW
		Max. switching rate	6 switchings per minute
		Mechanical service life	10 ⁷ switching cycles
		Electrical service life	
		at 250 V AC (ohmic load)	10 ⁵ switching cycles at 6 A 10 ⁶ switching cycles at 1 A 10 ⁷ switching cycles at 0.25 A
		at 24 V DC (ohmic load)	6 × 10 ³ switching cycles at 6 A 10 ⁶ switching cycles at 3 A 1.5 × 10 ⁶ switching cycles at 1 A 10 ⁷ switching cycles at 0.1 A

Terminal data

Wiring of the terminals X11/34, X11/33, X11/K32, X11/K31, X5/28:

Leitungstyp	Wire end ferrule	Cable cross-section	Tightening torque	Stripping length
 Rigid	—	2,5 mm ² (AWG 14)	0,5 ... 0,6 Nm (4.4 ... 5.3 lb-in)	5 mm
 Flexible	With plastic sleeve	2,5 mm ² (AWG 14)		

Wiring

**Danger!****Faulty operation in case of earth faults possible**

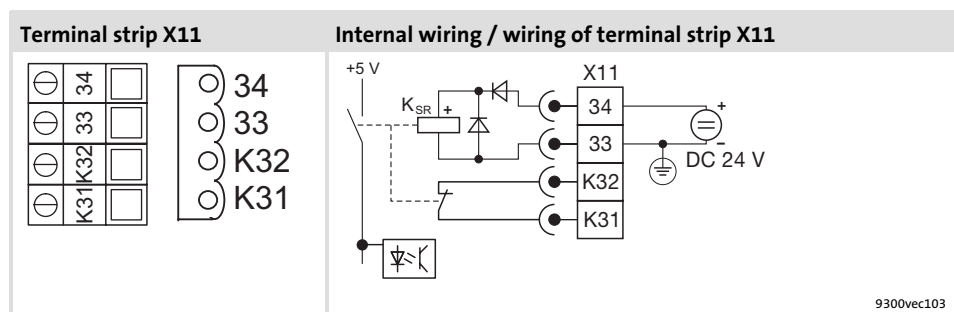
The correct functioning of the safety function is not ensured if an earth fault occurs.

Possible consequences:

- A failure of the safety function can lead to death, severe injuries or damage to material.

Protective measures:

The electrical reference point for the coil of the safety relay K_{SR} must be connected to the PE conductor system (EN 60204-1, paragraph 9.4.3)!

Fig. 11.3-1 Safety relay K_{SR}

Terminal	Function	Level / state	Electrical data
	Bold print = Lenze setting		
X11/K32 X11/K31	Safety relay K _{SR} 1st disconnecting path	Open contact: Pulse inhibit is inactive (operation) Closed contact: Pulse inhibit is active	See technical data of the safety relay K _{SR}
X11/33	– coil of safety relay K _{SR}	Coil is not carrying any current: pulse inhibit is active	
X11/34	+ coil of safety relay K _{SR}	Coil is carrying current: pulse inhibit is inactive (operation)	
X5/28	Controller inhibit (DCTRL-CINH) 2nd disconnecting path	LOW: Controller inhibited HIGH: Controller enabled	LOW: 0 ... +3 V HIGH: +12 ... +30 V Input current at +24 V: 8 mA Reading and processing the input signals - 1/ms (mean value)

11.4 Functional test**11.4.1 Important notes****Danger!****Unexpected start-up of the machine possible**

The "Safe torque off" safety function provides protection against an unexpected start-up of the drive and therefore is an important item within the safety concept for a machine. It has to be ensured that this function works correctly.

Possible consequences:

- ▶ Death, severe injury, or damage to material assets, when the safety function fails.

Protective measures:

After the installation and at regular intervals, the operator has to check the function of the "Safe torque off" circuit.

- ▶ When doing this, check both disconnecting paths separately with regard to their disconnection capability.
- ▶ The functional test can be carried out manually or automatically via the PLC.
- ▶ Basically the inspection interval depends on the application and the corresponding risk analysis, as well as on the system as a whole. It should not exceed 1 year.
- ▶ If the functional test shows impermissible states,
 - the drive or the machine has to be shut down immediately.
 - commissioning is not permitted until the safety function operates correctly.

11.4.2 Manual safety function check

For the functional test, check both disconnecting paths **separately**.

1. disconnecting path: Pulse inhibit via safety relay K_{SR}

How to proceed during the test:

1. Alternately apply LOW and HIGH level to input X11/34 and check the states given in the table below.

	Specification	Correct status
Individual test	Input relay activation (X11/34)	Output feedback (X11/K31)
Pulse inhibit	LOW	HIGH
Pulse enable	HIGH	LOW

The individual tests are passed if the correct states given in the table result.

2. disconnecting path: Controller inhibit

Requirement for the test:

- ▶ "Quickstop" (QSP) function deactivated
- ▶ "Automatic DC injection brake" deactivated (C0019 = 0)
- ▶ Pulses enabled by the safety relay K_{SR} (X11/34 = HIGH)

How to proceed during the test:

1. Set controller inhibit (X5/28 = LOW).
2. Define a setpoint $n_{\text{set}} > 0$.
3. Check that the motor is not rotating.

The individual test is passed if the motor does not rotate.

Functional test not passed

If an individual test results in an impermissible status, the functional test is not passed.

- ▶ The drive or machine has to be shut down immediately.
- ▶ Commissioning is not permitted until the safety function operates correctly.

11.4.3 Monitoring the safety function with a PLC

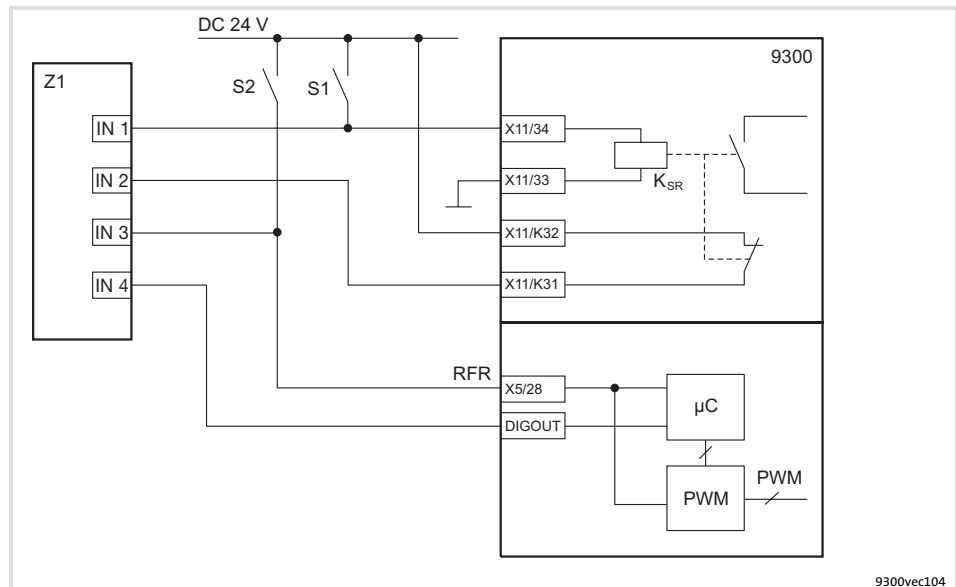


Fig. 11.4-1 Circuit diagram for monitoring the safety function with a PLC

S1, S2	Separate disconnection options of the two disconnecting paths
K _{SR}	Safety relay
X11/34	Safety relay control
X11/33	Safety relay control (GND)
X11/K32	Forcibly guided feedback contact (24 V)
X11/K31	Forcibly guided feedback contact
DIGOUT	Digital output for evaluating the motor current
X5/28	Controller inhibit
Z1	Programmable logic controller (PLC)
IN 1 - 4	Digital inputs

Requirements

The following conditions must be met:

- The PLC must be programmed such that the complete system is set to a safe state immediately when the function check leads to an impermissible state.
- The parameter setting of a digital output must be such that you can conclude to the output current I_{motor} of the drive (see parameterisation example).

Example: Parameterising a digital output

In the following we will show you a possibility of parameterising a digital output, so that a conclusion with regard to the motor current is provided.

Sequence	Parameter	Note
1.	Configure function block CMP3 (comparator)	
	Connect CMP3-IN1 to MCTRL-IACT	C0693/1 = 5004
	Connect CMP3-IN2 to FCODE-472/1	C0693/2 = 19521
	Configure the function $IN1 < IN2$	C0690 = 3
2.	Configure output signal of CMP3	C0117/4 = 10660
	Connect DIGOUT4 to CMP3-OUT	
3.	Enter function block CMP3 in the processing table	
	Select a free space in the processing table In the Lenze setting, for instance space 2 of the processing table is free	C0465/2 = 10660
4.	Set the current threshold	C0472/1 = 2.00
	Set the current threshold for $I_{rated\ FI}$ to 2 %	$I_{Motor} = 0 \rightarrow DIGOUT4 = HIGH$ $I_{Motor} \neq 0 \rightarrow DIGOUT4 = LOW$

Functional test within the inspection interval

For the functional test, check both disconnecting paths **separately**.

1. disconnecting path: Pulse inhibit via safety relay K_{SR}

The individual tests are passed if the correct states given in the table result.

Individual test	Specification	Correct status
	Input relay activation (X11/34)	Output feedback (X11/K31)
Pulse inhibit	LOW	HIGH
Pulse enable	HIGH	LOW

2. disconnecting path: Controller inhibit

Requirement for the test:

- ▶ "Quickstop" (QSP) function deactivated
- ▶ "Automatic DC injection brake" deactivated (C0019 = 0)
- ▶ Pulses enabled by the safety relay K_{SR} (X11/34 = HIGH)

The individual tests are passed if the correct states given in the table result.

Individual test	Specification		Correct status
	X5/28	Setpoint	Output DIGOUT
Controller inhibit	LOW	$n_{\text{set}} > 0$	HIGH
Controller enable	HIGH		LOW

Functional test not passed

If an individual test results in an impermissible status, the functional test is not passed.

- ▶ The drive or machine has to be shut down immediately.
- ▶ Commissioning is not permitted until the safety function operates correctly.

12 Braking operation

Contents

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12.1 Brake operation with external brake resistor

Larger moments of inertia or longer generator-mode operation require an external brake resistor. It converts mechanical brake energy into heat.

The brake transistor integrated into the controller switches the external brake resistor in addition when the DC-bus voltage exceeds a threshold. It can thus be avoided that the controller sets pulse inhibit in the event of an "overvoltage" and forces the drive to coast to standstill. External brake resistors ensure braking operation at any time.

12.1.1 Selection of the brake resistors

The suitable brake resistor must meet the following criteria:

Brake resistor	Application	
	with active load	with passive load
Continuous braking power [W]	$\geq P_{\max} \cdot \eta_e \cdot \eta_m \cdot \frac{t_1}{t_{\text{zykl}}}$	$\geq \frac{P_{\max} \cdot \eta_e \cdot \eta_m}{2} \cdot \frac{t_1}{t_{\text{zykl}}}$
Thermal capacity [Ws]	$\geq P_{\max} \cdot \eta_e \cdot \eta_m \cdot t_1$	$\geq \frac{P_{\max} \cdot \eta_e \cdot \eta_m}{2} \cdot t_1$
Resistance [Ω]	$R_{\min} \leq R \leq \frac{U_{\text{DC}}^2}{P_{\max} \cdot \eta_e \cdot \eta_m}$	

Field	Description
Active load	Can move without being influenced by the controller (e.g. unwinders)
Passive load	Decelerates to standstill without influence of the controller (e.g. horizontal traversing drives, centrifuges, fans)
V_{DC} [V]	Threshold for brake transistor
$P_{\max}$ [W]	Max. brake power determined by the application IMPORTANT: With EVF9381-EV, EVF9382-EV, EVF9383-EV only calculate with $P_{\max}/2$ since these devices dissipate the brake energy evenly via master and slave. If the brake power is lower, the brake energy can also be dissipated via the master or the slave; use $P_{\max}$ for the calculation.
η_e	Electrical efficiency (controller + motor) Guide value: 0.94
η_m	Mechanical efficiency (gearbox, machine)
t_1 [s]	Braking time
t_{cycl} [s]	Cycle time = time between two braking processes (= t_1 + break)
$R_{\min}$ [Ω]	Lowest permissible brake resistance (see rated data for the integrated brake transistor)

12.2 Lenze brake resistors

12.2.1 Rated data

Field	Data
Resistance R	15 Ω
Continuous power ¹⁾	4.0 kW
Thermal capacity	600.0 kW s
Switch-on cycle	Braking for max. 19/15/14/11 s, then at least 131/135/136/139 s break ²⁾
Cable cross-section to be connected	6 mm ² AWG 10
Mass	12.5 kg
Order No.	ERBD015R04K0

Observe the national and regional legislation

- ¹⁾ The continuous power is a reference value for the selection of brake resistors. Braking at peak brake power (V_{DC}^2/R).
- ²⁾ More information on the switching threshold V_{DC} (685 V, 755 V, 785 V, 885 V) of the brake transistor can be found in chapter 12.1



Note!

As standard the brake resistor is equipped with a temperature switch (NC contact max. AC 250 V, 0.5 A).

12.2.2 Dimensions

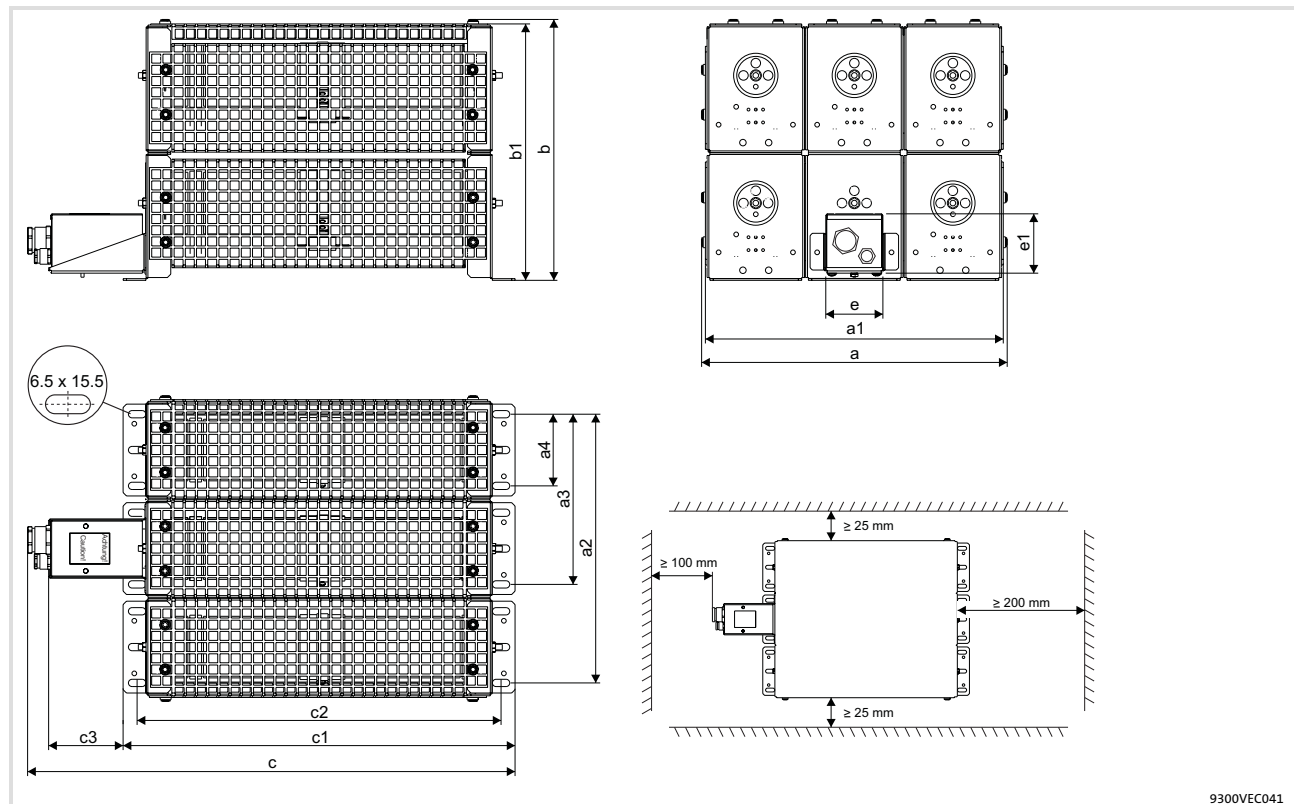


Fig. 12.2-1 Dimensions of the ERBD015R04K0 brake resistor

Type	a	a1	a2	a3	a4	b	b1	c	c1	c2	c3	e	e1
ERBD015R04K0	273	266	240	152	64	233	229	640	550	526	66.5	51	53

All values in [mm]

12.2.3 Selection



Stop!

The value must not fall below the lowest permissible resistance.

Connect several brake resistors of type ERBD015R04K0 in parallel to get the brake resistance that matches your application.

The number of resistors to be connected in parallel is calculated with $1/4 \times$ of the required continuous power (round the result).

12.2.4 Connection of external brake resistor

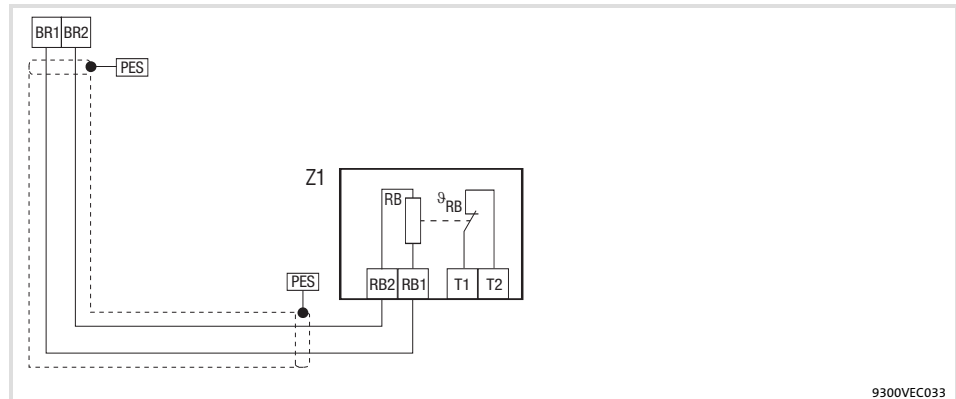


Fig. 12.2-2 Brake resistor connection

RB1, RB2 Controller terminals for connecting the brake resistor

Z1 Brake resistor

PES HF-shield end by PE connection through shield bracket.

Important notes

- Brake resistors can get hot and under certain conditions a brake resistor can even burn down. For this reason, the brake resistors must be mounted so that the possibly high temperatures cannot cause any damage.
- Provide a safety shutdown in the event the brake resistor overheats.
- Use the thermal contacts of the brake resistor (e.g. T1 / T2) as control contacts to disconnect the controller from the cable!
- Only use shielded brake resistor cables.
- Connect the shield close to the controller and close to the brake resistor with a surface as large as possible to the mounting plate by using a shield clamp.
- The shield of the control cables for digital signals (temperature monitoring T1 / T2) must be connected at both sides (controller and brake resistor).
- Unshielded cables between shield clamp and connection terminals must not be longer than 40 mm.

12.3 Rated data of the integrated brake transistor

Rated data for types EVF93xx-EVV060 and EVF93xx-EVV110 at 400 V rated mains voltage

Brake transistor		9300 vector			
		EVF9335-EVV060 EVF9335-EVV110	EVF9336-EVV060 EVF9336-EVV110	EVF9337-EVV060 EVF9337-EVV110	EVF9338-EVV060 EVF9338-EVV110
Threshold V_{DC}	[V DC]	685			
Peak brake current	[A DC]	315	375	450	560
Max. continuous current	[A DC]	210	250	300	375
Lowest permissible brake resistance ¹⁾	[Ω]	2.2	1.8	1.5	1.2
Current derating		Derate the peak brake current by 2.5 %/°C above 40 °C Derate the peak brake current by 5 %/1000 m above 1000 m a.m.s.l.			
Switch-on cycle ³⁾		max. 60 s braking at peak brake power, followed by min. 30 s break			

Brake transistor		9300 vector		
		EVF9381-EVV060 ²⁾ EVF9381-EVV110 ²⁾	EVF9382-EVV060 ²⁾ EVF9382-EVV110 ²⁾	EVF9383-EVV060 ²⁾ EVF9383-EVV110 ²⁾
Threshold V_{DC}	[V DC]	685		
Peak brake current	[A DC]	2 × 375	2 × 450	2 × 560
Max. continuous current	[A DC]	2 × 250	2 × 300	2 × 375
Lowest permissible brake resistance ¹⁾	[Ω]	1.8	1.5	1.2
Current derating		Derate the peak brake current by 2.5 %/°C above 40 °C Derate the peak brake current by 5 %/1000 m above 1000 m a.m.s.l.		
Switch-on cycle ³⁾		max. 60 s braking at peak brake power, followed by min. 30 s break		

- ¹⁾ Please consider the cable resistance if you use longer connection cables. The cable resistance must be added to the brake resistance and has therefore a considerable influence on the total resistance.
- ²⁾ Device consists of master and slave connected in parallel. Usually, the brake energy is dissipated evenly via master and slave.
- ³⁾ Please see the switch-on cycle of the brake resistor used.

Rated data for types EVF93xx-EVV270 and EVF93xx-EVV300 at 400 V or 460 V rated mains voltage

Brake transistor		9300 vector			
		EVF9335-EVV270 EVF9335-EVV300	EVF9336-EVV270 EVF9336-EVV300	EVF9337-EVV270 EVF9337-EVV300	EVF9338-EVV270 EVF9338-EVV300
Threshold V_{DC}	[V DC]	755			
Peak brake current	[A DC]	315	375	450	560
Max. continuous current	[A DC]	210	250	300	375
Lowest permissible brake resistance ¹⁾	[Ω]	2.5	2.1	1.8	1.4
Current derating		Derate the peak brake current by 2.5 %/°C above 40 °C Derate the peak brake current by 5 %/1000 m above 1000 m a.m.s.l.			
Switch-on cycle ³⁾		max. 60 s braking at peak brake power, followed by min. 30 s break			

Brake transistor		9300 vector		
		EVF9381-EVV270 ²⁾ EVF9381-EVV300 ²⁾	EVF9382-EVV270 ²⁾ EVF9382-EVV300 ²⁾	EVF9383-EVV270 ²⁾ EVF9383-EVV300 ²⁾
Threshold V_{DC}	[V DC]	755		
Peak brake current	[A DC]	2 × 375	2 × 450	2 × 560
Max. continuous current	[A DC]	2 × 250	2 × 300	2 × 375
Lowest permissible brake resistance ¹⁾	[Ω]	2.1	1.8	1.4
Current derating		Derate the peak brake current by 2.5 %/°C above 40 °C Derate the peak brake current by 5 %/1000 m above 1000 m a.m.s.l.		
Switch-on cycle ³⁾		max. 60 s braking at peak brake power, followed by min. 30 s break		

- ¹⁾ Please consider the cable resistance if you use longer connection cables. The cable resistance must be added to the brake resistance and has therefore a considerable influence on the total resistance.
- ²⁾ Device consists of master and slave connected in parallel. Usually, the brake energy is dissipated evenly via master and slave.
- ³⁾ Please see the switch-on cycle of the brake resistor used.

Rated data for types EVF93xx-EVV270 and EVF93xx-EVV300 at 480 V rated mains voltage

Brake transistor		9300 vector			
		EVF9335-EVV270 EVF9335-EVV300	EVF9336-EVV270 EVF9336-EVV300	EVF9337-EVV270 EVF9337-EVV300	EVF9338-EVV270 EVF9338-EVV300
Threshold V_{DC}	[V DC]	785			
Peak brake current	[A DC]	315	375	450	560
Max. continuous current	[A DC]	210	250	300	375
Lowest permissible brake resistance ¹⁾	[Ω]	2.5	2.1	1.8	1.4
Current derating		Derate the peak brake current by 2.5 %/°C above 40 °C Derate the peak brake current by 5 %/1000 m above 1000 m a.m.s.l.			
Switch-on cycle ³⁾		max. 60 s braking at peak brake power, followed by min. 30 s break			

Brake transistor		9300 vector		
		EVF9381-EVV270 ²⁾ EVF9381-EVV300 ²⁾	EVF9382-EVV270 ²⁾ EVF9382-EVV300 ²⁾	EVF9383-EVV270 ²⁾ EVF9383-EVV300 ²⁾
Threshold V_{DC}	[V DC]	785		
Peak brake current	[A DC]	2 × 375	2 × 450	2 × 560
Max. continuous current	[A DC]	2 × 250	2 × 300	2 × 375
Lowest permissible brake resistance ¹⁾	[Ω]	2.1	1.8	1.4
Current derating		Derate the peak brake current by 2.5 %/°C above 40 °C Derate the peak brake current by 5 %/1000 m above 1000 m a.m.s.l.		
Switch-on cycle ³⁾		max. 60 s braking at peak brake power, followed by min. 30 s break		

- ¹⁾ Please consider the cable resistance if you use longer connection cables. The cable resistance must be added to the brake resistance and has therefore a considerable influence on the total resistance.
- ²⁾ Device consists of master and slave connected in parallel. Usually, the brake energy is dissipated evenly via master and slave.
- ³⁾ Please see the switch-on cycle of the brake resistor used.

Rated data for types EVF93xx-EVV270 and EVF93xx-EVV300 at 500 V rated mains voltage

Brake transistor		9300 vector			
		EVF9335-EVV270 EVF9335-EVV300	EVF9336-EVV270 EVF9336-EVV300	EVF9337-EVV270 EVF9337-EVV300	EVF9338-EVV270 EVF9338-EVV300
Threshold V_{DC}	[V DC]	885			
Peak brake current	[A DC]	315	375	450	560
Max. continuous current	[A DC]	210	250	300	375
Lowest permissible brake resistance ¹⁾	[Ω]	2.8	2.3	1.9	1.6
Current derating		Derate the peak brake current by 2.5 %/°C above 40 °C Derate the peak brake current by 5 %/1000 m above 1000 m a.m.s.l.			
Switch-on cycle ³⁾		max. 60 s braking at peak brake power, followed by min. 30 s break			

Brake transistor		9300 vector		
		EVF9381-EVV270 ²⁾ EVF9381-EVV300 ²⁾	EVF9382-EVV270 ²⁾ EVF9382-EVV300 ²⁾	EVF9383-EVV270 ²⁾ EVF9383-EVV300 ²⁾
Threshold V_{DC}	[V DC]	885		
Peak brake current	[A DC]	2 × 375	2 × 450	2 × 560
Max. continuous current	[A DC]	2 × 250	2 × 300	2 × 375
Lowest permissible brake resistance ¹⁾	[Ω]	2.3	1.9	1.6
Current derating		Derate the peak brake current by 2.5 %/°C above 40 °C Derate the peak brake current by 5 %/1000 m above 1000 m a.m.s.l.		
Switch-on cycle ³⁾		max. 60 s braking at peak brake power, followed by min. 30 s break		

- ¹⁾ Please consider the cable resistance if you use longer connection cables. The cable resistance must be added to the brake resistance and has therefore a considerable influence on the total resistance.
- ²⁾ Device consists of master and slave connected in parallel. Usually, the brake energy is dissipated evenly via master and slave.
- ³⁾ Please see the switch-on cycle of the brake resistor used.

12.4 Braking operation in the network

Basic circuit diagram

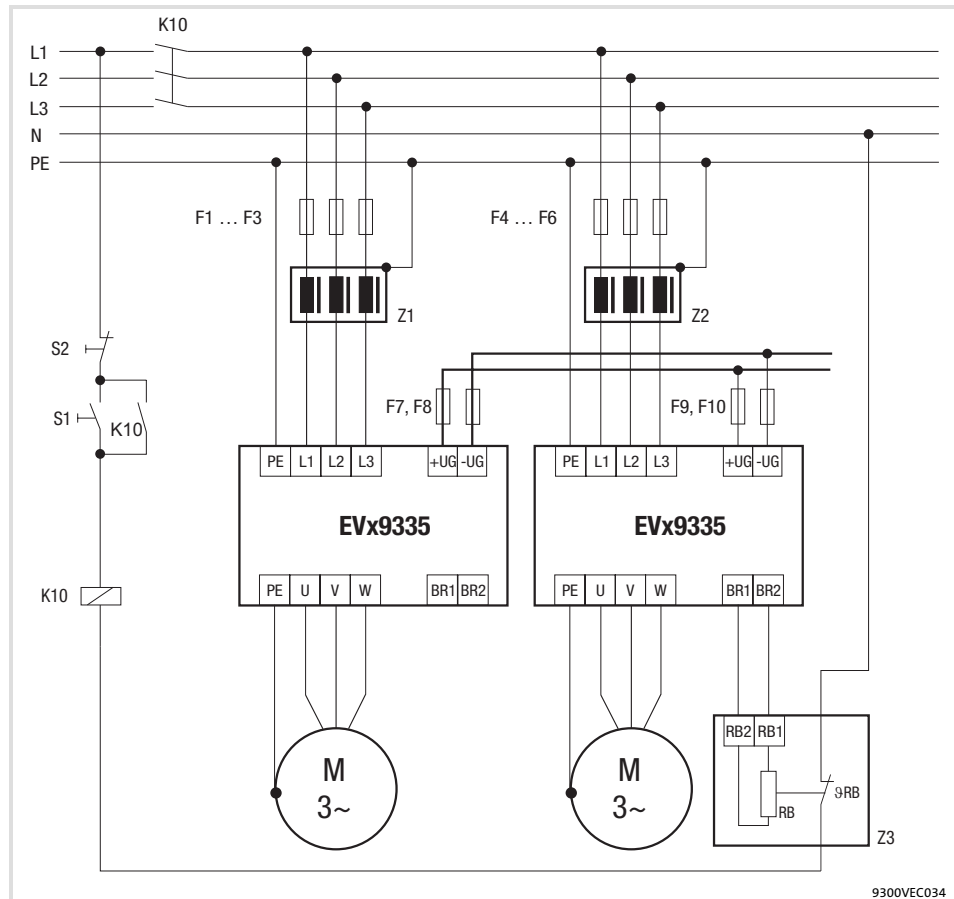


Fig. 12.4-1 Controller with decentralised supply in DC-bus operation and with brake resistor

F1...F6	Mains fuses
F7 ... F14	Fuses on DC level
Z1, Z2	Mains choke
Z3	Brake resistor
K10	Mains contactor
S1	Mains "ON"
S2	Mains "OFF"

12.4.1 Selection



Stop!

- Set the DC-bus voltage thresholds of the controllers to the same value under C0173.
- Set the brake transistor thresholds for the controllers under C0174.

Code		Possible settings				IMPORTANT			
No.	Name	Lenze	Selection						
C0173 	UG limit	1					Check during commissioning and adapt, if necessary! All controllers in the system must have the same threshold! • Adaptation of UG thresholds • Only display in case of the variants for 400 V mains (EVF93xx-EV, EVF93xx-EVV030, EVF93xx-EVV060, EVF93xx-EVV110): – C0173 = 1 – OU = 700 ... 685 V	 12-1 See System Manual (extension)	
				Mains	LU	OU	Device with or without brake transistor		
			0	< 400 V	285 V	770 ... 755 V			
			1	400 V	285 V	770 ... 755 V	Device without brake transistor		
			2	460 V	328 V	770 ... 755 V			
			3	480 V	342 V	770 ... 755 V			Device with brake transistor
C0174	BR Limit	3					Display of the brake transistor thresholds Check during commissioning and adapt, if necessary! All controllers connected to the bus must have the same threshold!	 12-1 See System Manual (extension)	
				Mains		U _{BR}	OU		Only display in case of the variants for 400 V mains (EVF93xx-EV, EVF93xx-EVV030, EVF93xx-EVV060, EVF93xx-EVV110)
			0	400 V		685 V	700 V		
			1	400 V / 460 V		755 V	770 V		Only in case of the variants for 400 V/500 V mains (EVF93xx-EVV210, EVF93xx-EVV240, EVF93xx-EVV270, EVF93xx-EVV300)
			2	480 V		785 V	800 V		
3	500 V		885 V	900 V					

Important notes

Provide a safety switch-off in the event of overheating if you use a brake resistor. Use the temperature switches of the brake resistor to

- disconnect all controllers from the mains.
- set controller inhibit in all controllers (terminal X528 = LOW).

13 Accessories (overview)

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13.1 General accessories

Accessories	Designation	Order number
Communication modules	LECOM-LI (optical fibre)	EMF2102IBCV003
	LECOM-B (RS485)	EMF2102IBCV002
	LECOM-A/B (RS232/485)	EMF2102IBCV001
	LON	EMF2141IB
	INTERBUS	EMF2113IB
	INTERBUS-Loop	EMF2112IB
	PROFIBUS-DP	EMF2133IB
	DeviceNet/CANopen	EMF2175IB
	Operating module keypad XT	EMZ9371BC
	Diagnosis terminal (keypad XT in handheld design, IP20) ¹⁾	E82ZBBXC
Other	Connecting cable	2.5 m E82ZWL025 5 m E82ZWL050 10 m E82ZWL100
	Parameterisation/operating software »Global Drive Control« (GDC)	ESP-GDC2
	PC system bus adapter (Voltage supply via DIN connection)	EMF2173IB
	PC system bus adapter (Voltage supply via PS2 connection)	EMF2173IB-V002
	PC system bus adapter (Voltage supply via PS2 connection, electrical isolation)	EMF2173IB-V003
	PC system bus adapter USB	EMF2177IB
	CAN repeater	EMF2176IB
	PC system cable RS232	5 m EWL0020 10 m EWL0021
	Optical fibre adapter (standard output power)	EMF2125IB
	Optical fibre adapter (increased output power)	EMF2126IB
	Power supply unit for optical fibre adapter	EJ0013
	Optical fibre, single-core, black PE sheath (basic protection), sold by the meter	EWZ0007
	Optical fibre, single-core, red PUR sheath (reinforced protection), sold by the meter	EWZ0006
	Setpoint potentiometer	ERPD0010k0001W
	Rotary knob for setpoint potentiometer	ERZ0001
	Scale for setpoint potentiometer	ERZ0002
	Digital display	EPD203
	Encoder cable	2.5 m EWLE002GX-T 5.0 m EWLE005GX-T 10.0 m EWLE010GX-T 15.0 m EWLE015GX-T 20.0 m EWLE020GX-T 25.0 m EWLE025GX-T 30.0 m EWLE030GX-T 35.0 m EWLE035GX-T 40.0 m EWLE040GX-T 45.0 m EWLE045GX-T 50.0 m EWLE050GX-T

Accessories	Designation	Order number
	Connecting cable for digital frequency coupling 2.5 m	EWLD002GGBS93

¹⁾ Additional connecting cable required

**Tip!**

Information and auxiliary devices related to the Lenze products can be found in the download area at

<http://www.Lenze.com>

13.2 Type-specific accessories

Accessories	9300 vector			
	EVF9335	EVF9336	EVF9337	EVF9338
Motor choke	ELM3-003H275	ELM3-003H275	ELM3-002H320	ELM3-002H410
Air lock	E93ZWL			
Brake resistor	ERBD015R04K0			

Accessories	9300 vector		
	EVF9381	EVF9382	EVF9383
Motor choke	2 × ELM3-003H275	2 × ELM3-002H320	2 × ELM3-002H410
Air lock	E93ZWL2		
Brake resistor	ERBD015R04K0		

14 Appendix

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14.1 Glossary

14.1.1 Terminology and abbreviations used

	Cross-reference to a chapter with the corresponding page number
AC	AC current or AC voltage
AIF	Automation interface AIF interface, interface for communication modules
CE	Communauté Européenne
Controller	Any frequency inverter, servo inverter, or DC speed controller
Cxxxx/y	Subcode y of code Cxxxx (e. g. C0404/2 = subcode 2 of code C0404)
DC	DC current or DC voltage
DIN	Deutsches Institut für Normung (German Institute for Standardization)
Drive	Lenze controller in combination with a geared motor, a three-phase AC motor, and other Lenze drive components
EMC	Electromagnetic compatibility
EN	European standard
f_r [Hz]	Rated motor frequency
I_a [A]	Current output current
IEC	International Electrotechnical Commission
I_{mains} [A]	Mains current
I_{max} [A]	Maximum output current
IP	International Protection Code
IPC	Industrial PC
I_{PE} [mA]	Discharge current
I_r [A]	Rated output current
L [mH]	Inductance
M_r [Nm]	Rated motor torque
NEMA	National Electrical Manufacturers Association
P_{DC} [kW]	Power that can be additionally taken from the DC bus if a power-adapted motor is used for operation
PLC	Programmable control system
P_{loss} [W]	Power loss of inverter

P_r [kW]	Rated motor power
R [Ω]	Resistance
S_N [kVA]	Controller output power
U_{DC} [V]	DC supply voltage
UL	Underwriters Laboratories
U_M [V]	Output voltage
U_{mains} [V]	Mains voltage
VDE	Verband deutscher Elektrotechniker (Association of German Electrical Engineers)
Xk/y	Terminal y on terminal strip Xk (e. g. X5/28 = terminal 28 on terminal strip X5)

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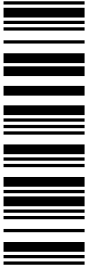
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EDSVF9383V ■ 13405788 ■ EN ■ 7.1-04/2012 ■ TD23

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System Manual

(Extension)

9300 vector *0,37 ... 400 kW*



EVF9321 ... EVF9333, EVF9335 ... EVF9338, EVF9381 ... EVF9383

Frequency inverter

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All indications given in this documentation have been selected carefully and comply with the hardware and software described.

Nevertheless, deviations cannot be ruled out. We do not take any responsibility or liability for damage which might possibly occur. Necessary corrections will be included in the next edition.

2.0

11/2007



1 Preface

Contents

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Preface

How to use this Manual

1.1 How to use this Manual

1.1.1 Which information does the System Manual contain?

Target group

This System Manual (extension) is intended for all persons who design, install, commission, and adjust the 9300 vector frequency inverter.

Together with the System Manual, document number EDSVF9333V or EDSVF9383V, and the catalogue it forms the project planning basis for machine and system builders.

The System Manual (extension) is only valid together with the System Manual, document number EDSVF9333V or EDSVF9383V.

Contents

The System Manual (extension) completes the System Manual, document number EDSVF9333V or EDSVF9383V:

- The features and functions are described in detail.
- It describes in detail additional possible applications.
- Examples describe how to set the parameters for typical applications.
- In case of doubt, the Operating Instructions delivered together with the 9300 vector frequency inverter always apply.



①	②	Contents of the System Manual	Contents of the System Manual (extension)
1	1	Preface	1 Preface
2	2	Safety	-
3	3	Technical data	-
4	4	Installing the basic device	-
5	5	Wiring the basic device	-
6	6	Commissioning	-
7	7	Parameter setting	-
8	8	Configuration	2 Configuration
	8.1	Function block description	2.1 Configuration with Global Drive Control
		Diameter calculator (DCALC)	2.2 Basic configuration
		Digital frequency input (DFIN)	2.3 Use of function blocks
		Digital frequency output (DFOUT)	2.4 Function blocks
		Digital frequency ramp function generator (DFRFG)	(Description of additional function blocks)
		Digital frequency processing (DFSET)	
		Internal motor control with V/f characteristic control (MCTRL1)	
		Internal motor control with vector control (MCTRL2)	
	8.2	Monitorings	
	8.3	Code table	
	8.4	Selection lists	
	8.5	Attribute table	
9	9	Troubleshooting and fault elimination	-
10	10	DC-bus operation	-
11	11	Safety engineering	-
-	12	Braking operation	-
-	-	-	3 Application examples
-	-	-	4 Signal flow charts
12	13	Accessories	-
13	14	Appendix	5 Appendix

① Chapters contained in the System Manual (EDSVF9333V) for EVF9321 ... EVF9333 frequency inverters

② Chapters contained in the System Manual (EDSVF9383V) for EVF9335 ... EVF9338, EVF9381 ... EVF9383 frequency inverters



Preface

How to use this Manual

How to find information

Use the System Manual as basis. It contains references to the corresponding chapters in the System Manual (extension):

- Each chapter is a complete unit and informs entirely about a subject.
- The Table of Contents and Index help you to find all information about a certain topic.
- Descriptions and data of other Lenze products (drive PLC, Lenze geared motors, Lenze motors, ...) can be found in the corresponding catalogues, Operating Instructions and Manuals. The required documentation can be ordered at your Lenze sales partner or downloaded as PDF file from the Internet.



Note!

Current documentation and software updates for Lenze products can be found on the Internet in the "Download" area under

<http://www.Lenze.com>

1.1.2 Products to which the System Manual applies

This documentation applies to 9300 frequency inverters as of version:

- EVF9321-xV Vxxx xx 73 ... EVF9333-xV Vxxx xx 73
- EVF9335-EV Vxxx xx 8x ... EVF9338-EV Vxxx xx 8x
- EVF9381-EV Vxxx xx 8x ... EVF9383-EV Vxxx xx 8x



1.2 Definition of notes used

All safety information given in these Instructions have the same layout:



Pictograph (indicates the type of danger)

Signal word! (indicates the severity of danger)

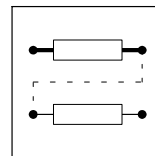
Note (describes the danger and explains how to avoid it)

	Pictograms used		Signal words	
Warning of damage to persons		Warning of dangerous electrical voltage	Danger!	Warns of impending danger . If disregarded: Death or most severe injuries
		Warning of general danger	Warning!	Warns of possible and very dangerous situations . If disregarded: Death or most severe injuries
			Caution!	Warns of possible and dangerous situations . If disregarded: Minor injuries
Warning of damage to material			Stop!	Warns of possible damage to material . If disregarded: Damage of the controller/drive system or its environment
Other notes			Note!	Indicates a useful tip. If you follow this tip, handling of the controller/drive system will be easier.



Preface

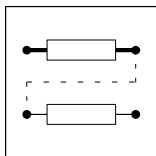
Definition of notes used



2 Configuration

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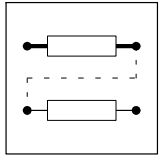
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2.4.50	Process controller (PCTRL)	2-147
2.4.51	Delay (PT1)	2-152
2.4.52	Ramp function generator (RFG)	2-153
2.4.53	CW/CCW/Quick stop (R/L/Q)	2-155
2.4.54	Sample & Hold (S&H)	2-156
2.4.55	Square-root calculator (SQRT)	2-157
2.4.56	S-ramp function generator (SRFG)	2-158
2.4.57	Output of digital status signals (STAT)	2-161
2.4.58	Edge evaluation (TRANS)	2-162



2.1 Configuration by means of Global Drive Control

In practice, every application requires an adapted controller-internal configuration. In general, a number of different function blocks are available which must be linked together in a suitable configuration. (📖 2-35)

With Global Drive Control (GDC), Lenze offers an easy-to-understand, clearly-laid-out and convenient tool for the configuration of your specific drive task.

Function block library

GDC provides an easy-to-read library of available function blocks (FB). GDC also displays the complete assignment of an FB.

Signal configuration

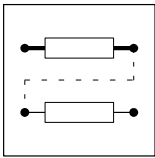
The signal configuration is done with only one dialog box. It is a convenient way

- to display every FB as a block diagram.
- to see the assignment of all signal inputs at a glance.
- to enter the FB in the processing table.
- to print your signal configuration.

Terminal assignment

Freely assignable terminals can be configured using two dialog boxes:

- Dialog box - to link digital inputs and outputs.
- Dialog box - to link analog inputs and outputs.



Configuration

Basic configuration

2.2 Basic configuration



Stop!

Under code C0005 you can load predefined basic configurations. If the configuration is changed via C0005, all input and output assignments will be overwritten with the corresponding basic configuration. If necessary, adapt the function assignment to your wiring.

For adapting the function assignment to a certain wiring or extended signal processing, please see the chapter "Use of function blocks".

A predefined basic configuration is selected to adapt the internal signal processing to your drive task (e.g. step control or dancer position control). Using the default setting, you can e.g. already control the speed of the drive.

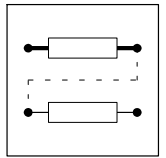
- For a detailed description of the individual basic configurations, terminal assignments, signal flow charts and applications examples, please see the chapter "Application examples".
- Before loading the basic configuration under C0005, the controller must be inhibited.

Under C0005, you can select and activate predefined basic configurations. A four-digit number is used for selection with specific characteristics being assigned to each digit.

First digit

Defines the basic function of the configuration.

Configuration of C0005	Basic function
1xxx	Speed control
2xxx	Step control
3xxx	Traversing control
4xxx	Torque control
5xxx	Digital frequency master
6xxx	Digital frequency slave (bus)
7xxx	Digital frequency slave (cascade)
8xxx	Dancer position control (external diameter detection)
9xxx	Dancer position control (internal diameter detection)



Second digit

Defines the additional function. Extends the basic function.

Configuration of C0005	Additional function
x0xx	No additional function
x1xx	Brake control via digital output X5/A2
x2xx	Setpoint selection via motor potentiometer
x3xx	PID-controller for process data control
x4xx	Mains failure control
x5xx	Setpoint selection via digital frequency input
x6xx	Analog gearbox factor trimming
x7xx	Digital gearbox factor trimming
x8xx	Digital frequency ramp function generator



Note!

The most important codes for parameterising the basic configurations can be found in the GLOBAL DRIVE CONTROL program and via the keypad under the "Short setup" menu items.

Third digit

Defines if an internal or external voltage supply is to be used for the analog and digital control inputs.

Configuration of C0005	Supply voltage
xx0x	External
xx1x	Internal via terminal X5/A1 and X6/63

Fourth digit

Defines the controller interface for reading certain control signals (e.g. speed setpoint).

Configuration of C0005	Interface
xxx0	Control terminals
xxx1	RS 232, RS 485 or optical fibre
xxx3	INTERBUS or PROFIBUS-DP
xxx5	System bus (CAN)

2.2.1 Changing the basic configuration

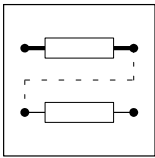
If a basic configuration must be changed to meet specific requirements, proceed as follows:

1. Select a basic configuration that largely meets your requirements under C0005.
2. Add functions that are not available by:
 - Changing the input and/or output configurations.
 - Parameterising function blocks. (▢ 2-33)
 - Adding or removing function blocks. (▢ 2-39)



Note!

If you change the signal flow of the basic configuration, e.g. by adding function blocks, C0005 will be set to 0. "COMMON" will be displayed on the display.



Configuration

Basic configuration

2.2.2 Control

The controller can be controlled via terminals (X5 and X6), a fieldbus module at X1, the system bus (X4) or by a combination of these.

Under the fourth digit of code C0005 you can select the interface used to control the controller.

Example: C0005 = 1005

This configuration corresponds to speed control with control via the system bus (CAN).

If you want to control further FB inputs via an interface, you first have to

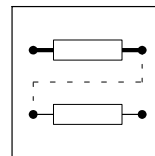
- assign "control objects" to the FB inputs to be controlled depending on the interface that is used (see chapter 2.3.3):
 - Free control codes
for control via LECOM A/B/LI (RS232, RS485 or optical fibre interface) or operating module.
 - AIF objects
for control, e.g. via INTERBUS or PROFIBUS-DP.
 - CAN objects
for control via system bus.
- After this, the inputs can be controlled via these codes or input objects by accessing them via the interface.

Example: Distributing control to terminals and RS232:

The main speed setpoint in configuration C0005=1000 shall be controlled via LECOM A/B/LI. All other inputs continue to be controlled via terminals.

1. Select C0780 via LECOM:
 - C0780 is the configuration code for the main setpoint NSET-N in the function block "Speed setpoint conditioning" (NSET).
2. Assign a free control code via the selection number:
 - E.g. 19515 (control code C0141).

The main speed setpoint is now controlled via C0141.



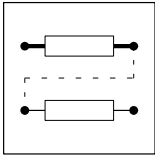
2.2.3 Speed control (C0005 = 1000)

The configuration C0005 = 1000 (Lenze setting) has mainly been designed for single drives. The setpoint speed for the drive is selected via the analog input X6/1. The signals are internally conditioned together with the digital control signals.

Short setup

The "Short setup" menu contains the following codes. In the "Short setup" menu of the XT keypad and "Global Drive Control", the codes are listed in the following order.

Code	Explanation	Lenze setting
C0005	Selection of the basic configuration	1000
C0010	Minimum speed	Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times 0 rpm
C0011	Maximum speed	
C0012	Acceleration time T_{ir} of the main setpoint	5.00 s
C0013	Deceleration time T_{if} of the main setpoint	5.00 s
C0034	Voltage / current range for analog signals at the input X6/1, X6/2	0
C0104	Selection of acceleration function of the linear ramp-function generator of NSET	0
C0038/1 ... C0038/6	Suppressing the speed ranges, function block NLIM1	0
C0039/1	JOG setpoints for the speed setpoint conditioning, function block NSET	1500 rpm
C0190	Arithmetic function, function block NSET Connects main setpoint (C0046) and additional setpoint (C0040)	0
C0220	Acceleration time T_{ir} for additional setpoint, function block NSET	2.00 s
C0221	Deceleration time T_{if} for additional setpoint, function block NSET	2.00 s
C0105	Quick stop deceleration time	5.00 s
C0909	Speed limitation, function block MCTRL	1
C0026/1	Offset of AIN1 (X6/1, X6/2)	0.00 %
C0026/2	Offset of AIN2 (X6/3, X6/4)	0.00 %
C0027/1	Gain AIN1 (X6/1, X6/2)	100.00 %
C0027/2	Gain AIN2 (X6/3, X6/4)	100.00 %
C0006	Selection of the operating mode for the motor control	5
C0025	Speed feedback	1
C0019	Operating threshold - automatic DC injection brake (Auto-GSB)	0 rpm
C0036	Set continuous brake current	0.0 A
C0107	Hold time for automatic DC injection braking (Auto-GSB)	0.00 s
C0142	Start conditions for flying restart circuit	1
C0145	Selection of flying restart method	1
C0070	Speed controller gain	10.0
C0071	Adjustment time of speed controller	50 ms
C0074	Limitation of the speed controller	10.00 %
C0077	Adjustment time of field controller	4.0 ms
C0898	Torque limitation in the field weakening range, function block MCTRL	0
C0472/3	Free control code for analog signals	100.00%
C0017	Q_{min} switching threshold	50 rpm



Configuration

Basic configuration

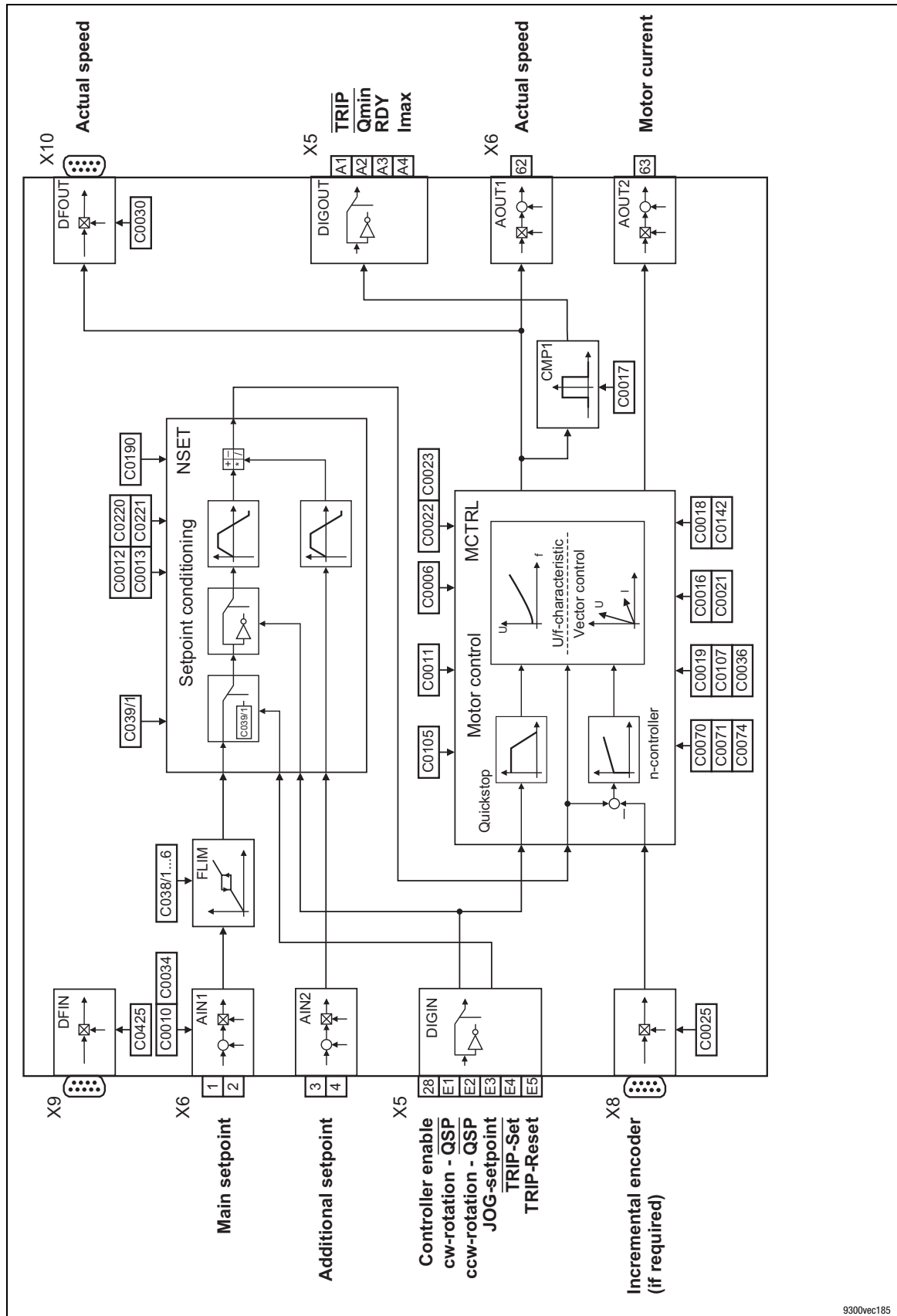
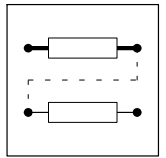


Fig. 2-1

Signal flow for configuration 1000: Speed control



2.2.4 Step control (C0005 = 2000)

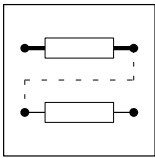
The configuration C0005 = 2000 supports applications in which the drive should repeatedly turn a specific number of revolutions. This type of application is used for example to move unit loads on a conveyor belt or for dosing specific amounts repeatedly on worm conveyors.

The conveyor speed and path or dosing speed and amount are controlled independently of one another via the two analog inputs. The execution of a step is started via the digital input X5/E4.

Short setup

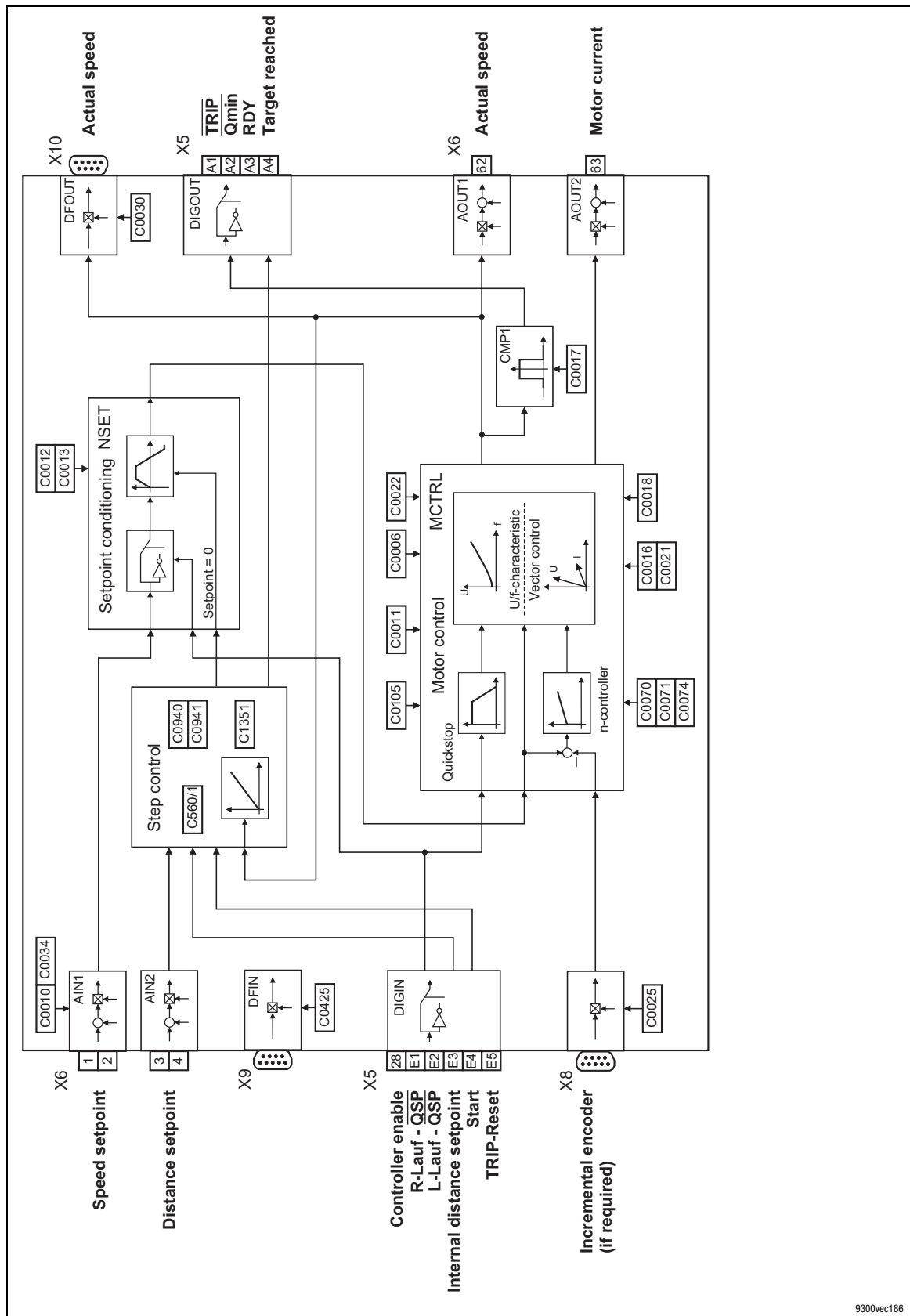
The "Short setup" menu contains the following codes. In the "Short setup" menu of the XT keypad and "Global Drive Control", the codes are listed in the following order.

Code	Explanation	Lenze setting
C0005	Selection of the basic configuration	2000
C0010	Minimum speed	Reference value for the absolute and relative setpoint 0 rpm
C0011	Maximum speed	selection for the acceleration and deceleration times 3000 rpm
C0012	Acceleration time T_{ir} of the main setpoint	1.00 s
C0013	Deceleration time T_{if} of the main setpoint	1.00 s
C0034	Voltage / current range for analog signals at the input X6/1, X6/2	0
C0104	Selection of acceleration function of the linear ramp-function generator of NSET	0
C1350	Function selection, function block INT1	0
C1351	Scaling factor, function block INT1	6553600 inc
C0560/1	Internal path setpoint (fixed setpoint), function block FIXSET1	100.00 %
C0940	Adaptation of the braking distance	$\frac{[C0940]}{[C0941]} = \frac{[C0011] \cdot [C013] \cdot 65536}{120 \cdot [1351]}$ C0940 = 1
C0941		C0941 = 4
C0105	Quick stop deceleration time	5.00 s
C0019	Operating threshold - automatic DC injection brake (Auto-GSB)	0 rpm
C0036	Set continuous brake current	0.0 A
C0107	Hold time for automatic DC injection braking (Auto-GSB)	0.00 s
C0026/1	Offset of AIN1 (X6/1, X6/2)	0.00 %
C0026/2	Offset of AIN2 (X6/3, X6/4)	0.00 %
C0027/1	Gain AIN1 (X6/1, X6/2)	100.00 %
C0027/2	Gain AIN2 (X6/3, X6/4)	100.00 %



Configuration

Basic configuration



9300vec186

Fig. 2-2 Signal flow for configuration 2000: Step control

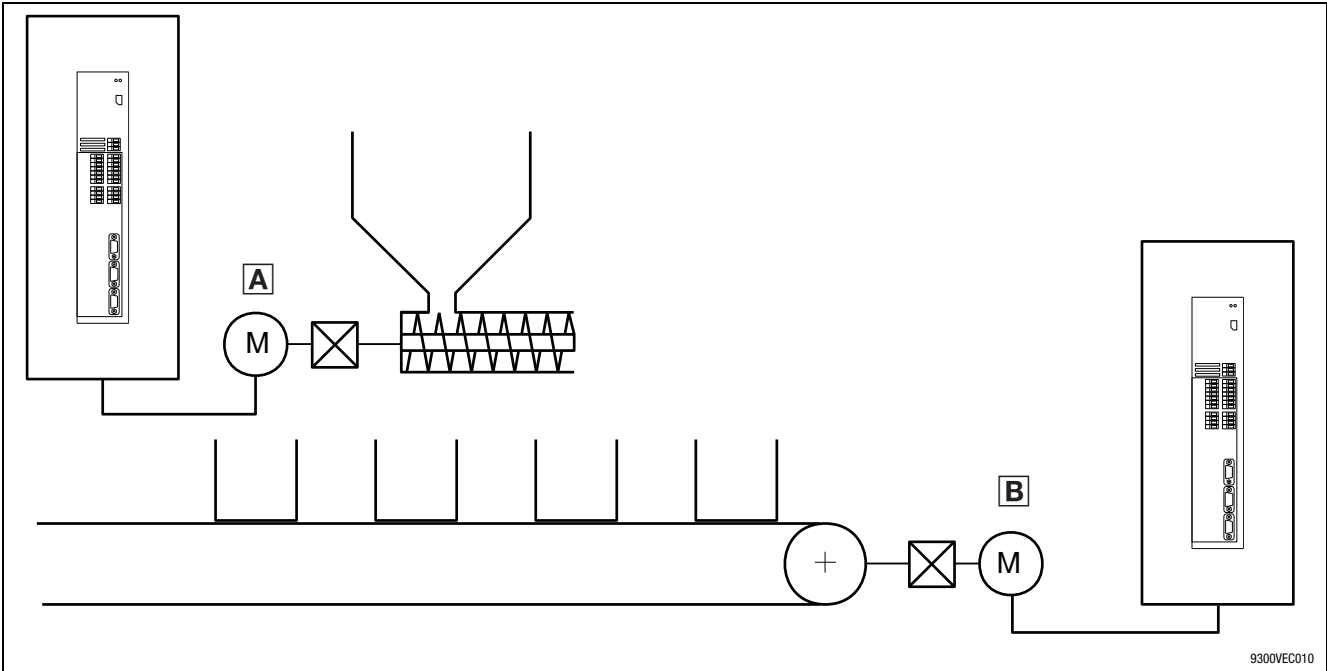
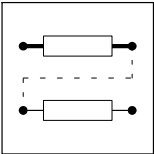
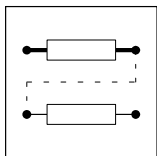


Fig. 2-3 Basic structure of a step controller for a bulk material filling station

- A Dosing drive
- B Conveyor drive

Input and output assignment	Dosing drive	Conveyor drive
Analog inputs	- Dosing speed - Dosing amount	- Conveyor speed - Step width
Digital inputs	- Controller enable - Direction of rotation - Defined dosing amount - Start dosing - TRIP reset	- Controller enable - Step direction - Defined step width - Start step - TRIP reset
Digital outputs	- Error (TRIP) - Current speed > C0017 (Qmin) - Ready for operation (RDY) - Dosing completed	- Error (TRIP) - Current speed > C0017 (Qmin) - Ready for operation (RDY) - Step completed
Analog outputs	- Actual speed - Motor current	- Actual speed - Motor current



Configuration

Basic configuration

2.2.5 Traversing control (C0005 = 3000)

The configuration C0005 = 3000 is designed for spindle drives moving material by means of winding.

The speed of the winding drive is transferred via the analog input X6/1 which is used to control the speed of the traversing drive. The reversing of the direction of rotation is controlled via the digital inputs X5/E1 and X5/E2. Limit switches operating as normally closed contacts which disable the active direction of rotation can for example be used for this purpose.

Short setup

The "Short setup" menu contains the following codes. In the "Short setup" menu of the XT keypad and "Global Drive Control", the codes are listed in the following order.

Code	Explanation	Lenze setting
C0005	Selection of the basic configuration	3000
C0011	Maximum speed Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times	3000 rpm
C0012	Acceleration time T_{if} of the main setpoint	1.00 s
C0013	Deceleration time T_{if} of the main setpoint	1.00 s
C0034	Voltage / current range for analog signals at the input X6/1, X6/2	0
C0104	Selection of acceleration function of the linear ramp-function generator of NSET	2
C0141	Additional setpoint for inching, activated via input X5/E3	10.00 %
C0472/1	Selection of traversing step	100.00 %
C0474/1	Selection of traversing break (65536 results in a break of one motor revolution, if 100 % reference setpoint = 3000 rpm)	10000 inc
C0655	Numerator	Conversion factor, function block CONV5
C0656	Denominator	C0655 = 1 C0656 = 5
C0190	Arithmetic function, function block NSET Connects main setpoint (C0046) and additional setpoint (C0040)	0
C0105	Quick stop deceleration time	5.00 s
C0026/1	Offset of AIN1 (X6/1, X6/2)	0.00 %
C0026/2	Offset of AIN2 (X6/3, X6/4)	0.00 %
C0027/1	Gain AIN1 (X6/1, X6/2)	100.00 %
C0027/2	Gain AIN2 (X6/3, X6/4)	100.00 %
C0685	Comparison function, function block CMP2	1
C0686	Hysteresis for input signals, function block CMP2	0.00 %
C0687	Window for signal comparison, function block CMP2	0.00 %

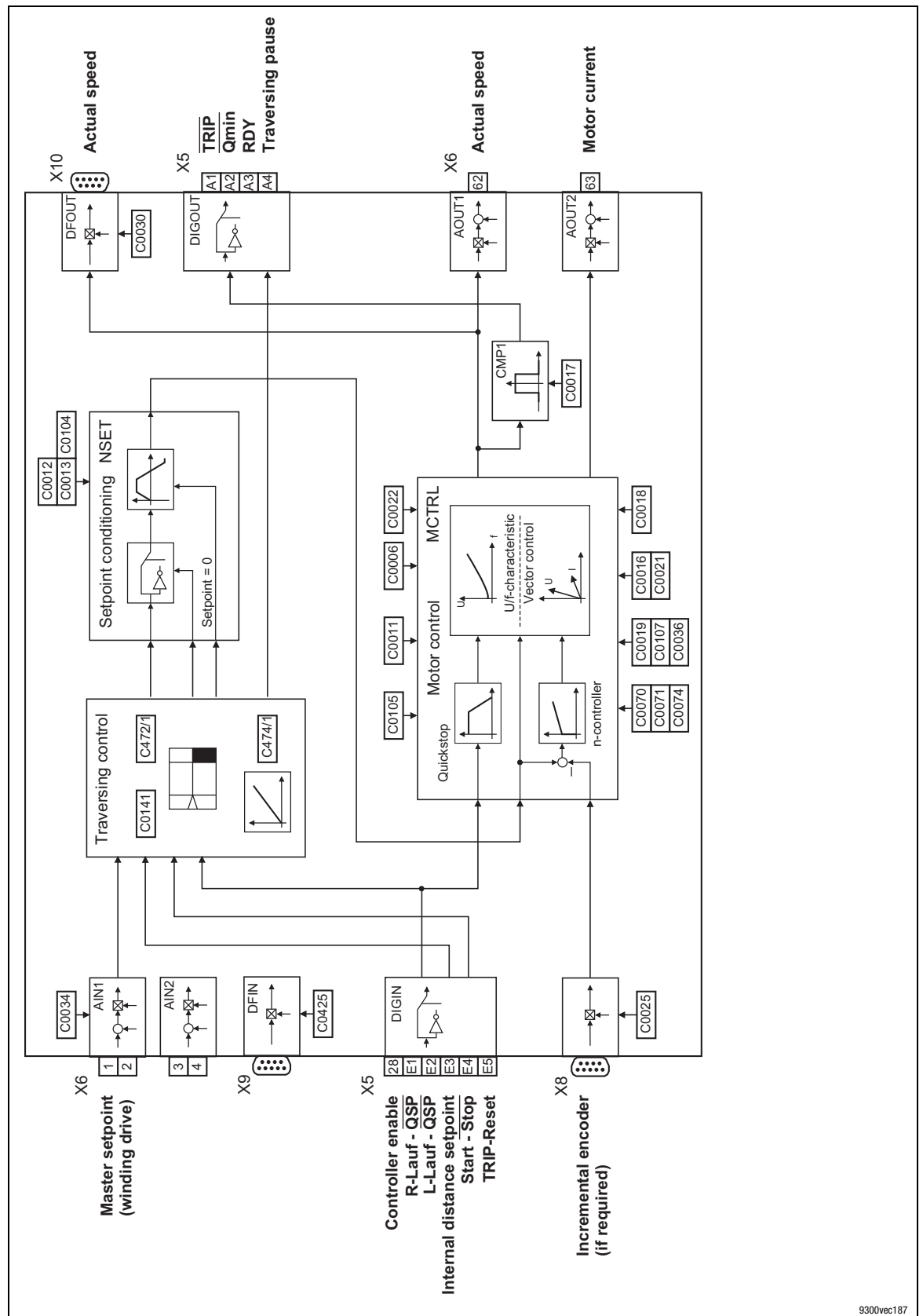
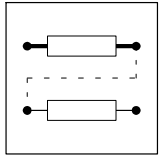
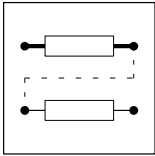


Fig. 2-4

Signal flow for configuration 3000: Traversing control

9300vec187



Configuration

Basic configuration

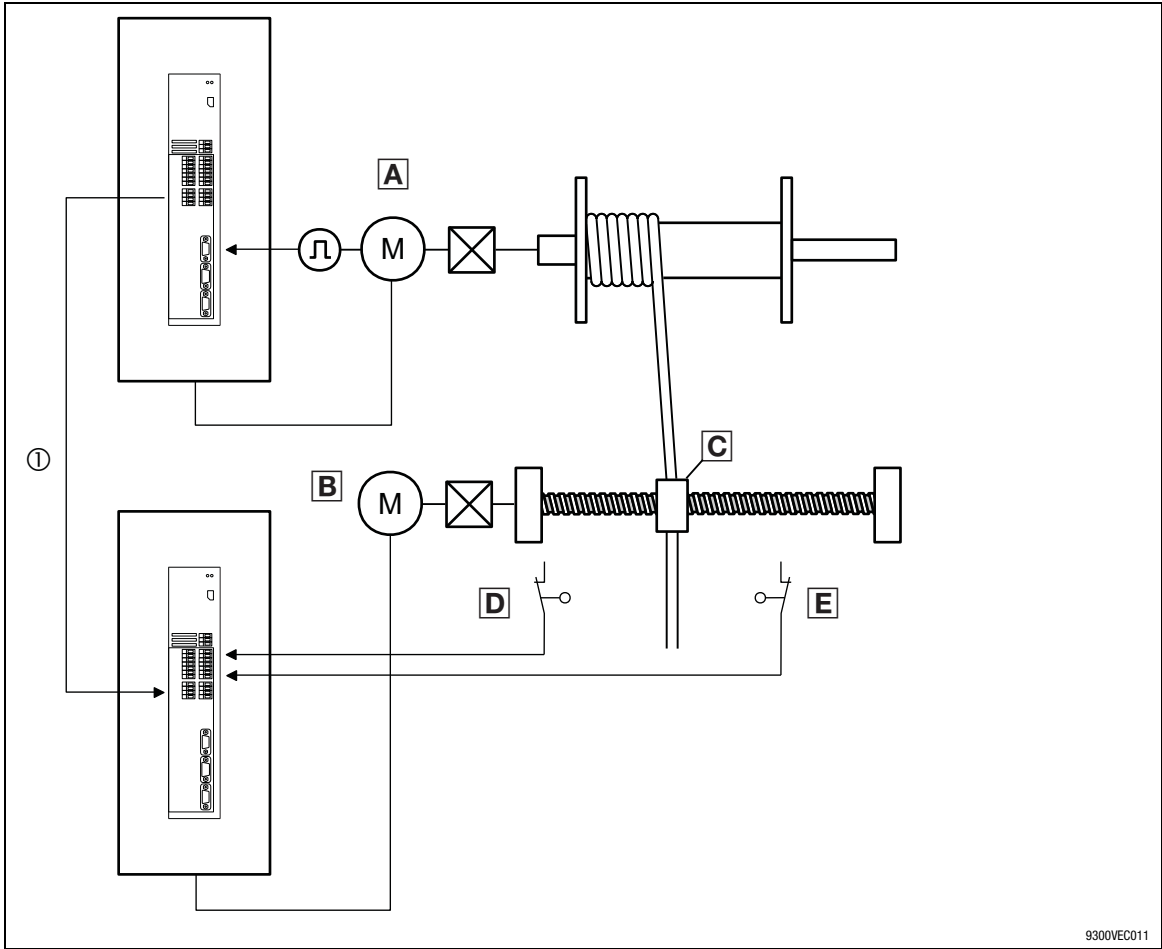
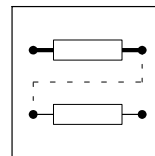


Fig. 2-5 Basic structure of a traversing controller

- A** Winding drive
- B** Traversing drive
- C** Traversing unit
- D** Limit switch for CCW rotation
- E** Limit switch for CW rotation
- 1** Reference setpoint (winding drive)

Input and output assignment	Traversing drive
Analog input	Reference setpoint
Digital inputs	- Controller enable - Direction of rotation - Additional setpoint - Start traversing - TRIP reset
Digital outputs	- Error (TRIP) - Current speed > C0017 (Qmin) - Ready for operation (RDY) - Traversing break
Analog outputs	- Actual speed value - Motor current



2.2.6 Torque control (C0005 = 4000)

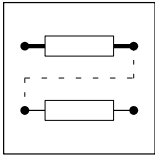
Configuration C0005 = 4000 is designed for drive control via a torque setpoint.

The setpoint is selected via the analog input X6/2. The torque direction results from the sign of the setpoint and the control of the digital inputs X5/E1 and X5/E2. The maximum permissible speed is selected via the analog input X6/1.

Short setup

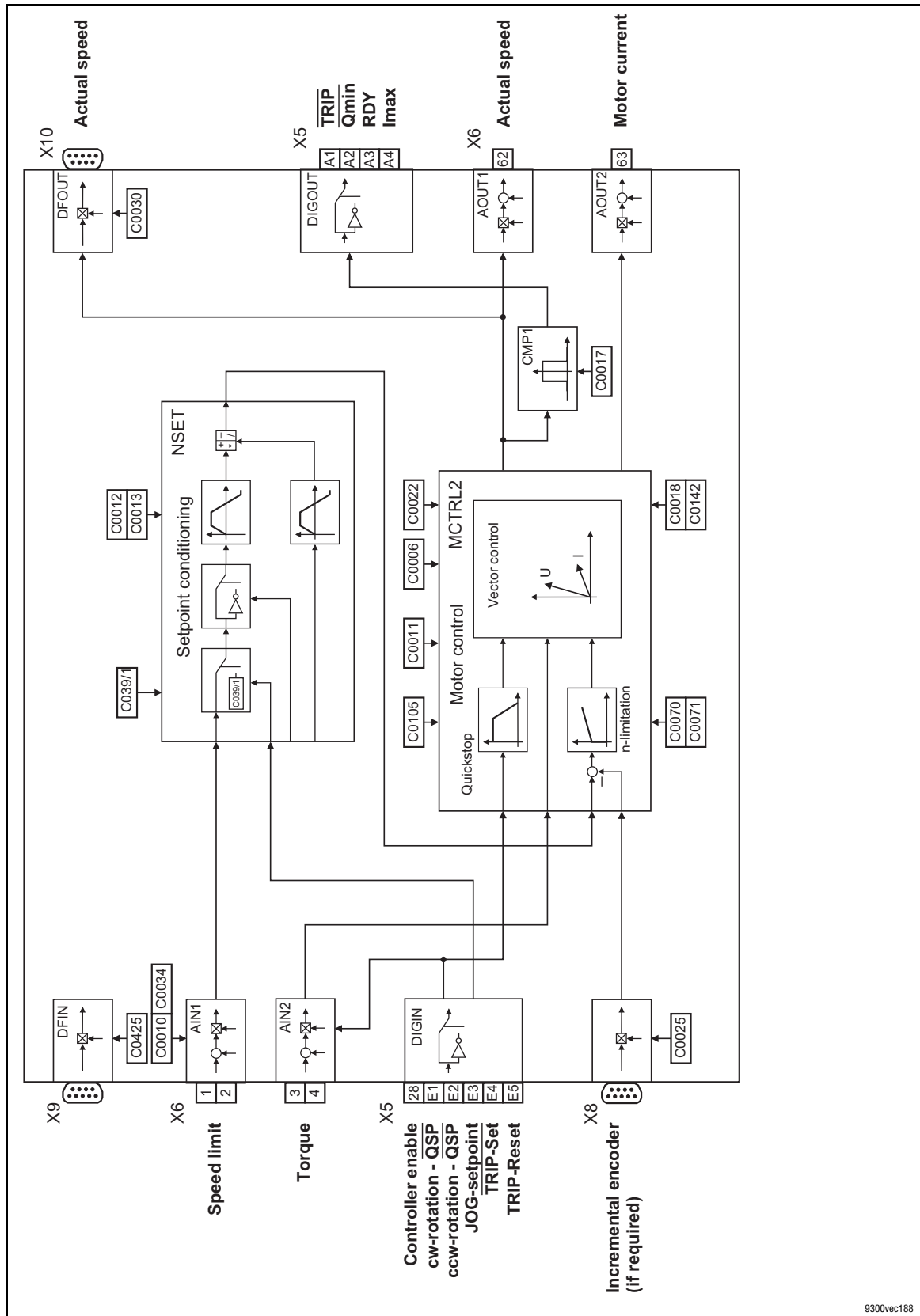
The "Short setup" menu contains the following codes. In the "Short setup" menu of the XT keypad and "Global Drive Control", the codes are listed in the following order.

Code	Explanation	Lenze setting
C0005	Selection of the basic configuration	4000
C0010	Minimum speed	Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times
C0011	Maximum speed	3000 rpm
C0012	Acceleration time T_{ir} of the main setpoint	5.00 s
C0013	Deceleration time T_{if} of the main setpoint	5.00 s
C0034	Voltage / current range for analog signals at the input X6/1, X6/2	0
C0039/1	JOG setpoints for the speed setpoint conditioning, function block NSET	1500 rpm
C0105	Quick stop deceleration time	5.00 s
C0909	Speed limitation, function block MCTRL	1
C0026/1	Offset of AIN1 (X6/1, X6/2)	0.00 %
C0026/2	Offset of AIN2 (X6/3, X6/4)	0.00 %
C0027/1	Gain AIN1 (X6/1, X6/2)	100.00 %
C0027/2	Gain AIN2 (X6/3, X6/4)	100.00 %
C0006	Selection of the operating mode for the motor control	5
C0022	I_{max} limit in motor mode	depends on the controller
C0023	I_{max} limit in generator mode	depends on the controller
C0025	Speed feedback	1
C0070	Speed controller gain	10.0
C0071	Adjustment time of speed controller	50 ms
C0074	Limitation of the speed controller	10.00 %
C0898	Torque limitation in the field weakening range, function block MCTRL	0
C0472/3	Free control code for analog signals	100.00 %
C0017	Q_{min} switching threshold (FCODE)	50 rpm



Configuration

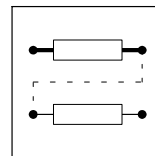
Basic configuration



9300vec188

Fig. 2-6

Signal flow for configuration 4000: Torque control



2.2.7 Digital frequency - master (C0005 = 5000)

The configuration C0005 = 5000 is used to control a drive system. Both the master and the slave drives use the preprocessed speed setpoint as a common reference value. The speed setpoint is forwarded to the slave drives via digital frequency output X10.

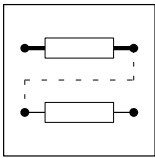
The parameterisation of the evaluation of the reference value allows you to adapt the speed ratio of every single drive to the process.

Fig. 2-10 shows the basic structure of a digital frequency network for textile machinery.

Short setup

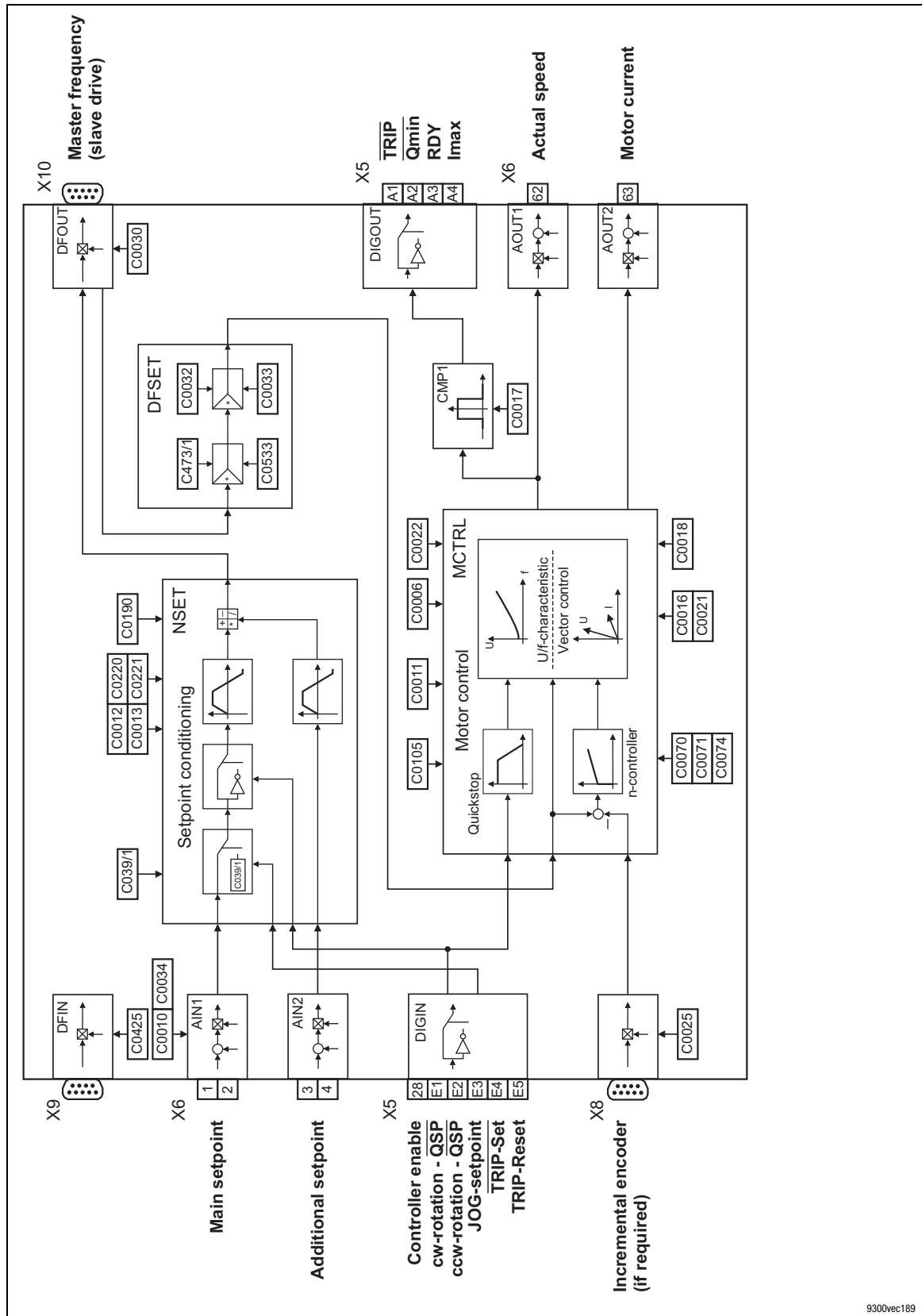
The "Short setup" menu contains the following codes. In the "Short setup" menu of the XT keypad and "Global Drive Control", the codes are listed in the following order.

Code	Explanation	Lenze setting
C0005	Selection of the basic configuration	5000
C0010	Minimum speed	Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times
C0011	Maximum speed	0 rpm
C0012	Acceleration time T_{ir} of the main setpoint	3000 rpm
C0013	Deceleration time T_{if} of the main setpoint	5.00 s
C0034	Voltage / current range for analog signals at the input X6/1, X6/2	5.00 s
C0039/1	JOG setpoints for speed setpoint conditioning, function block NSET	0
C0190	Arithmetic function, function block NSET Connects main setpoint (C0046) and additional setpoint (C0040)	1500 rpm
C0220	Acceleration time T_{ir} for additional setpoint, function block NSET	0
C0221	Deceleration time T_{if} for additional setpoint, function block NSET	2.00 s
C0105	Quick stop deceleration time	2.00 s
C0909	Speed limitation, function block MCTRL	5.00 s
C0026/1	Offset of AIN1 (X6/1, X6/2)	1
C0026/2	Offset of AIN2 (X6/3, X6/4)	0.00 %
C0027/1	Gain AIN1 (X6/1, X6/2)	0.00 %
C0027/2	Gain AIN2 (X6/3, X6/4)	100.00 %
C0473/1	Numerator	Digital frequency signal evaluation, function block DFSET
C0533	Denominator	C0473/1 = 1
C0530	Setpoint integrator evaluation, function block DFSET	C0533 = 1
C0032	Numerator	0
C0033	Denominator	C0032 = 1
C0252	Phase offset for master frequency processing, function block DFSET	C0033 = 1
C0253	Speed-dependent phase trimming for the master frequency processing, function block DFSET	0 inc
C0531	Actual zero pulse divisor, function block DFSET	18700 inc
C0535	Desired zero pulse divisor, function block DFSET	1
C0532	Zero pulse / touch probe, function block DFSET	1
C0534	Zero pulse function, function block DFSET (drive synchronisation)	1
C0529	Offset multiplier, function block DFSET	0
C0472/5	Free control code for analog signals	1
C0473/3	Free control code for absolute analog signals	0.00 %
C0030	Constant for digital frequency output X10, function block DFOUT	0
C0540	Function selection, function block DFOUT	3
C0545	Phase offset, function block DFOUT	0
		0 inc

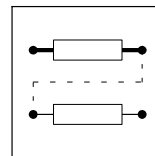


Configuration

Basic configuration



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2.2.8 Digital frequency – slave (bus) (C0005 = 6000)

The configuration C0005 = 6000 is used to integrate the drive controller into a drive system.

The drive is controlled by reading in the digital frequency setpoint via input X9. This value is then evaluated and the speed of the drive is adapted to the process based on the result of the evaluation.

An internal additional setpoint can also be activated via digital input X5/E3.

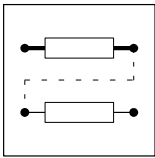
The digital frequency setpoint is forwarded to the slave drives without being changed.

Fig. 2-10 shows the basic structure of a digital frequency network for textile machinery.

Short setup

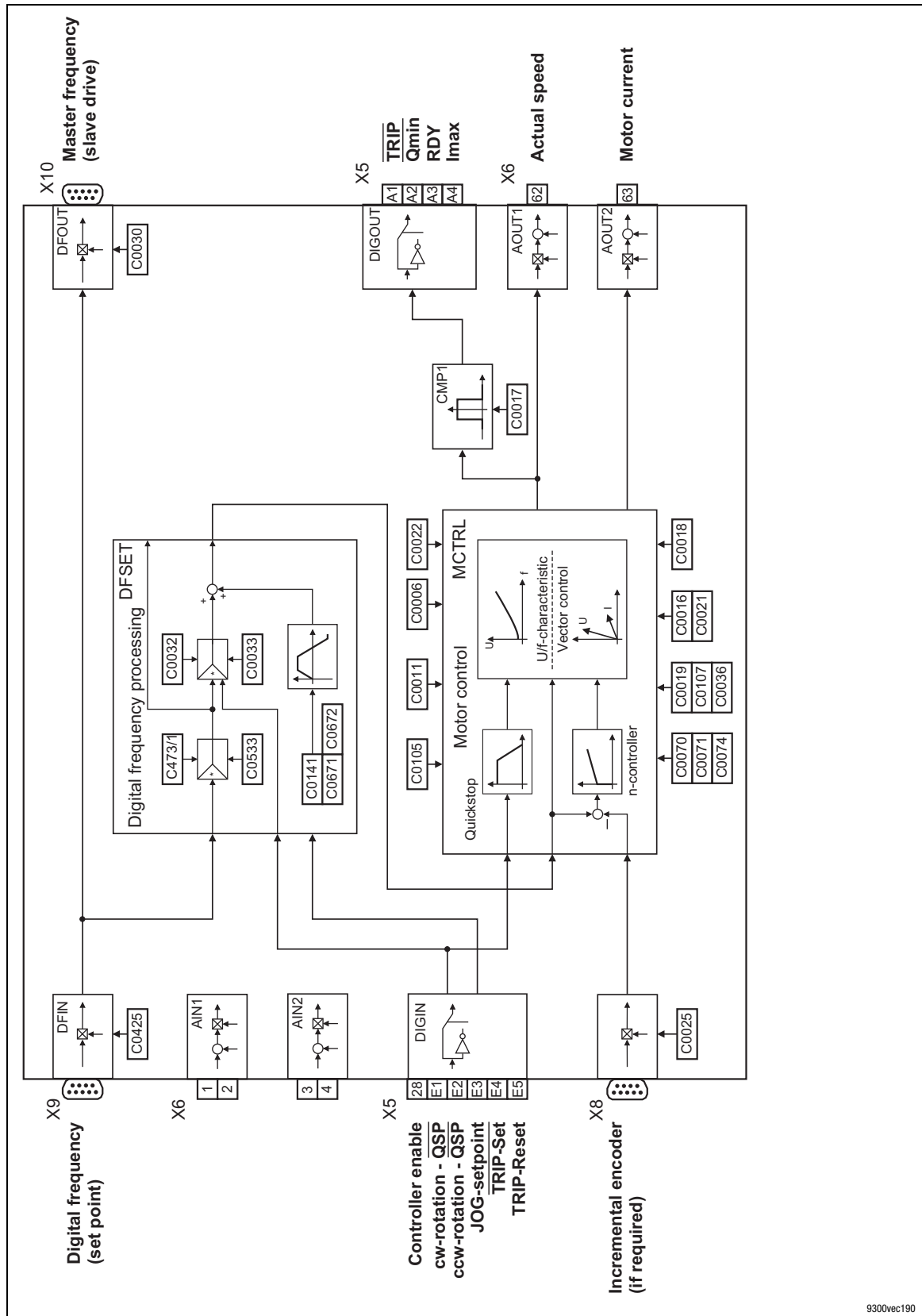
The "Short setup" menu contains the following codes. In the "Short setup" menu of the XT keypad and "Global Drive Control", the codes are listed in the following order.

Code	Explanation	Lenze setting
C0005	Selection of the basic configuration	6000
C0011	Maximum speed	Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times
C0105	Quick stop deceleration time	5.00 s
C0141	Additional setpoint, activated via input X5/E3	10.00 %
C0671	Acceleration time T_{if} , function block RFG1	5.00 s
C0672	Deceleration time T_{if} , function block RFG1	5.00 s
C0425	Digital frequency input constant, function block DFIN	3
C0473/1	Numerator	Digital frequency signal evaluation, function block DFSET
C0533	Denominator	C0473/1 = 1
C0530	Setpoint integrator evaluation, function block DFSET	C0533 = 1
C0032	Numerator	0
C0033	Denominator	Gearbox factor, function block DFSET
C0252	Phase offset for master frequency processing, function block DFSET	C0032 = 1
C0253	Speed-dependent phase trimming for the master frequency processing, function block DFSET	C0033 = 1
C0531	Actual zero pulse divisor, function block DFSET	0 inc
C0535	Desired zero pulse divisor, function block DFSET	4000 inc
C0532	Zero pulse / touch probe, function block DFSET	1
C0534	Zero pulse function, function block DFSET (drive synchronisation)	1
C0529	Offset multiplier, function block DFSET	0
C0472/5	Free control code for analog signals	1
C0473/3	Free control code for absolute analog signals	0.00 %
C0030	Constant for digital frequency output X10, function block DFOUT	0
C0540	Function selection, function block DFOUT	3
C0545	Phase offset, function block DFOUT	4
		0 inc



Configuration

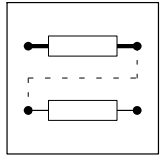
Basic configuration



9300vec190

Fig. 2-8

Signal flow for configuration 6000: Digital frequency slave (bus)



2.2.9 Digital frequency – slave (cascade) (C0005 = 7000)

The configuration C0005 = 7000 is used to integrate the drive controller into a drive system.

The drive is controlled by reading in the digital frequency setpoint via input X9. This value is then evaluated and the speed of the drive is adapted to the process based on the result of the evaluation.

An internal additional setpoint can also be activated via digital input X5/E3.

Unlike in configuration 6000, the evaluated control setpoint is forwarded via digital frequency output X10. This means that changes in the evaluation also affect subsequent drives.

Fig. 2-10 shows the basic structure of a digital frequency network for textile machinery.

Short setup

The "Short setup" menu contains the following codes. In the "Short setup" menu of the XT keypad and "Global Drive Control", the codes are listed in the following order.

Code	Explanation		Lenze setting
C0005	Selection of the basic configuration		7000
C0011	Maximum speed	Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times	3000 rpm
C0105	Quick stop deceleration time		5.00 s
C0141	Additional setpoint, activated via input X5/E3		10.00 %
C0671	Acceleration time T_{if} , function block RFG1		5.00 s
C0672	Deceleration time T_{if} , function block RFG1		5.00 s
C0425	Digital frequency input constant, function block DFIN		3
C0473/1	Numerator	Digital frequency signal evaluation, function block DFSET	C0473/1 = 1
C0533	Denominator		C0533 = 1
C0530	Setpoint integrator evaluation, function block DFSET		0
C0032	Numerator	Gearbox factor, function block DFSET	C0032 = 1
C0033	Denominator		C0033 = 1
C0252	Phase offset for master frequency processing, function block DFSET		0 inc
C0253	Speed-dependent phase trimming for the master frequency processing, function block DFSET		4000 inc
C0531	Actual zero pulse divisor, function block DFSET		1
C0535	Desired zero pulse divisor, function block DFSET		1
C0532	Zero pulse / touch probe, function block DFSET		1
C0534	Zero pulse function, function block DFSET (drive synchronisation)		0
C0529	Offset multiplier, function block DFSET		1
C0472/5	Free control code for analog signals		0.00 %
C0473/3	Free control code for absolute analog signals		0
C0540	Function selection, function block DFOUT		1



Note!

In this configuration, incremental encoder input X8 cannot be activated.

Configuration

Basic configuration

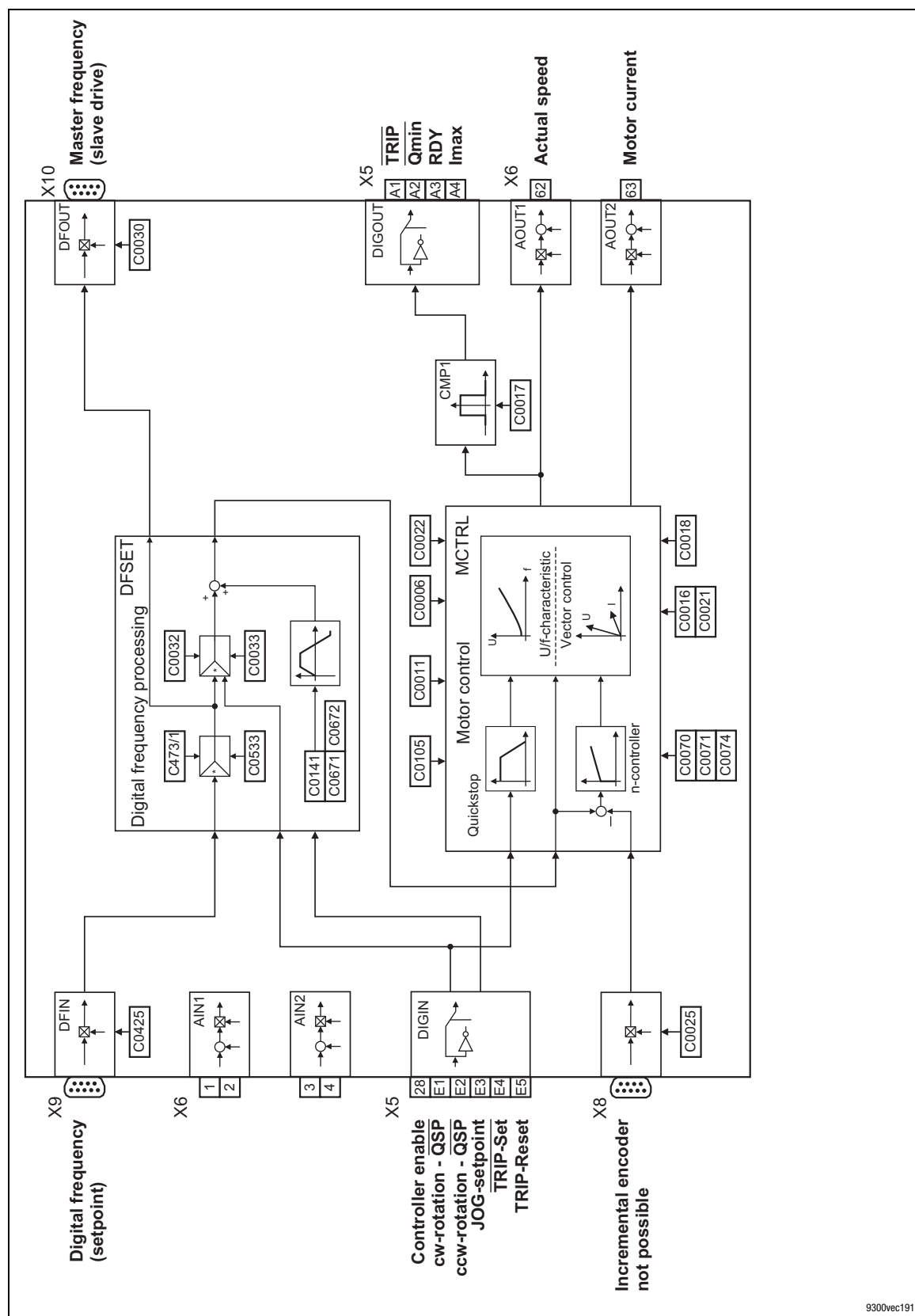


Fig. 2-9 Signal flow for configuration 7000: Digital frequency slave (cascade)

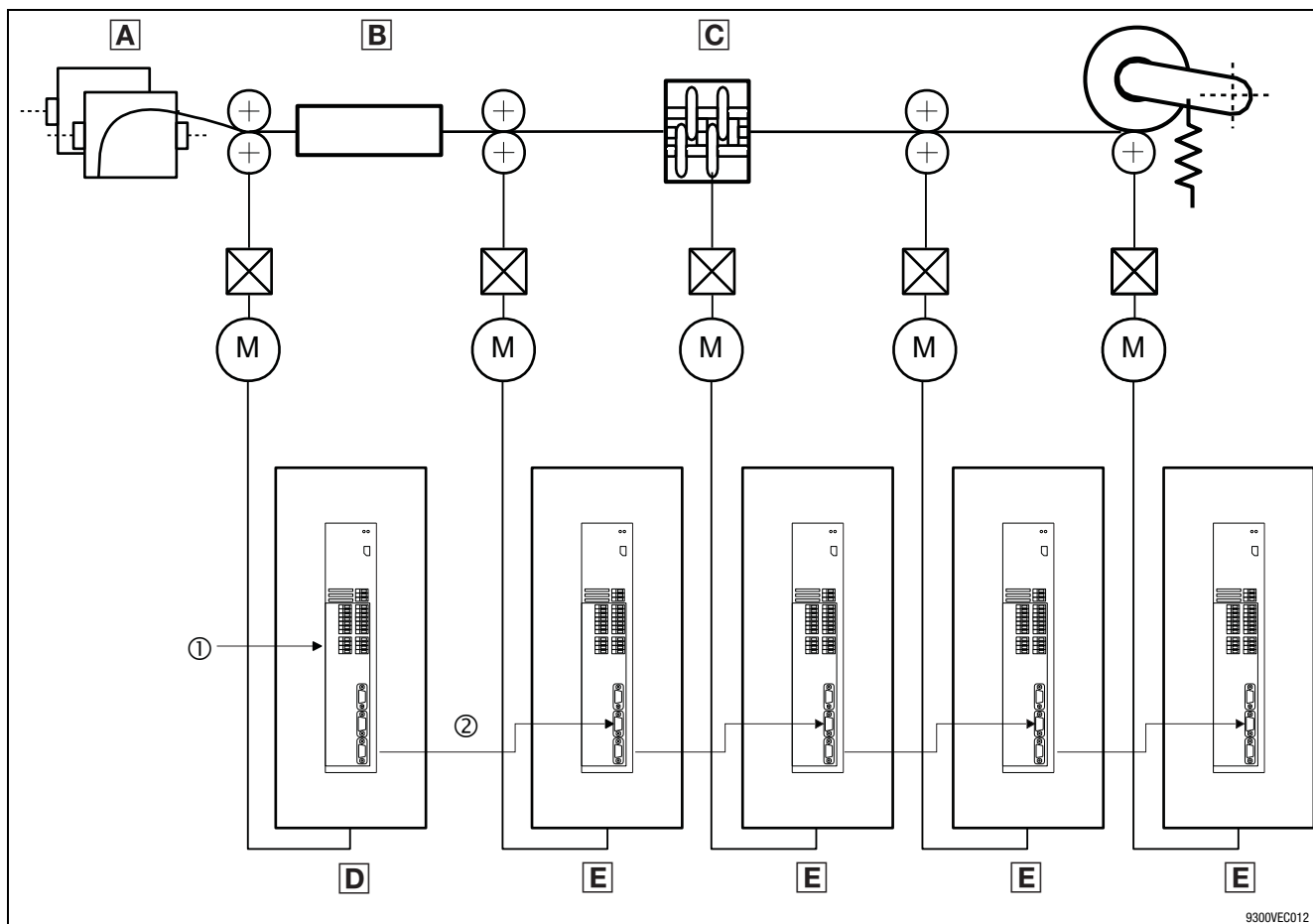
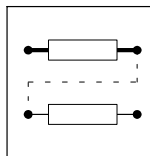
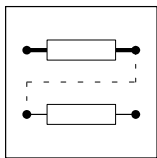


Fig. 2-10

Basic structure of a digital frequency network for textile machinery

- A** Raw material
- B** Warm-up
- C** Napping
- D** Main drive, digital frequency master
- E** Slave drive, digital frequency slave (bus/cascade)
- ① Main setpoint
- ② Digital frequency



Configuration

Basic configuration

2.2.10 Dancer position control with external diameter detection (C0005 = 8000)

The configuration C0005 = 8000 is designed for winding drives with dancer position control and external diameter detection.

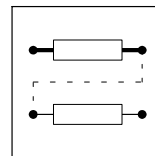
A digital frequency signal is sent for precontrolling the drive with the system/material speed. On the basis of the actual position of the dancer, the dancer position controller generates a correction signal which is added to the precontrol signal. This results in a circumferential speed setpoint which, in the case of a surface winder, can be applied directly as the speed setpoint.

On a centre winding machine, the speed setpoint is obtained by evaluating the reel diameter. The analog signal generated by the diametrical sensor is preprocessed accordingly inside the controller.

Short setup

The "Short setup" menu contains the following codes. In the "Short setup" menu of the XT keypad and "Global Drive Control", the codes are listed in the following order.

Code	Explanation	Lenze setting
C0005	Selection of the basic configuration	8000
C0011	Maximum speed Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times	3000 rpm
C0034	Voltage / current range for analog signals at the input X6/1, X6/2	0
C0425	Digital frequency input constant, function block DFIN	3
C0427	Digital frequency input function, function block DFIN	0
C0141	Dancer position setpoint	10.00 %
C1330	Acceleration time t_{if} , function block PCTRL2	1.0 s
C1331	Deceleration time t_{if} , function block PCTRL2	1.0 s
C1332	Gain V_p , function block PCTRL2	1.0
C1333	Integral-action time T_n , function block PCTRL2	400 ms
C1334	Differential component K_d , function block PCTRL2	0.0
C1335	Sphere of action, function block PCTRL2	0
C1336	Fade-in time, function block PCTRL2	0.1 s
C1337	Fade-out time, function block PCTRL2	0.1 s
C0472/1	Influence, function block PCTRL2	10.00 %
C0026/1	Offset of AIN1 (X6/1, X6/2)	0.00 %
C0026/2	Offset of AIN2 (X6/3, X6/4)	0.00 %
C0027/1	Gain AIN1 (X6/1, X6/2)	100.00 %
C0027/2	Gain AIN2 (X6/3, X6/4)	100.00 %



Code	Explanation	Lenze setting
C1300	Motor speed at D_{max} , function block DCALC1	300 rpm
C1301	Maximum line speed, function block DCALC1	3000 rpm
C1302	Calculation cycle, function block DCALC1	0.1 rev
C1303	Filter time constant, function block DCALC1	0.10 s
C1304	Maximum diameter, function block DCALC1	500 mm
C1305	Lower diameter limit, function block DCALC1	100 mm
C1306	Upper diameter limit, function block DCALC1	500 mm
C1307	Hysteresis - diameter limitation, function block DCALC1	1.00 %
C1308	Selection of the arithmetic function, function block DCALC1	1
C1309	Minimum diameter, function block DCALC1	100 mm
C1310	Acceleration and deceleration time, function block DCALC1	1.000 s
C1311	Permissible diameter difference, function block DCALC1	1.00 %
C1328	Display of current diameter, function block DCALC1	0 mm
C0105	Quick stop deceleration time	5.00 s
C0640	Time constant, function block PT1-1	1.00 s
C0685	Comparison function, function block CMP2	1
C0686	Hysteresis for input signals, function block CMP2	1.00 %
C0687	Window for signal comparison, function block CMP2	1.00 %
C0720	Function, function block DIGDEL1	2
C0721	Delay time, function block DIGDEL1	0.100 s
C0950	Numerator for digital frequency evaluation	5
C0951	Denominator for digital frequency evaluation	1
C0017	Q_{min} switching threshold	50 rpm



Note!

In this configuration, incremental encoder input X8 can be activated by selecting output input signal at X8 (C0540 = 5) for digital frequency output X10.

Configuration

Basic configuration

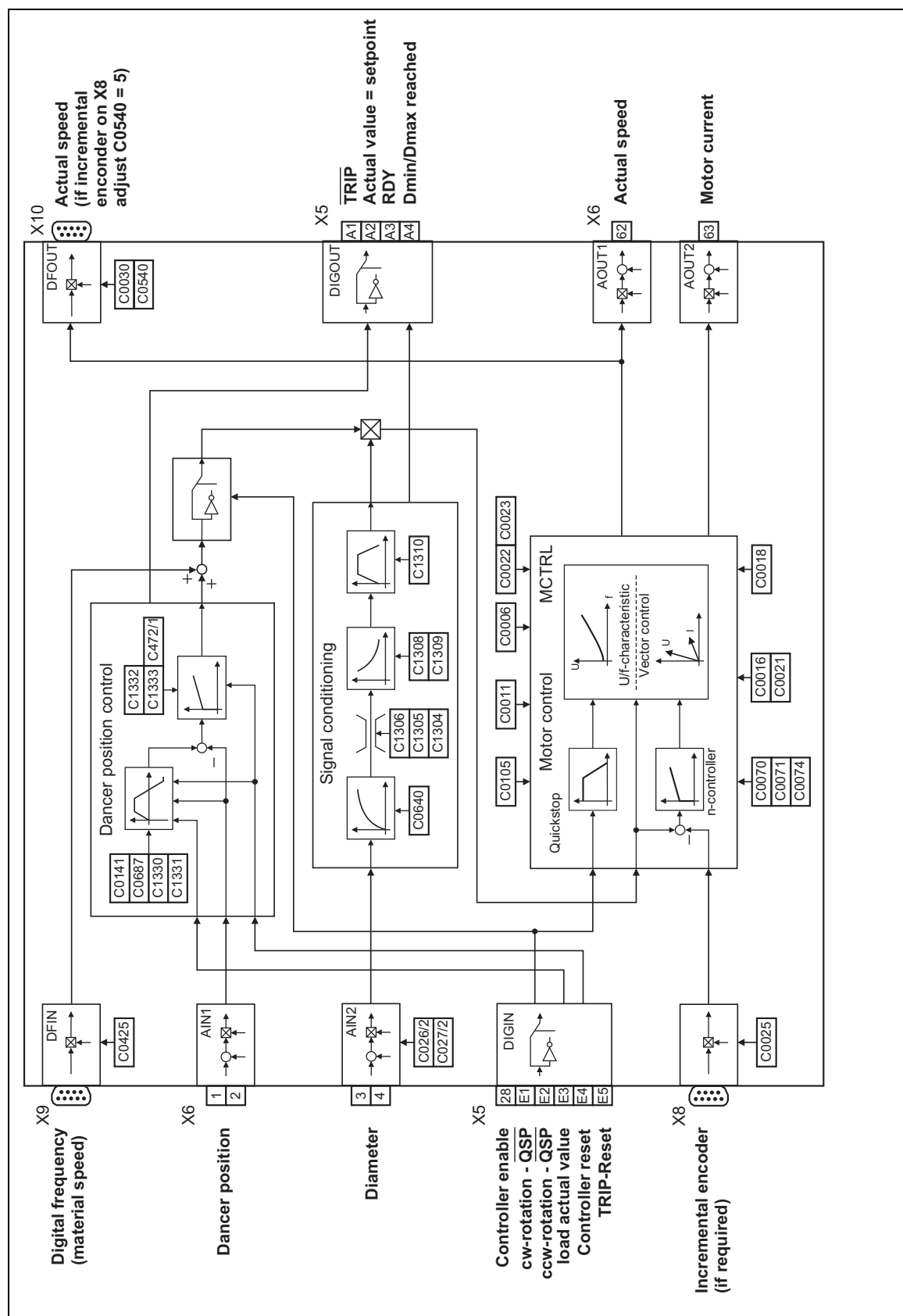


Fig. 2-11

Signal flow for configuration 8000: Dancer position control (external diameter detection)

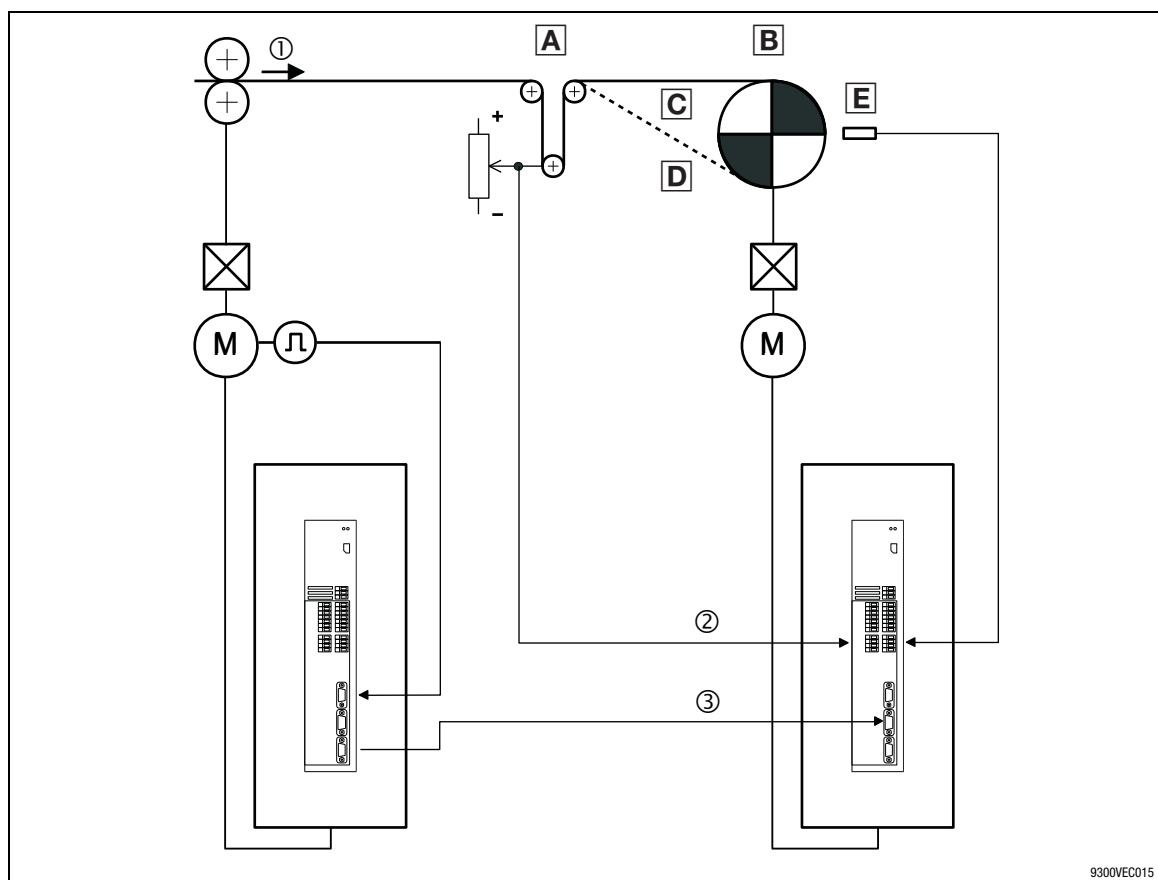
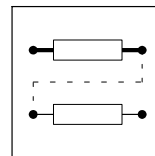
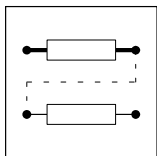


Fig. 2-12

Basic structure of a dancer position control with external diameter detection via a diametrical sensor

- ▣ A Dancer
- ▣ B Winder
- ▣ C CW rotation
- ▣ D CCW rotation
- ▣ E Diametrical sensor
- ① Line speed V_{Line}
- ② Dancer position
- ③ Line speed



Configuration

Basic configuration

2.2.11 Dancer position control with internal diameter detection (C0005 = 9000)

The configuration C0005 = 9000 is designed for winding drives with dancer position control. Unlike configuration 8000, in this type of application, the diameter is calculated internally.

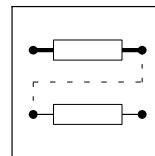
A digital frequency signal is sent for precontrolling the drive with the system/material speed. On the basis of the actual position of the dancer, the dancer position controller generates a correction signal which is added to the precontrol signal. This results in a circumferential speed setpoint which, when multiplied by $1/D$, provides the speed setpoint.

The reel diameter is calculated using the signals for the line speed and the winding speed. Each time the reel changes, the new initial diameter can be loaded.

Short setup

The "Short setup" menu contains the following codes. In the "Short setup" menu of the XT keypad and "Global Drive Control", the codes are listed in the following order.

Code	Explanation	Lenze setting
C0005	Selection of the basic configuration	9000
C0011	Maximum speed Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times	3000 rpm
C0034	Voltage / current range for analog signals at the input X6/1, X6/2	0
C0425	Digital frequency input constant, function block DFIN	3
C0427	Digital frequency input function, function block DFIN	0
C0141	Dancer position setpoint	10.00 %
C1330	Acceleration time t_{if} , function block PCTRL2	1.0 s
C1331	Deceleration time t_{if} , function block PCTRL2	1.0 s
C1332	Gain V_p , function block PCTRL2	1.0
C1333	Integral-action time T_n , function block PCTRL2	400 ms
C1334	Differential component K_d , function block PCTRL2	0.0
C1335	Sphere of action, function block PCTRL2	0
C1336	Fade-in time, function block PCTRL2	0.1 s
C1337	Fade-out time, function block PCTRL2	0.1 s
C0472/1	Influence, function block PCTRL2	10.00 %
C0026/1	Offset of AIN1 (X6/1, X6/2)	0.00 %
C0026/2	Offset of AIN2 (X6/3, X6/4)	0.00 %
C0027/1	Gain AIN1 (X6/1, X6/2)	100.00 %
C0027/2	Gain AIN2 (X6/3, X6/4)	100.00 %

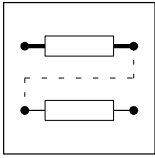


Code	Explanation	Lenze setting
C1300	Motor speed at D_{max} , function block DCALC1	500 rpm
C1301	Maximum line speed, function block DCALC1	2500 rpm
C1302	Calculation cycle, function block DCALC1	0.1 rev
C1303	Filter time constant, function block DCALC1	1.00 s
C1304	Maximum diameter, function block DCALC1	500 mm
C1305	Lower diameter limit, function block DCALC1	100 mm
C1306	Upper diameter limit, function block DCALC1	500 mm
C1307	Hysteresis - diameter limitation, function block DCALC1	1.00 %
C1308	Selection of the arithmetic function, function block DCALC1	1
C1309	Minimum diameter, function block DCALC1	100 mm
C1310	Acceleration and deceleration time, function block DCALC1	1.000 s
C1311	Permissible diameter difference, function block DCALC1	1.00 %
C1328	Display of current diameter, function block DCALC1	0 mm
C0105	Quick stop deceleration time	5.00 s
C0640	Time constant, function block PT1-1	1.00 s
C0685	Comparison function, function block CMP2	1
C0686	Hysteresis for input signals, function block CMP2	1.00 %
C0687	Window for signal comparison, function block CMP2	1.00 %
C0720	Function, function block DIGDEL1	2
C0721	Delay time, function block DIGDEL1	0.100 s
C0950	Numerator for digital frequency evaluation	5
C0951	Denominator for digital frequency evaluation	1
C0017	Q_{min} switching threshold	50 rpm



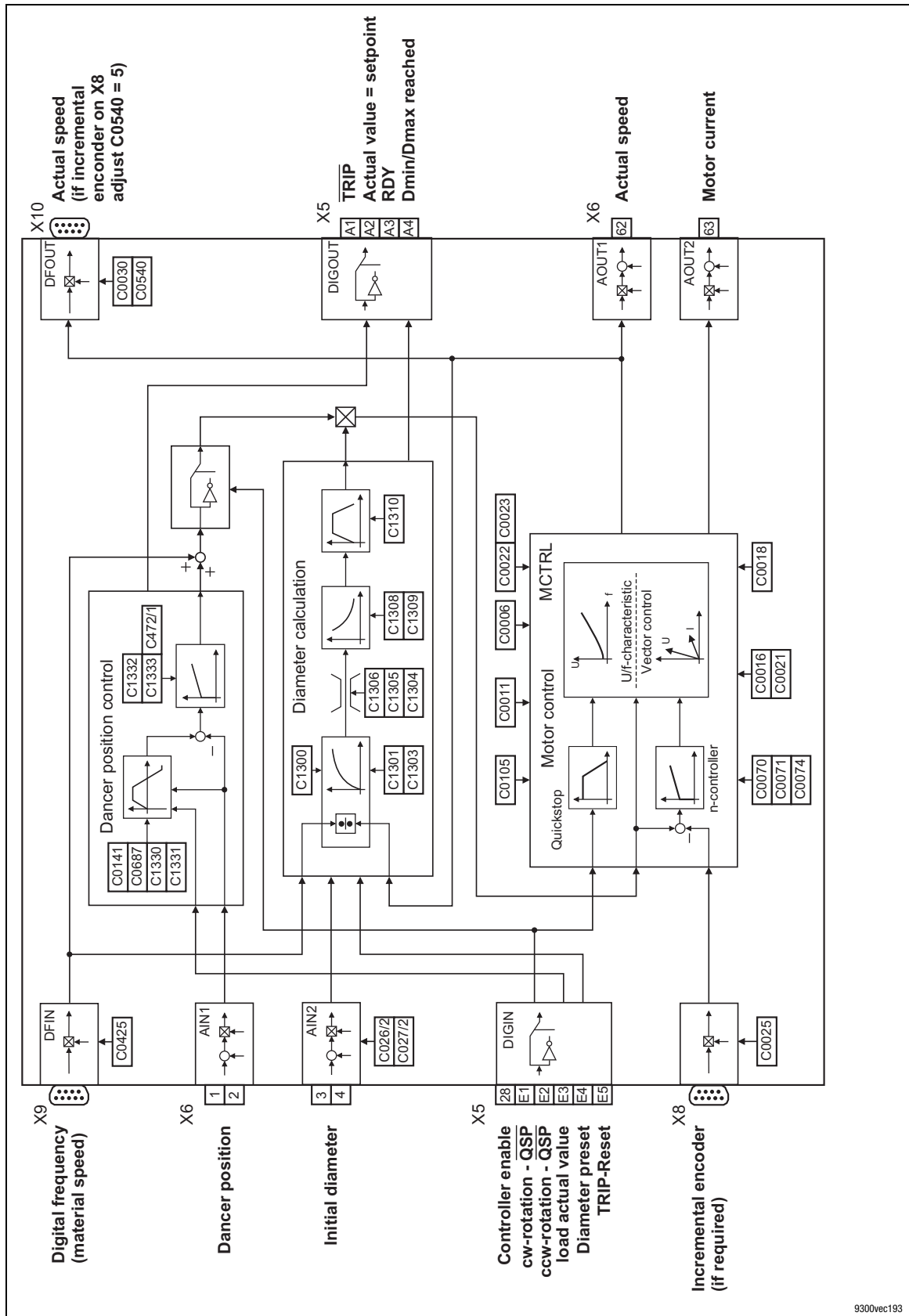
Note!

In this configuration, incremental encoder input X8 can be activated by selecting output input signal at X8 (C0540 = 5) for digital frequency output X10.



Configuration

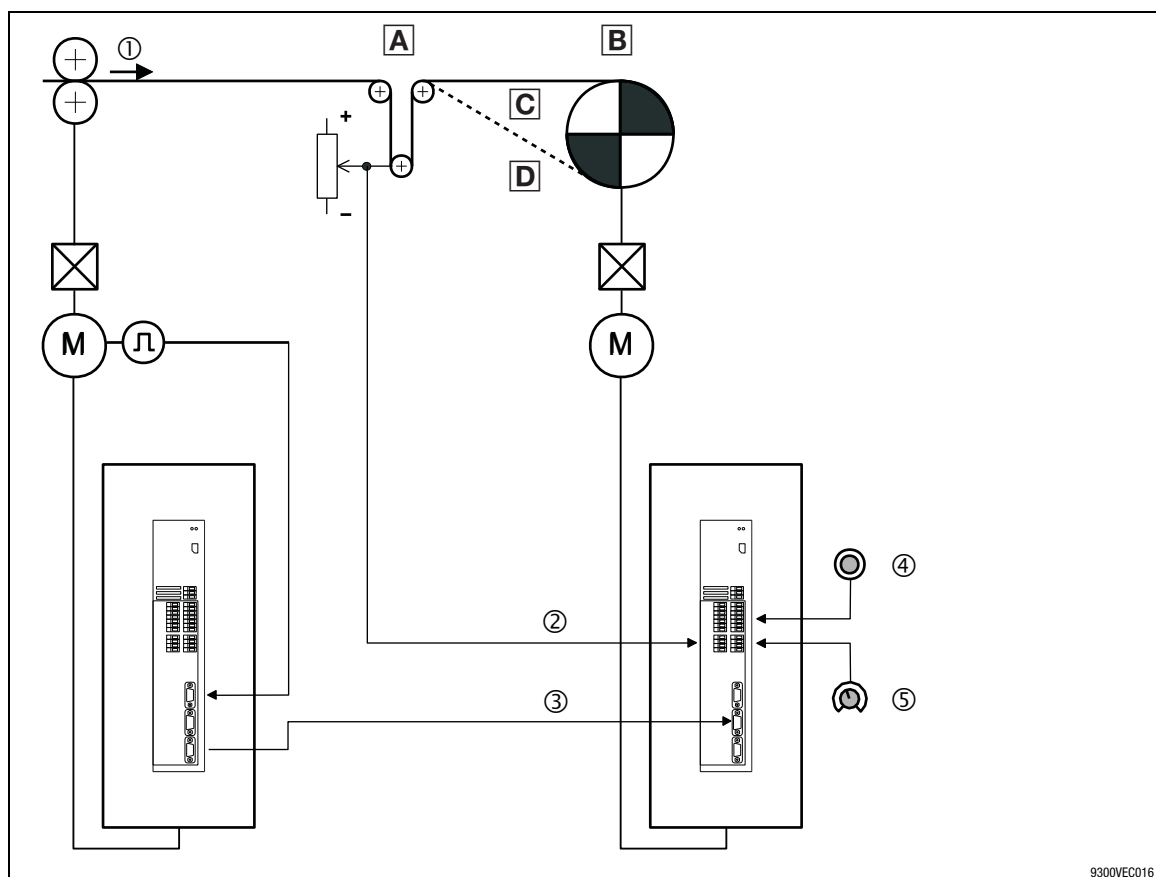
Basic configuration



9300vec193

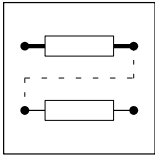
Fig. 2-13

Signal flow for configuration 9000: Dancer position control (internal diameter calculation)



Basic structure of a dancer controller with diameter calculation via the internal diameter calculator

- A** Dancer
- B** Winder
- C** CW rotation
- D** CCW rotation
- ① Line speed V_{Line}
- ② Dancer position
- ③ Line speed
- ④ Preset diameter
- ⑤ Initial diameter



Configuration

Use of funktion blocks

2.3 Use of function blocks

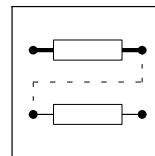
You can configure the signal flow in the controller yourself by interconnecting function blocks. This makes it easy to adapt the controller to different applications.

2.3.1 Signal types

Every function block has a specific number of inputs and outputs which can be connected to one another. The signal types occurring at the inputs and outputs depend on the individual functions:

- Quasi analog signals
 - Symbol: ○
 - Unit: %
 - Identification: a
 - Value range: $\pm 16384 = \pm 100\%$
 - Resolution: 16-bit, scaling $\pm 16384 \triangleq \pm 100\%$
- Digital signals
 - Symbol: □
 - Unit: binary, with HIGH or LOWlevel
 - Identification: d
 - Resolution: 1-bit
- Speed signals
 - Symbol: Δ
 - Unit: rpm (for display, internal representation in [inc/ms])
 - Identification: phd
 - Value range: $\pm 2^{15} - 1$
 - Resolution: 16-bit
- Phase signals
 - Symbol: ▲
 - Unit: inc
 - Identification: ph
 - Value range: $\pm 2^{31} - 1$
 - Resolution: 32-bit, scaling 1 revolution $\triangleq 65536$ inc

Only signals of the same type can be combined. I.e. an analog output signal of a function block can only be linked with the analog input of another function block. If you try to combine two different signal types, the combination will not be accepted.



2.3.2 Function block elements

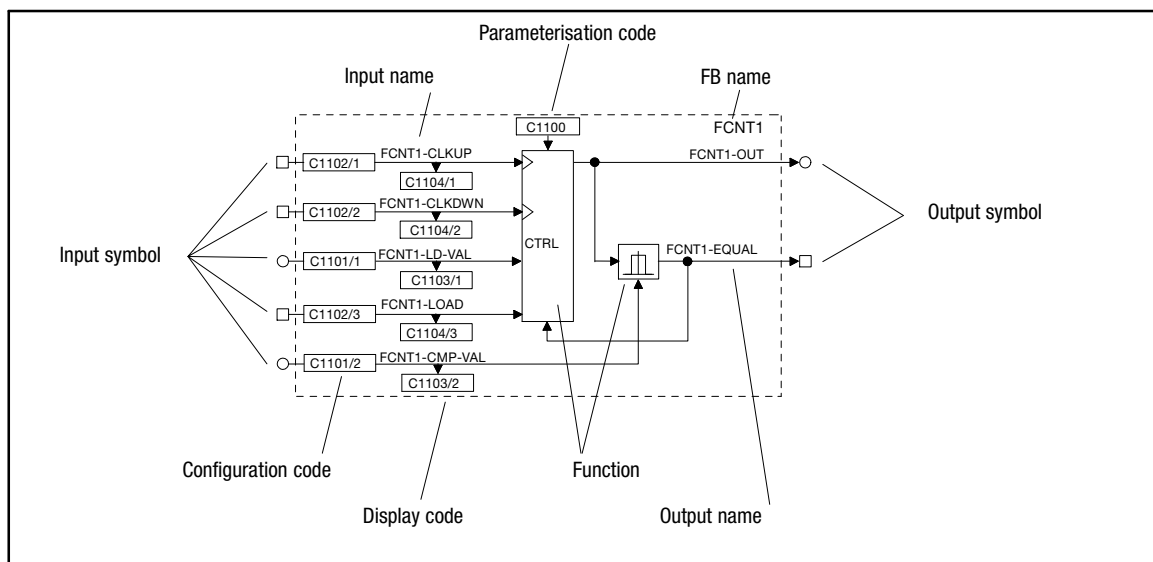


Fig. 2-15 Example: Structure of function block (FB) FCNT1

FB name

Unambiguously identifies the FB. Several FBs with the same function are distinguished by a number following the name.

Every FB is defined by means of a selection number. For calculating the FB, the selection number must be entered into the processing table. (2-39)

The selection numbers are listed in selection list 5.

Example:

(FCNT1, see Fig. 2-15)

- FCNT1 $\triangle$ selection number 6400 (selection list 5).

Input symbol

Indicates the signal type permitted as signal source at the input. (2-32)

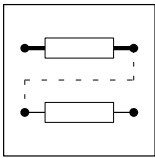


Note!

You can only configure inputs which are led out of the FB.

Input name

Consists of the FB name and a designation. Inputs with the same function are distinguished by a number following the designation.



Configuration

Use of funktion blocks

Configuration code

Configures the input with a signal source (e. g. terminal signal, control code, FB output, ...). Inputs with the same code are distinguished by their subcode. The subcode is added to the code (Cxxx/1). These codes are configured via the subcode.

Every input can only be connected to one signal source.

Display code

Indicates the current input value. Inputs with the same code are distinguished by their subcode. The subcode is added to the code (Cxxx/1). These codes are displayed via the subcode.

Display codes cannot be edited.

Function

Shows the mathematical function as a block diagram (see Fig. 2-15).

Parameterisation code

Adapts the function and the behaviour to the drive task. The possible settings are described in the text and/or in line charts. (📖 2-41)

Output symbol

Indicates the signal type. Connections with inputs of the same signal type are possible. (📖 2-32)

Every output is defined via a selection number. The selection numbers are listed in selection lists (1 ... 4) corresponding to the different signal types.

The selection numbers are used to connect the outputs with inputs.

Example:

(FCNT1, see Fig. 2-15)

- FCNT1-OUT $\triangle$ selection number 6400 (analog signal, selection list 1).
- FCNT1-EQUAL $\triangle$ selection number 6400 (digital signal, selection list 2).

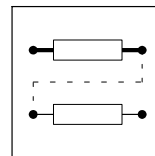


Note!

You can only configure outputs which are led out of the FB.

Output name

Consists of the FB name and a designation. Outputs with the same function are distinguished by a number following the designation.



2.3.3 Connecting function blocks

General rules

- To every input a signal source is assigned.
- Every input can only have one signal source.
- Inputs of different function blocks can have the same signal source.
- Only identical signal types can be combined.



Stop!

Existing connections that are not wanted must be reconfigured and removed. Otherwise, the drive may execute functions that are not desired.



Note!

Lenze provides a network list generator for the visualisation of existing connections.

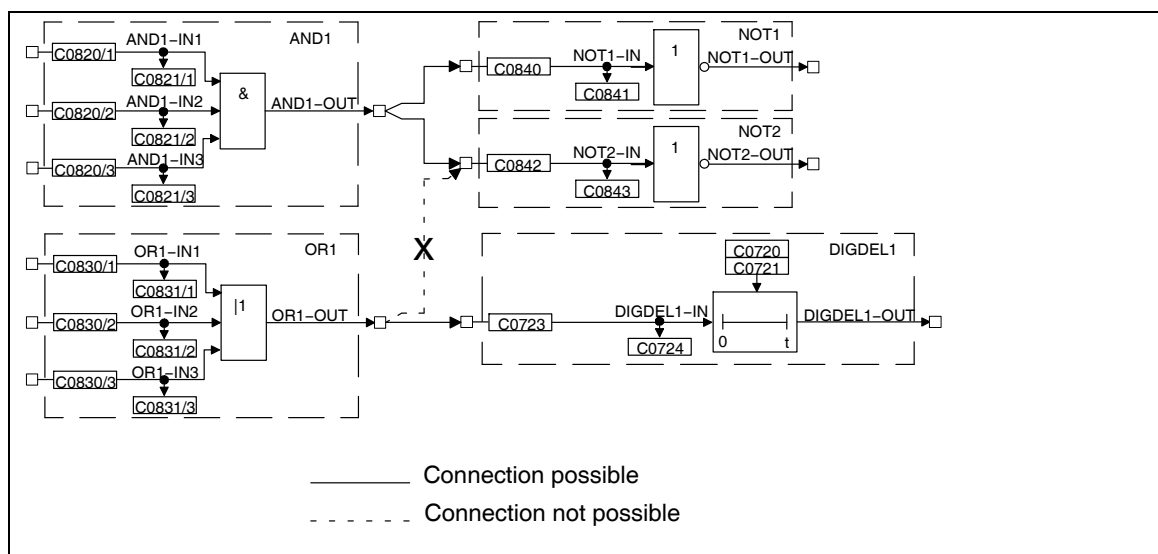
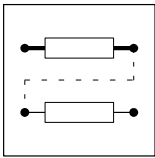


Fig. 2-16

Correct connection of function blocks



Configuration

Use of funktion blocks

Basic procedure

1. Select the configuration code of the function block input to be changed.
2. Where do you want the input signal for the selected input to come from? (e.g. from the output of another function block).
3. A menu which only contains signal sources of the same type as the function block input to be assigned is used to assign the function block input.
4. Select and confirm the signal source.
5. Remove connections that are not desired, if necessary.
 - For this, use the configuration code and select a corresponding input signal assignment (e. g. FIXED0, FIXED1, FIXED0%, ...).
6. Repeat steps 1 to 5 until the desired configuration has been created.
7. Save the new configuration in the desired parameter set.

Example

- Condition:
 - Default setting
- Task:
 - Square the analog signal of X6/3, X6/4 and output it at X6/62.
- Solution:
 - You need the function blocks AIN2, ARIT2 and AOUT2.

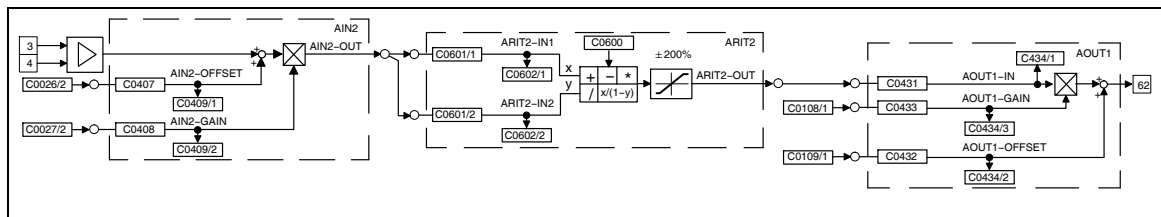
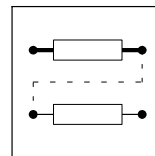


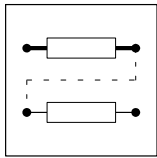
Fig. 2-17

Example of a simple configuration



Building up connections

1. Determine the signal source for ARIT2-IN1:
 - Use the arrow keys and go to the code level.
 - Use **▲** or **▼** to select C0601/1.
 - Press PRG to go to the parameter level.
 - Use **▲** or **▼** to select the output AIN2-OUT (selection number 55).
 - Confirm with SH + PRG.
 - Press PRG to go back to the code level.
2. Determine the signal source for ARIT2-IN2:
 - Use **▲** to select C0601/2.
 - Press PRG to go to the parameter level.
 - Use **▲** or **▼** to select the output AIN2-OUT (selection number 55).
 - Confirm with SH + PRG.
 - Press PRG to go back to the code level.
3. Parameterise ARIT2:
 - Use **▼** to select C0600.
 - Press PRG to go to the parameter level.
 - Select multiplication (selection number 3).
 - Confirm with SH + PRG.
 - Press PRG to go back to the code level.
4. Determine the signal source for AOUT1:
 - Use **▼** to select C0431.
 - Press PRG to go to the parameter level.
 - Select output ARIT2-OUT (selection number 5505).
 - Confirm with SH + PRG.
 - Press PRG to go back to the code level.
5. Enter function block ARIT2 into the processing table:
 - Use **▲** to select C0465 and subcode 8.
 - Press PRG to go to the parameter level.
 - Enter function block ARIT2 (selection number 5505).
 - Confirm with SH + PRG.
 - Press PRG to go back to the code level.
 - This determines the order of FB processing.



Configuration

Use of funktion blocks

Removing connections

- Since a source may have several targets, there may be additional signal connections, which may under certain conditions not be wanted.
- Example:
 - In the default setting of the basic configuration C0005 = 1000 (speed control) ASW1-IN1 and AIN2-OUT are connected.
 - The above-taken steps do not automatically deactivate this connection! If the connection is not desired, it must be removed.

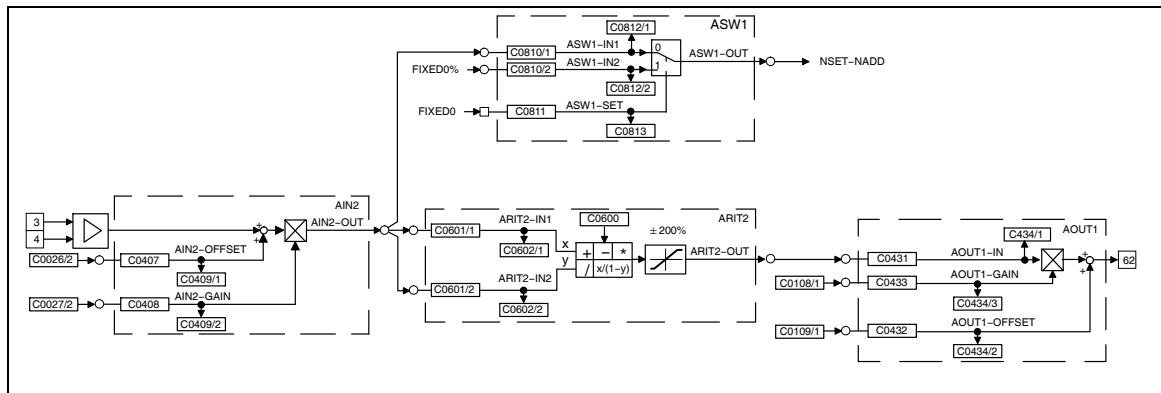


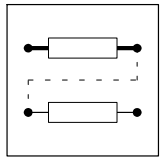
Fig. 2-18

Removing connections in a configuration

6. Remove the connection between ASW1-IN1 and AIN2-OUT:
 - Use **▲** or **▼** to select C0810/1
 - Press PRG to go to the parameter level.
 - Use **▲** or **▼** to select the constant FIXED0% (selection number 1000).
 - Confirm with SH + PRG.
 - Press PRG to go back to the code level.

The connection has now been removed.

7. Save the new configuration, if necessary:
 - Use C0003 and save the new signal configuration in a parameter set to ensure that the changes will not get lost after mains switching.



2.3.4 Entries in the processing table

The 93XX controller provides a certain computing time for FB processing. Since type and number of the FBs used may vary in the individual applications, the controller does not continuously calculate all FBs available. Under code C0465 you can find a processing table which contains only the FBs that are used in the application. In this way, the drive system is ideally adapted to the application. If additional FBs are added to an existing configuration, they must be entered into the processing table.

For the entry, the following points must be observed:

The number of FBs to be processed is limited

Every configuration can contain maximally 50 FBs. Every FB needs a certain processing time (run time). Code C0466 indicates the remaining process time for FB processing. When the process time is used up, you cannot add any further FBs.

Order of FB entries

In general, the entries under C0465 can be made in any order. However, with highly dynamic drive tasks, the order of the entries may be important. Usually, we recommend to adapt the order of the entries to the signal flow.

Example:

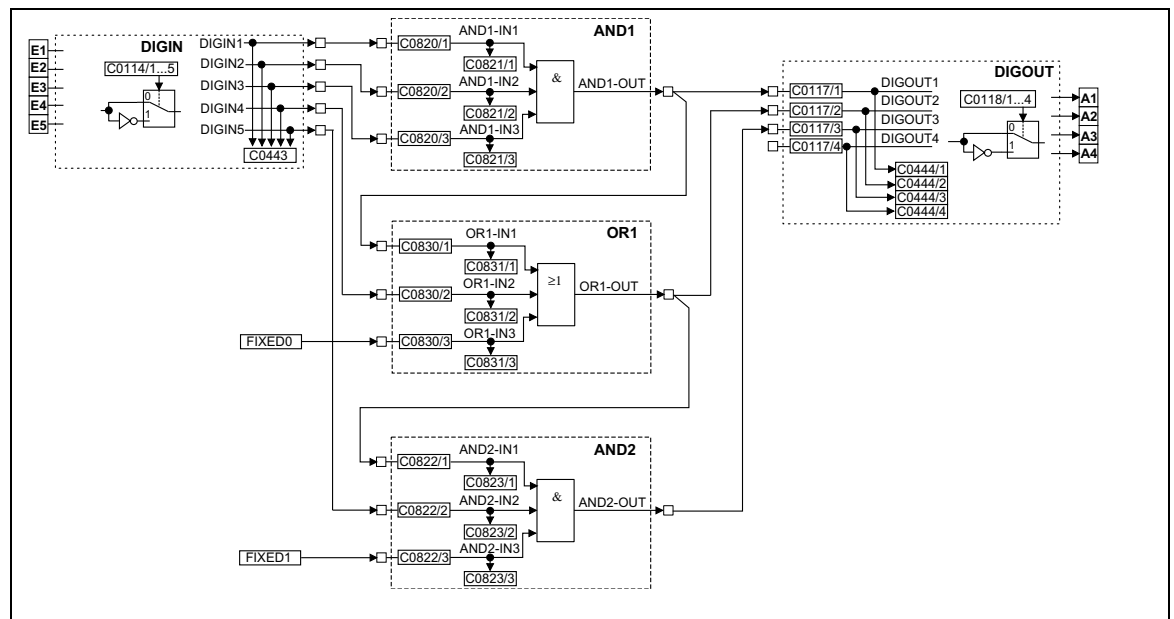
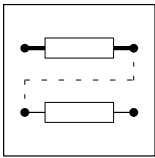


Fig. 2-19

Configuration example

Structure of the processing table for the configuration example in Fig. 2-19:

1. DIGIN need not be entered into the processing table.
2. AND1 is the first FB because it receives its input signals from DIGIN and only has successors.
3. OR1 is the second FB because its signal source is the output of AND1 (predecessor). I.e. the output signal in AND1 must first be generated before it can be processed in OR1. OR1 also has a successor. I.e. OR1 must be entered before its successor in the processing table.



Configuration

Use of funktion blocks

4. AND2 is the third FB because it has a predecessor (see 3.)
5. Accordingly, the entries under C0465 are as follows:
 - Position 10: AND1 10500
 - Position 11: OR1 10550
 - Position 12: AND2 10505

The example starts with position 10 because these positions have not been assigned with the default setting.

The FBs need not be entered directly one after the other in the processing table. Empty positions are permitted.



Note!

Other FBs may be entered between the FBs used in the example.

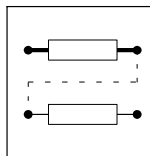
FBs which need not be entered into the processing table

The following signal sources are always executed. This is why they need not be entered into the processing table:

- AIF-IN
- CANx-IN
- DIGIN
- DIGOUT
- FCODE (all free codes)
- MCTRL
- fixed signal sources (FIXED0, FIXED0%, etc.)

Frequent configuration errors

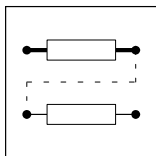
Error	Cause	Remedy
FB sends no output signal	FB has not been entered into the processing table under C0465	Enter FB into the processing table
FB only sends constant signals	FB has been removed from the processing table or overwritten	Enter FB again into the processing table, if necessary, under a different subcode (position)
The following FB does not receive the output signal	No connection between the FBs	Build up connection (seen from the subsequent FB's view) under the configuration code (CFG)
FB cannot be entered into the table under C0465	Not enough process time available (see C0466)	Remove FBs which are not used, if any (e.g. inputs and outputs which are not used) With DC bus connections, some functions may be transferred to other controllers, if necessary
Controller transmits internal signals with delay to the outputs	FB processing order is not correct	Adapt the processing table to the signal flow under C0465



2.4 Function blocks

2.4.1 List of function blocks

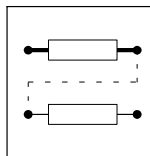
Function block	Description	CPU time [μs]	used in basic configuration C0005								
			1000	2000	3000	4000	5000	6000	7000	8000	9000
ABS1	Absolute-value generator	4		Δ	Δ						
ADD1	Addition block 1	8		Δ	Δ			Δ		Δ	Δ
ADD2	Addition block 2										
AIF-IN	Fieldbus	-	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
AIF-OUT	Fieldbus	56	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
AIN1	Analog input X6/1, X6/2	11	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
AIN2	Analog input X6/3, X6/4	29	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
AND1	Logic AND, block1	6			Δ						
AND2	Logic AND, block2										
AND3	Logic AND, block3										
AND4	Logic AND, block4										
AND5	Logic AND, block5										
ANEG1	Analog inverter 1	4	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
ANEG2	Analog inverter 2					Δ		Δ	Δ	Δ	Δ
AOUT1	Analog output X6/62	12	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
AOUT2	Analog output X6/63		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
ARIT1	Arithmetic block 1	11		Δ	Δ					Δ	Δ
ARIT2	Arithmetic block 2										
ARIT3	Arithmetic block 3										
ASW1	Analog selector 1	4				Δ		Δ	Δ	Δ	Δ
ASW2	Analog selector 2							Δ	Δ		
ASW3	Analog selector 3										
BRK1	Holding brake control	15									
CAN-IN	System bus	-	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
CAN-OUT	System bus	56	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
CMP1	Comparator 1	15	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
CMP2	Comparator 2			Δ	Δ						
CMP3	Comparator 3			Δ							
CMP4	Comparator 4										
CONV1	Analog signal conversion	8		Δ	Δ						
CONV2	Analog signal conversion										
CONV3	Converting speed signals into analog signals									Δ	Δ
CONV4	Converting speed signals into analog signals										
CONV5	Converting analog signals into speed signals				Δ						
CONVPHA1	32-bit conversion	6									
CURVE1	Characteristic function	15									
DB1	Dead band	7									
DCALC1	Diameter calculator	50								Δ	Δ
DCTRL	Device control	-	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
DFIN	Digital frequency input	5						Δ	Δ	Δ	Δ
DFOUT	Digital frequency output	35	Δ	Δ	Δ	Δ	Δ	Δ	Δ		
DFRFG1	Digital frequency ramp function generator	40									
DFSET	Digital frequency processing	85					Δ	Δ	Δ		
DIGDEL1	Binary delay element 1	9			Δ						
DIGDEL2	Binäres delay element 2										
DIGIN	Input terminal X5/E1...X5/E5	-	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
DIGOUT	Output terminal X5/A1...X5/A4	-	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
DT1-1	Differentiator	12									
FCNT1	Free unit counter	11									
FDO	Free digital outputs	-	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ



Configuration

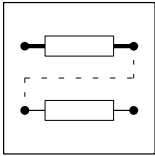
Function blocks

Function block	Description	CPU time [μs]	used in basic configuration C0005								
			1000	2000	3000	4000	5000	6000	7000	8000	9000
FEVAN1	Freely assignable input variable	4									
FIXSET1	Fixed setpoints	9		Δ	Δ						
FLIP1	D-flipflop 1	6			Δ						
FLIP2	D-flipflop 2										
FOLL1	Compensator	22									
INT1	Integrator 1	25		Δ	Δ						
INT2	Integrator 2										
LIM1	Limiter	6									
MCTRL	Motor control	-	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
MFAIL	Mains failure control	44									
MLP1	Motor phase failure detection	30									
MONIT	Monitorings	-	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
MPOT1	Motor potentiometer	20									
NLIM1	Skip frequencies	8	Δ								
NOT1	Logic NOT, block1	4		Δ	Δ						
NOT2	Logic NOT, block2										
NOT3	Logic NOT, block3										
NOT4	Logic NOT, block4										
NOT5	Logic NOT, block5										
NSET	Speed setpoint conditioning	70	Δ	Δ	Δ	Δ	Δ				
OR1	Logic OR, block1	6		Δ	Δ					Δ	Δ
OR2	Logic OR, block2									Δ	Δ
OR3	Logic OR, block3										
OR4	Logic OR, block4										
OR5	Logic OR, block5										
OSZ	Oscilloscope function	70									
PCTRL1	Process controller 1	58									
PCTRL2	Process controller 2	44								Δ	Δ
PT1-1	First-order delay elements	8								Δ	
PT1-2											
R/L/Q	QSP / setpoint inversion	8	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
RFG1	Ramp function generator	16						Δ	Δ		
S&H	Sample and hold	4									
SQRT1	Root calculator	18									
SRFG1	S-shaped ramp function generator	15									
STAT	Digital status signals	-	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
TRANS1	Binary transition evaluation	7		Δ	Δ						
TRANS2	Binary transition evaluation										



2.4.2 List of free control codes

Free control code	CPU time [μs]	used in basic configuration C0005								
		1000	2000	3000	4000	5000	6000	7000	8000	9000
FCODE16	-	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
FCODE17		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
FCODE26/1		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
FCODE26/2		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
FCODE27/1		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
FCODE27/2		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
FCODE32						Δ	Δ	Δ		
FCODE37										
FCODE108/1		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
FCODE108/2		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
FCODE109/1		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
FCODE109/2		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
FCODE141				Δ			Δ	Δ	Δ	Δ
FCODE175										
FCODE250										
FCODE471										
FCODE472/1				Δ					Δ	Δ
FCODE472/2										
FCODE472/3										
FCODE472/4										
FCODE472/5										
FCODE472/6										
FCODE472/7										
FCODE472/8										
FCODE472/9										
FCODE472/10										
FCODE472/11										
FCODE472/12										
FCODE472/13										
FCODE472/14										
FCODE472/15										
FCODE472/16										
FCODE472/17										
FCODE472/18										
FCODE472/19										
FCODE472/20										
FCODE473/1						Δ	Δ	Δ		
FCODE473/2										
FCODE473/3										
FCODE473/4										
FCODE473/5										
FCODE473/6										
FCODE473/7										
FCODE473/8										
FCODE473/9										
FCODE473/10										
FCODE474/1				Δ			Δ			
FCODE474/2							Δ			
FCODE475/1										
FCODE475/2										



Configuration

2.4.3 Absolute value generation (ABS)

This FB changes bipolar signals to unipolar signals.

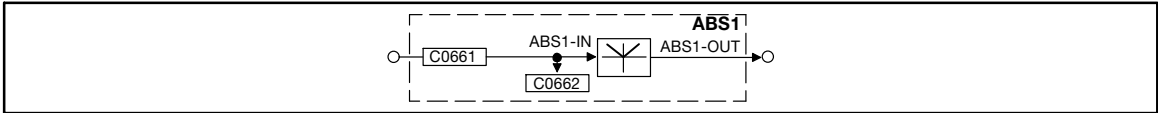
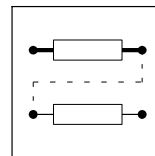


Fig. 2-20 Absolute value generator (ABS1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
ABS1-IN1	a	C0662	dec [%]	C0661	1	1000	-
ABS1-OUT	a	-	-	-	-	-	-

Function

The absolute value of the input signal is generated.



2.4.4 Addition (ADD)

These FBs add or subtract analog signals, depending on the input that is used.

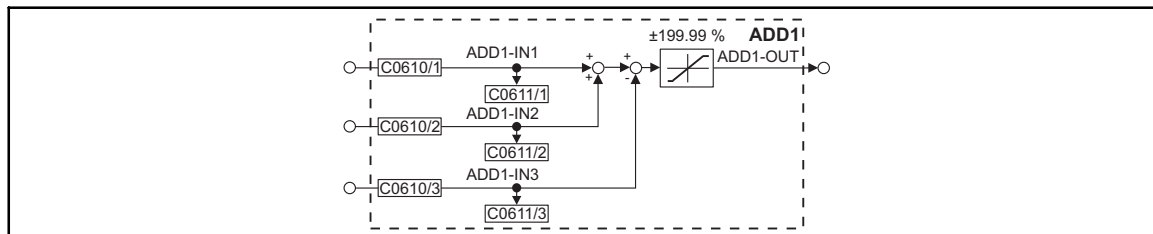


Fig. 2-21

Addition (ADD1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
ADD1-IN1	a	C0611/1	dec [%]	C0610/1	1	1000	Addition input
ADD1-IN2	a	C0611/2	dec [%]	C0610/2	1	1000	Addition input
ADD1-IN3	a	C0611/3	dec [%]	C0610/3	1	1000	Subtraction input
ADD1-OUT	a	-	-	-	-	-	Limited to ±199.99 %

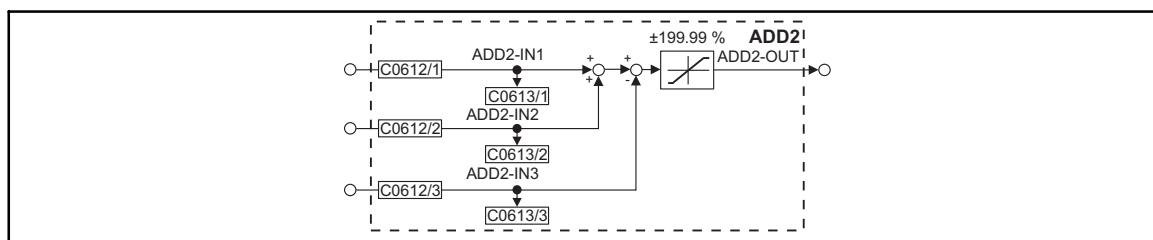


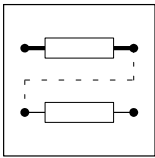
Fig. 2-22

Addition (ADD2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
ADD2-IN1	a	C0612/1	dec [%]	C0613/1	1	1000	Addition input
ADD2-IN2	a	C0612/2	dec [%]	C0613/2	1	1000	Addition input
ADD2-IN3	a	C0612/3	dec [%]	C0613/3	1	1000	Subtraction input
ADD2-OUT	a	-	-	-	-	-	Limited to ±199.99 %

Functional sequence

1. The value at ADDx-IN1 is added to the value of ADDx-IN2.
2. The value of ADDx-IN3 is subtracted from the calculated result.
3. Then the result of the subtraction is limited to ±199.99 %.



Configuration

2.4.5 Automation interface (AIF-IN)

This FB is used as an interface for input signals from the connected field bus module (e.g. INTERBUS, PROFIBUS-DP) for setpoints and actual values as binary, analog or phase information.



Tip!

Please observe the corresponding Operating Instructions of the connected field bus module.

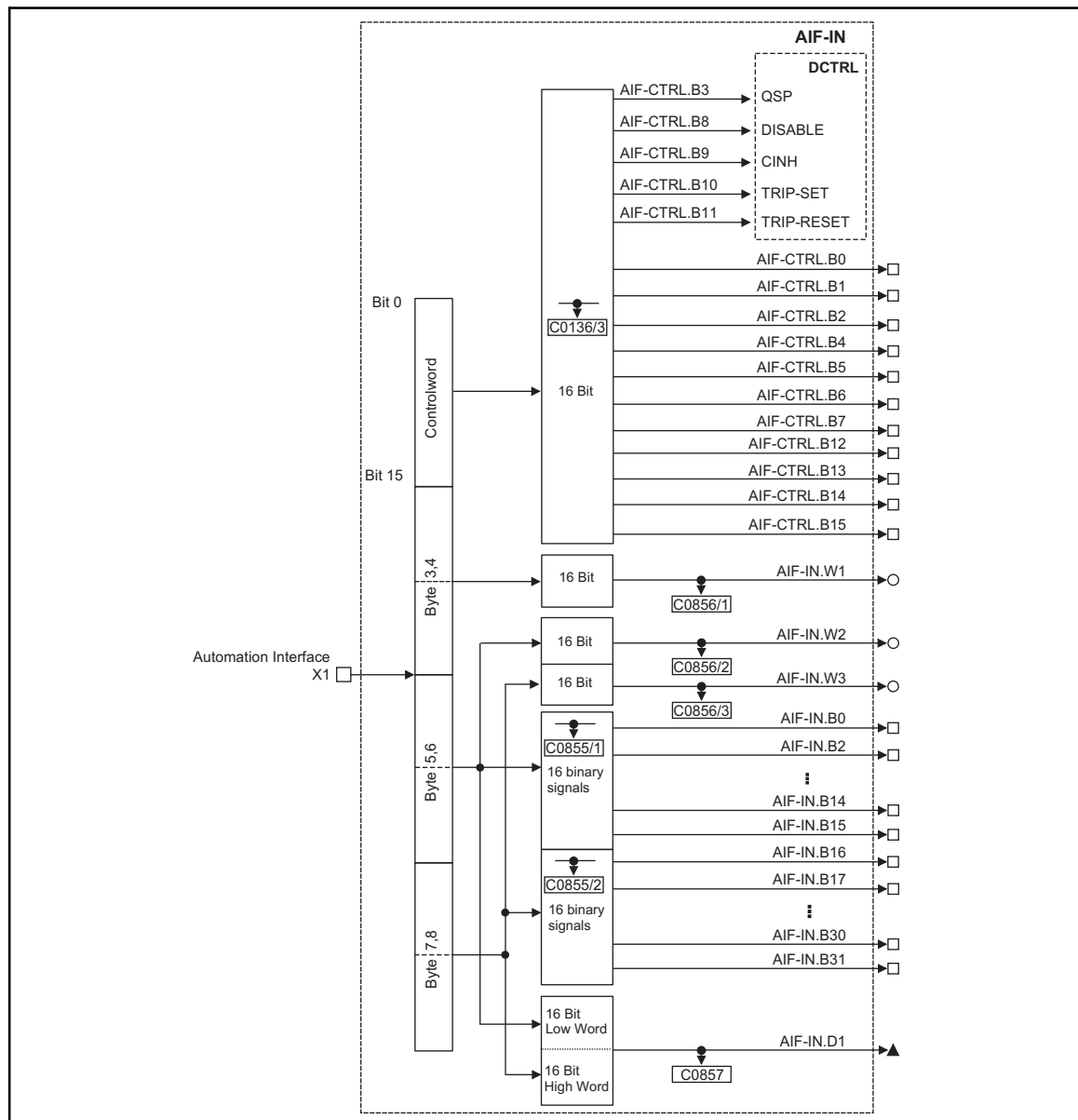
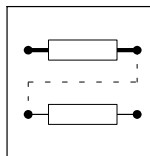
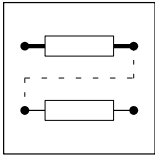


Fig. 2-23 Automation interface (AIF-IN)



Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
AIF-CTRL.B0	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B1	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B2	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B4	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B5	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B6	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B7	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B12	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B13	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B14	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B15	d	C0136/3	hex	-	-	-	-
AIF-IN.W1	a	C0856/1	dec [%]	-	-	-	+16384 = +100 %
AIF-IN.W2	a	C0856/2	dec [%]	-	-	-	+16384 = +100 %
AIF-IN.W3	a	C0856/3	dec [%]	-	-	-	+16384 = +100 %
AIF-IN.D1	ph	C0857	dec [inc]	-	-	-	65536 = 1 revolution
AIF-IN.B0	d	C0855/1	hex	-	-	-	-
AIF-IN.B1	d	C0855/1	hex	-	-	-	-
AIF-IN.B2	d	C0855/1	hex	-	-	-	-
AIF-IN.B3	d	C0855/1	hex	-	-	-	-
AIF-IN.B4	d	C0855/1	hex	-	-	-	-
AIF-IN.B5	d	C0855/1	hex	-	-	-	-
AIF-IN.B6	d	C0855/1	hex	-	-	-	-
AIF-IN.B7	d	C0855/1	hex	-	-	-	-
AIF-IN.B8	d	C0855/1	hex	-	-	-	-
AIF-IN.B9	d	C0855/1	hex	-	-	-	-
AIF-IN.B10	d	C0855/1	hex	-	-	-	-
AIF-IN.B11	d	C0855/1	hex	-	-	-	-
AIF-IN.B12	d	C0855/1	hex	-	-	-	-
AIF-IN.B13	d	C0855/1	hex	-	-	-	-
AIF-IN.B14	d	C0855/1	hex	-	-	-	-
AIF-IN.B15	d	C0855/1	hex	-	-	-	-
AIF-IN.B16	d	C0855/2	hex	-	-	-	-
AIF-IN.B17	d	C0855/2	hex	-	-	-	-
AIF-IN.B18	d	C0855/2	hex	-	-	-	-
AIF-IN.B19	d	C0855/2	hex	-	-	-	-
AIF-IN.B20	d	C0855/2	hex	-	-	-	-
AIF-IN.B21	d	C0855/2	hex	-	-	-	-
AIF-IN.B22	d	C0855/2	hex	-	-	-	-
AIF-IN.B23	d	C0855/2	hex	-	-	-	-
AIF-IN.B24	d	C0855/2	hex	-	-	-	-
AIF-IN.B25	d	C0855/2	hex	-	-	-	-
AIF-IN.B26	d	C0855/2	hex	-	-	-	-
AIF-IN.B27	d	C0855/2	hex	-	-	-	-
AIF-IN.B28	d	C0855/2	hex	-	-	-	-
AIF-IN.B29	d	C0855/2	hex	-	-	-	-
AIF-IN.B30	d	C0855/2	hex	-	-	-	-
AIF-IN.B31	d	C0855/2	hex	-	-	-	-



Configuration

Function

The input signals of the 8 byte user data of the AIF object are converted into corresponding signal types. The signals can be used via further function blocks.

Control word (Byte 1, 2)

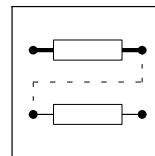
Byte 1, 2 form the control word for the controller. The bits 3, 8, 9, 10, and 11 of these bytes are directly transferred to the function block DCTRL where they are linked to other signals. The other 11 bits can be used to control further function blocks.

Byte 3, 4

Byte 3, 4 are the signal to AIF-IN.W1.

Byte 5, 6, and byte 7, 8

The meaning of these user data results from the different signal types which you can select. Depending on the requirement, these data can be evaluated as up to 2 analog signals, 32 digital signals or one phase signal. Mixed forms are also possible.



2.4.6 Automation interface (AIF-OUT)

This FB is used as an interface for output signals to the connected field bus module (e.g. INTERBUS, PROFIBUS-DP) for setpoints and actual values as binary, analog or phase information.



Tip!

Please observe the corresponding Operating Instructions of the connected field bus module.

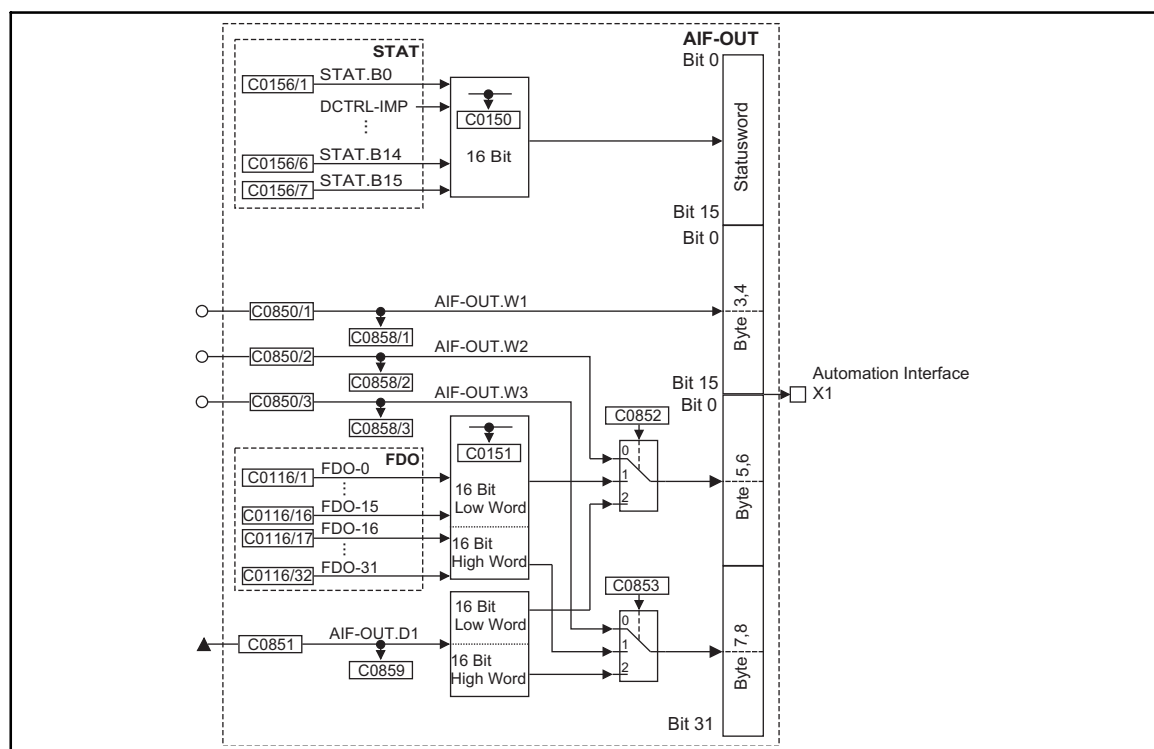
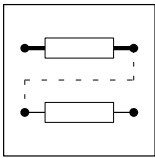


Fig. 2-24

Automation interface (AIF-OUT)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
AIF-OUT.W1	a	C0858/1	dec [%]	C0850/1	1	1000	+100 % = +16384
AIF-OUT.W2	a	C0858/2	dec [%]	C0850/2	1	1000	+100 % = +16384
AIF-OUT.W3	a	C0858/3	dec [%]	C0850/3	1	1000	+100 % = +16384
AIF-OUT.D1	ph	C0859	abs [inc]	C0851	4	1000	1 revolution = 65536



Configuration

Function

The input signals of this FB are copied to the 8 byte user data of the AIF object and laid on the connected field bus module. The meaning of the user data can be determined very easily with C0852 and C0853 and the corresponding configuration codes.

Status word (Byte 1, 2)

Here, the status word of the function block STAT is mapped. Some of the bits are freely assignable.
(2-159)

Byte 3, 4

The analog signal at AIF-OUT.W1 is output.

Byte 5, 6

- C0852 = 0
 - The analog signal to AIF-OUT.W2 is output.
- C0852 = 1
 - Bits 0 ... 15 of FDO are output.
- C0852 = 2
 - The LOW WORD from AIF-OUT.D1 is output.

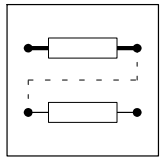
Byte 7, 8

- C0853 = 0
 - The analog signal at AIF-OUT.W3 is output.
- C0853 = 1
 - Bits 16 ... 31 of FDO are output.
- C0853 = 2
 - The HIGH WORD of AIF-OUT.D1 is output.

Example

You want to output 16 digital signals of FDO and the LOW WORD of AIF-OUT.D1:

- The LOW-WORD of AIF-OUT.D1 can only be output on byte 5 and 6.
 - For this, C0852 is set to 2. The phase signal at C0851 is output on byte 5 and 6.
- For the digital signals, only the bits 16 ... 31 (byte 7 and 8) are available:
 - For this, C0853 is set to 1. Bit 16 ... 31 (FDO) are output on byte 7 and 8.



2.4.7 Analog inputs via terminal X6/1,2 and X6/3,4 (AIN)

These FBs are the interface for analog signals as setpoint input, actual value input and parameter control.

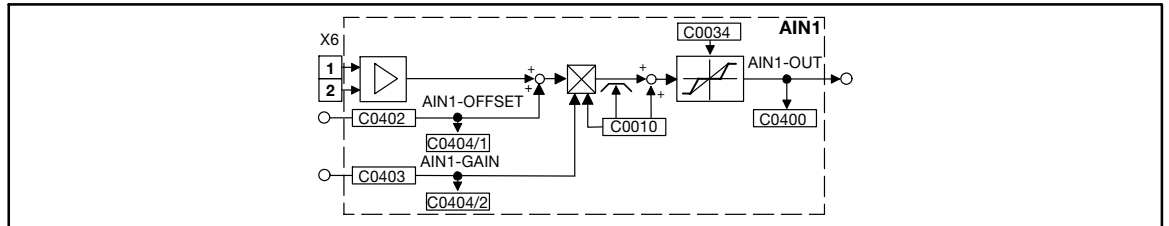


Fig. 2-25 Analog input via terminal X6/1,2 (AIN1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
AIN1-OFFSET	a	C0404/1	dec [%]	C0402	1	19502	-
AIN1-GAIN	a	C0404/2	dec [%]	C0403	1	19504	-
AIN1-OUT	a	C0400	dec [%]	-	-	-	-

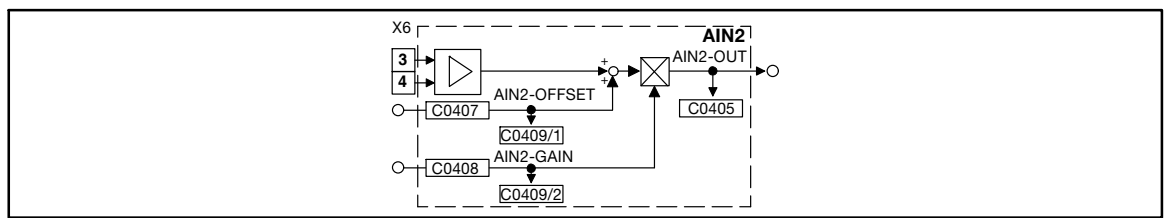
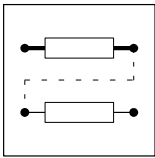


Fig. 2-26 Analog input via terminal X6/3, 4 (AIN2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
AIN2-OFFSET	a	C0409/1	dec [%]	C0407	1	19503	-
AIN2-GAIN	a	C0409/2	dec [%]	C0408	1	19505	-
AIN2-OUT	a	C0406	dec [%]	-	-	-	-



Configuration

Function

- Offset
 - The value at AINx-OFFSET is added to the value at AINx-IN.
 - The result of the addition is limited to $\pm 200\%$.
- Gain
 - The limited value (after offset) is multiplied with the value at AINx-GAIN.
 - The signal is then limited to $\pm 200\%$.
- The signal is output at AINx-OUT.

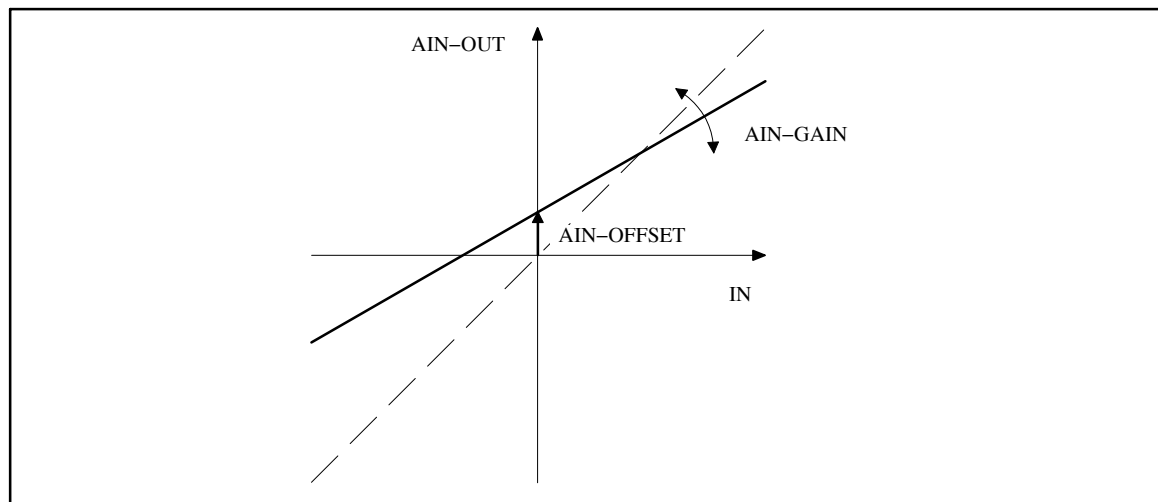


Fig. 2-27

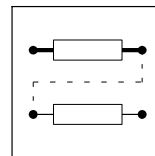
Offset and gain of the analog input

Special feature of AIN1

- A minimum speed can be set under C0010. The signal gain is reduced such that the signal at AIN1-OUT = 100 % with a setpoint of 10 V at X6/1 and X6/2.
 - Setting range: 0 ... 36000 rpm
 - Setting range: 0 rpm (function inactive)
 - Input limits: C0010 < C0011
 - AIN1-OFFSET and AIN1-GAIN are independent of C0010.
- A dead band element can be integrated into the output signal at AIN1 via C0034. You can achieve the function 4 ... 20 mA as a current master value together with the jumper setting X2 (controller front).
- The signal at X6/1 and X6/2 is read cyclically (1 ms).

Special feature of AIN2

- The signal at X6/3 and X6/4 is read cyclically (250 μ s).



2.4.8 Logic AND (AND)

These FBs carry out logic AND operations of digital signals. You can use these FBs for the control of functions or the generation of status information.

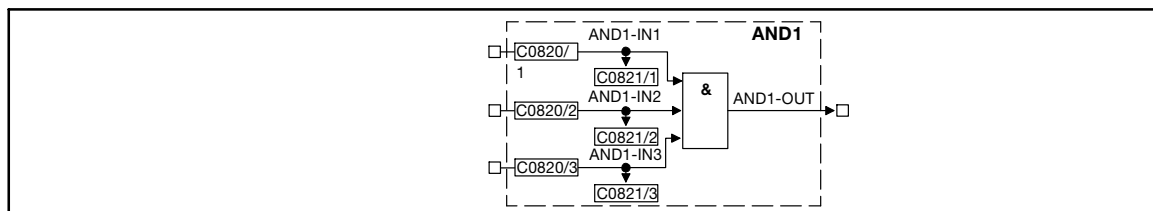


Fig. 2-28

Logic AND (AND1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
AND1-IN1	d	C0821/1	bin	C0820/1	2	1000	-
AND1-IN2	d	C0821/2	bin	C0820/2	2	1000	-
AND1-IN3	d	C0821/3	bin	C0820/3	2	1000	-
AND1-OUT	d	-	-	-	-	-	-

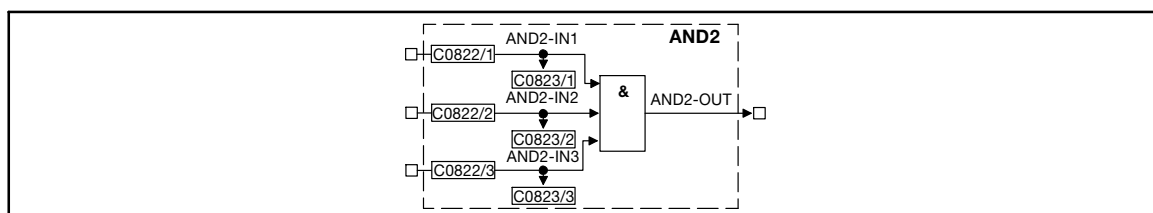
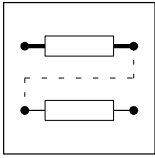


Fig. 2-29

Logic AND (AND2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
AND2-IN1	d	C0823/1	bin	C0822/1	2	1000	-
AND2-IN2	d	C0823/2	bin	C0822/2	2	1000	-
AND2-IN3	d	C0823/3	bin	C0822/3	2	1000	-
AND2-OUT	d	-	-	-	-	-	-



Configuration

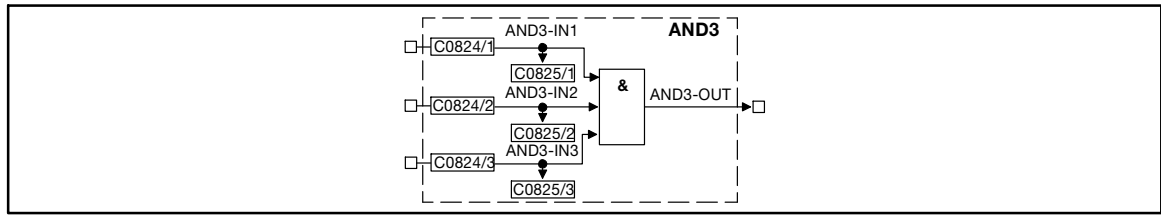


Fig. 2-30

Logic AND (AND3)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
AND3-IN1	d	C0825/1	bin	C0824/1	2	1000	-
AND3-IN2	d	C0825/2	bin	C0824/2	2	1000	-
AND3-IN3	d	C0825/3	bin	C0824/3	2	1000	-
AND3-OUT	d	-	-	-	-	-	-

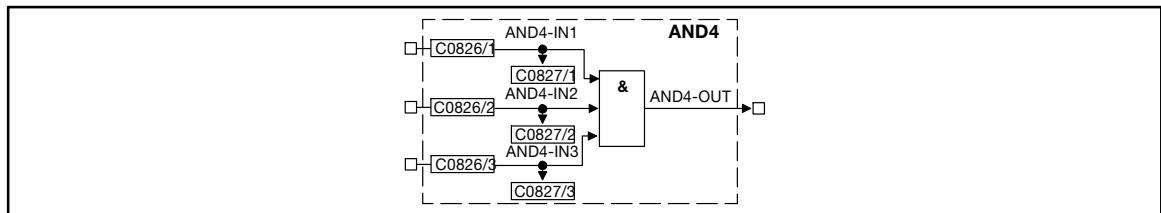


Fig. 2-31

Logic AND (AND4)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
AND4-IN1	d	C0827/1	bin	C0826/1	2	1000	-
AND4-IN2	d	C0827/2	bin	C0826/2	2	1000	-
AND4-IN3	d	C0827/3	bin	C0826/3	2	1000	-
AND4-OUT	d	-	-	-	-	-	-

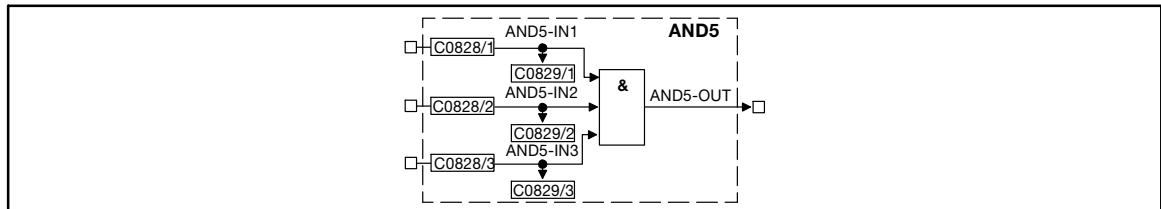
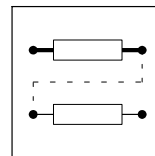


Fig. 2-32

Logic AND (AND5)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
AND5-IN1	d	C0829/1	bin	C0828/1	2	1000	-
AND5-IN2	d	C0829/2	bin	C0828/2	2	1000	-
AND5-IN3	d	C0829/3	bin	C0828/3	2	1000	-
AND5-OUT	d	-	-	-	-	-	-



Function

ANDx-IN1	ANDx-IN2	ANDx-IN3	ANDx-OUT
0	0	0	0
1	0	0	0
0	1	0	0
1	1	0	0
0	0	1	0
1	0	1	0
0	1	1	0
1	1	1	1

0 = LOW

1 = HIGH

In a contactor control, the function corresponds to a series connection of normally-open contacts.

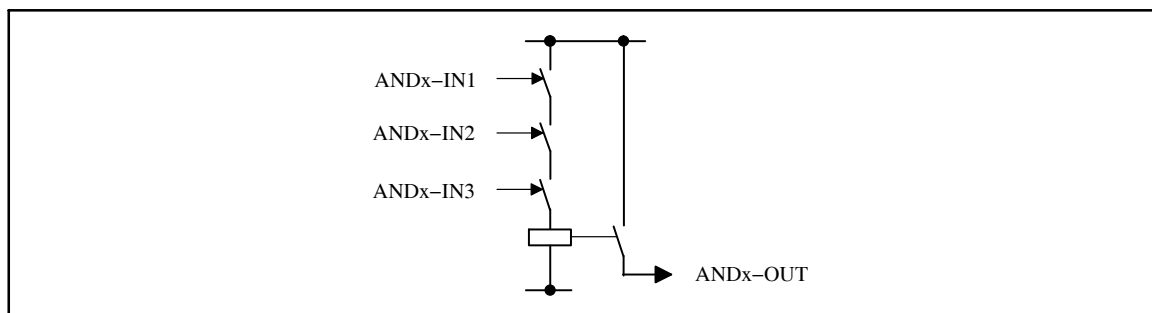


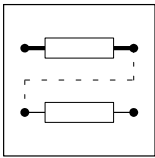
Fig. 2-33

AND function as a series connection of normally-open contacts



Tip!

If only two inputs are required, use the inputs ANDx-IN1 and ANDx-IN2. Assign the input ANDx-IN3 to the signal source FIXED1.



Configuration

2.4.9 Inversion (ANEG)

These FBs invert the sign of an analog signal. The input value is multiplied with -1 and then output.

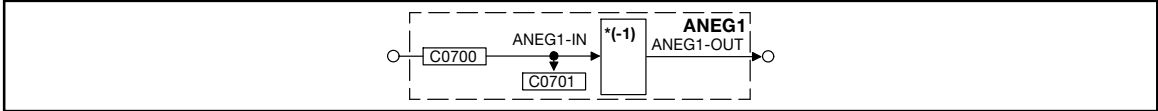


Fig. 2-34

Inverter (ANEG1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
ANEG1-IN	a	C0701	dec [%]	C0700	1	19523	-
ANEG1-OUT	a	-	-	-	-	-	-

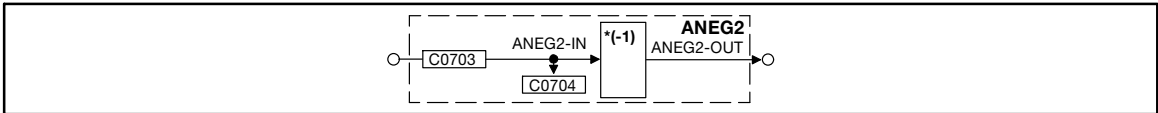
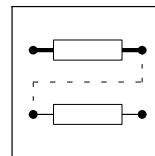


Fig. 2-35

Inverter (ANEG2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
ANEG2-IN	a	C0704	dec [%]	C0703	1	1000	-
ANEG2-OUT	a	-	-	-	-	-	-



2.4.10 Analog outputs via terminals X6/62 and X6/63 (AOUT)

These FB are used to output internal analog signals as voltage signals and e.g. display values or setpoints for slaves.

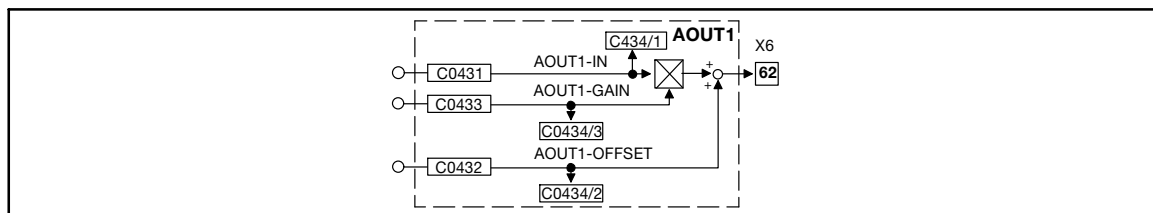


Fig. 2-36 Analog output via terminal X6/62 (AOUT1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
AOUT1-IN	a	C0434/1	dec [%]	C0431	1	5001	-
AOUT1-OFFSET	a	C0434/2	dec [%]	C0432	1	19512	-
AOUT1-GAIN	a	C0434/3	dec [%]	C0433	1	19510	-

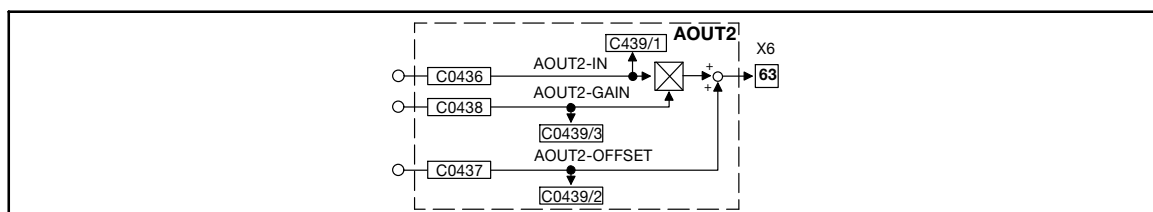
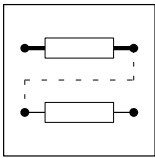


Fig. 2-37 Analog output via terminal X6/63 (AOUT2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
AOUT2-IN	a	C0439/1	dec [%]	C0436	1	5002	-
AOUT2-OFFSET	a	C0439/2	dec [%]	C0437	1	19513	-
AOUT2-GAIN	a	C0439/3	dec [%]	C0438	1	19511	-



Configuration

Function

- Gain
 - The value at AOUTx-IN is multiplied with the value at AOUTx-GAIN.
 - Example for the multiplication of analog signals:
 $100 \% \cdot 100 \% = 100 \%$
 - The result of the multiplication is limited to $\pm 200 \%$.
- Offset
 - The limited value (after the gain) is added to the value at AOUTx-OFFSET.
 - The result of the addition is limited to $\pm 200 \%$.
- The result of the calculation is mapped in such a way that $100 \% = 10 \text{ V}$. This signal is output at terminal X6/62 or X6/63.

Example:

AOUT1-IN = 50 %

AOUT1-GAIN = 100 %

AOUT1-OFFSET = 10 %

Signal at terminal X6/62:

$((50 \% \cdot 100 \%) = 50 \%) + 10 \% = 60 \%) = 6 \text{ V}$

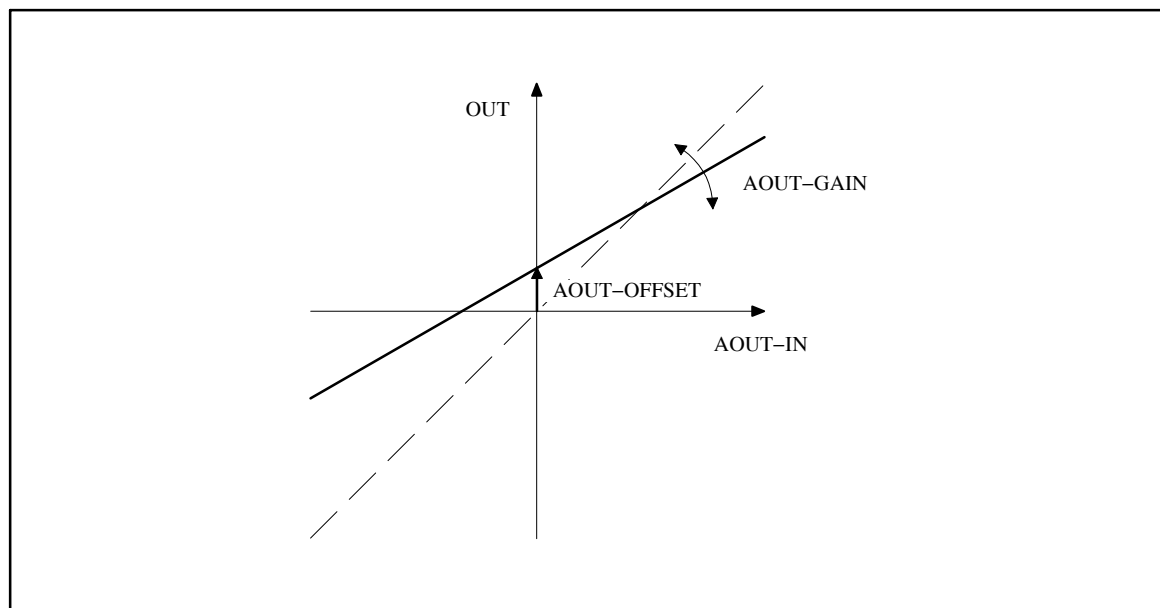
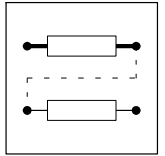


Fig. 2-38

Offset and gain of the analog output



2.4.11 Arithmetic (ARIT)

These FBs combine two analog signals arithmetically.

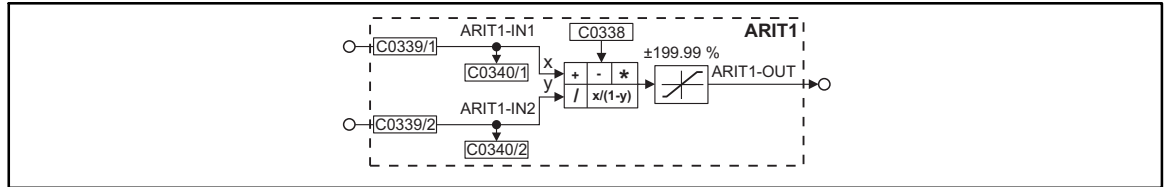


Fig. 2-39 Arithmetic (ARIT1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
ARIT1-IN1	a	C0340/1	dec [%]	C0339/1	1	1000	-
ARIT1-IN2	a	C0340/2	dec [%]	C0339/2	1	1000	-
ARIT1-OUT	a	-	-	-	-	-	limited to ±199.99 %

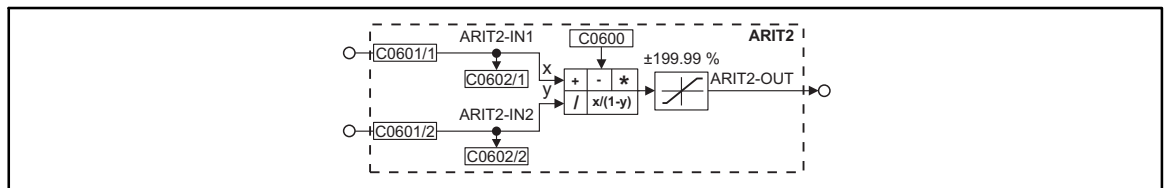


Fig. 2-40 Arithmetic (ARIT2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
ARIT2-IN1	a	C0602/1	dec [%]	C0601/1	1	1000	-
ARIT2-IN2	a	C0602/2	dec [%]	C0601/2	1	1000	-
ARIT2-OUT	a	-	-	-	-	-	limited to ±199.99 %

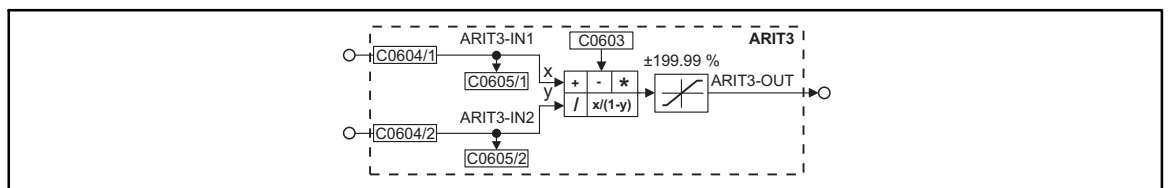
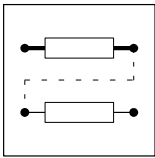


Fig. 2-41 Arithmetic (ARIT3)

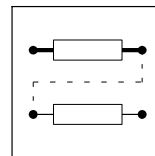
Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
ARIT3-IN1	a	C0605/1	dec [%]	C0604/1	1	1000	-
ARIT3-IN2	a	C0605/2	dec [%]	C0604/2	1	1000	-
ARIT3-OUT	a	-	-	-	-	-	limited to ±199.99 %



Configuration

Function

Code	Value	Function
C0338 for ARIT1 C0600 for ARIT2 C0603 for ARIT3	0	• $\text{ARITx-OUT} = \text{ARITx-IN1}$ – ARITx-IN2 is not processed
	1	• $\text{ARITx-OUT} = \text{ARITx-IN1} + \text{ARITx-IN2}$ – Example: 100 % = 50 % + 50 %
	2	• $\text{ARITx-OUT} = \text{ARITx-IN1} - \text{ARITx-IN2}$ – Example: 50 % = 100 % - 50 %
	3	• $\text{ARITx-OUT} = \text{ARITx-IN1} * \text{ARITx-IN2}$ – Example: 100 % = 100 % * 100 %
	4	• $\text{ARITx-OUT} = \text{ARITx-IN1} / |\text{ARITx-IN2}|$ – Example: 1 % = 100 % / 100 %
	5	• $\text{ARITx-OUT} = \text{ARITx-IN1} / (100 \% - \text{ARITx-IN2})$ – Example: 200 % = 100 % / (100 % - 50 %)



2.4.12 Toggling (ASW)

These FBs toggle between two analog signals, thus enabling two different initial diameters for winding, for instance.

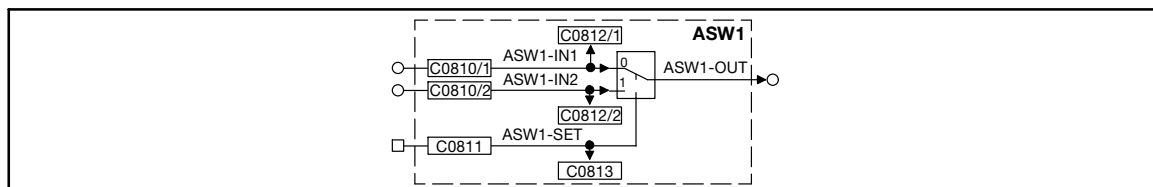


Fig. 2-42 Toggling (ASW1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
ASW1-IN1	a	C0812/1	dec [%]	C0810/1	1	55	-
ASW1-IN2	a	C0812/2	dec [%]	C0810/2	1	1000	-
ASW1-SET	d	C0813	bin	C0811	2	1000	-
ASW1-OUT	a	-	-	-	-	-	-

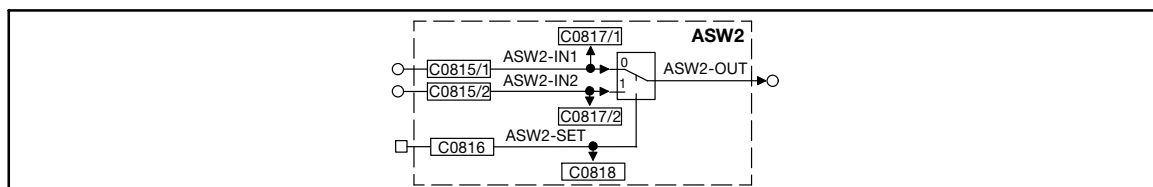
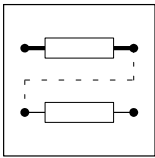


Fig. 2-43 Toggling (ASW2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
ASW2-IN2	a	C0817/1	dec [%]	C0815/1	1	1000	-
ASW2-IN1	a	C0817/2	dec [%]	C0815/2	1	1000	-
ASW2-SET	d	C0818	bin	C0816	2	1000	-
ASW2-OUT	a	-	-	-	-	-	-



Configuration

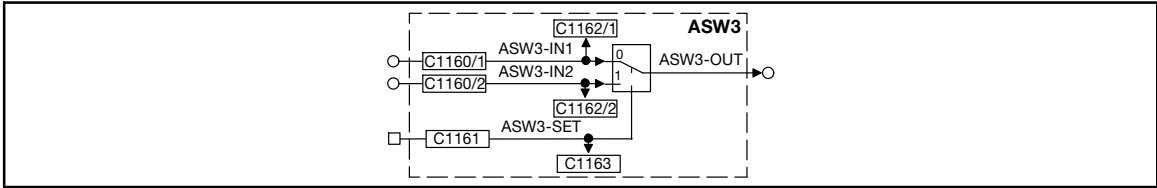
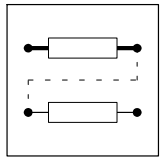


Fig. 2-44 Toggling (ASW3)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
ASW3-IN2	a	C1162/1	dec [%]	C1160/1	1	1000	-
ASW3-IN1	a	C1162/2	dec [%]	C1160/2	1	1000	-
ASW3-SET	d	C1163	bin	C1161	2	1000	-
ASW3-OUT	a	-	-	-	-	-	-

Function

Control signal	Output signal
ASWx-SET = HIGH	ASWx-OUT = ASWx-IN2
ASWx-SET = LOW	ASWx-OUT = ASWx-IN1



2.4.13 Holding brake (BRK)

This FB triggers a holding brake. You can use it e.g. in configurations for lift and travelling drives and active loads.

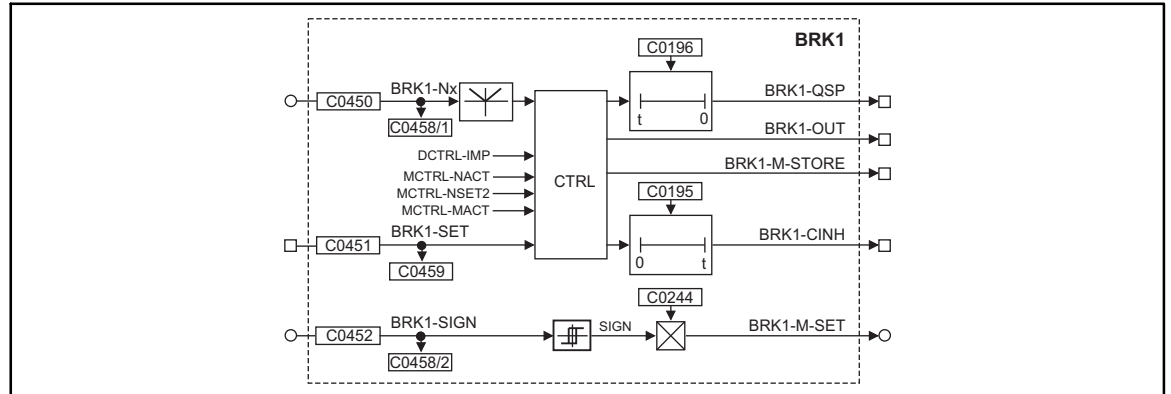


Fig. 2-45 Holding brake (BRK1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
BRK1-SET	d	C0459	bin	C0451	2	1000	-
BRK1-NX	a	C0458/1	dec [%]	C0450	1	1000	Speed threshold from which the drive can output the signal "close brake". The signal source for this input can be a control code, a fixed value or any other analog output of a FB.
BRK1-SIGN	a	C0458/2	dec [%]	C0452	1	1000	Direction of the torque with which the drive has to build a torque against the brake. The signal source for this input can be a control code, a fixed value or any other analog output of a FB.
BRK1-M-SET	a	-	dec [%]	C0244	-	0.00	Holding torque of the DC injection brake 100 % = value of C0057
BRK1-T-ACT	a	-	dec	C0195	-	99.9	Brake engaging time
BRK1-T-RELEASE	a	-	dec	C0196	-	0.0	Brake disengaging time

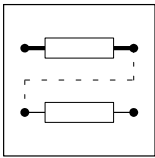


Tip!

The function block processes the absolute values of the signals MCTRL-NACT, MCTRL-MACT, MCTRL-NSET2 and BRK1-Nx.

Range of functions

- Close brake
- Open brake (release)
- Set controller inhibit



Configuration

2.4.13.1 Close brake

Function procedure

1. The function is activated using BRK1-SET = HIGH.
 - At the same time, BRK1-QSP is set to HIGH. You can use this signal to decelerate the drive to zero speed via a deceleration ramp.
2. If the setpoint speed exceeds the value at BRK1-Nx, BRK1-OUT = HIGH.
 - Invert the signal at the digital output if you need a protection against wire breakage (e. g. via C0118).
3. A time element is triggered when BRK1-OUT = HIGH. After the time set under C0195 has elapsed, BRK1-CINH is set to HIGH.
 - This signal is used to set controller inhibit (inside the controller). In general, the brake close time is set here. This is necessary because the brake does not engage immediately when BRK1-OUT = HIGH and the drive must therefore provide a holding torque for the time set.

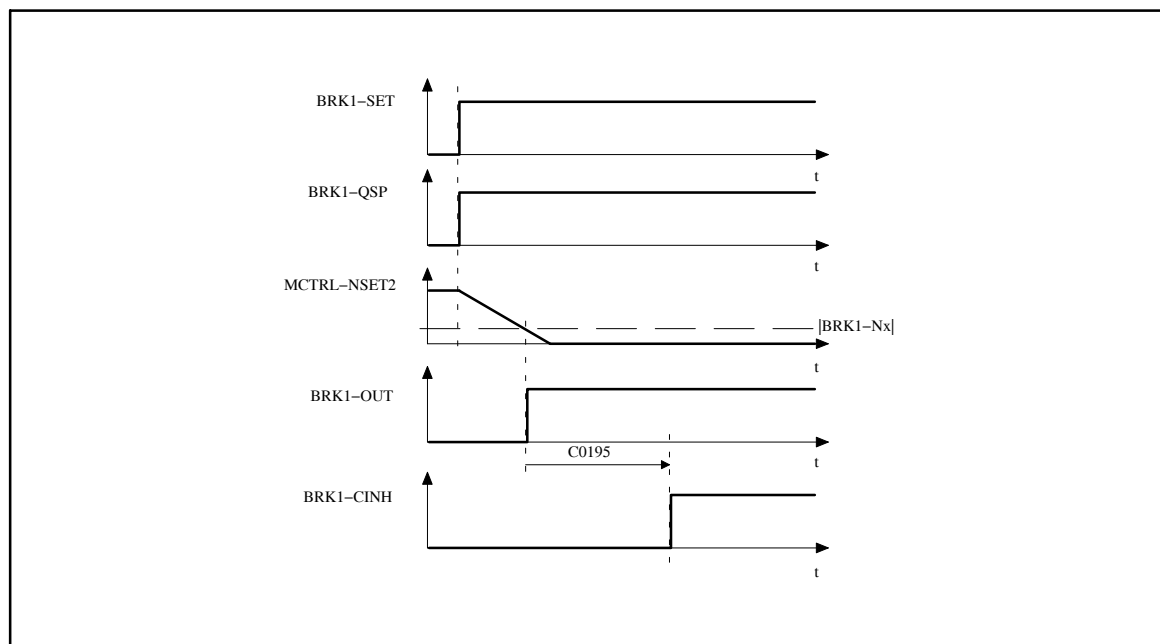
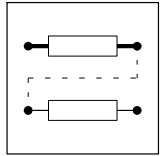


Fig. 2-46 Signal sequence when the brake is closed



2.4.13.2 Open the brake

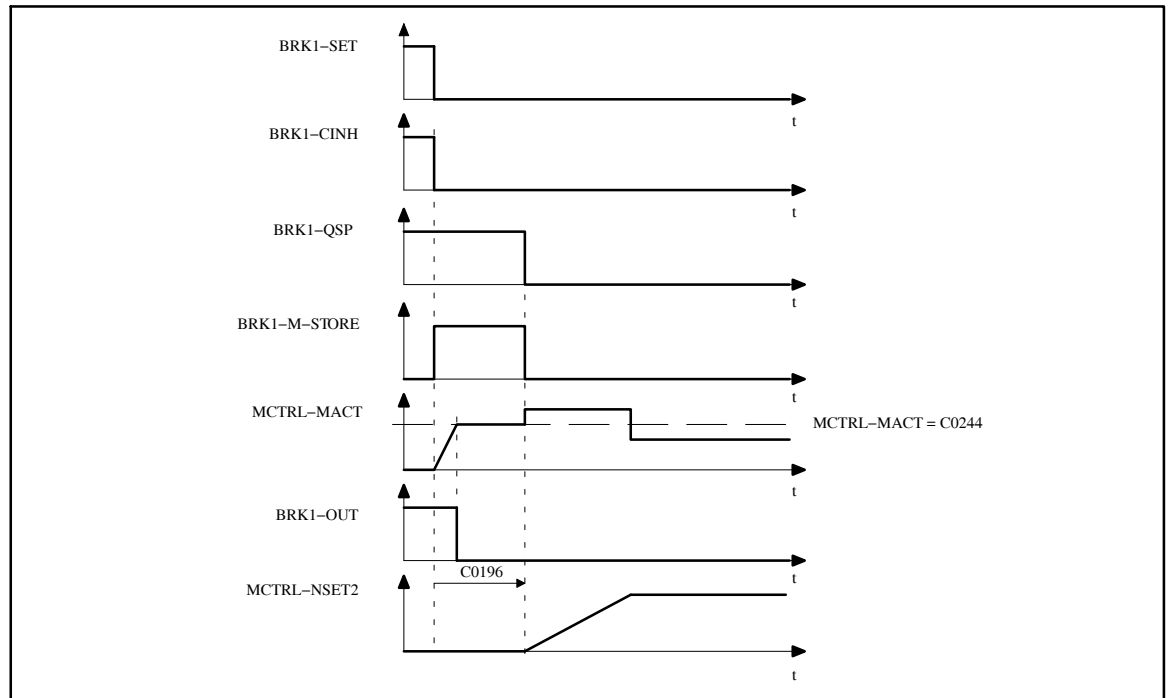


Fig. 2-47 Signal sequence when the brake is opened (released)

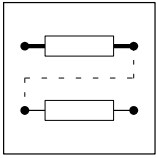
Function procedure

1. With BRK-SET = LOW, BRK-CINH is immediately set LOW. At the same time, BRK-M-STORE is set HIGH.
 - You can use this signal to create a defined torque in the drive, before the brake opens. In hoists, for instance, a "lowering" during the load transfer is thus avoided. The signal is reset only after the time set under C0196 has elapsed.
2. Once the torque has reached the value (holding torque) set under C0244, BRK-OUT = LOW.
3. When the input is reset, a time element is triggered. After the time set under C0196 has elapsed, BRK-QSP = LOW.
 - This signal is used e.g. to enable the setpoint integrator after the brake disengaging time has elapsed.



Tip!

- When the brake is disengaged before the brake disengaging time (C0196) has elapsed and an actual speed is detected which is higher than the value at BRK-Nx, BRK-QSP = LOW and BRK-M-STORE = LOW. The drive can immediately operated speed-controlled.
- For an optimum starting behaviour, the time under C0196 should not be much longer than the actual brake disengaging time.



Configuration

2.4.13.3 Set pulse inhibit

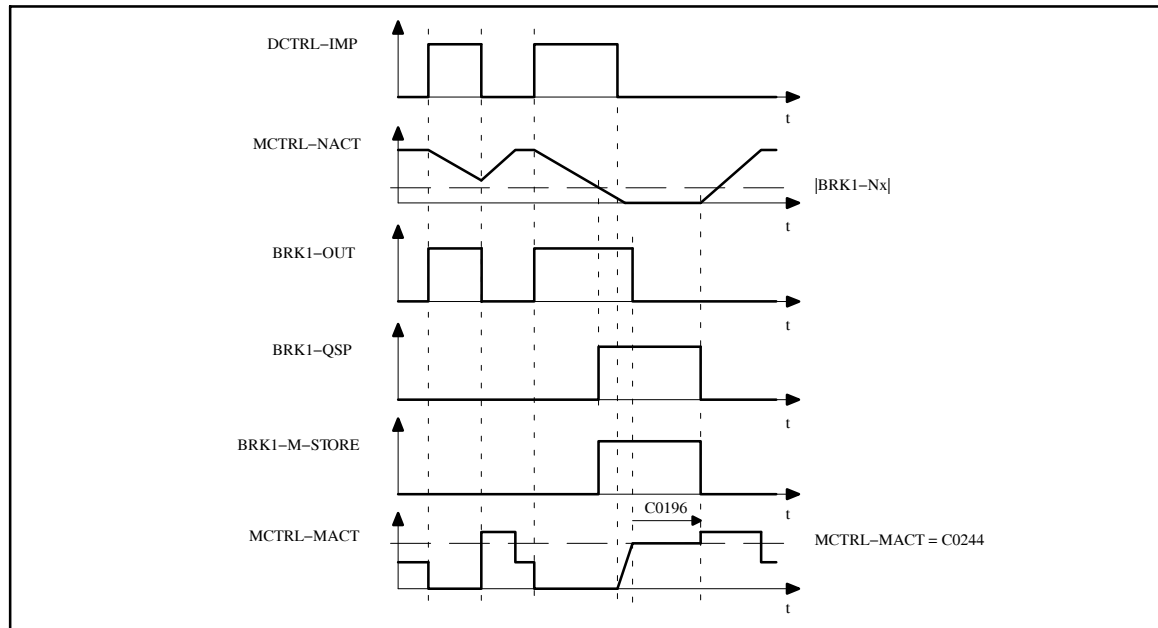
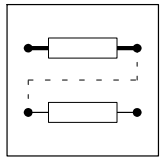


Fig. 2-48

Brake control with IMP (possible only when using an incremental encoder).



Function procedure

1. When pulse inhibit (IMP) by controller inhibit or a fault (LU, OU, ...), BRK-OUT changes immediately to HIGH.
 - The drive is then braked by its mechanical brake.
2. When pulse inhibit is reset (DCTRL-CINH = LOW) before the actual speed has fallen below the threshold BRK-Nx, BRK-OUT changes immediately to LOW (possible only with incremental encoder).
 - The drive synchronizes itself to the momentary speed and follows its setpoint.
 - The drive starts once the threshold was undershot. (2-65)

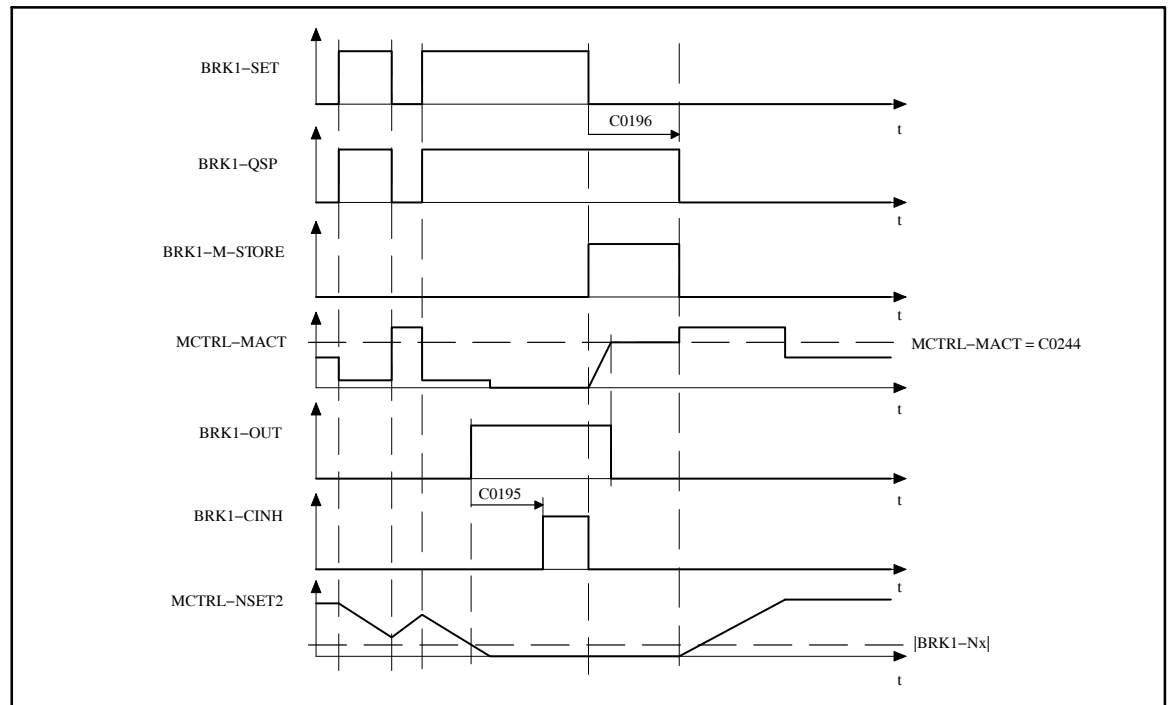
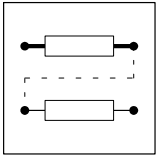


Fig. 2-49

Stopping and starting switching cycle



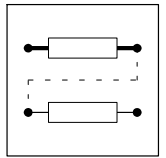
Configuration

2.4.14 System bus (CAN-IN)

A detailed description of the system bus (CAN) can be found in the "Communication Manual CAN".

2.4.15 System bus (CAN-OUT)

A detailed description of the system bus (CAN) can be found in the "Communication Manual CAN".



2.4.16 Comparison (CMP)

These FBs compare two analog signals. Comparators can be used as threshold switches. Different comparing functions are available.

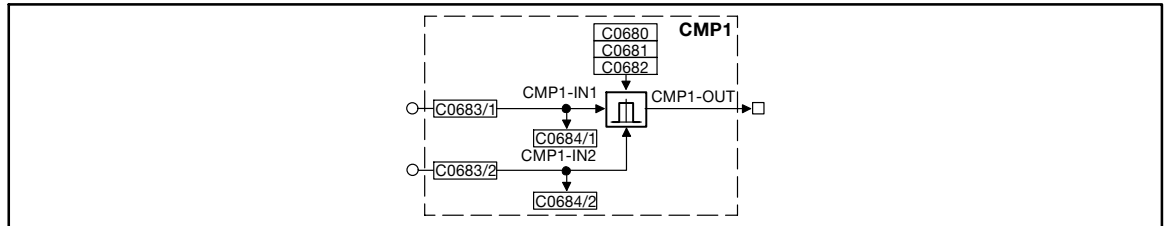


Fig. 2-50

Comparison (CMP1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
CMP1-IN1	a	C0684/1	dec [%]	C0683/1	1	5001	-
CMP1-IN2	a	C0684/2	dec [%]	C0683/2	1	19500	-
CMP1-OUT	d	-	-	-	-	-	-

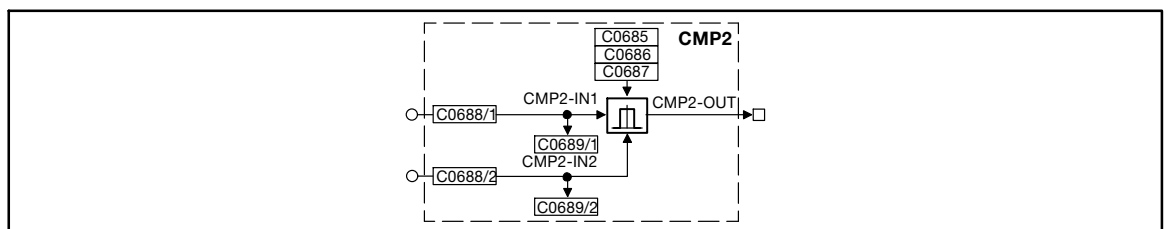


Fig. 2-51

Comparison (CMP2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
CMP2-IN1	a	C0689/1	dec [%]	C0688/1	1	1000	-
CMP2-IN2	a	C0689/2	dec [%]	C0688/2	1	1000	-
CMP2-OUT	d	-	-	-	-	-	-

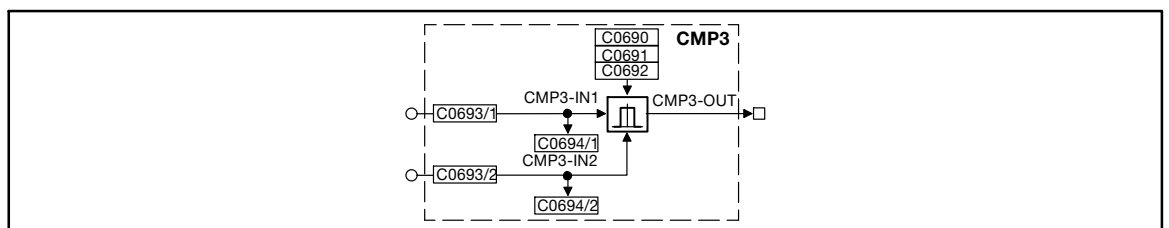
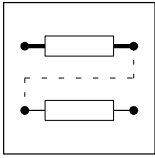


Fig. 2-52

Comparison (CMP3)



Configuration

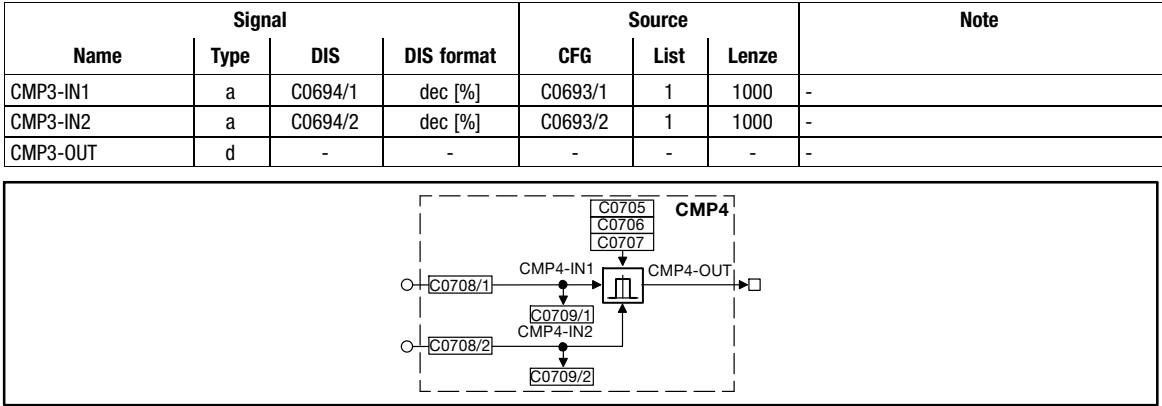


Fig. 2-53

Comparison (CMP4)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
CMP4-IN1	a	C0709/1	dec [%]	C0708/1	1	1000	-
CMP4-IN2	a	C0709/2	dec [%]	C0708/2	1	1000	-
CMP4-OUT	a	-	-	-	-	-	-

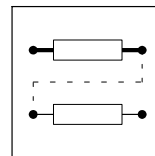
Range of functions

	Code			
	CMP1	CMP2	CMP3	CMP4
Comparing function	C0680	C0685	C0690	C0705
Hysteresis	C0681	C0686	C0691	C0706
Window	C0682	C0687	C0693	C0707

The description of CMP1 serves as an example. It is also valid for CMP2 ... CMP4.

The following comparing functions are available:

- $CMP1-IN1 = CMP1-IN2$
- $CMP1-IN1 > CMP1-IN2$
- $CMP1-IN1 < CMP1-IN2$
- $|CMP1-IN1| = |CMP1-IN2|$
- $|CMP1-IN1| > |CMP1-IN2|$
- $|CMP1-IN1| < |CMP1-IN2|$



2.4.16.1 Function 1: CMP1-IN1 = CMP1-IN2

- Selection: C0680 = 1
- This function compares two signals. For instance, you can compare the actual speed and the setpoint speed ($n_{act.} = n_{set.}$).
- The exact function can be obtained from the line diagram.

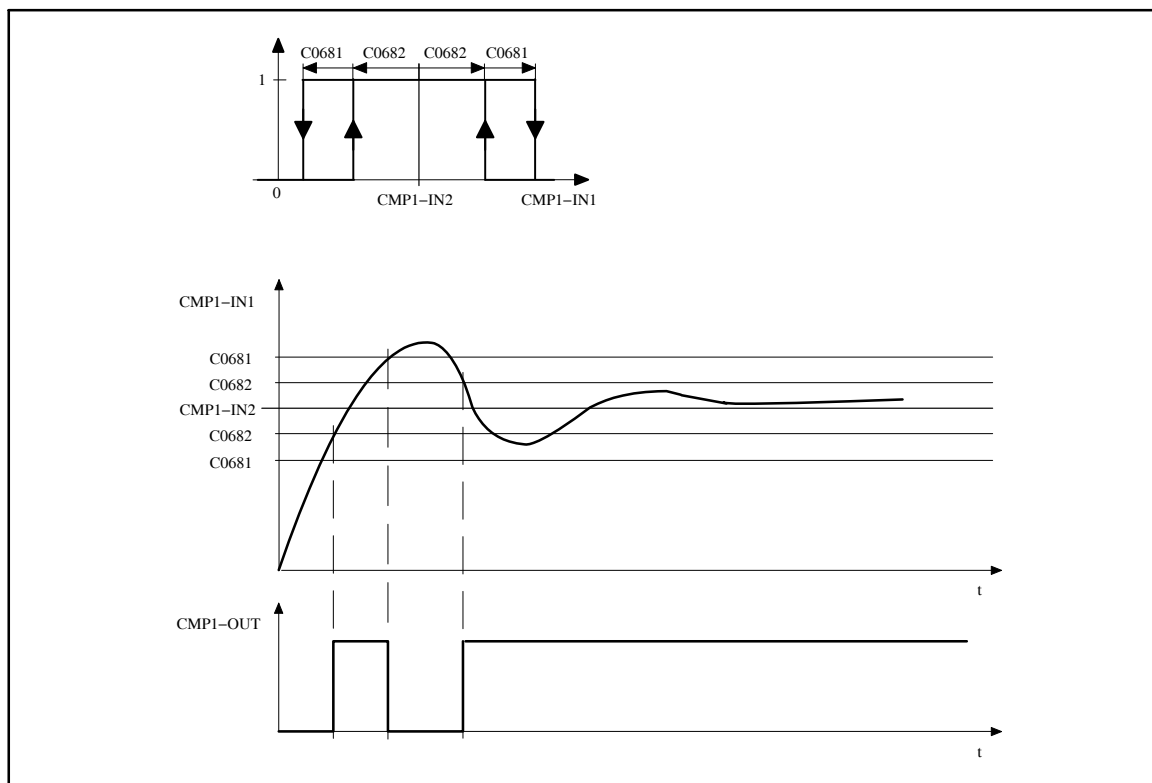
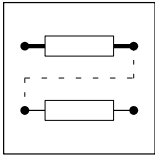


Fig. 2-54

Equality of signals (CMP1-IN1 = CMP1-IN2)

Function procedure

1. Under C0682, set the window where the equality is to be effective.
2. Under C0681 you set a hysteresis if the input signals are not stable and therefore the output oscillates.



Configuration

2.4.16.2 Function 2: $CMP1-IN1 > CMP1-IN2$

- Selection: C0680 = 2
- This function is used to find out whether the actual speed is higher than a limit value ($n_{act.} > n_x$) for one direction of rotation.

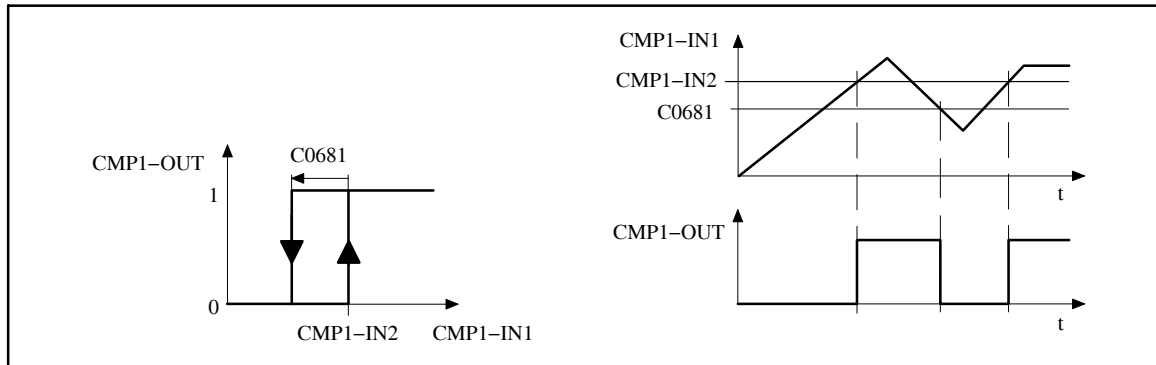


Fig. 2-55 Exceeding signal values ($CMP1-IN1 > CMP1-IN2$)

Function procedure

1. If the value at CMP1-IN1 exceeds the value at CMP1-IN2, CMP1-OUT changes from LOW to HIGH.
2. If the value at CMP1-IN1 undershoots the value at CMP1-IN2 minus C0681 again, CMP1-OUT changes from HIGH to LOW.

2.4.16.3 Function 3: $CMP1-IN1 < CMP1-IN2$

- Selection: C0680 = 3
- This function is used to find out whether the actual speed is lower than a limit value ($n_{act.} < n_x$) for one direction of rotation.

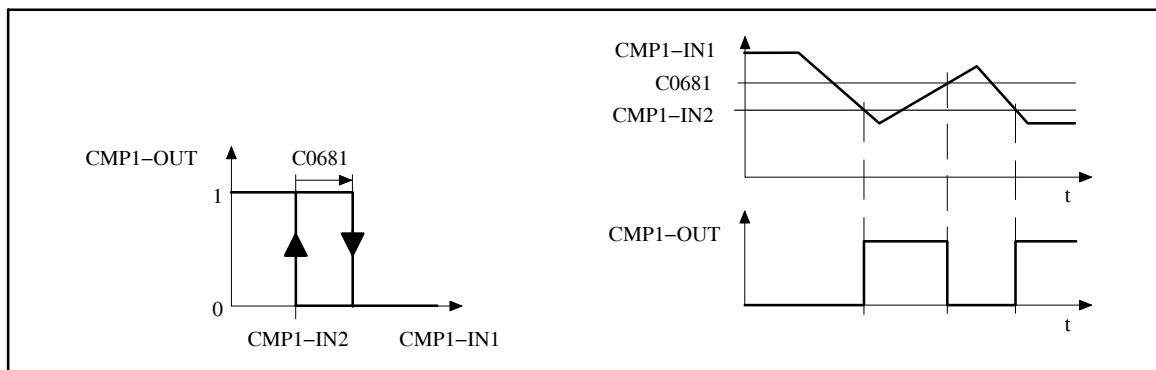
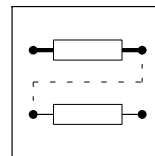


Fig. 2-56 Undershooting signal values ($CMP1-IN1 < CMP1-IN2$)

Function procedure

1. If the value at CMP1-IN1 falls below the value at CMP1-IN2, CMP1-OUT changes from LOW to HIGH.
2. If the value at CMP1-IN1 exceeds the value at CMP1-IN2 plus C0681 again, CMP1-OUT changes from HIGH to LOW.



2.4.16.4 Function 4: $|\text{CMP1-IN1}| = |\text{CMP1-IN2}|$

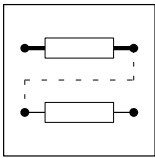
- Selection: C0680 = 4
- This function is used to carry out the comparison " $|n_{\text{act.}}| = |n_x|$ " for instance.
- This function is the same as function 1. (📖 2-71)
 - However, the absolute value of the input signals (without sign) is created before the signals are processed.

2.4.16.5 Function 5: $|\text{CMP1-IN1}| > |\text{CMP1-IN2}|$

- Selection: C0680 = 5
- This function is used to carry out the comparison " $|n_{\text{act.}}| > |n_x|$ " independently of the direction of rotation.
- This function is the same as function 3. (📖 2-72)
 - However, the absolute value of the input signals (without sign) is created before the signals are processed.

2.4.16.6 Function 6: $|\text{CMP1-IN1}| < |\text{CMP1-IN2}|$

- Selection: C0680 = 6
- This function is the same as function 2. (📖 2-72)
 - However, the absolute value of the input signals (without sign) is created before the signals are processed.
- This function is used to carry out the comparison " $|n_{\text{act.}}| < |n_x|$ " independently of the direction of rotation.



Configuration

2.4.17 Conversion (CONV)

These FBs convert analog signals or convert signals into another signal type. The conversion factor as numerator and denominator is calculated using residual value processing.

CONV1

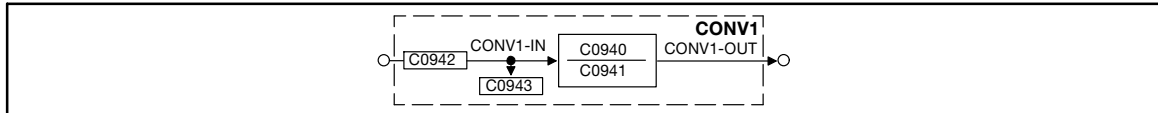


Fig. 2-57

Conversion (CONV1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
CONV1-IN	a	C0943	dec [%]	C0942	1	1000	
CONV1-OUT	a	-	-	-	-	-	Limited to ±199.99 %

This FB is used to multiply analog signals with a specified factor. The calculation is done according to the following formula:

$$\text{CONV1-OUT} = \text{CONV1-IN} \cdot \frac{\text{C0940}}{\text{C0941}}$$

Example:

- You want to multiply an analog signal with 1.12.
- For this, enter C0940 = 112 and C0941 = 100.

CONV2

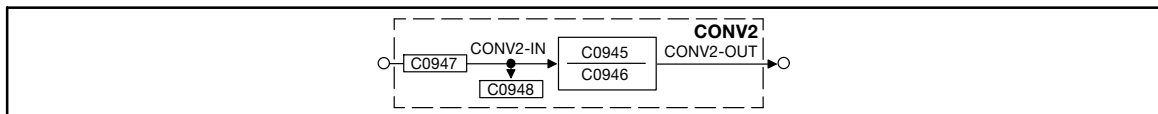


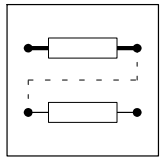
Fig. 2-58

Conversion (CONV2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
CONV2-IN	a	C0948	dec [%]	C0947	1	1000	
CONV2-OUT	a	-	-	-	-	-	Limited to ±199.99 %

This FB is used to multiply analog signals with a specified factor. The calculation is done according to the following formula:

$$\text{CONV2-OUT} = \text{CONV2-IN} \cdot \frac{\text{C0945}}{\text{C0946}}$$



CONV3

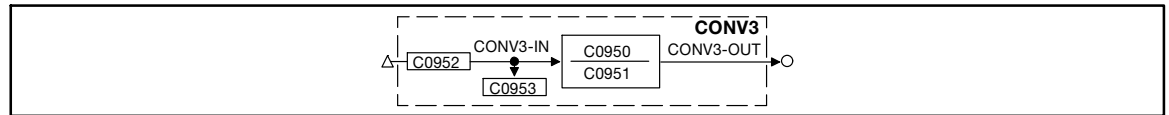


Fig. 2-59

Conversion (CONV3)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
CONV3-IN	phd	C0953	dec [rpm]	C0952	4	1000	
CONV3-OUT	a	-	-	-	-	-	Limited to ±199.99 %

This FB is used to convert speed signals into analog signals. The conversion is done according to the formula:

$$\text{CONV3-OUT} = \text{CONV3-IN} \cdot \frac{100 \%}{15000 \text{ rpm}} \cdot \frac{\text{C0950}}{\text{C0951}}$$

CONV4

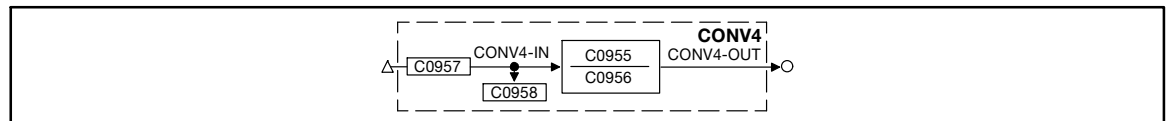


Fig. 2-60

Conversion (CONV4)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
CONV4-IN	phd	C0958	dec [rpm]	C0957	4	1000	
CONV4-OUT	a	-	-	-	-	-	Limited to ±199.99 %

This FB is used to convert speed signals into analog signals. The conversion is done according to the formula:

$$\text{CONV4-OUT} = \text{CONV4-IN} \cdot \frac{100 \%}{15000 \text{ rpm}} \cdot \frac{\text{C0955}}{\text{C0956}}$$

CONV5

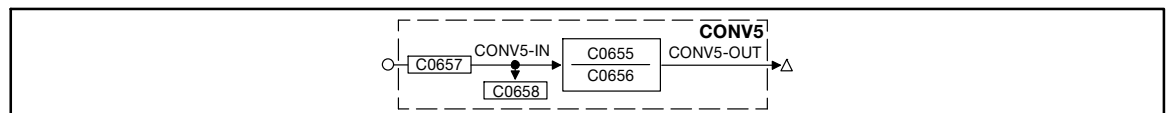


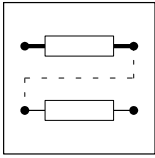
Fig. 2-61

Conversion (CONV5)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
CONV5-IN	a	C0658	dec [%]	C0657	1	1000	
CONV5-OUT	phd	-	-	-	-	-	Limited to ±29999 rpm

This FB is used to convert analog signals into speed signals. The conversion is done according to the formula:

$$\text{CONV5-OUT} = \text{CONV5-IN} \cdot \frac{15000 \text{ rpm}}{100 \%} \cdot \frac{\text{C0655}}{\text{C0656}}$$



Configuration

2.4.18 Conversion phase to analog (CONVPHA)

This FB converts a phase signal into an analog signal.

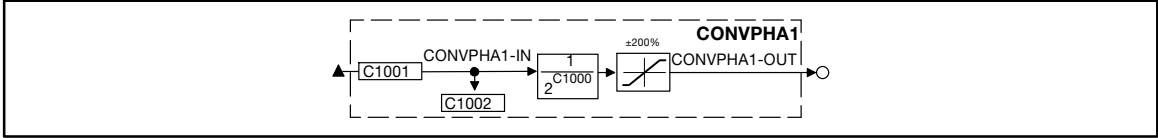


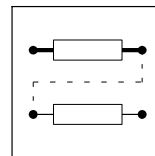
Fig. 2-62 Conversion phase to analog (CONVPHA1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	List	
CONVPHA1-IN	ph	C1002	dec [inc]	C1001	3	1000	-
CONVPHA1-OUT	a	-	-	-	-	-	limited to ±200 %, residual value processing

Function

- The conversion with adaptation using divisor is as follows:

$$\text{CONVPHA1-OUT} = \text{CONVPHA1-IN [inc]} \cdot \frac{100 \%}{2^{14} \cdot 2^{C1000}}$$



2.4.19 Characteristic function (CURVE)

This FB converts analog signals according to the programmed characteristic.

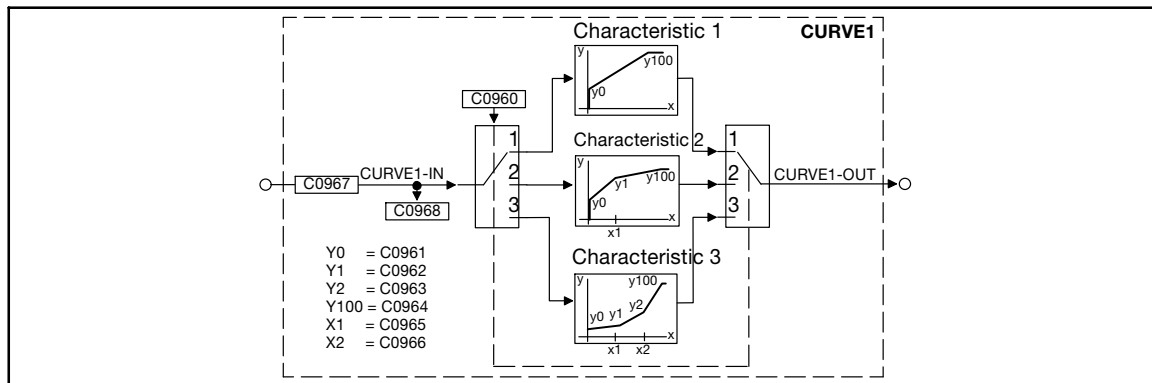


Fig. 2-63

Characteristic function (CURVE1)

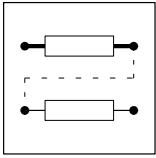
Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
CURVE1-IN	a	C0968	dec [%]	C0967	1	5001	-
CURVE1-OUT	a	-	-	-	-	-	-

Range of functions

- Characteristic with two co-ordinates
- Characteristic with three co-ordinates
- Characteristic with four co-ordinates

Function

- A linear interpolation is carried out between the co-ordinates.
- For negative values at CURVE1-IN, setting values of the interpolation points are processed as inverted values (see diagrams).
 - If this is not desired, add an ABS or a LIM function block in front of or behind the CURVE function block.



Configuration

2.4.19.1 Characteristic with two co-ordinates

C0960 = 1

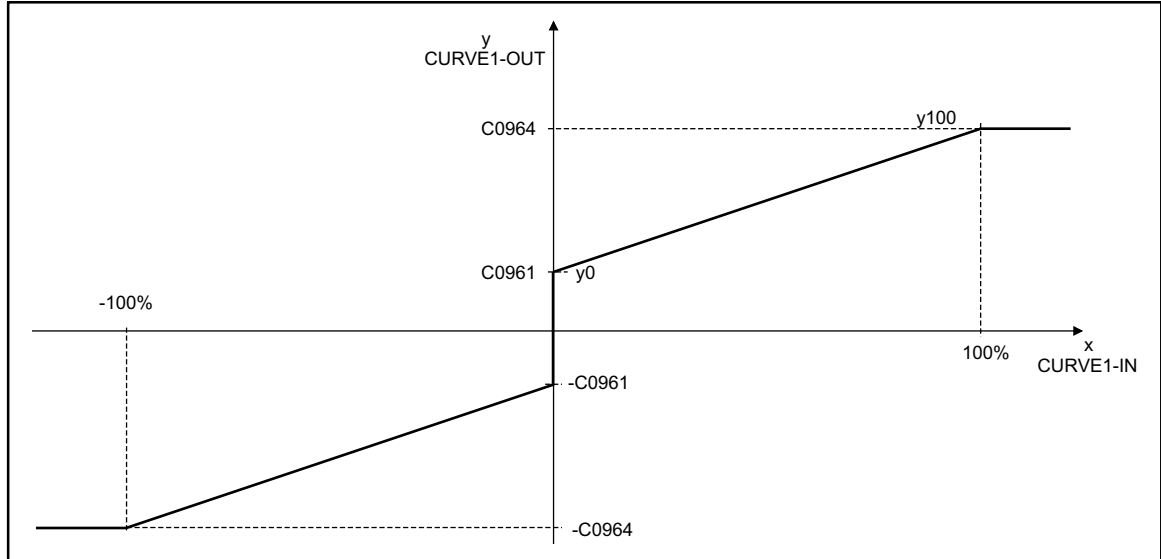


Fig. 2-64

Characteristic with two co-ordinates

2.4.19.2 Characteristic with three co-ordinates

C0960 = 2

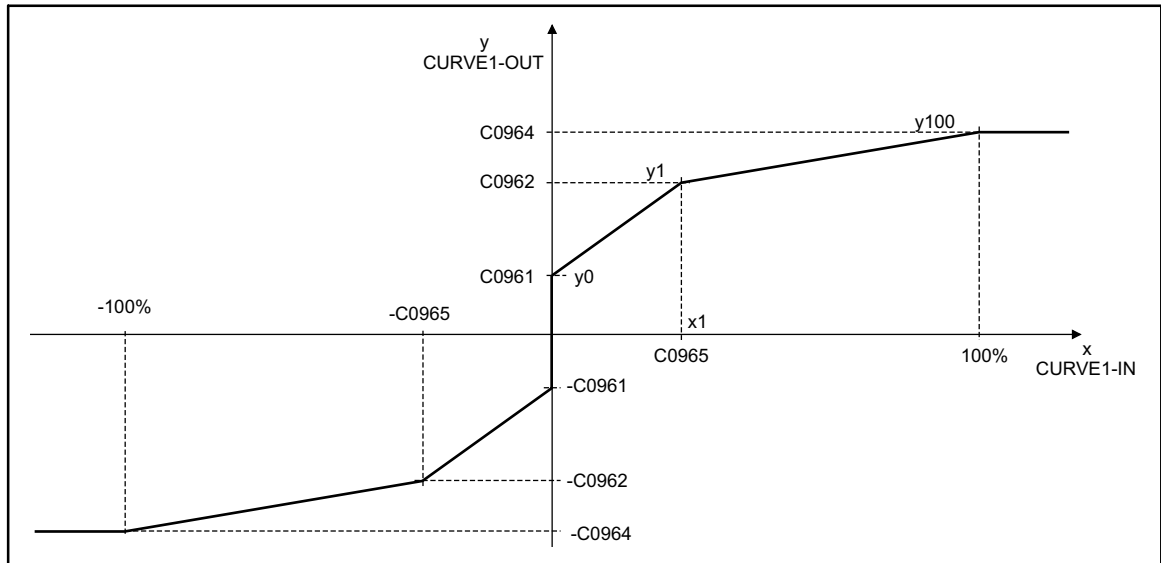
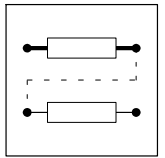


Fig. 2-65

Characteristic with three co-ordinates



2.4.19.3 Characteristic with four co-ordinates

C0960 = 3

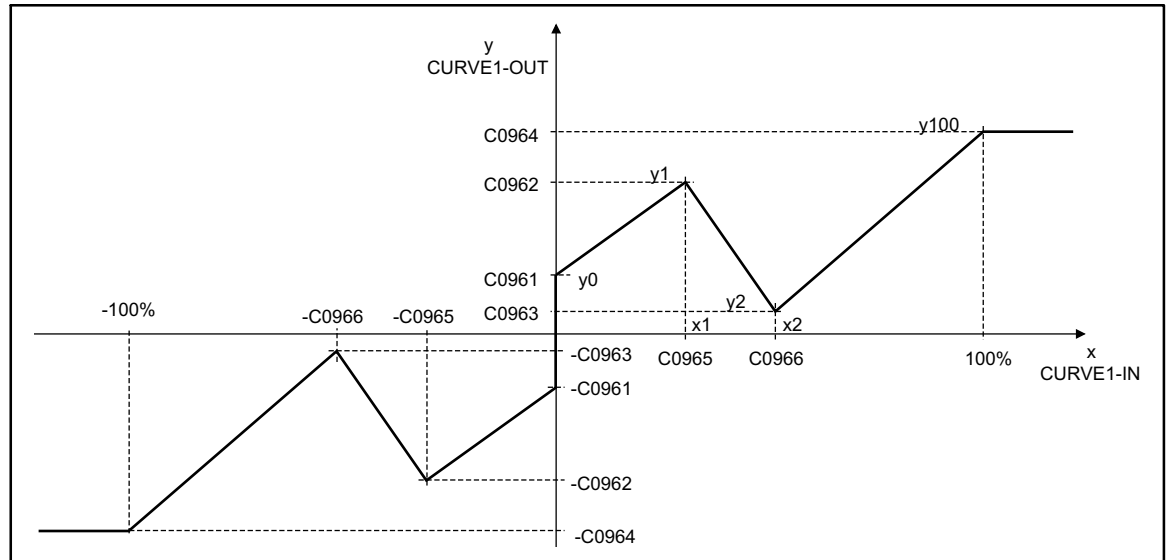
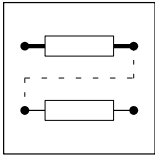


Fig. 2-66 Characteristic with four co-ordinates



Configuration

2.4.20 Dead band (DB)

This FB eliminates input signals around the zero point (e.g. disturbances on analog input voltages).

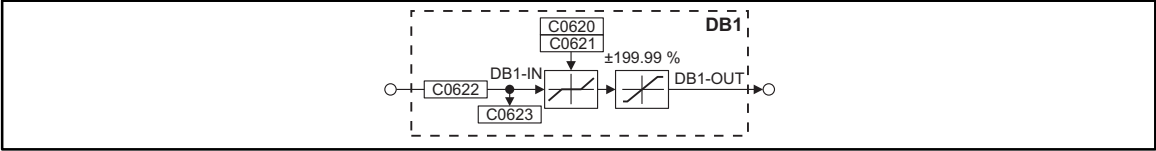


Fig. 2-67 Dead band (DB1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
DB1-IN	a	C0623	dec [%]	C0622	1	1000	-
DB1-OUT	a	-	-	-	-	-	limited to ±199.99 %

Function

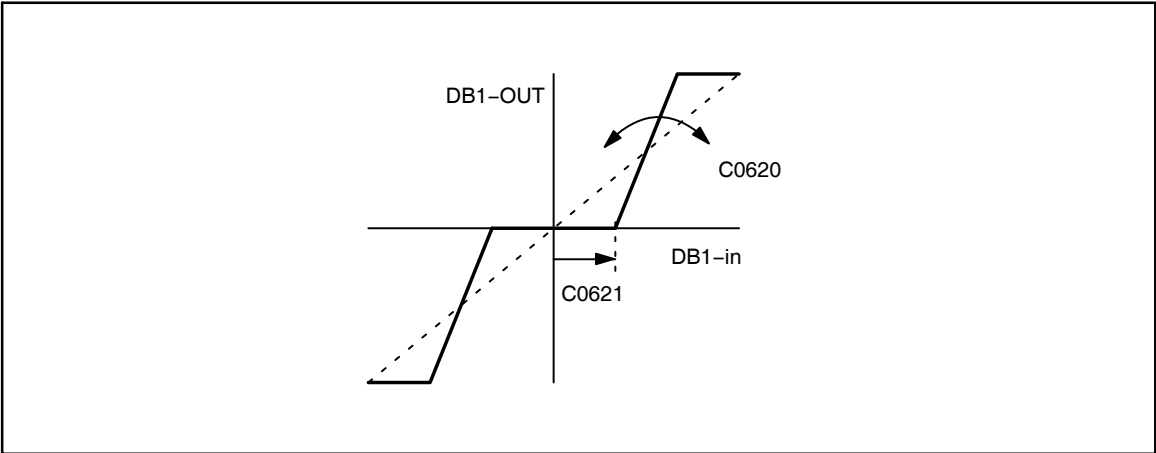
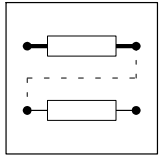


Fig. 2-68 Dead band and gain

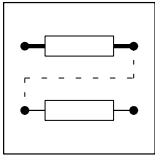
- Under C0621 you can set the parameters for the dead band.
- Under C0620 you can alter the gain.



2.4.21 Diameter calculator (DCALC)

For the function block description, please see the corresponding System Manual:

- EVF9321 ... EVF9333 controllers
 - System Manual with document number EDSVF9333V
- EVF9335 ... EVF9338 and EVF9381 ... EVF9383 controllers
 - System Manual with document number EDSVF9383V



Configuration

2.4.22 Device control (DCTRL)

This FB controls the device to specified states (e.g. trip, trip reset, quick stop or controller inhibit).

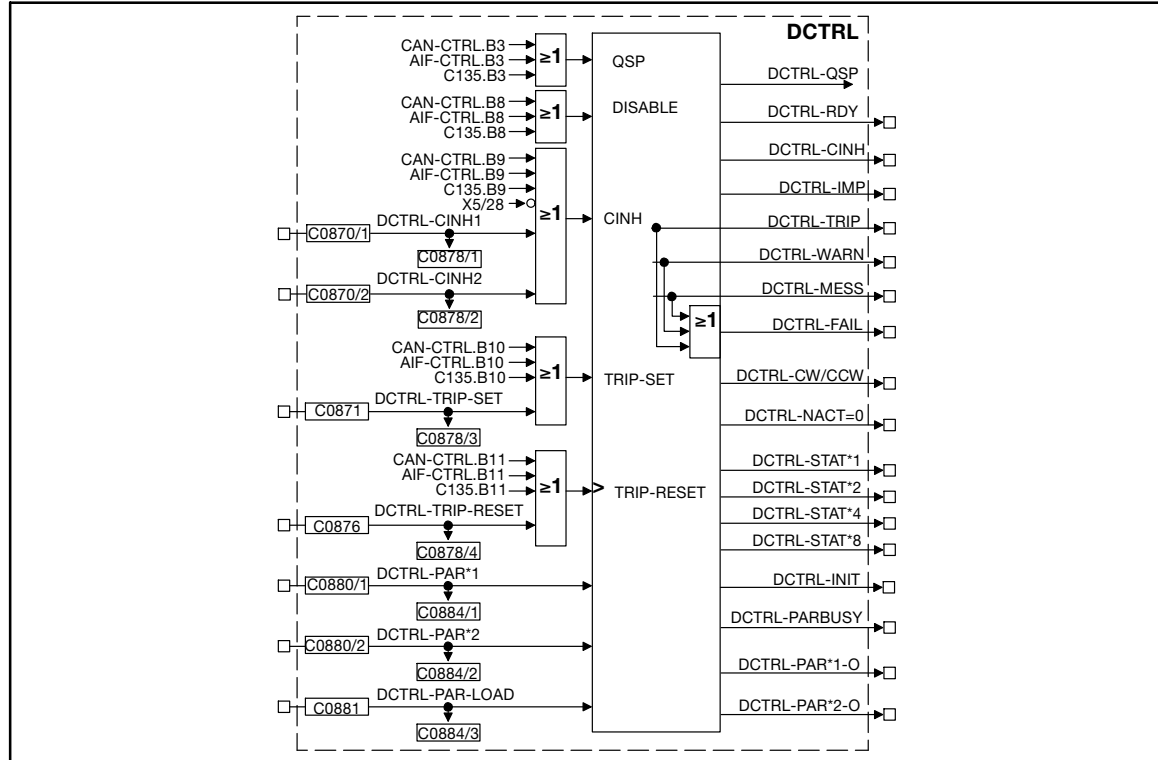
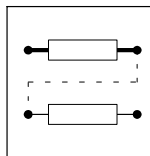


Fig. 2-69 Device control (DCTRL)



Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
DCTRL-CINH1	d	C0878/1	bin	C0870/1	2	1000	HIGH = inhibit controller
DCTRL-CINH2	d	C0878/2	bin	C0870/2	2	1000	HIGH = inhibit controller
DCTRL-TRIP-SET	d	C0878/3	bin	C0871	2	54	HIGH = fault indication EEr
DCTRL-TRIPRESET	d	C0878/4	bin	C0876	2	55	LOW-HIGH signal = Trip reset
DCTRL-PAR*1	d	C0884/1	bin	C0880/1	2	1000	Select parameter set
DCTRL-PAR*2	d	C0884/2	bin	C0880/2	2	1000	Select parameter set
DCTRL-PAR-LOAD	d	C0884/3	bin	C0881	2	1000	LOW-HIGH signal = Load parameter set
DCTRL-RDY	d	-	-	-	-	-	HIGH = Ready for operation
DCTRL-CINH	d	-	-	-	-	-	HIGH = Controller reset
DCTRL-IMP	d	-	-	-	-	-	HIGH = High-resistance power output stages
DCTRL-TRIP	d	-	-	-	-	-	HIGH = Active fault
DCTRL-WARN	d	-	-	-	-	-	HIGH = Active warning
DCTRL-MESS	d	-	-	-	-	-	HIGH = Active message
DCTRL-FAIL	d	-	-	-	-	-	-
DCTRL-CW/CCW	d	-	-	-	-	-	LOW = CW rotation, HIGH = CCW rotation
DCTRL-NACT=0	d	-	-	-	-	-	HIGH = Motor speed < C0019
DCTRL-STAT*1	d	-	-	-	-	-	general status (binary coded)
DCTRL-STAT*2	d	-	-	-	-	-	general status (binary coded)
DCTRL-STAT*4	d	-	-	-	-	-	general status (binary coded)
DCTRL-STAT*8	d	-	-	-	-	-	general status (binary coded)
DCTRL-INIT	d	-	-	-	-	-	-
DCTRL-PARBUSY	d	-	-	-	-	-	HIGH = Change of parameter set active
DCTRL-PAR*1-0	d	-	-	-	-	-	Parameter set X active (binary coded)
DCTRL-PAR*2-0	d	-	-	-	-	-	Parameter set X active (binary coded)

Range of functions

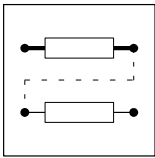
- Quick stop (QSP)
- Operation inhibited (DISABLE)
- Controller inhibit (CINH)
- TRIP-SET
- TRIP-RESET
- Changing the parameter set (PAR)
- Controller state

2.4.22.1

Quick stop (QSP)

If QSP is activated, the drive is decelerated to zero speed via the deceleration ramp C0105.

- QSP is activated via three inputs:
 - Control word CAN-CTRL.B3 from CAN-IN1
 - Control word AIF-CTRL.B 3 from AIF-IN
 - Control word C0135.B3
- All inputs are linked by an OR-operation
- QSP can also be activated via the input MCTRL-QSP in the FB MCTRL.



Configuration

2.4.22.2 Operating inhibited (DISABLE)

When the operation is inhibited, the output stages are inhibited and all controllers are reset. When the operation is inhibited, the drive cannot be started by the controller enable command.

- The function is activated via three inputs:
 - Control word CAN-CTRL.B8 from CAN-IN1
 - Control word AIF-CTRL.B8 from AIF-IN
 - Control word C0135.B8
- All inputs are linked by an OR-operation.

2.4.22.3 Controller inhibit (CINH)

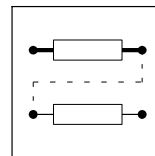
When the controller is inhibited, the output stages are inhibited and all controllers are reset.

- The function is activated via seven inputs:
 - Terminal X5/28 (LOW = controller inhibit)
 - MONIT-TRIP (HIGH = In the MONIT function block the monitoring configured to TRIP has tripped)
 - Control word CAN-CTRL.B9 from CAN-IN1
 - Control word AIF-CTRL.B9 from AIF-IN
 - Control word C0135.B9
 - Free input DCTRL-CINH1
 - Free input DCTRL-CINH2
- All inputs are linked by an OR-operation.

2.4.22.4 TRIP-SET

The drive is controlled into the state under C0581 and indicates EEr (external monitoring).

- The function is activated via four inputs:
 - Control word CAN-CTRL.B10 from CAN-IN1
 - Control word AIF-CTRL.B10 from AIF-IN
 - Control word C0135.B10
 - Free input DCTRL-TRIP-SET
- All inputs are linked by an OR-operation.



2.4.22.5 TRIP-RESET

TRIP-RESET resets an active trip once the cause of fault has been eliminated. If the cause of fault is still active, there is no reaction.

- The function is activated via four inputs:
 - Control word CAN-CTRL.B11 from CAN-IN1
 - Control word AIF-CTRL.B11 from AIF-IN
 - Control word C0135.B11
 - Free input DCTRL-TRIP-RESET
- All inputs are linked by an OR-operation.
- The function can only be performed by a LOW-HIGH edge of the signal resulting from the OR operation.



Tip!

If one of the inputs is set to HIGH, no LOW-HIGH edge can occur at the resulting signal.

2.4.22.6 Changing the parameter set (PAR)

The controller loads and uses the selected parameter set.

- The parameter set to be loaded is selected via the inputs DCTRL-PAR*1 and DCTRL-PAR*2. The inputs are binary coded (1 of 4).

PAR*2	PAR*1	Selected parameter set
0	0	Parameter set 1
0	1	Parameter set 2
1	0	Parameter set 3
1	1	Parameter set 4

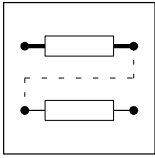
- With a LOW-HIGH - signal at the input DCTRL-PAR-LOAD the controller changes to the selected parameter set.
- The parameter set can be changed only if the controlled inhibit is activated. (📖 2-84)



Tip!

If the parameter set to be loaded via terminal X5/Ex is selected before connecting the supply voltage, the LOW-HIGH signal at the input DCTRL-PAR-LOAD is not necessary. In this case, the controller loads automatically the selected parameter set.

- The controller is not ready for approx. 1 s. DCTRL- RDY shows LOW during this time.

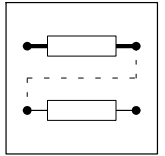


Configuration

2.4.22.7 Controller state

The state is binary coded in the outputs DCTRL-STAT*x.

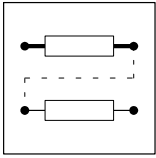
STAT*8	STAT*4	STAT*2	STAT*1	Action of the controller
0	0	0	0	Initialization after connection of the supply voltage
0	0	0	1	Lock mode, Protection against restart active C0142
0	0	1	1	Drive is in controller inhibit mode
0	1	1	0	Controller enabled
0	1	1	1	The release of a monitoring function resulted in a "message"
1	0	0	0	The release of a monitoring function resulted in a "trip"



2.4.23 Digital frequency input (DFIN)

For the function block description, please see the corresponding System Manual:

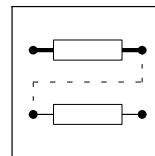
- EVF9321 ... EVF9333 controllers
 - System Manual with document number EDSVF9333V
- EVF9335 ... EVF9338 and EVF9381 ... EVF9383 controllers
 - System Manual with document number EDSVF9383V



2.4.24 Digital frequency output (DFOUT)

For the function block description, please see the corresponding System Manual:

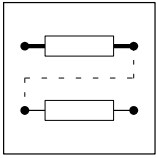
- EVF9321 ... EVF9333controllers
 - System Manual with document number EDSVF9333V
- EVF9335 ... EVF9338 and EVF9381 ... EVF9383controllers
 - System Manual with document number EDSVF9383V



2.4.25 Digital frequency ramp function generator (DFRFG)

For the function block description, please see the corresponding System Manual:

- EVF9321 ... EVF9333controllers
 - System Manual with document number EDSVF9333V
- EVF9335 ... EVF9338 and EVF9381 ... EVF9383controllers
 - System Manual with document number EDSVF9383V



Configuration

2.4.26 Digital frequency processing (DFSET)

For the function block description, please see the corresponding System Manual:

- EVF9321 ... EVF9333 controllers
 - System Manual with document number EDSVF9333V
- EVF9335 ... EVF9338 and EVF9381 ... EVF9383 controllers
 - System Manual with document number EDSVF9383V

2.4.27 Delay (DIGDEL)

These FBs delay digital signals. You can use the FB for the control of other functions or the generation of status information.

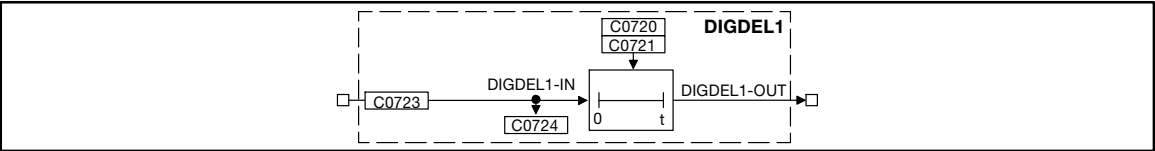


Fig. 2-70 Delay (DIGDEL1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DIGDEL1-IN	d	C0724	bin	C0723	2	1000	-
DIGDEL1-OUT	d	-	-	-	-	-	-

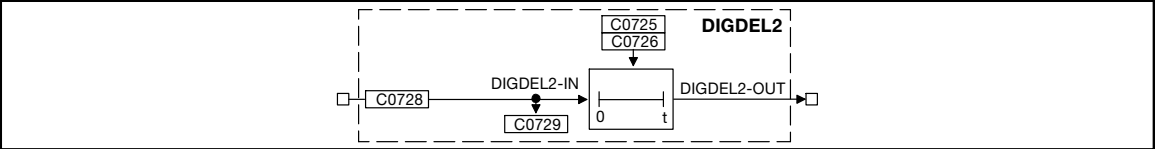
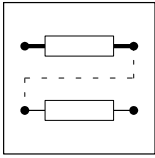


Fig. 2-71 Delay (DIGDEL2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DIGDEL2-IN	d	C0729	bin	C0728	2	1000	-
DIGDEL-OUT	d	-	-	-	-	-	-

Range of functions

- On-delay
- Off-delay
- General delay



Configuration

2.4.27.1 On-delay

- C0720 = 0 (DIGDEL1)
- C0725 = 0 (DIGDEL2)

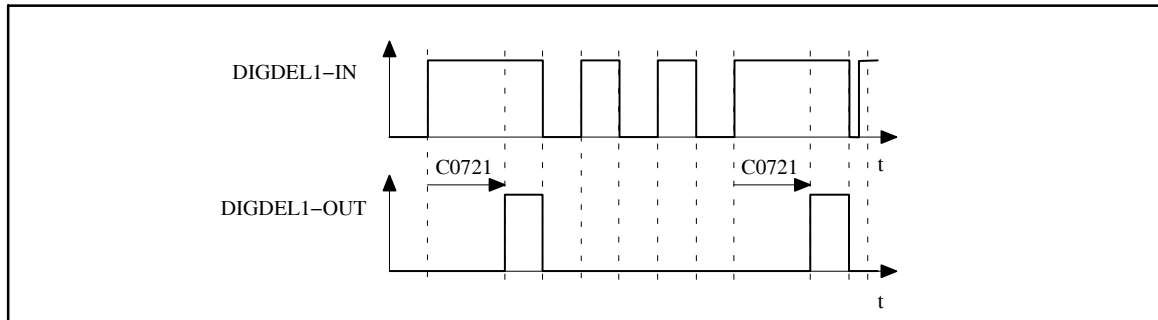


Fig. 2-72

On-delay (DIGDEL1)

In this function, the time-element operates like a retriggerable monoflop:

Function procedure

1. A LOW-HIGH edge at DIGDELx-IN starts the time element.
2. After the delay set under C0721 (DIGDEL1) or C0726 (DIGDEL2) has elapsed, DIGDELx-OUT changes to HIGH.
3. A HIGH-LOW signal at DIGDELx-IN resets the time element and changes DIGDELx-OUT to LOW.

2.4.27.2 Off-delay

- C0720 = 1 (DIGDEL1)
- C0725 = 1 (DIGDEL2)

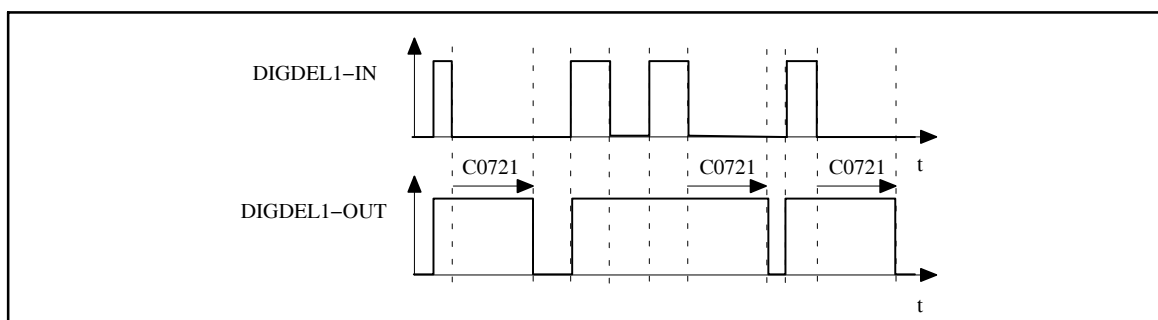
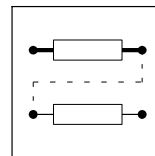


Fig. 2-73

Off-delay (DIGDEL1)

Function procedure

1. A LOW-HIGH signal at DIGDELx-IN changes DIGDELx-OUT to HIGH and resets the time element.
2. A HIGH-LOW signal at DIGDELx-IN starts the time element.
3. After the delay set under C0721 (DIGDEL1) or C0726 (DIGDEL2) has elapsed, DIGDELx-OUT changes to LOW.



2.4.27.3 General delay

- C0720 = 2 (DIGDEL1)
- C0725 = 2 (DIGDEL2)

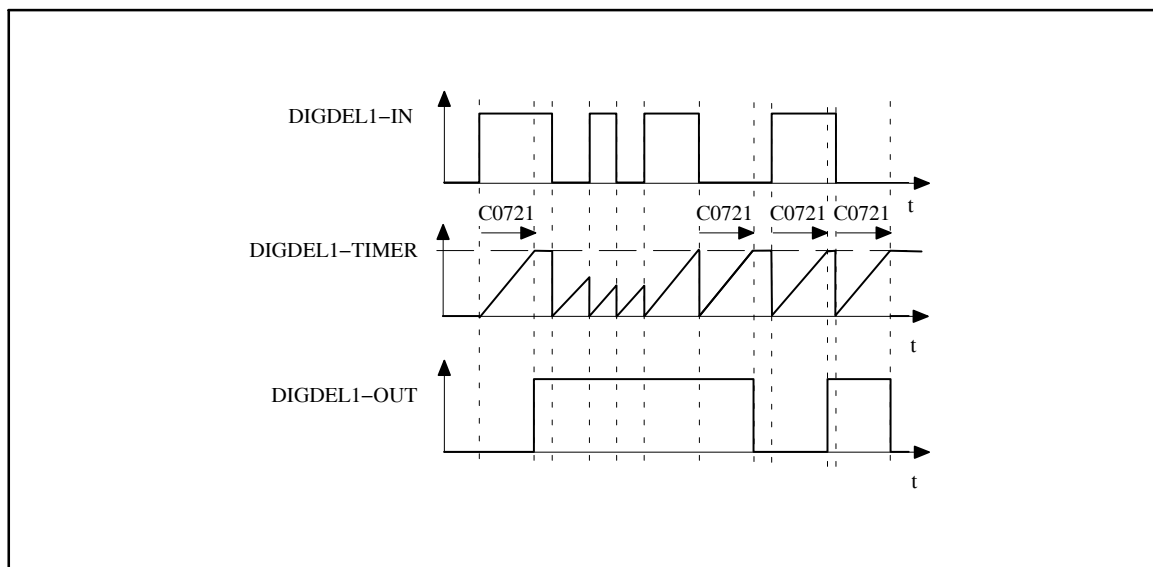
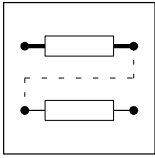


Fig. 2-74

General delay (DIGDEL1)

Function procedure

1. Any signal at DIGDELx-IN starts the time element.
2. When the timer has reached the upper limit (DIGDEL1: C0721, DIGDEL2: C0726), DIGDELx-OUT is set to the same value applied at DIGDELx-IN.



Configuration

2.4.28 Digital inputs (DIGIN)

This FB reads digital signals at the terminals X5/E1 ... X5/E5 and X5/ST and conditions them.

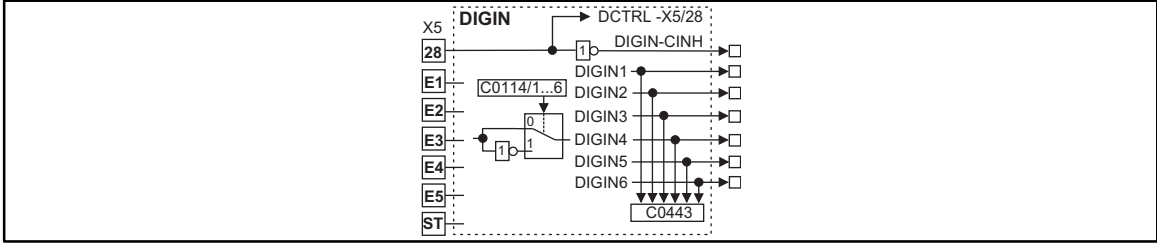


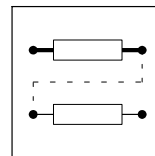
Fig. 2-75 Digital inputs (DIGIN)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
DIGIN-CINH	d	-	dec	-	-	-	Controller inhibit acts directly on the DCTRL control
DIGIN1	d	C0443	dec	-	-	-	-
DIGIN2	d	C0443	dec	-	-	-	-
DIGIN3	d	C0443	dec	-	-	-	-
DIGIN4	d	C0443	dec	-	-	-	-
DIGIN5	d	C0443	dec	-	-	-	-
DIGIN6	d	C0443	dec	-	-	-	-

Function

The terminals X5/E1 to X5/E5 and X5/ST are scanned every millisecond. The level for every input can be inverted.

- Select the desired input under C0114 with the corresponding subcode (e.g. subcode C0114/3 for input X5/E3)
- Select the desired level:
 - 0 = Level not inverted (HIGH active)
 - 1 = Level inverted (LOW active)



2.4.29 Digital outputs (DIGOUT)

This FB conditions digital signals and output them at terminals X5/A1 ... X5/A4.

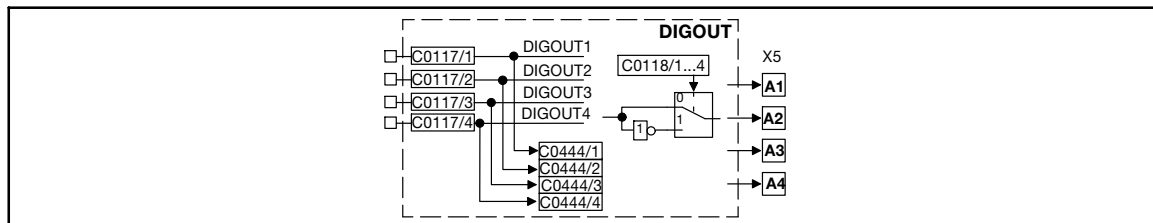


Fig. 2-76

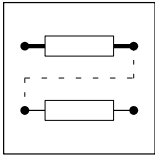
Digital outputs (DIGOUT)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
DIGOUT1	d	C0444/1	bin	C0117/1	2	15000	-
DIGOUT2	d	C0444/2	bin	C0117/2	2	10650	-
DIGOUT3	d	C0444/3	bin	C0117/3	2	500	-
DIGOUT4	d	C0444/4	bin	C0117/4	2	5003	-

Function

The terminals X5/A1 to X5/A4 are updated every millisecond. The level for every output can be inverted.

- Select the desired output under C0118 with the corresponding subcode (e.g. subcode C0118/3 for output X5/A3)
- Select the desired level:
 - 0 = Level not inverted (HIGH active)
 - 1 = Level inverted (LOW active)



Configuration

2.4.30 Differentiation (DT1-1)

This FB differentiates signals. You can, for instance, calculate the controller acceleration (dv/dt) required for applying an acceleration.

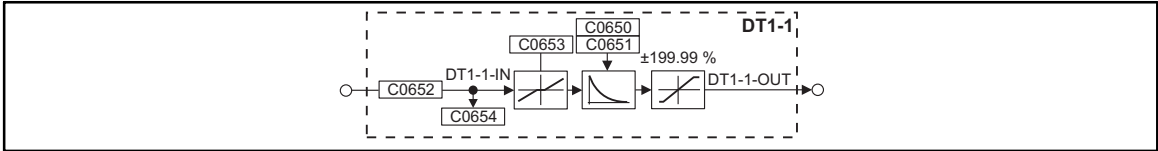


Fig. 2-77 Differentiation (DT1-1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
DT1-1-IN	a	C0654	dec [%]	C0652	1	1000	-
DT1-1-OUT	a	-	-	-	-	-	limited to ±199.99 %

Function

- The gain K is selected under C0650.
- The delay time T_v is selected under C0651.
- The input sensitivity can be reduced under C0653.
 - According to the setting, the FB only evaluates the most significant bits specified.

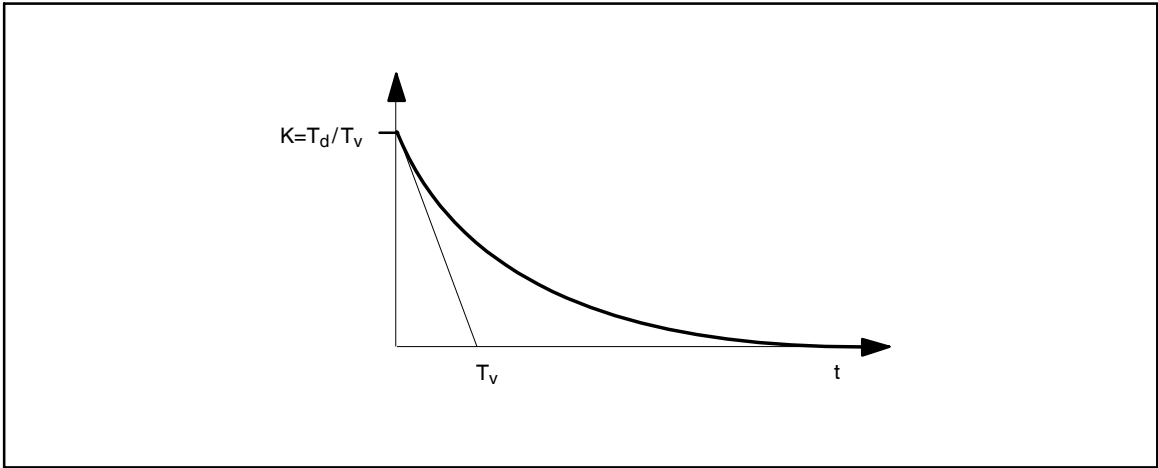
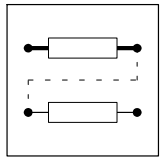


Fig. 2-78 Delay time T_v



2.4.31 Counter (FCNT)

This FB is used for digital counting up and down.

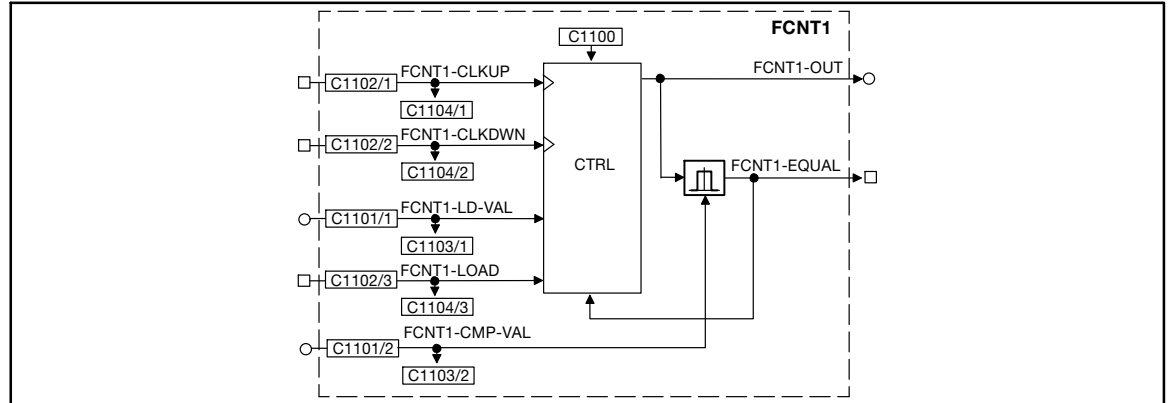


Fig. 2-79

Counter (FCNT1)

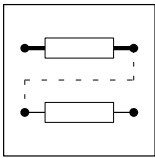
Name	Signal			Source		Note
	Type	DIS	DIS format	CFG	List	
FCNT1-CLKUP	d	C1104/1	bin	C1102/1	2	LOW-HIGH edge = counts up by 1
FCNT1-CLKDWN	d	C1104/2	bin	C1102/2	2	LOW-HIGH edge = counts down by 1
FCNT1-LD-VAL	a	C1103/1	dec	C1101/1	1	Start value
FCNT1-LOAD	d	C1104/3	bin	C1102/3	2	- HIGH = Accept start value - The input has the highest priority
FCNT1-CMP-VAL	a	C1103/2	dec	C1101/2	1	Comparison value
FCNT1-OUT	a	-	-	-	-	Counter limited to $\pm 199.99\%$
FCNT1-EQUAL	d	-	-	-	-	HIGH = comparison value reached

Setting start value

- As long as FCNT1-LOAD = HIGH, the value at FCNT1-LD-VAL (start value) is switched to FCNT1-OUT.
- When FCNT1-LOAD = LOW, the counter is enabled for counting up and down.
- When FCNT1-LOAD = HIGH, the counter is reset to the value at FCNT1-LD-VAL.

Counting up/down

- A LOW-HIGH signal at FCNT1-CLKUP increases the counter by 1.
- A LOW-HIGH signal at FCNT1-CLKDWN reduces the counter by 1.



Configuration

Comparing counter

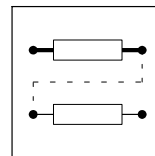
- C1100 = 1
 - If | counter content | $\geq$ | FCNT1-CMP-VAL | (comparison value), FCNT1-EQUAL is set = HIGH for 1 ms. Afterwards the counter is reset to the starting value (FCNT1-LD-VAL).



Note!

If the signal is to be available longer, e. g. for a query of the output via a PLC, you can prolong the signal via the TRANS function block.

- C1100 = 2
 - If | counter content | $\geq$ | FCNT1-CMP-VAL | (comparison value), the counter is stopped.
 - Via FCNT1-LOAD = HIGH, the counter is reset to the starting value (FCNT1-LD-VAL).
- C1100 = 3
 - If | counter content | = | FCNT1-CMP-VAL | (comparison value), the counter is stopped.
 - Via FCNT1-LOAD = HIGH, the counter is reset to the starting value (FCNT1-LD-VAL).



2.4.32 Free digital outputs (FDO)

This FB is used to link free digital signals which are to be transmitted to a field bus.

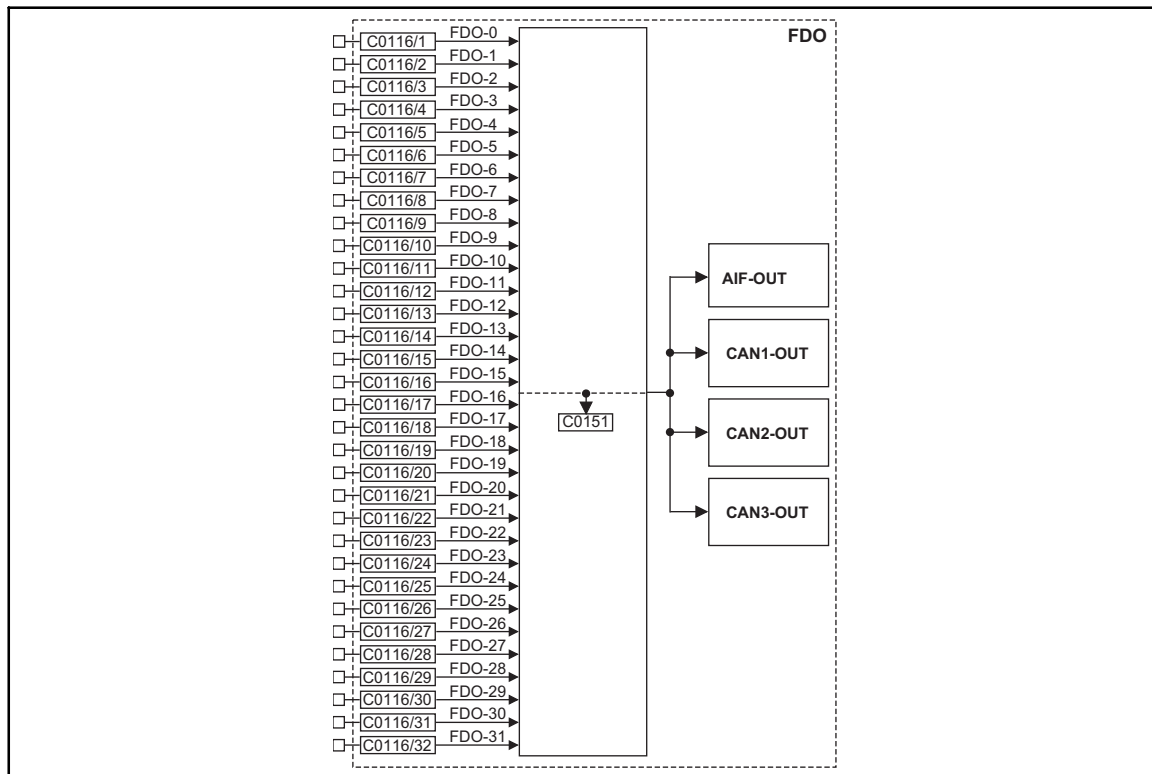
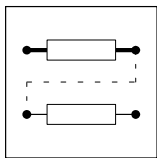


Fig. 2-80

Free digital outputs (FDO)



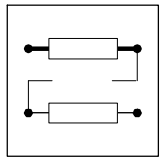
Configuration

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
FDO-0	d	C0151	hex	C0116/1	2	1000	
FDO-1	d	C0151	hex	C0116/2	2	1000	
FDO-2	d	C0151	hex	C0116/3	2	1000	
FDO-3	d	C0151	hex	C0116/4	2	1000	
FDO-4	d	C0151	hex	C0116/5	2	1000	
FDO-5	d	C0151	hex	C0116/6	2	1000	
FDO-6	d	C0151	hex	C0116/7	2	1000	
FDO-7	d	C0151	hex	C0116/8	2	1000	
FDO-8	d	C0151	hex	C0116/9	2	1000	
FDO-9	d	C0151	hex	C0116/10	2	1000	
FDO-10	d	C0151	hex	C0116/11	2	1000	
FDO-11	d	C0151	hex	C0116/12	2	1000	
FDO-12	d	C0151	hex	C0116/13	2	1000	
FDO-13	d	C0151	hex	C0116/14	2	1000	
FDO-14	d	C0151	hex	C0116/15	2	1000	
FDO-15	d	C0151	hex	C0116/16	2	1000	
FDO-16	d	C0151	hex	C0116/17	2	1000	
FDO-17	d	C0151	hex	C0116/18	2	1000	
FDO-18	d	C0151	hex	C0116/19	2	1000	
FDO-19	d	C0151	hex	C0116/20	2	1000	
FDO-20	d	C0151	hex	C0116/21	2	1000	
FDO-21	d	C0151	hex	C0116/22	2	1000	
FDO-22	d	C0151	hex	C0116/23	2	1000	
FDO-23	d	C0151	hex	C0116/24	2	1000	
FDO-24	d	C0151	hex	C0116/25	2	1000	
FDO-25	d	C0151	hex	C0116/26	2	1000	
FDO-26	d	C0151	hex	C0116/27	2	1000	
FDO-27	d	C0151	hex	C0116/28	2	1000	
FDO-28	d	C0151	hex	C0116/29	2	1000	
FDO-29	d	C0151	hex	C0116/30	2	1000	
FDO-30	d	C0151	hex	C0116/31	2	1000	
FDO-31	d	C0151	hex	C0116/32	2	1000	

Function

You can freely select a digital signal source for every signal input.

- The corresponding bit in the data word is marked with FDO-x (e.g. FDO-0 for the LSB and FDO-31 for the MSB).
- The data word is transferred to the function blocks AIF-OUT, CAN-OUT1, CAN-OUT2, and CAN-OUT3.



2.4.33 Code assignment (FEVAN)

This FB transfers analog signals to any code. At the same time, it converts the signal to the data format of the target code.

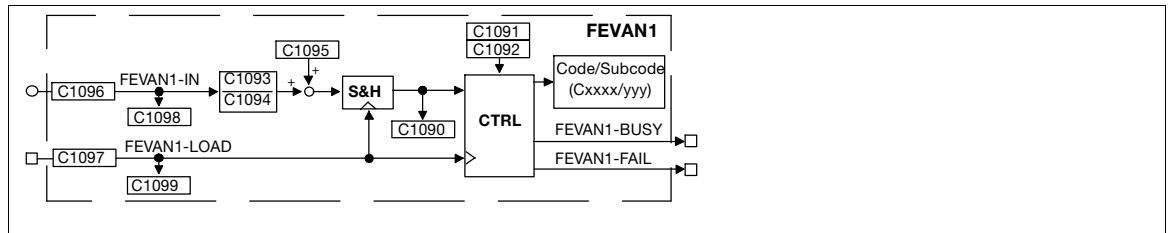


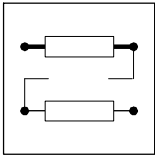
Fig. 2-81

Code assignment (FEVAN1)

Name	Signal			Source		Note
	Type	DIS	DIS format	CFG	List	
FEVAN1-IN	a	C1098	dec	C1096	1	Input value
FEVAN1-LOAD	d	C1099	bin	C1097	2	A LOW-HIGH edge transmits the converted signal to the target code.
FEVAN1-BUSY	d	-	-	-	-	HIGH = transmitting
FEVAN1-FAIL	d	-	-	-	-	- HIGH = transmission failed – A LOW-HIGH edge at FEVAN1-LOAD switches FEVAN1-FAIL = LOW.
-	-	C1090	-	-	-	Display of the converted signal

Range of functions

- Data transmission
- Conversion



Configuration

2.4.33.1 Data transmission

The data transmission is started with a LOW-HIGH signal at FEVAN1-LOAD. FEVAN1-BUSY = HIGH is set for the time of transmission.

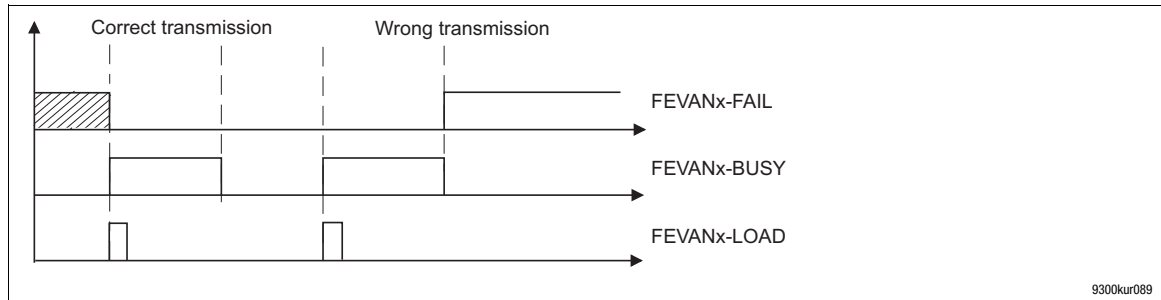


Fig. 2-82

Signal flow

Transmission errors can occur, if:

- the target code is not available
- the target subcode is not available
- the transmitted data are out of the target code limits
- the target code is inhibited since it can only be written if the controller is inhibited. Inhibit the controller (see code table).

Cyclic data transmission

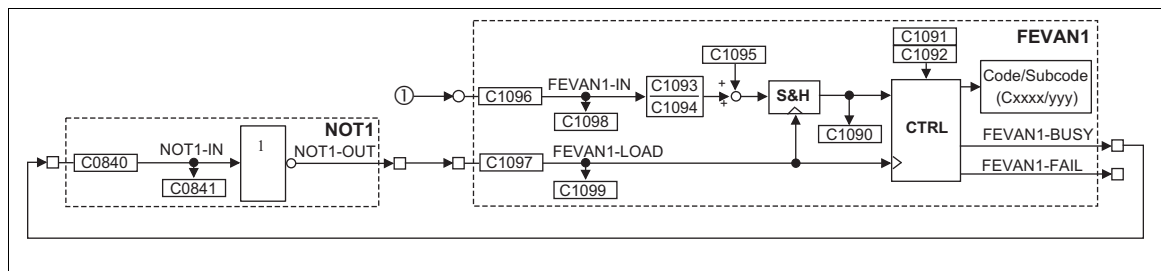
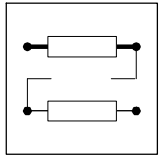


Fig. 2-83

Example for a cycle data transmission to a target code

- ① Input signal which is to be transmitted to the target code



2.4.33.2 Conversion

The analog input signal at FEVAN1-IN is converted into the corresponding value of the target using C1093 (numerator) and C1094 (denominator). At the same time, it is adapted to the suitable data format.



Tip!

Make sure that the input signal is processed unscaled (100% correspond to 16384) when determining the values for C1093 and C1094.

For the decimal positions of the target code, always multiply the value to be transmitted with the factor 10000.

Mandatory:

$$\text{Value of the target code} = \left[\text{Input signal [\%]} \cdot \frac{16384}{100} \cdot \frac{C1093}{C1094} + C1095 \right] \cdot \frac{1}{10000}$$

Example 1

A signal of 100 % is to result in a maximum current $I_{\max}$ (C0022) of 10 A.

- The input signal of 100 % results in an input value of 16384.
- The value to be transmitted (C1090) must be 100000 (10 A · 10000).
- Enter these values in C1093 (numerator) and C1094 (denominator):

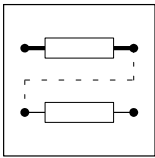
$$\frac{C1093}{C1094} = \frac{\text{Value to be transmitted}}{\text{Input value}} = \frac{100000}{16384}$$

Example 2

A signal of 10 % ... 50 % is to result in an acceleration time T_{ir} (C0012) of 1.5 s ... 7.5 s.

- The input signal of 50 % results in an input value of 8192.
- The value to be transmitted (C1090) must be 75000 (7.5 s · 10000).
- Enter these values in C1093 (numerator) and C1094 (denominator):

$$\frac{C1093}{C1094} = \frac{\text{Value to be transmitted}}{\text{Input value}} = \frac{75000}{8192}$$



Configuration

2.4.34 Programming of fixed setpoints (FIXSET)

This FB is used to change an analog signal source to programmed fixed values.

You can use these fixed values e.g. for different dancer setpoint positions in a dancer position control or different stretch ratios (gearbox factor) for a speed ratio synchronizing with digital frequency coupling.

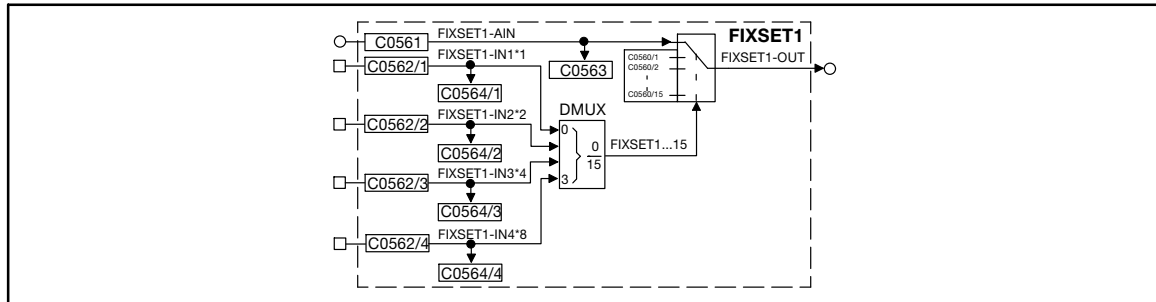


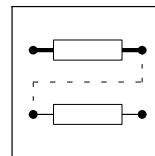
Fig. 2-84 Programming of fixed setpoints (FIXSET1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
FIXSET1-AIN	a	C0563	dec [%]	C0561	1	1000	The input is switched to the output, if a LOW level is applied at all selection inputs FIXSET-INx. The number of inputs to be assigned depends on the number of required FIXSET setpoints.
FIXSET1-IN1*1	d	C0564/1	bin	C0562/1	2	1000	
FIXSET1-IN2*2	d	C0564/2	bin	C0562/2	2	1000	
FIXSET1-IN3*4	d	C0564/3	bin	C0562/3	2	1000	
FIXSET1-IN4*8	d	C0564/4	bin	C0562/4	2	1000	
FIXSET1-OUT	a	-	-	-	-	-	

Function

The output of the FB can be used as a setpoint source (signal source) for another FB (e.g. process controller, arithmetic block, etc.). The parameterization and handling is the same as for the JOG setpoints in FB NSET. (2-135)

- Parameterization of the fixed setpoints
 - The individual fixed setpoints are parameterized by the subcodes of C0560.
- Output of the selected fixed setpoint:
 - If the binary inputs are triggered with a HIGH signal, a fixed setpoint from the table is switched to the output.
- Range:
 - The values for the fixed setpoint can be between -200 % and +200 %.



2.4.34.1 Enable of the FIXSET1 setpoints

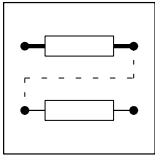
Number of required fixed setpoints	Number of the inputs to be assigned
1	at least 1
1 ... 3	at least 2
4 ... 7	at least 3
8 ... 15	4

Decoding table of the binary input signals:

Output signal FIXSET1-OUT =	1st input FIXSET1-IN1	2nd input FIXSET1-IN2	3rd input FIXSET1-IN3	4th input FIXSET1-IN4
FIXSET1-AIN	0	0	0	0
C0560/1	1	0	0	0
C0560/2	0	1	0	0
C0560/3	1	1	0	0
C0560/4	0	0	1	0
C0560/5	1	0	1	0
C0560/6	0	1	1	0
C0560/7	1	1	1	0
C0560/8	0	0	0	1
C0560/9	1	0	0	1
C0560/10	0	1	0	1
C0560/11	1	1	0	1
C0560/12	0	0	1	1
C0560/13	1	0	1	1
C0560/14	0	1	1	1
C0560/15	1	1	1	1

0 = LOW

1 = HIGH



Configuration

2.4.35 Flipflop (FLIP)

These FBs are D-flipflops. This function is used to evaluate and save digital signals.

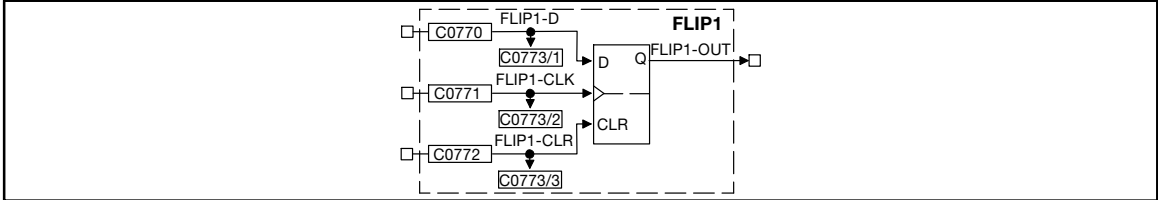


Fig. 2-85 Flipflop (FLIP1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
FLIP1-D	d	C0773/1	bin	C0770	2	1000	-
FLIP1-CLK	d	C0773/2	bin	C0771	2	1000	Evaluates LOW-HIGH edges only
FLIP1-CLR	d	C0773/3	bin	C0772	2	1000	Evaluates the input level only: input has highest priority
FLIP1-OUT	d	-	-	-	-	-	-

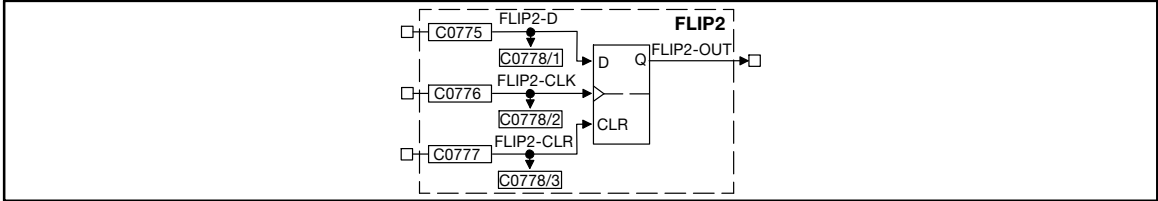
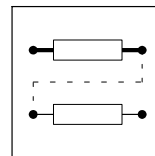


Fig. 2-86 Flipflop (FLIP2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
FLIP2-D	d	C0778/1	bin	C0775	2	1000	-
FLIP2-CLK	d	C0778/2	bin	C0776	2	1000	Evaluates LOW-HIGH edges only
FLIP2-CLR	d	C0778/3	bin	C0777	2	1000	Evaluates the input level only: input has highest priority
FLIP2-OUT	d	-	-	-	-	-	-



Function

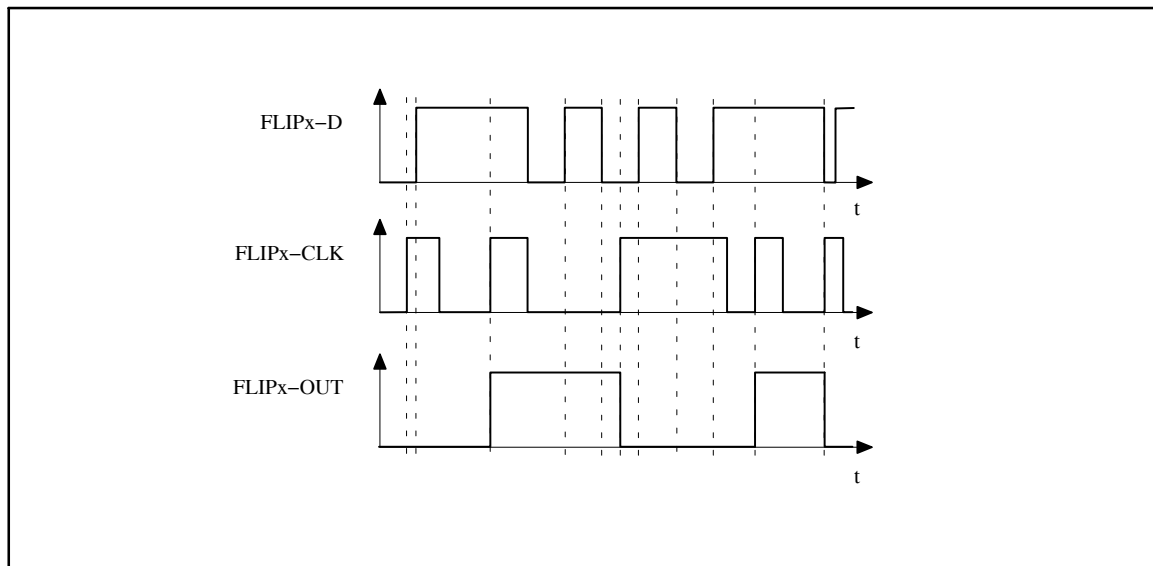
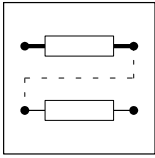


Fig. 2-87

Sequence of a flipflop

- A LOW-HIGH signal at the input FLIPx-CLK changes the signal at the input FLIPx-D to the output FLIPx-OUT and saves it until
 - another LOW-HIGH edge is applied at the input FLIPx-CLK or
 - the input FLIPx-CLR is set HIGH.
- The input FLIPx-CLR always has priority.
 - If the input FLIPx-CLR = HIGH, the output FLIPx-OUT = LOW and held as long as FLIPx-CLR = HIGH.



Configuration

2.4.36 Curve follower (FOLL)

This FB is used to evaluate slowly changing process variables and use them for drive control.

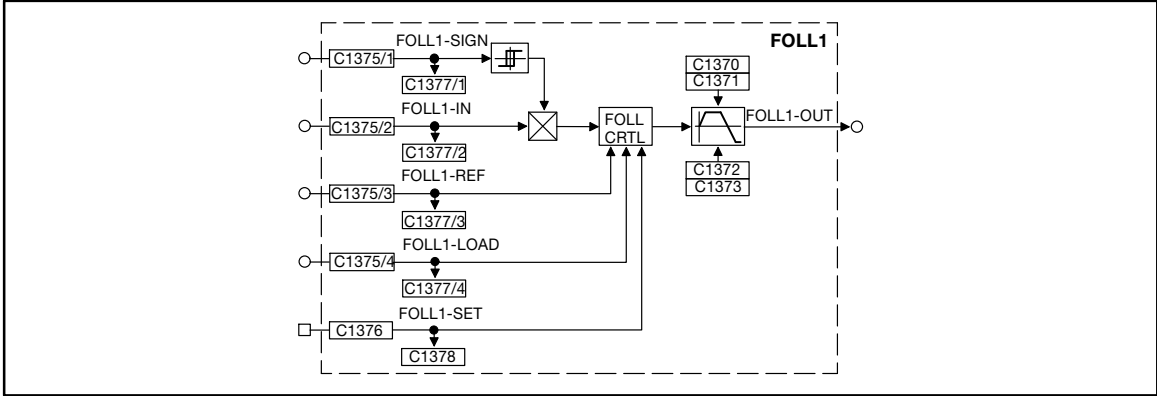
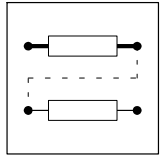


Fig. 2-88 Curve follower (FOLL1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
FOLL1-SIGN	a	C1377/1	dec [%]	C1375/1	1	1000	-
FOLL1-IN	a	C1377/2	dec [%]	C1375/2	1	1000	-
FOLL1-REF	a	C1377/3	dec [%]	C1375/3	1	1000	-
FOLL1-LOAD	a	C1377/4	dec [%]	C1375/4	1	1000	-
FOLL1-SET	d	C1378	bin	C1376	2	1000	-
FOLL1-OUT	a	-	-	-	-	-	-

Function

- Basic function
- Setting the initial value
- Saving the initial value



2.4.36.1 Basic function

- If the input signal at FOLL1-IN exceeds the reference value at FOLL1-REF, the ramp function generator starts and the output signal at FOLL1-OUT has the same direction as the input signal.
- You can change the sign of the input signal at FOLL1-IN with a negative signal at the input FOLL1-SIGN.
 - If the input signal at FOLL1-IN exceeds the reference value at FOLL1-REF, the ramp function generator starts and the output signal at FOLL1-OUT has the opposite direction as the input signal.

Setting range of the ramp generator

- C1370 defines the upper limit $FOLL_{max}$ in [%]
- C1371 defines the lower limit $FOLL_{min}$ in [%]

Acceleration and deceleration time of the ramp function generator

- C1372 defines the acceleration time $FOLL_{Tir}$ in [s]
- C1373 defines the deceleration time $FOLL_{Tif}$ in [s]

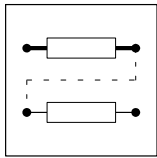
2.4.36.2 Setting the initial value

An initial value is set via the inputs

- FOLL1-SET (analog signal) or
- FOLL1-LOAD (digital signal).

2.4.36.3 Saving the initial value

- The reached output value is saved when the controller is switched off.
 - The value saved last is loaded when the controller is switched on.



Configuration

2.4.37 Integrator (INT)

These FBs calculate an angle of rotation from a speed signal. The angle of rotation is output as phase signal and analog signal.

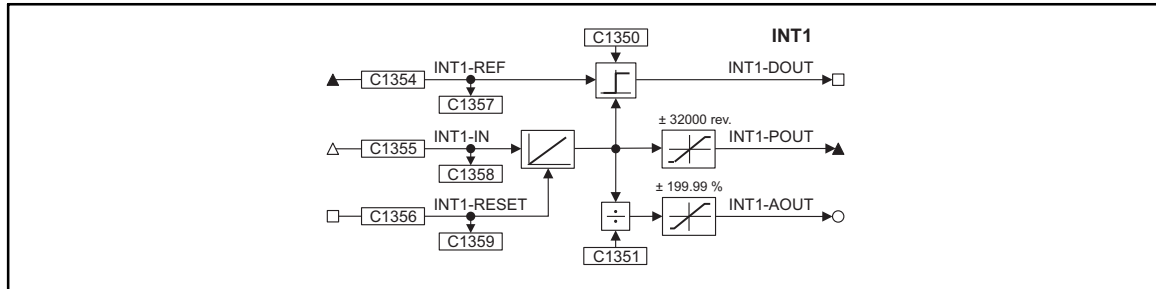


Fig. 2-89

Integrator (INT1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
INT1-REF	ph	C1357	dec [inc]	C1354	3	1000	-
INT1-IN	phd	C1358	dec [rpm]	C1355	4	1000	-
INT1-RESET	d	C1359	bin	C1356	2	1000	HIGH = sets the integrator to zero
INT1-DOUT	d	-	-	-	-	-	-
INT1-POUT	ph	-	-	-	-	-	-
INT1-AOUT	a	-	-	-	-	-	limited to $\pm 199.99\%$

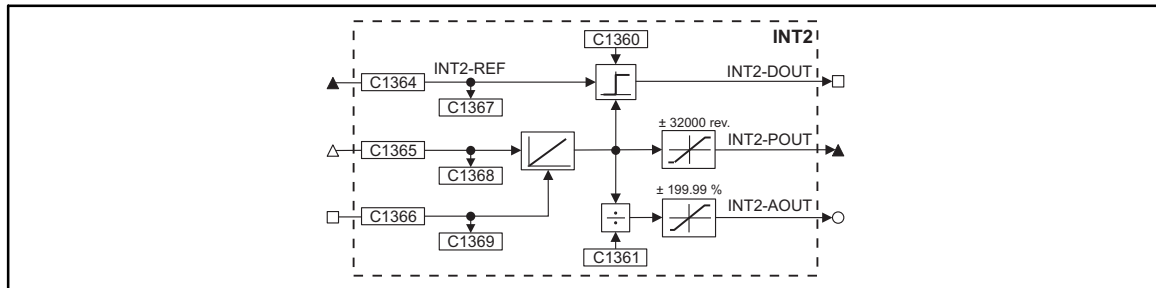


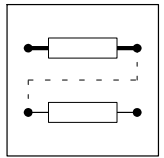
Fig. 2-90

Integrator (INT2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
INT2-REF	ph	C1367	dec [inc]	C1364	3	1000	-
INT2-IN	phd	C1368	dec [rpm]	C1365	4	1000	-
INT2-RESET	d	C1369	bin	C1366	2	1000	HIGH = sets the integrator to zero
INT2-DOUT	d	-	-	-	-	-	-
INT2-POUT	ph	-	-	-	-	-	-
INT2-AOUT	a	-	-	-	-	-	limited to $\pm 199.99\%$

Range of functions

- Output angle of rotation as phase signal
- Compare angle of rotation with reference value
- Output angle of rotation as analog signal
- Phase signal reset



2.4.37.1 Output angle of rotation as phase signal

The speed signal at INTx-IN is integrated to an angle of rotation. After this, the angle of rotation is output as a phase signal at INTx-POUT.

An angle of rotation of 360 ° (one revolution) corresponds to 65536 increments (inc).

2.4.37.2 Compare angle of rotation with reference value

The angle of rotation obtained at INTx-IN can be compared with a reference value.

An angle of rotation of 360 ° (one revolution) corresponds to 65536 increments (inc).

- Apply a phase signal as reference value to INTx-REF.
- If the angle of rotation (integrated speed signal at INTx-IN) reaches the reference value at INTx-REF, INTx-DOUT changes to HIGH.
- The following comparison operations are available:

Function block	Code	Value	Function
INT1	C1350	0	INT1-DOUT = HIGH, if angle of rotation $\geq$ reference value
		1	INT1-DOUT = HIGH, if $|\text{angle of rotation}| \geq \text{reference value}$
INT2	C1360	0	INT2-DOUT = HIGH, if angle of rotation $\geq$ reference value
		1	INT2-DOUT = HIGH, if $|\text{angle of rotation}| \geq \text{reference value}$

2.4.37.3 Output angle of rotation as analog signal

The speed signal at INTx-IN is integrated to an angle of rotation. The angle of rotation is normalised under C1351 (INT1) and C1361 (INT2) and converted into an analog signal. After this, it is output as an analog signal at INTx-POUT.

The following formula is used for the conversion (in this case for INT1):

$$\text{INT1-AOUT} = \frac{\text{Drehwinkel [inc]}}{\text{C1351}} \cdot 100 \%$$

An angle of rotation of 360 ° (one revolution) corresponds to 65536 increments (inc).

Example

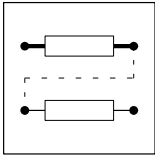
The angle of rotation for 100 revolutions shall correspond to an analog signal of 100 %.

Solution:

- 100 revolutions correspond to an angle of rotation of $100 \cdot 65536 \text{ inc} = 6553600 \text{ inc}$.
- Enter this value under C1351.

2.4.37.4 Phase signal reset

INTx-RESET = HIGH resets the calculated angle of rotation to zero.



Configuration

2.4.38 Limitation (LIM)

This FB limits the input signal to an adjustable range.

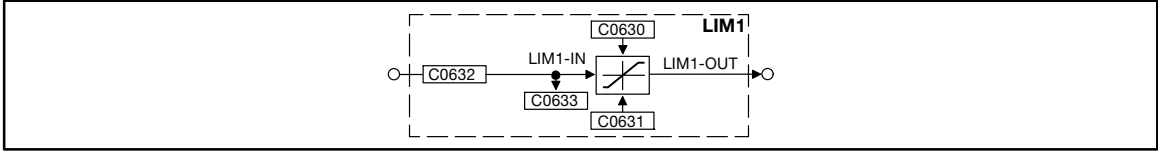


Fig. 2-91 Limitation (LIM1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
LIM1-IN1	a	C0633	dec [%]	C0632	1	1000	-
LIM1-OUT	a	-	-	-	-	-	-

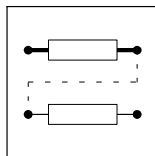
Function

- If the input signal exceeds the upper limit (C0630), the upper limit is effective.
- If the input signal falls below the lower limit (C0631), the lower limit is effective.



Tip!

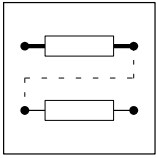
The lower limit (C0631) must be smaller than the upper limit (C0630).



2.4.39 Internal motor control with V/f characteristic control (MCTRL1)

For the function block description, please see the corresponding System Manual:

- EVF9321 ... EVF9333 controllers
 - System Manual with document number EDSVF9333V
- EVF9335 ... EVF9338 and EVF9381 ... EVF9383 controllers
 - System Manual with document number EDSVF9383V

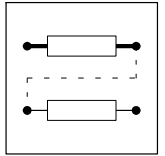


Configuration

2.4.40 Internal motor control with vector control (MCTRL2)

For the function block description, please see the corresponding System Manual:

- EVF9321 ... EVF9333controllers
 - System Manual with document number EDSVF9333V
- EVF9335 ... EVF9338 and EVF9381 ... EVF9383controllers
 - System Manual with document number EDSVF9383V



2.4.41 Mains failure control (MFAIL)

This FB is used to decelerate the drive/drive network in a controlled manner to standstill. Without this function, the drive/drive network would coast down after a mains failure.



Tip!

The basic configurations speed control with mains failure control (C0005 = 14xx) and digital frequency master with mains failure control (C0005 = 54xx) are application examples which can be directly loaded.

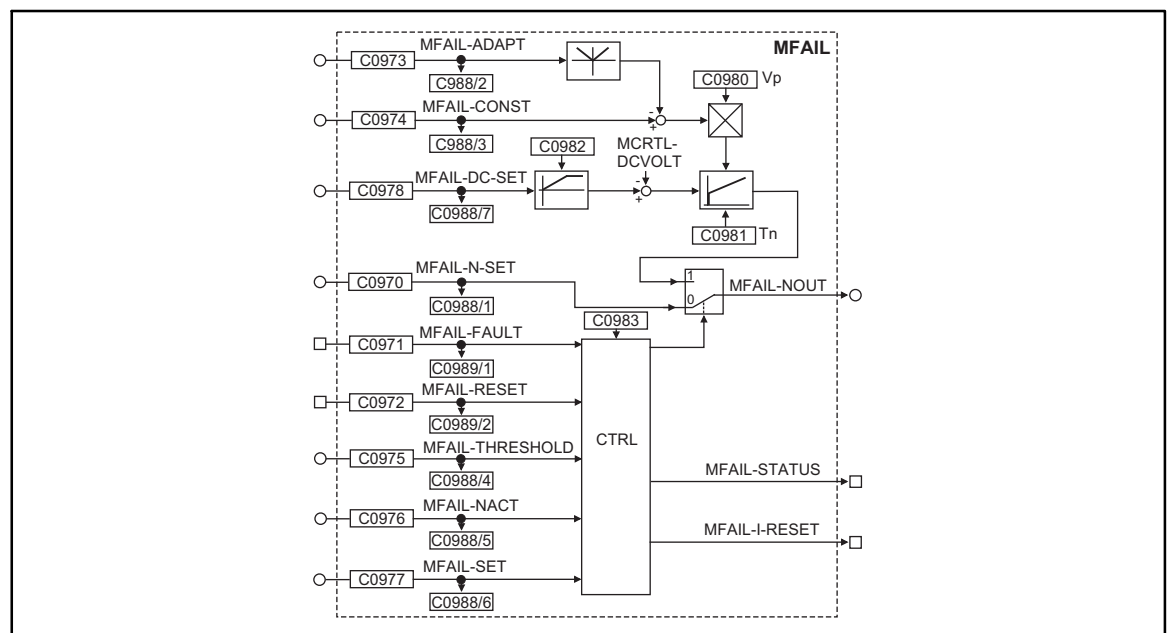
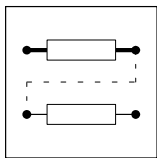


Fig. 2-92

Mains failure control (MFAIL)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
MFAIL-N-SET	a	C0988/1	dec [%]	C0970	1	1000	Speed setpoint in [%] of C0011
MFAIL-ADAPT	a	C0988/2	dec [%]	C0973	1	1000	Dynamic adaptation of the proportional gain of the U_{Gset} controller in [%] of C0980
MFAIL-KONST	a	C0988/3	dec [%]	C0974	1	1000	Proportional gain of the U_{Gset} controller in [%] of C0980
MFAIL-THRESHOLD	a	C0988/4	dec [%]	C0975	1	1000	Restart threshold in [%] of C0011
MFAIL-NACT	a	C0988/5	dec [%]	C0976	1	1000	Comparison value for the restart threshold in [%] of C0011
MFAIL-SET	a	C0988/6	dec [%]	C0977	1	1000	Speed starting point for deceleration in [%] of C0011
MFAIL-DC-SET	a	C0988/7	dec [%]	C0978	1	1000	Voltage setpoint at which the DC-bus voltage is to be maintained, 100 % = 1000 V
MFAIL-FAULT	d	C0989/1	bin	C0971	2	1000	HIGH = activates the mains failure control
MFAIL-RESET	d	C0989/2	bin	C0972	2	1000	HIGH = reset
MFAIL-N-OUT	a	-	-	-	-	-	Speed setpoint in [%] of C0011
MFAIL-STATUS	d	-	-	-	-	-	HIGH = mains failure control is active
MFAIL-I-RESET	d	-	-	-	-	-	HIGH = mains failure control is active, the drive is braking



Configuration

Range of functions

- Mains failure detection
- Mains failure control
- Restart protection
- Reset of the mains failure control
- Dynamic adaptation of the control parameters
- Fast mains recovery (KU)
- Application examples

2.4.41.1 Mains failure detection

The type of the mains-failure detection to be used depends on the drive system used.

A failure of the voltage supply of the power stage is detected:

- by the level of the DC-bus voltage or
- by an external system (e.g. supply module or voltage-detection relay).
- Different systems can be combined.

Mains failure detected by the level of the DC-bus voltage

Use with single drives or multi-axis drives, which do not use external monitoring systems.

- For this, you can use a comparator (e.g. CMP2). Set the following signal links:
 - C0688/1 = 5005 (MCTRL-DCVOLT to CMP2-IN1)
 - C0688/2 = 19540 (free code C0472/20 to CMP2-IN2)
 - C0971 = 10655 (CMP2-OUT to MFAIL-FAULT)
 - Set the comparator function CMP2 with C0685 = 3

Enter the function blocks CMP2 and MFAIL at free positions into the processing table under C0465.

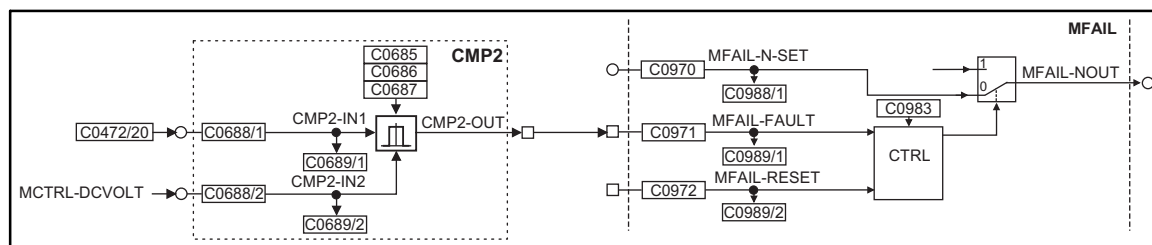
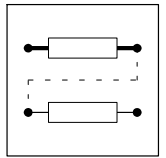


Fig. 2-93

Example of a mains failure detection with internal function blocks (section)



Mains failure detection of the supply module

- A digital output of the supply module is switched to the function block MFAIL via the digital inputs DIGIN of the 93XX controller. In the example, input X5/E4 is used. Set the following signal links:
 - C0971 = 54 (DIGIN4 to MFAIL-FAULT)
 - C0871 = 1000 (remove DCTRL-TRIP-SET from terminal X5/E4)
 - Select the input level (HIGH or LOW active) with C0114/4

Enter the FB MFAIL at a free position into the processing table under C0465.

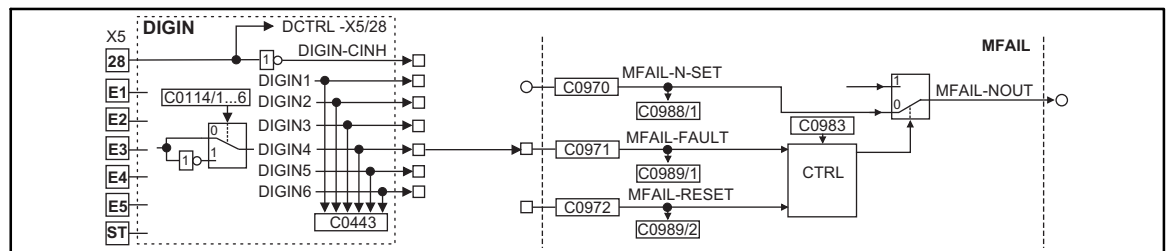


Fig. 2-94

Example of a mains failure detection by an external monitoring system

Combination of these methods

- These methods are combined via an OR link with an internal function block. In the example, OR5 is used. Set the following signal links:
 - C0688/1 = 5005 (MCTRL-DCVOLT to CMP2-IN1)
 - C0688/2 = 19540 (free code C0472/20 to CMP2-IN2)
 - Set the comparator function CMP2 with C0685 = 3
 - C0838/1 = 10655 (CMP2-OUT to OR5-IN1)
 - C0838/2 = 54 (DIGIN5 to OR5-IN2)
 - C0971 = 10570 (OR5-OUT to MFAIL-FAULT)

Enter the function blocks CMP2, OR5 and MFAIL at free positions into the processing table under C0465.

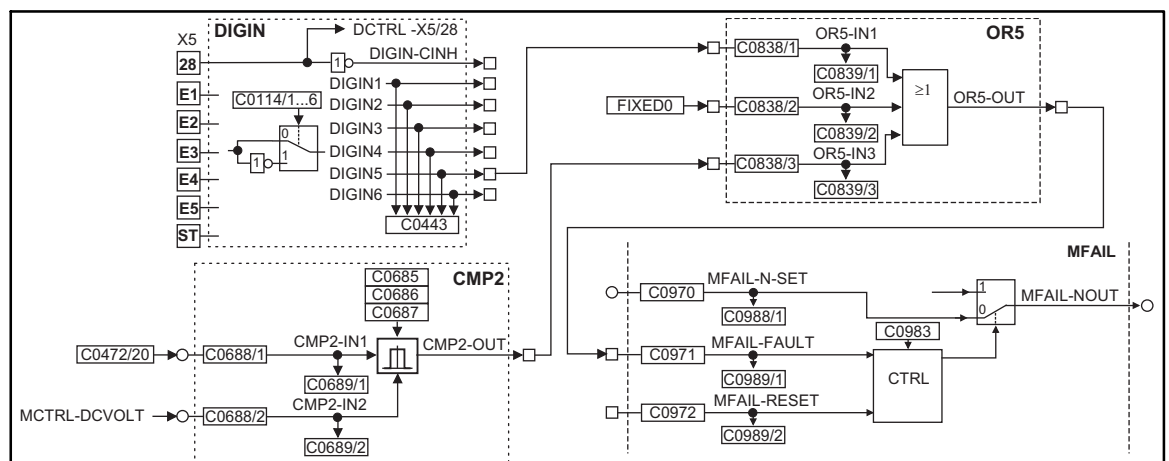
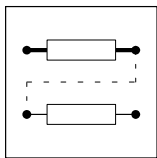


Fig. 2-95

Example of a mains failure detected by different sources



Configuration

2.4.41.2 Mains failure control

Integration of the FB into the signal flow of the controller

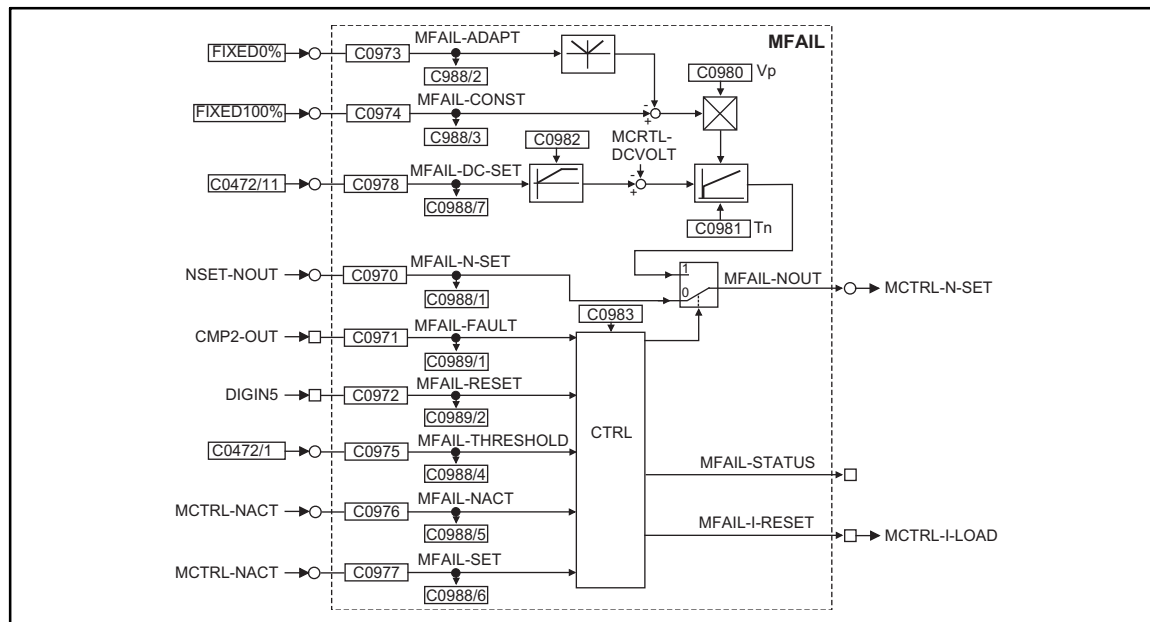
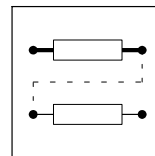


Fig. 2-96

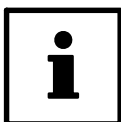
Links for the basic configuration C0005 = 1000

As an example, the function block is integrated into the basic configuration C0005 = 1000 (speed control):

1. Create the speed setpoint path:
 - C0970 = 5050 (NSET-NOUT to MFAIL-N-SET)
 - C0890 = 6100 (MFAIL-NOUT to MCTRL-N-SET)
2. Define the start value for deceleration (here, the actual speed value):
 - C0977 = 6100 (MFAIL-NOUT to MFAIL-SET)
3. Define the source for the setpoint of the DC-bus voltage (here, from the freely linkable code FCODE C0472/19):
 - C0978 = 19539 (C0472/19 to MFAIL-DC-SET)
4. Define the source for the activation of the mains failure control. (2-116):



5. Proportional gain and adaptation of the DC-bus voltage controller:
 - C0974 = 1006 (FIXED100% to MFAIL-CONST)
 - C0973 = 1000 (FIXED0% to MFAIL-ADAPT)
6. Establish the restart protection
 - C0976 = 6100 (MFAIL-NOUT to MCTRL-NACT)
 - C0975 = 19538 (C0472/18 to MFAIL-THRESHOLD)
 - Under C0472/18, first, enter approx. 2 % (reference: $n_{\max}$ C0011)
7. Connect the reset input (here, with terminal X5/E5 TRIP-RESET):
 - C0972 = 55 (DIGIN5 to MFAIL-RESET)
8. Enter all functions blocks which are used (except for codes and digital inputs DIGIN) at free positions into the processing table under C0465.

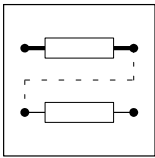


Tip!

Use C0003 to save all settings in a parameter set , if they are to be retained on power-off.

Activation

- MFAIL-FAULT = HIGH activates the mains failure control.
- MFAIL-FAULT = LOW triggers a timing element. After elapse of the preset time under C0983, the mains failure control is ended/cancelled. (📖 2-126, mains recovery)
 - The drive is accelerated to the speed setpoint, if the restart protection is not active.
 - The drive is still braked to zero speed, if the restart protection is active. (📖 2-125, restart protection)
 - When restart protection is active, the drive can only be reset with MFAIL-RESET = HIGH.



Configuration

Function

The drive controller gains the required energy from the rotational energy of the driven machine. The driven machine is braked through the power loss of the controller and the motor. The speed deceleration ramp is thus shorter than for an uncontrolled system (coasting drive).

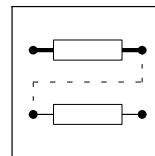
After activation:

- The DC-bus voltage is controlled to the value at the input MFAIL-DC-SET.
- At the output MFAIL-N-OUT, an internally generated speed setpoint is output. The drive can thus be braked to zero speed (via the speed setpoint).
 - The start value for the controlled deceleration is the value at the input MFAIL-SET. This input is usually connected to the output MCTRL-NACT (actual speed) or MCTRL-NSET2, MFAIL-NOUT (set speed).
 - The speed deceleration ramp (and thus the brake torque) results from the moment of inertia of the driven machine(s), the power loss of the drive (group), and the parameter settings.



Stop!

- If a connected brake unit is activated, the drive is braked with the maximum possible torque ($I_{\max}$). In this case, it may be necessary to adapt the parameterisation (see description of parameter setting).
 - If the power stage is not supplied, the drive cannot generate a standstill torque (important for active loads such as hoists).
-



Parameter setting

The parameters to be set are strongly dependent on the motor used, the inertia of the driven machine and the drive configuration (single drive, drive network, master-slave operation, etc.). This function must therefore be adapted to the individual application in every case.

The following specifications refer to the description of the mains failure detection. (📖 2-116)

Important settings prior to the initial commissioning:

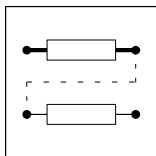
1. Save the settings in a parameter set (e.g. parameter set 4).



Stop!

With internal voltage supply to the terminals (C0005 = xx1x), terminal X6/63 is used as a voltage source for external potentiometers. In this case, measure across terminals $+U_G$, $-U_G$.

2. Measure the DC-bus voltage with an oscilloscope (channel 1):
 - With a suitable voltage divider across the terminals $+U_G$, $-U_G$ or
 - by providing the DC-bus voltage at terminal X6/62, for instance. To do this, set C0436 = 5005 (MCTRL-DCVOLT). 1 V at terminal X6/62 corresponds to 100 V at $+U_G$, $-U_G$.
3. Measure the speed with an oscilloscope (channel 2):
 - By providing the speed at terminal X6/62, for instance, (standard setting). To do this, set C0431 = 5001 (MCTRL-NACT). 10 V at terminal X6/62 correspond to $n_{\max}$ (C0011).



Configuration

4. Select the threshold for the mains failure detection under C0472/20. The selection depends on the setting under C0173.
 - Set the threshold approx. 50 V above the switch-off threshold LU (example for C0173 = 0.1; C0472/20 = 33.5 % = 335 V).

9300 vector	UG thresholds						
EVF9321 ... EVF9333	Mains voltage range		C0173	Switch-off threshold LU	Switch-on threshold LU	Switch-off threshold OU	Switch-on threshold OU
	< 400 V	Operation with/without brake chopper	0	285 V	430 V	770 V	755 V
	400 V	Operation with/without brake chopper	1 *	285 V	430 V	770 V	755 V
	460 V	Operation with/without brake chopper	2	328 V	473 V	770 V	755 V
	480 V	Operation without brake chopper	3	342 V	487 V	770 V	755 V
	480 V	Operation with brake chopper	4	342 V	487 V	800 V	785 V

9300 vector	UG thresholds						
EVF9335 ... EVF9383	Mains voltage range		C0173	Switch-off threshold LU	Switch-on threshold LU	Switch-off threshold OU	Switch-on threshold OU
EVF93xx-ExV210 EVF93xx-ExV240 EVF93xx-ExV270 EVF93xx-ExV300	< 400 V	Operation with or without brake transistor	0	285 V	430 V	770 V	755 V
	400 V	Operation with or without brake transistor	1 *	285 V	430 V	770 V	755 V
	460 V	Operation with or without brake transistor	2	328 V	473 V	770 V	755 V
	480 V	Operation without brake transistor	3	342 V	487 V	770 V	755 V
	480 V	Operation with brake transistor	4	342 V	487 V	800 V	785 V
	500 V	Operation with or without brake transistor	5	342 V	487 V	900 V	885 V
EVF93xx-Ex EVF93xx-ExV060 EVF93xx-ExV110	400 V	Operation with or without brake transistor	Only display	285 V	430 V	700 V	685 V

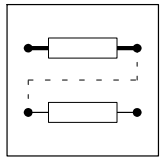
* Lenze setting



Stop!

This setpoint must be below the threshold of any brake unit which may be connected. If a connected brake unit is activated, the drive is braked with the maximum possible torque (I_{max}). The desired operating behaviour is lost.

5. Set the setpoint to which the DC-bus voltage is to be controlled:
 - Set the setpoint to approx. 700 V (C0472/18 = 70 %).



Commissioning

The commissioning should be carried out with motors without any load.

1. Start the drive with a LOW-HIGH transition at X5/E5.
2. Setting the acceleration time T_{ir} :
 - Set the speed setpoint to 100 %, operate the controller with maximum speed.
 - Inhibit the controller via terminal X5/28 (you can also use any other source for the controller inhibit, CINH) and measure the deceleration time to standstill.
 - Set approx. 1/10 of the deceleration time under C0982.
3. Setting the retrigger time
 - For mains failure detection by detecting the DC-bus voltage level:
 - Under C0983, set the deceleration time measured under point 2..
 - For mains failure detection via an external system (e.g. 934X supply module):
 - Under C0983, set the time for which the drive continues to be braked in a controlled way in the event of a short-term mains recovery.
4. Switch off the supply voltage (mains or DC bus).
 - The oscilloscope should display the following sequence:

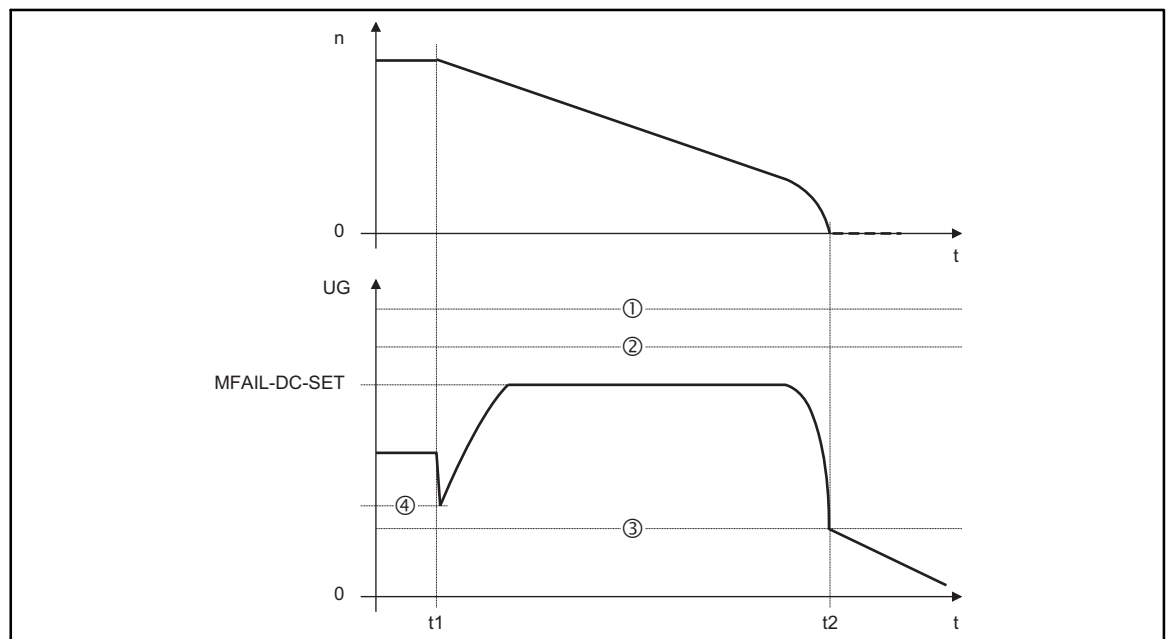
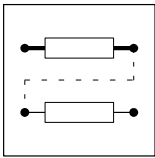


Fig. 2-97

Schematic representation with activated mains failure control (ideal characteristic)

- ① Switch-off threshold OU
- ② Switch-on threshold for brake unit
- ③ Switch-off threshold LU
- ④ Threshold CMP2-OUT
- t1 Mains failure
- t2 Zero speed reached



Configuration

Fine setting

For the fine setting, repeat the following points several times.

1. Try to obtain a very low final speed without the controller reaching the undervoltage threshold LU:
 - Increase the proportional gain V_p (C0980).
 - Reduce the integral-action time T_n (C0981).
2. Try to avoid activation of the brake unit or the undervoltage threshold OU:
 - Increase the integral-action time T_n (C0981) until the characteristic in Fig. 2-97 is almost reached.
 - If necessary, also reduce the setpoint of the DC-bus voltage at the input MFAIL-DC-SET (in the example C0472/19).
3. An increase of the deceleration time or reduction of the brake torque (see Fig. 2-98) is only possible with restrictions:
 - Increasing the acceleration time T_{ir} (C0982) reduces the initial brake torque and simultaneously increases the deceleration time.
 - Increasing the integral-action time T_n (C0981) reduces the initial brake torque and simultaneously increases the deceleration time. If the integral-action times under C0981 are too long, the controller reaches the LU threshold before zero speed is reached. The drive is thus no longer under control.
4. Re-establish any signal connections which may be required to the outputs of the drive controller (terminals X6).



Tip!

Use C0003 to save all settings in a parameter set , if they are to be retained on power-off.

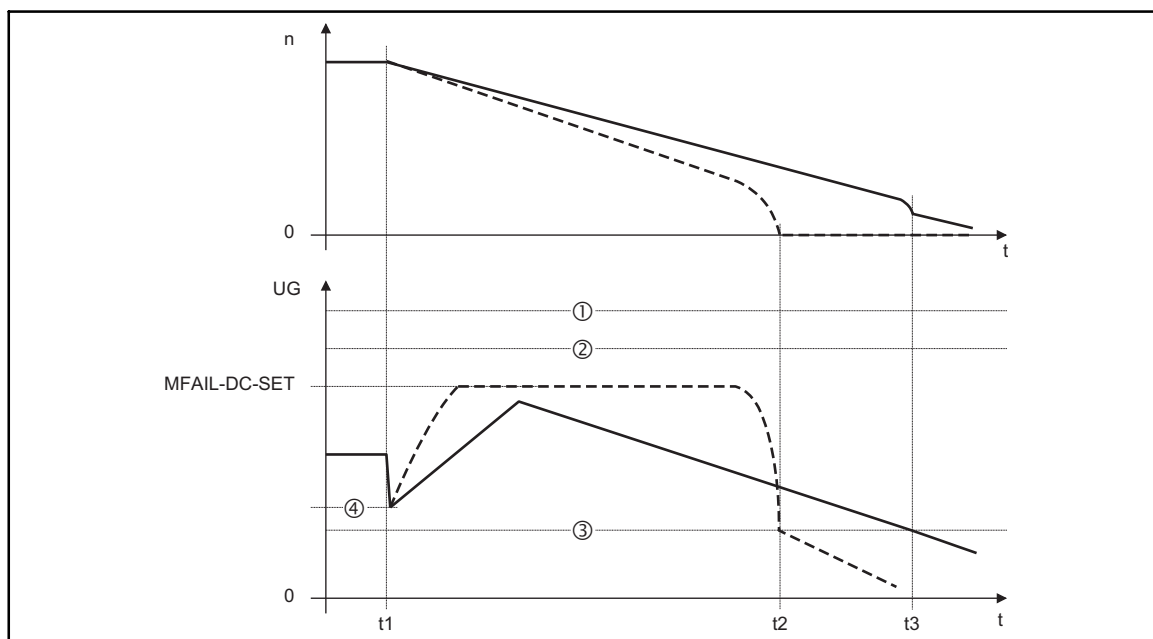
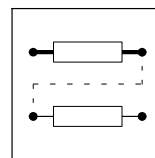


Fig. 2-98

Schematic representation with different brake torques

- ① Switch-off threshold OU
- ② Switch-on threshold for brake unit
- ③ Switch-off threshold LU
- ④ Threshold CMP2-OUT

$t = t_1$ Mains failure

$t = t_2$ Zero speed with higher brake torque (short adjustment time)

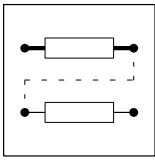
$t = t_3$ Drive reaches the LU switch-off threshold with lower brake torque (high adjustment time), without reaching zero speed

$t > t_3$ Drive is no longer under control (is braked by friction)

2.4.41.3 Restart protection

The integrated restart protection is to avoid a restart in the lower speed range, after the supply voltage was interrupted for a short time only (mains recovery before the drive has come to standstill).

- Establish the restart protection. (2-118, point 6.)
- In C0472/18, enter the threshold in [%] of $n_{\max}$ (C0011) below which no automatic start is wanted after mains recovery.
 - If the speed at mains recovery $<$ threshold in C0472/18, the drive will still be braked under control. This function can only be ended by MFAIL-RESET = HIGH.
 - If the speed at mains recovery $>$ threshold in C0472/18, the drive accelerates to its setpoint along the set ramps.
- This function is deactivated by:
 - C0472/18 = 0 % or
 - C0975 = 1000 (FIXED0% to MFAIL-THRESHLD)
- A reset is made by MFAIL-RESET = HIGH:
 - A reset is required after every mains (re)connection
 - The reset is shown by MFAIL-STATUS = HIGH, when MFAIL-FAULT = LOW.



Configuration

2.4.41.4 Reset of the mains failure control

- The mains failure control is reset with MFAIL-RESET = HIGH (in the example, through terminal X5/E5).
- The reset pulse is always required if:
 - The restart protection is active.
 - The restart protection is used and the supply (mains or DC supply) was switched on.

2.4.41.5 Dynamic adaptation of the control parameters

In special cases, a dynamic modification of the proportional gain may be useful. Two inputs (MFAIL-CONST and MFAIL-ADAPT) are available for this purpose at the FB MFAIL. The resulting proportional gain results from:

$$V_p = C0980 \cdot \frac{MFAIL-CONST - |MFAIL-ADAPT|}{100 \%}$$

2.4.41.6 Fast mains recovery (KU)

The fast mains recovery causes a restart of the controller, unless the restart protection is active. The drive accelerates to its setpoint. If this is not wanted, you can delay the restart by the retrigger time C0983 or prevent it in combination with the restart protection.

A fast mains recovery occurs:

- Due to the system, the mains recovery is indicated by the mains failure detection via the level of the DC-bus voltage. (▢ 2-116)
- Because of a "short interruption" (KU) of the utility company (e.g. in a thunderstorm).
- Because of faulty components in the supply cables (e.g. slip-rings).

So set the retrigger time C0983 > the measured deceleration time achieved in braking operation.

2.4.41.7 Application example

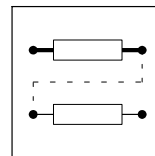
Drive network with digital frequency coupling



Stop!

For drive networks which are connected via digital frequency (a master and one or more slaves):

- The mains failure detection and control must only be activated for the master.
 - You must link the mains failure control into the signal flow to meet this requirement.
- You must operate all the controllers through the terminals +UG, -UG in a DC-bus configuration. Observe the specifications in the chapter "Dimensioning".



2.4.42 Motor phase failure detection (MLP)

Purpose

Motor phase monitoring.

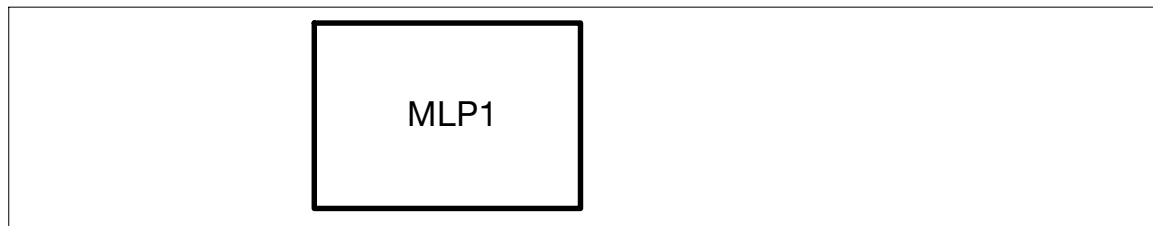


Fig. 2-99

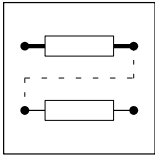
Motor phase failure detection (MLP1)

Code	LCD	Possible settings		IMPORTANT
		Lenze	Selection	
C0597	MONIT LP1	3	0 Trip 2 Warning 3 Off	Conf. LP1 Configuration of motor phase failure monitoring
C0599	LIMIT LP 1	5.0	1.0 {0.1}	Current limit LP1 Current limit for motor phase failure monitoring

Function

For detailed descriptions of the monitorings / error messages, please see the chapter "Troubleshooting and fault elimination" in the System Manual.

The function block MLP1 must be entered into the processing table, if the motor phase failure detection shall be used.



Configuration

2.4.43 Monitor outputs of monitoring system (MONIT)

Purpose

The monitoring functions output digital monitor signals.

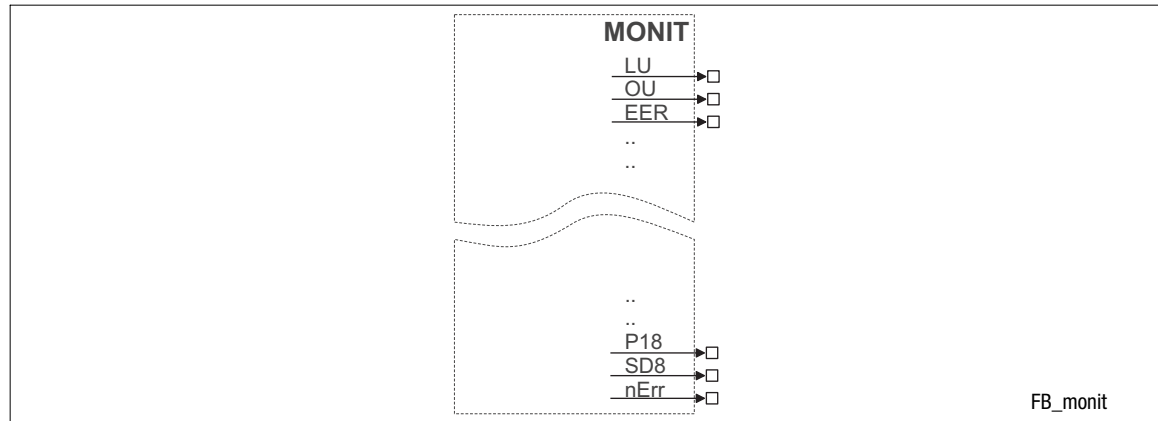


Fig. 2-100 Monitor outputs of the monitoring system (MONIT)

Function

The MONIT-outputs switch to HIGH level if one of the monitoring functions responds.

The digital monitor signals respond dynamically, i.e.

- depending on the state of the monitoring function, but
- independent of the selected fault reaction.

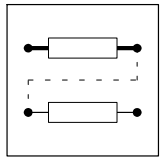
Example

MONIT-LP1 (motor phase monitoring) responds if a cable disruption is detected in a motor connection phase, although the fault reaction of LP1 is set to "Off" (C0597 = 3).



Tip!

- Only with a corresponding signal conditioning it is possible to use the MONIT-outputs to detect the cause of malfunction afterwards (e.g. storing the signal by using function block FLIP).
- A detailed description concerning monitoring /fault messages can be found in the chapter "Troubleshooting and fault elimination".



2.4.44 Motor potentiometer (MPOT)

This FB is used as an alternative setpoint source which is triggered by two inputs.

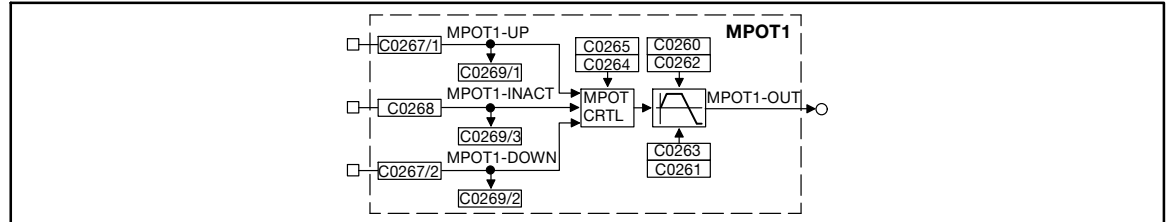


Fig. 2-101

Motor potentiometer (MPOT1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
MPOT1-UP	d	C0269/1	bin	C0267/1	2	1000	-
MPOT1-INACT	d	C0269/3	bin	C0268	2	1000	-
MPOT1-DOWN	d	C0269/2	bin	C0267/2	2	1000	-
MPOT1-OUT	a	-	-	-	-	-	-

Range of functions

- Control of the motor potentiometer
- Deactivation of the motor potentiometer
- Initialization of the motor potentiometer

2.4.44.1 Control of the motor potentiometer

- MPOT1-UP = HIGH
 - The motor potentiometer approaches its upper limit.
- MPOT1-DOWN = HIGH
 - The motor potentiometer approaches its lower limit.
- MPOT1-UP = LOW and MPOT1-DOWN = LOW or
MPOT1-UP = HIGH and MPOT1-DOWN = HIGH:
 - The motor potentiometer does not change its output signal.

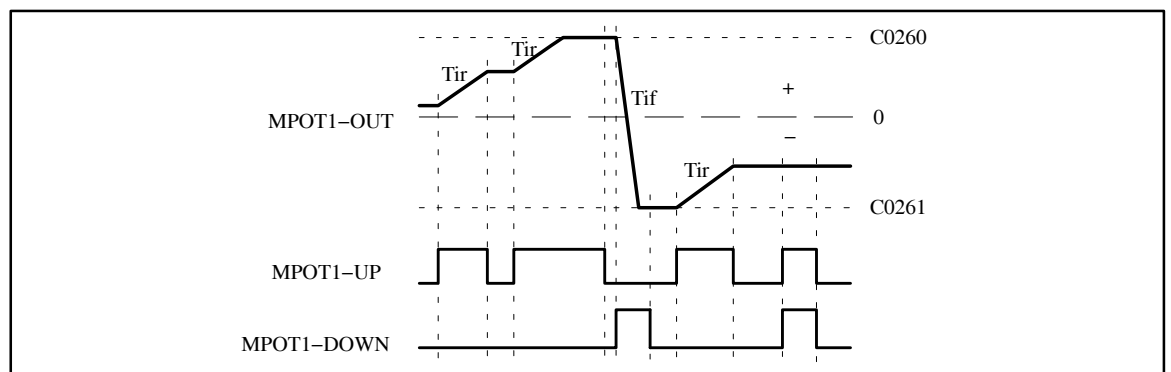
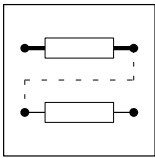


Fig. 2-102

Control signals of the motor potentiometer



Configuration

2.4.44.2 Deactivation of the motor potentiometer

You can deactivate the function of the motor potentiometer using the input MPOT1-INACT.

- The motor potentiometer function is deactivated with MPOT1-INACT = HIGH.
- The input MPOT1-INACT has priority over the inputs MPOT1-UP and MPOT1-DOWN.
- When the function is deactivated, the output signal at MPOT1-OUT follows the function set under C0264. You can set the following functions under C0264:

C0264	Meaning
0	No further action; the output MPOT1-OUT keeps its value
1	The motor potentiometer returns to 0 % with the corresponding T_i time
2	The motor potentiometer approaches its lower limit (C0261) with the corresponding deceleration time
3	The motor potentiometer immediately changes its output to 0 % (important for emergency stop function)
4	The motor potentiometer immediately changes its output to the lower limit (C02619)
5	The motor potentiometer approaches its upper limit (C0260) with the corresponding T_i time

If the deactivation of the motor potentiometer is cancelled with MPOT1-INACT = LOW, the subsequent function depends on

- the momentary output signal,
- the set limits (C0261: lower limit, C0260: upper limit),
- the control signals MPOT1-UP and MPOT1-DOWN.

If the output value is out of the limits, the output signal approaches the next limit with the suitable T_i time (C0262: acceleration time T_{if} , C0263: deceleration time T_{ir}). This function is independent of the control inputs MPOT1-UP and MPOT1-DOWN

If the output value is within the limits, the output signal follows the selected control function MPOT1-UP, MPOT1-DOWN or no action.

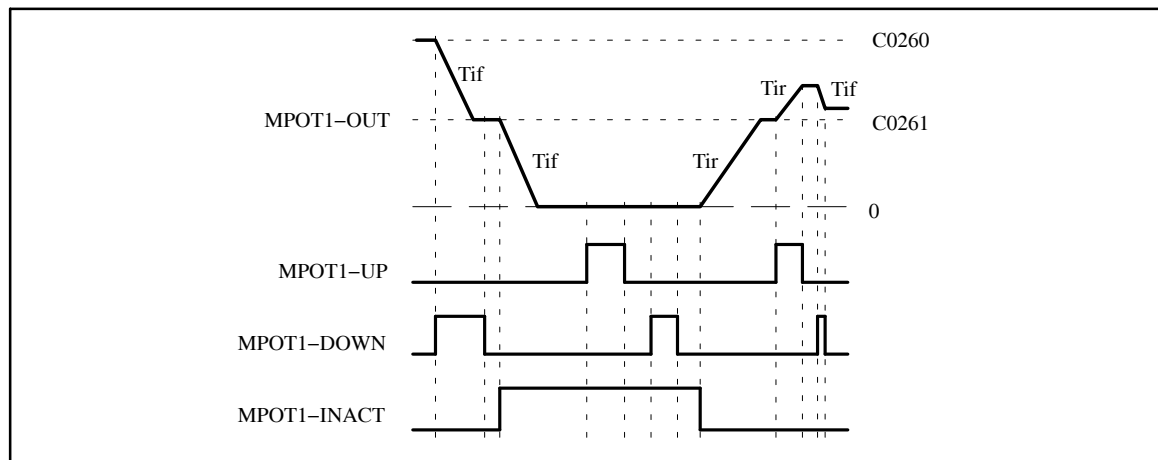
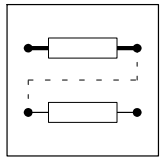


Fig. 2-103

Deactivation of the motor pot via the input MPOT1-INACT

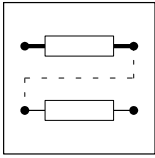


2.4.44.3 Initialization of the motor potentiometer

Under C0265, you can activate different initialization functions for the mains switch-on.

- C0265 = 0
 - The current output value is saved before mains disconnection or mains failure. The motor potentiometer starts with this value after mains connection.
- C0265 = 1
 - The motor potentiometer starts with the lower limit (C0261) after mains connection.
- C0265 = 2
 - The motor potentiometer starts with 0% after mains connection.

If the initialization is completed, the motor potentiometer follows the applied control function.



Configuration

2.4.45 Blocking frequencies (NLIM)

This FB blocks signals in max. three speed ranges which can be defined. The output signal skips the defined ranges. If you use the output signal as setpoint speed, the motor only passes the blocked ranges.

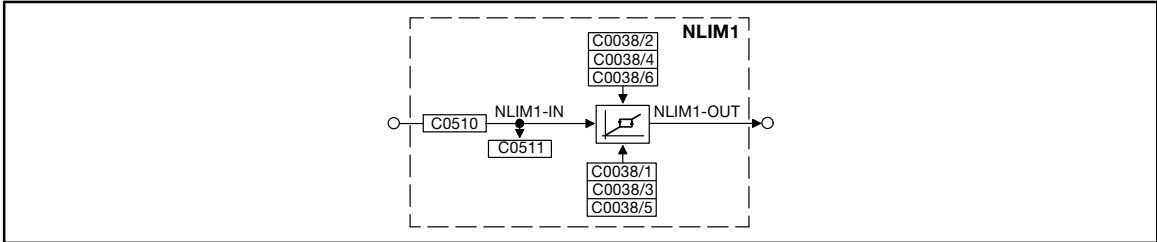


Fig. 2-104

Blocking frequencies (NLIM1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
NLIM1-IN	a	C0511	dec [%]	C0510	1	1000	-
NLIM1-OUT	a	-	-	-	-	-	-

Function

A blocked speed range is activated by entering a lower and an upper speed limit.

The output signal remains at the lower limit of the block range until the input signal has over- or undershot the blocked speed range.

Code	Choice	Function
C0038/1	0 {1 rpm} 36000 0 = Function not active	Blocked speed range 1
C0038/2		defines the lower limit
C0038/3		defines the upper limit
C0038/4		Blocked speed range 2
C0038/5		defines the lower limit
C0038/6		defines the upper limit

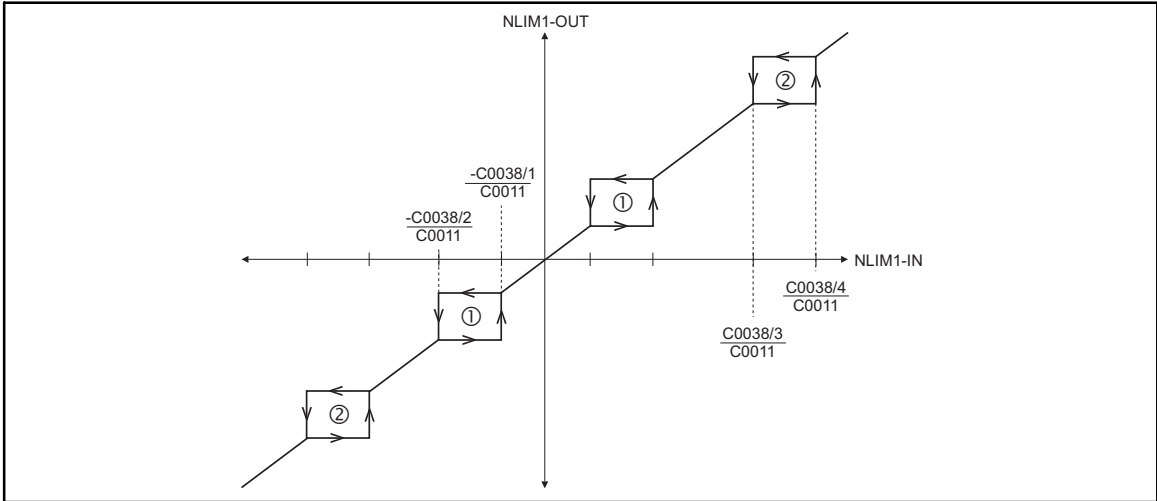
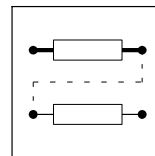


Fig. 2-105

Representation of the upper and lower limits of the blocked speed ranges

- ① Blocked speed range 1
- ② Blocked speed range 2



2.4.46 Logic NOT

These FB enable a long inversion of digital signals. You can use the FBs for the control of functions or the generation of status information.

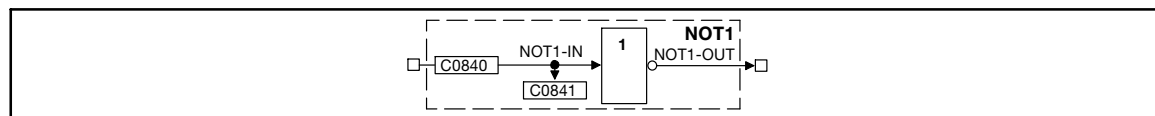


Fig. 2-106

Logic NOT

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
NOT1-IN	d	C0841	bin	C0840	2	1000	-
NOT1-OUT	d	-	-	-	-	-	-

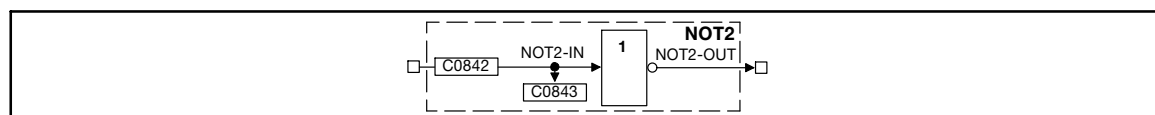


Fig. 2-107

Logic NOT (NOT2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
NOT2-IN	d	C0843	bin	C0842	2	1000	-
NOT2-OUT	d	-	-	-	-	-	-

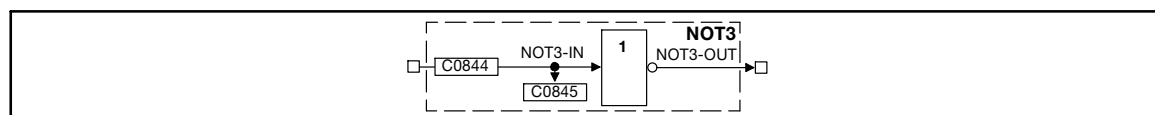
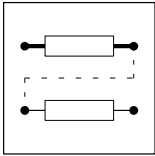


Fig. 2-108

Logic NOT (NOT3)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
NOT3-IN	d	C0845	bin	C0844	2	1000	-
NOT3-OUT	d	-	-	-	-	-	-



Configuration

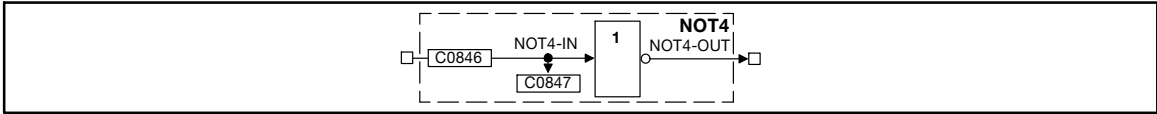


Fig. 2-109

Logic NOT (NOT4)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
NOT4-IN	d	C0847	bin	C0846	2	1000	-
NOT4-OUT	d	-	-	-	-	-	-

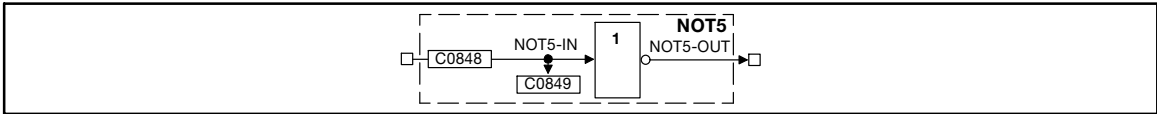


Fig. 2-110

Logic NOT (NOT5)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
NOT5-IN	d	C0849	bin	C0848	2	1000	-
NOT5-OUT	d	-	-	-	-	-	-

Function

NOTx-IN1	NOTx-OUT
0	1
1	0

0 = LOW

1 = HIGH

In a contactor control, the function corresponds to a change from a normally-open to a normally-closed contact.

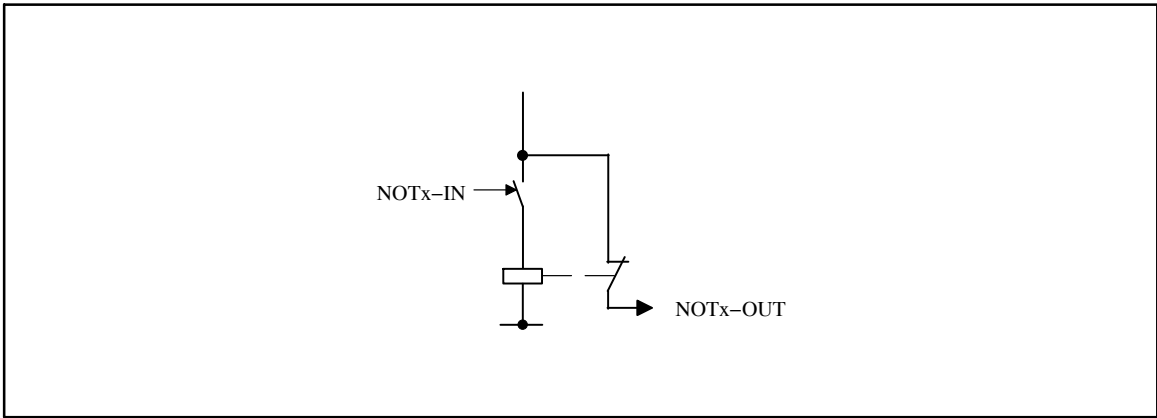
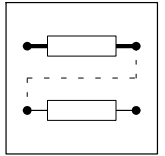


Fig. 2-111

Function of NOT as a change from a normally-open to a normally-closed contact



2.4.47 Speed preconditioning (NSET)

This FB contains several functions that can be used to generate a speed setpoint. Both analog and digital input signals are conditioned.

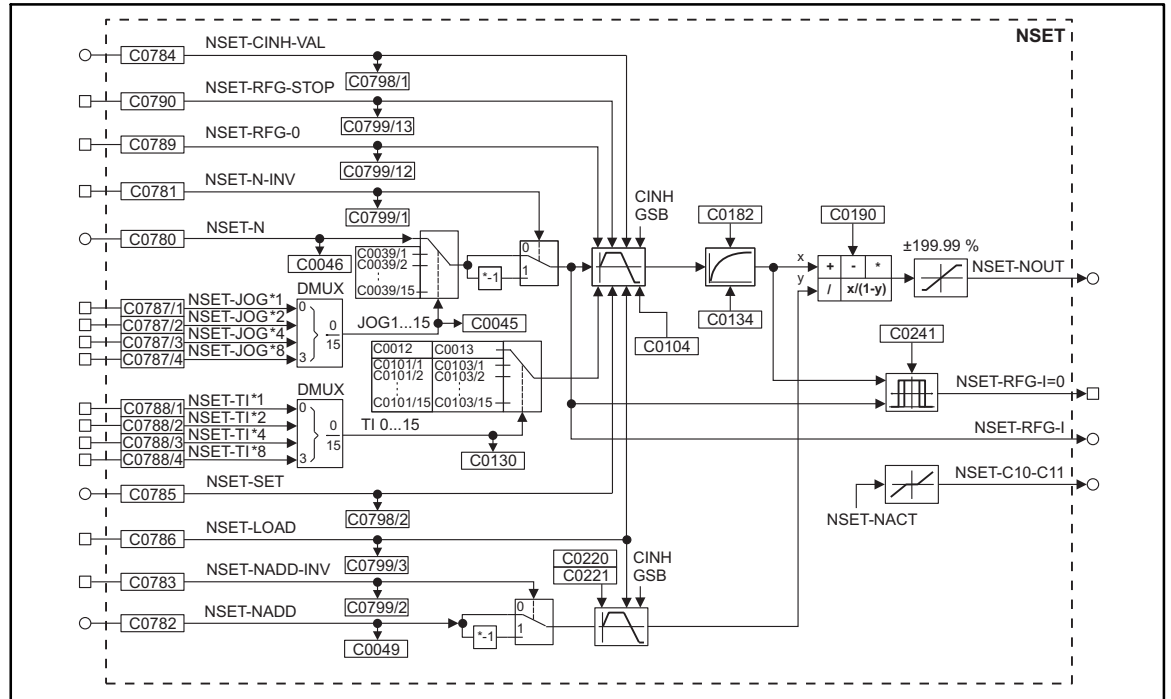
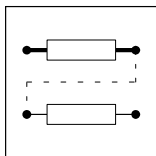


Fig. 2-112 Speed setpoint preconditioning (NSET)

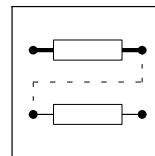


Configuration

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
NSET-N	a	C0046	dec [%]	C0780	1	50	Provided for main setpoint; other signals are permissible
NSET-NADD	a	C0047	dec [%]	C0782	1	5650	Provided for additional setpoint; other signals are permissible
NSET-JOG*1	d	C0799/4	bin	C0787/1	2	53	Selection and control of overriding "fixed setpoints" for the main setpoint
NSET-JOG*2	d	C0799/5	bin	C0787/2	2	1000	
NSET-JOG*4	d	C0799/6	bin	C0787/3	2	1000	
NSET-JOG*8	d	C0799/7	bin	C0787/4	2	1000	
NSET-TI*1	d	C0799/8	bin	C0788/1	2	1000	Selection and control of alternative "fixed setpoints" for the main setpoint
NSET-TI*2	d	C0799/9	bin	C0788/2	2	1000	
NSET-TI*4	d	C0799/10	bin	C0788/3	2	1000	
NSET-TI*8	d	C0799/11	bin	C0788/4	2	1000	
NSET-N-INV	d	C0799/1	bin	C0781	2	10251	Control of the signal inversion for the main setpoint
NSET-NADD-INV	d	C0799/2	bin	C0783	2	1000	Control of the signal inversion for the additional setpoint
NSET-RFG-0	d	C0799/12	bin	C0789	2	1000	Leads the main setpoint integrator via the current T_i times to 0
NSET-RFG-STOP	d	C0799/13	bin	C0790	2	1000	Holding (freezing) of the main setpoint integrator to its current value
NSET-CINH-VAL	a	C0798/1	dec [%]	C0784	1	5001	Here the signal is applied that the main setpoint integrator is to accept when the controller is inhibited
NSET-SET	a	C0798/2	dec [%]	C0785	1	5000	Here the signal is applied that the main setpoint integrator is to accept when the input NSET-LOAD is set
NSET-LOAD	d	C0799/3	bin	C0786	2	5001	Control of both ramp function generators in special situations, e. g. QSP
NSET-OUT	a	-	-	-	-	-	Limited to ± 199.99 %
NSET-RFG-I=0	d	-	-	-	-	-	-
NSET-RFG-I	a	-	-	-	-	-	-
NSET-C10-C11	a	-	-	-	-	-	-

Range of functions

- Main setpoint channel
- JOG setpoints
- Setpoint inversion
- Ramp function generator for the main setpoint
- Acceleration functions
- S-ramp
- Arithmetic operation
- Additional setpoint



2.4.47.1 Main setpoint channel

- The signal at the input NSET-N is initially led by the function JOG-select.
- The JOG function overrides the setpoint input NSET-N. I.e. a selected JOG value switches the input inactive. After this, the following signal conditioning uses the JOG value.
- The signals in the main setpoint channel are limited to the range of $\pm 199.99\%$.

2.4.47.2 JOG setpoints

The JOG setpoints are parameterised under C0039/1 ... C0039/15.

- JOG setpoints are fixed values that are defined under C0039/1 ... C0039/15.
- The JOG values can be activated via the inputs NSET-JOG*x.
- The four inputs NSET-JOG*x are binary coded, so that 15 JOG values can be called.
- The decoding for the enabling of the JOG values is carried out according to the following table:

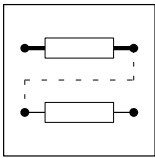
Output signal	1st input NSET-JOG*1	2nd input NSET-JOG*2	3rd input NSET-JOG*4	4th input NSET-JOG*8
NSET-n	0	0	0	0
JOG 1	1	0	0	0
JOG 2	0	1	0	0
JOG 3	1	1	0	0
JOG 4	0	0	1	0
JOG 5	1	0	1	0
JOG 6	0	1	1	0
JOG 7	1	1	1	0
JOG 8	0	0	0	1
JOG 9	1	0	0	1
JOG 10	0	1	0	1
JOG 11	1	1	0	1
JOG 12	0	0	1	1
JOG 13	1	0	1	1
JOG 14	0	1	1	1
JOG 15	1	1	1	1

0 = LOW

1 = HIGH

- If all inputs are set to 0, the input NSET-N is active.
- The number of inputs to be assigned depends on the number of JOG setpoints required. A maximum of 4 inputs and thus 15 selection possibilities are available. Digital signal sources are assigned under C0787 and the corresponding subcode.

Number of the required JOG setpoints	Number of the inputs to be assigned
1	at least 1
1 ... 3	at least 2
4 ... 7	at least 3
8 ... 15	4



Configuration

2.4.47.3 Setpoint inversion

The output signal of the JOG function is led via an inverter.

The sign of the setpoint is inverted, when the input NSET-N-INV = HIGH.

2.4.47.4 Ramp function generator for the main setpoint

The setpoint is then led via a ramp function generator with a linear characteristic. The ramp function generator converts setpoint jumps at the input into a ramp.

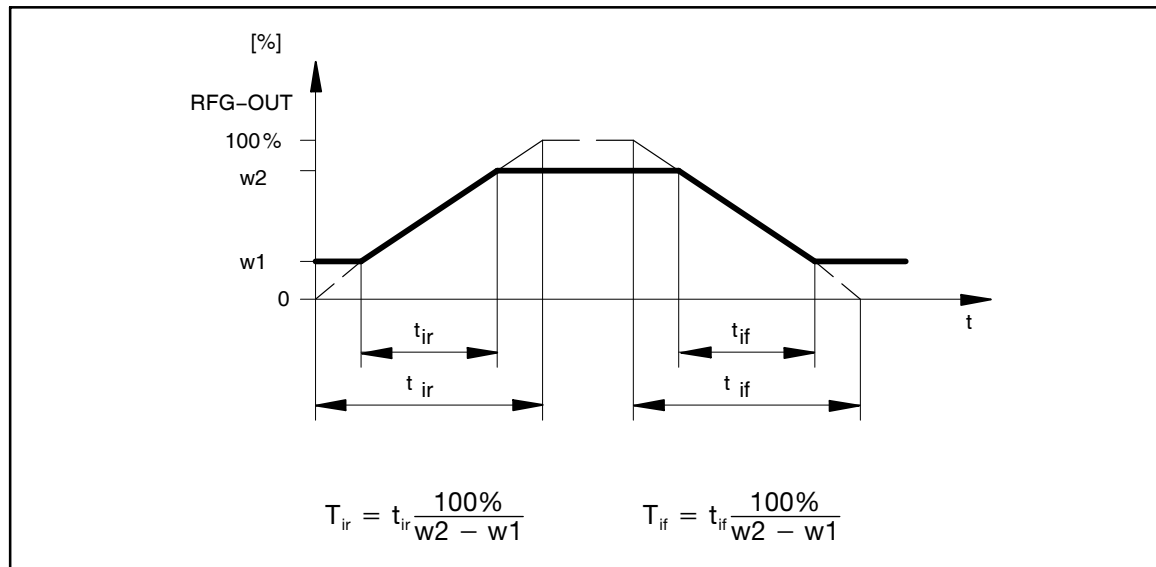
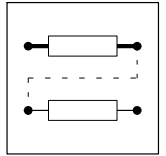


Fig. 2-113

Acceleration and deceleration times of the ramp function generator

- The acceleration and deceleration ramps can be separately selected.
 - Via the inputs NSET-TI*x 16 you can activate different acceleration and deceleration times (see JOG setpoints, table and function. The decoding is made according to the signal plan).
 - The T_i times can only be activated in pairs.
- When the controller inhibit (CINH) is set, the ramp function generator accepts the value at the input NSET-CINH-VAL and passes it on to the following function. This function has priority over all other functions.
- NSET-RFG-STOP = HIGH
 - The ramp function generator is stopped. Changes at the input of the ramp function generator have no effect on the output signal.
- NSET-RFG-0 = HIGH
 - The ramp function generator decelerates to zero along its deceleration ramp.
- It is also possible to load the ramp function generator in advance with a value. For this, the input NSET-LOAD must be set = HIGH. As long as this input is set, the value at the input NSET-SET is accepted by the ramp function generator and provided at the output.



Priorities:

CINH	NSET-LOAD	NSET-RFG-0	NSET-RFG-STOP	Function
0	0	0	0	RFG follows the input value via the set ramps
0	0	0	1	The value at the output of RFG is frozen
0	0	1	0	RFG decelerates to zero along the set deceleration ramp
0	0	1	1	
0	1	0	0	RFG accepts the value at the input NSET-SET and provides it at its output
0	1	0	1	
0	1	1	0	
0	1	1	1	
1	0	0	0	RFG accepts the value at the input NSET-CINH-VAL and provides it at its output
1	0	0	1	
1	0	1	0	
1	0	1	1	
1	1	0	0	
1	1	0	1	
1	1	1	0	
1	1	1	1	

0 = LOW

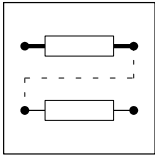
1 = HIGH

2.4.47.5 Acceleration functions

Under C0104, you can select the following acceleration functions for the linear ramp function generator:

Code	Function	Application
C0104 = 0	The drive starts and stops with constant acceleration. The actual acceleration time is proportional to the selected setpoint and the activated T_i time. The following formula applies: $t_{acc} = T_i \cdot \frac{n_{soll}}{n_{max}}$	
C0104 = 1	The drive starts and stops in the activated T_i time. The selected setpoint has no influence on the acceleration time. The following formula applies: $t_{acc} = T_i$	With acceleration with a fixed time, a drive system is, for instance, simultaneously accelerated and decelerated to standstill. The individual drives can have different speed values.
C0104 = 2	The drive starts and stops with a predefined number of revolutions or over a selected distance. The actual acceleration time results from the selected setpoint and the activated T_i time. The following formula applies: $t_{acc} = T_i \cdot \frac{n_{max}}{n_{soll}}$	With acceleration over a specified distance, the distance selected via the T_i time is traversed when the drive is decelerated to standstill. The speed does not have any influence.

Start and stop with a preselected time or distance is only possible with the control signal at NSET-RFG-0 **and** after controller enable.



Configuration

2.4.47.6 S-ramp

A PT1 element is connected to the linear ramp function generator. This arrangement implements an S-ramp for an almost jerk-free acceleration and deceleration.

- The PT1 element is switched on/off under C0134.
- The time constant is set under C0182.

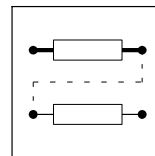
2.4.47.7 Arithmetic operation

The output value is led to an arithmetic function which combines the main setpoint and the additional setpoint. The arithmetic combination is selected under C0190 (see the following table).

C0190	Function	Example
0	Output = X (Y is not processed)	-
1	Output = X + Y	100 % = 50 % + 50 %
2	Output = X - Y	50 % = 100 % - 50 %
3	Output = X * Y	100 % = 100 % * 100 %
4	Output = X / |Y|	1 % = 100 % / 100 %
5	Output = X / (100 % - Y)	200 % = 100 % / (100 % - 50 %)

2.4.47.8 Additional setpoint

- Via the input NSET-NADD you can combine an additional setpoint (e.g. a correction signal) with the main setpoint.
- With NSET-NADD-INV = HIGH you can invert the signal at NSET-ADD, before it is applied to the ramp function generator. The ramp function generator has a linear characteristic with acceleration time T_{ir} (C0220) and deceleration time T_{if} (C0221).
- With NSET-LOAD = HIGH or when controller inhibit is set, the ramp function generator is set to 0 and held there, without considering the T_i times.



2.4.48 Logic OR

These FBs enable a logic OP operation of digital signals. You can use the FBs for the control of functions or the generation of status information.

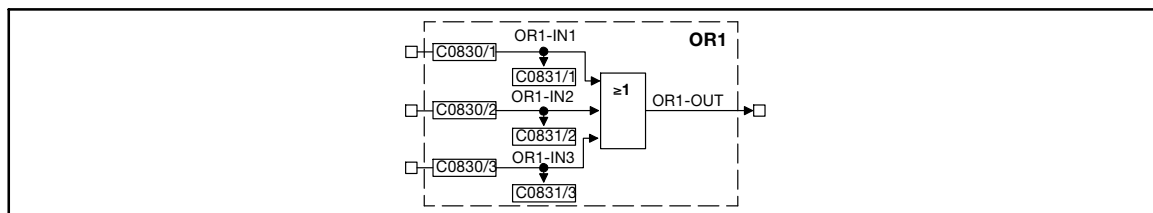


Fig. 2-114

Logic OR (OR1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
OR1-IN1	d	C0831/1	bin	C0830/1	2	1000	-
OR1-IN2	d	C0831/2	bin	C0830/2	2	1000	-
OR1-IN3	d	C0831/3	bin	C0830/3	2	1000	-
OR1-OUT	d	-	-	-	-	-	-

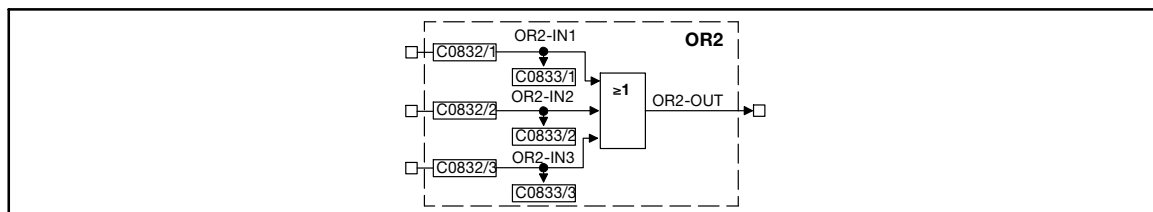
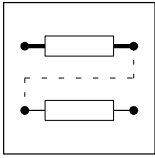


Fig. 2-115

Logic OR (OR2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
OR2-IN1	d	C0833/1	bin	C0832/1	2	1000	-
OR2-IN2	d	C0833/2	bin	C0832/2	2	1000	-
OR2-IN	d	C0833/3	bin	C0832/3	2	1000	-
OR2-OUT	d	-	-	-	-	-	-



Configuration

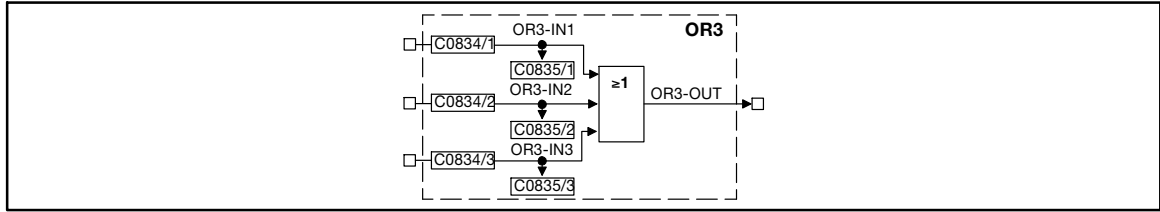


Fig. 2-116

Logic OR (OR3)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
OR3-IN1	d	C0835/1	bin	C0834/1	2	1000	-
OR3-IN2	d	C0835/2	bin	C0834/2	2	1000	-
OR3-IN3	d	C0835/3	bin	C0834/3	2	1000	-
OR3-OUT	d	-	-	-	-	-	-

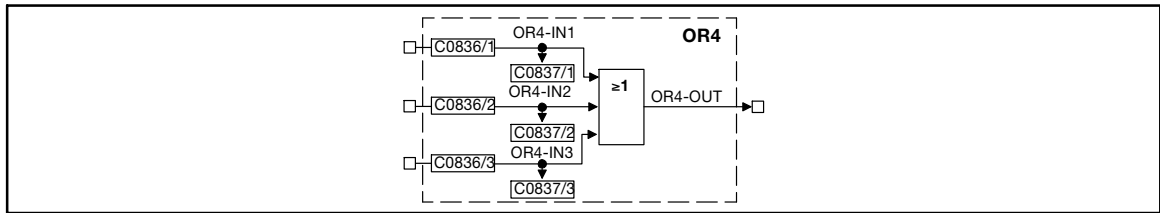


Fig. 2-117

Logic OR (OR4)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
OR4-IN1	d	C0837/1	bin	C0826/1	2	1000	-
OR4-IN2	d	C0837/2	bin	C0826/2	2	1000	-
OR4-IN3	d	C0837/3	bin	C0826/3	2	1000	-
OR4-OUT	d	-	-	-	-	-	-

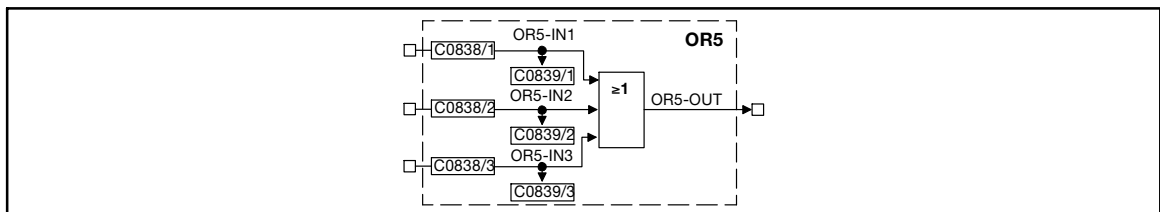
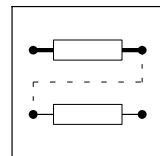


Fig. 2-118

Logic OR (OR5)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
OR5-IN1	d	C0839/1	bin	C0828/1	2	1000	-
OR5-IN2	d	C0839/2	bin	C0828/2	2	1000	-
OR5-IN3	d	C0839/3	bin	C0828/3	2	1000	-
OR5-OUT	d	-	-	-	-	-	-



Function

ORx-IN1	ORx-IN2	ORx-IN3	ORx-OUT
0	0	0	0
1	0	0	0
0	1	0	0
1	1	0	0
0	0	1	0
1	0	1	0
0	1	1	0
1	1	1	1

0 = LOW

1 = HIGH

In a contactor control, the function corresponds to a parallel connection of normally-open contacts.

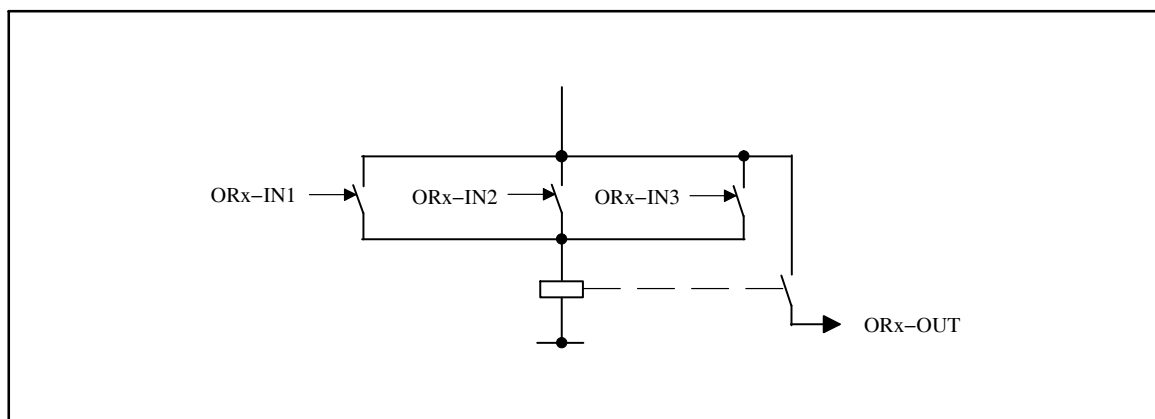


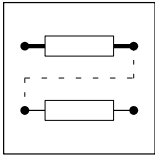
Fig. 2-119

Function of the OR operation as a parallel connection of normally-open contacts



Tip!

If only two inputs are required, use the inputs ORx-IN1 and ORx-IN2. Assign the input ORx-IN3 with the signal source FIXED0.



Configuration

2.4.49 Oscilloscope function (OSZ)

This FB detects any measurement variables (e.g. setpoint speed, actual speed, torque, etc.) to support you in the commissioning of drives and to facilitate troubleshooting.

Measurement signals are displayed using **Global Drive Control (GDC)**.

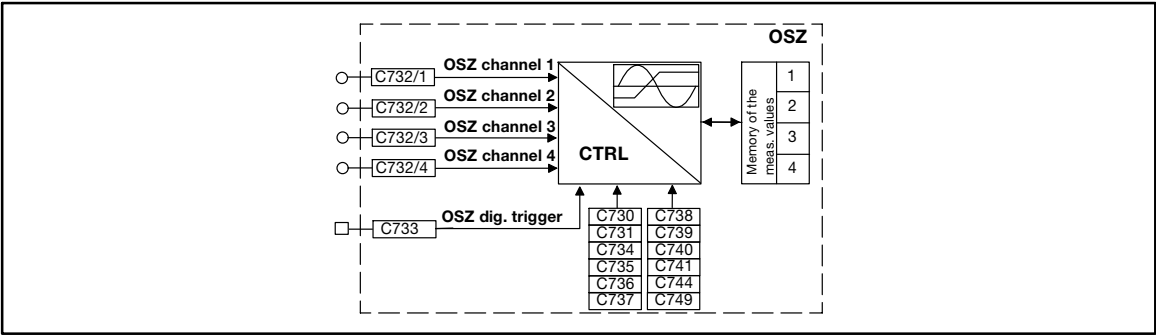


Fig. 2-120 Oscilloscope function (OSZ)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
OSZ CHANNEL 1	a	-	-	C0732/1	1	-	-
OSZ CHANNEL 2	a	-	-	C0732/2	1	-	-
OSZ CHANNEL 3	a	-	-	C0732/3	1	-	-
OSZ CHANNEL 4	a	-	-	C0732/4	1	-	-
OSZ-DIG-TRIGGER	d	-	-	C0733/1	2	-	-

Range of functions

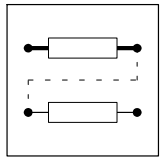
The FB consists of three units:

- Trigger check
 - Monitoring the digital trigger source for a valid trigger result
- Processing the measured signal
 - Linking the measurement inputs
 - Calculating the time
 - Monitoring the analog trigger source for a valid trigger result
- Memory of the measured values
 - Scaling the ring buffer memory
 - Saving measured data in the ring buffer memory
 - Saving measured points for the reconstruction of the graphic



Tip!

For a comprehensive description refer to the user's manual "Oscilloscope function".



2.4.50 Process controller (PCTRL)

You can use these FBs for the control of state variables such as pressure, level, dancer position, etc. Setpoint and actual value are sent to the process controller via the corresponding inputs and processed according to the selected control algorithm (PID-, PI- or P-algorithm).

- You can adapt the gain in the FB PCTRL1.
- The FB PCTRL2 is optimal for control circuits which must be activated or deactivated online.

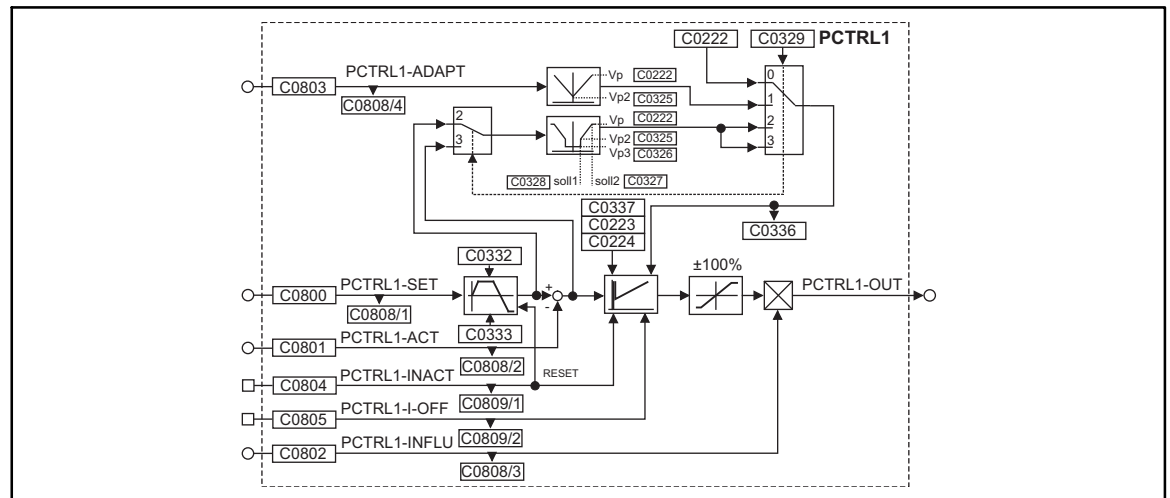
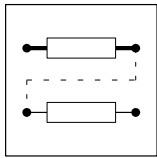


Fig. 2-121 Process controller (PCTRL1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
PCTRL1-SET	a	C0808/1	dec [%]	C0800	1	1000	Input for process setpoint. Possible value range: ± 200 %. The time of step-change signals can be decelerated via the ramp generator (C0332 for the acceleration time; C0333 for the deceleration time).
PCTRL1-ACT	a	C0808/2	dec [%]	C0801	1	1000	Input for actual value; value range ± 200 %
PCTRL1-INFLU	a	C0808/3	dec [%]	C0802	1	1000	Evaluation (influence) of the output signal; value range ± 200 %
PCTRL1-ADAPT	a	C0808/4	dec [%]	C0803	1	1000	Changing the gain V_p ; Value range ± 200 % (online)
PCTRL1-INACT	d	C0809/1	bin	C0804	2	1000	HIGH = Inactivation of the process controller (online)
PCTRL1-I-OFF	d	C0809/2	bin	C0805	2	1000	HIGH = switch off I component (online) LOW = switch off I component (online)
PCTRL1-OUT	a	-	-	-	-	-	-



Configuration

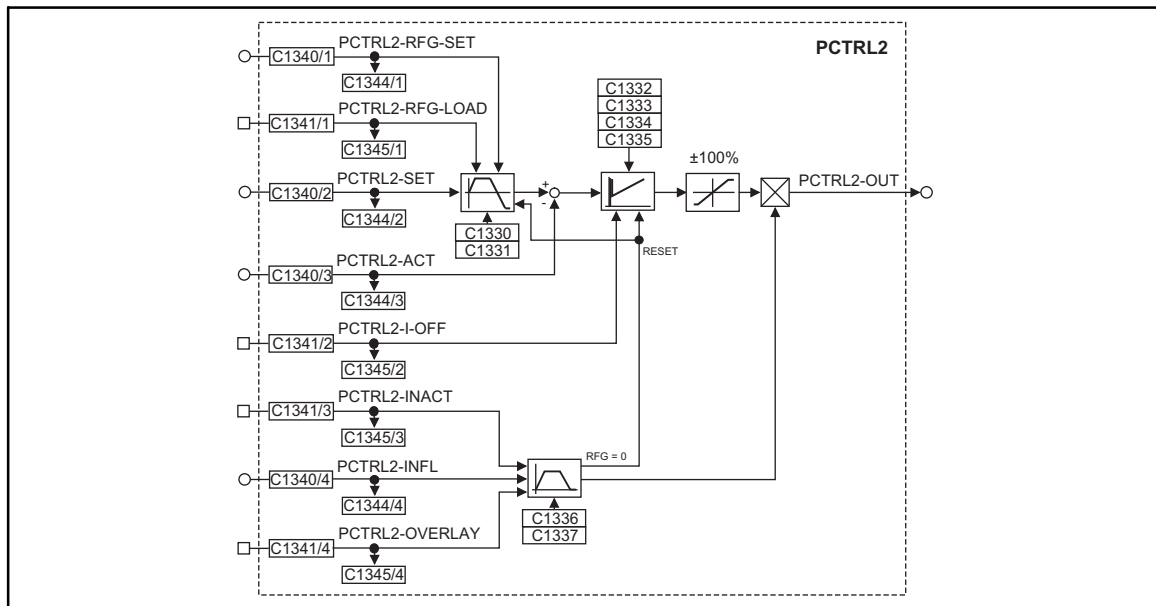


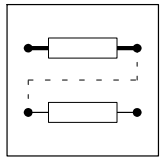
Fig. 2-122

Process controller (PCTRL2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
PCTRL2-RFG-SET	a	C1344/1	dec [%]	C1340/1	1	1000	The process setpoint is shown at PCTRL2-SET with any start value via a ramp generator. The function is activated using PCTRL-RFG-LOAD.
PCTRL2-RFG-LOAD	d	C1345/1	bin	C1341/1	2	1000	HIGH = Function of PCTRL2-RFG-SET is active
PCTRL2-SET	a	C1344/2	dec [%]	C1340/2	1	1000	Input for process setpoint. Possible value range: ± 200 %. The time of step-change signals can be decelerated via the ramp generator (C1330 for the acceleration time; C1331 for the deceleration time).
PCTRL2-ACT	a	C1344/3	dec [%]	C1340/3	1	1000	Input for actual value; value range ± 200 %
PCTRL2-INFL	a	C1344/4	dec [%]	C1340/4	1	1000	Evaluation (influence) of the output signal; value range ± 200 %
PCTRL2-I-OFF	d	C1345/2	bin	C1341/2	2	1000	HIGH = switch off I component (online) LOW = switch off I component (online)
PCTRL2-INACT	d	C1345/3	bin	C1341/3	2	1000	HIGH = Inactivation of the process controller (online)
PCTRL2-OVERLAY	d	C1345/4	bin	C1341/4	2	1000	HIGH = Show influence LOW = Hide influence
PCTRL2-OUT	a	-	-	-	-	-	-

Range of functions

- Control characteristic
- Ramp generator
- Value range of the output signal
- Evaluating the output signal
- Deactivating the process controller



2.4.50.1 Control characteristic

In the default setting, the PID algorithm is active.

- The D component is deactivated with
 - C0224 = 0 for PCTRL1,
 - C1334 = 0 for PCTRL2.
- The I-component is switched on or off online via the PCTRLx-I-OFF input. For this, the input is assigned a digital signal source (e.g. one of the freely assignable digital input terminals). If the I-component is to be switched off permanently, the input is assigned the signal source FIXED1.
 - PCTRLx-I-OFF = HIGH switches off the I-component.
 - PCTRLx-I-OFF = LOW switches on the I-component.
- The adjustment time T_n is parameterized via
 - C0223 for PCTRL1,
 - C1333 for PCTRL2.

Gain V_p for PCTRL1

You can adapt the gain V_p in different ways. The function for the provision of the gain V_p is selected under C0329:

- C0329 = 0
 - The gain V_p is entered under C0222.
- C0329 = 1
 - The gain V_p is entered using the input PCTRL1-ADAPT. The input value is led via a linear characteristic. The shape of the characteristic is set under C0222 (upper limit) and C0325 (lower limit). The value under C0222 is valid if the input value = +100 % or -100 %. The value under C0325 is valid if the input value = 0 %.

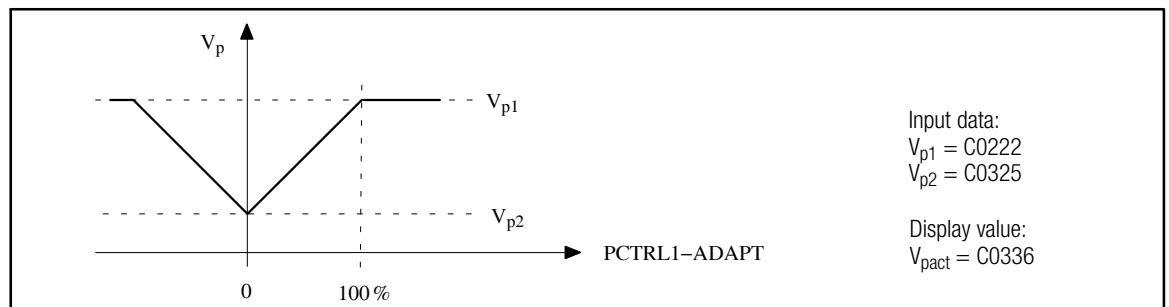
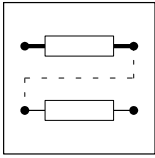


Fig. 2-123

The gain V_p is entered via input PCTRL1-ADAPT



Configuration

- C0329 = 2
 - The input of gain V_p is derived from the process setpoint PCTRL1-SET. The setpoint is obtained after the ramp generator and calculated via the characteristic with three co-ordinates.

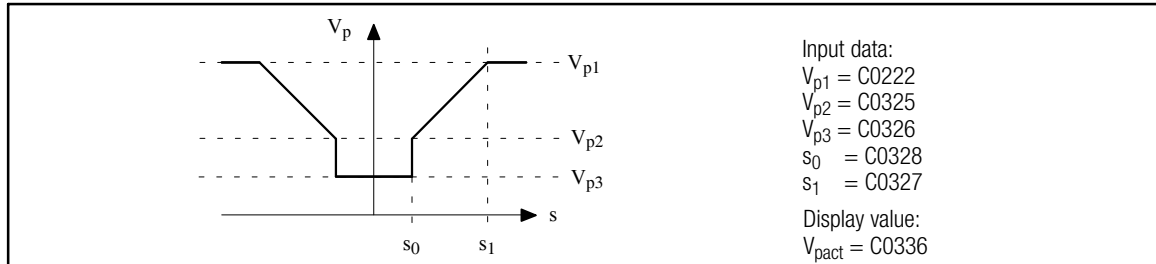


Fig. 2-124 The input of gain V_p is derived from the process setpoint PCTRL1-SET

- C0329 = 3
 - The input of gain V_p is derived from the control difference and led via the characteristic generation as C0329 = 2.

Gain V_p for PCTRL2

The gain V_p is entered under C1332.

2.4.50.2 Ramp generator

The setpoint PCTRLx-SET is led by a ramp generator with linear characteristic. Thus, setpoint step-changes at the input can be transformed into a ramp.

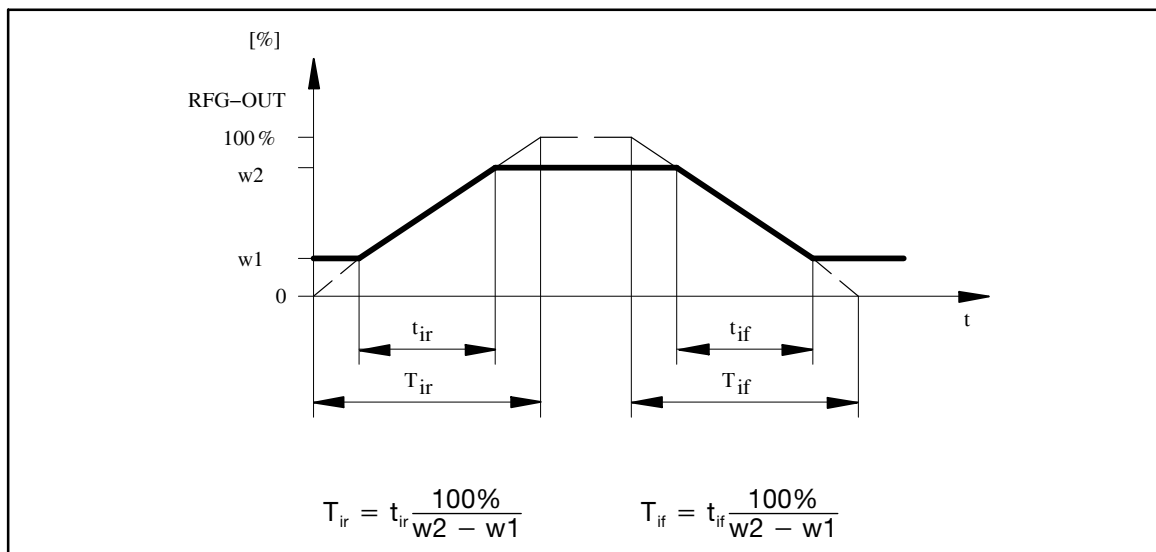
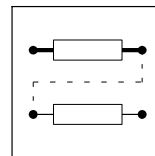


Fig. 2-125 Acceleration and deceleration times of the ramp generator

	Set ramps for acceleration and deceleration		Reset ramp generator (the ramp generator is set to 0)
	Acceleration time t_{ir}	Deceleration time t_{if}	
PCTRL1	C0332	C0333	PCTRL1-INACT = HIGH
PCTRL2	C1330	C1331	PCTRL2-INACT = HIGH



Load ramp generator (only PCTRL2)

A jerk-free acting of the process controller is possible only when the setpoint ramp generator has previously been loaded with the actual value.

- PCTRL2-RFG-LOAD = HIGH activates the function.
- The start value (e.g. the actual value) is entered via PCTRL2-RFG-SET.

2.4.50.3 Value range of the output signal

Range of the process controller	PCTRL1	PCTRL2	Limitation
Bipolar (default setting)	C0337 = 0	C1335 = 0	Limits the output value to $\pm 100\%$
Unipolar	C0337 = 1	C1335 = 1	Limits the output value to 0 ... +100 %

2.4.50.4 Evaluating the output signal

After the limitation, the output signal is evaluated.

PCTRL1

You can enter the influence of the process controller via PCTRL1-INFLU.

- With PCTRL1-INFLU = 100 %, the output signal of the controller is output unchanged. The influence changes in relation to the value at PCTRL1-INFLU.

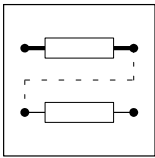
PCTRL2

The overlay function of the process controller can be slowly activated or deactivated using an internal ramp generator.

- The influence of the process controller is entered via PCTRL2-INFL.
- The influence is activated with PCTRL2-OVERLAY = HIGH.
- The influence is deactivated with PCTRL2-OVERLAY = LOW.
- Ramps for activation and deactivation:
 - C1336 = Acceleration time T_{ir}
 - C1337 = Deceleration time T_{if}

2.4.50.5 Deactivating the process controller

- The process controller is deactivated using PCTRLx-INACT = HIGH.
 - PCTRLx-OUT is set to zero.
 - The I-component is set to zero.
 - The ramp generator is set to zero.



Configuration

2.4.51 Delay (PT1)

These FBs are low-pass filters. They filter and delay analog signals.

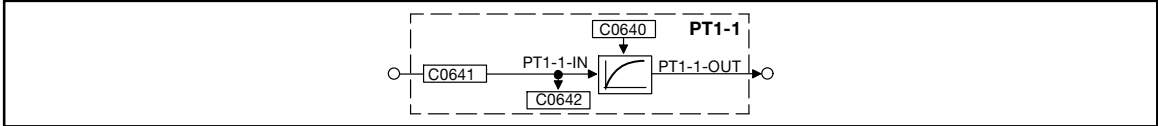


Fig. 2-126

Delay (PT1-1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
PT1-1-IN	a	C0642	dec [%]	C0641	1	1000	-
PT1-1-OUT	a	-	-	-	-	-	-

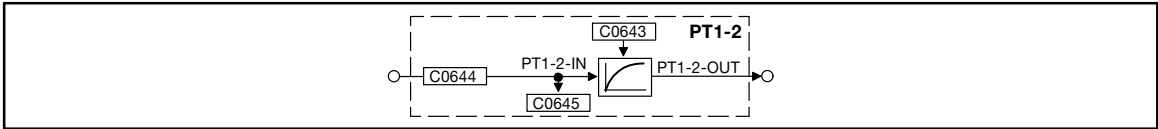


Fig. 2-127

Delay (PT1-2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
PT1-2-IN	a	C0645	dec [%]	C0644	1	1000	-
PT1-2-OUT	a	-	-	-	-	-	-

Function

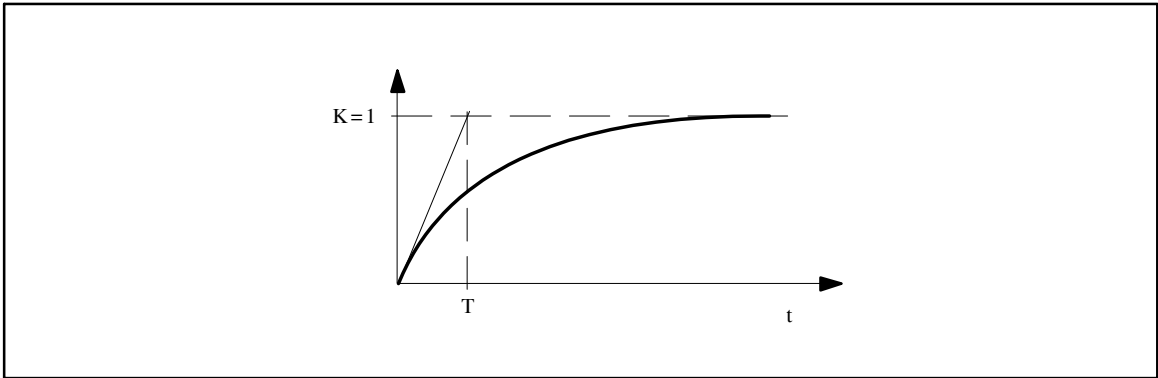
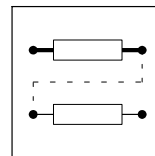


Fig. 2-128

Delay behaviour of PT1

- The delay T is set under C0640 (PT1-1) or C0643 (PT1-2).
- The proportional value is fixed at $K = 1$.



2.4.52 Ramp function generator (RFG)

This FB converts step changes into ramps. The output signal follows the input signal with limited rate of rise.

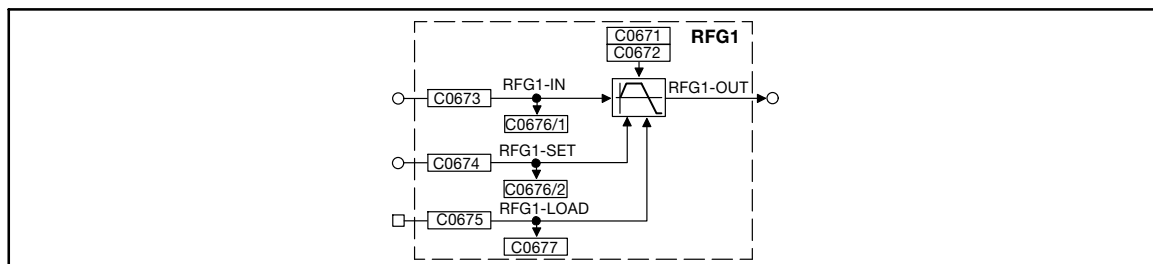


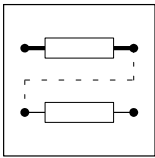
Fig. 2-129

Ramp generator (RFG1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
RFG1-IN	a	C0676/1	dec [%]	C0673	1	1000	-
RFG1-SET	a	C0676/2	dec [%]	C0674	1	1000	-
RFG1-LOAD	d	C0677	-	C0675	2	1000	-
RFG1-OUT	a	-	-	-	-	-	-

Range of functions

- Ramp function generator
- Load ramp generator



Configuration

2.4.52.1 Ramp function generator

The maximum speed of change with which the output signal can follow the input signal, is parameterized via the acceleration and deceleration time of the ramp function generator. They refer to a change of the output signal from 0 to 100%. The times to be set T_{ir} and T_{if} are to be calculated as follows:

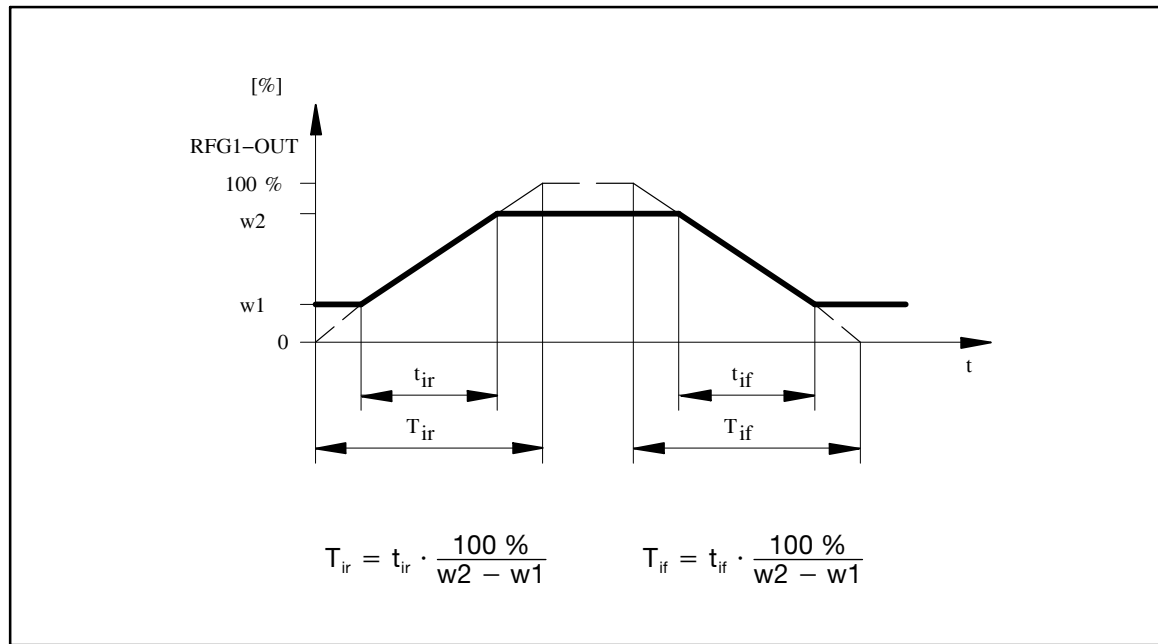


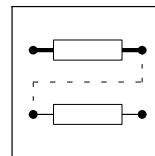
Fig. 2-130 Acceleration and deceleration times of the ramp function generator

Here, t_{ir} and t_{if} are the desired times for the change between $w1$ and $w2$. You can set the calculated value under C0671 (T_{ir}) and C0672 (T_{if}).

2.4.52.2 Load ramp function generator

You can initialize the ramp function generator with defined values via the inputs RFG1-SET and RFG1-LOAD.

- As long as RFG1-LOAD = HIGH, the value at RFG1-SET is switched to RFG1-OUT.
- If the RFG1-LOAD = LOW, the ramp function generator accelerates from this value to its input value at REG1-IN via the set T_i times.



2.4.53 CW/CCW/Quick stop (R/L/Q)

This FB evaluates the input of the direction of rotation protected against wire breakage. If there is no signal for the direction of rotation, quick stop is released.

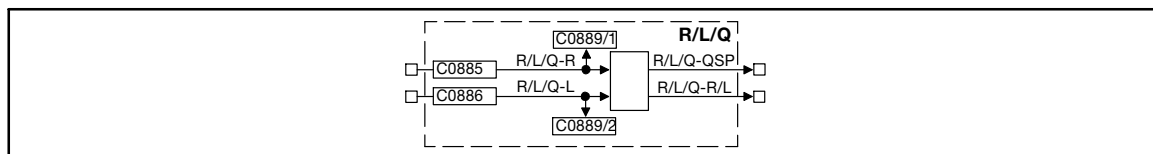


Fig. 2-131

CW/CCW/Quick stop (R/L/Q)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
R/L/Q-R	d	C0889/1	bin	C0885	2	51	-
R/L/Q-L	d	C0889/2	bin	C0886	2	52	-
R/L/Q-QSP	d	-	-	-	-	-	-
R/L/Q-R/L	d	-	-	-	-	-	-

Function

- After mains connection, the two outputs are initialized as follows:

Inputs		Outputs	
R/L/Q-R	R/L/Q-L	R/L/Q-R/L	R/L/Q-QSP
-	-	0	1

0 = LOW

1 = HIGH

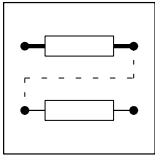
- After the initialization, the following relationship results in dependence of the input signals:

Inputs		Outputs	
R/L/Q-R	R/L/Q-L	R/L/Q-R/L	R/L/Q-QSP
0	0	0/1*	1
1	0	0	0
0	1	1	0
1	1	unchanged	unchanged

0 = LOW

1 = HIGH

* If you have selected a direction of rotation and then set both inputs to LOW, the signal state at R/L/Q-R/L will not change.



Configuration

2.4.54 Sample & Hold (S&H)

This FB can accept analog signals and save them non-volatile. The saved value is also available after mains disconnection.

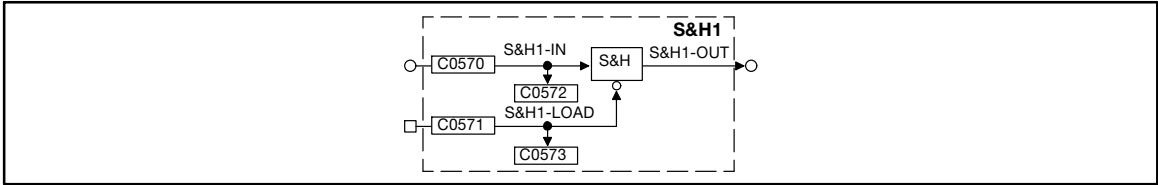
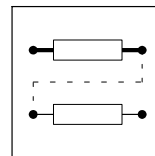


Fig. 2-132 Sample & Hold (S&H1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
S&H1-IN	a	C0572	dec [%]	C0570	1	1000	
S&H1-LOAD	d	C0573	bin	C0571	2	1000	LOW = save
S&H1-OUT	a	-	-	-	-	-	

Function

- With S&H1-LOAD = HIGH the signal at the input S&H1-IN is switched to the output S&H1-OUT.
- With S&H1-LOAD = LOW the output S&H1-OUT is disconnected from the input S&H1-IN and outputs the value which was last valid and S&H-OUT outputs the value which was accepted last.
- Saving before mains disconnection:
 - The value which was accepted last is saved non-volatile in the internal memory before the supply voltage is switched off. When the supply voltage is switched on, the saved value is loaded into the FB S&H1.



2.4.55 Square-root calculator (SQRT)

This FB calculates the square-root from the absolute value of the input signal and then adds the sign again. This is used to convert state variables with their relationship.

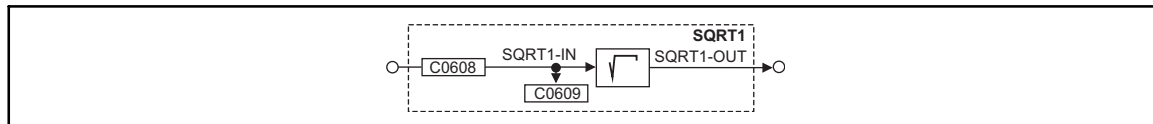


Fig. 2-133

Square-root calculator (SQRT1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
SQRT1-IN	a	C0609	dec [%]	C0608	1	1000	-
SQRT1-OUT	a	-	-	-	-	-	-

Function

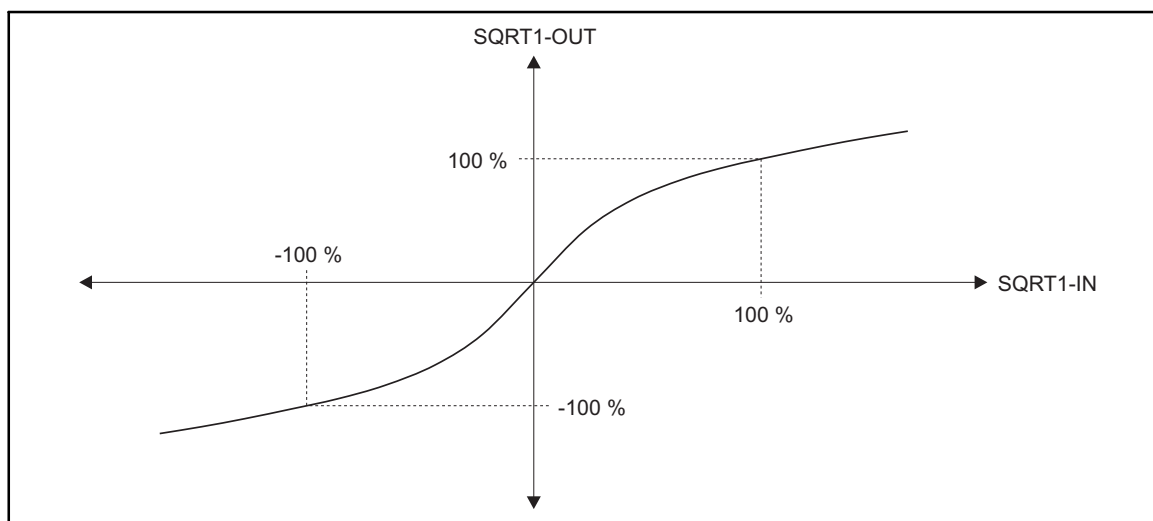
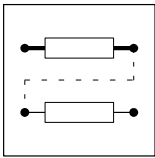


Fig. 2-134

Characteristic of the output signal at SQRT1-OUT to the input signal at SQRT1-IN

When the input signal at SQRT1-IN = 100 %, the output signal at SQRT1-OUT = 100 %.



Configuration

2.4.56 S-ramp function generator (SRFG)

This FB converts setpoint step changes into S-shaped ramps. Thus, you can accelerate the drive practically jolt-free.

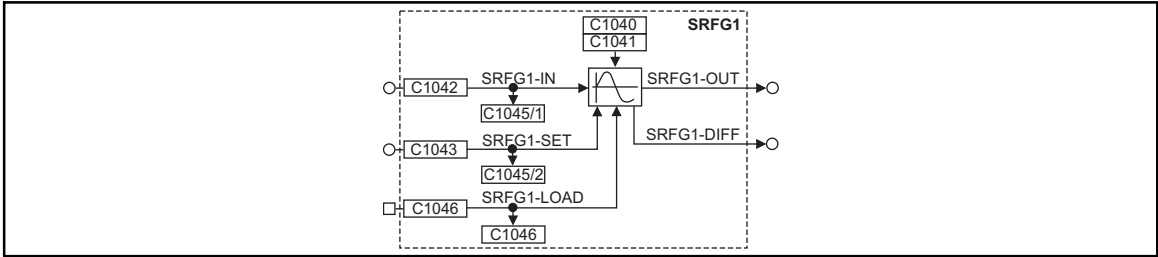
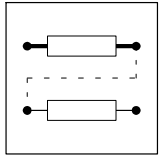


Fig. 2-135 S-ramp function generator (SRFG1)

Name	Signal			Source		Note
	Type	DIS	DIS format	CFG	List	
SRFG1-IN	a	C1045/1	dec [%]	C1042	1	Input
SRFG1-SET	a	C1045/2	dec [%]	C1043	1	Start value for the ramp function generator, acceptance when SRFG1-LOAD = High
SRFG1-LOAD	d	C1046	bin	C0144	2	HIGH = accepts the value at SRFG1-SET and supplies it to SRFG1-OUT; SRFG1-DIFF remains at 0 %
SRFG1-OUT	a	-	-	-	-	Output limited to ± 100 %
SRFG1-DIFF	a	-	-	-	-	Output limited to ± 100 %, supplies the acceleration of the ramp function generator

Range of functions

- Ramp function generator
- Load ramp function generator



2.4.56.1 Ramp function generator

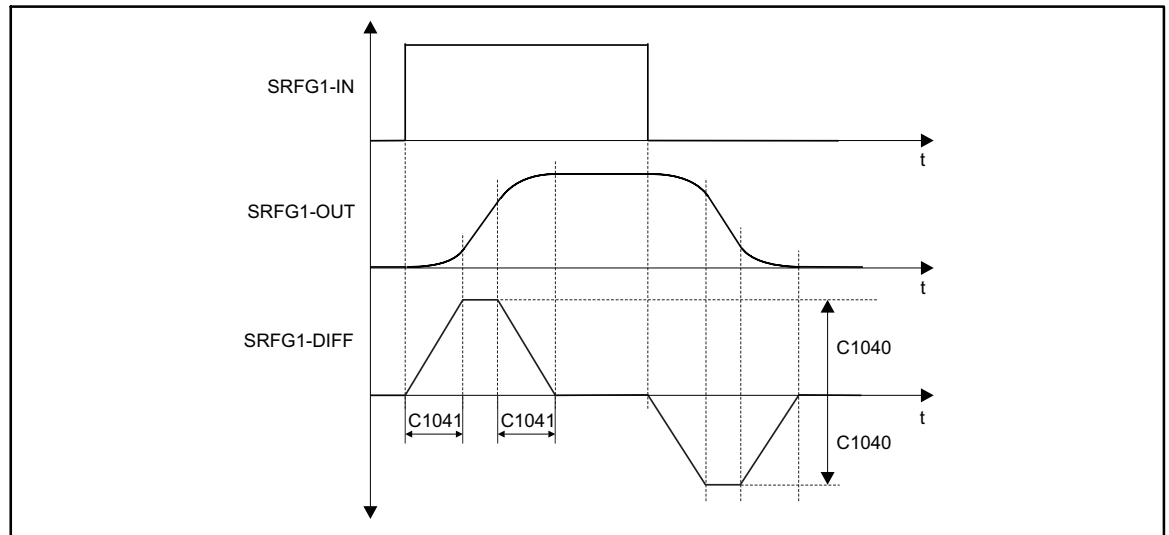


Fig. 2-136

Characteristic of the ramp function generator

The s-shaped characteristic of the output signal is parameterized via the max. acceleration (C1040) and the rounding time (C1041).

- The max. acceleration is entered as a percentage, which the output signal is allowed to pass per second.
- During the rounding time (C1041), from zero acceleration to maximum acceleration (or from maximum acceleration to zero acceleration), the acceleration changes in a linear way.
 - The acceleration characteristic (signal at SRFG1-DIFF) in Fig. 2-136 shows the linear rising or falling of the signal during the rounding time (C1041).

Calculation of the max. acceleration

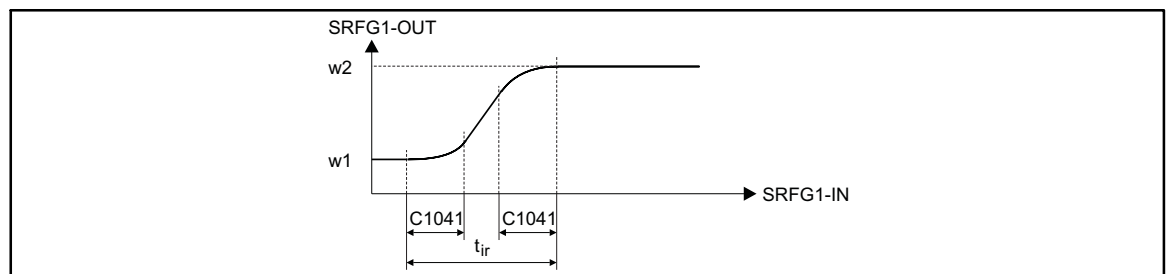
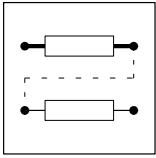


Fig. 2-137

Signal characteristic with jolt-free acceleration

Calculate the necessary max. acceleration for the change between w1 and w2 in the desired time t_{ir} according to the following formula:

$$C1040 = \frac{W1 - W2}{t_{ir} - C1041}$$

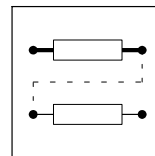


Configuration

2.4.56.2 Load ramp function generator

You can initialize the ramp function generator with defined values via the inputs SRFG1-SET and SRFG1-LOAD.

- As long as SRFG1-LOAD = HIGH, the value at SRFG1-SET is switched to SRFG1-OUT.
- When SRFG1-LOAD = LOW, the ramp generator accelerates from this value to its input value at SRFG1-IN via the set S-shape.



2.4.57 Output of digital status signals (STAT)

The FB accepts digital signals of the function blocks and the status of the controller and passes them on to C0150 and to the FB AIF-OUT and CAN-OUT1.

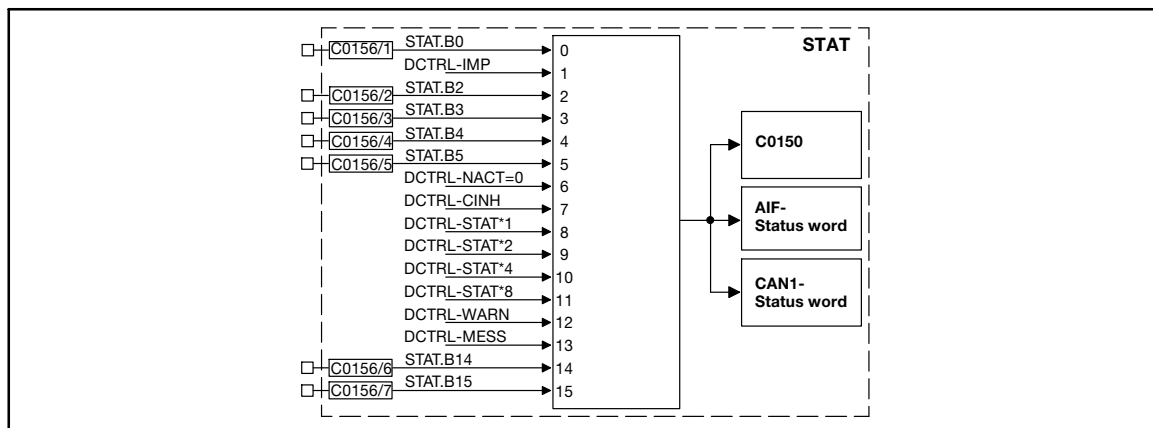


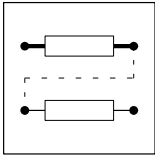
Fig. 2-138 Output of digital status signals (STAT)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
STAT.B0	d	-	bin	C0156/1	2	2000	-
STAT.B2	d	-	bin	C0156/2	2	5002	-
STAT.B3	d	-	bin	C0156/3	2	5003	-
STAT.B4	d	-	bin	C0156/4	2	5050	-
STAT.B5	d	-	bin	C0156/5	2	10650	-
STAT.B14	d	-	bin	C0156/6	2	505	-
STAT.B15	d	-	bin	C0156/7	2	500	-

Function

The status word consists of some linked (DCTRL-xxxx-) and some freely linkable signal inputs (STAT.Bx).

- Digital signal sources can be freely assigned to the inputs STAT.Bx.
- The corresponding bit in the data word is marked with STAT.Bx (e.g. STAT.B0 for the least significant bit).
- The status word is transferred to code C0150 and to the function blocks AIF-OUT, CAN-OUT1, CAN-OUT2, and CAN-OUT1.
- The inputs with the name DCTRL-xxxx are directly accepted from the function block DCTRL. (2-82)



Configuration

2.4.58 Edge evaluation (TRANS)

These FBs evaluate the switching edges of the input signals and generate pulses. The pulse length can be set.

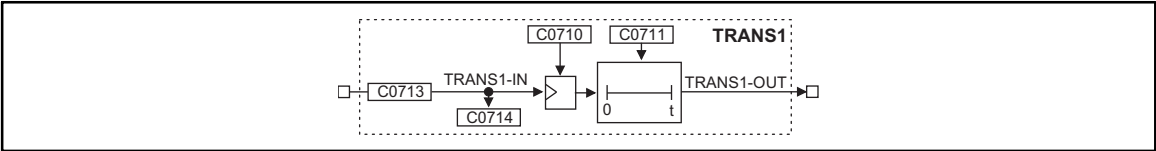


Fig. 2-139 Edge evaluation (TRANS1)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
TRANS1-IN	d	C0714	bin	C0713	2	1000	-
TRANS1-OUT	d	-	-	-	-	-	-

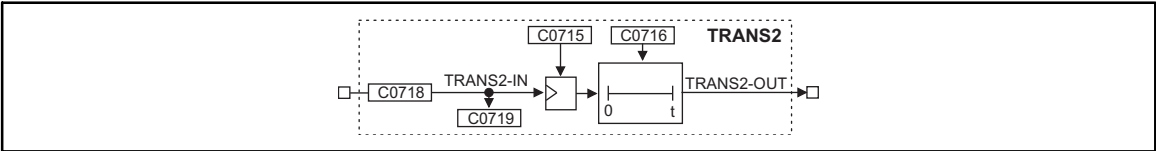
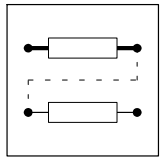


Fig. 2-140 Edge evaluation (TRANS2)

Name	Signal			Source			Note
	Type	DIS	DIS format	CFG	List	Lenze	
TRANS2-IN	d	C0719	bin	C0718	2	1000	-
TRANS2-OUT	d	-	-	-	-	-	-

Range of functions

- Evaluate positive edge
- Evaluate negative edge
- Evaluate positive or negative edge



2.4.58.1 Evaluate positive edge

- C0710 = 0 (TRANS1)
- C0715 = 0 (TRANS2)

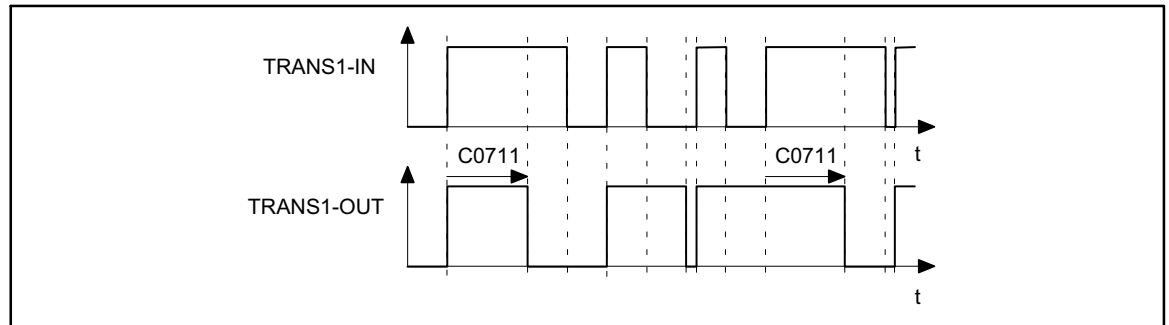


Fig. 2-141 Evaluation of positive edges (TRANS1)

Function procedure

1. With a LOW-HIGH edge at TRANSx-IN, TRANSx-OUT = HIGH.
2. After the time set under C0711 (TRANS1) or C0716 (TRANS2) has elapsed, TRANSx-OUT switches to LOW again.
 - Every new trigger event (LOW-HIGH edge at TRANSx-IN) switches TRANSx-OUT = HIGH and restarts the elapsing time.

2.4.58.2 Evalute negative edge

- C0710 = 1 (TRANS1)
- C0715 = 1 (TRANS2)

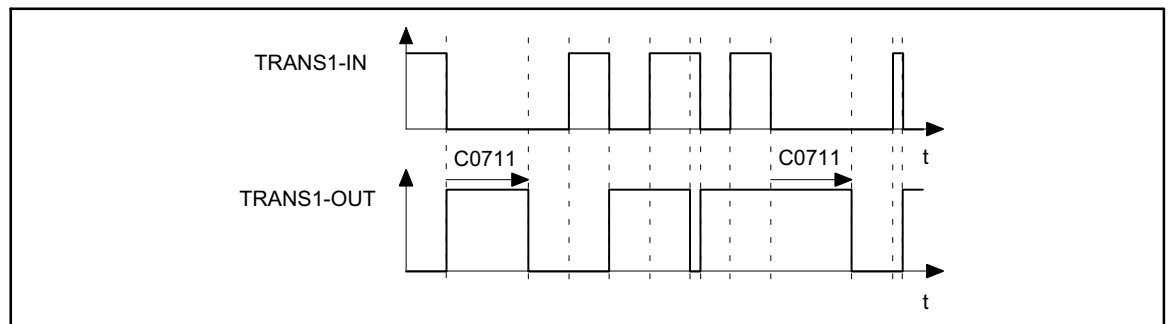
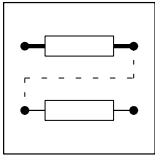


Fig. 2-142 Evaluation of negative edges (TRANS1)

Function procedure

1. With a HIGH-LOW edge at TRANSx-IN, TRANSx-OUT = HIGH.
2. After the time set under C0711 (TRANS1) or C0716 (TRANS2) has elapsed, TRANSx-OUT switches to LOW again.
 - Every new trigger event (LOW-HIGH edge at TRANSx-IN) switches TRANSx-OUT = HIGH and restarts the elapsing time.



Configuration

2.4.58.3 Evaluate positive or negative edge

- C0710 = 2 (TRANS1)
- C0715 = 2 (TRANS2)

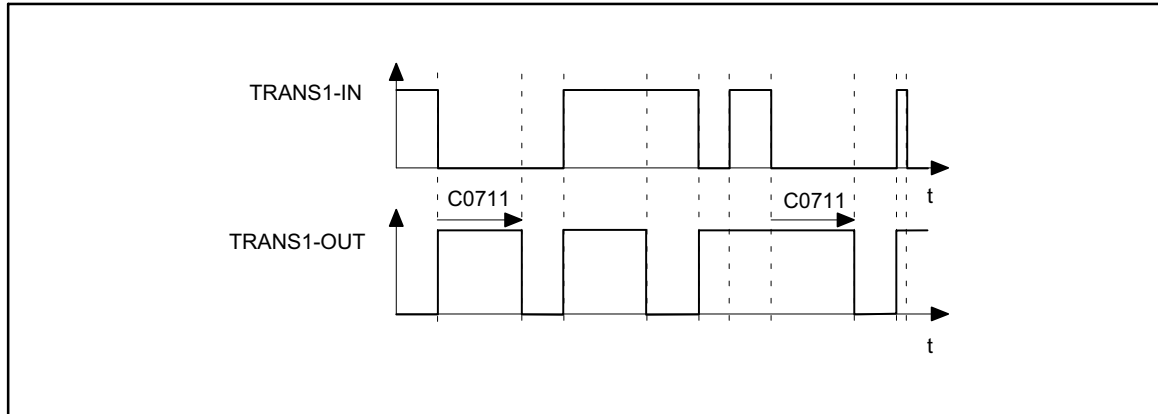


Fig. 2-143 Evaluation of positive and negative edges (TRANS1)

Function procedure

1. With a HIGH-LOW edge or a LOW-HIGH edge at TRANSx-IN, TRANSx-OUT = HIGH.
2. After the time set under C0711 (TRANS1) or C0716 (TRANS2) has elapsed, TRANSx-OUT switches to LOW again.
 - Every new trigger event (LOW-HIGH edge or HIGH-LOW edge at TRANSx-IN) switches TRANSx-OUT = HIGH and restarts the elapsing time.



3 Application examples

Contents

3.1	Important notes	3-4
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3.4	Dosing drive for a filling station	3-8
3.5	Traversing drive for a wire winder	3-10
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3.7	Centre winder with internal diameter calculation	3-16



Application examples

Important notes

3.1 Important notes

For frequent applications, the controller-internal signal processing is stored in basic configurations.

- Under C0005, the basic configurations can be selected, activated, and, with a few settings, adapted to your application (Short Setup). (📖 2-4)
- The setting of the motor data and the adaptation of the motor control are usually independent of the configuration and described in the chapter "Commissioning".



Note!

In the "Short setup" menus of the "Global Drive Control" (GDC) operating/parameter setting software and the XT keypad, you can find the most important codes for the basic configurations.



3.2 Accelerating and decelerating with constant time

This application is based on the basic configuration C0005 = 1000.

Example

A conveyor drive used together with other drives shall accelerate and decelerate in a constant time. The setpoint for the conveying speed shall not influence the acceleration and deceleration time.

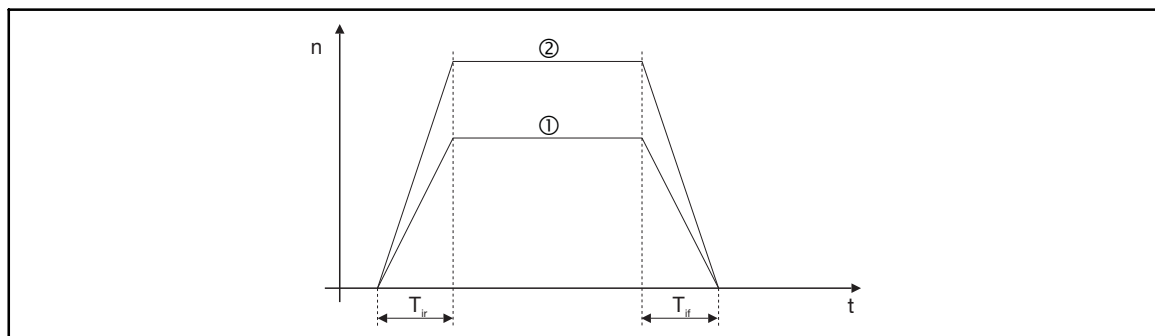


Fig. 3-1

Accelerating and decelerating with constant time (C0104 = 1)

- ① Setpoint 1
- ② Setpoint 2
- n Speed
- T_{ir} Acceleration time
- T_{if} Deceleration time



Application examples

Accelerating and decelerating with constant time

Solution

The drive is enabled and stopped via the inputs for the direction of rotation. The function of the digital inputs remains unchanged. The internal signal processing for quick stop (QSP) has been adapted accordingly.

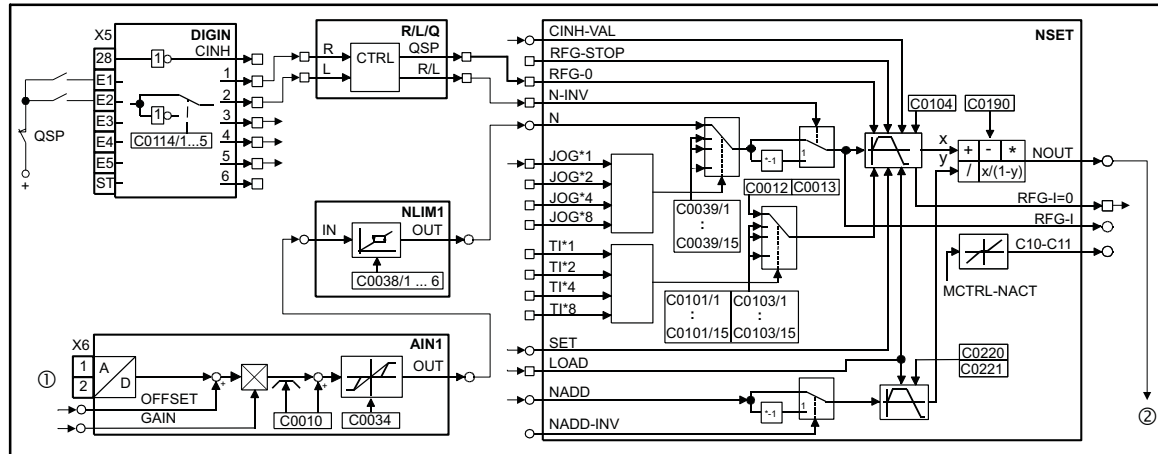


Fig. 3-2

Changes made in configuration 1000 for accelerating and decelerating in a constant time

- ① Setpoint
- ② Setpoint for input MCTRL-N-SET

Parameter setting

1. Remove the connection between the output R/LQ-QSP and the input MCTRL-QSP of the FB MCTRL.
2. Set MCTRL-QSP to FIXED0 (C0900 = 1000).
3. Connect the output R/L/Q-QSP with the input NSET-RFG-0 (C0789 = 10250).
4. Set C0104 = 1
 - The drive accelerates to the setpoint at X6/1,2 or decelerates to zero speed in a constant time.
5. Select the acceleration time (T_{ir}) under C0012 and the deceleration time (T_{if}) under C0013.



Tip!

If you want to use different acceleration and deceleration times, select the desired T_i time before or at the same time with the changeover of the setpoint at NSET-RFG-0.



3.3 Accelerating and decelerating with constant path

Use the basic configuration C0005 = 1000 with the changes shown in Fig. 3-2. However, set C0104 = 2.

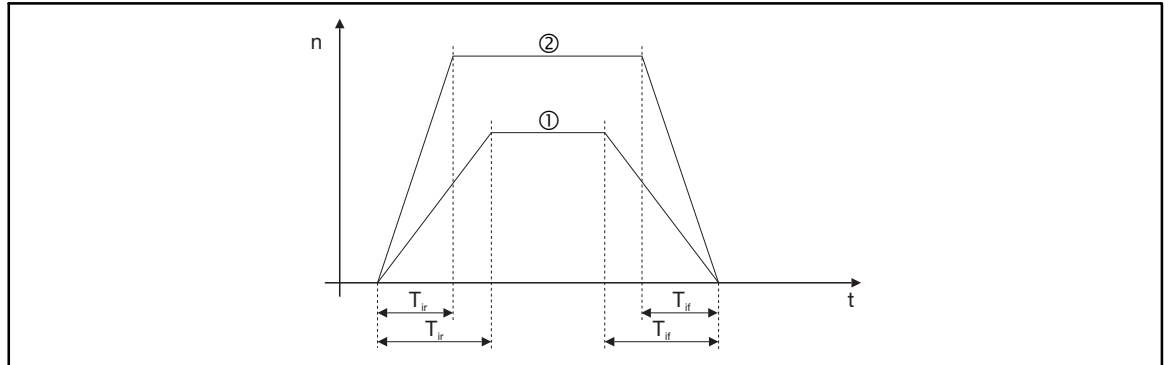


Fig. 3-3

Accelerating and decelerating with constant path (C0104 = 2)

① Setpoint 1	T_{ir} Acceleration time
② Setpoint 2	T_{if} Deceleration time
n Speed	

The distance is proportional to the number of motor revolutions. The distances are selected by setting the Ti times (C0012, C0013).

- The number of motor revolutions during acceleration or deceleration are calculated according to the following formula:

$$N = \frac{n_{\max}}{60} \cdot \frac{T_i}{2}$$

N	Number of motor revolutions
$n_{\max}$	Maximum speed (value in C0011)
T_i	Acceleration time T_{ir} (value in C0012) or deceleration time T_{if} (value in C0013)



Application examples

Dosing drive for a filling station

3.4 Dosing drive for a filling station

This application is based on the basic configuration C0005 = 2000.

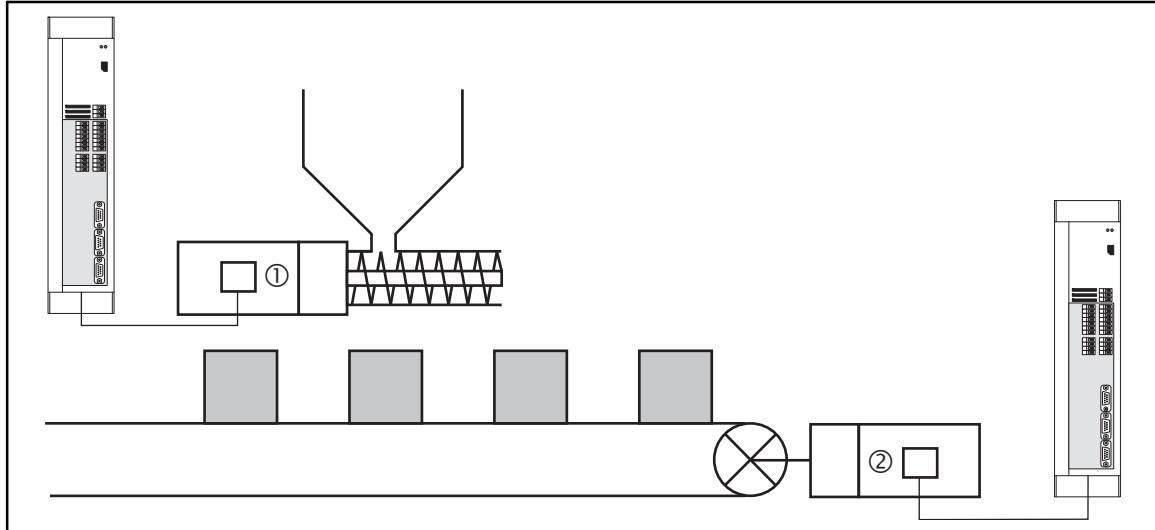


Fig. 3-4 Basic structure of a step controller for a bulk material filling station

- ① Dosing drive
- ② Conveyor drive

Input and output assignment		Dosing drive	Conveyor drive
Analog inputs	X6/1,2 X6/3,4	• Dosing speed • Dosing amount	• Conveyor speed • Step width
Digital inputs	X5/28 X5/E1, X5/E2 X5/E3 X5/E4 X5/E5	• Controller enable • Direction of rotation/quick stop • Fixed dosing amount • Start dosing • TRIP reset	• Controller enable • Step direction/quick stop • Fixed step width • Start step • TRIP reset
Digital outputs	X5/A1 X5/A2 X5/A3 X5/A4	• Error (TRIP) • Current speed > C0017 (Q_{min}) • Ready for operation (RDY) • Dosing completed	• Error (TRIP) • Current speed > C0017 (Q_{min}) • Ready for operation (RDY) • Step completed
Analog outputs	X6/62 X6/63	• Actual speed • Motor current	• Actual speed • Motor current



Tip!

If the required amount has not yet been reached at the end of dosing, you can control redosing via the setpoint.



Calculating the actual value

- Use the FB INT1 to add the motor speed to an angle of rotation. The dosing amount can be calculated via the angle of rotation.
 - An angle of rotation of 360 ° (one revolution) corresponds to 65536 inc.
- Via C1351, the angle of rotation is converted into an analog signal and adapted to the setpoint.

Example

With a setpoint of INT1-AOUT = 100 %, the conveyor worm shall make 50 revolutions. The geared motor has a ratio of $I = 20$.

- The motor must make 1000 revolutions.
 - The angle of rotation is 65536 inc · 1000.
- Select 65536000 under C1351.
- The following formula is used for the calculation:

$$\text{INT1-AOUT} = \frac{\text{Drehwinkel [inc]}}{\text{C1351}} \cdot 100 \%$$

See also: (📖 2-110)

Completing dosing

The FB CMP2 sends the brake signal for the linear ramp function generator in the FB NSET. The ramp function generator is controlled via NSET-RFG-0 and thus led to the zero speed setpoint.

Deceleration is activated if the actual amount plus the remaining amount (this amount is added during deceleration) corresponds to the setpoint.

Considering the remaining amount

- Use the FB ARIT1 to square the current speed ($C0338 = 3$).
- Use the FB CONV1 to adapt the output signal of ARIT1 under consideration of the deceleration time T_{if} to the setpoint and actual value. The following formula is used to calculate the C0940/C0941 ratio:

$\frac{C0940}{C0941} = \frac{n_{\max}}{60} \cdot \frac{T_{if}}{2} \cdot \frac{65536}{C1351}$	$\frac{n_{\max}}{T_{if}}$	Value in C0011 Deceleration time (value in C0013)

Example

- $n_{\max} = 3000 \text{ rpm}$
- $T_{if} = 1 \text{ s}$
- $C1351 = 65536000$ (corresponds to 1000 motor revolutions)

The C0940/C0941 ratio must be 0.025 (e.g. C0940 = 25; C0941 = 1000).



Application examples

Traversing for a wire winder

3.5 Traversing drive for a wire winder

This application is based on the basic configuration C0005 = 3000.

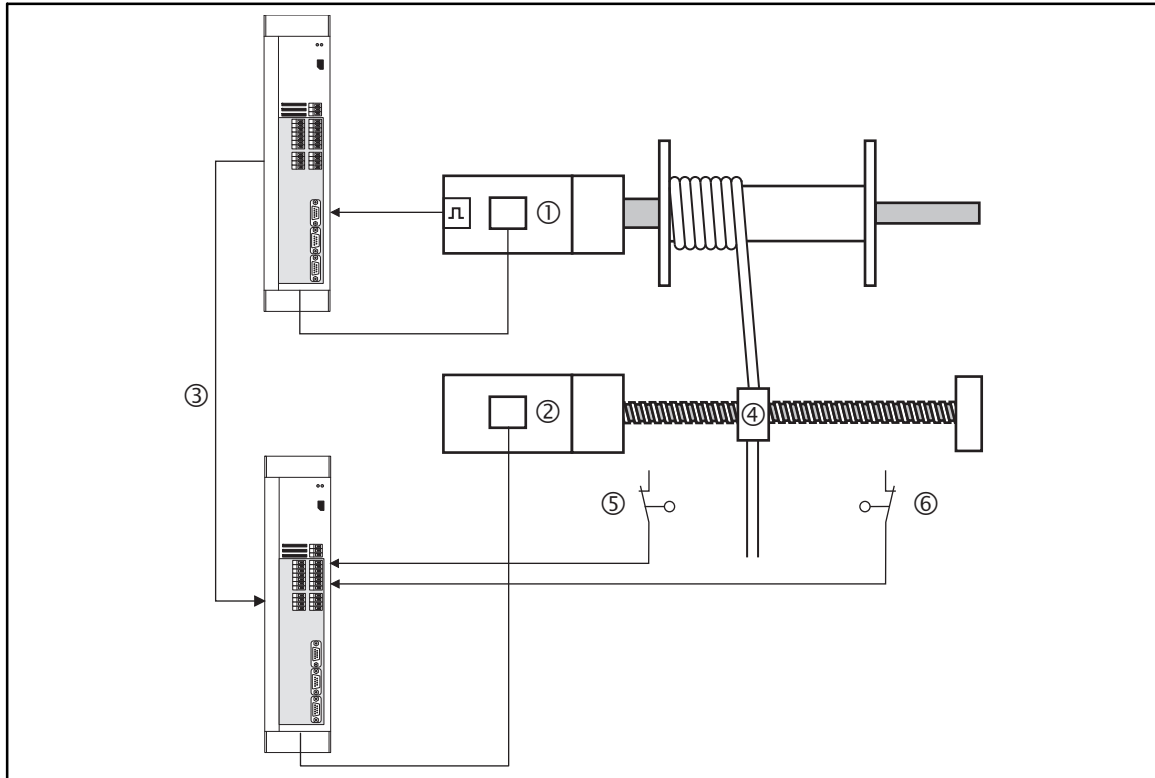


Fig. 3-5

Basic structure of a traversing controller

① Winding drive	④ Traversing unit
② Traversing drive	⑤ Limit switch for changeover to CCW rotation
③ Reference setpoint (winding drive)	⑥ Limit switch for changeover to CW rotation

Input and output assignment		Traversing drive
Analog input	X6/1,s	Reference setpoint
Digital inputs	X5/28 X5/E1, X5/E2 X5/E3 X5/E4 X5/E5	- Controller enable - Direction of rotation/quick stop - Additional setpoint - Start traversing - TRIP reset
Digital outputs	X5/A1 X5/A2 X5/A3 X5/A4	- Error (TRIP) - Current speed > C0017 (Q_{min}) - Ready for operation (RDY) - Traversing break
Analog outputs	X6/62 X6/63	- Actual speed - Motor current



The traversing speed results from the precontrol signal proportional to the winding speed and the evaluation setting (traversing step). Limit switches detect the position of the traversing unit at the reel ends. The traversing drive is decelerated and accelerated with a constant path and independently of the winding speed.

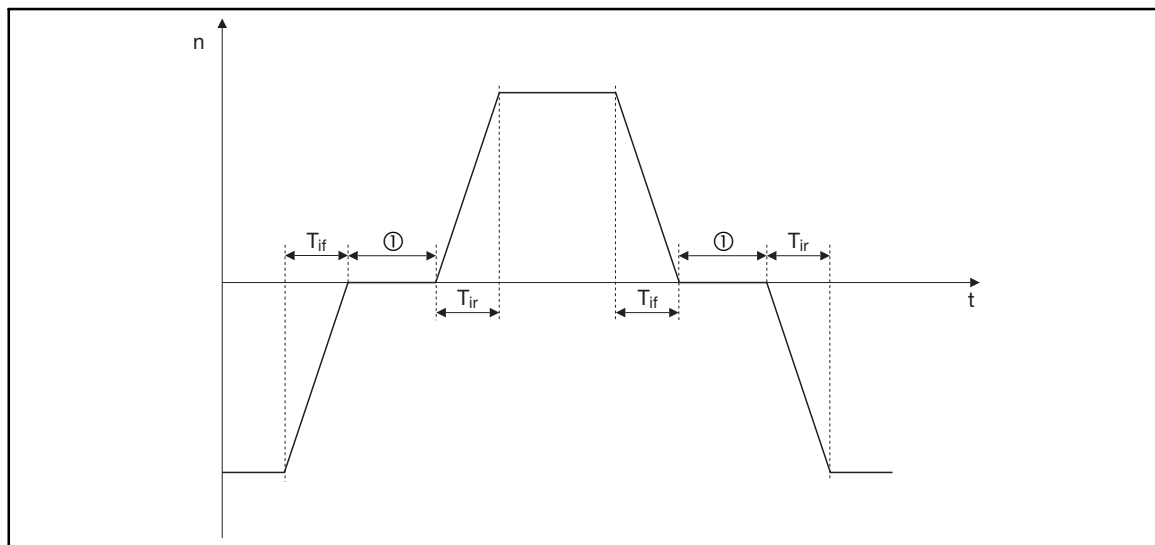


Fig. 3-6

Decelerating and accelerating the traversing drive with traversing break

① Traversing break	T_{ir} Acceleration time
n Speed	T_{if} Deceleration time

At the turning points, the traversing drive remains at standstill until the winding drive has traversed a specified angle of rotation.

Traversing step

For the traversing speed and the traversing step, the reference setpoint (winding speed via X6/1,2) is multiplied by C0472/1.

With a reference setpoint of 10 V and an evaluation of C0472/1 = 100 %, the traversing drive reaches the speed selected under C0011 (n_{max}).

Additional setpoint

Via X5/E3 you can activate an internal additional setpoint (C0471) which is added to the reference setpoint via the FB ADD1. The additional setpoint can, for instance, be used to adjust the traversing drive while the winding drive is at standstill.



Application examples

Traversing for a wire winder

Remaining path during deceleration and acceleration

The linear ramp function generator in the FB NSET (controlled via the input NSET-RFG-0) decelerates and accelerates the traversing drive.

Functional sequence

1. If the traversing unit reaches a limit switch (NC contact), the FB R/L/Q detects a change of direction of rotation.
2. The D-flipflop FLIP1 is set via the FB TRANS1.
3. The input NSET-RFG-0 is activated via the FB OR1 and deceleration starts.
4. When the ramp function generator has been decelerated to zero (NSET-NOUT = 0), the FB CMP2 enables the calculation of the angle of rotation for the traversing break.
5. When the traversing break is over, the D-flipflop FLIP1 is reset via the FB INT1 (INT1-DOUT = HIGH).
6. The traversing drive starts with a new direction of rotation.



Tip!

When the basic configuration C0005 = 3000 is loaded for this application, the ramp function generator is default-set to traversing drive deceleration and acceleration with constant path (C0104 = 2) and independently of the winding speed.

Determining the distance traversed during deceleration and acceleration

The distance traversed during deceleration and acceleration corresponds to a certain number of motor revolutions (N). The number N is determined by setting the Ti-times (C0012, C0013).

- The number of motor revolutions during deceleration or acceleration are calculated according to the following formula:

$$N = \frac{n_{\max}}{60} \cdot \frac{T_i}{2}$$

N	Number of motor revolutions
$n_{\max}$	Maximum speed (value in C0011)
T_i	Acceleration time T_{ir} (value in C0012) or deceleration time T_{if} (value in C0013)



Traversing break

Via X6/1,2, the controller of the traversing drive receives a normalised reference setpoint from the controller of the winding drive. For determining the angle of rotation which the winding drive is to traverse during the traversing break, calculate the speed signal of the winding drive via the FB CONV5. CONV5 is parameterised under C0655 and C0656.

- The following formula is used to calculate the C0655/C0656 ratio:

$$\frac{C0655}{C0656} = \frac{\text{max. Wickeldrehzahl [rpm]}}{\text{max. Führungssollwert [\%]}} \cdot \frac{100 \%}{15000 \text{ rpm}}$$

Example

- Max. winding speed = 1000 rpm
- Max. reference setpoint = 100 % (at max. winding speed)

The C0655/C0656 ratio must be 0.0666 (e.g. C0655 = 1000; C0656 = 15000).

Selecting the angle of rotation for the winding drive during the traversing break

An angle of rotation of 360 ° (one revolution) corresponds to 65536 inc. The following formula is used to calculate the value for C0474/1:

$$C0474/1 = 65536 \cdot \frac{\text{Drehwinkel}}{360^\circ}$$

For a traversing break of half a revolution of the winding drive, 32768 must be entered under C0474/1.



Tip!

When C0474/1 = 0 is selected, the traversing drive decelerates and starts with constant acceleration.



Application examples

Diameter detection with a distance sensor

3.6 Diameter detection with a distance sensor

This application is based on the basic configuration C0005 = 8000.

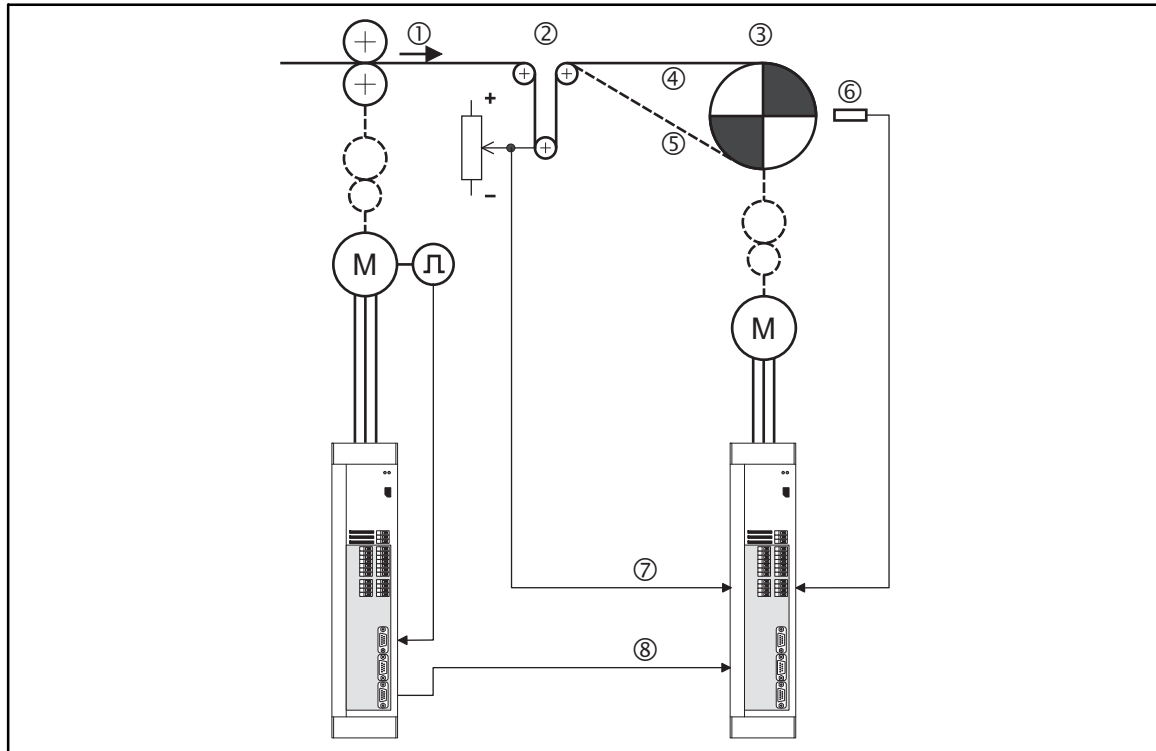


Fig. 3-7

Basic structure of a dancer position control with external diameter detection via a distance sensor

① Line speed (material speed)	⑤ Material guide for CCW rotation of the winder
② Dancer	⑥ Distance sensor (detects the distance to the winding surface)
③ Winder	⑦ Actual dancer position
④ Material guide for CW rotation of the winder	⑧ Digital frequency of material speed

Input and output assignment		Winding drive
Digital frequency input	X9	Line speed (material speed)
Analog input	X6/1,2 X6/3,4	- Actual dancer position - Signal from distance sensor
Digital inputs	X5/28 X5/E1, X5/E2 X5/E3 X5/E4 X5/E5	- Controller enable - Direction of rotation/quick stop - Loading the actual value - Reset of dancer position controller - TRIP reset
Digital outputs	X5/A1 X5/A2 X5/A3 X5/A4	- Error (TRIP) - Actual dancer position = setpoint - Ready for operation (RDY) D_{min}/D_{max} reached
Analog outputs	X6/62 X6/63	- Actual speed - Motor current

The analog input X6/3,4 (AIN2) is assigned with the signal of the diameter detection. If a distance sensor is used to detect the reel diameter, gain and offset of the FB AIN2 can be selected in a way that the diameter signal will be directly generated from the sensor signal.

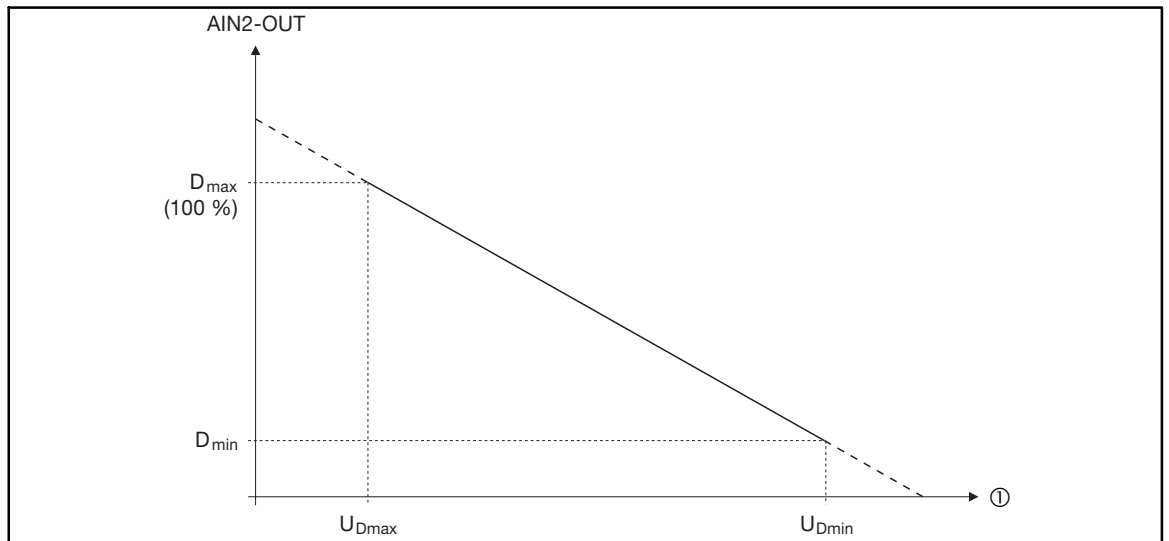


Fig. 3-8

Transfer characteristic of X6/3,4 when using a distance sensor

$D_{\max}$	Maximum reel diameter	$V_{D\max}$	Signal voltage of the sensor with maximum reel diameter
$D_{\min}$	Minimum reel diameter	$V_{D\min}$	Signal voltage of the sensor with minimum reel diameter
		①	Sensor signal

With maximum reel diameter, the signal at AIN2-OUT must be 100 %. This is why the FB AIN2 must receive the inverse transfer characteristic shown in Fig. 3-8.

The following formulas are used to calculate the values for gain (C0027/2) and offset (C0026/2):

$$C0027/2 = \frac{10 \text{ V}}{D_{\max}} \cdot \frac{D_{\max} - D_{\min}}{U_{D\max} - U_{D\min}}$$

$$C0026/2 = C0027/2 \cdot \frac{U_{D\max}}{10 \text{ V}} - 100 \%$$

Example

$$V_{D\min} = 8 \text{ V}, D_{\min} = 100 \text{ mm}$$

$$V_{D\max} = 2 \text{ V}, D_{\max} = 500 \text{ mm}$$

Enter the following values under C0027/2 and C0026/2:

$$C0027/2 = \frac{10 \text{ V}}{500 \text{ mm}} \cdot \frac{500 \text{ mm} - 100 \text{ mm}}{2 \text{ V} - 8 \text{ V}} = -133.33 \%$$

$$C0026/2 = -133.33 \% \cdot \frac{2 \text{ V}}{10 \text{ V}} - 100 \% = -126.67 \%$$



Tip!

For more detailed information on parameter setting, please see the application example for the basic configuration C0005 = 9000. (3-14)



Application examples

Centre winder with internal diameter calculation

3.7 Centre winder with internal diameter calculation

This application is based on the basic configuration C0005 = 9000.

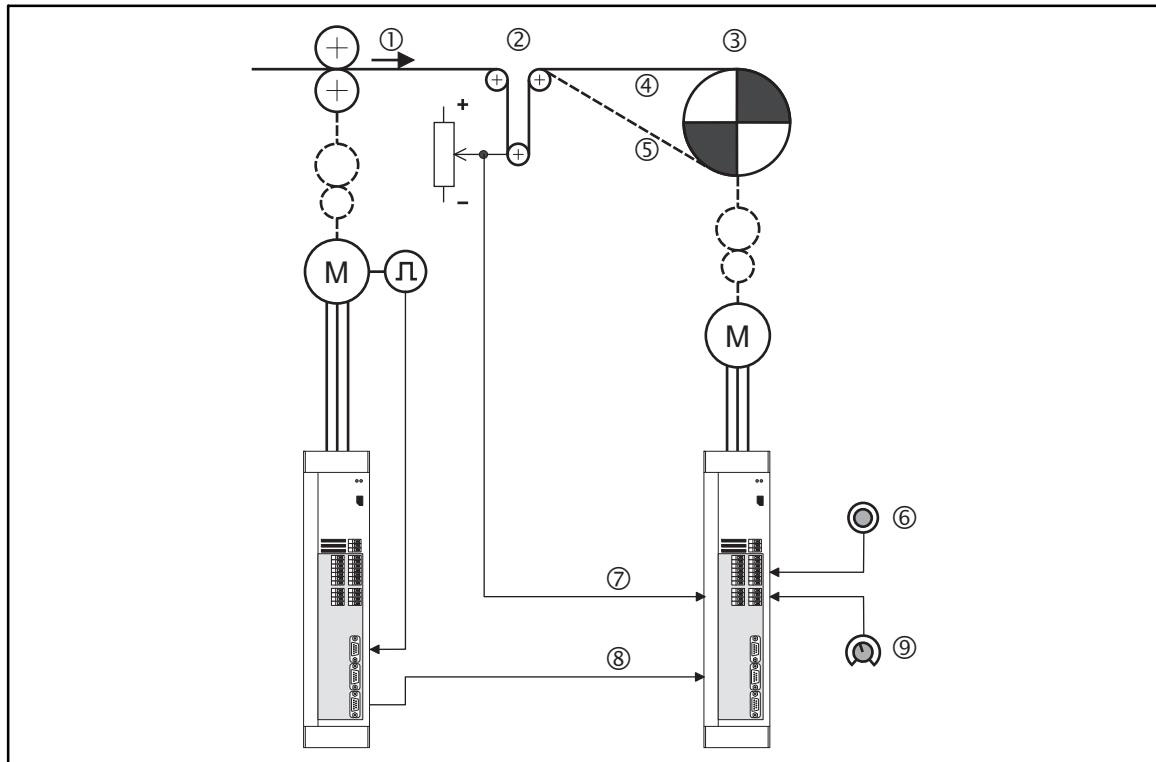


Fig. 3-9

Basic structure of a dancer position control with internal diameter detection

① Line speed	⑥ Preset diameter
② Dancer	⑦ Actual dancer position
③ Winder	⑧ Digital frequency proportional to the line speed
④ Material guide for CW rotation of the winder	⑨ Initial diameter
⑤ Material guide for CCW rotation of the winder	

Input and output assignment		Winding drive
Digital frequency input	X9	• Line speed
Analog input	X6/1,2 X6/3,4	• Actual dancer position • Initial diameter
Digital inputs	X5/28 X5/E1, X5/E2 X5/E3 X5/E4 X5/E5	• Controller enable • Direction of rotation/quick stop • Loading the actual value • Accepting the initial diameter • TRIP reset
Digital outputs	X5/A1 X5/A2 X5/A3 X5/A4	• Error (TRIP) • Actual dancer position = setpoint • Ready for operation (RDY) • D_{min}/D_{max} reached
Analog outputs	X6/62 X6/63	• Actual speed • Motor current



The following values are required for parameter setting:

- Rated line speed (V_{LN}) selected via the digital frequency input X9.
- Winding drive speed with rated line speed and minimum reel diameter (n_{Dmin}).
 - The winding drive speed results from the line speed V_L and the reciprocal of the reel diameter:

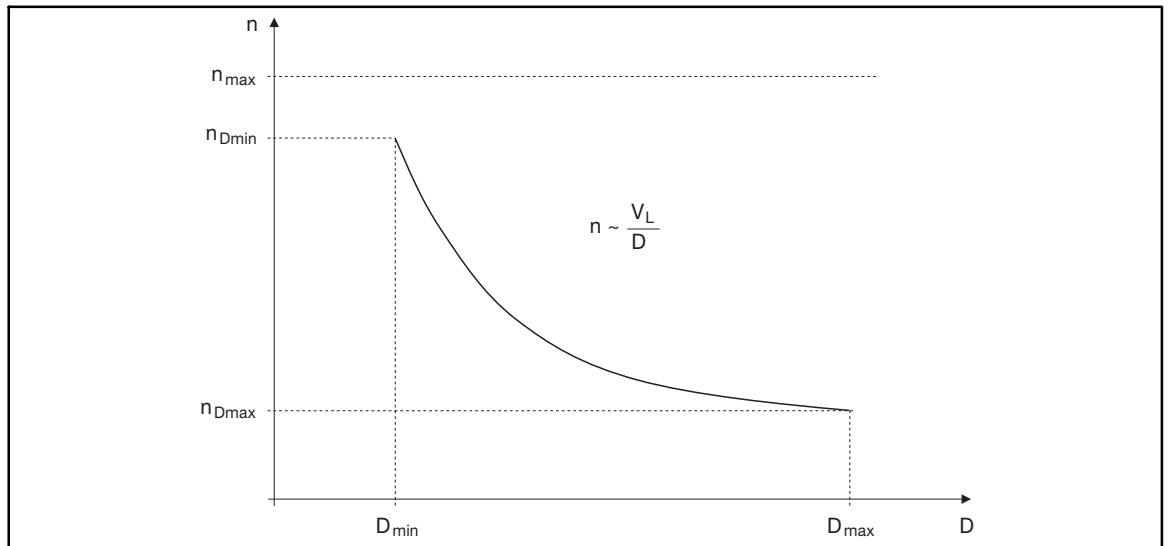


Fig. 3-10

Speed behaviour of the winding drive with reference to the reel diameter

d	Reel diameter	n	Winding drive speed
D_{max}	Maximum reel diameter	n_{Dmax}	Winding drive speed with maximum reel diameter
D_{min}	Minimum reel diameter	n_{Dmin}	Winding drive speed with minimum reel diameter
		V_L	Line speed

Example

For a clearer representation of the parameter setting in this application example, the following values are assumed for the calculations:

- At rated line speed (V_{LN}) the winding drive receives a digital frequency signal from which a speed of 3000 rpm is calculated (DFIN-OUT).
- The winding drive speed with minimum reel diameter and rated line speed V_{LN} (n_{DminN}) is 4000 rpm (MCTRL-PHI-ACT).



Application examples

Centre winder with internal diameter calculation

Determining the maximum speed $n_{\max}$ (C0011)

Through the influence of the dancer position controller (C0472/1) the drive may for a short time reach a higher speed than n_{DminN} . The higher speed is, for instance, required to reach the setpoint dancer position after starting with D_{min} .

$$C0011 \geq n_{DminN} \cdot \left(\frac{100 \%}{100 \% - C0472/1} \right)$$

Example:

With $C0472/1 = 10 \%$ (Lenze setting) and $n_{DminN} = 4000 \text{ rpm}$, C0011 must be set to, for instance, 4500 rpm.

Adapting the precontrol signal

The FB CONV3 is used to convert the speed signal proportional to the line speed (signal at DFIN-OUT) into a normalised (analog) precontrol signal.

It is assumed that during steady operation the speed setpoint is only generated by the precontrol signal and with minimum diameter sent to the motor control without being changed (diameter evaluation = 100 %). Accordingly, the following formula is to be used to calculate the line speed (speed at DFIN-OUT) for steady operation with rated line speed and minimum reel diameter:

$$CONV3-OUT = \frac{n_{DminN}}{C0011}$$

For the parameterisation of the FB CONV3 this means accordingly:

$$\frac{C0950}{C0951} = \frac{15000 \text{ rpm}}{DFIN-OUT [\text{rpm}]} \cdot \frac{n_{DminN}}{C0011}$$

Example:

$$\frac{C0950}{C0951} = \frac{15000 \text{ rpm}}{3000 \text{ rpm}} \cdot \frac{4000 \text{ rpm}}{4500 \text{ rpm}} = 4.444$$

E.g.: $C0950 = 4444$, $C0951 = 1000$



Diameter evaluation

The FB ARIT1 is used to multiply the precontrol signal by the reciprocal of the reel diameter.

The diameter calculator (DCALC1) calculates the reel diameter from the line speed (speed at DFIN-OUT) and the motor speed and then calculates the reciprocal (C1308 = 1).

For a correct diameter calculation, enter the following values:

- Under C1300: Motor speed with maximum diameter
- Under C1301: Corresponding line speed (speed at DFIN-OUT)
- Under C1304: Maximum diameter
- Under C1309: Reference diameter for the calculation of the reciprocal

Example:

With a diameter ratio $q = 5$ (e.g. $D_{\min} = 100 \text{ mm}$, $D_{\max} = 500 \text{ mm}$), this means in this case:

- C1300 = 3000 rpm
- $C1301 = \frac{n_{D\min N}}{q} = 800 \text{ rpm}$
- C1304 = 500 mm
- C1309 = 100 mm (enter the value used as a basis for determining $n_{D\min N}$)

Limit values for the reel diameter

Under C1305 and C1306 you can select limit values to limit incorrect diameter values during the start and stop phases to permissible values.

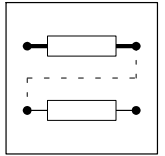
Example:

- C1305 = 100 mm
- C1306 = 500 mm



Application examples

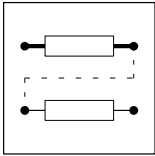
Centre winder with internal diameter calculation



4 Signal-flow charts

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4.2	Speed control (C0005 = 1000)	4-5
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4.4	Traversing control (C0005 = 3000)	4-21
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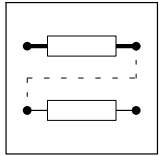


Signal-flow charts

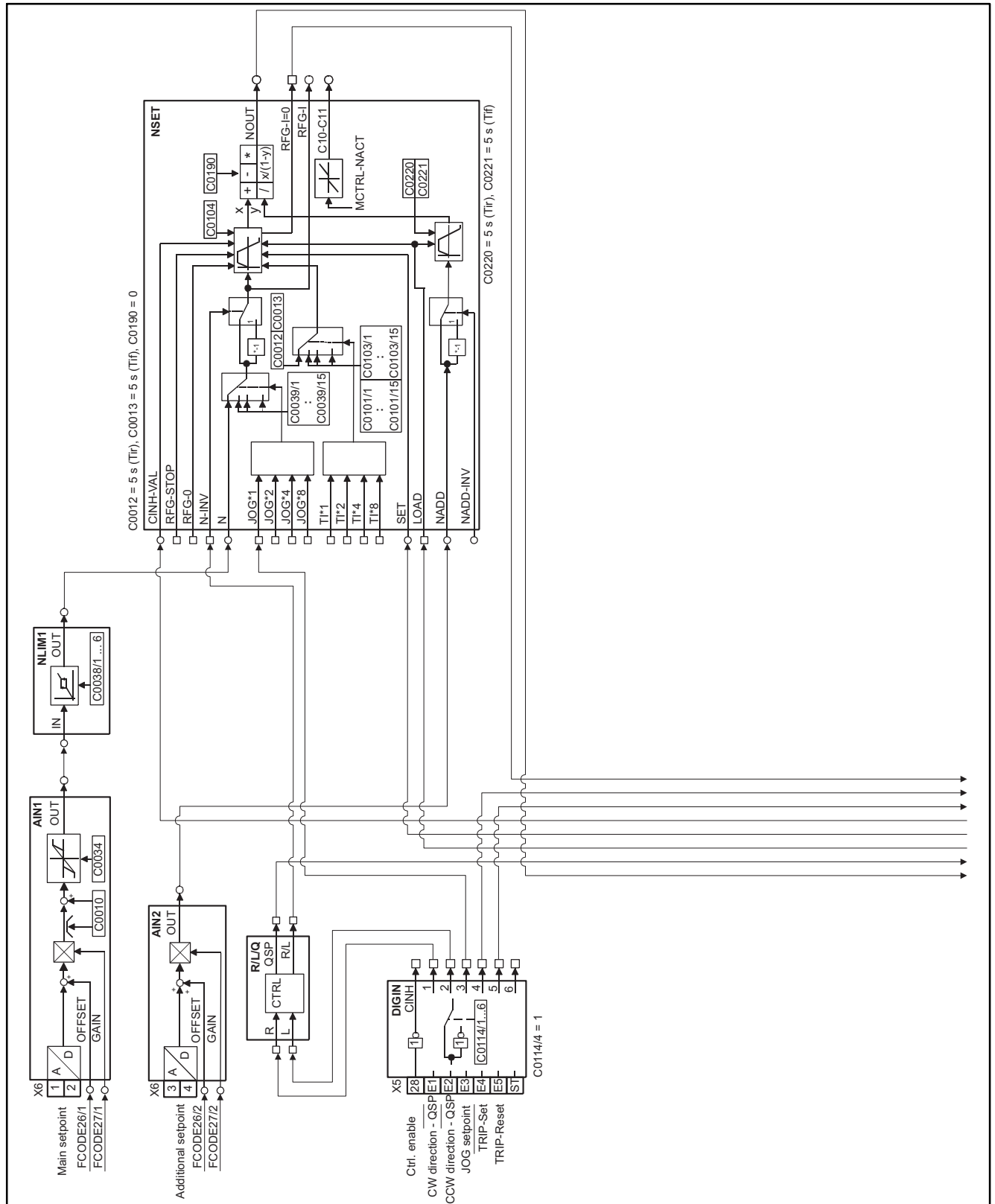
How to read the signal-flow charts

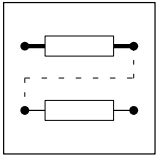
4.1 How to read the signal-flow charts

Symbol	Meaning
	Signal connection in the Lenze setting
	Analog input, can be freely connected to any analog output
	Analog output
	Digital input, can be freely connected to any digital output
	Digital output
	Input for speed signals, can be freely connected to any output for speed signals
	Output for speed signals
	Input for phase signals, can be freely connected to any output for phase signals
	Output for phase signals



4.2 Speed control (C0005 = 1000)





Signal-flow charts

Speed control

Fig. 4-1

Basic configuration 1000 - speed control (sheet 1)

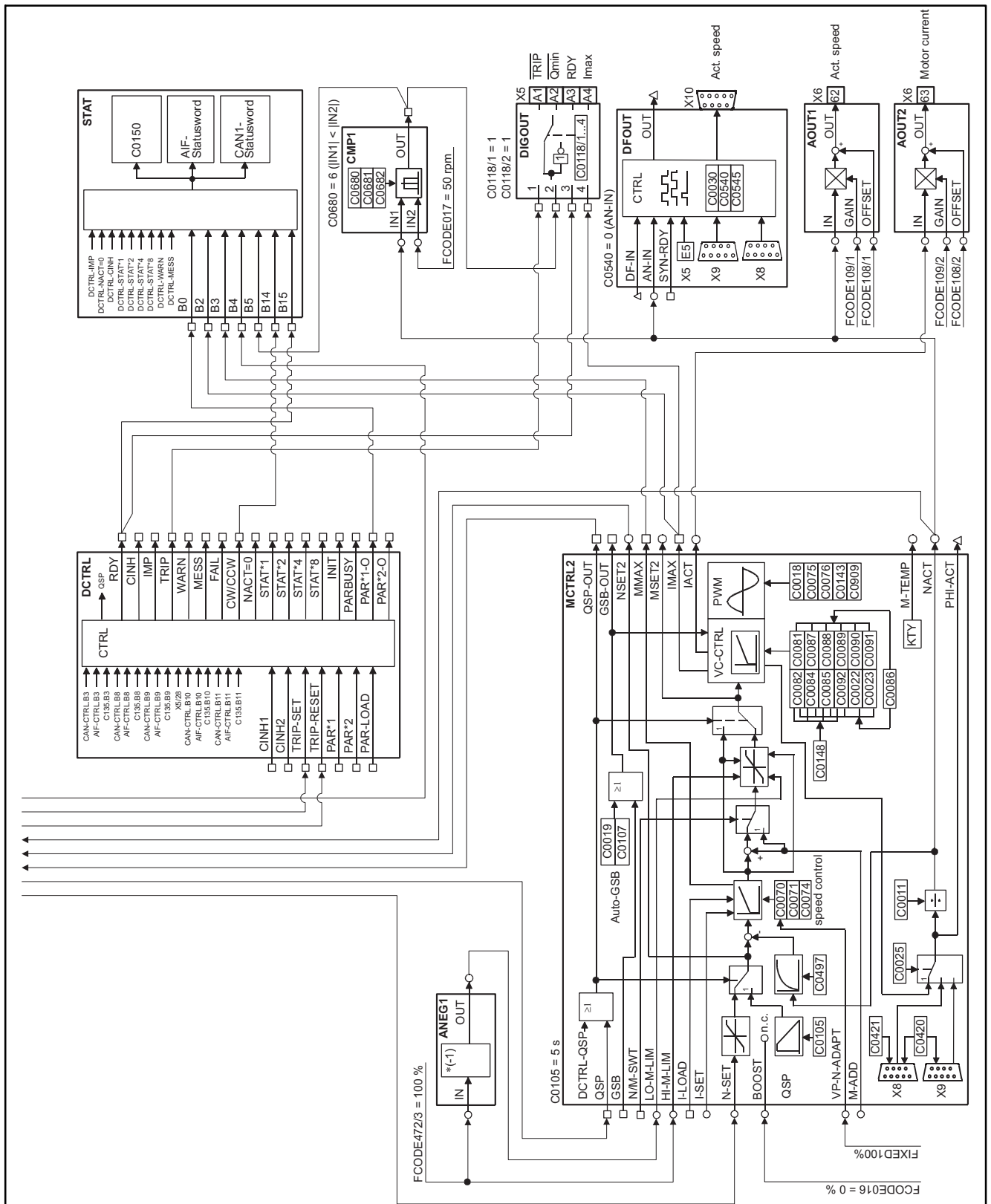
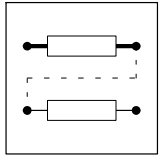


Fig. 4-2

Basic configuration 1000 - speed control (sheet 2)

Signal-flow charts

Speed control

4.2.1 Speed control with brake output (C0005 = 1100)

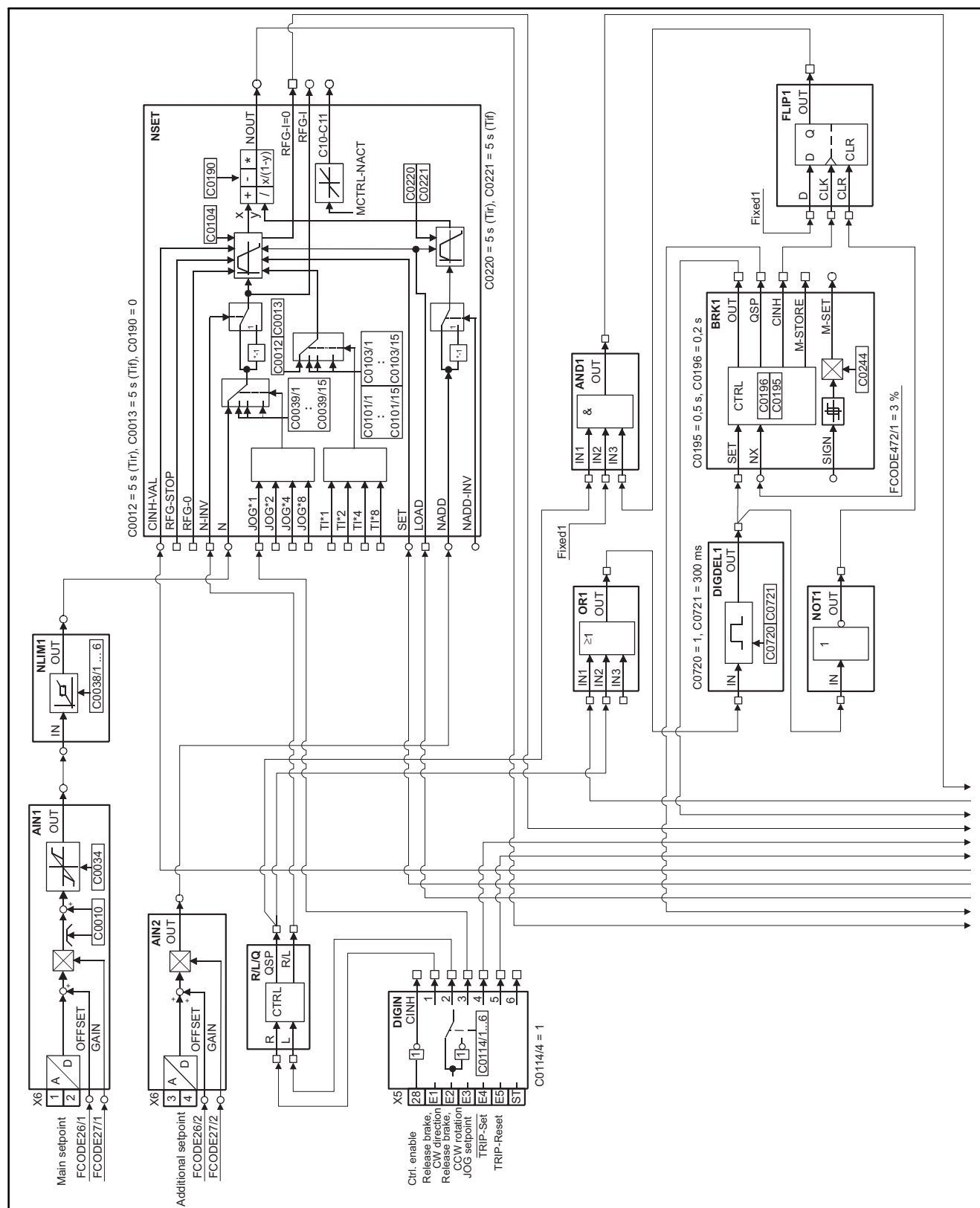
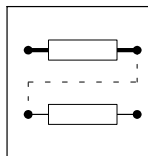
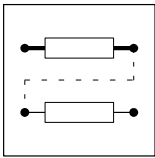


Fig. 4-3 Basic configuration 1100 - speed control with brake output (sheet 1)



Basic configuration 1100 - speed control with brake output (sheet 2)



Signal-flow charts

Speed control

4.2.2 Speed control with motor potentiometer (C0005 = 1200)

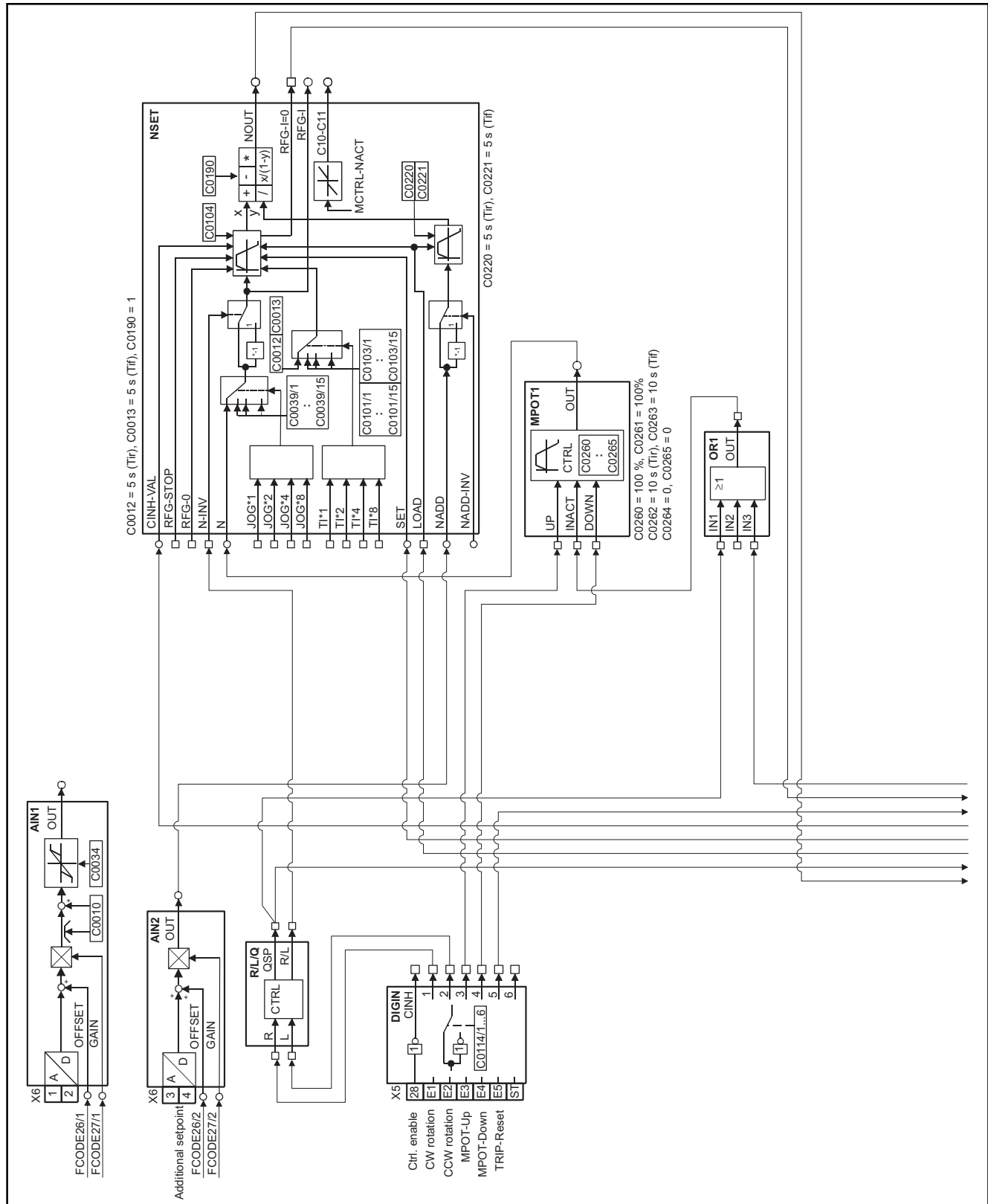
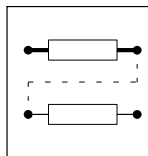


Fig. 4-5 Basic configuration 1200 - speed control with motor potentiometer (sheet 1)



Signal-flow charts

Speed control

4.2.3 Speed control with process controller (C0005 = 1300)

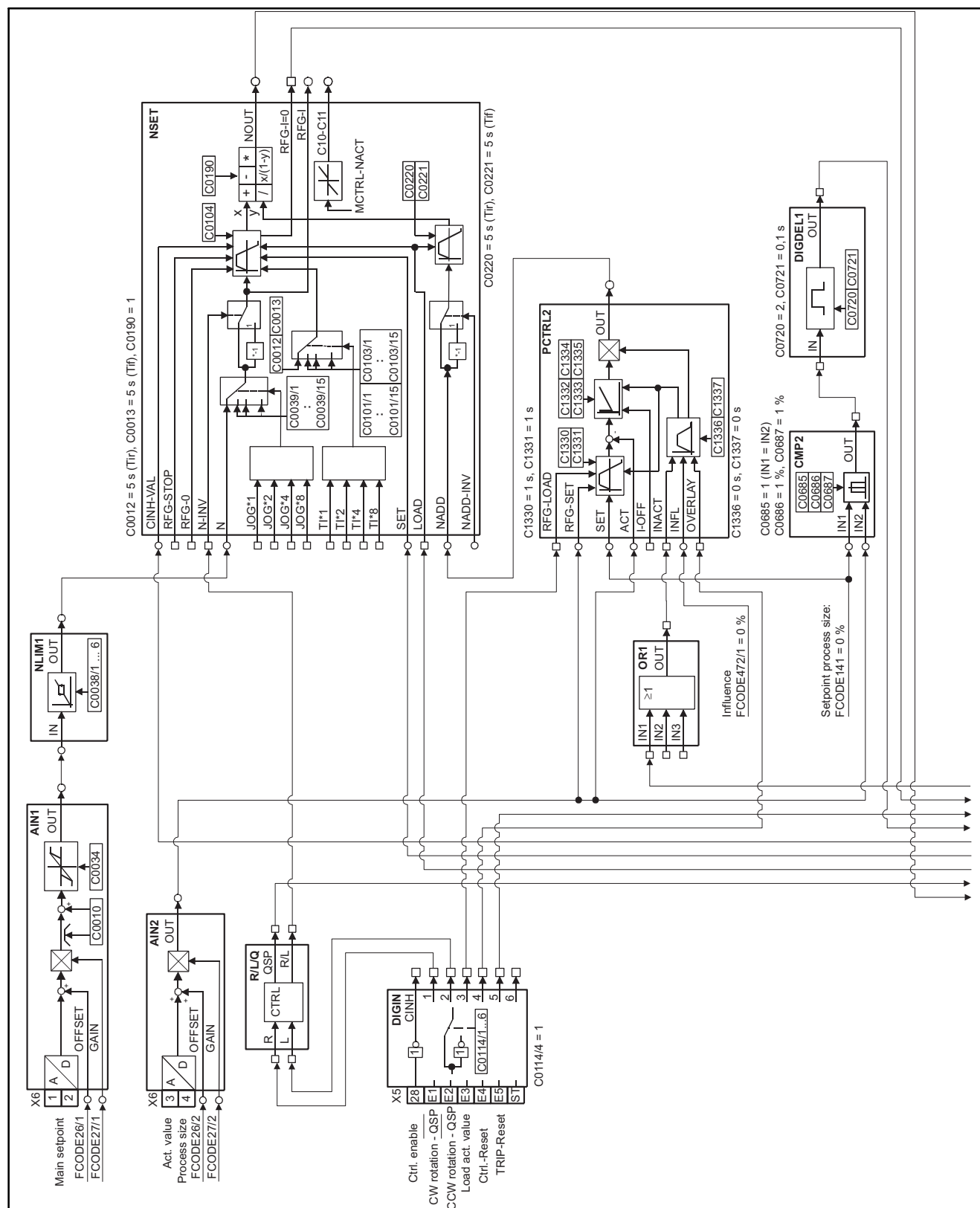


Fig. 4-7 Basic configuration 1300 - speed control with process controller (sheet 1)

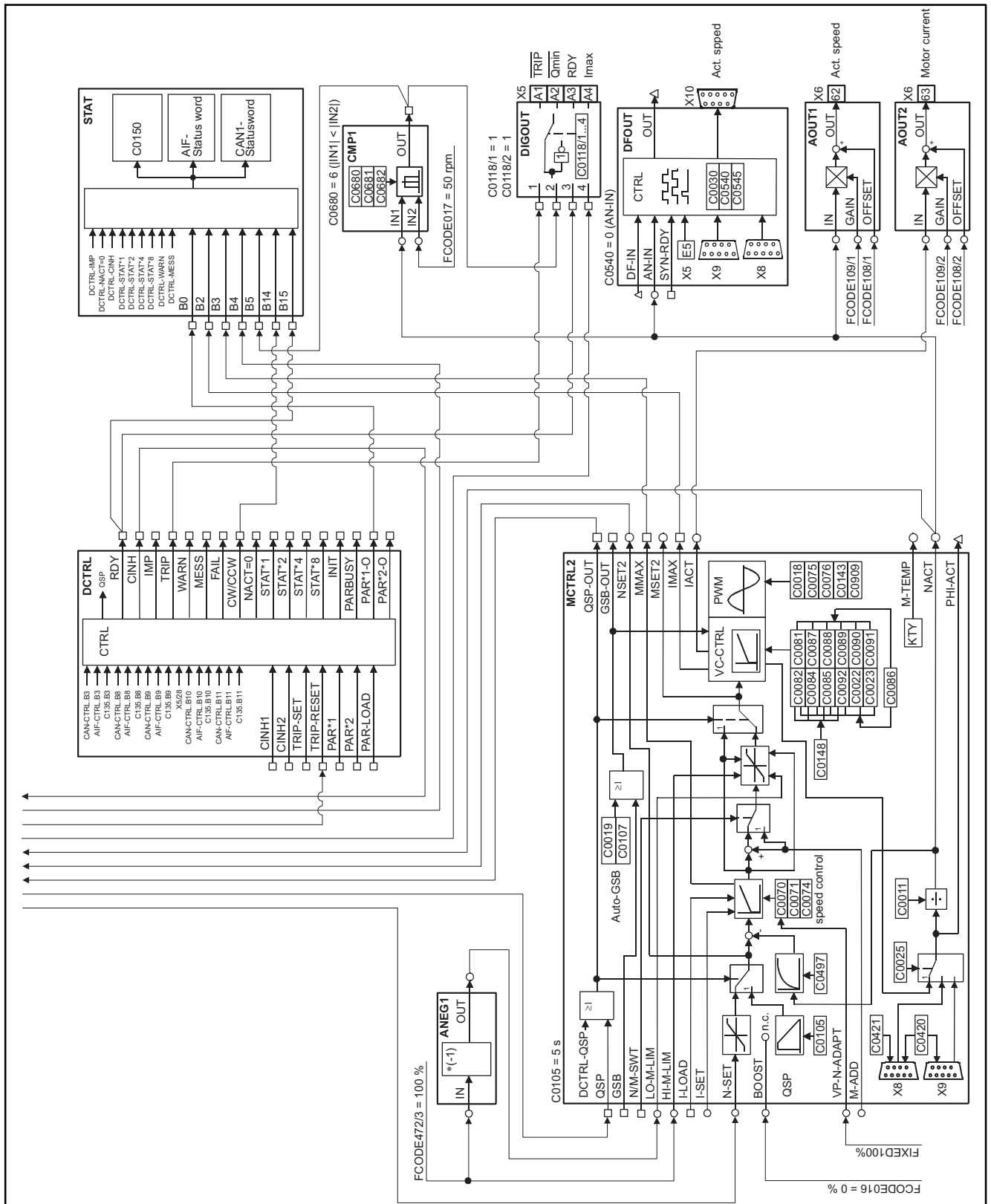
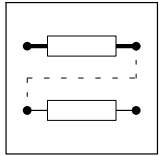
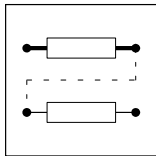


Fig. 4-8

Basic configuration 1300 - speed control with process controller (sheet 2)



Signal-flow charts

Speed control

4.2.4 Speed control with mains failure control (C0005 = 1400)

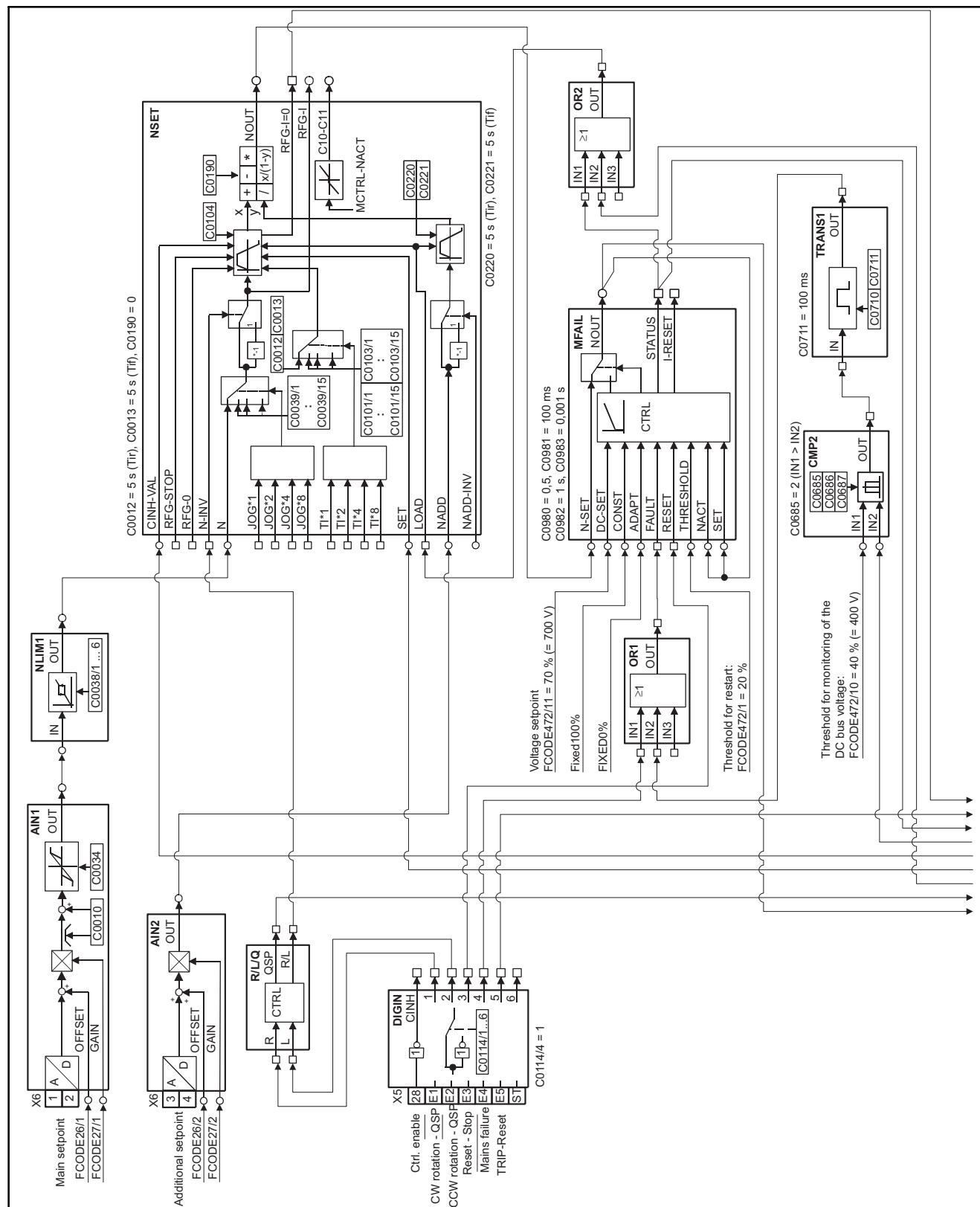


Fig. 4-9 Basic configuration 1400 - speed control with mains failure control (sheet 1)

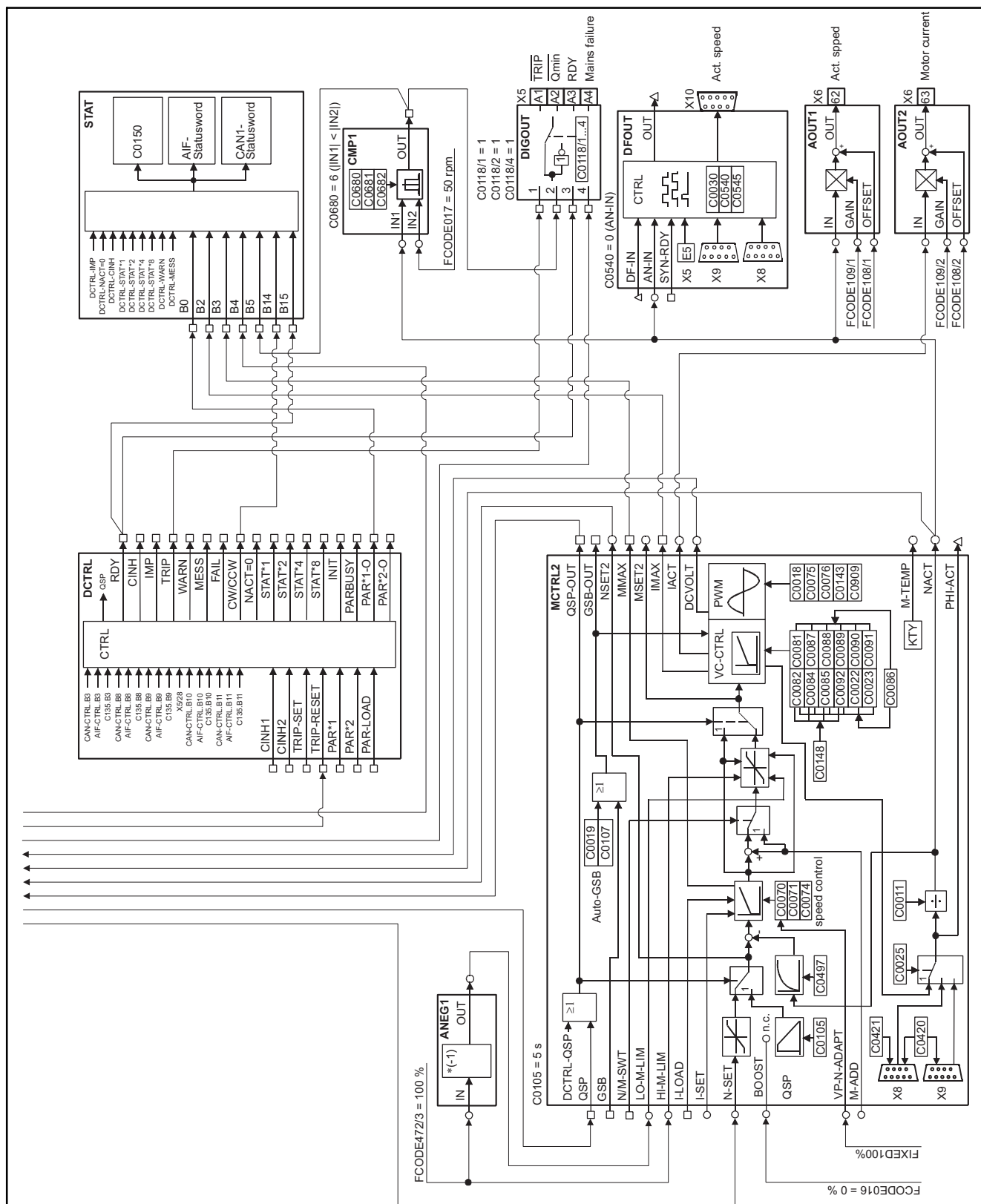
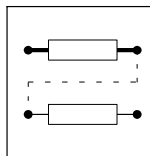
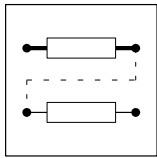


Fig. 4-10

Basic configuration 1400 - speed control with mains failure control (sheet 2)



Signal-flow charts

Speed control

4.2.5 Speed control with digital frequency input (C0005 = 1500)

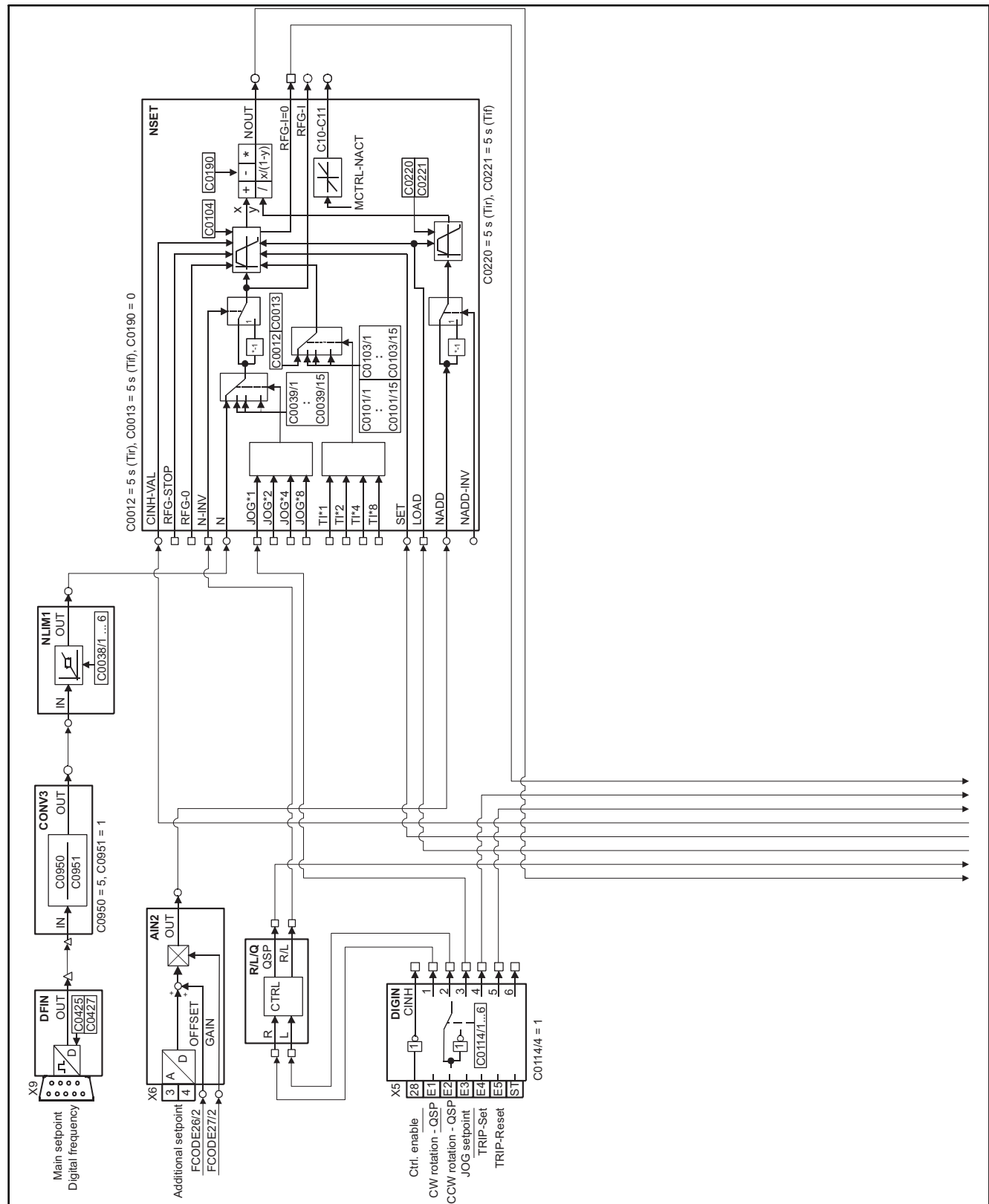


Fig. 4-11 Basic configuration 1000 - speed control with digital frequency input (sheet 1)

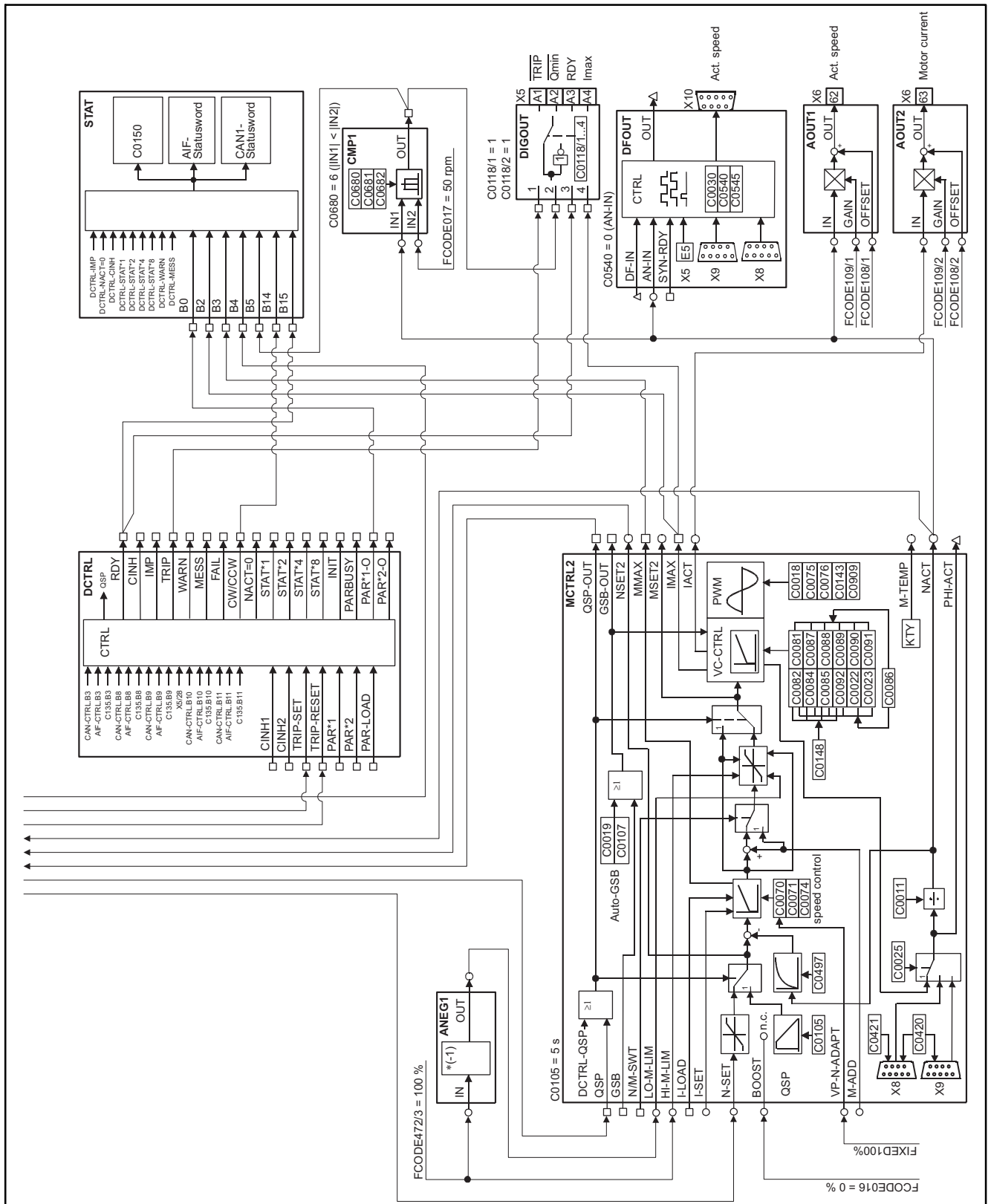
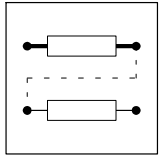
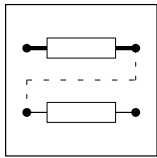


Fig. 4-12

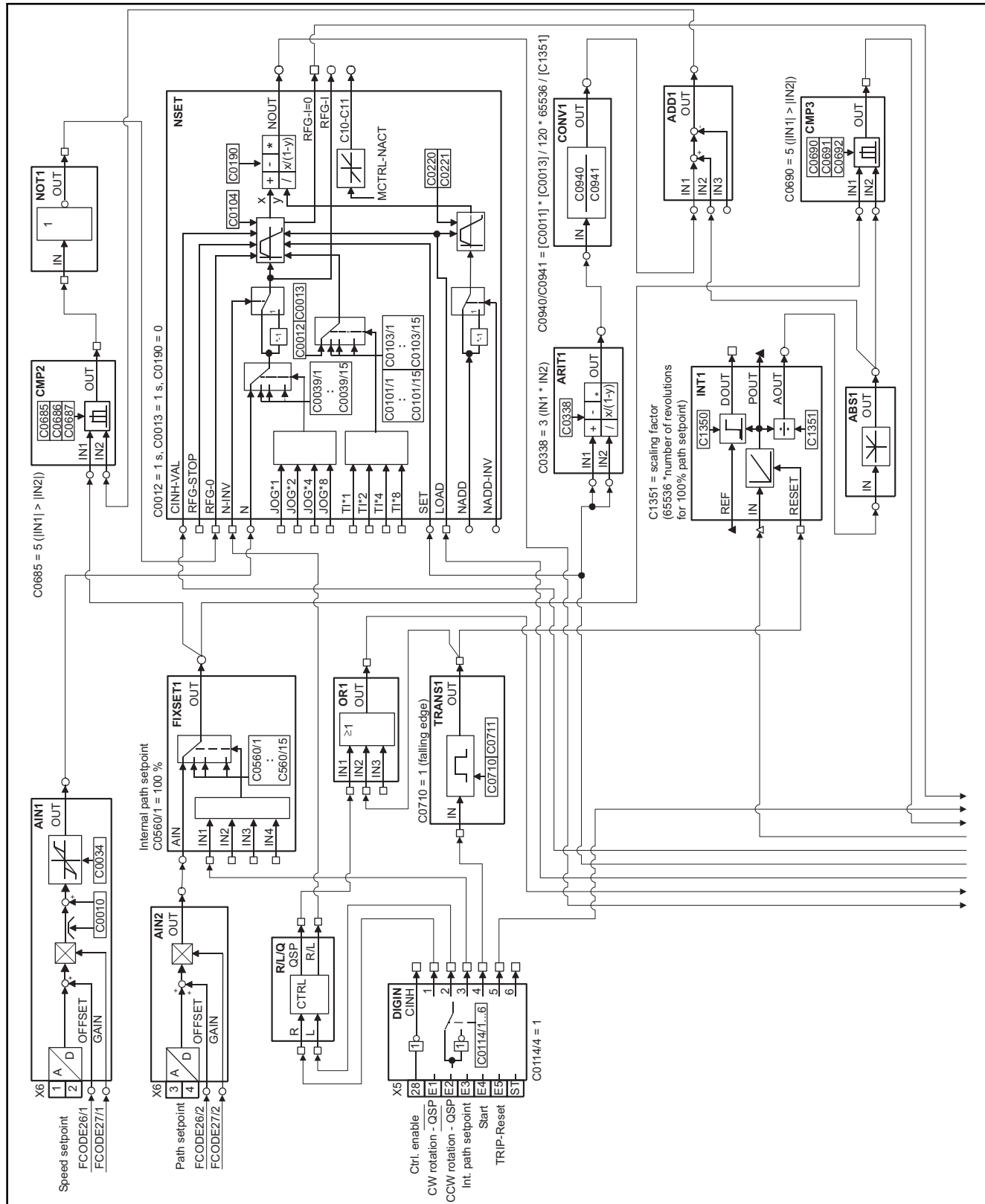
Basic configuration 1000 - speed control with digital frequency input (sheet 2)



Signal-flow charts

Step control

4.3 Step control (C0005 = 2000)



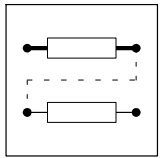


Fig. 4-13 Basic configuration 2000 - step control (sheet 1)

Signal-flow charts

Step control

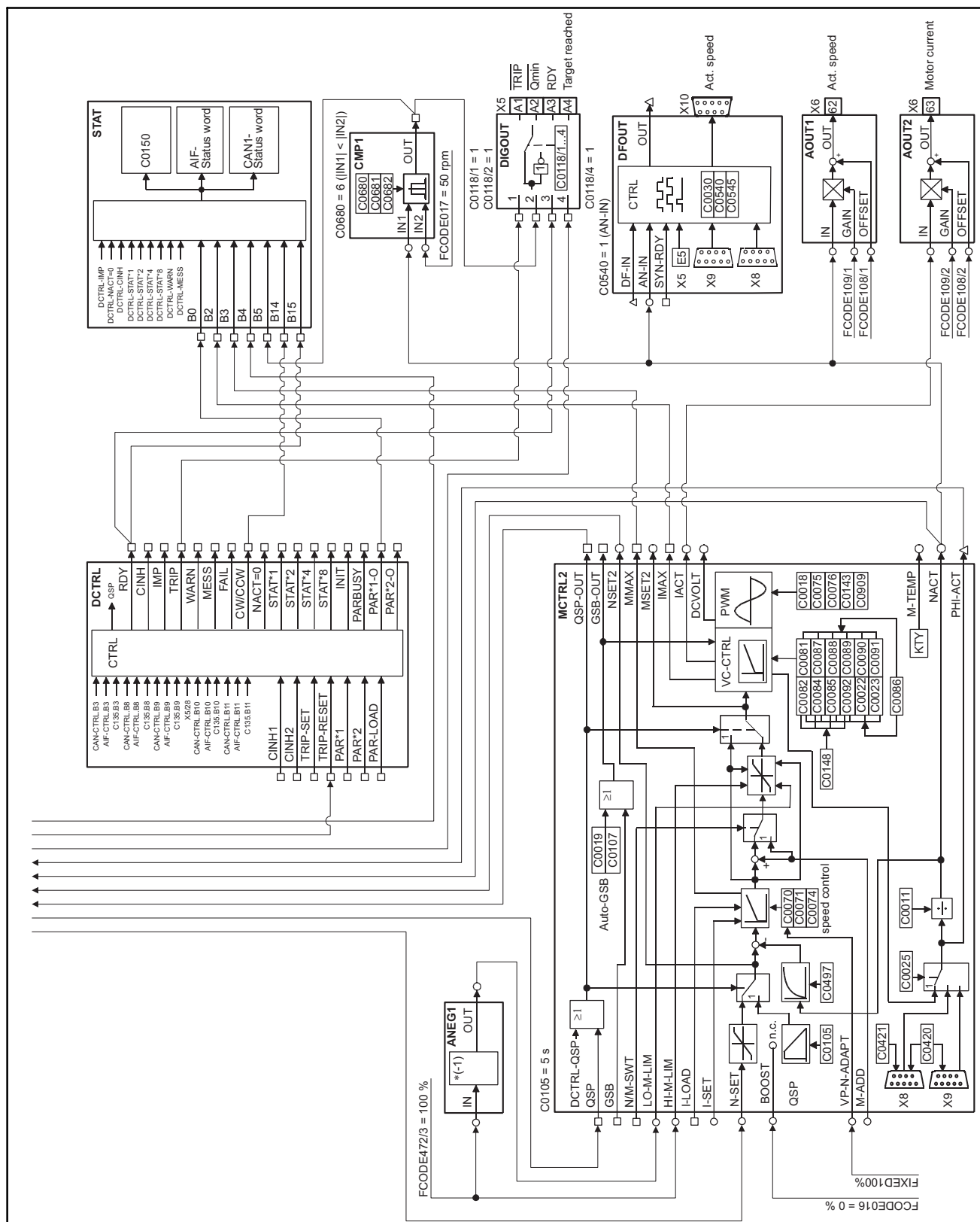
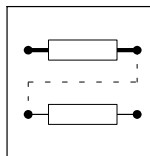
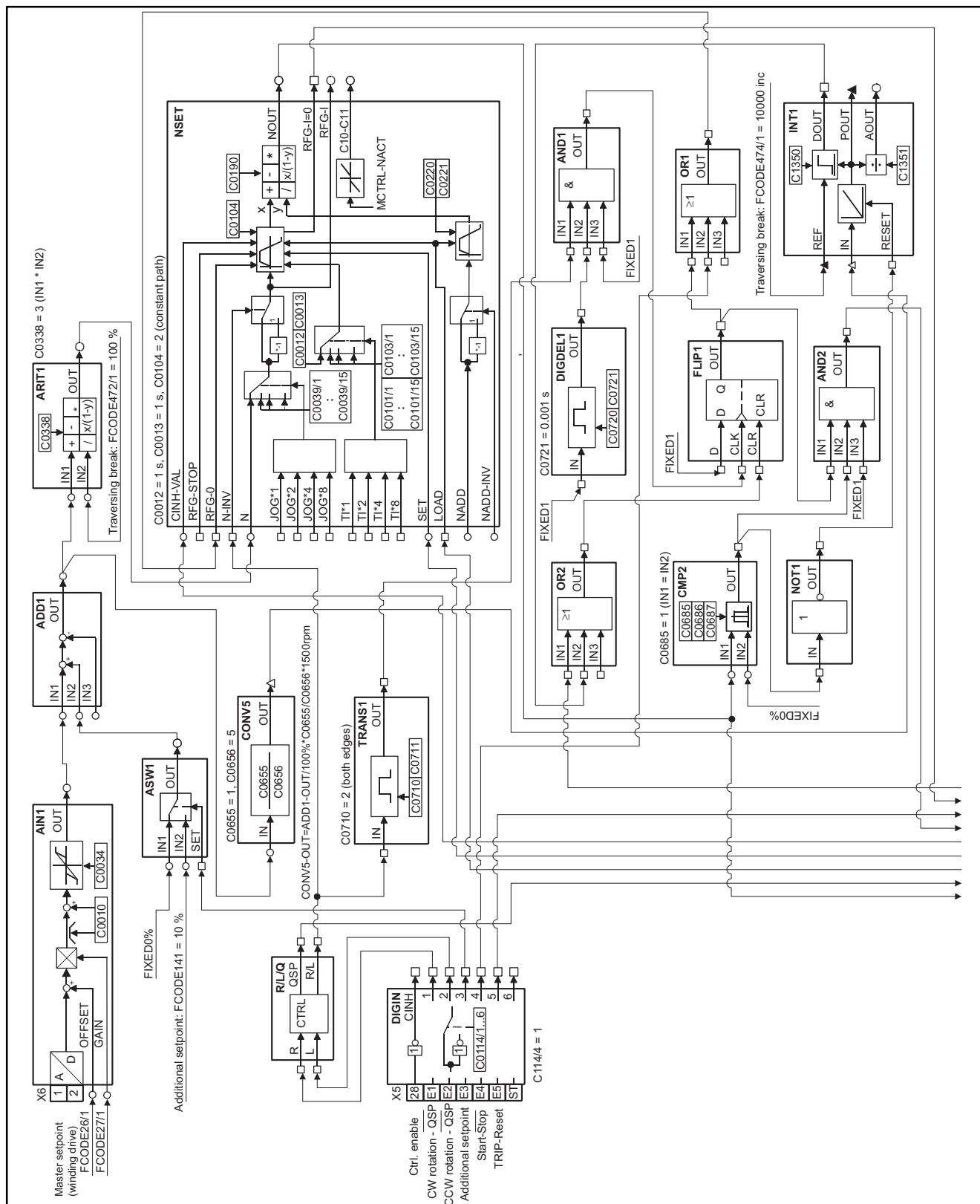


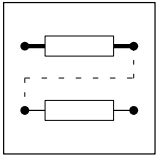
Fig. 4-14

Basic configuration 2000 - step control (sheet 2)



4.4 Traversing control (C0005 = 3000)





Signal-flow charts

Traversing control

Fig. 4-15

Basic configuration 3000 - traversing control (sheet 1)

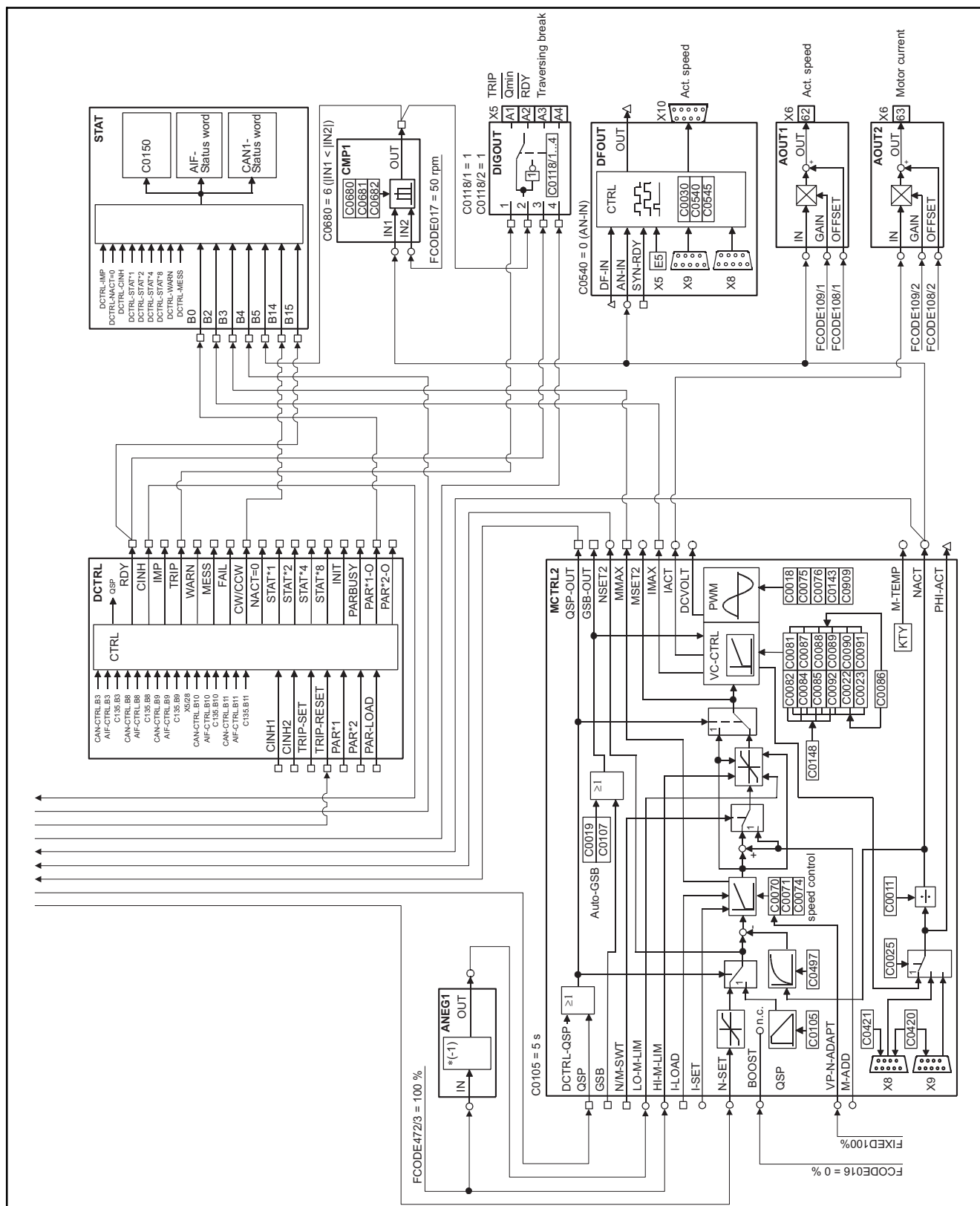
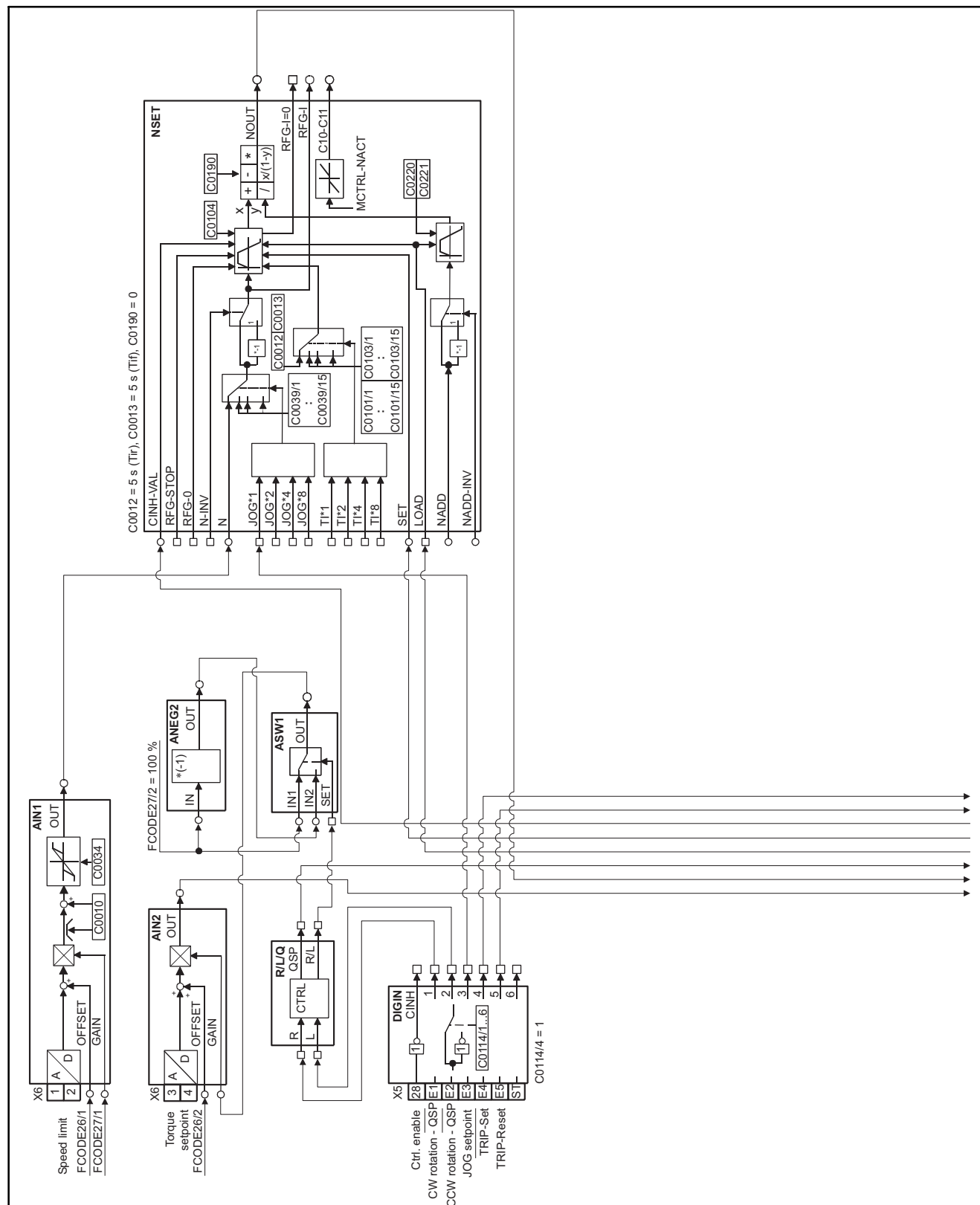


Fig. 4-16 Basic configuration 3000 - traversing control (sheet 2)

4.5 Torque control (C0005 = 4000)



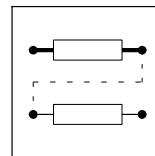
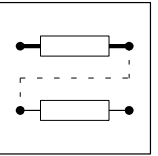


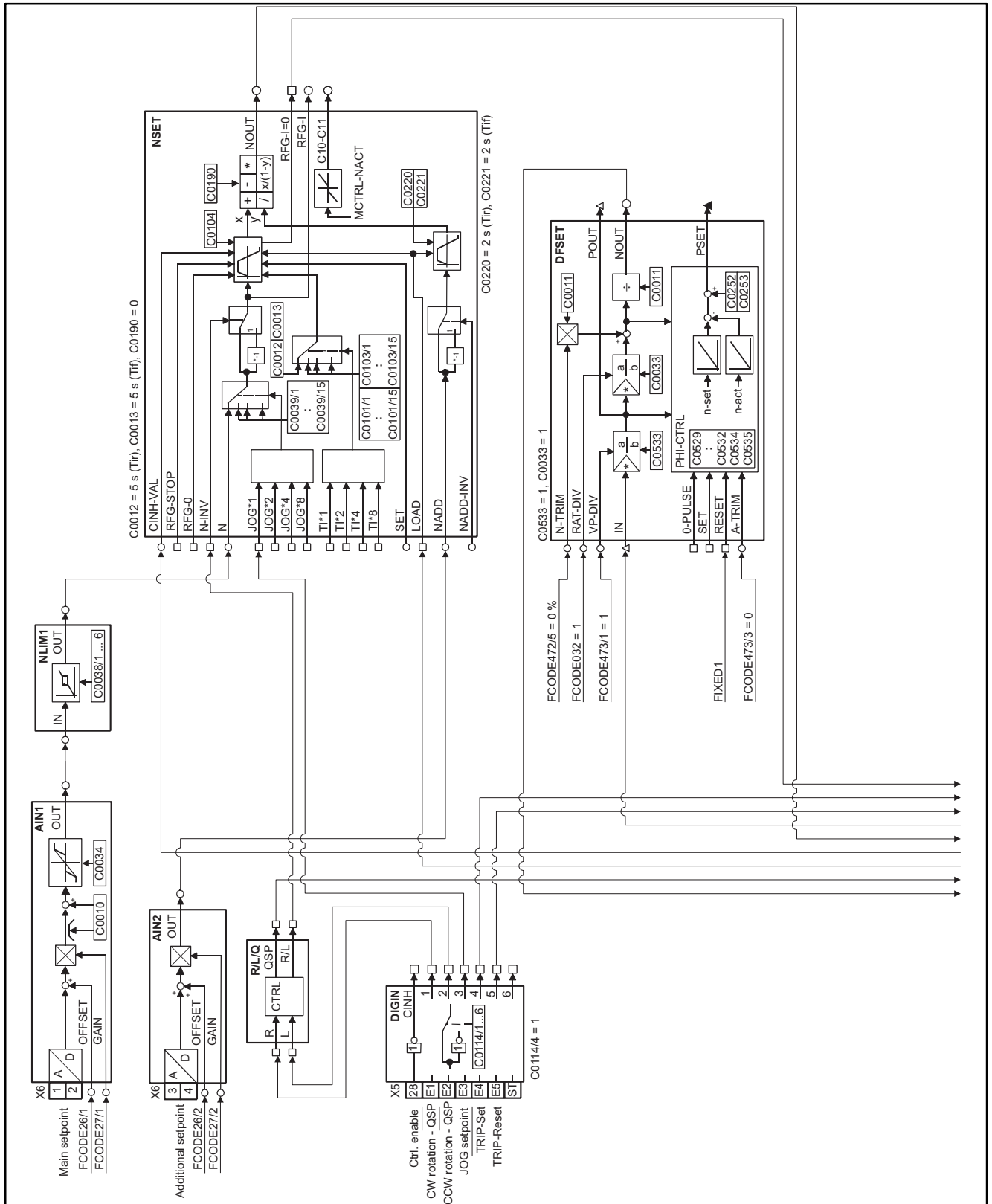
Fig. 4-17 Basic configuration 4000 - torque control (sheet 1)

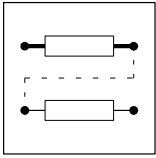


Fig. 4-18 Basic configuration 4000 - torque control (sheet 2)



4.6 Digital frequency master (C0005 = 5000)





Signal-flow charts

Digital frequency master

Fig. 4-19

Basic configuration 5000 - digital frequency master (sheet 1)

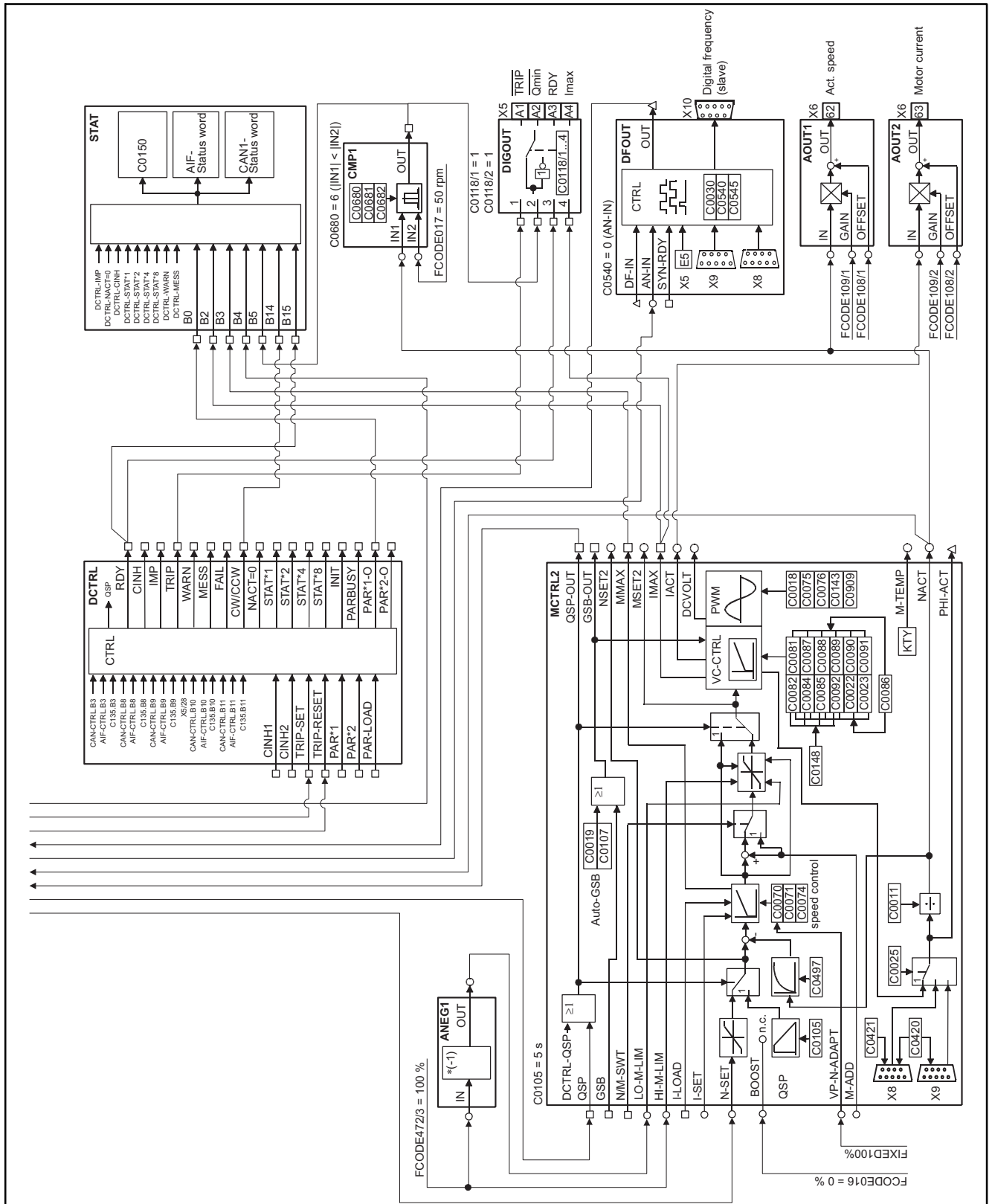
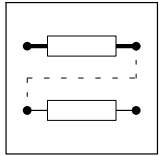
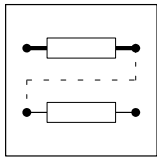


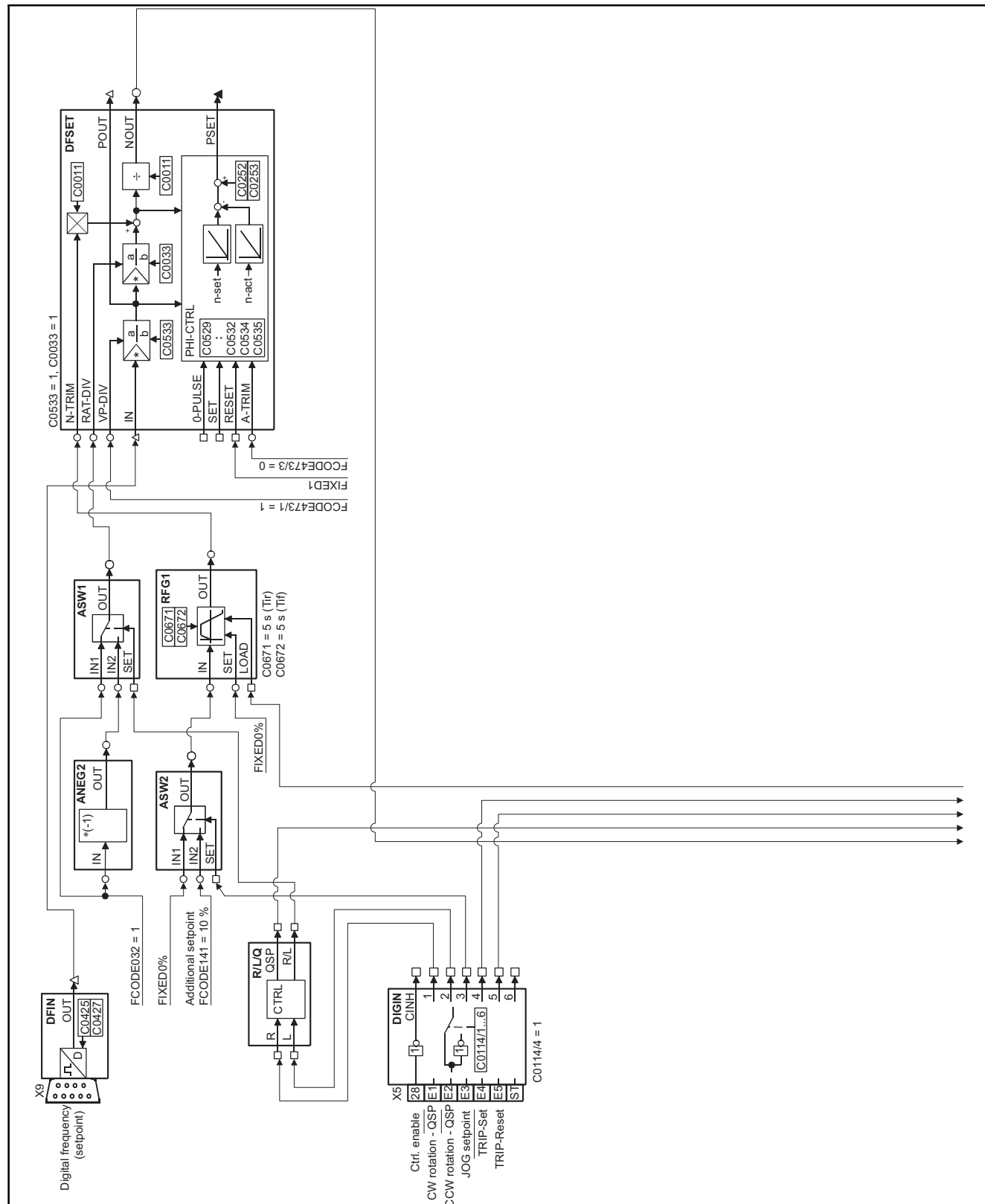
Fig. 4-20 Basic configuration 5000 - digital frequency master (sheet 2)



Signal-flow charts

Digital frequency bus

4.7 Digital frequency bus (C0005 = 6000)



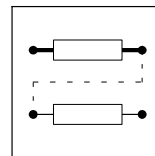
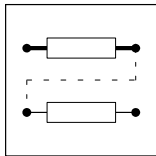


Fig. 4-21 Basic configuration 6000 - digital frequency bus (sheet 1)



Signal-flow charts

Digital frequency bus

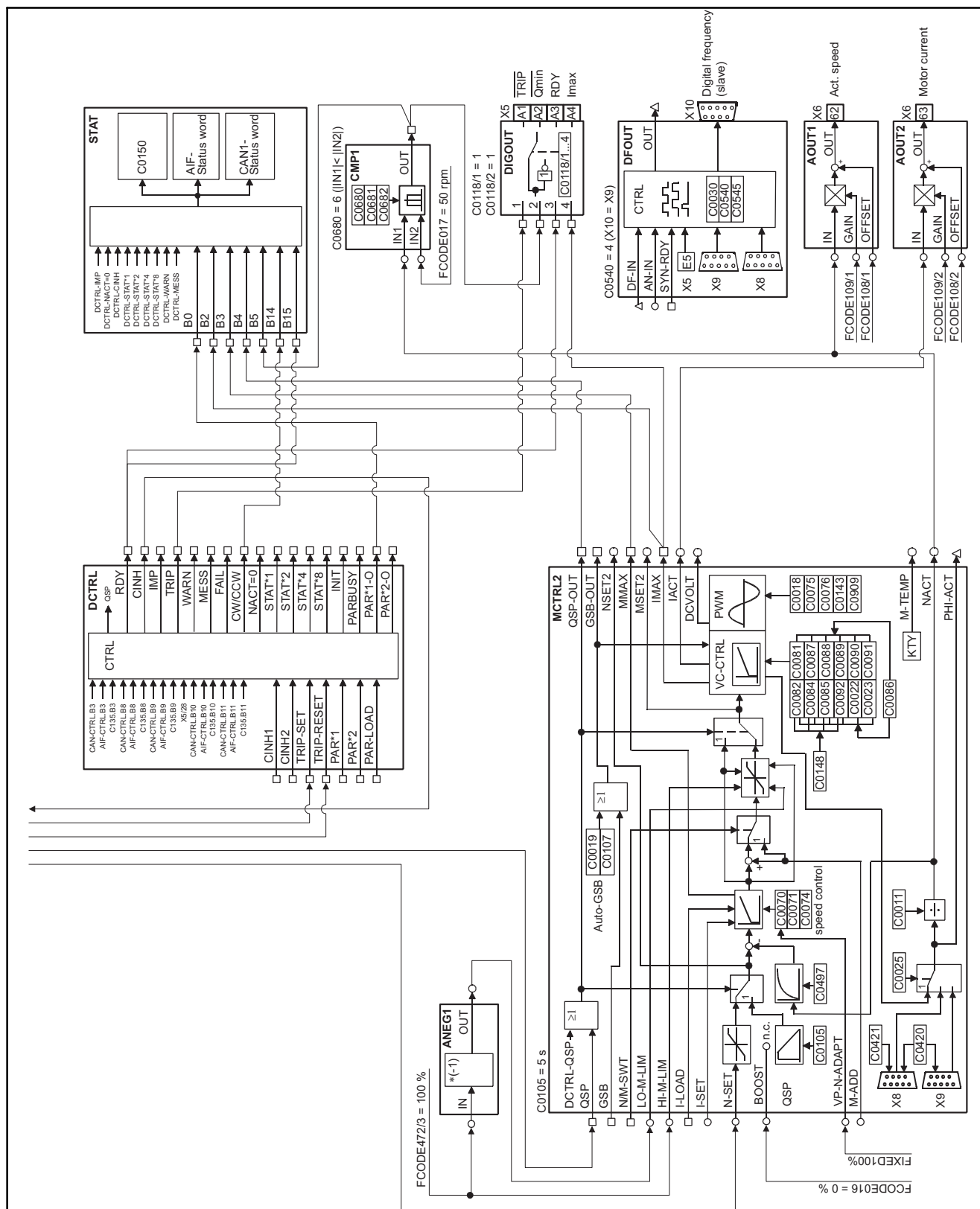
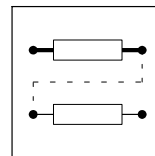
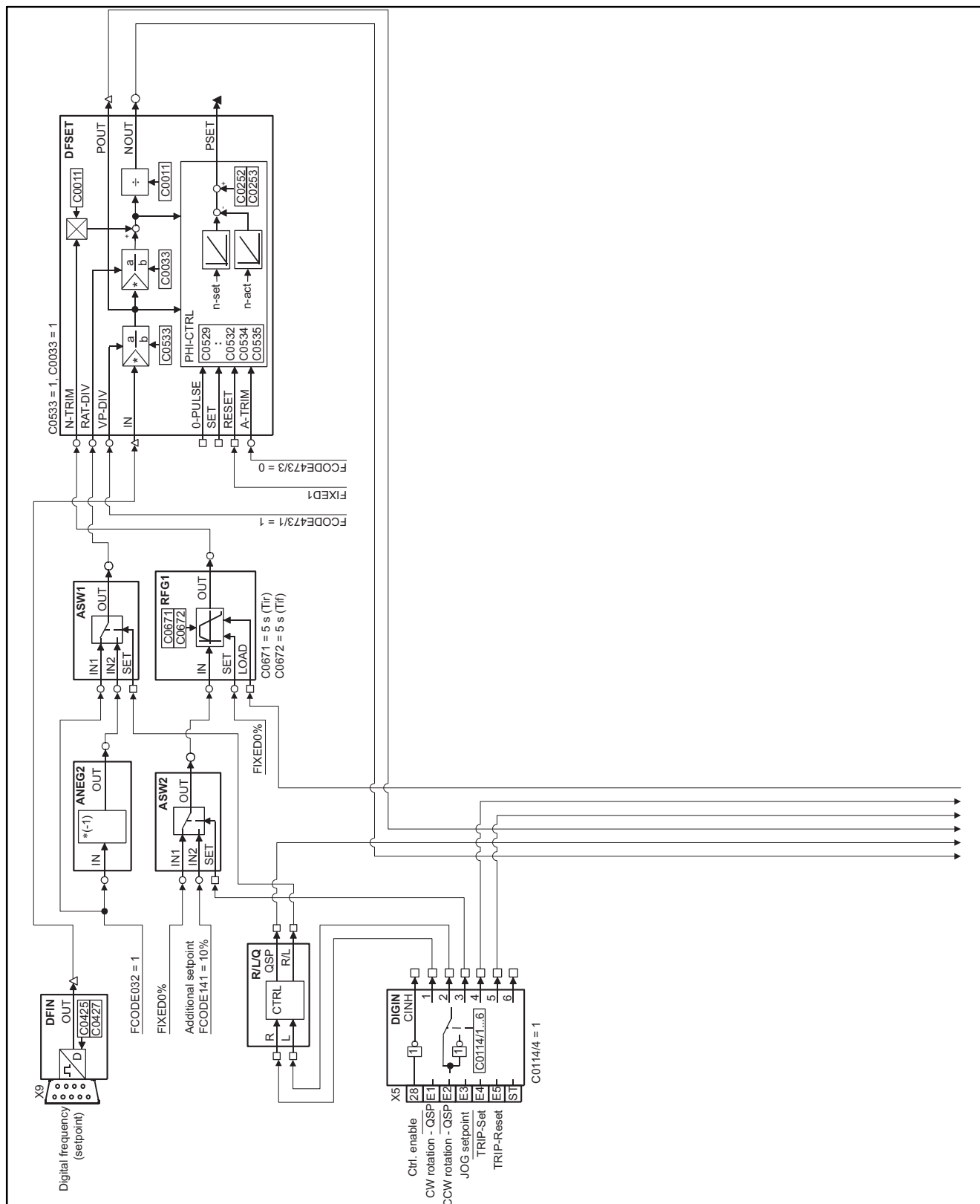
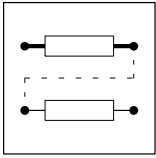


Fig. 4-22 Basic configuration 6000 - digital frequency bus (sheet 2)



4.8 Digital frequency cascade (C0005 = 7000)



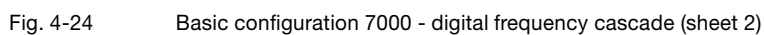


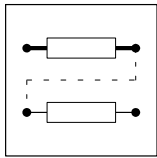
Signal-flow charts

Digital frequency cascade

Fig. 4-23

Basic configuration 7000 - digital frequency cascade (sheet 1)

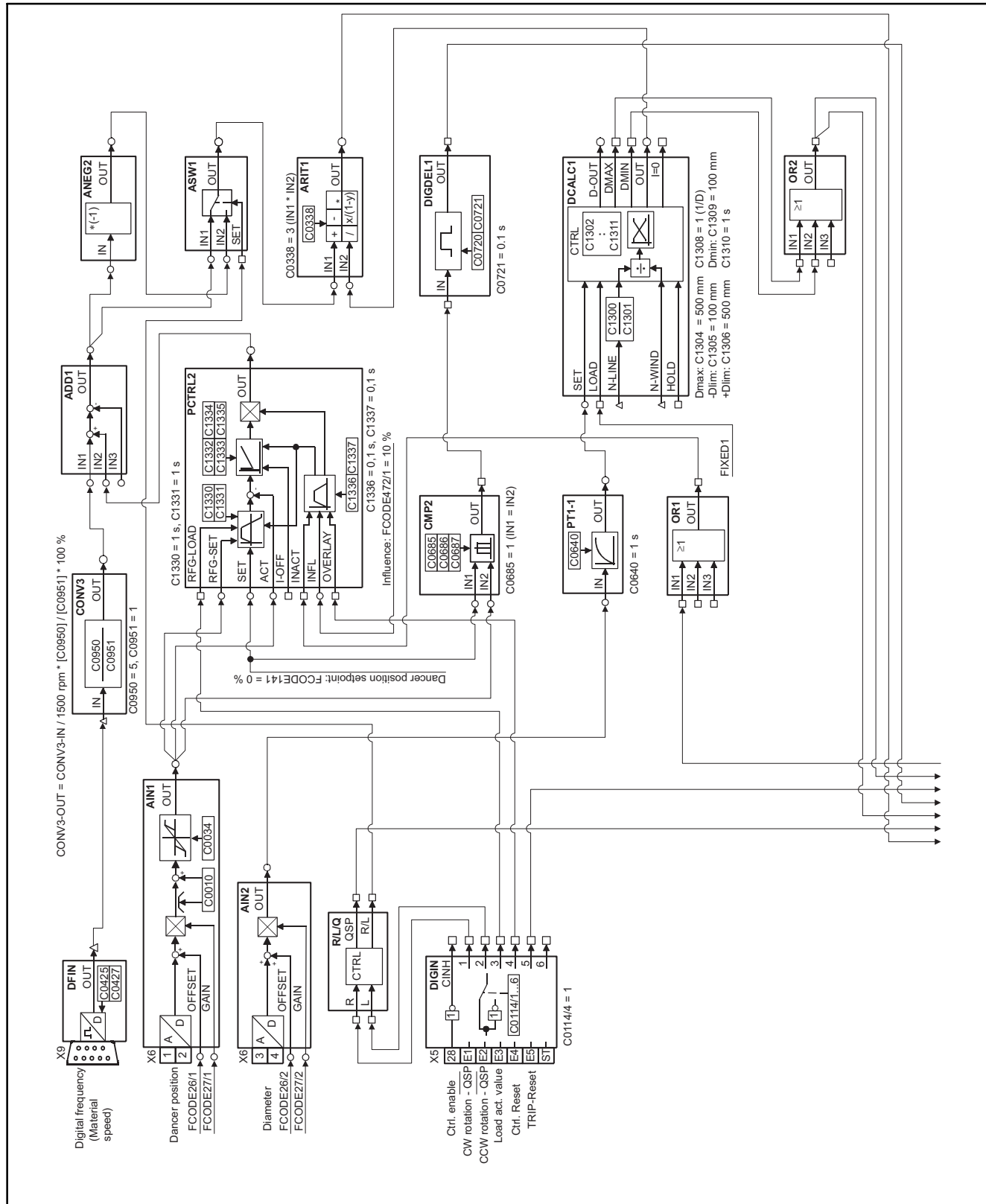




Signal-flow charts

Dancer position control (external diameter calculator)

4.9 Dancer position control (external diameter calculator) (C0005 = 8000)



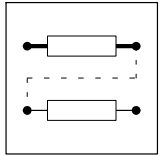
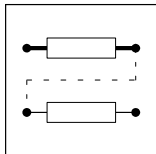


Fig. 4-25 Basic configuration 8000 - dancer position control with external diameter calculator (sheet 1)



Signal-flow charts

Dancer position control (external diameter calculator)

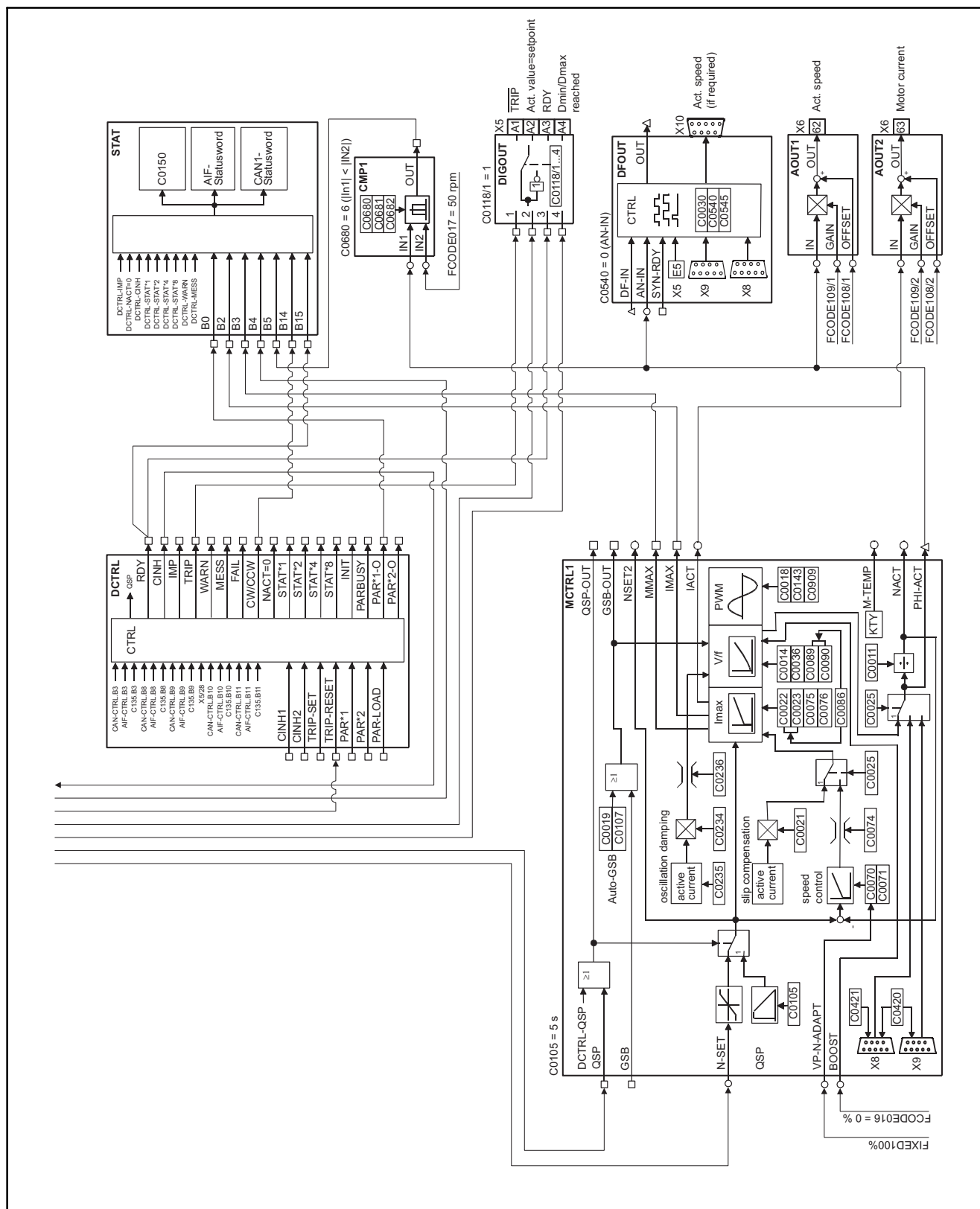
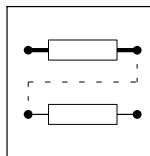
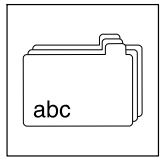


Fig. 4-26 Basic configuration 8000 - dancer position control with external diameter calculator (sheet 2)

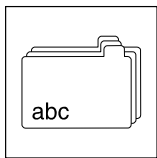




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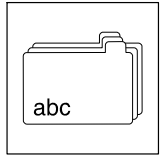


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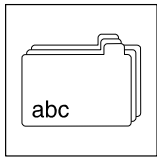
Terminology and abbreviations used

5.1 Terminology and abbreviations used

AIF	Automation interface AIF interface, interface for communication modules
Controller	Any frequency inverter, servo inverter or DC speed controller
Drive	Lenze controller in combination with a geared motor, a three-phase AC motor and other Lenze drive components
Cxxxx/y	Subcode y of code Cxxxx (e.g. C0404/2 = subcode 2 of code C0404)
Xk/y	Terminal y on terminal strip Xk (e.g. X5/28 = terminal 28 on terminal strip X5)
	Cross-reference to a chapter and the corresponding page number
V_{mains} [V]	Mains voltage
V_{DC} [V]	DC-supply voltage
V_M [V]	Output voltage
I_{mains} [A]	Mains current
I_r [A]	Rated output current
I_{max} [A]	Maximum output current
I_{PE} [mA]	Discharge current
P_r [kW]	Rated motor power
P_v [W]	Power loss of inverter
P_{DC} [kW]	For operation with power-adapted motor, additional power which can be drawn from the DC bus
S_N [kVA]	Output power of controller
M_r [Nm]	Rated torque
f_{max} [Hz]	Maximum frequency
L [mH]	Inductance
R [Ω]	Resistance
AC	AC current or AC voltage
DC	DC current or DC voltage
DIN	German standardisation institute
EMC	Electromagnetic compatibility
EN	European standard
IEC	International Electrotechnical Commission



IP	International Protection Code
NEMA	National Electrical Manufacturers Association
VDE	Association of German Electrotechnical Engineers
CE	Communauté Européenne
UL	Underwriters Laboratories



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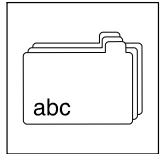
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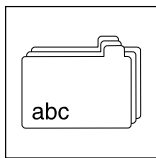
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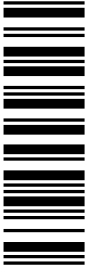
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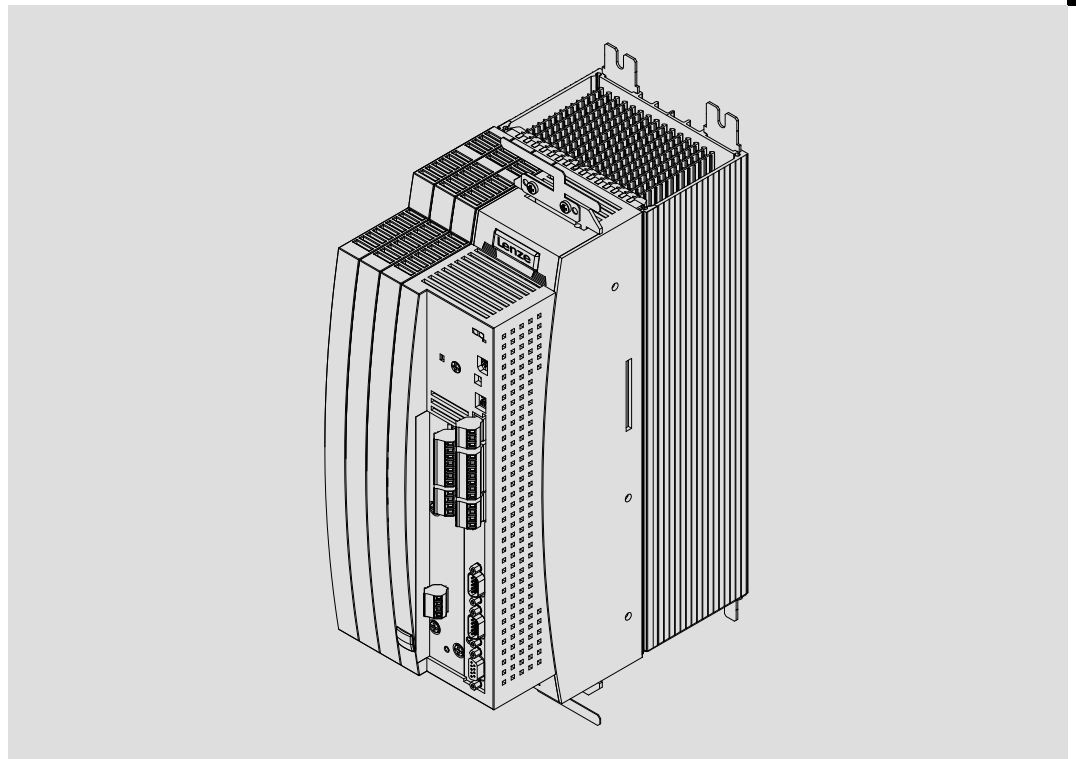
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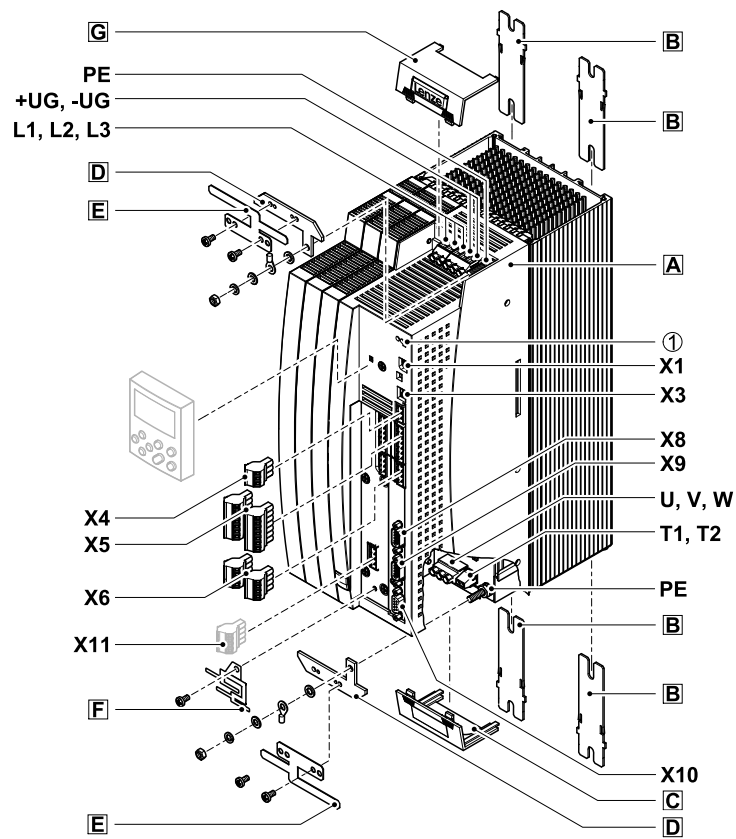
Information for the operator of the machine

9300 vector 0.37 ... 11 kW



EVF9321-xV ... EVF9326-xV

Frequency inverter



Key for overview

Position	Description
A	Controller
B	Fixing rails for standard mounting
C	Cover for the motor connection
D	Shield connection support with fixing screws (2 items) 1 support for the shield sheet for the supply connections 1 support for the shield sheet for the motor cable
E	EMC shield sheet with fixing screws (2 items) 1 shield sheet for the supply connections 1 shield sheet for the motor cable and the feed cable for the motor temperature monitoring with PTC thermistor or thermal contact (NC contact)
F	EMC shield sheet with fixing screws for shielded control cables
G	Cover for the supply connections

Connections and interfaces

Position	Description
L1, L2, L3, PE	Mains connection
+UG, -UG	DC supply
U, V, W, PE	Motor connection
T1, T2	Connection of PTC thermistor or thermal contact (NC contact) of the motor
X1	AIF interface (automation interface) Slot for communication module (e. g. XT EMZ9371BC keypad)
X3	Jumper for setting analog input signal at X6/1, X6/2
X4	System bus (CAN) connection
X5	Connection of digital inputs and outputs
X6	Connection of analog inputs and outputs
X8	Connection of incremental encoder with TTL level or SinCos encoder and KTY temperature sensor of the motor
X9	Connection of digital frequency input signal
X10	Connection of digital frequency output signal
X11	Connection of K _{SR} relay output for "safe standstill" (for variants V004 and V024 only)

Status displays

Position	LED red	LED green	Operating status
①	Off	On	Controller is enabled
	On	On	Mains is switched on and automatic start is inhibited
	Off	Blinking slowly	Controller is inhibited
	Off	On	Motor data identification is active
	Blinking quickly	Off	Undervoltage or overvoltage
	Blinking slowly	Off	Active fault

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1 About this documentation



Note!

This documentation contains all the information required by the machine operator to run the drive controllers of the 9300 vector series installed in your machine/system.

You may make further use of the information contained in this documentation without asking Lenze for permission if you do not change the contents.

1.1 Document history

What is new / what has changed?

Material number	Version			Description
13445254	3.0	11/2013	TD06	Error corrections
13330574	2.1	03/2010	TD14	Change of the company's address
13330574	2.0	03/2010	TD14	New edition due to reorganisation of the company UL-warnings updated Revision for software version 8x
13217739	1.0	07/2007	TD23	First edition



Tip!

Information and auxiliary devices related to the Lenze products can be found in the download area at

<http://www.Lenze.com>

1.2 Target group

This documentation is directed at qualified skilled personnel according to IEC 60364.

Qualified skilled personnel are persons who have the required qualifications to carry out all activities involved in installing, mounting, commissioning, and operating the product.

1 About this documentation

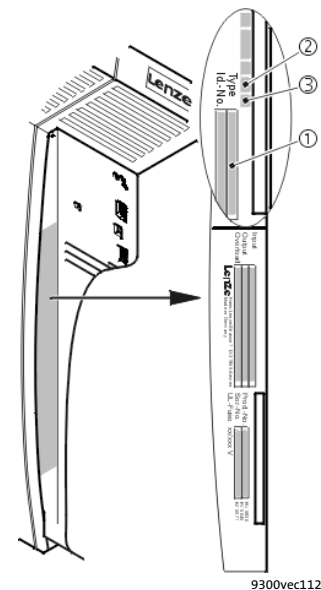
Validity information

1.3 Validity information

... 9300 vector frequency inverters as of nameplate data:

		①		②		③		Nameplate	
		EVF	93xx	—	x	V	Vxxx	1x	8x
Product series									
EVF =	Frequency inverter								
Type no. / rated power									
	400 V	480 V							
9321 =	0.37 kW	0.37 kW							
9322 =	0.75 kW	0.75 kW							
9323 =	1.5 kW	1.5 kW							
9324 =	3.0 kW	3.0 kW							
9325 =	5.5 kW	5.5 kW							
9326 =	11 kW	11 kW							
Type									
E =	Panel-mounted unit								
C =	Built-in unit in "cold plate" technique								
Design									
V =	Vector-controlled frequency inverter								
Variant									
—	Standard								
V003 =	In "cold plate" technique								
V004 =	With "safe standstill" function								
V024 =	With "safe standstill" function and for IT mains								
V100 =	For IT mains								
Hardware version									
Software version									

9300vec112



9300vec112

1.4 Conventions used

This documentation uses the following conventions to distinguish between different types of information:

Type of information	Identification	Examples/notes
Spelling of numbers		
Decimal separator	language-dependent	In each case, the signs typical for the target language are used as decimal separators. For example: 1234.56 or 1234,56
Warnings		
UL warnings	Ⓛ	Given in English and French
UR warnings	Ⓡ	
Text		
Program name	» «	PC software For example: »Engineer«, »Global Drive Control« (GDC)
Icons		
Page reference	📖	Reference to another page with additional information For instance: 📖 16 = see page 16
Documentation reference	📄	Reference to another documentation with additional information For example: 📄 EDKxxx = see documentation EDKxxx

1 About this documentation

Notes used

1.5 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:



Danger!

(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
 Danger!	Danger of personal injury through dangerous electrical voltage. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Danger!	Danger of personal injury through a general source of danger. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Stop!	Danger of property damage. Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
 Note!	Important note to ensure troublefree operation
 Tip!	Useful tip for simple handling
	Reference to another documentation

Special safety instructions and application notes

Pictograph and signal word	Meaning
 Warnings!	Safety note or application note for the operation according to UL or CSA requirements.
 Warnings!	The measures are required to meet the requirements according to UL or CSA.

2 Safety instructions

2.1 General safety and application notes for Lenze controllers

(in accordance with Low-Voltage Directive 2006/95/EC)

For your personal safety

Disregarding the following safety measures can lead to severe injury to persons and damage to material assets:

- ▶ Only use the product as directed.
- ▶ Never commission the product in the event of visible damage.
- ▶ Never commission the product before assembly has been completed.
- ▶ Do not carry out any technical changes on the product.
- ▶ Only use the accessories approved for the product.
- ▶ Only use original spare parts from Lenze.
- ▶ Observe all regulations for the prevention of accidents, directives and laws applicable on site.
- ▶ Transport, installation, commissioning and maintenance work must only be carried out by qualified personnel.
 - Observe IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE 0110 and all national regulations for the prevention of accidents.
 - According to this basic safety information, qualified, skilled personnel are persons who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.
- ▶ Observe all specifications in this documentation.
 - This is the condition for safe and trouble-free operation and the achievement of the specified product features.
 - The procedural notes and circuit details described in this documentation are only proposals. It is up to the user to check whether they can be transferred to the particular applications. Lenze Automation GmbH does not accept any liability for the suitability of the procedures and circuit proposals described.
- ▶ Depending on their degree of protection, some parts of the Lenze controllers (frequency inverters, servo inverters, DC speed controllers) and their accessory components can be live, moving and rotating during operation. Surfaces can be hot.
 - Non-authorised removal of the required cover, inappropriate use, incorrect installation or operation, creates the risk of severe injury to persons or damage to material assets.
 - For more information, please see the documentation.
- ▶ High amounts of energy are produced in the controller. Therefore it is required to wear personal protective equipment (body protection, headgear, eye protection, ear protection, hand guard).

Application as directed

Controllers are components which are designed for installation in electrical systems or machines. They are not to be used as domestic appliances, but only for industrial purposes according to EN 61000-3-2.

When controllers are installed into machines, commissioning (i.e. starting of the operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 2006/42/EC (Machinery Directive); EN 60204 must be observed.

Commissioning (i.e. starting of the operation as directed) is only allowed when there is compliance with the EMC Directive (2004/108/EC).

The controllers meet the requirements of the Low-Voltage Directive 2006/95/EC. The harmonised standard EN 61800-5-1 applies to the controllers.

The technical data and supply conditions can be obtained from the nameplate and the documentation. They must be strictly observed.

Warning: Controllers are products which can be installed in drive systems of category C2 according to EN 61800-3. These products can cause radio interferences in residential areas. In this case, special measures can be necessary.

Transport, storage

Please observe the notes on transport, storage, and appropriate handling.

Observe the climatic conditions according to the technical data.

Installation

The controllers must be installed and cooled according to the instructions given in the corresponding documentation.

The ambient air must not exceed degree of pollution 2 according to EN 61800-5-1.

Ensure proper handling and avoid excessive mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts.

Controllers contain electrostatic sensitive devices which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

Electrical connection

When working on live controllers, observe the applicable national regulations for the prevention of accidents (e.g. VBG 4).

The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). Additional information can be obtained from the documentation.

This documentation contains information on installation in compliance with EMC (shielding, earthing, filter, and cables). These notes must also be observed for CE-marked controllers. The manufacturer of the system is responsible for compliance with the limit values demanded by EMC legislation. The controllers must be installed in housings (e.g. control cabinets) to meet the limit values for radio interferences valid at the site of installation. The housings must enable an EMC-compliant installation. Observe in particular that e.g. the control cabinet doors have a circumferential metal connection to the housing. Reduce housing openings and cutouts to a minimum.

Lenze controllers may cause a DC current in the PE conductor. If a residual current device (RCD) is used for protection against direct or indirect contact for a controller with three-phase supply, only a residual current device (RCD) of type B is permissible on the supply side of the controller. If the controller has a single-phase supply, a residual current device (RCD) of type A is also permissible. Apart from using a residual current device (RCD), other protective measures can be taken as well, e.g. electrical isolation by double or reinforced insulation or isolation from the supply system by means of a transformer.

Operation

If necessary, systems including controllers must be equipped with additional monitoring and protection devices according to the valid safety regulations (e.g. law on technical equipment, regulations for the prevention of accidents). The controllers can be adapted to your application. Please observe the corresponding information given in the documentation.

After the controller has been disconnected from the supply voltage, all live components and power terminals must not be touched immediately because capacitors can still be charged. Please observe the corresponding stickers on the controller.

All protection covers and doors must be shut during operation.

Safety functions

Certain controller versions support safety functions (e.g. "Safe torque off", formerly "Safe standstill") according to the requirements of the EC Directive 2006/42/EC (Machinery Directive). The notes on the integrated safety system provided in this documentation must be observed.

Maintenance and servicing

The controllers do not require any maintenance if the prescribed operating conditions are observed.

Disposal

Recycle metal and plastic materials. Ensure professional disposal of assembled PCBs.

The product-specific safety and application notes given in these instructions must be observed!

2.2

Thermal motor monitoring

**Note!**

From software version 8.1 onwards, the 9300 vector controllers are provided with an I²x t function for sensorless thermal monitoring of the connected motor.

- ▶ I²x t monitoring is based on a mathematical model which calculates a thermal motor utilisation from the detected motor currents.
- ▶ The calculated motor utilisation is saved when the mains is switched off.
- ▶ The function is UL-certified, i.e. additional protective measures for the motor are not required in UL-approved systems.
- ▶ Nevertheless, I²x t monitoring does **not** provide full motor protection because other influences on the motor utilisation such as changes in the cooling conditions (e.g. cooling air flow interrupted or too warm) cannot be detected.

The I² x t load of the motor is displayed in C0066.

The thermal loading capacity of the motor is expressed by the thermal motor time constant (τ , C0128). Find the value in the rated motor data or contact the manufacturer of the motor.

The I² x t monitoring has been designed such that it will be activated after 179 s in the event of a motor with a thermal motor time constant of 5 minutes (Lenze setting C0128), a motor current of 1.5 x I_N and a trigger threshold of 100 %.

Two adjustable trigger thresholds provide for different responses.

- ▶ Adjustable response OC8 (TRIP, warning, off).
 - The trigger threshold is set in C0127.
 - The response is set in C0606.
 - The response OC8, for instance, can be used for an advance warning.
- ▶ Fixed response OC6-TRIP.
 - The trigger threshold is set in C0120.

Behaviour of the I ² x t monitoring	Condition
The I ² x t monitoring is deactivated. C0066 is set = 0 % and MCTRL-LOAD-I2XT is set = 0.00 %.	When C0120 = 0 % and C0127 = 0 %, set controller inhibit.
I ² x t monitoring is stopped. The current value in C0066 and at the MCTRL-LOAD-I2XT output is frozen.	When C0120 = 0 % and C0127 = 0 %, set controller enable.
I ² x t monitoring is deactivated. The motor load is displayed in C0066.	Set C0606 = 3 (off) and C0127 > 0 %.

**Note!**

An error message OC6 or OC8 can only be reset if the I² x t load falls below the set trigger threshold by 5 %.

2.2.1 Forced ventilated or naturally ventilated motors

Parameter setting

The following codes can be set for $I^2 \times t$ monitoring:

Code	Meaning	Value range	Lenze setting
C0066	Display of the $I^2 \times t$ load of the motor	0 ... 250 %	-
C0120	Threshold: Triggering of error "OC6"	0 ... 120 %	0 %
C0127	Threshold: Triggering of error "OC8"	0 ... 120 %	0 %
C0128	Thermal motor time constant	0.1 ... 50.0 min	5.0 min
C0606	Response to error "OC8"	TRIP, warning, off	Warning

Calculate release time and $I^2 \times t$ load

Formula for release time	Information
$t = -(\tau) \times \ln \left[1 - \frac{z + 1}{\left(\frac{I_{Mot}}{I_N} \right)^2 \times 100} \right]$	I_{Mot} Actual motor current (C0054)
	I_r Rated motor current (C0088)
	τ Thermal motor time constant (C0128)
	z Threshold value in C0120 (OC6) or C0127 (OC8)

Formulae for $I^2 \times t$ load	Information
$L(t) = \left(\frac{I_{Mot}}{I_N} \right)^2 \times 100\% \times \left(1 - e^{-\frac{t}{\tau}} \right)$	$L(t)$ Chronological sequence of the $I^2 \times t$ load of the motor (Display: C0066)
	I_{Mot} Actual motor current (C0054)
	I_r Rated motor current (C0088)
	τ Thermal motor time constant (C0128)

If the controller is inhibited, the $I^2 \times t$ load is reduced:

$L(t) = L_{Start} \times \sqrt{e^{-\frac{t}{\tau}}}$	L_{Start} $I^2 \times t$ load before controller inhibit If an error is triggered, the value corresponds to the threshold value set in C0120 (OC6) or C0127 (OC8).

Read release time in the diagram

Diagram for detecting the release times for a motor with a thermal motor time constant of 5 minutes (Lenze setting C0128):

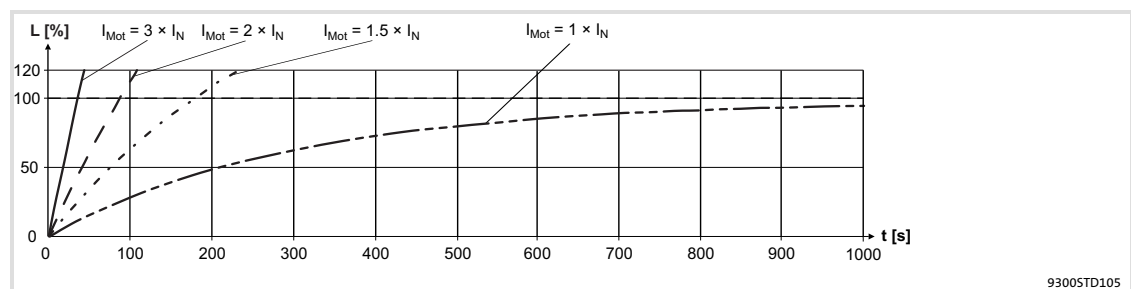


Fig. 2-1 $I^2 \times t$ -monitoring: Release times for different motor currents and trigger thresholds

I_{Mot}	Actual motor current (C0054)
I_r	Rated motor current (C0088)
L	$I^2 \times t$ load of the motor (display: C0066)
T	Time

2.2.2

Self-ventilated motors

Due to the construction, self-ventilated standard motors are exposed to an increased heat generation in the lower speed range compared to forced ventilated motors.

**Warnings!**

For complying with the UL 508C standard, you have to set the speed-dependent evaluation of the permissible torque via code **C0129/x**.

Parameter setting

The following codes can be set for $I^2 \times t$ monitoring:

Code	Meaning	Value range	Lenze setting
C0066	Display of the $I^2 \times t$ load of the motor	0 ... 250 %	-
C0120	Threshold: Triggering of error "OC6"	0 ... 120 %	0 %
C0127	Threshold: Triggering of error "OC8"	0 ... 120 %	0 %
C0128	Thermal motor time constant	0.1 ... 50.0 min	5.0 min
C0606	Response to error "OC8"	TRIP, warning, off	Warning
C0129/1	S1 torque characteristic I_1/I_{rated}	10 ... 200 %	100 %
C0129/2	S1 torque characteristics n_2/n_{rated}	10 ... 200 %	40 %

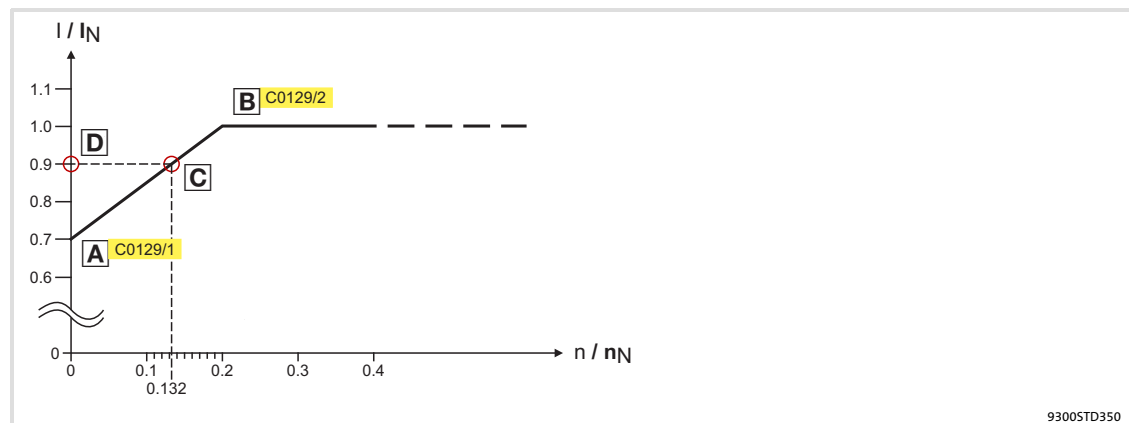
Effect of code C0129/x

Fig. 2-2 Working point in the range of characteristic lowering

The lowered speed / torque characteristic (Fig. 2-2) reduces the permissible thermal load of self-ventilated standard motors. The characteristic is a line the definition of which requires two points:

- Point **A**: Definition with **C0129/1**
This value also enables an increase of the maximally permissible load.
- Point **B**: Definition with **C0129/2**
With increasing speeds, the maximally permissible load remains unchanged ($I_{Mot} = I_{rated}$).

In Fig. 2-2, the motor speed and the corresponding permissible motor torque (**D**) can be read for each working point (**C**) on the characteristic (**A**) ... (**B**). **D** can also be calculated using the values in **C0129/1** and **C0129/2** (evaluation coefficient "y", 15).

Calculate release time and I²xt load

Calculate the release time and the I² x t load of the motor considering the values in **C0129/1** and **C0129/2**(evaluation coefficient "y").

Formulae for release time	Information
$T = -(\tau) \times \ln \left[1 - \frac{z + 1}{\left(\frac{I_{Mot}}{y \times I_N} \right)^2 \times 100} \right]$ $y = \frac{100\% - C0129/1}{C0129/2} \times \frac{n}{n_N} + C0129/1$	T
	Release time of the I ² x t monitoring
	τ
	Thermal motor time constant (C0128)
	ln
	Function: Natural logarithm
	I _{Mot}
	Actual motor current (C0054)
	I _r
	Rated motor current (C0088)
	z
	Threshold value in C0120 (OC6) <u>or</u> C0127 (OC8)
	y
	Evaluation coefficient
	n _{rated}
	Rated speed (C0087)
Formulae for I ² x t load	Information
$L(t) = \left(\frac{I_{Mot}}{y \times I_N} \right)^2 \times 100\% \times \left(1 - e^{-\frac{t}{\tau}} \right)$	L(t)
	Chronological sequence of the I ² x t load of the motor (Display: C0066)
	y
	Evaluation coefficient
	I _{Mot}
	Actual motor current (C0054)
	I _r
	Rated motor current (C0088)
	τ
	Thermal motor time constant (C0128)
If the controller is inhibited, the I ² x t load is reduced:	
$L(t) = L_{start} \times \sqrt{e^{-\frac{t}{\tau}}}$	L _{start}
	I ² x t load before controller inhibit If an error is triggered, the value corresponds to the threshold value set in C0120 (OC6) <u>or</u> C0127 (OC8).

2.3**Residual hazards****Protection of persons**

- ▶ Before working on the controller, check that no voltage is applied to the power terminals:
 - Because the power terminals V, W, +U_G and -U_G remain live for at least 3 minutes after disconnecting from mains.
 - Because the power terminals L1, L2, L3; U, V, W, +U_G and -U_G remain live when the motor is stopped.
- ▶ The leakage current to earth (PE) is >3.5 mA. According to EN 61800-5-1
 - a fixed installation is required,
 - a double PE connection is required, or, if there is only a single PE connection, the PE conductor must have a cross-section of at least 10 mm².
- ▶ The heat sink of the controller has an operating temperature of > 80 °C:
 - Contact with the heatsink results in burns.
- ▶ If you use the "flying-restart circuit" function (C0142 = 2, 3) for machines with a low moment of inertia and minimum friction:
 - After controller enable in standstill, the motor may start or change its direction of rotation for a short time, because the flying restart process also is carried out at a speed of 0.
- ▶ During parameter set transfer, the control terminals of the controller can have undefined states!
 - Therefore the plugs X5 and X6 must be unplugged, before the transfer is executed. This ensures that the controller is inhibited and all control terminals have the defined "LOW" state.

Device protection

- ▶ Frequent mains switching (e.g. inching mode via mains contactor) can overload and destroy the input current limitation of the drive controller:
 - At least 3 minutes must pass between switching off and restarting the devices EVS9321-xS and EVS9322-xS.
 - At least 3 minutes must pass between two starting procedures of the devices EVS9323-xS ... EVS9332-xS.
 - Use the "safe torque off" safety function (STO) if safety-related mains disconnections occur frequently. The drive variants Vxx4 are equipped with this function.

Motor protection

- ▶ Certain drive controller settings can overheat the connected motor:
 - E. g. long-time operation of the DC injection brake.
 - Long-time operation of self-ventilated motors at low speeds.

Protection of the machine/system

- ▶ Drives can reach dangerous overspeeds (e. g. setting of high output frequencies in connection with motors and machines not suitable for this purpose):
 - The drive controllers do not provide protection against such operating conditions. For this purpose, use additional components.

2.4

Safety instructions for the installation according to UL

Original - English

**Warnings!**

- ▶ **Motor Overload Protection**
 - For information on the protection level of the internal overload protection for a motor load, see the corresponding manuals or software helps.
 - If the integral solid state motor overload protection is not used, external or remote overload protection must be provided.
- ▶ **Branch Circuit Protection**
 - The integral solid state protection does not provide branch circuit protection.
 - Branch circuit protection has to be provided externally in accordance with corresponding instructions, the National Electrical Code and any additional codes.
- ▶ Please observe the specifications for fuses and screw-tightening torques in these instructions.
- ▶ **EVS9321 ... EVS9326:**
 - Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 480 V maximum, when protected by fuses.
 - Suitable for use on a circuit capable of delivering not more than 50000 rms symmetrical amperes, 480 V maximum, when protected by CC, J, T or R class fuses.
 - Maximum surrounding air temperature: 0 ... +55 °C
 - > +40 °C: reduce the rated output current by 2.5 %/°C
 - Use 75 °C copper wire only.

Original - French



Warnings!

- ▶ Protection du moteur contre les surcharges
 - Pour obtenir des informations sur le niveau de protection offert par la protection intégrée contre les surcharges du moteur, se reporter aux manuels correspondants ou aux systèmes d'aide logiciels.
 - Si la protection statique intégrée contre les surcharges du moteur n'est pas utilisée, prévoir impérativement un dispositif de protection externe ou séparé contre les surcharges.
- ▶ Protection par disjoncteur
 - La protection statique intégrée n'offre pas la même protection qu'un disjoncteur.
 - Une protection par disjoncteur externe doit être fournie, conformément aux indications fournies, au National Electrical Code et aux autres dispositions applicables.
- ▶ Se conformer aux spécifications relatives aux fusibles et aux couples de serrage contenues dans le présent document.
- ▶ EVS9321 ... EVS9326 :
 - Convient aux circuits non susceptibles de délivrer plus de 5000 ampères symétriques eff., maximum 480 V, avec protection par fusibles.
 - Convient aux circuits non susceptibles de délivrer plus de 50000 ampères symétriques eff., maximum 480 V, avec protection par des fusibles CC de calibre J, T ou R.
 - Température ambiante maximale : 0 ... +55 °C
 - > +40 °C: ramener le courant assigné de sortie à 2,5 %/°C
 - Utiliser exclusivement des conducteurs en cuivre 75 °C.

3

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
General data and operating conditions

3

Parameter setting

3.1

Parameter setting with the XT EMZ9371BC keypad

Description

The keypad is available as an accessory. A full description of the keypad can be obtained from the Instructions included in the keypad delivery.

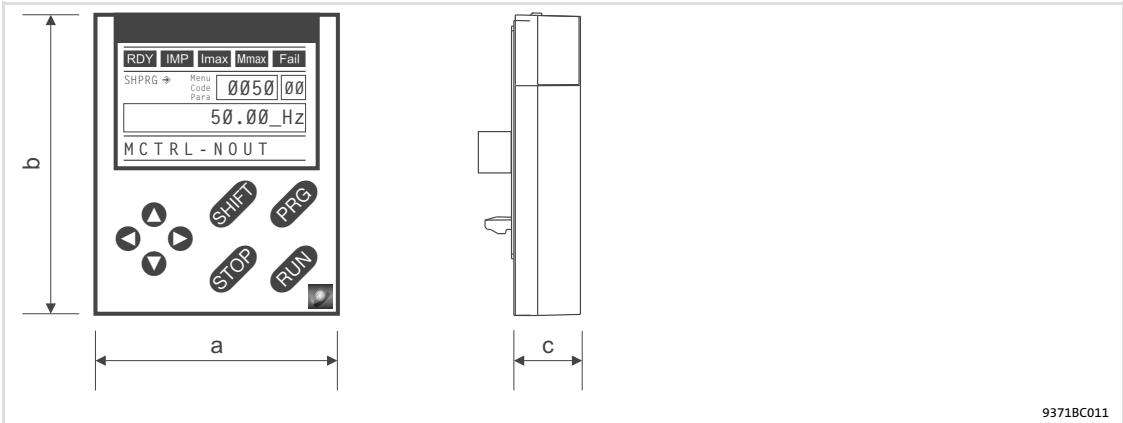
Plugging in the keypad

It is possible to plug the keypad into the AIF interface or remove it during operation.

As soon as the keypad is supplied with voltage, it carries out a self-test. The keypad is ready for operation if it is in display mode.

3.1.1

General data and operating conditions



Feature		Values
Dimensions		
Width	a	60 mm
Height	b	73.5 mm
Depth	c	15 mm
Environmental conditions		
Climate		
Storage	IEC/EN 60721-3-1	1K3 (-25 ... +60 °C)
Transport	IEC/EN 60721-3-2	2K3 (-25 ... +70 °C)
Operation	IEC/EN 60721-3-3	3K3 (-10 ... +60 °C)
Enclosure		IP 20

3.1.2 Installation and commissioning

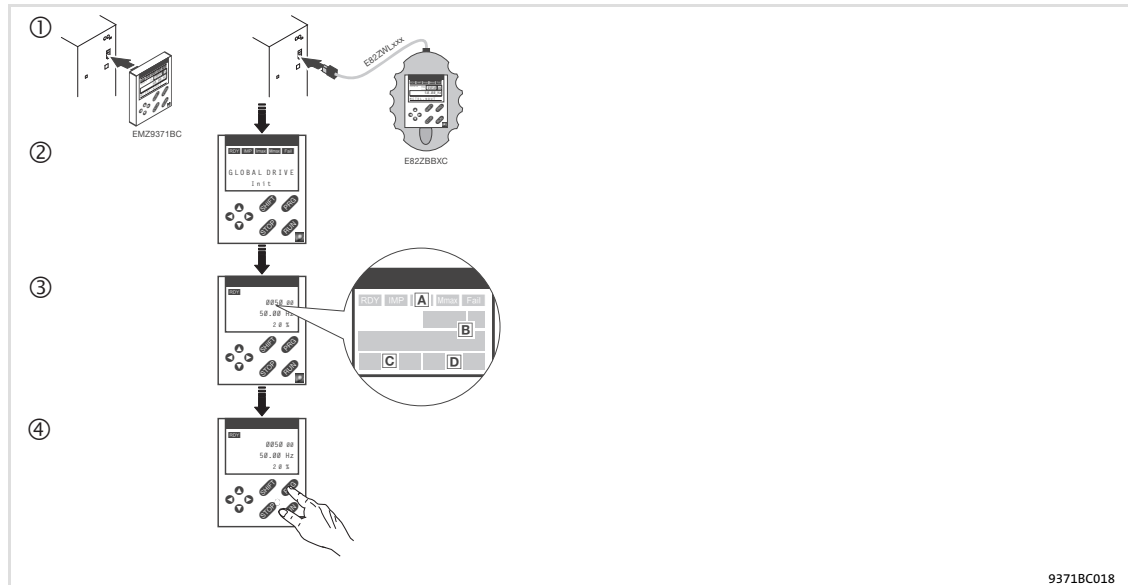


Fig. 3-1 Installation and commissioning of XT EMZ9371BC keypad or E82ZBBXC diagnosis terminal

- ① Connect keypad to the AIF interface on the front of the standard device.
The keypad can be connected/disconnected during operation.
- ② As soon as the keypad is supplied with voltage, it carries out a short self-test.
- ③ The operation level indicates when the keypad is ready for operation:
 - Ⓐ Current state of the standard device
 - Ⓑ Memory location 1 of the user menu (C0517):
Code number, subcode number, and current value
 - Ⓒ Active fault message or additional status message
 - Ⓓ Actual value in % of the status display defined in C0004
- ④ **PRG** must be pressed to leave the operation level

3.1.3 Display elements and function keys

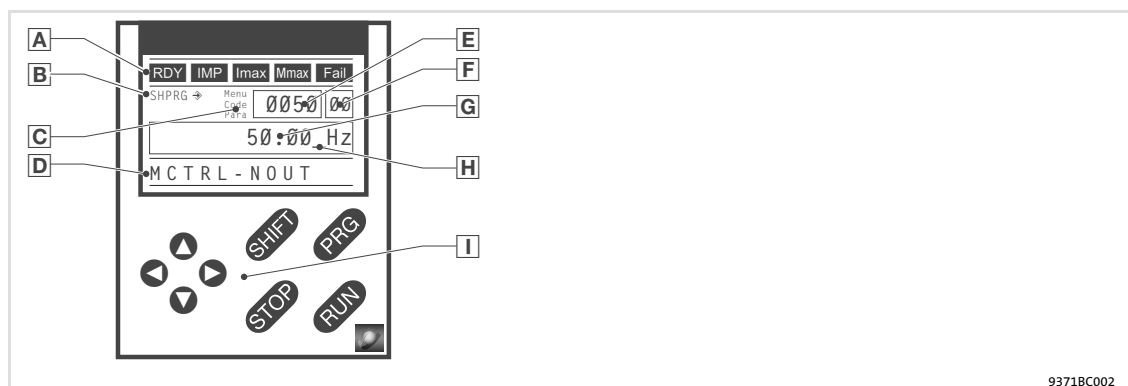


Fig. 3-2 Display elements and function keys of the XT EMZ9371BC keypad

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Display elements and function keys

Displays

A Status displays of standard device		
Display	Meaning	Explanation
RDY	Ready for operation	
IMP	Pulse inhibit is active	Power outputs are inhibited
Imax	The set current limit is exceeded in motor or generator mode	
Mmax	Speed controller 1 in the limitation	Drive is torque-controlled (Only active for operation with standard devices of the 9300 series)
Fail	Active fault	
B Acceptance of the parameters		
Display	Meaning	Explanation
↔	Parameter is accepted immediately	Standard device operates immediately with the new parameter value
SHPRG ↔	Parameter must be acknowledged with SHIFT PRG	Standard device operates with the new parameter value after being acknowledged
SHPRG	Parameter must be acknowledged in case of controller inhibit SHIFT PRG	Standard device operates with the new parameter value after the controller is enabled again
None	Display parameter	Change is not possible
C Active level		
Display	Meaning	Explanation
Menu	Menu level is active	Select main menu and submenus
Code	Code level is active	Select codes and subcodes
Para	Parameter level is active	Change parameters in the codes or subcodes
None	Operating level is active	Display operating parameters
D Short text		
Display	Meaning	Explanation
alphanumeric	Contents of the menus, meaning of the codes and parameters	
	In the operating level display of C0004 in % and the active fault	
E Number		
Active level	Meaning	Explanation
Menu level	Menu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
Code level	Four-digit code number	
F Number		
Active level	Meaning	Explanation
Menu level	Submenu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
Code level	Two-digit subcode number	
G Parameter value		
	Parameter value with unit	
H Cursor		
	In the parameter level, the digit above the cursor can be directly changed	
I Function keys		
	For description see the following table	

Function keys



Note!

Shortcuts with **SHIFT**:

Press and hold **SHIFT**, then press the second key in addition.

Key	Function			
	Menu level	Code level	Parameter level	Operating level
PRG		Change to the parameter level	Change to the operating level	Change to the code level
SHIFT PRG	Go to the "Short setup" menu and load predefined configurations ¹⁾		Accept parameters when SHPRG → or SHPRG is displayed	
↶ ↷	Change between menu items	Change of code number	Change of digit via cursor	
SHIFT ↶ SHIFT ↷	Quick change between menu items	Quick change of code number	Quick change of digit via cursor	
→ ←	Change between main menu, submenu and code level		Cursor to the right Cursor to the left	
RUN	Deactivate the function of the key STOP , the LED in the key goes off			
STOP	Inhibit the controller, the LED in the key is lit.			
	Reset fault (TRIP-Reset): 1. Remove the cause of malfunction 2. Press STOP 3. Press RUN			

¹⁾ Only active for operation with standard devices of the 8200 vector or 8200 motec series

3.1.4

Changing and saving parameters



Note!

Your settings have an effect on the current parameters in the main memory. You must save your settings in a parameter set so that they are not lost when the mains are connected.

If you only need one parameter set, save your settings as parameter set 1, since parameter set 1 is loaded automatically after mains connection.

Step	Key sequence		Action
1. Select the menu	↶↶↶↶		Use the arrow keys to select the desired menu
2. Change to the code level	→		Display of the first code in the menu
3. Select code or subcode	↶↶		Display of the current parameter value
4. Change to the parameter level	PRG		
5. When SHPRG is displayed, inhibit the controller	STOP ¹⁾		The drive coasts
6. Change parameter			
	A	↶↶	Move cursor below the digit to be changed
	B	↶↶	Change of digit
		SHIFT ↶ SHIFT ↷	Quick change of digit

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Changing and saving parameters

Step		Key sequence	Action	
7.	Accept the changed parameter			
	Display of SHPRG or SHPRG ⇨	SHIFT PRG	Confirm change to accept the parameter Display "OK"	
	Display ⇨	-	The parameter has been accepted immediately	
8.	Enable the controller, if required	RUN 1)	The drive runs again	
9.	Change to the code level			
	A	PRG	Display of the operating level	
	B	PRG	Display of the code with changed parameter	
10.	Change further parameters		Restart the "loop" with step 1. or 3.	
11.	Save changed parameters			
	A	▲▼▶◀	Select the code C0003 "PAR SAVE" in the menu "Load/Store"	
	B	PRG	Change to the parameter level Display "0" and "READY"	
	Select the parameter set in which the parameters are to be saved permanently	C	▲	Save as parameter set 1: ⇨ Set "1" "Save PS1"
				Save as parameter set 2: ⇨ Set "2" "Save PS2"
				Save as parameter set 3: ⇨ Set "3" "Save PS3"
Save as parameter set 4: ⇨ Set "4" "Save PS4"				
D	SHIFT PRG	When "OK" is displayed, the settings are permanently saved in the selected parameter set.		
12.	Change to the code level			
	A	PRG	Display of the operating level	
	B	PRG	Display of C0003 "PAR SAVE"	
13.	Set parameters for another parameter set		Restart the "loop" with step 1. or 3.	

- ¹⁾ The function of the STOP key can be programmed:
C0469 = 1: Controller inhibit
C0469 = 2: Quick stop (Lenze setting)

3.1.5 Loading a parameter set

The keypad serves to load a saved parameter set into the main memory when the controller is inhibited. After the controller is enabled, it operates with the new parameters.



Danger!

- ▶ When a new parameter set is loaded, the controller is reinitialised and acts as if it had been connected to the mains:
 - System configurations and terminal assignments can be changed. Make sure that your wiring and drive configuration comply with the settings of the parameter set.
- ▶ Only use terminal X5/28 as source for the controller inhibit! Otherwise the drive may start in an uncontrolled way when switching over to another parameter set.



Note!

- ▶ After switching on the supply voltage, the controller always loads parameter set 1 into the main memory.
- ▶ It is also possible to load other parameter sets into the main memory via the digital inputs or bus commands.

Step		Key sequence	Action
1.	Inhibit controller		Terminal X5/28 = LOW
2.	Load the saved parameter set into the main memory		
	A	0000	Select the code C0002 "PAR LOAD" in the menu "Load/Store"
	B	PRG	Change to the parameter level The active parameter set is displayed, e. g. display "0" and "Load Default" If you want to restore the delivery status, proceed with D
	Select the parameter set to be loaded	C	0 Load parameter set 1: ⇒ Set "1" "Load PS1" Load parameter set 2: ⇒ Set "2" "Load PS2" Load parameter set 3: ⇒ Set "3" "Load PS3" Load parameter set 4: ⇒ Set "4" "Load PS4"
	D	SHIFT PRG	"RDY" goes off. The parameter set is loaded completely into the main memory if "RDY" is displayed again.
3.	Change to the code level		
	A	PRG	Display of the operating level
	B	PRG	Display of C0002 "PAR LOAD"
4.	Enable controller		Terminal X5/28 = HIGH The drive is running with the settings of the loaded parameter set

3.1.6 Transferring parameters to other standard devices

Parameter settings can be easily copied from one standard device to another by using the keypad.

For this purpose use the "Load/Store" menu

**Danger!**

During the parameter transfer from the keypad to the standard device the control terminals can adopt undefined states!

Therefore the plugs X5 and X6 must be disconnected from the standard device before the transfer takes place. This ensures that the controller is inhibited and all control terminals have the defined state "LOW".

Copying parameter sets from the standard device into the keypad**Note!**

After copying the parameter sets into the XT keypad (C0003 = 11), always the parameter set that was loaded last via C0002 is activated.

Like this the current parameters also remain active after copying:

- Save the current parameters in the parameter set before copying and load this parameter set in the controller via C0002.

Step	Key sequence	Action
1. Connect the keypad to standard device 1		
2. Inhibit controller		Terminal X5/28 = LOW The drive coasts.
3. Select C0003 in the "Load/Store" menu	◀◀◀◀	Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys.
4. Change to the parameter level	PRG	Display "0" and "READY"
5. Copy all parameter set into the keypad	▶	The settings saved in the keypad are overwritten. Set "11" "Save extern"
6. Start copying	SHIFT PRG	The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off after approx. one minute, all parameter sets were copied into the keypad. The "RDY" status display is lit.
7. Change to the code level	A PRG	Display of the operating level
	B PRG	Display C0003 and "PAR SAVE"
8. Enable controller		Terminal X5/28 = HIGH
9. Remove keypad from standard device 1		

Copying parameter sets fom keypad into the standard device

Step		Key sequence	Action
1.	Connect the keypad to standard device 2		
2.	Inhibit controller		Terminal X5/28 = LOW The "IMP" status display is it. The drive coasts
3.	Pull the plugs X5 and X6		All control terminals have the defined "LOW" status.
4.	Select C0002 in the "Load/Store" menu	▲▼◀▶	Select code C0002 "PAR LOAD" in the "Load/Store" menu using the arrow keys.
5.	Change to the parameter level	PRG	The active parameter set is shown, e. g. display "0" and "Load Default"
6.	Select the correct copy function		The settings saved in the standard device are overwritten.
	Copy all parameter sets available into the EEPROM of the standard device and save them permanently.		- The parameter set that was active before copying is overwritten. - The parameters are not yet active after copying. Select parameter set and load it in the main memory. 25
		◐	Set "20" "ext -> EEPROM"
	Copy individual parameter sets into the main memory of the standard device.		
		◐	Copy parameter set 1 into the main memory: Set ⇨ "11" "Load ext PS1"
			Copy parameter set 2 into the main memory: Set ⇨ "12" "Load ext PS2"
			Copy parameter set 3 into the main memory: Set ⇨ "13" "Load ext PS3"
			Copy parameter set 4 into the main memory: Set ⇨ "14" "Load ext PS4"
7.	Start copying	SHIFT PRG	The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off, the parameter sets selected were copied into the standard device. The "RDY" status display is lit.
8.	Change to the code level	A	
		PRG	Display of the operating level
		B	
		PRG	Display C0002 and "PAR LOAD"
9.	- If the function "Copy all parameter sets into the EEPROM" (C0002 = 20) is selected, they might have to be loaded in the main memory manually. - If the function "Copy individual parameter sets into the main memory" (C0002 = 1x) is selected, they might have to be saved permanently in the EEPROM manually.	▲▼◀▶	Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys and store the contents of the main memory permanently.
10.	Plug in plugs X5 and X6		
11.	Enable controller		Terminal X5/28 = HIGH The drive is running with the new settings.

3.1.7

Activating password protection

**Note!**

- ▶ If the password protection is activated (C0094 = 1 ... 9999), you only have free access to the user menu.
- ▶ To access the other menus, you must enter the password. By this, the password protection is annulled until you enter a new password.
- ▶ Please observe that the password-protected parameters can be overwritten as well when transferring the parameter sets to other standard devices. The password is not transferred.
- ▶ Do not forget your password! If you have forgotten your password, it can only be reset via a PC or a bus system!

Activate password protection

Step	Key sequence	Action
1. Select the "USER menu"	⬅➡⬅➡	Change to the user menu using the arrow keys
2. Change to the code level	➡	Display of code C0051 "MCTRL-NACT"
3. Select C0094	⬆	Display of code C0094 "Password"
4. Change to the parameter level	PRG	Display "0" = no password protection
5. Set password		
	A ⬆	Select password (1 ... 9999)
	B SHIFT PRG	Confirm password
6. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"
7. Change to the "USER menu"	⬅➡⬅➡	

The password protection is active now.

You can only quit the user menu if you re-enter the password and confirm it with SHIFT PRG.

Remove password protection

Step	Key sequence	Action
1. Change to the code level in the user menu	➡	
2. Select C0094	⬆	Display of code C0094 "Password"
3. Change to the parameter level	PRG	Display "9999" = password protection is active
4. Enter password		
	A ⬆	Set valid password
	B SHIFT PRG	Confirm The password protection is deactivated by entering the password once again.
5. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"

The password protection is deactivated now. All menus can be freely accessed again.

3.1.8 Diagnostics

In the "Diagnostic" menu the two submenus "Actual info" and "History" contain all codes for

- monitoring the drive
- fault/error diagnosis

In the operating level, more status messages are displayed. If several status messages are active, the message with the highest priority is displayed.

Priority	Display	Meaning
1	GLOBAL DRIVE INIT	Initialisation or communication error between keypad and controller
2	XXX - TRIP	Active TRIP (contents of C0168/1)
3	XXX - MESSAGE	Active message (contents of C0168/1)
4	Special device states:	
		Switch-on inhibit
5	Source for controller inhibit (the value of C0004 is displayed simultaneously):	
	STP1	9300 servo: Terminal X5/28 ECSxS/P/M/A: Terminal X6/SI1
	STP3	Operating module or LECOM A/B/LI
	STP4	INTERBUS or PROFIBUS-DP
	STP5	9300 servo, ECSxA/E: System bus (CAN) ECSxS/P/M: MotionBus (CAN)
	STP6	C0040
6	Source for quick stop (QSP):	
	QSP-term-Ext	The MCTRL-QSP input of the MCTRL function block is on HIGH signal.
	QSP-C0135	Operating module or LECOM A/B/LI
	QSP-AIF	INTERBUS or PROFIBUS-DP
	QSP-CAN	9300 servo, ECSxA: System bus (CAN) ECSxS/P/M: MotionBus (CAN)
7	XXX - WARNING	Active warning (contents of C0168/1)
8	xxxx	Value below C0004

3.1.9

Menu structure

For simple, user-friendly operation, the codes are clearly arranged in function-related menus:

Main menu	Submenus	Description
Display	Display	
User-Menu		Codes defined in C0517
Code list		All available codes
	ALL	All available codes listed in ascending order (C0001 ... C7999)
	PS 1	Codes in parameter set 1 (C0001 ... C1999)
	PS 2	Codes in parameter set 2 (C2001 ... C3999)
	PS 3	Codes in parameter set 3 (C4001 ... C5999)
	PS 4	Codes in parameter set 4 (C6001 ... C7999)
Load/Store		Parameter set management Parameter set transfer, restore delivery status
Diagnostic		Diagnostic
	Actual info	Display codes to monitor the drive
	History	Fault analysis with history buffer
Short setup		Quick configuration of predefined applications Configuration of the user menu The predefined applications depend on the type of the standard device (frequency inverter, servo inverter, position controller, ...)
Main FB		Configuration of the main function blocks
	NSET	Setpoint processing
	NSET-JOG	Fixed setpoints
	NSET-RAMP1	Ramp function generator
	MCTRL	Motor control
	DFSET	Digital frequency processing
	DCTRL	Internal control
Terminal I/O		Connection of inputs and outputs with internal signals
	AIN1 X6.1/2	Analog input 1
	AIN2 X6.3/4	Analog input 2
	AOUT1 X6.62	Analog output 1
	AOUT2 X6.63	Analog output 2
	DIGIN	Digital inputs
	DIGOUT	Digital outputs
	DFIN	Digital frequency input
	DFOUT	Digital frequency output
	State bus	State bus (not with 9300 frequency inverter)
Controller		Configuration of internal control parameters
	Speed	Speed controller
	Current	Current controller or torque controller
	Phase	Phase controller (not with 9300 frequency inverter)
Motor/Feedb.		Input of motor data, configuration of speed feedback
	Motor adj	Motor data
	Feedback	Configuration of feedback systems
Monitoring		Configuration of monitoring functions

Main menu	Submenus	Description
Display	Display	
LECOM/AIF		Configuration of operation with communication modules
	LECOM A/B	Serial interface
	AIF interface	Process data
	Status word	Display of status words
System bus		Configuration of system bus (CAN)
	Management	CAN communication parameters
	CAN-IN1	CAN object 1
	CAN-OUT1	
	CAN-IN2	CAN object 2
	CAN-OUT2	
	CAN-IN3	CAN object 3
	CAN-OUT3	
	Status word	Display of status words
	FDO	Free digital outputs
	Diagnostic	CAN diagnostic
FB config		Configuration of function blocks
Func blocks		Parameterisation of function blocks The submenus contain all available function blocks
FCODE		Configuration of free codes
Identify		Identification
	Drive	Software version of standard device
	Op Keypad	Software version of keypad

4 Troubleshooting and fault elimination

Display of operating data, diagnostics

Display of operating data

4 Troubleshooting and fault elimination

4.1 Display of operating data, diagnostics

4.1.1 Display of operating data

Description

Important operating parameters are measured by the controller. They can be displayed with the keypad or PC.

Some operating data can be calibrated to be displayed or selected directly with the unit of the process quantity (e.g. pressure, temperature, speed).



Note!

The calibration always affects all specified codes simultaneously.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0051	MCTRL-NACT		-36000	{1 rpm}	36000	Actual speed value, function block MCTRL ● Read only
C0052	MCTRL-Umot		0	{1 V}	800	Motor voltage, function block MCTRL ● Read only ● MCTRL-VACT = 100 % = C0090
C0053	UG-VOLTAGE		0	{1 V}	900	DC-bus voltage, function block MCTRL ● Read only ● MCTRL-DCVOLT = 100 % = 1000 V
C0054	IMot		0.0	{0.1 A}	500.0	Current motor current, function block MCTRL ● Read only ● MCTRL-IACT = 100 % = C0022
C0061	Heatsink temp		0	{1 °C}	100	Heatsink temperature ● Read only ● If the temperature of the heatsink > 85 °C, the controller sets TRIP <i>OH</i> ● Early warning is possible via <i>OH4</i> , temperature is set in C0122
C0063	Mot temp		0	{1 °C}	200	Motor temperature ● Read only ● Monitoring of the motor temperature must be activated. ● KTY at X8/5, X8/8: – At 150 °C, TRIP <i>OH3</i> is set – Early warning is possible via <i>OH7</i> , temperature is set in C0121 ● PTC, thermal contact at T1, T2: – Release sets TRIP or warning <i>OH8</i>

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0064	Utilization		0 {1 %} 150				Device utilisation I×t ● Read only ● Device utilisation during the last 180 s of operating time ● C0064 > 100 % releases warning <i>ÜCS</i> ● C0064 > 140 % limits the output current of the controller to 67 % of the maximum current in C0022
C0150	Status word		Bit00 –	Bit08	Status code	Read only Decimal status word for networking via automation interface (AIF) ● Binary interpretation indicates the bit states	
			Bit01 IMP	Bit09	Status code		
			Bit02 –	Bit10	Status code		
			Bit03 –	Bit11	Status code		
			Bit04 –	Bit12	Warning		
			Bit05 –	Bit13	Message		
			Bit06 n = 0	Bit14	–		
			Bit07 CINH	Bit15	–		

4.1.2 Diagnostics

Description

Display codes for diagnostics

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0093	DRIVE IDENT					Controller identification	
			0	invalid		Read only	
			1	none		Damaged power section	
			9321	9321VC		No power section	
			9333	9333VC		Display of the controller used	
C0099	S/W version		x.y			Software version	
			x	Main version		Read only	
			y	Subversion			

4 Troubleshooting and fault elimination

Troubleshooting

Status display via controller LEDs

4.2 Troubleshooting

Detecting breakdowns

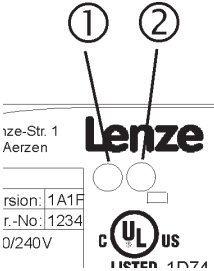
A breakdown can be detected quickly via the LEDs at the controller or via the status information at the keypad.

Analysing errors

Analyse the error using the history buffer. The list of fault messages gives you advice how to remove the fault. (📖 40)

4.2.1 Status display via controller LEDs

During operation the operating status of the controller is shown by 2 LEDs.

LED		Operating status	
Red ①	Green ②		
Off	On	Controller is enabled	
On	On	Mains is switched on and automatic start is inhibited	
Off	Blinking slowly	Controller is inhibited	
Off	On	Motor data identification is being performed	
Blinking quickly	Off	Undervoltage	
Blinking slowly	Off	Active fault	

4.2.2 Fault analysis with the history buffer

Retracing faults

Faults can be retraced via the history buffer. Fault messages are stored in the 8 memory locations in the order of their appearance.

The memory locations can be retrieved via codes.

Structure of the history buffer

Code			Memory location	Entry	Note
C0168/1	C0169/1	C0170/1	Memory location 1	Active fault	If the fault is no longer pending or has been acknowledged: - The contents of the memory locations 1 ... 7 are shifted "up" to the next memory location. - The content of memory location 8 is deleted from the history buffer and cannot be retrieved anymore. - Memory location 1 is deleted (= no active fault).
C0168/2	C0169/2	C0170/2	Memory location 2	Last fault	
C0168/3	C0169/3	C0170/3	Memory location 3	Last but one fault	
C0168/4	C0169/4	C0170/4	Memory location 4	Last but two fault	
C0168/5	C0169/5	C0170/5	Memory location 5	Last but three fault	
C0168/6	C0169/6	C0170/6	Memory location 6	Last but four fault	
C0168/7	C0169/7	C0170/7	Memory location 7	Last but five fault	
C0168/8	C0169/8	C0170/8	Memory location 8	Last but six fault	

Explanations regarding the codes

C0168	Fault indication and response - The entry is effected as a LECOM error number - If several faults with different responses occur at the same time: - Only the fault with the highest priority response is entered (1. TRIP, 2. message, 3. warning). - If several faults with the same response (e.g. 2 messages) occur at the same time: - Only the fault which occurred first is entered.
C0169	Time of fault occurrence - The reference time is provided by the power-on time meter (C0179). - If the same fault occurs several times in succession, only the time of the last occurrence is stored.
C0170	Fault frequency Only the time of the last occurrence is stored.

Clear history buffer

Set C0167 = 1 to clear the history buffer.

4.3 Drive behaviour in the event of faults

The controller responds differently to the three possible fault types TRIP, message, or warning:

TRIP

TRIP (display in keypad XT: )

- ▶ Switches the power outputs U, V, W to a high-resistance state until TRIP reset is executed.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ The drive coasts without any control!
- ▶ After TRIP reset ( 45):
 - The drive travels along the ramps to its setpoint.
 - The fault indication is moved to C0168/2 as "last fault".

Messages

Message (display in keypad XT: )

- ▶ Switches the power outputs U, V, W to a high-resistance state.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ In case of a fault ≤ 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint with maximum torque.
- ▶ In case of a fault > 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint along the adjusted ramps.
- ▶ If the message is not active anymore, the fault indication is moved to C0168/2 as "last fault".

Warnings

"Heatsink overtemperature" (keypad XT: )

- ▶ The drive continues to travel in a controlled way!
- ▶ The warning signal goes off when the fault is not active anymore.

"Error in motor phase" (keypad XT: )

"PTC monitoring" (keypad XT: )

- ▶ The drive continues to travel in a controlled way!
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ After TRIP reset, the fault indication is moved to C0168/2 as "last fault".

4.4 Fault elimination

4.4.1 Drive errors

Malfunction	Cause	Remedy
An asynchronous motor with feedback rotates in an uncontrolled manner and with low speed	The motor phases are reversed so that the rotating field of the motor is not identical with the rotating field of the feedback system. The drive shows the following behaviour: • V/f characteristic control (C0006 = 5) – The motor rotates faster than the speed setpoint by the value set in C0074 (influence of the speed controller, Lenze setting 10 % of n_{max}). After the controller is enabled, it does not stop at zero speed setpoint or quick stop (QSP). – The final motor current depends, among other things, on the set value of the V_{min} boost (C0016) and can rise to I_{max} (C0022). This may activate the fault message OC5. • Vector control (C0006 = 1) – The motor rotates slowly with maximum slip speed (depending on motor data and maximum current) and does not react to a speed setpoint. The direction of rotation, however, is determined by the sign of the speed setpoint. – The motor current rises up to I_{max} (C0022). This may activate the fault message OC5 with a time delay.	• Check motor cable for correct phase relation. • If possible, operate the motor with deactivated feedback (C0025 = 1) and check the direction of rotation of the motor.
Motor does not rotate although the controller is enabled (IMP is off) and a speed setpoint has been specified.	The two terminal strips X5 are reversed. Since X5/A1 and X5/28 face each other, the controller can be enabled if the control terminals are internally supplied. All other connections, however, are assigned incorrectly so that the motor cannot start.	Check the position of the terminal strips: • If you look at the connection unit in reading direction, the left terminal strip X5 must be connected with the input signals and the right terminal strip X5 must be connected with the output signals.
The monitoring of the motor phases (LP1) does not respond if a motor phase is interrupted, although C0597 = 0 or 2	The function block MLP1 is not entered into the processing table.	Enter the function block MLP1 into the processing table. The function block MLP1 requires 30 μ s of calculating time.
If during high speeds DC-injection braking (GSB) is activated, the fault OC1 (TRIP) or OU (TRIP) occurs	During DC-injection braking the controller sets pulse inhibit for a short time (DCTRL-IMP) to reduce the magnetisation in the motor before a DC voltage is injected into the motor. At high speeds (e. g. in case of mid-frequency motors) the residual voltage which develops from the residual magnetism and high speed can generate such a high motor current that OC1 or OU are activated.	Prolong the duration of the pulse inhibit: • Connect the output signal DCTRL-IMP to the function block TRANSx and adjust the desired switch-off time there (usually 500 ms). If DCTRL-CINH1 is set to HIGH, the duration of the pulse inhibit is prolonged by the time adjusted.

4.4.2 Controller in clamp operation

The clamp operation is a permissible operating mode. But since, however, pulse inhibit is set again and again, the controller cannot provide the optimum power.

If the output power is optimal, the output current mainly is right below the clamp threshold.

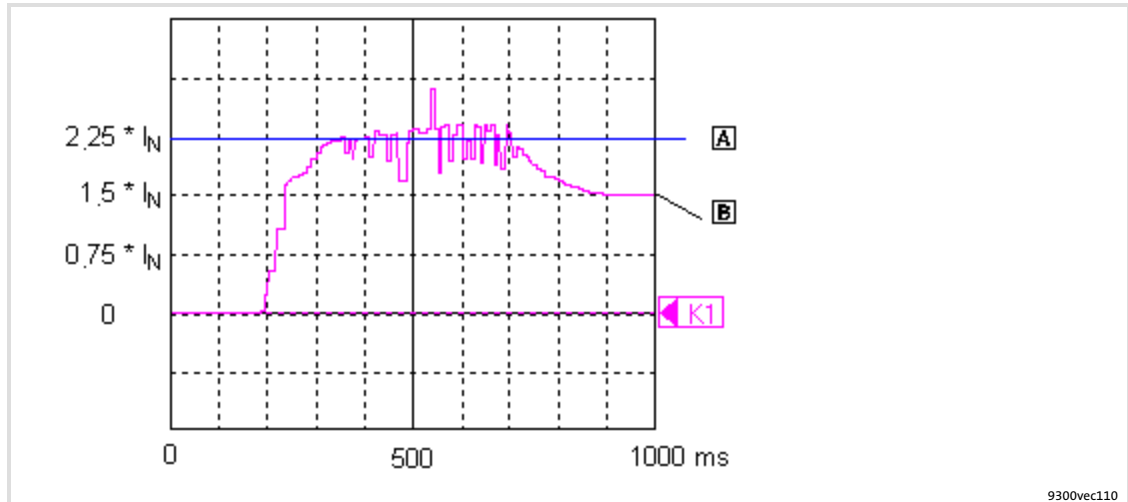


Fig. 4-1 Output current when starting a motor with high load (shown with the oscilloscope in GDC)

- Ⓐ Clamp threshold
- Ⓑ Output current

Function

1. When the output current reaches $2.25 \times I_r$, a software clamp is activated.
2. The controller sets pulse inhibit for a short time. The motor current decreases as a function of the inductance in the motor circuit.
 - An internal counter is increased by the value one.
3. After max. 250 μ s the pulse inhibit is deactivated.
4. If a software clamp reoccurs within 2 s, the internal counter is again increased by the value one. Otherwise the counter is set to zero.
 - If the counter reaches the value 4300, OC3 (TRIP) is activated.

4.4.3 Behaviour in case of overvoltage in the DC bus (OU message)

Description

If the DC-bus voltage (U_{DC}) exceeds the switch-off threshold OU, the pulse inhibit is set. At the same time, an internal timing element starts for a delay time (C0912).

The pulse inhibit is deactivated if the voltage falls below the switch-on threshold OU and the delay time has elapsed.

Switching thresholds in case of overvoltage in the DC bus (OU):

Mains voltage range		C0173	Switch-off threshold OU	Switch-on threshold OU
< 400 V	Operation with / without brake chopper	0	770 V	755 V
400 V	Operation with / without brake chopper	1 *	770 V	755 V
460 V	Operation with / without brake chopper	2	770 V	755 V
480 V	Operation without brake chopper	3	770 V	755 V
480 V	Operation with brake chopper	4	800 V	785 V

* Lenze setting

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0912	OV delay time	→	- {1 ms}	- Delay time of the pulse enable after an OU message → Depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 A change of one of the codes resets C0912 to the time of the selected motor • The time is derived from the double rotor time constant

Adjustment

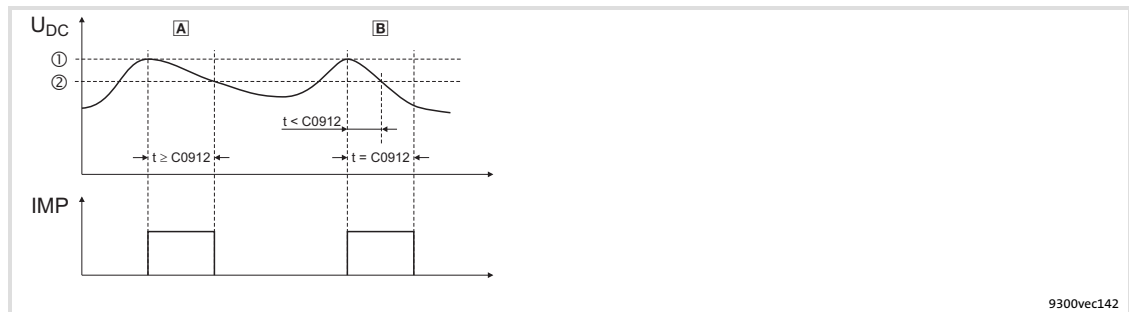


Fig. 4-2 Influence of the delay time (C0912)

① Switch-off threshold OU

② Switch-on threshold OU

A The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU equals or is higher than the delay time set in C0912.

After undershooting the switch-on threshold OU, the pulse inhibit is deactivated.

B The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU is lower than the delay time set in C0912.

The pulse inhibit is deactivated after the delay time in C0912 has elapsed.

- The delay time in [ms] is set under C0912. The Lenze setting can be changed by the factor 0.5 ... 2.

4.5 System error messages

4.5.1 General error messages

**Note!**

In the case of a query via system bus (CAN), the fault messages are represented as numbers (see first column of the table).

Fault message		Description	Cause	Remedy
No.	Display			
---	---	No fault	-	-
0011	OC1	Overcurrent in motor cable ($I_a > 2.25 \times I_N$; Hardware monitoring)	In the event of a short circuit	- Search for the cause of the short circuit. - Check the motor cable.
			Capacitive charging current of the motor cable is too high	Use motor cable which is shorter or of lower capacitance
			Too short acceleration or deceleration times in proportion to the load (C0012, C0013, C0105)	- Increase the gain (P component) of the I_{max} controller (C0075). - Reduce integral-action time (integral action component) of the I_{max} controller (C0076)
			The drive is connected to the coasting machine. The coasting is caused by a short-time pulse inhibit, e.g. at - OU (overvoltage in the DC bus) - external or internal controller inhibit	Activate flying restart circuit
			- Encoder error - Tracks during encoder feedback of the motor speed are interchanged	Check wiring of the encoder
			DC-injection braking at high speeds	See  37
			Missing mains phase	- Check the connections and the supply cable of the device - Check mains voltage
0012	OC2	Motor cable earth fault	One of the motor phases has earth contact.	- Search for cause of short circuit. - Check motor cable.
0013	OC3	Overload during acceleration.	Too short acceleration or deceleration times in proportion to the load (C0012, C0013, C0105).	- Increase the gain (P component) of the current controller (C0075). - Reduce the reset time (integral action component) of the I_{max} controller (C0076). - Increase ramp times.  38, "controller in clamp operation (fault OC3)"
0015	OC5	$I \times t$ overload	- Frequent and too long acceleration with overcurrent - Continuous overload with $I_{motor} > 1.05 \times I_{rx}$.	Check drive dimensioning.
0016	OC6	$I^2 t$ overload	- Frequent and too long acceleration processes with motor overcurrent. - Permanent motor overload with $I_{motor} > I_{rmotor}$	Check drive dimensioning.
x018	OC8	$I^2 t$ overload advance warning	- Frequent and too long acceleration processes with motor overcurrent. - Permanent motor overload with $I_{motor} > I_{rmotor}$	Check drive dimensioning.
2020	OU	Overvoltage in the DC bus	Braking energy is too high. (DC-bus voltage is higher than set in C0173.)	- Use a braking unit or regenerative module. - Check dimensioning of the brake resistor.
1030	LU	Undervoltage in the DC bus	DC bus voltage is lower than specified in C0173.	- Check mains voltage - Check supply cable

Fault message		Description	Cause	Remedy
No.	Display			
x032	LP1	Motor phase failure	A current-carrying motor phase has failed.	- Check motor. - Check motor cable. - Switch off monitoring (C0597 = 3).
			The current limit value is set too low.	Set higher current limit value via C0599.
0050	OH	Heatsink temperature > +90 °C	Ambient temperature $T_u > +40\text{ °C}$ or $> +50\text{ °C}$	- Allow module to cool and ensure better ventilation. - Check ambient temperature in the control cabinet.
			Heatsink is very dirty.	Clean heatsink.
			Wrong mounting position	Change mounting position.
x053	OH3	Motor temperature > +150 °C threshold (temperature detection via resolver or incremental value encoder)	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0583 = 3).
			No PTC/temperature contact connected.	Correct wiring.
x054	OH4	Heatsink temperature > C0122	Ambient temperature $T_u > +40\text{ °C}$ or $> +50\text{ °C}$	- Allow module to cool and ensure better ventilation. - Check ambient temperature in the control cabinet. - Switch off monitoring (C0582 = 3).
			Heatsink is very dirty.	Clean heatsink
			Wrong mounting position	Change mounting position.
			The value specified under C0122 is set too low.	Enter a higher value under C0122.
x057	OH7	Motor temperature > C0121 (temperature detection via resolver or incremental value encoder)	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0584 = 3).
			No PTC/temperature contact connected.	Correct wiring.
			The value specified under C0121 is set too low.	Enter a higher value in C0121.
x058	OH8	Motor temperature via inputs T1 and T2 is too high.	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0585 = 3).
			Terminals T1 and T2 are not connected	Connect PTC/temperature contact.
x061	CE0	Automation interface (AIF) communication error	Faulty transfer of control commands via AIF.	- Plug in the communication module/keypad XT firmly, screw down, if necessary. - Switch off monitoring (C0126 = 3).

Fault message		Description	Cause	Remedy
No.	Display			
x062	CE1	Communication error on the process data input object CAN1_IN	CAN1_IN object receives faulty data or communication is interrupted.	• Check wiring at X4. • Check sender. • Increase monitoring time under C0357/1, if necessary. • Switch off monitoring (C0591 = 3).
x063	CE2	Communication error on the process data input object CAN2_IN	CAN2_IN object receives faulty data or communication is interrupted.	• Check wiring at X4. • Check sender. • Increase monitoring time under C0357/2, if necessary. • Switch off monitoring (C0592 = 3).
x064	CE3	Communication error on the process data input object CAN3_IN	CAN3_IN object receives faulty data or communication is interrupted.	• Check wiring at X4. • Check sender. • Increase monitoring time under C0357/3, if necessary. • Switch off monitoring (C0593 = 3).
x065	CE4	BUS-OFF state of system bus (CAN)	The controller has received too many faulty telegrams via the system bus (CAN) and has disconnected from the bus.	• Check wiring at X4: Is the bus correctly terminated? • Check shield connection of the cables. • Check PE connection. • Check bus load, reduce the baud rate if necessary. (Observe the cable length!) • Switch off the monitoring (C0595 = 3).
0071	CCr	System failure	Strong interference injection on the control cables	Screen control cables
			Ground or earth loops in the wiring	• Check wiring • Check PE connection
				After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0072	PR1	Checksum error in parameter set 1 CAUTION: The Lenze setting is loaded automatically!	• Fault when loading a parameter set. • Interruption while transmitting the parameter set via keypad.	• Set the required parameters and store them under C0003 = 1. • As to PLC devices, check the use of pointers.
			The stored parameters are incompatible with the loaded software version.	Store the parameter set under C0003 = 1 first to allow for a faults reset.
0073	PR2	Checksum error in parameter set 2 PLEASE NOTE: The Lenze setting is loaded automatically!	• Fault while loading a parameter set. • Interruption during the transfer of the parameter set via keypad.	• Set the required parameters and save them with C0003 = 2.
			The parameters saved do not comply with the software version loaded.	In order to be able to acknowledge the error, first save the parameter set with C0003 = 2.

Fault message		Description	Cause	Remedy
No.	Display			
0074	PEr	Program error	Error in the program flow	Send the parameter set (on floppy disk/CD-ROM) with a detailed description of the problem to Lenze. After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0075	PR0	Error in parameter set.	The operating system software has been updated.	Storage of the Lenze setting C0003 = 1. After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0077	PR3	Checksum error in parameter set 3 PLEASE NOTE: The Lenze setting is loaded automatically!	- Fault while loading a parameter set. - Interruption during the transfer of the parameter set via keypad. The parameters saved do not comply with the software version loaded.	Set the required parameters and save them with C0003 = 3. In order to be able to acknowledge the error, first save the parameter set with C0003 = 3.
0078	PR4	Checksum error in parameter set 4 PLEASE NOTE: The Lenze setting is loaded automatically!	- Fault while loading a parameter set. - Interruption during the transfer of the parameter set via keypad. The parameters saved do not comply with the software version loaded.	Set the required parameters and save them with C0003 = 4. In order to be able to acknowledge the error, first save the parameter set with C0003 = 4.
0079	PI	Fault during parameter initialisation	- An error has been detected during the parameter set transfer between two devices. - The parameter set does not match the controller, e.g. if data has been transferred from a higher-power controller to a lower-power controller.	- Correct parameter set. - Send parameter set (on floppy disk/CD-ROM) and a detailed description of the problem to Lenze.
x083	Sd3	Encoder error at X9	Cable interrupted. Pin X9/8 not connected.	Check cable for open circuit. Apply 5 V to pin X9/8 or switch off monitoring (C0587 = 3).
x085	Sd5	Encoder error at X6/1 and X6/2 (C0034 = 1)	Current signal at X6/1 X6/2 < 2mA.	- Check cable for open circuit. - Check current signal encoder. - Switch off monitoring (C0598 = 3).
x086	Sd6	Motor temperature sensor error (X7 or X8)	Encoder for detecting the motor temperature at X7 or X8 indicates undefined values.	- Check cable for firm connection. - Switch off the monitoring (C0594 = 3).
x091	EEr	External monitoring has been triggered via DCTRL .	A digital signal assigned to the TRIP-SET function has been activated.	- Check external encoder. - Switch off the monitoring (C0581 = 3).
0105	H05	Internal fault (memory)		Contact Lenze.
0107	H07	Internal fault (power stage)	During initialisation of the controller, an incorrect power stage was detected.	Contact Lenze.
x110	H10	Heatsink temperature sensor error	Sensor for detecting the heatsink temperature indicates undefined values.	- Contact Lenze. - Switch off the monitoring (C0588 = 3).
x111	H11	Temperature sensor error: Temperature inside the controller	Sensor for detecting the internal temperature indicates undefined values.	- Contact Lenze. - Switch off the monitoring (C0588 = 3).

Fault message		Description	Cause	Remedy
No.	Display			
0140	ID1	Error during motor data identification.	No motor connected.	Check motor connection.
			Stator resistance too high.	Check entered motor data.
			Controller inhibited externally.	Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
0141	ID2	Error during motor data identification.	Motor too small.	- Check entered motor data. For parameterisation with Global Drive Control, use the input assistant for motor data. - The measurements for the inverter error characteristic and the stator resistance are correct (save measured values in C0003). For the operating mode V/f characteristic control the motor data identification can be completed.
			Controller inhibited externally.	Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
x200	NMAX	Maximum system speed (C0596) has been exceeded.	- Active load (e.g. for hoists) is too high. - Drive is not speed-controlled, torque is excessively limited.	- Check drive dimensioning. - Increase torque limit, if necessary. - Switch off monitoring (C0607 = 3).

Representation of the error number:

x 0 = TRIP, 1 = message, 2 = warning

E. g. "2091": An external monitoring function has triggered EEr warning

4.5.2 Resetting system error messages

Response	Measures for resetting the fault message	
TRIP		Note! If a TRIP source is still active, the pending TRIP cannot be reset.
		Resetting the TRIP can be effected by: - Pressing the keypad XT EMZ9371 BC ⇒ STOP. Then press RUN to re-enable the controller. - Setting code C0043 = 0. - Control word C0135, bit 11 - Control word AIF - Control word of system bus (CAN) After resetting the TRIP, the drive remains at standstill.
Message		Danger! After elimination of the fault, the fault message is cancelled automatically and the drive restarts automatically.
Warning		After elimination of the fault, the fault message is cancelled automatically.



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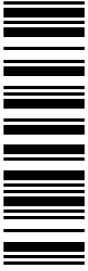
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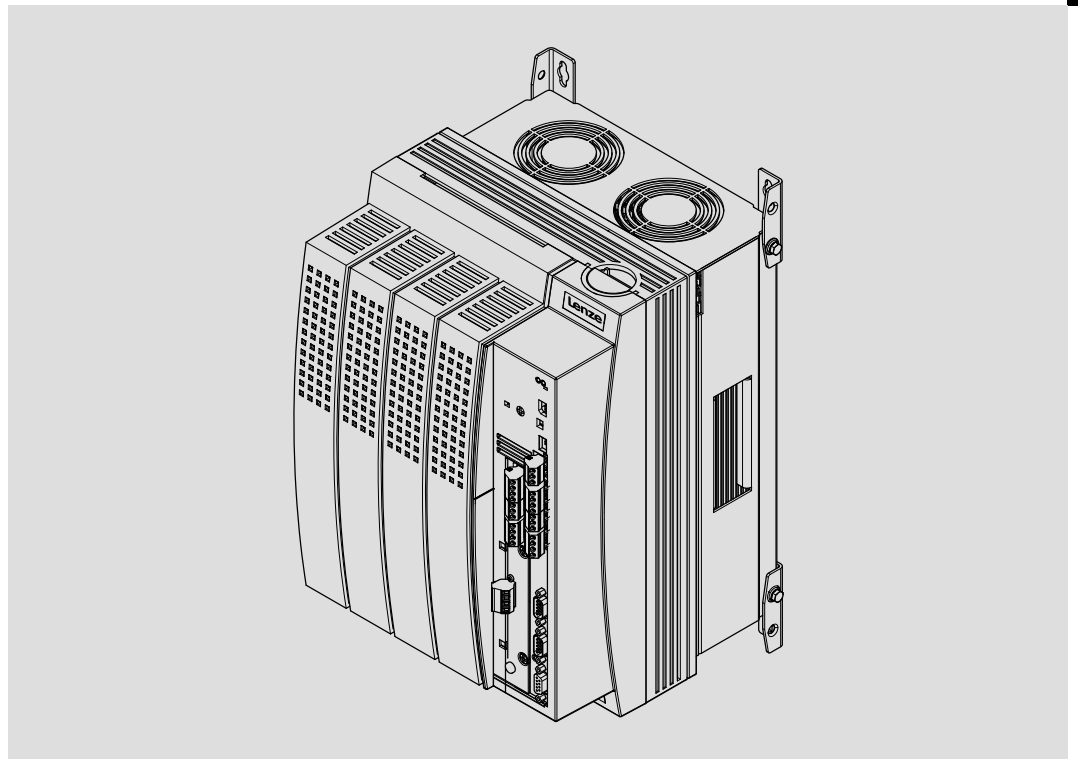
EDKVF93-01 ■ 13445254 ■ EN ■ 3.0 ■ TD06

10 9 8 7 6 5 4 3 2 1



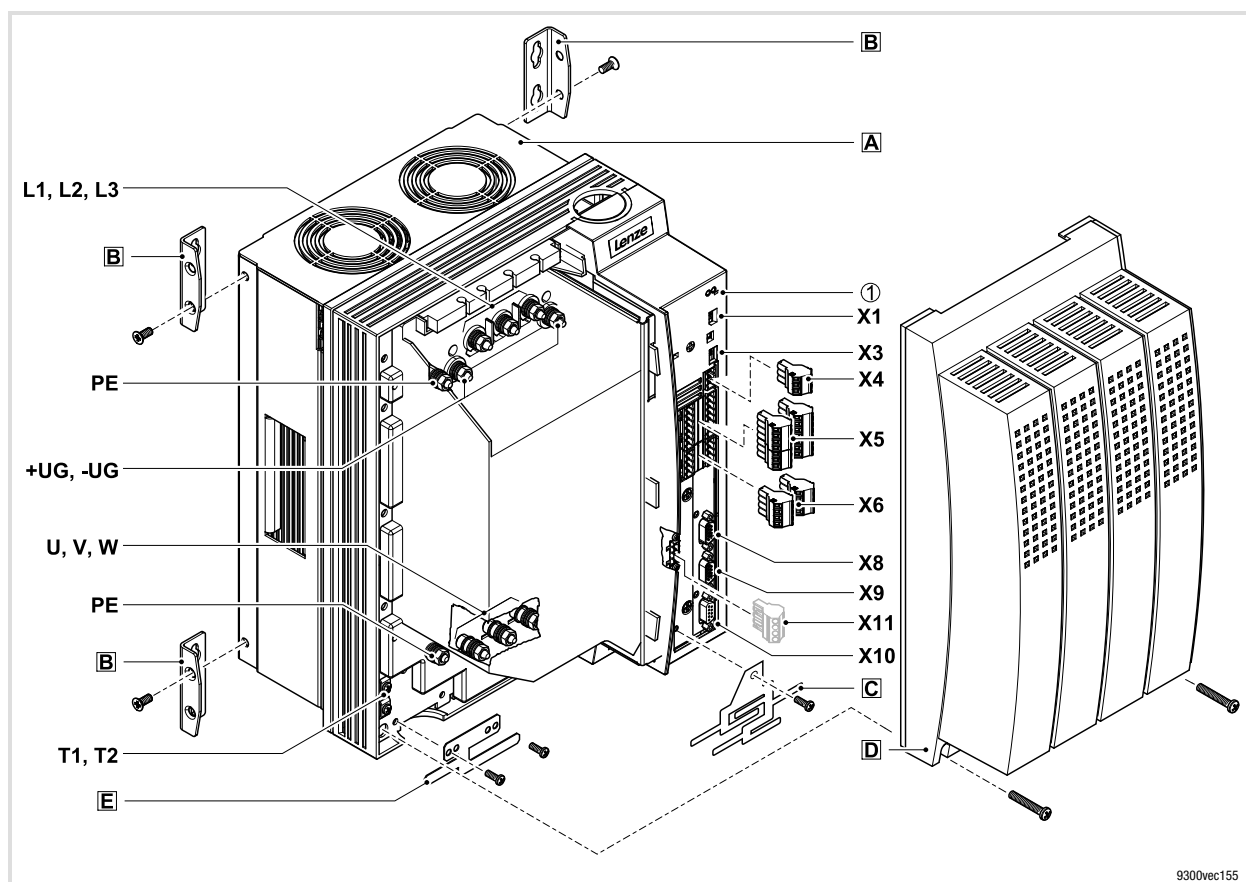
Information for the operator of the machine

9300 vector 15 ... 30 kW



EVS9327-xV ... EVS9329-xV

Frequency inverter



Key for overview

Position	Description
A	Controller
B	Fixing bracket for standard mounting
C	EMC shield sheet with fixing screws for shielded control cables
D	Cover with fixing screws
E	EMC shield sheet for the motor cable and the feed cable for the motor temperature monitoring with PTC thermistor or thermal contact (NC contact)

Interfaces and displays

Position	Description
L1, L2, L3, PE	Mains connection
+UG, -UG	DC supply
U, V, W, PE	Motor connection
T1, T2	Connection of PTC thermistor or thermal contact (NC contact) of the motor
X1	AIF interface (automation interface) Slot for communication module (e. g. XT EMZ9371BC keypad)
X3	Jumper for setting analog input signal at X6/1, X6/2
X4	System bus (CAN) connection
X5	Connection of digital inputs and outputs
X6	Connection of analog inputs and outputs
X8	Connection of incremental encoder with TTL level or SinCos encoder and KTY temperature sensor of the motor
X9	Connection of digital frequency input signal
X10	Connection of digital frequency output signal
X11	Connection of K _{SR} relay output for "safe standstill" (for variants V004 and V024 only)

Status displays

Position	LED red	LED green	Operating status
①	Off	On	Controller is enabled
	On	On	Mains is switched on and automatic start is inhibited
	Off	Blinking slowly	Controller is inhibited
	Off	On	Motor data identification is active
	Blinking quickly	Off	Undervoltage or overvoltage
	Blinking slowly	Off	Active fault

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1 About this documentation



Note!

This documentation contains all the information required by the machine operator to run the drive controllers of the 9300 vector series installed in your machine/system.

You may make further use of the information contained in this documentation without asking Lenze for permission if you do not change the contents.

1.1 Document history

What is new / what has changed?

Material number	Version			Description
13445286	3.0	11/2013	TD06	Error corrections
13217737	2.1	03/2010	TD23	Change of the company's address
13217737	2.0	03/2010	TD14	New edition due to reorganisation of the company UL-warnings updated Revision for software version 8x
13217737	1.0	07/2007	TD23	First edition



Tip!

Information and auxiliary devices related to the Lenze products can be found in the download area at

<http://www.Lenze.com>

1.2 Target group

This documentation is directed at qualified skilled personnel according to IEC 60364.

Qualified skilled personnel are persons who have the required qualifications to carry out all activities involved in installing, mounting, commissioning, and operating the product.

1 About this documentation

Validity information

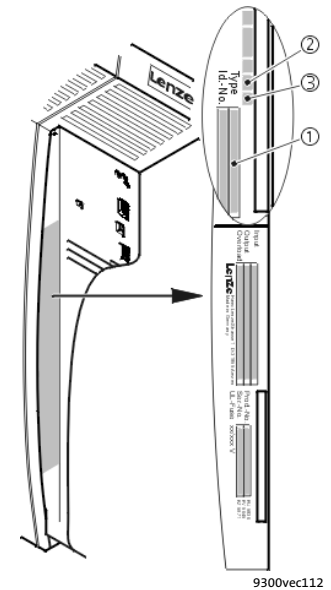
1.3 Validity information

... 9300 vector frequency inverters as of nameplate data:

		①					②		③		Nameplate	
		EVF	93xx	—	x	V	Vxxx	1x	8x			
Product series												
EVF =		Frequency inverter										
Type no. / rated power												
		400V	480 V									
9327 =		15 kW	18.5 kW									
9328 =		22 kW	30 kW									
9329 =		30 kW	37 kW									
Type												
E =		Built-in unit										
C =		Built-in unit in "cold plate" technique										
Design												
V =		Vector-controlled frequency inverter										
Variant												
—		Standard										
V003 =		In "cold plate" technique										
V004 =		With "safe standstill" function										
V024 =		With "safe standstill" function and for IT mains										
V100 =		For IT systems										
Hardware version												
Software version												

The diagram shows a Lenze inverter unit. A callout circle highlights the nameplate area, which is divided into three sections: ① Type Id.-No., ②, and ③. An arrow points from the main unit to a detailed view of the nameplate. The nameplate contains the following information: Lenze, Type Id.-No., Output, Input, and a table with columns for Power, Voltage, and Current. The table has three rows: 1, 2, and 3. The first row shows 15 kW, 400 V, and 30 A. The second row shows 18.5 kW, 480 V, and 37 A. The third row shows 22 kW, 480 V, and 45 A. The third row is marked with a cross (x). The nameplate also includes a table with columns for Power, Voltage, and Current, and a row for IT mains.

9300vec112



1.4 Conventions used

This documentation uses the following conventions to distinguish between different types of information:

Type of information	Identification	Examples/notes
Spelling of numbers		
Decimal separator	language-dependent	In each case, the signs typical for the target language are used as decimal separators. For example: 1234.56 or 1234,56
Warnings		
UL warnings	Ⓛ	Given in English and French
UR warnings	℞	
Text		
Program name	» «	PC software For example: »Engineer«, »Global Drive Control« (GDC)
Icons		
Page reference	📖	Reference to another page with additional information For instance: 📖 16 = see page 16
Documentation reference	📄	Reference to another documentation with additional information For example: 📄 EDKxxx = see documentation EDKxxx

1 About this documentation

Notes used

1.5 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:



Danger!

(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
 Danger!	Danger of personal injury through dangerous electrical voltage. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Danger!	Danger of personal injury through a general source of danger. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Stop!	Danger of property damage. Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
 Note!	Important note to ensure troublefree operation
 Tip!	Useful tip for simple handling
	Reference to another documentation

Special safety instructions and application notes

Pictograph and signal word	Meaning
 Warnings!	Safety note or application note for the operation according to UL or CSA requirements.
 Warnings!	The measures are required to meet the requirements according to UL or CSA.

2 Safety instructions

2.1 General safety and application notes for Lenze controllers

(in accordance with Low-Voltage Directive 2006/95/EC)

For your personal safety

Disregarding the following safety measures can lead to severe injury to persons and damage to material assets:

- ▶ Only use the product as directed.
- ▶ Never commission the product in the event of visible damage.
- ▶ Never commission the product before assembly has been completed.
- ▶ Do not carry out any technical changes on the product.
- ▶ Only use the accessories approved for the product.
- ▶ Only use original spare parts from Lenze.
- ▶ Observe all regulations for the prevention of accidents, directives and laws applicable on site.
- ▶ Transport, installation, commissioning and maintenance work must only be carried out by qualified personnel.
 - Observe IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE 0110 and all national regulations for the prevention of accidents.
 - According to this basic safety information, qualified, skilled personnel are persons who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.
- ▶ Observe all specifications in this documentation.
 - This is the condition for safe and trouble-free operation and the achievement of the specified product features.
 - The procedural notes and circuit details described in this documentation are only proposals. It is up to the user to check whether they can be transferred to the particular applications. Lenze Automation GmbH does not accept any liability for the suitability of the procedures and circuit proposals described.
- ▶ Depending on their degree of protection, some parts of the Lenze controllers (frequency inverters, servo inverters, DC speed controllers) and their accessory components can be live, moving and rotating during operation. Surfaces can be hot.
 - Non-authorized removal of the required cover, inappropriate use, incorrect installation or operation, creates the risk of severe injury to persons or damage to material assets.
 - For more information, please see the documentation.
- ▶ High amounts of energy are produced in the controller. Therefore it is required to wear personal protective equipment (body protection, headgear, eye protection, ear protection, hand guard).

Application as directed

Controllers are components which are designed for installation in electrical systems or machines. They are not to be used as domestic appliances, but only for industrial purposes according to EN 61000-3-2.

When controllers are installed into machines, commissioning (i.e. starting of the operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 2006/42/EC (Machinery Directive); EN 60204 must be observed.

Commissioning (i.e. starting of the operation as directed) is only allowed when there is compliance with the EMC Directive (2004/108/EC).

The controllers meet the requirements of the Low-Voltage Directive 2006/95/EC. The harmonised standard EN 61800-5-1 applies to the controllers.

The technical data and supply conditions can be obtained from the nameplate and the documentation. They must be strictly observed.

Warning: Controllers are products which can be installed in drive systems of category C2 according to EN 61800-3. These products can cause radio interferences in residential areas. In this case, special measures can be necessary.

Transport, storage

Please observe the notes on transport, storage, and appropriate handling.

Observe the climatic conditions according to the technical data.

Installation

The controllers must be installed and cooled according to the instructions given in the corresponding documentation.

The ambient air must not exceed degree of pollution 2 according to EN 61800-5-1.

Ensure proper handling and avoid excessive mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts.

Controllers contain electrostatic sensitive devices which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

Electrical connection

When working on live controllers, observe the applicable national regulations for the prevention of accidents (e.g. VBG 4).

The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). Additional information can be obtained from the documentation.

This documentation contains information on installation in compliance with EMC (shielding, earthing, filter, and cables). These notes must also be observed for CE-marked controllers. The manufacturer of the system is responsible for compliance with the limit values demanded by EMC legislation. The controllers must be installed in housings (e.g. control cabinets) to meet the limit values for radio interferences valid at the site of installation. The housings must enable an EMC-compliant installation. Observe in particular that e.g. the control cabinet doors have a circumferential metal connection to the housing. Reduce housing openings and cutouts to a minimum.

Lenze controllers may cause a DC current in the PE conductor. If a residual current device (RCD) is used for protection against direct or indirect contact for a controller with three-phase supply, only a residual current device (RCD) of type B is permissible on the supply side of the controller. If the controller has a single-phase supply, a residual current device (RCD) of type A is also permissible. Apart from using a residual current device (RCD), other protective measures can be taken as well, e.g. electrical isolation by double or reinforced insulation or isolation from the supply system by means of a transformer.

Operation

If necessary, systems including controllers must be equipped with additional monitoring and protection devices according to the valid safety regulations (e.g. law on technical equipment, regulations for the prevention of accidents). The controllers can be adapted to your application. Please observe the corresponding information given in the documentation.

After the controller has been disconnected from the supply voltage, all live components and power terminals must not be touched immediately because capacitors can still be charged. Please observe the corresponding stickers on the controller.

All protection covers and doors must be shut during operation.

Safety functions

Certain controller versions support safety functions (e.g. "Safe torque off", formerly "Safe standstill") according to the requirements of the EC Directive 2006/42/EC (Machinery Directive). The notes on the integrated safety system provided in this documentation must be observed.

Maintenance and servicing

The controllers do not require any maintenance if the prescribed operating conditions are observed.

Disposal

Recycle metal and plastic materials. Ensure professional disposal of assembled PCBs.

The product-specific safety and application notes given in these instructions must be observed!

2.2

Thermal motor monitoring

**Note!**

From software version 8.1 onwards, the 9300 vector controllers are provided with an I²x t function for sensorless thermal monitoring of the connected motor.

- ▶ I²x t monitoring is based on a mathematical model which calculates a thermal motor utilisation from the detected motor currents.
- ▶ The calculated motor utilisation is saved when the mains is switched off.
- ▶ The function is UL-certified, i.e. additional protective measures for the motor are not required in UL-approved systems.
- ▶ Nevertheless, I²x t monitoring does **not** provide full motor protection because other influences on the motor utilisation such as changes in the cooling conditions (e.g. cooling air flow interrupted or too warm) cannot be detected.

The I² x t load of the motor is displayed in C0066.

The thermal loading capacity of the motor is expressed by the thermal motor time constant (τ , C0128). Find the value in the rated motor data or contact the manufacturer of the motor.

The I² x t monitoring has been designed such that it will be activated after 179 s in the event of a motor with a thermal motor time constant of 5 minutes (Lenze setting C0128), a motor current of 1.5 x I_N and a trigger threshold of 100 %.

Two adjustable trigger thresholds provide for different responses.

- ▶ Adjustable response OC8 (TRIP, warning, off).
 - The trigger threshold is set in C0127.
 - The response is set in C0606.
 - The response OC8, for instance, can be used for an advance warning.
- ▶ Fixed response OC6-TRIP.
 - The trigger threshold is set in C0120.

Behaviour of the I ² x t monitoring	Condition
The I ² x t monitoring is deactivated. C0066 is set = 0 % and MCTRL-LOAD-I2XT is set = 0.00 %.	When C0120 = 0 % and C0127 = 0 %, set controller inhibit.
I ² x t monitoring is stopped. The current value in C0066 and at the MCTRL-LOAD-I2XT output is frozen.	When C0120 = 0 % and C0127 = 0 %, set controller enable.
I ² x t monitoring is deactivated. The motor load is displayed in C0066.	Set C0606 = 3 (off) and C0127 > 0 %.

**Note!**

An error message OC6 or OC8 can only be reset if the I² x t load falls below the set trigger threshold by 5 %.

2.2.1 Forced ventilated or naturally ventilated motors

Parameter setting

The following codes can be set for $I^2 \times t$ monitoring:

Code	Meaning	Value range	Lenze setting
C0066	Display of the $I^2 \times t$ load of the motor	0 ... 250 %	-
C0120	Threshold: Triggering of error "OC6"	0 ... 120 %	0 %
C0127	Threshold: Triggering of error "OC8"	0 ... 120 %	0 %
C0128	Thermal motor time constant	0.1 ... 50.0 min	5.0 min
C0606	Response to error "OC8"	TRIP, warning, off	Warning

Calculate release time and $I^2 \times t$ load

Formula for release time	Information
$t = -(\tau) \times \ln \left[1 - \frac{z + 1}{\left(\frac{I_{Mot}}{I_N} \right)^2 \times 100} \right]$	I_{Mot} Actual motor current (C0054)
	I_r Rated motor current (C0088)
	τ Thermal motor time constant (C0128)
	z Threshold value in C0120 (OC6) or C0127 (OC8)

Formulae for $I^2 \times t$ load	Information
$L(t) = \left(\frac{I_{Mot}}{I_N} \right)^2 \times 100\% \times \left(1 - e^{-\frac{t}{\tau}} \right)$	$L(t)$ Chronological sequence of the $I^2 \times t$ load of the motor (Display: C0066)
	I_{Mot} Actual motor current (C0054)
	I_r Rated motor current (C0088)
	τ Thermal motor time constant (C0128)

If the controller is inhibited, the $I^2 \times t$ load is reduced:

$L(t) = L_{Start} \times \sqrt{e^{-\frac{t}{\tau}}}$	L_{Start} $I^2 \times t$ load before controller inhibit If an error is triggered, the value corresponds to the threshold value set in C0120 (OC6) or C0127 (OC8).

Read release time in the diagram

Diagram for detecting the release times for a motor with a thermal motor time constant of 5 minutes (Lenze setting C0128):

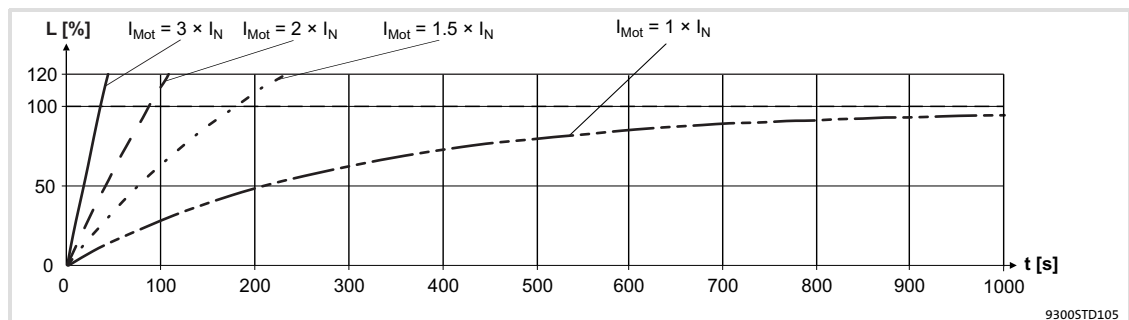


Fig. 2-1 $I^2 \times t$ -monitoring: Release times for different motor currents and trigger thresholds

I_{Mot}	Actual motor current (C0054)
I_r	Rated motor current (C0088)
L	$I^2 \times t$ load of the motor (display: C0066)
T	Time

2.2.2

Self-ventilated motors

Due to the construction, self-ventilated standard motors are exposed to an increased heat generation in the lower speed range compared to forced ventilated motors.

**Warnings!**

For complying with the UL 508C standard, you have to set the speed-dependent evaluation of the permissible torque via code **C0129/x**.

Parameter setting

The following codes can be set for $I^2 \times t$ monitoring:

Code	Meaning	Value range	Lenze setting
C0066	Display of the $I^2 \times t$ load of the motor	0 ... 250 %	-
C0120	Threshold: Triggering of error "OC6"	0 ... 120 %	0 %
C0127	Threshold: Triggering of error "OC8"	0 ... 120 %	0 %
C0128	Thermal motor time constant	0.1 ... 50.0 min	5.0 min
C0606	Response to error "OC8"	TRIP, warning, off	Warning
C0129/1	S1 torque characteristic I_1/I_{rated}	10 ... 200 %	100 %
C0129/2	S1 torque characteristics n_2/n_{rated}	10 ... 200 %	40 %

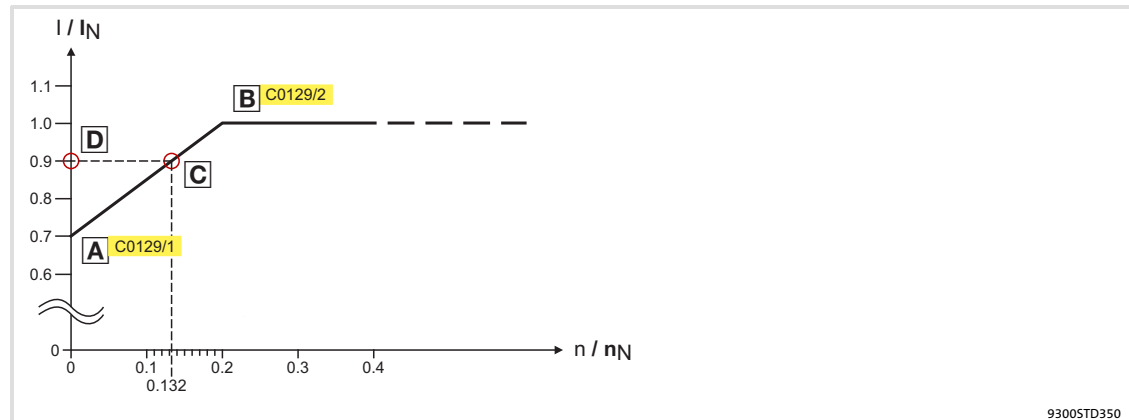
Effect of code C0129/x

Fig. 2-2 Working point in the range of characteristic lowering

The lowered speed / torque characteristic (Fig. 2-2) reduces the permissible thermal load of self-ventilated standard motors. The characteristic is a line the definition of which requires two points:

- Point **A**: Definition with **C0129/1**
This value also enables an increase of the maximally permissible load.
- Point **B**: Definition with **C0129/2**
With increasing speeds, the maximally permissible load remains unchanged ($I_{Mot} = I_{rated}$).

In Fig. 2-2, the motor speed and the corresponding permissible motor torque (**D**) can be read for each working point (**C**) on the characteristic (**A**) ... (**B**). **D** can also be calculated using the values in **C0129/1** and **C0129/2** (evaluation coefficient "y", 15).

Calculate release time and I²xt load

Calculate the release time and the I² x t load of the motor considering the values in **C0129/1** and **C0129/2**(evaluation coefficient "y").

Formulae for release time	Information
$T = -(\tau) \times \ln \left[1 - \frac{z + 1}{\left(\frac{I_{Mot}}{y \times I_N} \right)^2 \times 100} \right]$	T Release time of the I ² x t monitoring
	τ Thermal motor time constant (C0128)
$y = \frac{100\% - C0129/1}{C0129/2} \times \frac{n}{n_N} + C0129/1$	ln Function: Natural logarithm
	I _{Mot} Actual motor current (C0054)
	I _r Rated motor current (C0088)
	z Threshold value in C0120 (OC6) <u>or</u> C0127 (OC8)
	y Evaluation coefficient
	n _{rated} Rated speed (C0087)
Formulae for I ² x t load	Information
$L(t) = \left(\frac{I_{Mot}}{y \times I_N} \right)^2 \times 100\% \times \left(1 - e^{-\frac{t}{\tau}} \right)$	L(t) Chronological sequence of the I ² x t load of the motor (Display: C0066)
	y Evaluation coefficient
	I _{Mot} Actual motor current (C0054)
	I _r Rated motor current (C0088)
	τ Thermal motor time constant (C0128)
If the controller is inhibited, the I ² x t load is reduced:	
$L(t) = L_{start} \times \sqrt{e^{-\frac{t}{\tau}}}$	L _{start} I ² x t load before controller inhibit If an error is triggered, the value corresponds to the threshold value set in C0120 (OC6) <u>or</u> C0127 (OC8).

2.3**Residual hazards****Protection of persons**

- ▶ Before working on the controller, check that no voltage is applied to the power terminals:
 - Because the power terminals V, W, +U_G and -U_G remain live for at least 3 minutes after disconnecting from mains.
 - Because the power terminals L1, L2, L3; U, V, W, +U_G and -U_G remain live when the motor is stopped.
- ▶ The leakage current to earth (PE) is >3.5 mA. According to EN 61800-5-1
 - a fixed installation is required,
 - a double PE connection is required, or, if there is only a single PE connection, the PE conductor must have a cross-section of at least 10 mm².
- ▶ The heat sink of the controller has an operating temperature of > 80 °C:
 - Contact with the heatsink results in burns.
- ▶ If you use the "flying-restart circuit" function (C0142 = 2, 3) for machines with a low moment of inertia and minimum friction:
 - After controller enable in standstill, the motor may start or change its direction of rotation for a short time, because the flying restart process also is carried out at a speed of 0.
- ▶ During parameter set transfer, the control terminals of the controller can have undefined states!
 - Therefore the plugs X5 and X6 must be unplugged, before the transfer is executed. This ensures that the controller is inhibited and all control terminals have the defined "LOW" state.

Device protection

- ▶ Frequent mains switching (e.g. inching mode via mains contactor) can overload and destroy the input current limitation of the drive controller:
 - At least 3 minutes must pass between switching off and restarting the devices EVS9321-xS and EVS9322-xS.
 - At least 3 minutes must pass between two starting procedures of the devices EVS9323-xS ... EVS9332-xS.
 - Use the "safe torque off" safety function (STO) if safety-related mains disconnections occur frequently. The drive variants Vxx4 are equipped with this function.

Motor protection

- ▶ Certain drive controller settings can overheat the connected motor:
 - E. g. long-time operation of the DC injection brake.
 - Long-time operation of self-ventilated motors at low speeds.

Protection of the machine/system

- ▶ Drives can reach dangerous overspeeds (e. g. setting of high output frequencies in connection with motors and machines not suitable for this purpose):
 - The drive controllers do not provide protection against such operating conditions. For this purpose, use additional components.

2.4

Safety instructions for the installation according to UL

Original - English

**Warnings!**

- ▶ **Motor Overload Protection**
 - For information on the protection level of the internal overload protection for a motor load, see the corresponding manuals or software helps.
 - If the integral solid state motor overload protection is not used, external or remote overload protection must be provided.
- ▶ **Branch Circuit Protection**
 - The integral solid state protection does not provide branch circuit protection.
 - Branch circuit protection has to be provided externally in accordance with corresponding instructions, the National Electrical Code and any additional codes.
- ▶ Please observe the specifications for fuses and screw-tightening torques in these instructions.
- ▶ **EVS9327 ... EVS9329:**
 - Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 480 V maximum, when protected by fuses.
 - Suitable for use on a circuit capable of delivering not more than 50000 rms symmetrical amperes, 480 V maximum, when protected by J, T or R class fuses.
 - Maximum surrounding air temperature: 0 ... +50 °C
 - > +40 °C: reduce the rated output current by 2.5 %/°C
 - Use 60/75 °C or 75 °C copper wire only.

Original - French



Warnings!

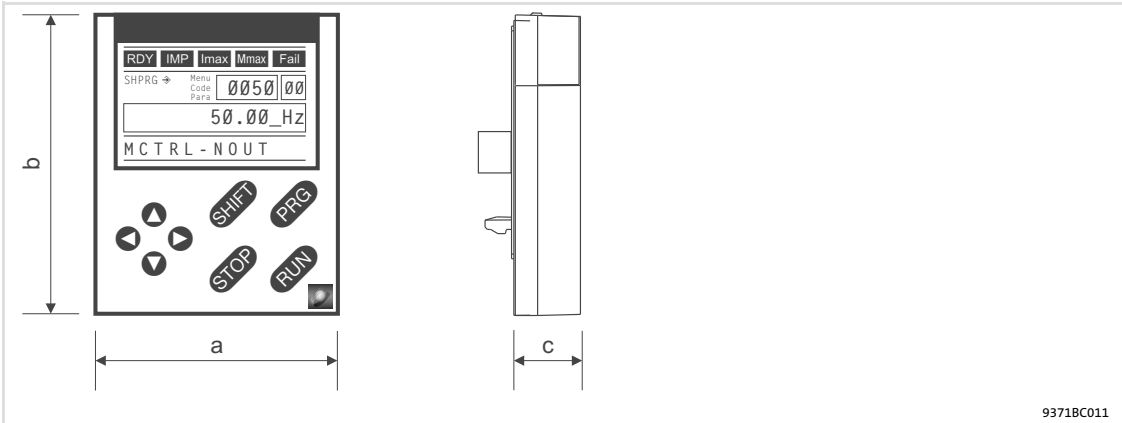
- ▶ Protection du moteur contre les surcharges
 - Pour obtenir des informations sur le niveau de protection offert par la protection intégrée contre les surcharges du moteur, se reporter aux manuels correspondants ou aux systèmes d'aide logiciels.
 - Si la protection statique intégrée contre les surcharges du moteur n'est pas utilisée, prévoir impérativement un dispositif de protection externe ou séparé contre les surcharges.
- ▶ Protection par disjoncteur
 - La protection statique intégrée n'offre pas la même protection qu'un disjoncteur.
 - Une protection par disjoncteur externe doit être fournie, conformément aux indications fournies, au National Electrical Code et aux autres dispositions applicables.
- ▶ Se conformer aux spécifications relatives aux fusibles et aux couples de serrage contenues dans le présent document.
- ▶ EVS9327 ... EVS9329 :
 - Convient aux circuits non susceptibles de délivrer plus de 5000 ampères symétriques eff., maximum 480 V, avec protection par fusibles.
 - Convient aux circuits non susceptibles de délivrer plus de 50000 ampères symétriques eff., maximum 480 V, avec protection par des fusibles de calibre J, T ou R.
 - Température ambiante maximale : 0 ... +50 °C
 - > +40 °C: ramener le courant assigné de sortie à 2,5 %/°C
 - Utiliser exclusivement des conducteurs en cuivre 60/75 °C ou 75 °C.

Description

The keypad is available as an accessory. A full description of the keypad can be obtained from the Instructions included in the keypad delivery.

Plugging in the keypad

It is possible to plug the keypad into the AIF interface or remove it during operation.
As soon as the keypad is supplied with voltage, it carries out a self-test. The keypad is ready for operation if it is in display mode.



Feature		Values
Dimensions		
Width	a	60 mm
Height	b	73.5 mm
Depth	c	15 mm
Environmental conditions		
Climate		
Storage	IEC/EN 60721-3-1	1K3 (-25 ... +60 °C)
Transport	IEC/EN 60721-3-2	2K3 (-25 ... +70 °C)
Operation	IEC/EN 60721-3-3	3K3 (-10 ... +60 °C)
Enclosure		IP 20

3.1.2 Installation and commissioning

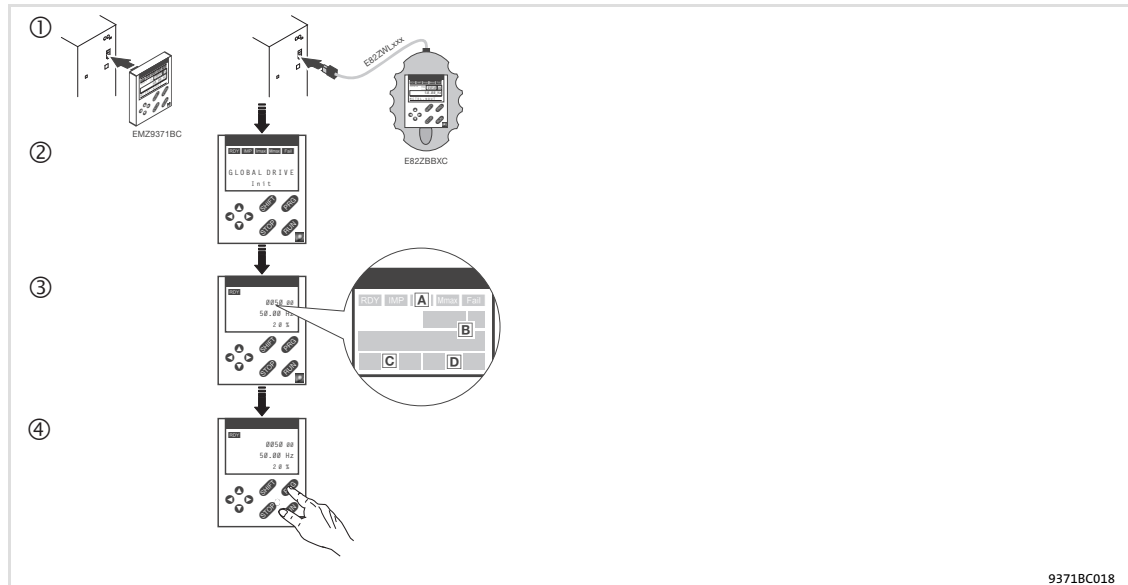


Fig. 3-1 Installation and commissioning of XT EMZ9371BC keypad or E82ZBBXC diagnosis terminal

- ① Connect keypad to the AIF interface on the front of the standard device.
The keypad can be connected/disconnected during operation.
- ② As soon as the keypad is supplied with voltage, it carries out a short self-test.
- ③ The operation level indicates when the keypad is ready for operation:
 - Ⓐ Current state of the standard device
 - Ⓑ Memory location 1 of the user menu (C0517):
Code number, subcode number, and current value
 - Ⓒ Active fault message or additional status message
 - Ⓓ Actual value in % of the status display defined in C0004
- ④ **PRG** must be pressed to leave the operation level

3.1.3 Display elements and function keys

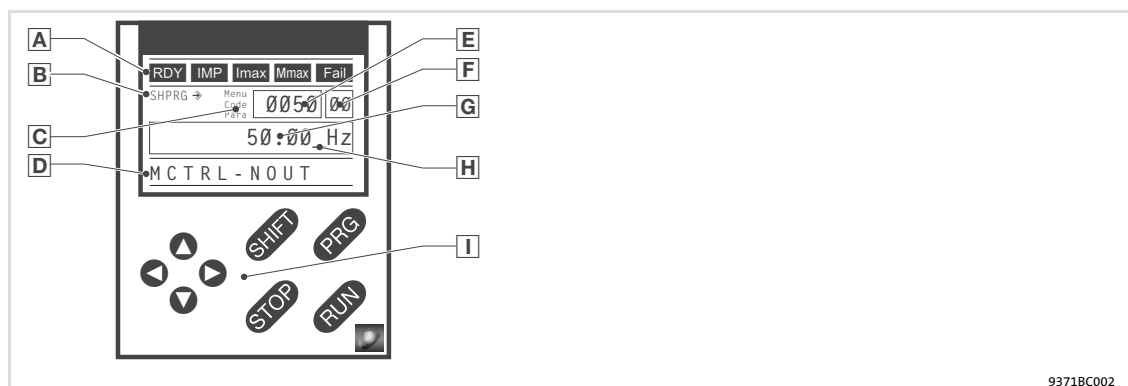


Fig. 3-2 Display elements and function keys of the XT EMZ9371BC keypad

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Display elements and function keys

Displays

A Status displays of standard device		
Display	Meaning	Explanation
RDY	Ready for operation	
IMP	Pulse inhibit is active	Power outputs are inhibited
Imax	The set current limit is exceeded in motor or generator mode	
Mmax	Speed controller 1 in the limitation	Drive is torque-controlled (Only active for operation with standard devices of the 9300 series)
Fault	Active fault	
B Acceptance of the parameters		
Display	Meaning	Explanation
↔	Parameter is accepted immediately	Standard device operates immediately with the new parameter value
SHPRG ↔	Parameter must be acknowledged with SHIFT PRG	Standard device operates with the new parameter value after being acknowledged
SHPRG	Parameter must be acknowledged in case of controller inhibit SHIFT PRG	Standard device operates with the new parameter value after the controller is enabled again
None	Display parameter	Change is not possible
C Active level		
Display	Meaning	Explanation
Menu	Menu level is active	Select main menu and submenus
Code	Code level is active	Select codes and subcodes
Para	Parameter level is active	Change parameters in the codes or subcodes
None	Operating level is active	Display operating parameters
D Short text		
Display	Meaning	Explanation
alphanumeric	Contents of the menus, meaning of the codes and parameters	
	In the operating level display of C0004 in % and the active fault	
E Number		
Active level	Meaning	Explanation
Menu level	Menu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
Code level	Four-digit code number	
F Number		
Active level	Meaning	Explanation
Menu level	Submenu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
Code level	Two-digit subcode number	
G Parameter value		
	Parameter value with unit	
H Cursor		
	In the parameter level, the digit above the cursor can be directly changed	
I Function keys		
	For description see the following table	

Function keys



Note!

Shortcuts with **SHIFT**:

Press and hold **SHIFT**, then press the second key in addition.

Key	Function			
	Menu level	Code level	Parameter level	Operating level
PRG		Change to the parameter level	Change to the operating level	Change to the code level
SHIFT PRG	Go to the "Short setup" menu and load predefined configurations ¹⁾		Accept parameters when SHPRG → or SHPRG is displayed	
↶ ↷	Change between menu items	Change of code number	Change of digit via cursor	
SHIFT ↶ SHIFT ↷	Quick change between menu items	Quick change of code number	Quick change of digit via cursor	
→ ←	Change between main menu, submenu and code level		Cursor to the right Cursor to the left	
RUN	Deactivate the function of the key STOP , the LED in the key goes off			
STOP	Inhibit the controller, the LED in the key is lit.			
	Reset fault (TRIP-Reset): 1. Remove the cause of malfunction 2. Press STOP 3. Press RUN			

¹⁾ Only active for operation with standard devices of the 8200 vector or 8200 motec series

3.1.4

Changing and saving parameters



Note!

Your settings have an effect on the current parameters in the main memory. You must save your settings in a parameter set so that they are not lost when the mains are connected.

If you only need one parameter set, save your settings as parameter set 1, since parameter set 1 is loaded automatically after mains connection.

Step	Key sequence	Action
1. Select the menu	↶↶↶↶	Use the arrow keys to select the desired menu
2. Change to the code level	→	Display of the first code in the menu
3. Select code or subcode	↶↶	Display of the current parameter value
4. Change to the parameter level	PRG	
5. When SHPRG is displayed, inhibit the controller	STOP ¹⁾	The drive coasts
6. Change parameter		
	A ↶↶	Move cursor below the digit to be changed
	B ↶↶	Change of digit
	SHIFT ↶ SHIFT ↷	Quick change of digit

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Changing and saving parameters

Step		Key sequence	Action	
7.	Accept the changed parameter			
	Display of SHPRG or SHPRG ⇨		Confirm change to accept the parameter Display "OK"	
	Display ⇨	-	The parameter has been accepted immediately	
8.	Enable the controller, if required	1)	The drive runs again	
9.	Change to the code level			
	A		Display of the operating level	
	B		Display of the code with changed parameter	
10.	Change further parameters		Restart the "loop" with step 1. or 3.	
11.	Save changed parameters			
	A		Select the code C0003 "PAR SAVE" in the menu "Load/Store"	
	B		Change to the parameter level Display "0" and "READY"	
	Select the parameter set in which the parameters are to be saved permanently	C		Save as parameter set 1: ⇨ Set "1" "Save PS1"
				Save as parameter set 2: ⇨ Set "2" "Save PS2"
				Save as parameter set 3: ⇨ Set "3" "Save PS3"
Save as parameter set 4: ⇨ Set "4" "Save PS4"				
D		When "OK" is displayed, the settings are permanently saved in the selected parameter set.		
12.	Change to the code level			
	A		Display of the operating level	
	B		Display of C0003 "PAR SAVE"	
13.	Set parameters for another parameter set		Restart the "loop" with step 1. or 3.	

- ¹⁾ The function of the STOP key can be programmed:
C0469 = 1: Controller inhibit
C0469 = 2: Quick stop (Lenze setting)

3.1.5 Loading a parameter set

The keypad serves to load a saved parameter set into the main memory when the controller is inhibited. After the controller is enabled, it operates with the new parameters.



Danger!

- ▶ When a new parameter set is loaded, the controller is reinitialised and acts as if it had been connected to the mains:
 - System configurations and terminal assignments can be changed. Make sure that your wiring and drive configuration comply with the settings of the parameter set.
- ▶ Only use terminal X5/28 as source for the controller inhibit! Otherwise the drive may start in an uncontrolled way when switching over to another parameter set.



Note!

- ▶ After switching on the supply voltage, the controller always loads parameter set 1 into the main memory.
- ▶ It is also possible to load other parameter sets into the main memory via the digital inputs or bus commands.

Step		Key sequence	Action
1.	Inhibit controller		Terminal X5/28 = LOW
2.	Load the saved parameter set into the main memory		
	A	0000	Select the code C0002 "PAR LOAD" in the menu "Load/Store"
	B	PRG	Change to the parameter level The active parameter set is displayed, e. g. display "0" and "Load Default" If you want to restore the delivery status, proceed with D
	Select the parameter set to be loaded	C	0 Load parameter set 1: ⇒ Set "1" "Load PS1" Load parameter set 2: ⇒ Set "2" "Load PS2" Load parameter set 3: ⇒ Set "3" "Load PS3" Load parameter set 4: ⇒ Set "4" "Load PS4"
	D	SHIFT PRG	"RDY" goes off. The parameter set is loaded completely into the main memory if "RDY" is displayed again.
3.	Change to the code level		
	A	PRG	Display of the operating level
	B	PRG	Display of C0002 "PAR LOAD"
4.	Enable controller		Terminal X5/28 = HIGH The drive is running with the settings of the loaded parameter set

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Transferring parameters to other standard devices

3.1.6 Transferring parameters to other standard devices

Parameter settings can be easily copied from one standard device to another by using the keypad.

For this purpose use the "Load/Store" menu



Danger!

During the parameter transfer from the keypad to the standard device the control terminals can adopt undefined states!

Therefore the plugs X5 and X6 must be disconnected from the standard device before the transfer takes place. This ensures that the controller is inhibited and all control terminals have the defined state "LOW".

Copying parameter sets from the standard device into the keypad



Note!

After copying the parameter sets into the XT keypad (C0003 = 11), always the parameter set that was loaded last via C0002 is activated.

Like this the current parameters also remain active after copying:

- Save the current parameters in the parameter set before copying and load this parameter set in the controller via C0002.

Step	Key sequence	Action
1. Connect the keypad to standard device 1		
2. Inhibit controller		Terminal X5/28 = LOW The drive coasts.
3. Select C0003 in the "Load/Store" menu	◀◀◀◀	Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys.
4. Change to the parameter level	PRG	Display "0" and "READY"
5. Copy all parameter set into the keypad	▶	The settings saved in the keypad are overwritten. Set "11" "Save extern"
6. Start copying	SHIFT PRG	The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off after approx. one minute, all parameter sets were copied into the keypad. The "RDY" status display is lit.
7. Change to the code level	A PRG	Display of the operating level
	B PRG	Display C0003 and "PAR SAVE"
8. Enable controller		Terminal X5/28 = HIGH
9. Remove keypad from standard device 1		

Copying parameter sets fom keypad into the standard device

Step	Key sequence	Action
1. Connect the keypad to standard device 2		
2. Inhibit controller		Terminal X5/28 = LOW The "IMP" status display is it. The drive coasts
3. Pull the plugs X5 and X6		All control terminals have the defined "LOW" status.
4. Select C0002 in the "Load/Store" menu	▲▼◀▶	Select code C0002 "PAR LOAD" in the "Load/Store" menu using the arrow keys.
5. Change to the parameter level	PRG	The active parameter set is shown, e. g. display "0" and "Load Default"
6. Select the correct copy function		The settings saved in the standard device are overwritten.
Copy all parameter sets available into the EEPROM of the standard device and save them permanently.		- The parameter set that was active before copying is overwritten. - The parameters are not yet active after copying. Select parameter set and load it in the main memory. 25
	◐	Set "20" "ext -> EEPROM"
Copy individual parameter sets into the main memory of the standard device.		
	◐	Copy parameter set 1 into the main memory: Set ⇨ "11" "Load ext PS1"
		Copy parameter set 2 into the main memory: Set ⇨ "12" "Load ext PS2"
		Copy parameter set 3 into the main memory: Set ⇨ "13" "Load ext PS3"
		Copy parameter set 4 into the main memory: Set ⇨ "14" "Load ext PS4"
7. Start copying	SHIFT PRG	The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off, the parameter sets selected were copied into the standard device. The "RDY" status display is lit.
8. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display C0002 and "PAR LOAD"
9. - If the function "Copy all parameter sets into the EEPROM" (C0002 = 20) is selected, they might have to be loaded in the main memory manually. - If the function "Copy individual parameter sets into the main memory" (C0002 = 1x) is selected, they might have to be saved permanently in the EEPROM manually.	▲▼◀▶	Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys and store the contents of the main memory permanently.
10. Plug in plugs X5 and X6		
11. Enable controller		Terminal X5/28 = HIGH The drive is running with the new settings.

3.1.7

Activating password protection

**Note!**

- If the password protection is activated (C0094 = 1 ... 9999), you only have free access to the user menu.
- To access the other menus, you must enter the password. By this, the password protection is annulled until you enter a new password.
- Please observe that the password-protected parameters can be overwritten as well when transferring the parameter sets to other standard devices. The password is not transferred.
- Do not forget your password! If you have forgotten your password, it can only be reset via a PC or a bus system!

Activate password protection

Step	Key sequence	Action
1. Select the "USER menu"	⬅➡⬅➡	Change to the user menu using the arrow keys
2. Change to the code level	➡	Display of code C0051 "MCTRL-NACT"
3. Select C0094	⬆	Display of code C0094 "Password"
4. Change to the parameter level	PRG	Display "0" = no password protection
5. Set password		
	A ⬆	Select password (1 ... 9999)
	B SHIFT PRG	Confirm password
6. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"
7. Change to the "USER menu"	⬅➡⬅➡	

The password protection is active now.

You can only quit the user menu if you re-enter the password and confirm it with SHIFT PRG.

Remove password protection

Step	Key sequence	Action
1. Change to the code level in the user menu	➡	
2. Select C0094	⬆	Display of code C0094 "Password"
3. Change to the parameter level	PRG	Display "9999" = password protection is active
4. Enter password		
	A ⬆	Set valid password
	B SHIFT PRG	Confirm The password protection is deactivated by entering the password once again.
5. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"

The password protection is deactivated now. All menus can be freely accessed again.

3.1.8 Diagnostics

In the "Diagnostic" menu the two submenus "Actual info" and "History" contain all codes for

- monitoring the drive
- fault/error diagnosis

In the operating level, more status messages are displayed. If several status messages are active, the message with the highest priority is displayed.

Priority	Display	Meaning
1	GLOBAL DRIVE INIT	Initialisation or communication error between keypad and controller
2	XXX - TRIP	Active TRIP (contents of C0168/1)
3	XXX - MESSAGE	Active message (contents of C0168/1)
4	Special device states:	
		Switch-on inhibit
5	Source for controller inhibit (the value of C0004 is displayed simultaneously):	
	STP1	9300 servo: Terminal X5/28 ECSxS/P/M/A: Terminal X6/SI1
	STP3	Operating module or LECOM A/B/LI
	STP4	INTERBUS or PROFIBUS-DP
	STP5	9300 servo, ECSxA/E: System bus (CAN) ECSxS/P/M: MotionBus (CAN)
	STP6	C0040
6	Source for quick stop (QSP):	
	QSP-term-Ext	The MCTRL-QSP input of the MCTRL function block is on HIGH signal.
	QSP-C0135	Operating module or LECOM A/B/LI
	QSP-AIF	INTERBUS or PROFIBUS-DP
	QSP-CAN	9300 servo, ECSxA: System bus (CAN) ECSxS/P/M: MotionBus (CAN)
7	XXX - WARNING	Active warning (contents of C0168/1)
8	xxxx	Value below C0004

3.1.9

Menu structure

For simple, user-friendly operation, the codes are clearly arranged in function-related menus:

Main menu	Submenus	Description
Display	Display	
User-Menu		Codes defined in C0517
Code list		All available codes
	ALL	All available codes listed in ascending order (C0001 ... C7999)
	PS 1	Codes in parameter set 1 (C0001 ... C1999)
	PS 2	Codes in parameter set 2 (C2001 ... C3999)
	PS 3	Codes in parameter set 3 (C4001 ... C5999)
	PS 4	Codes in parameter set 4 (C6001 ... C7999)
Load/Store		Parameter set management Parameter set transfer, restore delivery status
Diagnostic		Diagnostic
	Actual info	Display codes to monitor the drive
	History	Fault analysis with history buffer
Short setup		Quick configuration of predefined applications Configuration of the user menu The predefined applications depend on the type of the standard device (frequency inverter, servo inverter, position controller, ...)
Main FB		Configuration of the main function blocks
	NSET	Setpoint processing
	NSET-JOG	Fixed setpoints
	NSET-RAMP1	Ramp function generator
	MCTRL	Motor control
	DFSET	Digital frequency processing
	DCTRL	Internal control
Terminal I/O		Connection of inputs and outputs with internal signals
	AIN1 X6.1/2	Analog input 1
	AIN2 X6.3/4	Analog input 2
	AOUT1 X6.62	Analog output 1
	AOUT2 X6.63	Analog output 2
	DIGIN	Digital inputs
	DIGOUT	Digital outputs
	DFIN	Digital frequency input
	DFOUT	Digital frequency output
	State bus	State bus (not with 9300 frequency inverter)
Controller		Configuration of internal control parameters
	Speed	Speed controller
	Current	Current controller or torque controller
	Phase	Phase controller (not with 9300 frequency inverter)
Motor/Feedb.		Input of motor data, configuration of speed feedback
	Motor adj	Motor data
	Feedback	Configuration of feedback systems
Monitoring		Configuration of monitoring functions

Main menu	Submenus	Description
Display	Display	
LECOM/AIF		Configuration of operation with communication modules
	LECOM A/B	Serial interface
	AIF interface	Process data
	Status word	Display of status words
System bus		Configuration of system bus (CAN)
	Management	CAN communication parameters
	CAN-IN1	CAN object 1
	CAN-OUT1	
	CAN-IN2	CAN object 2
	CAN-OUT2	
	CAN-IN3	CAN object 3
	CAN-OUT3	
	Status word	Display of status words
	FDO	Free digital outputs
	Diagnostic	CAN diagnostic
FB config		Configuration of function blocks
Func blocks		Parameterisation of function blocks The submenus contain all available function blocks
FCODE		Configuration of free codes
Identify		Identification
	Drive	Software version of standard device
	Op Keypad	Software version of keypad

4 Troubleshooting and fault elimination

Display of operating data, diagnostics

Display of operating data

4 Troubleshooting and fault elimination

4.1 Display of operating data, diagnostics

4.1.1 Display of operating data

Description

Important operating parameters are measured by the controller. They can be displayed with the keypad or PC.

Some operating data can be calibrated to be displayed or selected directly with the unit of the process quantity (e.g. pressure, temperature, speed).



Note!

The calibration always affects all specified codes simultaneously.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0051	MCTRL-NACT		-36000	{1 rpm}	36000	Actual speed value, function block MCTRL • Read only
C0052	MCTRL-Umot		0	{1 V}	800	Motor voltage, function block MCTRL • Read only • MCTRL-VACT = 100 % = C0090
C0053	UG-VOLTAGE		0	{1 V}	900	DC-bus voltage, function block MCTRL • Read only • MCTRL-DCVOLT = 100 % = 1000 V
C0054	IMot		0.0	{0.1 A}	500.0	Current motor current, function block MCTRL • Read only • MCTRL-IACT = 100 % = C0022
C0061	Heatsink temp		0	{1 °C}	100	Heatsink temperature • Read only • If the temperature of the heatsink > 85 °C, the controller sets TRIP <i>OH</i> • Early warning is possible via <i>OH4</i>, temperature is set in C0122
C0063	Mot temp		0	{1 °C}	200	Motor temperature • Read only • Monitoring of the motor temperature must be activated. • KTY at X8/5, X8/8: – At 150 °C, TRIP <i>OH3</i> is set – Early warning is possible via <i>OH7</i>, temperature is set in C0121 • PTC, thermal contact at T1, T2: – Release sets TRIP or warning <i>OH8</i>

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0064	Utilization		0 {1 %} 150				Device utilisation I×t - Read only - Device utilisation during the last 180 s of operating time - C0064 > 100 % releases warning <i>ÜCS</i> - C0064 > 140 % limits the output current of the controller to 67 % of the maximum current in C0022
C0150	Status word		Bit00 –	Bit08	Status code	Read only Decimal status word for networking via automation interface (AIF) Binary interpretation indicates the bit states	
			Bit01 IMP	Bit09	Status code		
			Bit02 –	Bit10	Status code		
			Bit03 –	Bit11	Status code		
			Bit04 –	Bit12	Warning		
			Bit05 –	Bit13	Message		
			Bit06 n = 0	Bit14	–		
			Bit07 CINH	Bit15	–		

4.1.2 Diagnostics

Description

Display codes for diagnostics

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0093	DRIVE IDENT					Controller identification	
			0	invalid		Read only	
			1	none		Damaged power section	
			9321	9321VC		No power section	
			...	...		Display of the controller used	
C0099	S/W version		9333	9333VC			
			x.y			Software version	
			x	Main version		Read only	
			y	Subversion			

4 Troubleshooting and fault elimination

Troubleshooting

Status display via controller LEDs

4.2 Troubleshooting

Detecting breakdowns

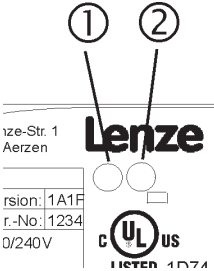
A breakdown can be detected quickly via the LEDs at the controller or via the status information at the keypad.

Analysing errors

Analyse the error using the history buffer. The list of fault messages gives you advice how to remove the fault. (📖 40)

4.2.1 Status display via controller LEDs

During operation the operating status of the controller is shown by 2 LEDs.

LED		Operating status	
Red ①	Green ②		
Off	On	Controller is enabled	
On	On	Mains is switched on and automatic start is inhibited	
Off	Blinking slowly	Controller is inhibited	
Off	On	Motor data identification is being performed	
Blinking quickly	Off	Undervoltage	
Blinking slowly	Off	Active fault	

4.2.2 Fault analysis with the history buffer

Retracing faults

Faults can be retraced via the history buffer. Fault messages are stored in the 8 memory locations in the order of their appearance.

The memory locations can be retrieved via codes.

Structure of the history buffer

Code			Memory location	Entry	Note
C0168/1	C0169/1	C0170/1	Memory location 1	Active fault	If the fault is no longer pending or has been acknowledged: - The contents of the memory locations 1 ... 7 are shifted "up" to the next memory location. - The content of memory location 8 is deleted from the history buffer and cannot be retrieved anymore. - Memory location 1 is deleted (= no active fault).
C0168/2	C0169/2	C0170/2	Memory location 2	Last fault	
C0168/3	C0169/3	C0170/3	Memory location 3	Last but one fault	
C0168/4	C0169/4	C0170/4	Memory location 4	Last but two fault	
C0168/5	C0169/5	C0170/5	Memory location 5	Last but three fault	
C0168/6	C0169/6	C0170/6	Memory location 6	Last but four fault	
C0168/7	C0169/7	C0170/7	Memory location 7	Last but five fault	
C0168/8	C0169/8	C0170/8	Memory location 8	Last but six fault	

Explanations regarding the codes

C0168	Fault indication and response - The entry is effected as a LECOM error number - If several faults with different responses occur at the same time: - Only the fault with the highest priority response is entered (1. TRIP, 2. message, 3. warning). - If several faults with the same response (e.g. 2 messages) occur at the same time: - Only the fault which occurred first is entered.
C0169	Time of fault occurrence - The reference time is provided by the power-on time meter (C0179). - If the same fault occurs several times in succession, only the time of the last occurrence is stored.
C0170	Fault frequency Only the time of the last occurrence is stored.

Clear history buffer

Set C0167 = 1 to clear the history buffer.

4.3 Drive behaviour in the event of faults

The controller responds differently to the three possible fault types TRIP, message, or warning:

TRIP

TRIP (display in keypad XT: )

- ▶ Switches the power outputs U, V, W to a high-resistance state until TRIP reset is executed.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ The drive coasts without any control!
- ▶ After TRIP reset ( 45):
 - The drive travels along the ramps to its setpoint.
 - The fault indication is moved to C0168/2 as "last fault".

Messages

Message (display in keypad XT: )

- ▶ Switches the power outputs U, V, W to a high-resistance state.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ In case of a fault ≤ 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint with maximum torque.
- ▶ In case of a fault > 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint along the adjusted ramps.
- ▶ If the message is not active anymore, the fault indication is moved to C0168/2 as "last fault".

Warnings

"Heatsink overtemperature" (keypad XT: )

- ▶ The drive continues to travel in a controlled way!
- ▶ The warning signal goes off when the fault is not active anymore.

"Error in motor phase" (keypad XT: )

"PTC monitoring" (keypad XT: )

- ▶ The drive continues to travel in a controlled way!
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ After TRIP reset, the fault indication is moved to C0168/2 as "last fault".

4.4 Fault elimination

4.4.1 Drive errors

Malfunction	Cause	Remedy
An asynchronous motor with feedback rotates in an uncontrolled manner and with low speed	The motor phases are reversed so that the rotating field of the motor is not identical with the rotating field of the feedback system. The drive shows the following behaviour: • V/f characteristic control (C0006 = 5) – The motor rotates faster than the speed setpoint by the value set in C0074 (influence of the speed controller, Lenze setting 10 % of n_{max}). After the controller is enabled, it does not stop at zero speed setpoint or quick stop (QSP). – The final motor current depends, among other things, on the set value of the V_{min} boost (C0016) and can rise to I_{max} (C0022). This may activate the fault message OC5. • Vector control (C0006 = 1) – The motor rotates slowly with maximum slip speed (depending on motor data and maximum current) and does not react to a speed setpoint. The direction of rotation, however, is determined by the sign of the speed setpoint. – The motor current rises up to I_{max} (C0022). This may activate the fault message OC5 with a time delay.	• Check motor cable for correct phase relation. • If possible, operate the motor with deactivated feedback (C0025 = 1) and check the direction of rotation of the motor.
Motor does not rotate although the controller is enabled (IMP is off) and a speed setpoint has been specified.	The two terminal strips X5 are reversed. Since X5/A1 and X5/28 face each other, the controller can be enabled if the control terminals are internally supplied. All other connections, however, are assigned incorrectly so that the motor cannot start.	Check the position of the terminal strips: • If you look at the connection unit in reading direction, the left terminal strip X5 must be connected with the input signals and the right terminal strip X5 must be connected with the output signals.
The monitoring of the motor phases (LP1) does not respond if a motor phase is interrupted, although C0597 = 0 or 2	The function block MLP1 is not entered into the processing table.	Enter the function block MLP1 into the processing table. The function block MLP1 requires 30 μ s of calculating time.
If during high speeds DC-injection braking (GSB) is activated, the fault OC1 (TRIP) or OU (TRIP) occurs	During DC-injection braking the controller sets pulse inhibit for a short time (DCTRL-IMP) to reduce the magnetisation in the motor before a DC voltage is injected into the motor. At high speeds (e. g. in case of mid-frequency motors) the residual voltage which develops from the residual magnetism and high speed can generate such a high motor current that OC1 or OU are activated.	Prolong the duration of the pulse inhibit: • Connect the output signal DCTRL-IMP to the function block TRANSx and adjust the desired switch-off time there (usually 500 ms). If DCTRL-CINH1 is set to HIGH, the duration of the pulse inhibit is prolonged by the time adjusted.

4.4.2 Controller in clamp operation

The clamp operation is a permissible operating mode. But since, however, pulse inhibit is set again and again, the controller cannot provide the optimum power.

If the output power is optimal, the output current mainly is right below the clamp threshold.

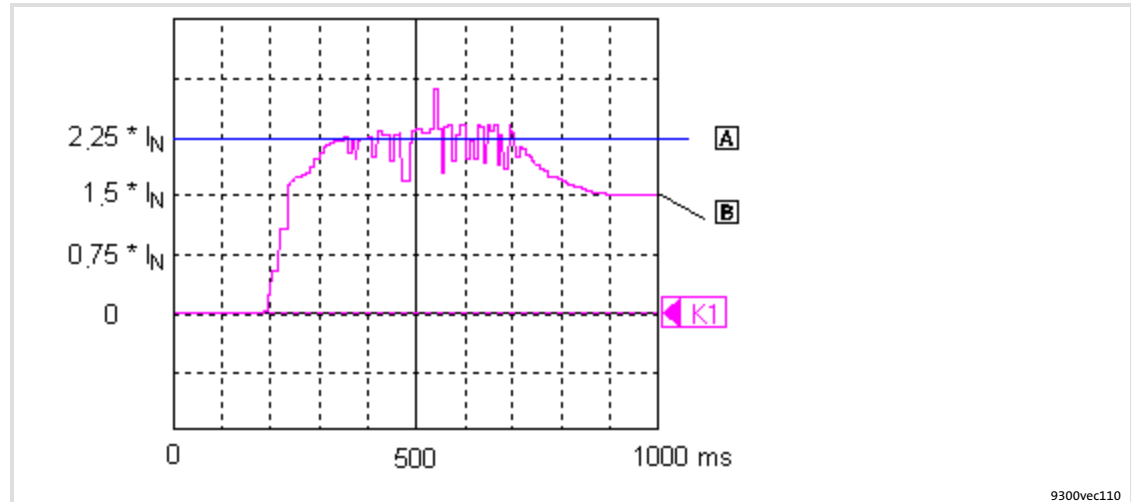


Fig. 4-1 Output current when starting a motor with high load (shown with the oscilloscope in GDC)

- Ⓐ Clamp threshold
- Ⓑ Output current

Function

1. When the output current reaches $2.25 \times I_r$, a software clamp is activated.
2. The controller sets pulse inhibit for a short time. The motor current decreases as a function of the inductance in the motor circuit.
 - An internal counter is increased by the value one.
3. After max. 250 μ s the pulse inhibit is deactivated.
4. If a software clamp reoccurs within 2 s, the internal counter is again increased by the value one. Otherwise the counter is set to zero.
 - If the counter reaches the value 4300, OC3 (TRIP) is activated.

4.4.3 Behaviour in case of overvoltage in the DC bus (OU message)

Description

If the DC-bus voltage (U_{DC}) exceeds the switch-off threshold OU, the pulse inhibit is set. At the same time, an internal timing element starts for a delay time (C0912).

The pulse inhibit is deactivated if the voltage falls below the switch-on threshold OU and the delay time has elapsed.

Switching thresholds in case of overvoltage in the DC bus (OU):

Mains voltage range		C0173	Switch-off threshold OU	Switch-on threshold OU
< 400 V	Operation with / without brake chopper	0	770 V	755 V
400 V	Operation with / without brake chopper	1 *	770 V	755 V
460 V	Operation with / without brake chopper	2	770 V	755 V
480 V	Operation without brake chopper	3	770 V	755 V
480 V	Operation with brake chopper	4	800 V	785 V

* Lenze setting

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0912	OV delay time	→	- {1 ms}	- Delay time of the pulse enable after an OU message → Depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 A change of one of the codes resets C0912 to the time of the selected motor • The time is derived from the double rotor time constant

Adjustment

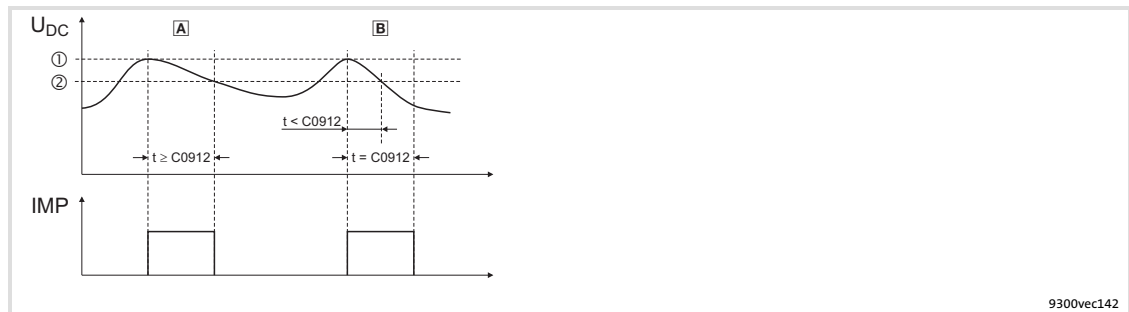


Fig. 4-2 Influence of the delay time (C0912)

① Switch-off threshold OU

② Switch-on threshold OU

A The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU equals or is higher than the delay time set in C0912.

After undershooting the switch-on threshold OU, the pulse inhibit is deactivated.

B The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU is lower than the delay time set in C0912.

The pulse inhibit is deactivated after the delay time in C0912 has elapsed.

- The delay time in [ms] is set under C0912. The Lenze setting can be changed by the factor 0.5 ... 2.

4.5 System error messages

4.5.1 General error messages

**Note!**

In the case of a query via system bus (CAN), the fault messages are represented as numbers (see first column of the table).

Fault message		Description	Cause	Remedy
No.	Display			
---	---	No fault	-	-
0011	OC1	Overcurrent in motor cable ($I_a > 2.25 \times I_N$; Hardware monitoring)	In the event of a short circuit	- Search for the cause of the short circuit. - Check the motor cable.
			Capacitive charging current of the motor cable is too high	Use motor cable which is shorter or of lower capacitance
			Too short acceleration or deceleration times in proportion to the load (C0012, C0013, C0105)	- Increase the gain (P component) of the I_{max} controller (C0075). - Reduce integral-action time (integral action component) of the I_{max} controller (C0076)
			The drive is connected to the coasting machine. The coasting is caused by a short-time pulse inhibit, e.g. at - OU (overvoltage in the DC bus) - external or internal controller inhibit	Activate flying restart circuit
			- Encoder error - Tracks during encoder feedback of the motor speed are interchanged	Check wiring of the encoder
			DC-injection braking at high speeds	See  37
			Missing mains phase	- Check the connections and the supply cable of the device - Check mains voltage
0012	OC2	Motor cable earth fault	One of the motor phases has earth contact.	- Search for cause of short circuit. - Check motor cable.
0013	OC3	Overload during acceleration.	Too short acceleration or deceleration times in proportion to the load (C0012, C0013, C0105).	- Increase the gain (P component) of the current controller (C0075). - Reduce the reset time (integral action component) of the I_{max} controller (C0076). - Increase ramp times.  38, "controller in clamp operation (fault OC3)"
0015	OC5	$I \times t$ overload	- Frequent and too long acceleration with overcurrent - Continuous overload with $I_{motor} > 1.05 \times I_{rx}$.	Check drive dimensioning.
0016	OC6	$I^2 \times t$ overload	- Frequent and too long acceleration processes with motor overcurrent. - Permanent motor overload with $I_{motor} > I_{rmotor}$	Check drive dimensioning.
x018	OC8	$I^2 \times t$ overload advance warning	- Frequent and too long acceleration processes with motor overcurrent. - Permanent motor overload with $I_{motor} > I_{rmotor}$	Check drive dimensioning.
2020	OU	Overvoltage in the DC bus	Braking energy is too high. (DC-bus voltage is higher than set in C0173.)	- Use a braking unit or regenerative module. - Check dimensioning of the brake resistor.
1030	LU	Undervoltage in the DC bus	DC bus voltage is lower than specified in C0173.	- Check mains voltage - Check supply cable

Fault message		Description	Cause	Remedy
No.	Display			
x032	LP1	Motor phase failure	A current-carrying motor phase has failed.	- Check motor. - Check motor cable. - Switch off monitoring (C0597 = 3).
			The current limit value is set too low.	Set higher current limit value via C0599.
0050	OH	Heatsink temperature > +90 °C	Ambient temperature $T_u > +40\text{ °C}$ or $> +50\text{ °C}$	- Allow module to cool and ensure better ventilation. - Check ambient temperature in the control cabinet.
			Heatsink is very dirty.	Clean heatsink.
			Wrong mounting position	Change mounting position.
x053	OH3	Motor temperature > +150 °C threshold (temperature detection via resolver or incremental value encoder)	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0583 = 3).
			No PTC/temperature contact connected.	Correct wiring.
x054	OH4	Heatsink temperature > C0122	Ambient temperature $T_u > +40\text{ °C}$ or $> +50\text{ °C}$	- Allow module to cool and ensure better ventilation. - Check ambient temperature in the control cabinet. - Switch off monitoring (C0582 = 3).
			Heatsink is very dirty.	Clean heatsink
			Wrong mounting position	Change mounting position.
			The value specified under C0122 is set too low.	Enter a higher value under C0122.
x057	OH7	Motor temperature > C0121 (temperature detection via resolver or incremental value encoder)	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0584 = 3).
			No PTC/temperature contact connected.	Correct wiring.
			The value specified under C0121 is set too low.	Enter a higher value in C0121.
x058	OH8	Motor temperature via inputs T1 and T2 is too high.	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0585 = 3).
			Terminals T1 and T2 are not connected	Connect PTC/temperature contact.
x061	CE0	Automation interface (AIF) communication error	Faulty transfer of control commands via AIF.	- Plug in the communication module/keypad XT firmly, screw down, if necessary. - Switch off monitoring (C0126 = 3).

Fault message		Description	Cause	Remedy
No.	Display			
x062	CE1	Communication error on the process data input object CAN1_IN	CAN1_IN object receives faulty data or communication is interrupted.	• Check wiring at X4. • Check sender. • Increase monitoring time under C0357/1, if necessary. • Switch off monitoring (C0591 = 3).
x063	CE2	Communication error on the process data input object CAN2_IN	CAN2_IN object receives faulty data or communication is interrupted.	• Check wiring at X4. • Check sender. • Increase monitoring time under C0357/2, if necessary. • Switch off monitoring (C0592 = 3).
x064	CE3	Communication error on the process data input object CAN3_IN	CAN3_IN object receives faulty data or communication is interrupted.	• Check wiring at X4. • Check sender. • Increase monitoring time under C0357/3, if necessary. • Switch off monitoring (C0593 = 3).
x065	CE4	BUS-OFF state of system bus (CAN)	The controller has received too many faulty telegrams via the system bus (CAN) and has disconnected from the bus.	• Check wiring at X4: Is the bus correctly terminated? • Check shield connection of the cables. • Check PE connection. • Check bus load, reduce the baud rate if necessary. (Observe the cable length!) • Switch off the monitoring (C0595 = 3).
0071	CCr	System failure	Strong interference injection on the control cables	Screen control cables
			Ground or earth loops in the wiring	• Check wiring • Check PE connection
				After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0072	PR1	Checksum error in parameter set 1 CAUTION: The Lenze setting is loaded automatically!	• Fault when loading a parameter set. • Interruption while transmitting the parameter set via keypad.	• Set the required parameters and store them under C0003 = 1. • As to PLC devices, check the use of pointers.
			The stored parameters are incompatible with the loaded software version.	Store the parameter set under C0003 = 1 first to allow for a faults reset.
0073	PR2	Checksum error in parameter set 2 PLEASE NOTE: The Lenze setting is loaded automatically!	• Fault while loading a parameter set. • Interruption during the transfer of the parameter set via keypad.	• Set the required parameters and save them with C0003 = 2.
			The parameters saved do not comply with the software version loaded.	In order to be able to acknowledge the error, first save the parameter set with C0003 = 2.

Fault message		Description	Cause	Remedy
No.	Display			
0074	PEr	Program error	Error in the program flow	Send the parameter set (on floppy disk/CD-ROM) with a detailed description of the problem to Lenze. After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0075	PR0	Error in parameter set.	The operating system software has been updated.	Storage of the Lenze setting C0003 = 1. After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0077	PR3	Checksum error in parameter set 3 PLEASE NOTE: The Lenze setting is loaded automatically!	- Fault while loading a parameter set. - Interruption during the transfer of the parameter set via keypad. The parameters saved do not comply with the software version loaded.	Set the required parameters and save them with C0003 = 3. In order to be able to acknowledge the error, first save the parameter set with C0003 = 3.
0078	PR4	Checksum error in parameter set 4 PLEASE NOTE: The Lenze setting is loaded automatically!	- Fault while loading a parameter set. - Interruption during the transfer of the parameter set via keypad. The parameters saved do not comply with the software version loaded.	Set the required parameters and save them with C0003 = 4. In order to be able to acknowledge the error, first save the parameter set with C0003 = 4.
0079	PI	Fault during parameter initialisation	- An error has been detected during the parameter set transfer between two devices. - The parameter set does not match the controller, e.g. if data has been transferred from a higher-power controller to a lower-power controller.	- Correct parameter set. - Send parameter set (on floppy disk/CD-ROM) and a detailed description of the problem to Lenze.
x083	Sd3	Encoder error at X9	Cable interrupted. Pin X9/8 not connected.	Check cable for open circuit. Apply 5 V to pin X9/8 or switch off monitoring (C0587 = 3).
x085	Sd5	Encoder error at X6/1 and X6/2 (C0034 = 1)	Current signal at X6/1 X6/2 < 2mA.	- Check cable for open circuit. - Check current signal encoder. - Switch off monitoring (C0598 = 3).
x086	Sd6	Motor temperature sensor error (X7 or X8)	Encoder for detecting the motor temperature at X7 or X8 indicates undefined values.	- Check cable for firm connection. - Switch off the monitoring (C0594 = 3).
x091	EEr	External monitoring has been triggered via DCTRL.	A digital signal assigned to the TRIP-SET function has been activated.	- Check external encoder. - Switch off the monitoring (C0581 = 3).
0105	H05	Internal fault (memory)		Contact Lenze.
0107	H07	Internal fault (power stage)	During initialisation of the controller, an incorrect power stage was detected.	Contact Lenze.
x110	H10	Heatsink temperature sensor error	Sensor for detecting the heatsink temperature indicates undefined values.	- Contact Lenze. - Switch off the monitoring (C0588 = 3).
x111	H11	Temperature sensor error: Temperature inside the controller	Sensor for detecting the internal temperature indicates undefined values.	- Contact Lenze. - Switch off the monitoring (C0588 = 3).

Fault message		Description	Cause	Remedy
No.	Display			
0140	ID1	Error during motor data identification.	No motor connected.	Check motor connection.
			Stator resistance too high.	Check entered motor data.
			Controller inhibited externally.	Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
0141	ID2	Error during motor data identification.	Motor too small.	- Check entered motor data. For parameterisation with Global Drive Control, use the input assistant for motor data. - The measurements for the inverter error characteristic and the stator resistance are correct (save measured values in C0003). For the operating mode V/f characteristic control the motor data identification can be completed.
			Controller inhibited externally.	Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
x200	NMAX	Maximum system speed (C0596) has been exceeded.	- Active load (e.g. for hoists) is too high. - Drive is not speed-controlled, torque is excessively limited.	- Check drive dimensioning. - Increase torque limit, if necessary. - Switch off monitoring (C0607 = 3).

Representation of the error number:

x 0 = TRIP, 1 = message, 2 = warning

E. g. "2091": An external monitoring function has triggered EEr warning

4.5.2 Resetting system error messages

Response	Measures for resetting the fault message	
TRIP		Note! If a TRIP source is still active, the pending TRIP cannot be reset.
		Resetting the TRIP can be effected by: - Pressing the keypad XT EMZ9371 BC ⇒ STOP. Then press RUN to re-enable the controller. - Setting code C0043 = 0. - Control word C0135, bit 11 - Control word AIF - Control word of system bus (CAN) After resetting the TRIP, the drive remains at standstill.
Message		Danger! After elimination of the fault, the fault message is cancelled automatically and the drive restarts automatically.
Warning		After elimination of the fault, the fault message is cancelled automatically.



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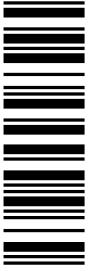


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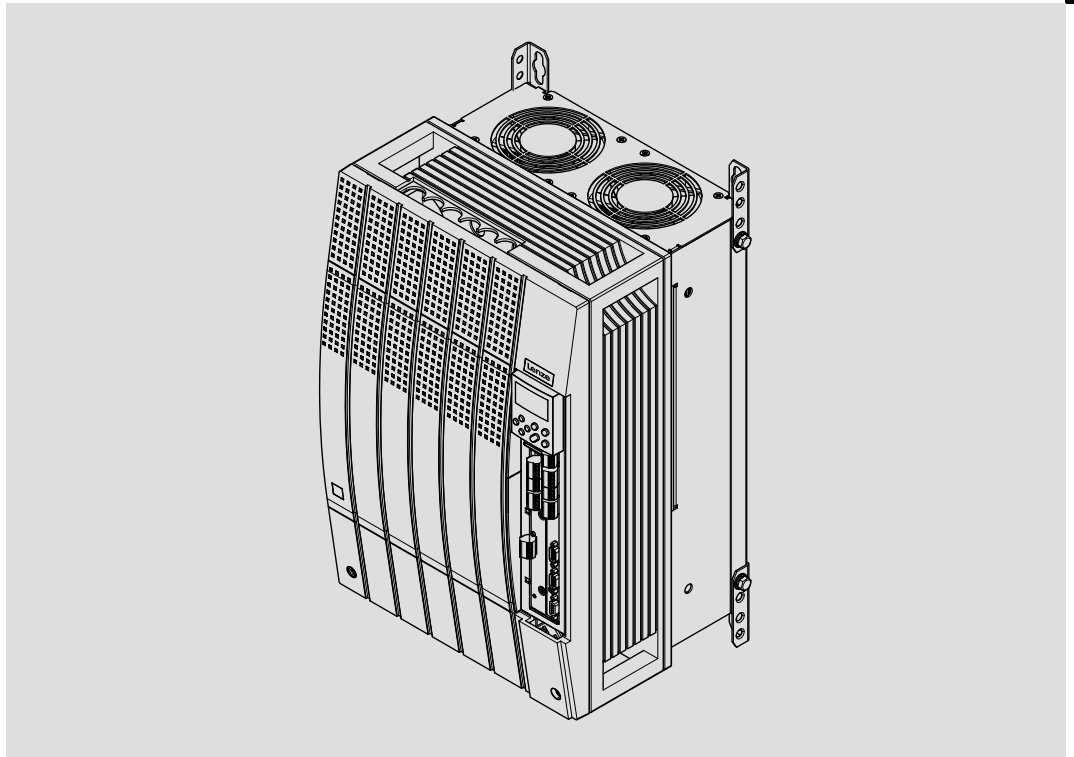
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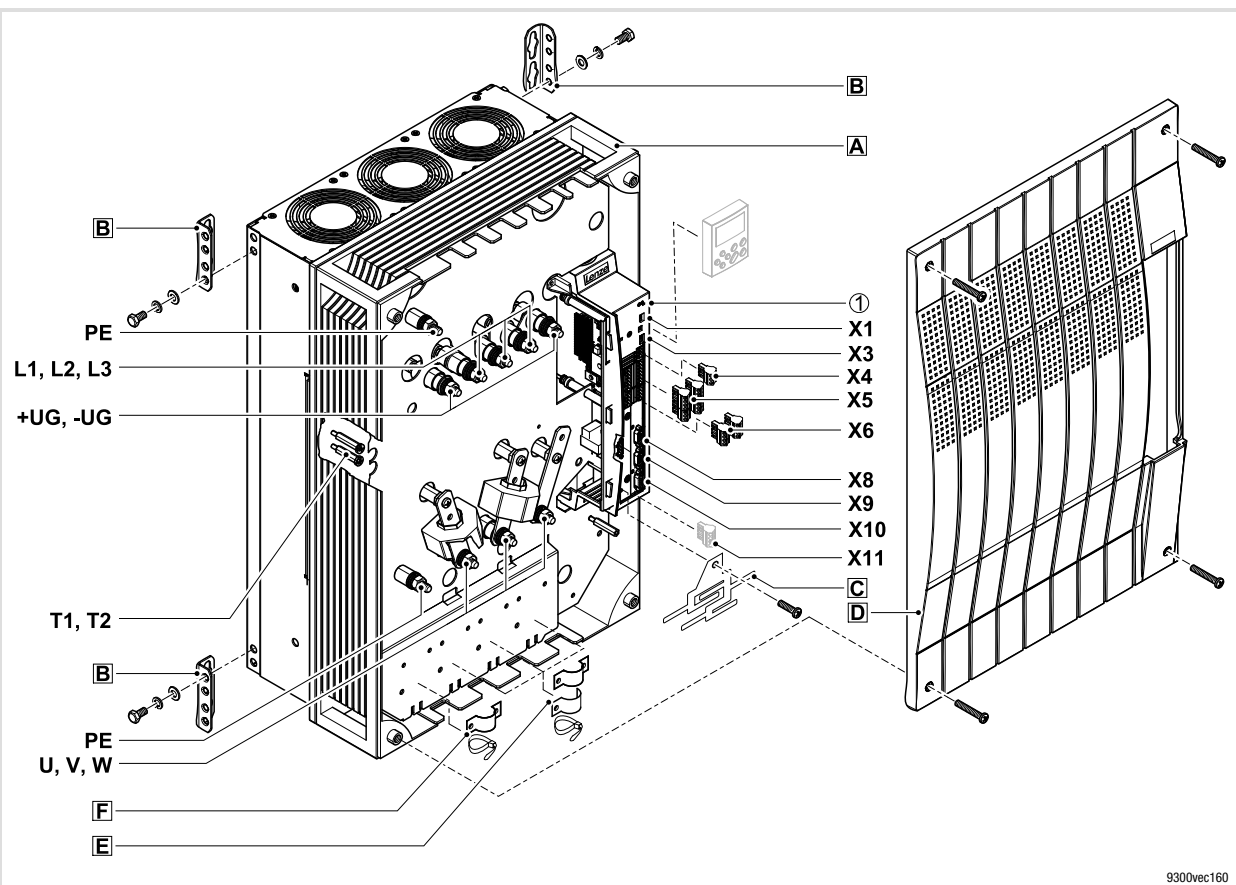
Information for the operator of the machine

9300 vector 45 ... 90 kW



EVF9330-xV ... EVF9333-xV

Frequency inverter



Key for overview

Position	Description
A	Controller
B	Fixing bracket for standard mounting
C	EMC shield sheet with fixing screws for shielded control cables
D	Cover with fixing screws
E	Shield clamp and strain relief for the motor cable
F	Strain relief for the PE motor cable and the feed cable for the motor temperature monitoring with PTC thermistor or thermal contact (NC contact)

Connections and interfaces

Position	Description
L1, L2, L3, PE	Mains connection
+UG, -UG	DC supply
U, V, W, PE	Motor connection
T1, T2	Connection of PTC thermistor or thermal contact (NC contact) of the motor
X1	AIF interface (automation interface) Slot for communication module (e. g. XT EMZ9371BC keypad)
X3	Jumper for setting analog input signal at X6/1, X6/2
X4	System bus (CAN) connection
X5	Connection of digital inputs and outputs
X6	Connection of analog inputs and outputs
X8	Connection of incremental encoder with TTL level or SinCos encoder and KTY temperature sensor of the motor
X9	Connection of digital frequency input signal
X10	Connection of digital frequency output signal
X11	Connection of K _{SR} relay output for "safe standstill" (for variants V004 and V024 only)

Status displays

Position	LED red	LED green	Operating status
①	Off	On	Controller is enabled
	On	On	Mains is switched on and automatic start is inhibited
	Off	Blinking slowly	Controller is inhibited
	Off	On	Motor data identification is active
	Blinking quickly	Off	Undervoltage or overvoltage
	Blinking slowly	Off	Active fault

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1 About this documentation



Note!

This documentation contains all the information required by the machine operator to run the drive controllers of the 9300 vector series installed in your machine/system.

You may make further use of the information contained in this documentation without asking Lenze for permission if you do not change the contents.

1.1 Document history

What is new / what has changed?

Material number	Version			Description
13445291	3.0	11/2013	TD06	Error corrections
13330576	2.1	03/2010	TD23	Change of the company's address
13330576	2.0	03/2010	TD14	New edition due to reorganisation of the company UL-warnings updated Revision for software version 8x
13217738	1.0	07/2007	TD23	First edition



Tip!

Information and auxiliary devices related to the Lenze products can be found in the download area at

<http://www.Lenze.com>

1.2 Target group

This documentation is directed at qualified skilled personnel according to IEC 60364.

Qualified skilled personnel are persons who have the required qualifications to carry out all activities involved in installing, mounting, commissioning, and operating the product.

1 About this documentation

Validity information

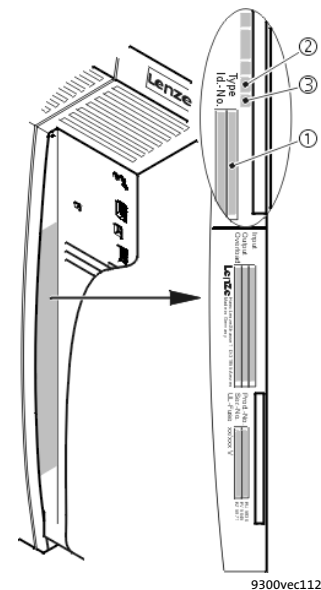
1.3 Validity information

... 9300 vector frequency inverters as of nameplate data:

		①			②		③		Nameplate
		EVF	93xx	— x V	Vxxx	1x	8x		
Product series									
EVF =		Frequency inverter							
Type no. / rated power									
		400V	480 V						
9330 =		45 kW	55 kW						
9331 =		55 kW	75 kW						
9332 =		75 kW	90 kW						
9333 =		90 kW	110 kW						
Type									
E =		Built-in unit							
C =		Built-in unit in "cold plate" technique							
Design									
V =		Vector-controlled frequency inverter							
Variant									
—		Standard							
V003 =		In "cold plate" technique							
V004 =		With "safe standstill" function							
V024 =		With "safe standstill" function and for IT mains							
V100 =		For IT systems							
Hardware version									
Software version									

The diagram shows a side view of a Lenze 9300vec112 frequency inverter. A callout circle highlights the nameplate area on the top right of the unit. Three numbered points indicate the nameplate details: 1 points to the Lenze logo, 2 points to the model number '9300vec112', and 3 points to the technical specifications.

9300vec112



1.4 Conventions used

This documentation uses the following conventions to distinguish between different types of information:

Type of information	Identification	Examples/notes
Spelling of numbers		
Decimal separator	language-dependent	In each case, the signs typical for the target language are used as decimal separators. For example: 1234.56 or 1234,56
Warnings		
UL warnings	Ⓛ	Given in English and French
UR warnings	Ⓡ	
Text		
Program name	» «	PC software For example: »Engineer«, »Global Drive Control« (GDC)
Icons		
Page reference	📖	Reference to another page with additional information For instance: 📖 16 = see page 16
Documentation reference	📄	Reference to another documentation with additional information For example: 📄 EDKxxx = see documentation EDKxxx

1 About this documentation

Notes used

1.5 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:



Danger!

(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
 Danger!	Danger of personal injury through dangerous electrical voltage. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Danger!	Danger of personal injury through a general source of danger. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Stop!	Danger of property damage. Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
 Note!	Important note to ensure troublefree operation
 Tip!	Useful tip for simple handling
	Reference to another documentation

Special safety instructions and application notes

Pictograph and signal word	Meaning
 Warnings!	Safety note or application note for the operation according to UL or CSA requirements.
 Warnings!	The measures are required to meet the requirements according to UL or CSA.

2 Safety instructions

2.1 General safety and application notes for Lenze controllers

(in accordance with Low-Voltage Directive 2006/95/EC)

For your personal safety

Disregarding the following safety measures can lead to severe injury to persons and damage to material assets:

- ▶ Only use the product as directed.
- ▶ Never commission the product in the event of visible damage.
- ▶ Never commission the product before assembly has been completed.
- ▶ Do not carry out any technical changes on the product.
- ▶ Only use the accessories approved for the product.
- ▶ Only use original spare parts from Lenze.
- ▶ Observe all regulations for the prevention of accidents, directives and laws applicable on site.
- ▶ Transport, installation, commissioning and maintenance work must only be carried out by qualified personnel.
 - Observe IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE 0110 and all national regulations for the prevention of accidents.
 - According to this basic safety information, qualified, skilled personnel are persons who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.
- ▶ Observe all specifications in this documentation.
 - This is the condition for safe and trouble-free operation and the achievement of the specified product features.
 - The procedural notes and circuit details described in this documentation are only proposals. It is up to the user to check whether they can be transferred to the particular applications. Lenze Automation GmbH does not accept any liability for the suitability of the procedures and circuit proposals described.
- ▶ Depending on their degree of protection, some parts of the Lenze controllers (frequency inverters, servo inverters, DC speed controllers) and their accessory components can be live, moving and rotating during operation. Surfaces can be hot.
 - Non-authorised removal of the required cover, inappropriate use, incorrect installation or operation, creates the risk of severe injury to persons or damage to material assets.
 - For more information, please see the documentation.
- ▶ High amounts of energy are produced in the controller. Therefore it is required to wear personal protective equipment (body protection, headgear, eye protection, ear protection, hand guard).

Application as directed

Controllers are components which are designed for installation in electrical systems or machines. They are not to be used as domestic appliances, but only for industrial purposes according to EN 61000-3-2.

When controllers are installed into machines, commissioning (i.e. starting of the operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 2006/42/EC (Machinery Directive); EN 60204 must be observed.

Commissioning (i.e. starting of the operation as directed) is only allowed when there is compliance with the EMC Directive (2004/108/EC).

The controllers meet the requirements of the Low-Voltage Directive 2006/95/EC. The harmonised standard EN 61800-5-1 applies to the controllers.

The technical data and supply conditions can be obtained from the nameplate and the documentation. They must be strictly observed.

Warning: Controllers are products which can be installed in drive systems of category C2 according to EN 61800-3. These products can cause radio interferences in residential areas. In this case, special measures can be necessary.

Transport, storage

Please observe the notes on transport, storage, and appropriate handling.

Observe the climatic conditions according to the technical data.

Installation

The controllers must be installed and cooled according to the instructions given in the corresponding documentation.

The ambient air must not exceed degree of pollution 2 according to EN 61800-5-1.

Ensure proper handling and avoid excessive mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts.

Controllers contain electrostatic sensitive devices which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

Electrical connection

When working on live controllers, observe the applicable national regulations for the prevention of accidents (e.g. VBG 4).

The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). Additional information can be obtained from the documentation.

This documentation contains information on installation in compliance with EMC (shielding, earthing, filter, and cables). These notes must also be observed for CE-marked controllers. The manufacturer of the system is responsible for compliance with the limit values demanded by EMC legislation. The controllers must be installed in housings (e.g. control cabinets) to meet the limit values for radio interferences valid at the site of installation. The housings must enable an EMC-compliant installation. Observe in particular that e.g. the control cabinet doors have a circumferential metal connection to the housing. Reduce housing openings and cutouts to a minimum.

Lenze controllers may cause a DC current in the PE conductor. If a residual current device (RCD) is used for protection against direct or indirect contact for a controller with three-phase supply, only a residual current device (RCD) of type B is permissible on the supply side of the controller. If the controller has a single-phase supply, a residual current device (RCD) of type A is also permissible. Apart from using a residual current device (RCD), other protective measures can be taken as well, e.g. electrical isolation by double or reinforced insulation or isolation from the supply system by means of a transformer.

Operation

If necessary, systems including controllers must be equipped with additional monitoring and protection devices according to the valid safety regulations (e.g. law on technical equipment, regulations for the prevention of accidents). The controllers can be adapted to your application. Please observe the corresponding information given in the documentation.

After the controller has been disconnected from the supply voltage, all live components and power terminals must not be touched immediately because capacitors can still be charged. Please observe the corresponding stickers on the controller.

All protection covers and doors must be shut during operation.

Safety functions

Certain controller versions support safety functions (e.g. "Safe torque off", formerly "Safe standstill") according to the requirements of the EC Directive 2006/42/EC (Machinery Directive). The notes on the integrated safety system provided in this documentation must be observed.

Maintenance and servicing

The controllers do not require any maintenance if the prescribed operating conditions are observed.

Disposal

Recycle metal and plastic materials. Ensure professional disposal of assembled PCBs.

The product-specific safety and application notes given in these instructions must be observed!

2.2

Thermal motor monitoring

**Note!**

From software version 8.1 onwards, the 9300 vector controllers are provided with an I²x t function for sensorless thermal monitoring of the connected motor.

- ▶ I²x t monitoring is based on a mathematical model which calculates a thermal motor utilisation from the detected motor currents.
- ▶ The calculated motor utilisation is saved when the mains is switched off.
- ▶ The function is UL-certified, i.e. additional protective measures for the motor are not required in UL-approved systems.
- ▶ Nevertheless, I²x t monitoring does **not** provide full motor protection because other influences on the motor utilisation such as changes in the cooling conditions (e.g. cooling air flow interrupted or too warm) cannot be detected.

The I² x t load of the motor is displayed in C0066.

The thermal loading capacity of the motor is expressed by the thermal motor time constant (τ , C0128). Find the value in the rated motor data or contact the manufacturer of the motor.

The I² x t monitoring has been designed such that it will be activated after 179 s in the event of a motor with a thermal motor time constant of 5 minutes (Lenze setting C0128), a motor current of 1.5 x I_N and a trigger threshold of 100 %.

Two adjustable trigger thresholds provide for different responses.

- ▶ Adjustable response OC8 (TRIP, warning, off).
 - The trigger threshold is set in C0127.
 - The response is set in C0606.
 - The response OC8, for instance, can be used for an advance warning.
- ▶ Fixed response OC6-TRIP.
 - The trigger threshold is set in C0120.

Behaviour of the I ² x t monitoring	Condition
The I ² x t monitoring is deactivated. C0066 is set = 0 % and MCTRL-LOAD-I2XT is set = 0.00 %.	When C0120 = 0 % and C0127 = 0 %, set controller inhibit.
I ² x t monitoring is stopped. The current value in C0066 and at the MCTRL-LOAD-I2XT output is frozen.	When C0120 = 0 % and C0127 = 0 %, set controller enable.
I ² x t monitoring is deactivated. The motor load is displayed in C0066.	Set C0606 = 3 (off) and C0127 > 0 %.

**Note!**

An error message OC6 or OC8 can only be reset if the I² x t load falls below the set trigger threshold by 5 %.

2.2.1 Forced ventilated or naturally ventilated motors

Parameter setting

The following codes can be set for $I^2 \times t$ monitoring:

Code	Meaning	Value range	Lenze setting
C0066	Display of the $I^2 \times t$ load of the motor	0 ... 250 %	-
C0120	Threshold: Triggering of error "OC6"	0 ... 120 %	0 %
C0127	Threshold: Triggering of error "OC8"	0 ... 120 %	0 %
C0128	Thermal motor time constant	0.1 ... 50.0 min	5.0 min
C0606	Response to error "OC8"	TRIP, warning, off	Warning

Calculate release time and $I^2 \times t$ load

Formula for release time	Information
$t = -(\tau) \times \ln \left[1 - \frac{z + 1}{\left(\frac{I_{Mot}}{I_N} \right)^2 \times 100} \right]$	I_{Mot} Actual motor current (C0054)
	I_r Rated motor current (C0088)
	τ Thermal motor time constant (C0128)
	z Threshold value in C0120 (OC6) or C0127 (OC8)

Formulae for $I^2 \times t$ load	Information
$L(t) = \left(\frac{I_{Mot}}{I_N} \right)^2 \times 100\% \times \left(1 - e^{-\frac{t}{\tau}} \right)$	$L(t)$ Chronological sequence of the $I^2 \times t$ load of the motor (Display: C0066)
	I_{Mot} Actual motor current (C0054)
	I_r Rated motor current (C0088)
	τ Thermal motor time constant (C0128)

If the controller is inhibited, the $I^2 \times t$ load is reduced:

$L(t) = L_{Start} \times \sqrt{e^{-\frac{t}{\tau}}}$	L_{Start} $I^2 \times t$ load before controller inhibit If an error is triggered, the value corresponds to the threshold value set in C0120 (OC6) or C0127 (OC8).

Read release time in the diagram

Diagram for detecting the release times for a motor with a thermal motor time constant of 5 minutes (Lenze setting C0128):

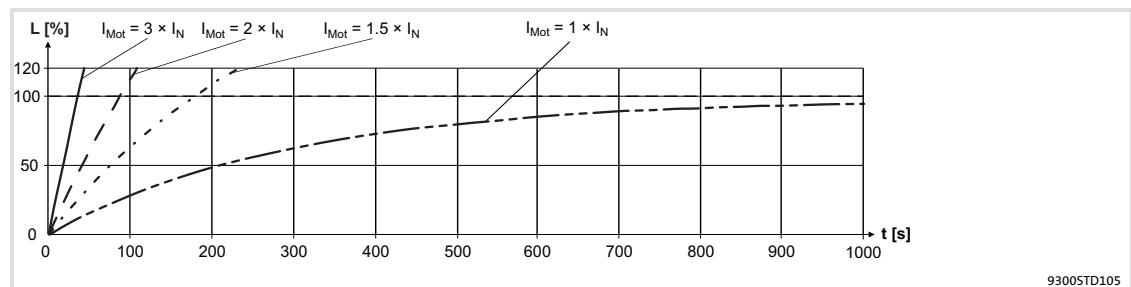


Fig. 2-1 $I^2 \times t$ -monitoring: Release times for different motor currents and trigger thresholds

I_{Mot}	Actual motor current (C0054)
I_r	Rated motor current (C0088)
L	$I^2 \times t$ load of the motor (display: C0066)
T	Time

2.2.2

Self-ventilated motors

Due to the construction, self-ventilated standard motors are exposed to an increased heat generation in the lower speed range compared to forced ventilated motors.

**Warnings!**

For complying with the UL 508C standard, you have to set the speed-dependent evaluation of the permissible torque via code **C0129/x**.

Parameter setting

The following codes can be set for $I^2 \times t$ monitoring:

Code	Meaning	Value range	Lenze setting
C0066	Display of the $I^2 \times t$ load of the motor	0 ... 250 %	-
C0120	Threshold: Triggering of error "OC6"	0 ... 120 %	0 %
C0127	Threshold: Triggering of error "OC8"	0 ... 120 %	0 %
C0128	Thermal motor time constant	0.1 ... 50.0 min	5.0 min
C0606	Response to error "OC8"	TRIP, warning, off	Warning
C0129/1	S1 torque characteristic I_1/I_{rated}	10 ... 200 %	100 %
C0129/2	S1 torque characteristics n_2/n_{rated}	10 ... 200 %	40 %

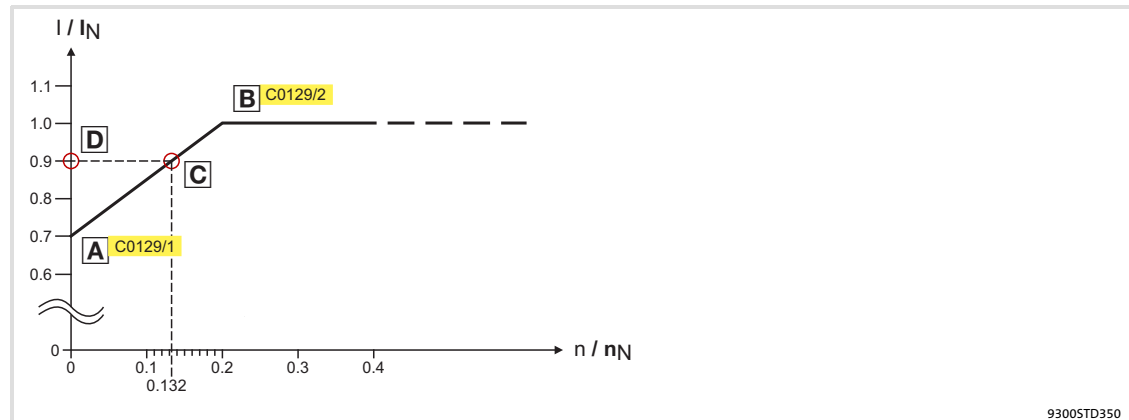
Effect of code C0129/x

Fig. 2-2 Working point in the range of characteristic lowering

The lowered speed / torque characteristic (Fig. 2-2) reduces the permissible thermal load of self-ventilated standard motors. The characteristic is a line the definition of which requires two points:

- Point **A**: Definition with **C0129/1**
This value also enables an increase of the maximally permissible load.
- Point **B**: Definition with **C0129/2**
With increasing speeds, the maximally permissible load remains unchanged ($I_{Mot} = I_{rated}$).

In Fig. 2-2, the motor speed and the corresponding permissible motor torque (**D**) can be read for each working point (**C**) on the characteristic (**A**) ... (**B**). **D** can also be calculated using the values in **C0129/1** and **C0129/2** (evaluation coefficient "y", 15).

Calculate release time and I²xt load

Calculate the release time and the I² x t load of the motor considering the values in **C0129/1** and **C0129/2**(evaluation coefficient "y").

Formulae for release time	Information
$T = -(\tau) \times \ln \left[1 - \frac{z + 1}{\left(\frac{I_{Mot}}{y \times I_N} \right)^2 \times 100} \right]$ $y = \frac{100\% - C0129/1}{C0129/2} \times \frac{n}{n_N} + C0129/1$	T
	Release time of the I ² x t monitoring
	τ
	Thermal motor time constant (C0128)
	ln
	Function: Natural logarithm
	I _{Mot}
	Actual motor current (C0054)
	I _r
	Rated motor current (C0088)
	z
	Threshold value in C0120 (OC6) <u>or</u> C0127 (OC8)
	y
	Evaluation coefficient
	n _{rated}
	Rated speed (C0087)
Formulae for I ² x t load	Information
$L(t) = \left(\frac{I_{Mot}}{y \times I_N} \right)^2 \times 100\% \times \left(1 - e^{-\frac{t}{\tau}} \right)$	L(t)
	Chronological sequence of the I ² x t load of the motor (Display: C0066)
	y
	Evaluation coefficient
	I _{Mot}
	Actual motor current (C0054)
	I _r
	Rated motor current (C0088)
	τ
	Thermal motor time constant (C0128)
If the controller is inhibited, the I ² x t load is reduced:	
$L(t) = L_{start} \times \sqrt{e^{-\frac{t}{\tau}}}$	L _{start}
	I ² x t load before controller inhibit If an error is triggered, the value corresponds to the threshold value set in C0120 (OC6) <u>or</u> C0127 (OC8).

2.3**Residual hazards****Protection of persons**

- ▶ Before working on the controller, check that no voltage is applied to the power terminals:
 - Because the power terminals V, W, +U_G and -U_G remain live for at least 3 minutes after disconnecting from mains.
 - Because the power terminals L1, L2, L3; U, V, W, +U_G and -U_G remain live when the motor is stopped.
- ▶ The leakage current to earth (PE) is >3.5 mA. According to EN 61800-5-1
 - a fixed installation is required,
 - a double PE connection is required, or, if there is only a single PE connection, the PE conductor must have a cross-section of at least 10 mm².
- ▶ The heat sink of the controller has an operating temperature of > 80 °C:
 - Contact with the heatsink results in burns.
- ▶ If you use the "flying-restart circuit" function (C0142 = 2, 3) for machines with a low moment of inertia and minimum friction:
 - After controller enable in standstill, the motor may start or change its direction of rotation for a short time, because the flying restart process also is carried out at a speed of 0.
- ▶ During parameter set transfer, the control terminals of the controller can have undefined states!
 - Therefore the plugs X5 and X6 must be unplugged, before the transfer is executed. This ensures that the controller is inhibited and all control terminals have the defined "LOW" state.

Device protection

- ▶ Frequent mains switching (e.g. inching mode via mains contactor) can overload and destroy the input current limitation of the drive controller:
 - At least 3 minutes must pass between switching off and restarting the devices EVF9321-xV and EVF9322-xV.
 - At least 3 minutes must pass between two starting procedures of the devices EVF9323-xV ... EVF9333-xV.
 - Use the "safe torque off" safety function (STO) if safety-related mains disconnections occur frequently. The drive variants Vxx4 are equipped with this function.

Motor protection

- ▶ Certain drive controller settings can overheat the connected motor:
 - E. g. long-time operation of the DC injection brake.
 - Long-time operation of self-ventilated motors at low speeds.

Protection of the machine/system

- ▶ Drives can reach dangerous overspeeds (e. g. setting of high output frequencies in connection with motors and machines not suitable for this purpose):
 - The drive controllers do not provide protection against such operating conditions. For this purpose, use additional components.

2.4

Safety instructions for the installation according to UL

Original - English

**Warnings!**

- ▶ **Motor Overload Protection**
 - For information on the protection level of the internal overload protection for a motor load, see the corresponding manuals or software helps.
 - If the integral solid state motor overload protection is not used, external or remote overload protection must be provided.
- ▶ **Branch Circuit Protection**
 - The integral solid state protection does not provide branch circuit protection.
 - Branch circuit protection has to be provided externally in accordance with corresponding instructions, the National Electrical Code and any additional codes.
- ▶ Please observe the specifications for fuses and screw-tightening torques in these instructions.
- ▶ **EVF9330 ... EVF9333:**
 - Suitable for use on a circuit capable of delivering not more than 10000 rms symmetrical amperes, 480 V maximum, when protected by fuses.
 - Suitable for use on a circuit capable of delivering not more than 50000 rms symmetrical amperes, 480 V maximum, when protected by J, T or R class fuses.
 - Maximum surrounding air temperature: 0 ... +50 °C
 - > +40 °C: reduce the rated output current by 2.5 %/°C
 - Use 60/75 °C or 75 °C copper wire only.

Original - French



Warnings!

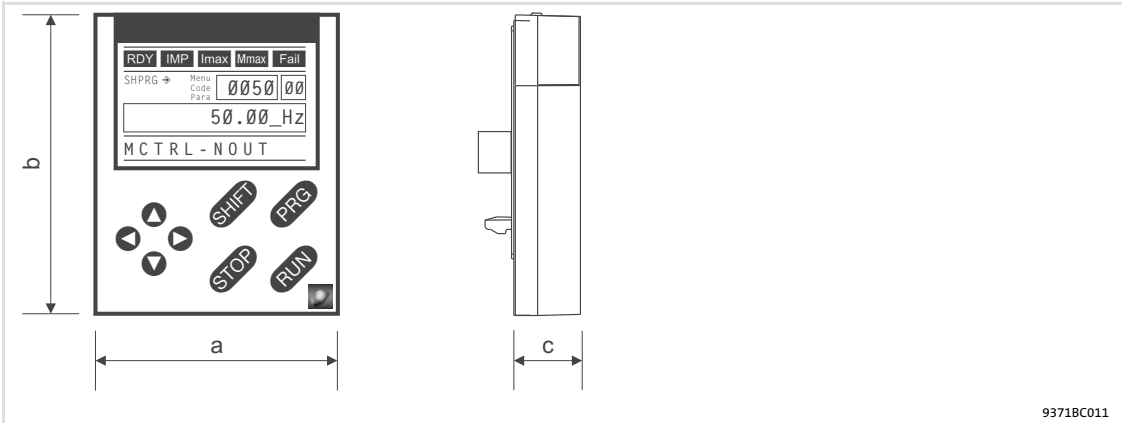
- ▶ **Motor Overload Protection**
 - For information on the protection level of the internal overload protection for a motor load, see the corresponding manuals or software helps.
 - If the integral solid state motor overload protection is not used, external or remote overload protection must be provided.
- ▶ **Branch Circuit Protection**
 - The integral solid state protection does not provide branch circuit protection.
 - Branch circuit protection has to be provided externally in accordance with corresponding instructions, the National Electrical Code and any additional codes.
- ▶ Please observe the specifications for fuses and screw-tightening torques in these instructions.
- ▶ **EVF9330 ... EVF9333 :**
 - Convient aux circuits non susceptibles de délivrer plus de 10000 ampères symétriques eff., maximum 480 V, avec protection par fusibles.
 - Convient aux circuits non susceptibles de délivrer plus de 50000 ampères symétriques eff., maximum 480 V, avec protection par des fusibles de calibre J, T ou R.
 - Température ambiante maximale : 0 ... +50 °C
 - > +40 °C: ramener le courant assigné de sortie à 2,5 %/°C
 - Utiliser exclusivement des conducteurs en cuivre 60/75 °C ou 75 °C.
- ▶ **EVF9330 ... EVF9333 :**
 - Convient aux circuits non susceptibles de délivrer plus de 10000 ampères symétriques eff., maximum 480 V, avec protection par fusibles.
 - Convient aux circuits non susceptibles de délivrer plus de 50000 ampères symétriques eff., maximum 480 V, avec protection par des fusibles de calibre J, T ou R.
 - Température ambiante maximale : 0 ... +50 °C
 - > +40 °C: ramener le courant assigné de sortie à 2,5 %/°C
 - Utiliser exclusivement des conducteurs en cuivre 60/75 °C ou 75 °C.

Description

The keypad is available as an accessory. A full description of the keypad can be obtained from the Instructions included in the keypad delivery.

Plugging in the keypad

It is possible to plug the keypad into the AIF interface or remove it during operation.
As soon as the keypad is supplied with voltage, it carries out a self-test. The keypad is ready for operation if it is in display mode.



Feature		Values
Dimensions		
Width	a	60 mm
Height	b	73.5 mm
Depth	c	15 mm
Environmental conditions		
Climate		
Storage	IEC/EN 60721-3-1	1K3 (-25 ... +60 °C)
Transport	IEC/EN 60721-3-2	2K3 (-25 ... +70 °C)
Operation	IEC/EN 60721-3-3	3K3 (-10 ... +60 °C)
Enclosure		IP 20

3.1.2 Installation and commissioning

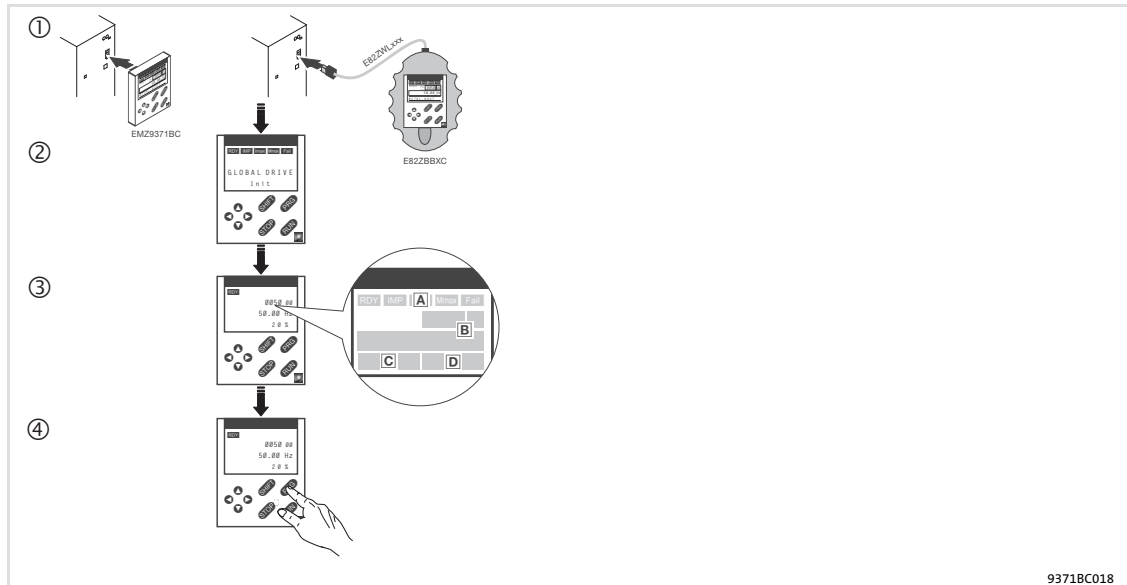


Fig. 3-1 Installation and commissioning of XT EMZ9371BC keypad or E82ZBBXC diagnosis terminal

- ① Connect keypad to the AIF interface on the front of the standard device.
The keypad can be connected/disconnected during operation.
- ② As soon as the keypad is supplied with voltage, it carries out a short self-test.
- ③ The operation level indicates when the keypad is ready for operation:
 - A Current state of the standard device
 - B Memory location 1 of the user menu (C0517):
Code number, subcode number, and current value
 - C Active fault message or additional status message
 - D Actual value in % of the status display defined in C0004
- ④ **PRG** must be pressed to leave the operation level

3.1.3 Display elements and function keys

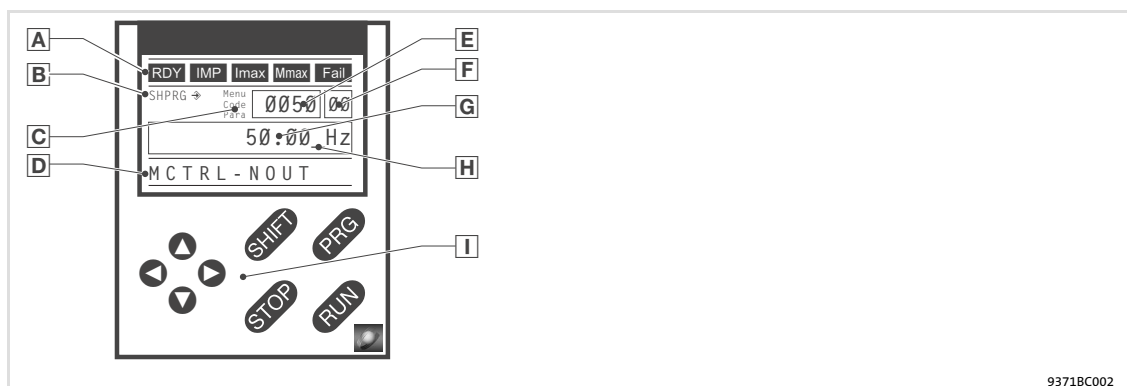


Fig. 3-2 Display elements and function keys of the XT EMZ9371BC keypad

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Display elements and function keys

Displays

A Status displays of standard device		
Display	Meaning	Explanation
RDY	Ready for operation	
IMP	Pulse inhibit is active	Power outputs are inhibited
Imax	The set current limit is exceeded in motor or generator mode	
Mmax	Speed controller 1 in the limitation	Drive is torque-controlled (Only active for operation with standard devices of the 9300 series)
Fail	Active fault	
B Acceptance of the parameters		
Display	Meaning	Explanation
↔	Parameter is accepted immediately	Standard device operates immediately with the new parameter value
SHPRG ↔	Parameter must be acknowledged with SHIFT PRG	Standard device operates with the new parameter value after being acknowledged
SHPRG	Parameter must be acknowledged in case of controller inhibit SHIFT PRG	Standard device operates with the new parameter value after the controller is enabled again
None	Display parameter	Change is not possible
C Active level		
Display	Meaning	Explanation
Menu	Menu level is active	Select main menu and submenus
Code	Code level is active	Select codes and subcodes
Para	Parameter level is active	Change parameters in the codes or subcodes
None	Operating level is active	Display operating parameters
D Short text		
Display	Meaning	Explanation
alphanumeric	Contents of the menus, meaning of the codes and parameters	
	In the operating level display of C0004 in % and the active fault	
E Number		
Active level	Meaning	Explanation
Menu level	Menu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
Code level	Four-digit code number	
F Number		
Active level	Meaning	Explanation
Menu level	Submenu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
Code level	Two-digit subcode number	
G Parameter value		
	Parameter value with unit	
H Cursor		
	In the parameter level, the digit above the cursor can be directly changed	
I Function keys		
	For description see the following table	

Function keys



Note!

Shortcuts with **SHIFT**:

Press and hold **SHIFT**, then press the second key in addition.

Key	Function			
	Menu level	Code level	Parameter level	Operating level
PRG		Change to the parameter level	Change to the operating level	Change to the code level
SHIFT PRG	Go to the "Short setup" menu and load predefined configurations ¹⁾		Accept parameters when SHPRG → or SHPRG is displayed	
↶ ↷	Change between menu items	Change of code number	Change of digit via cursor	
SHIFT ↶ SHIFT ↷	Quick change between menu items	Quick change of code number	Quick change of digit via cursor	
→ ←	Change between main menu, submenu and code level		Cursor to the right Cursor to the left	
RUN	Deactivate the function of the key STOP , the LED in the key goes off			
STOP	Inhibit the controller, the LED in the key is lit.			
	Reset fault (TRIP-Reset): 1. Remove the cause of malfunction 2. Press STOP 3. Press RUN			

¹⁾ Only active for operation with standard devices of the 8200 vector or 8200 motec series

3.1.4

Changing and saving parameters



Note!

Your settings have an effect on the current parameters in the main memory. You must save your settings in a parameter set so that they are not lost when the mains are connected.

If you only need one parameter set, save your settings as parameter set 1, since parameter set 1 is loaded automatically after mains connection.

Step	Key sequence		Action
1. Select the menu	↶↶↶↶		Use the arrow keys to select the desired menu
2. Change to the code level	→		Display of the first code in the menu
3. Select code or subcode	↶↶		Display of the current parameter value
4. Change to the parameter level	PRG		
5. When SHPRG is displayed, inhibit the controller	STOP ¹⁾		The drive coasts
6. Change parameter			
	A	↶↶	Move cursor below the digit to be changed
	B	↶↶	Change of digit
		SHIFT ↶ SHIFT ↷	Quick change of digit

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Changing and saving parameters

Step		Key sequence	Action	
7.	Accept the changed parameter			
	Display of SHPRG or SHPRG ⇨	SHIFT PRG	Confirm change to accept the parameter Display "OK"	
	Display ⇨	-	The parameter has been accepted immediately	
8.	Enable the controller, if required	RUN 1)	The drive runs again	
9.	Change to the code level			
	A	PRG	Display of the operating level	
	B	PRG	Display of the code with changed parameter	
10.	Change further parameters		Restart the "loop" with step 1. or 3.	
11.	Save changed parameters			
	A	▲▼▶◀	Select the code C0003 "PAR SAVE" in the menu "Load/Store"	
	B	PRG	Change to the parameter level Display "0" and "READY"	
	Select the parameter set in which the parameters are to be saved permanently	C	▲	Save as parameter set 1: ⇨ Set "1" "Save PS1"
				Save as parameter set 2: ⇨ Set "2" "Save PS2"
				Save as parameter set 3: ⇨ Set "3" "Save PS3"
Save as parameter set 4: ⇨ Set "4" "Save PS4"				
D	SHIFT PRG	When "OK" is displayed, the settings are permanently saved in the selected parameter set.		
12.	Change to the code level			
	A	PRG	Display of the operating level	
	B	PRG	Display of C0003 "PAR SAVE"	
13.	Set parameters for another parameter set		Restart the "loop" with step 1. or 3.	

- ¹⁾ The function of the STOP key can be programmed:
C0469 = 1: Controller inhibit
C0469 = 2: Quick stop (Lenze setting)

3.1.5 Loading a parameter set

The keypad serves to load a saved parameter set into the main memory when the controller is inhibited. After the controller is enabled, it operates with the new parameters.



Danger!

- ▶ When a new parameter set is loaded, the controller is reinitialised and acts as if it had been connected to the mains:
 - System configurations and terminal assignments can be changed. Make sure that your wiring and drive configuration comply with the settings of the parameter set.
- ▶ Only use terminal X5/28 as source for the controller inhibit! Otherwise the drive may start in an uncontrolled way when switching over to another parameter set.



Note!

- ▶ After switching on the supply voltage, the controller always loads parameter set 1 into the main memory.
- ▶ It is also possible to load other parameter sets into the main memory via the digital inputs or bus commands.

Step		Key sequence	Action
1.	Inhibit controller		Terminal X5/28 = LOW
2.	Load the saved parameter set into the main memory		
	A	0000	Select the code C0002 "PAR LOAD" in the menu "Load/Store"
	B	PRG	Change to the parameter level The active parameter set is displayed, e. g. display "0" and "Load Default" If you want to restore the delivery status, proceed with D
	Select the parameter set to be loaded	C	0 Load parameter set 1: ⇒ Set "1" "Load PS1" Load parameter set 2: ⇒ Set "2" "Load PS2" Load parameter set 3: ⇒ Set "3" "Load PS3" Load parameter set 4: ⇒ Set "4" "Load PS4"
	D	SHIFT PRG	"RDY" goes off. The parameter set is loaded completely into the main memory if "RDY" is displayed again.
3.	Change to the code level		
	A	PRG	Display of the operating level
	B	PRG	Display of C0002 "PAR LOAD"
4.	Enable controller		Terminal X5/28 = HIGH The drive is running with the settings of the loaded parameter set

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Transferring parameters to other standard devices

3.1.6 Transferring parameters to other standard devices

Parameter settings can be easily copied from one standard device to another by using the keypad.

For this purpose use the "Load/Store" menu



Danger!

During the parameter transfer from the keypad to the standard device the control terminals can adopt undefined states!

Therefore the plugs X5 and X6 must be disconnected from the standard device before the transfer takes place. This ensures that the controller is inhibited and all control terminals have the defined state "LOW".

Copying parameter sets from the standard device into the keypad



Note!

After copying the parameter sets into the XT keypad (C0003 = 11), always the parameter set that was loaded last via C0002 is activated.

Like this the current parameters also remain active after copying:

- Save the current parameters in the parameter set before copying and load this parameter set in the controller via C0002.

Step	Key sequence	Action
1. Connect the keypad to standard device 1		
2. Inhibit controller		Terminal X5/28 = LOW The drive coasts.
3. Select C0003 in the "Load/Store" menu	⬅⬅⬅⬅	Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys.
4. Change to the parameter level	PRG	Display "0" and "READY"
5. Copy all parameter set into the keypad	⬆	The settings saved in the keypad are overwritten. Set "11" "Save extern"
6. Start copying	SHIFT PRG	The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off after approx. one minute, all parameter sets were copied into the keypad. The "RDY" status display is lit.
7. Change to the code level	A PRG	Display of the operating level
	B PRG	Display C0003 and "PAR SAVE"
8. Enable controller		Terminal X5/28 = HIGH
9. Remove keypad from standard device 1		

Copying parameter sets fom keypad into the standard device

Step	Key sequence	Action
1. Connect the keypad to standard device 2		
2. Inhibit controller		Terminal X5/28 = LOW The "IMP" status display is it. The drive coasts
3. Pull the plugs X5 and X6		All control terminals have the defined "LOW" status.
4. Select C0002 in the "Load/Store" menu	▲▼◀▶	Select code C0002 "PAR LOAD" in the "Load/Store" menu using the arrow keys.
5. Change to the parameter level	PRG	The active parameter set is shown, e. g. display "0" and "Load Default"
6. Select the correct copy function		The settings saved in the standard device are overwritten.
Copy all parameter sets available into the EEPROM of the standard device and save them permanently.		- The parameter set that was active before copying is overwritten. - The parameters are not yet active after copying. Select parameter set and load it in the main memory. 25
	◐	Set "20" "ext -> EEPROM"
Copy individual parameter sets into the main memory of the standard device.		
	◐	Copy parameter set 1 into the main memory: Set ⇨ "11" "Load ext PS1"
		Copy parameter set 2 into the main memory: Set ⇨ "12" "Load ext PS2"
		Copy parameter set 3 into the main memory: Set ⇨ "13" "Load ext PS3"
		Copy parameter set 4 into the main memory: Set ⇨ "14" "Load ext PS4"
7. Start copying	SHIFT PRG	The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off, the parameter sets selected were copied into the standard device. The "RDY" status display is lit.
8. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display C0002 and "PAR LOAD"
9. - If the function "Copy all parameter sets into the EEPROM" (C0002 = 20) is selected, they might have to be loaded in the main memory manually. - If the function "Copy individual parameter sets into the main memory" (C0002 = 1x) is selected, they might have to be saved permanently in the EEPROM manually.	▲▼◀▶	Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys and store the contents of the main memory permanently.
10. Plug in plugs X5 and X6		
11. Enable controller		Terminal X5/28 = HIGH The drive is running with the new settings.

3.1.7

Activating password protection

**Note!**

- If the password protection is activated (C0094 = 1 ... 9999), you only have free access to the user menu.
- To access the other menus, you must enter the password. By this, the password protection is annulled until you enter a new password.
- Please observe that the password-protected parameters can be overwritten as well when transferring the parameter sets to other standard devices. The password is not transferred.
- Do not forget your password! If you have forgotten your password, it can only be reset via a PC or a bus system!

Activate password protection

Step	Key sequence	Action
1. Select the "USER menu"	⬅➡⬅➡	Change to the user menu using the arrow keys
2. Change to the code level	➡	Display of code C0051 "MCTRL-NACT"
3. Select C0094	⬆	Display of code C0094 "Password"
4. Change to the parameter level	PRG	Display "0" = no password protection
5. Set password		
	A ⬆	Select password (1 ... 9999)
	B SHIFT PRG	Confirm password
6. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"
7. Change to the "USER menu"	⬅➡⬅➡	

The password protection is active now.

You can only quit the user menu if you re-enter the password and confirm it with SHIFT PRG.

Remove password protection

Step	Key sequence	Action
1. Change to the code level in the user menu	➡	
2. Select C0094	⬆	Display of code C0094 "Password"
3. Change to the parameter level	PRG	Display "9999" = password protection is active
4. Enter password		
	A ⬆	Set valid password
	B SHIFT PRG	Confirm The password protection is deactivated by entering the password once again.
5. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"

The password protection is deactivated now. All menus can be freely accessed again.

3.1.8 Diagnostics

In the "Diagnostic" menu the two submenus "Actual info" and "History" contain all codes for

- monitoring the drive
- fault/error diagnosis

In the operating level, more status messages are displayed. If several status messages are active, the message with the highest priority is displayed.

Priority	Display	Meaning
1	GLOBAL DRIVE INIT	Initialisation or communication error between keypad and controller
2	XXX - TRIP	Active TRIP (contents of C0168/1)
3	XXX - MESSAGE	Active message (contents of C0168/1)
4	Special device states:	
		Switch-on inhibit
5	Source for controller inhibit (the value of C0004 is displayed simultaneously):	
	STP1	9300 servo: Terminal X5/28 ECSxS/P/M/A: Terminal X6/SI1
	STP3	Operating module or LECOM A/B/LI
	STP4	INTERBUS or PROFIBUS-DP
	STP5	9300 servo, ECSxA/E: System bus (CAN) ECSxS/P/M: MotionBus (CAN)
	STP6	C0040
6	Source for quick stop (QSP):	
	QSP-term-Ext	The MCTRL-QSP input of the MCTRL function block is on HIGH signal.
	QSP-C0135	Operating module or LECOM A/B/LI
	QSP-AIF	INTERBUS or PROFIBUS-DP
	QSP-CAN	9300 servo, ECSxA: System bus (CAN) ECSxS/P/M: MotionBus (CAN)
7	XXX - WARNING	Active warning (contents of C0168/1)
8	xxxx	Value below C0004

3.1.9 Menu structure

For simple, user-friendly operation, the codes are clearly arranged in function-related menus:

Main menu	Submenus	Description
Display	Display	
User-Menu		Codes defined in C0517
Code list		All available codes
	ALL	All available codes listed in ascending order (C0001 ... C7999)
	PS 1	Codes in parameter set 1 (C0001 ... C1999)
	PS 2	Codes in parameter set 2 (C2001 ... C3999)
	PS 3	Codes in parameter set 3 (C4001 ... C5999)
	PS 4	Codes in parameter set 4 (C6001 ... C7999)
Load/Store		Parameter set management Parameter set transfer, restore delivery status
Diagnostic		Diagnostic
	Actual info	Display codes to monitor the drive
	History	Fault analysis with history buffer
Short setup		Quick configuration of predefined applications Configuration of the user menu The predefined applications depend on the type of the standard device (frequency inverter, servo inverter, position controller, ...)
Main FB		Configuration of the main function blocks
	NSET	Setpoint processing
	NSET-JOG	Fixed setpoints
	NSET-RAMP1	Ramp function generator
	MCTRL	Motor control
	DFSET	Digital frequency processing
	DCTRL	Internal control
Terminal I/O		Connection of inputs and outputs with internal signals
	AIN1 X6.1/2	Analog input 1
	AIN2 X6.3/4	Analog input 2
	AOUT1 X6.62	Analog output 1
	AOUT2 X6.63	Analog output 2
	DIGIN	Digital inputs
	DIGOUT	Digital outputs
	DFIN	Digital frequency input
	DFOUT	Digital frequency output
	State bus	State bus (not with 9300 frequency inverter)
Controller		Configuration of internal control parameters
	Speed	Speed controller
	Current	Current controller or torque controller
	Phase	Phase controller (not with 9300 frequency inverter)
Motor/Feedb.		Input of motor data, configuration of speed feedback
	Motor adj	Motor data
	Feedback	Configuration of feedback systems
Monitoring		Configuration of monitoring functions

Main menu	Submenus	Description
Display	Display	
LECOM/AIF		Configuration of operation with communication modules
	LECOM A/B	Serial interface
	AIF interface	Process data
	Status word	Display of status words
System bus		Configuration of system bus (CAN)
	Management	CAN communication parameters
	CAN-IN1	CAN object 1
	CAN-OUT1	
	CAN-IN2	CAN object 2
	CAN-OUT2	
	CAN-IN3	CAN object 3
	CAN-OUT3	
	Status word	Display of status words
	FDO	Free digital outputs
	Diagnostic	CAN diagnostic
FB config		Configuration of function blocks
Func blocks		Parameterisation of function blocks The submenus contain all available function blocks
FCODE		Configuration of free codes
Identify		Identification
	Drive	Software version of standard device
	Op Keypad	Software version of keypad

4 Troubleshooting and fault elimination

Display of operating data, diagnostics

Display of operating data

4 Troubleshooting and fault elimination

4.1 Display of operating data, diagnostics

4.1.1 Display of operating data

Description

Important operating parameters are measured by the controller. They can be displayed with the keypad or PC.

Some operating data can be calibrated to be displayed or selected directly with the unit of the process quantity (e.g. pressure, temperature, speed).



Note!

The calibration always affects all specified codes simultaneously.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0051	MCTRL-NACT		-36000	{1 rpm}	36000	Actual speed value, function block MCTRL • Read only
C0052	MCTRL-Umot		0	{1 V}	800	Motor voltage, function block MCTRL • Read only • MCTRL-VACT = 100 % = C0090
C0053	UG-VOLTAGE		0	{1 V}	900	DC-bus voltage, function block MCTRL • Read only • MCTRL-DCVOLT = 100 % = 1000 V
C0054	IMot		0.0	{0.1 A}	500.0	Current motor current, function block MCTRL • Read only • MCTRL-IACT = 100 % = C0022
C0061	Heatsink temp		0	{1 °C}	100	Heatsink temperature • Read only • If the temperature of the heatsink > 85 °C, the controller sets TRIP <i>OH</i> • Early warning is possible via <i>OH4</i>, temperature is set in C0122
C0063	Mot temp		0	{1 °C}	200	Motor temperature • Read only • Monitoring of the motor temperature must be activated. • KTY at X8/5, X8/8: – At 150 °C, TRIP <i>OH3</i> is set – Early warning is possible via <i>OH7</i>, temperature is set in C0121 • PTC, thermal contact at T1, T2: – Release sets TRIP or warning <i>OH8</i>

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0064	Utilization		0 {1 %} 150				Device utilisation I×t ● Read only ● Device utilisation during the last 180 s of operating time ● C0064 > 100 % releases warning <i>ÜCS</i> ● C0064 > 140 % limits the output current of the controller to 67 % of the maximum current in C0022
C0150	Status word		Bit00 –	Bit08	Status code	Read only Decimal status word for networking via automation interface (AIF) ● Binary interpretation indicates the bit states	
			Bit01 IMP	Bit09	Status code		
			Bit02 –	Bit10	Status code		
			Bit03 –	Bit11	Status code		
			Bit04 –	Bit12	Warning		
			Bit05 –	Bit13	Message		
			Bit06 n = 0	Bit14	–		
			Bit07 CINH	Bit15	–		

4.1.2 Diagnostics

Description

Display codes for diagnostics

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0093	DRIVE IDENT					Controller identification	
			0	invalid		Read only	
			1	none		Damaged power section	
			9321	9321VC		No power section	
			...	...		Display of the controller used	
C0099	S/W version		9333	9333VC			
			x.y			Software version	
			x	Main version		Read only	
			y	Subversion			

4 Troubleshooting and fault elimination

Troubleshooting

Status display via controller LEDs

4.2 Troubleshooting

Detecting breakdowns

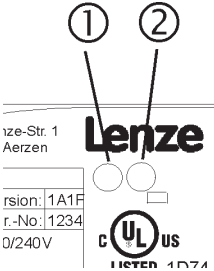
A breakdown can be detected quickly via the LEDs at the controller or via the status information at the keypad.

Analysing errors

Analyse the error using the history buffer. The list of fault messages gives you advice how to remove the fault. (📖 40)

4.2.1 Status display via controller LEDs

During operation the operating status of the controller is shown by 2 LEDs.

LED		Operating status	
Red ①	Green ②		
Off	On	Controller is enabled	
On	On	Mains is switched on and automatic start is inhibited	
Off	Blinking slowly	Controller is inhibited	
Off	On	Motor data identification is being performed	
Blinking quickly	Off	Undervoltage	
Blinking slowly	Off	Active fault	

4.2.2 Fault analysis with the history buffer

Retracing faults

Faults can be retraced via the history buffer. Fault messages are stored in the 8 memory locations in the order of their appearance.

The memory locations can be retrieved via codes.

Structure of the history buffer

Code			Memory location	Entry	Note
C0168/1	C0169/1	C0170/1	Memory location 1	Active fault	If the fault is no longer pending or has been acknowledged: - The contents of the memory locations 1 ... 7 are shifted "up" to the next memory location. - The content of memory location 8 is deleted from the history buffer and cannot be retrieved anymore. - Memory location 1 is deleted (= no active fault).
C0168/2	C0169/2	C0170/2	Memory location 2	Last fault	
C0168/3	C0169/3	C0170/3	Memory location 3	Last but one fault	
C0168/4	C0169/4	C0170/4	Memory location 4	Last but two fault	
C0168/5	C0169/5	C0170/5	Memory location 5	Last but three fault	
C0168/6	C0169/6	C0170/6	Memory location 6	Last but four fault	
C0168/7	C0169/7	C0170/7	Memory location 7	Last but five fault	
C0168/8	C0169/8	C0170/8	Memory location 8	Last but six fault	

Explanations regarding the codes

C0168	Fault indication and response - The entry is effected as a LECOM error number - If several faults with different responses occur at the same time: - Only the fault with the highest priority response is entered (1. TRIP, 2. message, 3. warning). - If several faults with the same response (e.g. 2 messages) occur at the same time: - Only the fault which occurred first is entered.
C0169	Time of fault occurrence - The reference time is provided by the power-on time meter (C0179). - If the same fault occurs several times in succession, only the time of the last occurrence is stored.
C0170	Fault frequency Only the time of the last occurrence is stored.

Clear history buffer

Set C0167 = 1 to clear the history buffer.

4.3 Drive behaviour in the event of faults

The controller responds differently to the three possible fault types TRIP, message, or warning:

TRIP

TRIP (display in keypad XT: )

- ▶ Switches the power outputs U, V, W to a high-resistance state until TRIP reset is executed.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ The drive coasts without any control!
- ▶ After TRIP reset ( 45):
 - The drive travels along the ramps to its setpoint.
 - The fault indication is moved to C0168/2 as "last fault".

Messages

Message (display in keypad XT: )

- ▶ Switches the power outputs U, V, W to a high-resistance state.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ In case of a fault ≤ 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint with maximum torque.
- ▶ In case of a fault > 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint along the adjusted ramps.
- ▶ If the message is not active anymore, the fault indication is moved to C0168/2 as "last fault".

Warnings

"Heatsink overtemperature" (keypad XT: )

- ▶ The drive continues to travel in a controlled way!
- ▶ The warning signal goes off when the fault is not active anymore.

"Error in motor phase" (keypad XT: )

"PTC monitoring" (keypad XT: )

- ▶ The drive continues to travel in a controlled way!
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ After TRIP reset, the fault indication is moved to C0168/2 as "last fault".

4.4 Fault elimination

4.4.1 Drive errors

Malfunction	Cause	Remedy
An asynchronous motor with feedback rotates in an uncontrolled manner and with low speed	The motor phases are reversed so that the rotating field of the motor is not identical with the rotating field of the feedback system. The drive shows the following behaviour: • V/f characteristic control (C0006 = 5) – The motor rotates faster than the speed setpoint by the value set in C0074 (influence of the speed controller, Lenze setting 10 % of n_{max}). After the controller is enabled, it does not stop at zero speed setpoint or quick stop (QSP). – The final motor current depends, among other things, on the set value of the V_{min} boost (C0016) and can rise to I_{max} (C0022). This may activate the fault message OC5. • Vector control (C0006 = 1) – The motor rotates slowly with maximum slip speed (depending on motor data and maximum current) and does not react to a speed setpoint. The direction of rotation, however, is determined by the sign of the speed setpoint. – The motor current rises up to I_{max} (C0022). This may activate the fault message OC5 with a time delay.	• Check motor cable for correct phase relation. • If possible, operate the motor with deactivated feedback (C0025 = 1) and check the direction of rotation of the motor.
Motor does not rotate although the controller is enabled (IMP is off) and a speed setpoint has been specified.	The two terminal strips X5 are reversed. Since X5/A1 and X5/28 face each other, the controller can be enabled if the control terminals are internally supplied. All other connections, however, are assigned incorrectly so that the motor cannot start.	Check the position of the terminal strips: • If you look at the connection unit in reading direction, the left terminal strip X5 must be connected with the input signals and the right terminal strip X5 must be connected with the output signals.
The monitoring of the motor phases (LP1) does not respond if a motor phase is interrupted, although C0597 = 0 or 2	The function block MLP1 is not entered into the processing table.	Enter the function block MLP1 into the processing table. The function block MLP1 requires 30 µs of calculating time.
If during high speeds DC-injection braking (GSB) is activated, the fault OC1 (TRIP) or OU (TRIP) occurs	During DC-injection braking the controller sets pulse inhibit for a short time (DCTRL-IMP) to reduce the magnetisation in the motor before a DC voltage is injected into the motor. At high speeds (e. g. in case of mid-frequency motors) the residual voltage which develops from the residual magnetism and high speed can generate such a high motor current that OC1 or OU are activated.	Prolong the duration of the pulse inhibit: • Connect the output signal DCTRL-IMP to the function block TRANSx and adjust the desired switch-off time there (usually 500 ms). If DCTRL-CINH1 is set to HIGH, the duration of the pulse inhibit is prolonged by the time adjusted.

4.4.2 Controller in clamp operation

The clamp operation is a permissible operating mode. But since, however, pulse inhibit is set again and again, the controller cannot provide the optimum power.

If the output power is optimal, the output current mainly is right below the clamp threshold.

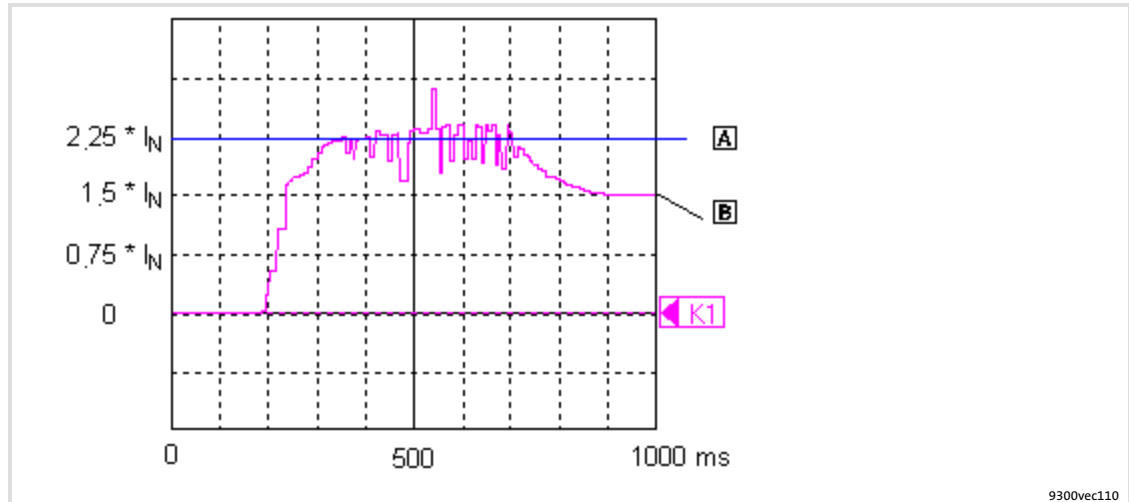


Fig. 4-1 Output current when starting a motor with high load (shown with the oscilloscope in GDC)

- Ⓐ Clamp threshold
- Ⓑ Output current

Function

1. When the output current reaches $2.25 \times I_r$, a software clamp is activated.
2. The controller sets pulse inhibit for a short time. The motor current decreases as a function of the inductance in the motor circuit.
 - An internal counter is increased by the value one.
3. After max. 250 μ s the pulse inhibit is deactivated.
4. If a software clamp reoccurs within 2 s, the internal counter is again increased by the value one. Otherwise the counter is set to zero.
 - If the counter reaches the value 4300, OC3 (TRIP) is activated.

4.4.3 Behaviour in case of overvoltage in the DC bus (OU message)

Description

If the DC-bus voltage (U_{DC}) exceeds the switch-off threshold OU, the pulse inhibit is set. At the same time, an internal timing element starts for a delay time (C0912).

The pulse inhibit is deactivated if the voltage falls below the switch-on threshold OU and the delay time has elapsed.

Switching thresholds in case of overvoltage in the DC bus (OU):

Mains voltage range		C0173	Switch-off threshold OU	Switch-on threshold OU
< 400 V	Operation with / without brake chopper	0	770 V	755 V
400 V	Operation with / without brake chopper	1 *	770 V	755 V
460 V	Operation with / without brake chopper	2	770 V	755 V
480 V	Operation without brake chopper	3	770 V	755 V
480 V	Operation with brake chopper	4	800 V	785 V

* Lenze setting

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0912	OV delay time	→	- {1 ms}	- Delay time of the pulse enable after an OU message → Depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 A change of one of the codes resets C0912 to the time of the selected motor • The time is derived from the double rotor time constant

Adjustment

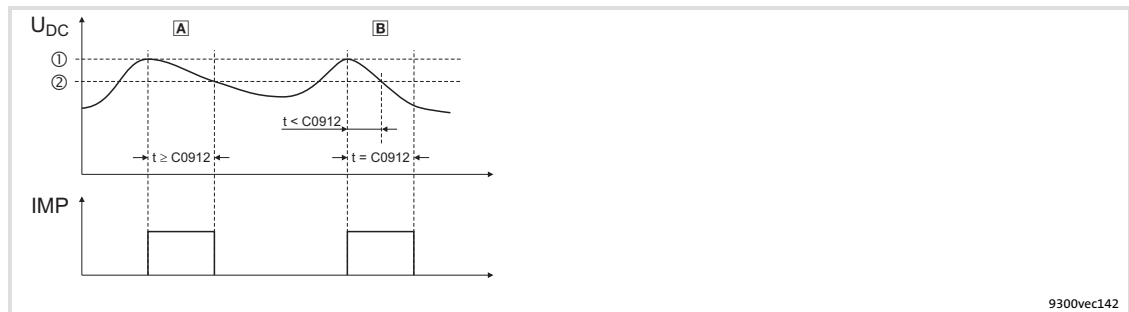


Fig. 4-2 Influence of the delay time (C0912)

① Switch-off threshold OU

② Switch-on threshold OU

A The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU equals or is higher than the delay time set in C0912.

After undershooting the switch-on threshold OU, the pulse inhibit is deactivated.

B The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU is lower than the delay time set in C0912.

The pulse inhibit is deactivated after the delay time in C0912 has elapsed.

- The delay time in [ms] is set under C0912. The Lenze setting can be changed by the factor 0.5 ... 2.

4.5 System error messages

4.5.1 General error messages

**Note!**

In the case of a query via system bus (CAN), the fault messages are represented as numbers (see first column of the table).

Fault message		Description	Cause	Remedy
No.	Display			
---	---	No fault	-	-
0011	OC1	Overcurrent in motor cable ($I_a > 2.25 \times I_N$; Hardware monitoring)	In the event of a short circuit	- Search for the cause of the short circuit. - Check the motor cable.
			Capacitive charging current of the motor cable is too high	Use motor cable which is shorter or of lower capacitance
			Too short acceleration or deceleration times in proportion to the load (C0012, C0013, C0105)	- Increase the gain (P component) of the I_{max} controller (C0075). - Reduce integral-action time (integral action component) of the I_{max} controller (C0076)
			The drive is connected to the coasting machine. The coasting is caused by a short-time pulse inhibit, e.g. at - OU (overvoltage in the DC bus) - external or internal controller inhibit	Activate flying restart circuit
			- Encoder error - Tracks during encoder feedback of the motor speed are interchanged	Check wiring of the encoder
			DC-injection braking at high speeds	See 37
			Missing mains phase	- Check the connections and the supply cable of the device - Check mains voltage
0012	OC2	Motor cable earth fault	One of the motor phases has earth contact.	- Search for cause of short circuit. - Check motor cable.
0013	OC3	Overload during acceleration.	Too short acceleration or deceleration times in proportion to the load (C0012, C0013, C0105).	- Increase the gain (P component) of the current controller (C0075). - Reduce the reset time (integral action component) of the I_{max} controller (C0076). - Increase ramp times. 38, "controller in clamp operation (fault OC3)"
0015	OC5	$I \times t$ overload	- Frequent and too long acceleration with overcurrent - Continuous overload with $I_{motor} > 1.05 \times I_{rx}$.	Check drive dimensioning.
0016	OC6	I^2xt overload	- Frequent and too long acceleration processes with motor overcurrent. - Permanent motor overload with $I_{motor} > I_{rmotor}$	Check drive dimensioning.
x018	OC8	I^2xt overload advance warning	- Frequent and too long acceleration processes with motor overcurrent. - Permanent motor overload with $I_{motor} > I_{rmotor}$	Check drive dimensioning.
2020	OU	Overvoltage in the DC bus	Braking energy is too high. (DC-bus voltage is higher than set in C0173.)	- Use a braking unit or regenerative module. - Check dimensioning of the brake resistor.
1030	LU	Undervoltage in the DC bus	DC bus voltage is lower than specified in C0173.	- Check mains voltage - Check supply cable

Fault message		Description	Cause	Remedy
No.	Display			
x032	LP1	Motor phase failure	A current-carrying motor phase has failed.	- Check motor. - Check motor cable. - Switch off monitoring (C0597 = 3).
			The current limit value is set too low.	Set higher current limit value via C0599.
0050	OH	Heatsink temperature > +90 °C	Ambient temperature $T_u > +40\text{ °C}$ or $> +50\text{ °C}$	- Allow module to cool and ensure better ventilation. - Check ambient temperature in the control cabinet.
			Heatsink is very dirty.	Clean heatsink.
			Wrong mounting position	Change mounting position.
x053	OH3	Motor temperature > +150 °C threshold (temperature detection via resolver or incremental value encoder)	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0583 = 3).
			No PTC/temperature contact connected.	Correct wiring.
x054	OH4	Heatsink temperature > C0122	Ambient temperature $T_u > +40\text{ °C}$ or $> +50\text{ °C}$	- Allow module to cool and ensure better ventilation. - Check ambient temperature in the control cabinet. - Switch off monitoring (C0582 = 3).
			Heatsink is very dirty.	Clean heatsink
			Wrong mounting position	Change mounting position.
			The value specified under C0122 is set too low.	Enter a higher value under C0122.
x057	OH7	Motor temperature > C0121 (temperature detection via resolver or incremental value encoder)	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0584 = 3).
			No PTC/temperature contact connected.	Correct wiring.
			The value specified under C0121 is set too low.	Enter a higher value in C0121.
x058	OH8	Motor temperature via inputs T1 and T2 is too high.	Motor is thermally overloaded due to: - Impermissible continuous current - Frequent or too long acceleration processes	- Check drive dimensioning. - Switch off monitoring (C0585 = 3).
			Terminals T1 and T2 are not connected	Connect PTC/temperature contact.
x061	CE0	Automation interface (AIF) communication error	Faulty transfer of control commands via AIF.	- Plug in the communication module/keypad XT firmly, screw down, if necessary. - Switch off monitoring (C0126 = 3).

Fault message		Description	Cause	Remedy
No.	Display			
x062	CE1	Communication error on the process data input object CAN1_IN	CAN1_IN object receives faulty data or communication is interrupted.	• Check wiring at X4. • Check sender. • Increase monitoring time under C0357/1, if necessary. • Switch off monitoring (C0591 = 3).
x063	CE2	Communication error on the process data input object CAN2_IN	CAN2_IN object receives faulty data or communication is interrupted.	• Check wiring at X4. • Check sender. • Increase monitoring time under C0357/2, if necessary. • Switch off monitoring (C0592 = 3).
x064	CE3	Communication error on the process data input object CAN3_IN	CAN3_IN object receives faulty data or communication is interrupted.	• Check wiring at X4. • Check sender. • Increase monitoring time under C0357/3, if necessary. • Switch off monitoring (C0593 = 3).
x065	CE4	BUS-OFF state of system bus (CAN)	The controller has received too many faulty telegrams via the system bus (CAN) and has disconnected from the bus.	• Check wiring at X4: Is the bus correctly terminated? • Check shield connection of the cables. • Check PE connection. • Check bus load, reduce the baud rate if necessary. (Observe the cable length!) • Switch off the monitoring (C0595 = 3).
0071	CCr	System failure	Strong interference injection on the control cables	Screen control cables
			Ground or earth loops in the wiring	• Check wiring • Check PE connection
0072	PR1	Checksum error in parameter set 1 CAUTION: The Lenze setting is loaded automatically!	• Fault when loading a parameter set. • Interruption while transmitting the parameter set via keypad.	• Set the required parameters and store them under C0003 = 1. • As to PLC devices, check the use of pointers.
			The stored parameters are incompatible with the loaded software version.	Store the parameter set under C0003 = 1 first to allow for a faults reset.
0073	PR2	Checksum error in parameter set 2 PLEASE NOTE: The Lenze setting is loaded automatically!	• Fault while loading a parameter set. • Interruption during the transfer of the parameter set via keypad.	• Set the required parameters and save them with C0003 = 2.
			The parameters saved do not comply with the software version loaded.	In order to be able to acknowledge the error, first save the parameter set with C0003 = 2.

Fault message		Description	Cause	Remedy
No.	Display			
0074	PEr	Program error	Error in the program flow	Send the parameter set (on floppy disk/CD-ROM) with a detailed description of the problem to Lenze. After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0075	PR0	Error in parameter set.	The operating system software has been updated.	Storage of the Lenze setting C0003 = 1. After troubleshooting: Deenergise the device completely (disconnect 24 V supply, discharge DC bus)!
0077	PR3	Checksum error in parameter set 3 PLEASE NOTE: The Lenze setting is loaded automatically!	- Fault while loading a parameter set. - Interruption during the transfer of the parameter set via keypad. The parameters saved do not comply with the software version loaded.	Set the required parameters and save them with C0003 = 3. In order to be able to acknowledge the error, first save the parameter set with C0003 = 3.
0078	PR4	Checksum error in parameter set 4 PLEASE NOTE: The Lenze setting is loaded automatically!	- Fault while loading a parameter set. - Interruption during the transfer of the parameter set via keypad. The parameters saved do not comply with the software version loaded.	Set the required parameters and save them with C0003 = 4. In order to be able to acknowledge the error, first save the parameter set with C0003 = 4.
0079	PI	Fault during parameter initialisation	- An error has been detected during the parameter set transfer between two devices. - The parameter set does not match the controller, e.g. if data has been transferred from a higher-power controller to a lower-power controller.	- Correct parameter set. - Send parameter set (on floppy disk/CD-ROM) and a detailed description of the problem to Lenze.
x083	Sd3	Encoder error at X9	Cable interrupted. Pin X9/8 not connected.	Check cable for open circuit. Apply 5 V to pin X9/8 or switch off monitoring (C0587 = 3).
x085	Sd5	Encoder error at X6/1 and X6/2 (C0034 = 1)	Current signal at X6/1 X6/2 < 2mA.	- Check cable for open circuit. - Check current signal encoder. - Switch off monitoring (C0598 = 3).
x086	Sd6	Motor temperature sensor error (X7 or X8)	Encoder for detecting the motor temperature at X7 or X8 indicates undefined values.	- Check cable for firm connection. - Switch off the monitoring (C0594 = 3).
x091	EEr	External monitoring has been triggered via DCTRL .	A digital signal assigned to the TRIP-SET function has been activated.	- Check external encoder. - Switch off the monitoring (C0581 = 3).
0105	H05	Internal fault (memory)		Contact Lenze.
0107	H07	Internal fault (power stage)	During initialisation of the controller, an incorrect power stage was detected.	Contact Lenze.
x110	H10	Heatsink temperature sensor error	Sensor for detecting the heatsink temperature indicates undefined values.	- Contact Lenze. - Switch off the monitoring (C0588 = 3).
x111	H11	Temperature sensor error: Temperature inside the controller	Sensor for detecting the internal temperature indicates undefined values.	- Contact Lenze. - Switch off the monitoring (C0588 = 3).

Fault message		Description	Cause	Remedy
No.	Display			
0140	ID1	Error during motor data identification.	No motor connected.	Check motor connection.
			Stator resistance too high.	Check entered motor data.
			Controller inhibited externally.	Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
0141	ID2	Error during motor data identification.	Motor too small.	- Check entered motor data. For parameterisation with Global Drive Control, use the input assistant for motor data. - The measurements for the inverter error characteristic and the stator resistance are correct (save measured values in C0003). For the operating mode V/f characteristic control the motor data identification can be completed.
			Controller inhibited externally.	Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
x200	NMAX	Maximum system speed (C0596) has been exceeded.	- Active load (e.g. for hoists) is too high. - Drive is not speed-controlled, torque is excessively limited.	- Check drive dimensioning. - Increase torque limit, if necessary. - Switch off monitoring (C0607 = 3).

Representation of the error number:

x 0 = TRIP, 1 = message, 2 = warning

E. g. "2091": An external monitoring function has triggered EEr warning

4.5.2 Resetting system error messages

Response	Measures for resetting the fault message	
TRIP		Note! If a TRIP source is still active, the pending TRIP cannot be reset.
		Resetting the TRIP can be effected by: - Pressing the keypad XT EMZ9371 BC ⇒ STOP. Then press RUN to re-enable the controller. - Setting code C0043 = 0. - Control word C0135, bit 11 - Control word AIF - Control word of system bus (CAN) After resetting the TRIP, the drive remains at standstill.
Message		Danger! After elimination of the fault, the fault message is cancelled automatically and the drive restarts automatically.
Warning		After elimination of the fault, the fault message is cancelled automatically.



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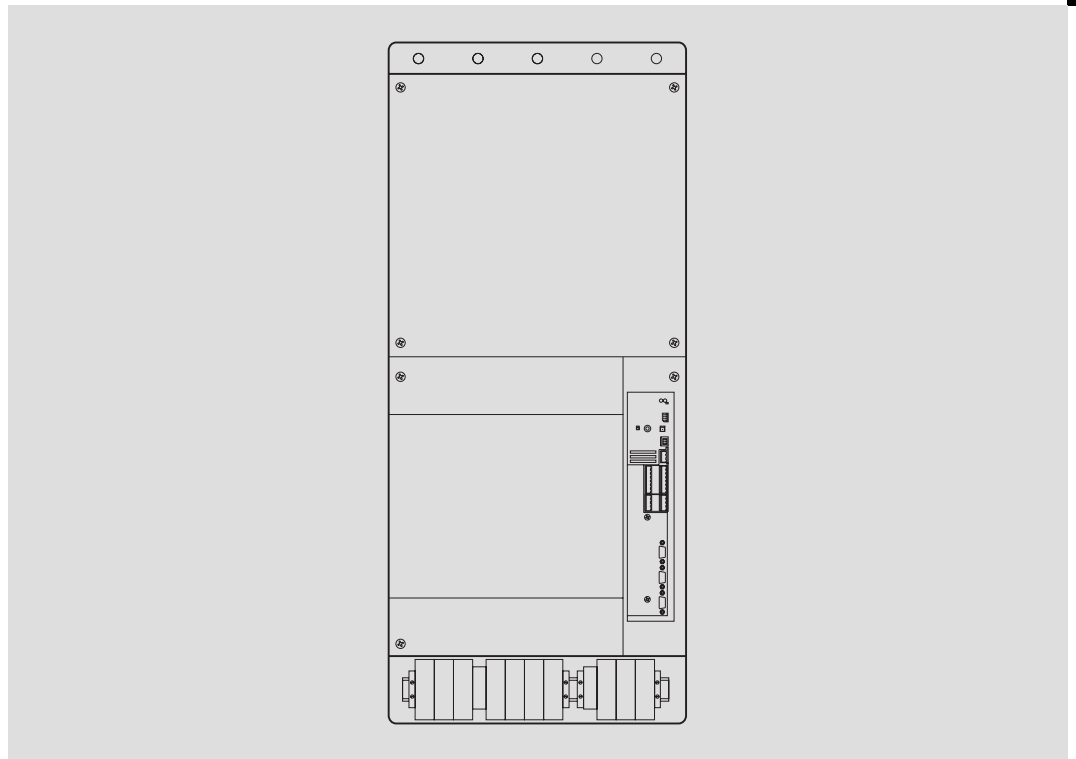
EDKVF93-03 ■ 13445291 ■ EN ■ 3.0 ■ TD06

10 9 8 7 6 5 4 3 2 1



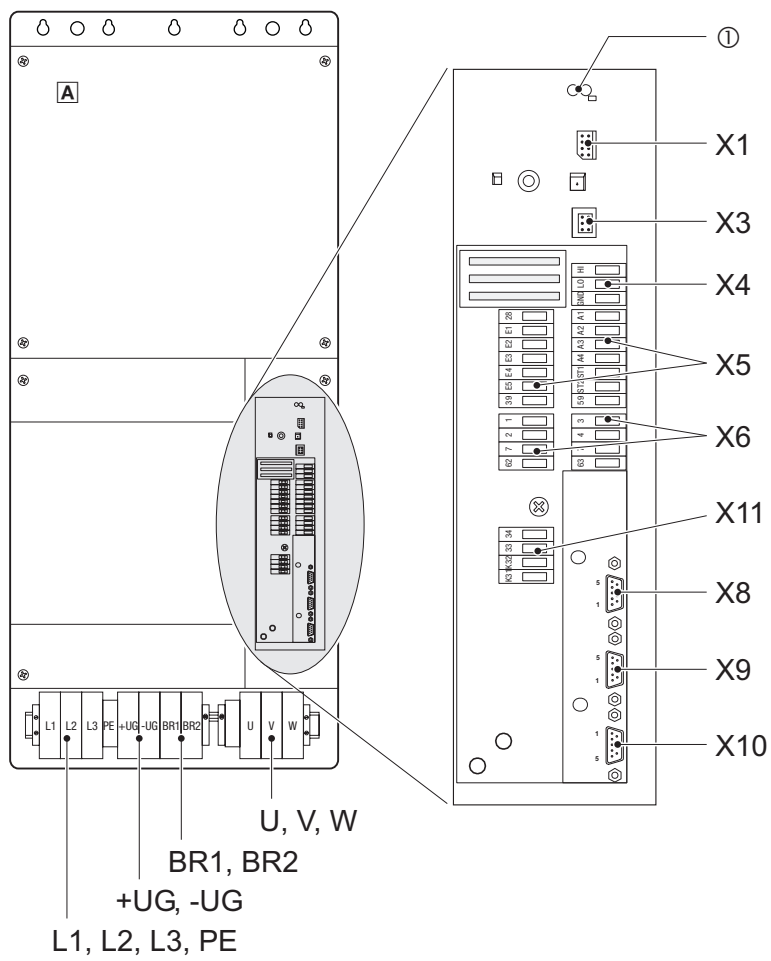
Information for the operator of the machine

9300 vector 110 ... 200 kW



EVF9335-EV ... EVF9338-EV

Frequency inverter



Key for overview

Position	Description
A	9300 vector frequency inverter

Connections and interfaces

Position	Description
L1, L2, L3, PE	Mains connection
+UG, -UG	DC supply (only for the variants V210, V240, V270, V300)
BR1, BR2	Connection of brake resistor (only for the variants V210, V240, V270, V300)
U, V, W, PE	Motor connection
X1	AIF interface (automation interface) slot for communication module (e.g. keypad XT EMZ9371BC)
X3	Jumper for setting the analog input signal at X6/1, X6/2
X4	Terminal strip for connection of system bus (CAN)
X5	Terminal strips for connection of digital inputs and outputs
X6	Terminal strips for connection of analog inputs and outputs
X8	Sub-D connector (male) for connection of incremental encoder with TTL level or sin/cos encoder and KTY thermal sensor of the motor
X9	Sub-D connector (male) for connection of digital frequency input signal
X10	Sub-D connector (female) for connection of digital frequency output signal
X11	Terminal strip for connection of relay output K _{SR} for "safe standstill"

Status displays

Position	LED red	LED green	Operating status
①	Off	On	Controller is enabled
	On	On	Mains is switched on and automatic start is inhibited
	Off	Blinking slowly	Controller is inhibited
	Off	On	Motor data identification is active
	Blinking quickly	Off	Undervoltage or overvoltage
	Blinking slowly	Off	Active fault

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1 About this documentation



Note!

This documentation contains all the information required by the machine operator to run the drive controllers of the 9300 vector series installed in your machine/system.

You may make further use of the information contained in this documentation without asking Lenze for permission if you do not change the contents.

1.1 Document history

What is new / what has changed?

Materialnummer	Version			Beschreibung
13334534	2.0	04/2010	TD23	Neuauflage wegen Neuorganisation des Unternehmens
13238412	1.0	07/2007	TD19	Erstausgabe



Tip!

Documentation and software updates for further Lenze products can be found on the Internet in the "Services & Downloads" area under <http://www.Lenze.com>

1.2 Target group

This documentation is intended for qualified personnel according to IEC 364.

Qualified, skilled personnel are persons who have the qualifications necessary for the work activities to be undertaken during the assembly, installation, commissioning, and operation of the product.

1 About this documentation

Validity information

1.3 Validity information

... 9300 vector frequency inverters as of nameplate data:

		①						②	③	Nameplate	
Type		EVF	93xx	–	x	V	Vxx	1x	7x		
		EVF	93xx	–	x	V	Vxx	Vx	6x		

Controller type
EVF Frequency inverter

Type no. / power
400 V 500 V
9335 110 kW 132 kW
9336 132 kW 160 kW
9337 162 kW 200 kW
9338 200 kW 250 kW

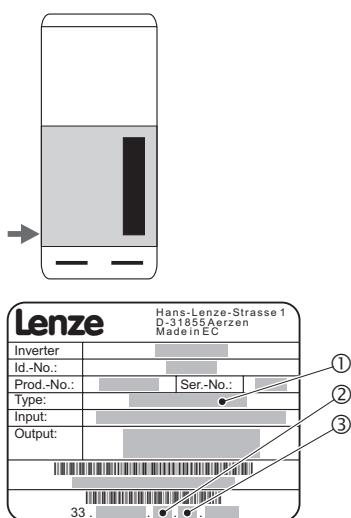
Design
E Built-in unit

Version
V Vector-controlled frequency inverter

Variant		Integrated RFI filter A		Integrated brake transistor	
–	400 V	–	–	–	–
V030	400 V	•	–	–	–
V060	400 V	–	•	–	–
V110	400 V	•	•	–	–
V210	400 V / 500 V	–	–	–	–
V240	400 V / 500 V	•	–	–	–
V270	400 V / 500 V	–	•	–	–
V300	400 V / 500 V	•	•	–	–

Hardware version

Software version



6

Lenze

EDKVF93-04 EN 2.0

1.4 Conventions used

This documentation uses the following conventions to distinguish between different types of information:

Type of information	Identification	Examples/notes
Spelling of numbers		
Decimal separator	language-dependent	In each case, the signs typical for the target language are used as decimal separators. For example: 1234.56 or 1234,56
Warnings		
UL warnings	Ⓐ	Are only given in English.
UR warnings	Ⓜ	
Text		
Program name	» «	PC software For example: »Engineer«, »Global Drive Control« (GDC)
Icons		
Page reference	📖	Reference to another page with additional information For instance: 📖 16 = see page 16

1.5 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:



Danger!

(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
 Danger!	Danger of personal injury through dangerous electrical voltage. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Danger!	Danger of personal injury through a general source of danger. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Stop!	Danger of property damage. Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
 Note!	Important note to ensure troublefree operation
 Tip!	Useful tip for simple handling
	Reference to another documentation

2 Safety instructions

2.1 General safety and application notes for Lenze controllers

(in accordance with Low-Voltage Directive 2006/95/EC)

For your personal safety

Disregarding the following safety measures can lead to severe injury to persons and damage to material:

- ▶ Only use the product as directed.
- ▶ Never commission the product in the event of visible damage.
- ▶ Never commission the product before assembly has been completed.
- ▶ Do not carry out any technical changes on the product.
- ▶ Only use the accessories approved for the product.
- ▶ Only use original spare parts from Lenze.
- ▶ Observe all regulations for the prevention of accidents, directives and laws applicable on site.
- ▶ Transport, installation, commissioning and maintenance work must only be carried out by qualified personnel.
 - Observe IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE 0110 and all national regulations for the prevention of accidents.
 - According to the basic safety information, qualified, skilled personnel are persons who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.
- ▶ Observe all specifications in this documentation.
 - This is the condition for safe and trouble-free operation and the achievement of the specified product features.
 - The procedural notes and circuit details described in this documentation are only proposals. It is up to the user to check whether they can be transferred to the particular applications. Lenze Automation GmbH does not accept any liability for the suitability of the procedures and circuit proposals described.
- ▶ Lenze controllers (frequency inverters, servo inverters, DC speed controllers) and the accessory components can include live and rotating parts - depending on their type of protection - during operation. Surfaces can be hot.
 - Non-authorised removal of the required cover, inappropriate use, incorrect installation or operation create the risk of severe injury to persons or damage to material assets.
 - For more information, please see the documentation.
- ▶ High amounts of energy are produced in the controller. Therefore it is required to wear personal protective equipment (body protection, headgear, eye protection, ear protection, hand guard).

Application as directed

Controllers are components which are designed for installation in electrical systems or machines. They are not to be used as domestic appliances, but only for industrial purposes according to EN 61000-3-2.

When controllers are installed into machines, commissioning (i.e. starting of the operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 98/37/EC (Machinery Directive); EN 60204 must be observed.

Commissioning (i.e. starting of the operation as directed) is only allowed when there is compliance with the EMC Directive (2004/108/EC).

The controllers meet the requirements of the Low-Voltage Directive 2006/95/EC. The harmonised standard EN 61800-5-1 applies to the controllers.

The technical data and supply conditions can be obtained from the nameplate and the documentation. They must be strictly observed.

Warning: Controllers are products which can be installed in drive systems of category C2 according to EN 61800-3. These products can cause radio interferences in residential areas. In this case, special measures can be necessary.

Transport, storage

Please observe the notes on transport, storage, and appropriate handling.

Observe the climatic conditions according to the technical data.

Installation

The controllers must be installed and cooled according to the instructions given in the corresponding documentation.

The ambient air must not exceed degree of pollution 2 according to EN 61800-5-1.

Ensure proper handling and avoid excessive mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts.

Controllers contain electrostatically sensitive devices which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

Electrical connection

When working on live controllers, observe the applicable national regulations for the prevention of accidents (e.g. VBG 4).

The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). Additional information can be obtained from the documentation.

The documentation contains information on the installation according to EMC (shielding, earthing, arrangement of filters, and installation of the cables). Also observe this information with regard to drive controllers labelled with CE marking. The manufacturer of the system or machine is responsible for the compliance of the limit values required in connection with EMC legislation. In order to observe the limit values for radio interference emissions effective at the installation site, you have to mount the drive controllers into housings (e. g. control cabinets). The housings have to enable an EMC-compliant structure. Particularly observe that, for instance, control cabinet doors preferably are metallically connected to the housing in a circumferential manner. Reduce openings or apertures through the housing to a minimum.

Lenze controllers can cause a DC current in the PE conductor. If a residual current device (RCD) is used for the protection in the case of direct or indirect contact on a three-phase supplied controller, only one residual current device of type B is permissible on the current supply side of the controller. If the controller is supplied with one phase, also a residual current device (RCD) of type A may be used. Apart from the use of a residual current device (RCD) also other protective measures can be used, like for instance isolation from the environment by double or reinforced insulation or isolation from the supply system by a transformer.

Operation

If necessary, systems including controllers must be equipped with additional monitoring and protection devices according to the valid safety regulations (e.g. law on technical equipment, regulations for the prevention of accidents). The controllers can be adapted to your application. Please observe the corresponding information given in the documentation.

After the controller has been disconnected from the supply voltage, all live components and power connections must not be touched immediately because capacitors can still be charged. Please observe the corresponding stickers on the controller.

All protection covers and doors must be shut during operation.

Notes for UL-approved systems with integrated controllers: UL warnings are notes that only apply to UL systems. The documentation contains special UL notes.

Safety functions

Special controller variants support safety functions (e.g. "safe torque off", formerly "safe standstill") according to the requirements of appendix I No. 1.2.7 of the EC Directive "Machinery" 98/37/EC, EN 954-1 category 3 and EN 1037. Strictly observe the notes on the safety functions given in the documentation on the respective variants.

Maintenance and servicing

The controllers do not require any maintenance if the prescribed operating conditions are observed.

Disposal

Recycle metals and plastics. Dispose of printed circuit board assemblies according to the state of the art.

The product-specific safety and application notes given in these instructions must be observed!

2.2 Residual hazards

Protection of persons

- ▶ Before working on the controller, check that no voltage is applied to the power terminals:
 - The power terminals U, V, W, +U_G, -U_G, BR1, BR2 and 101 ... 104 remain live for at least five minutes after disconnecting from the mains.
 - The power terminals L1, L2, L3, U, V, W, +U_G, -U_G, BR1, BR2 and 101 ... 104 remain live when the motor is stopped.
- ▶ The leakage current to earth (PE) is >3.5 mA. EN 50178 requires a fixed installation.
- ▶ The heatsink of the controller has an operating temperature of > 80 °C:
 - Direct skin contact causes burns.
- ▶ During the parameter set transfer, the control terminals of the controller can assume undefined states.
 - For this reason, the connectors X5 and X6 have to be unplugged before the transfer is executed. This ensures that the controller is inhibited and all control terminals are in the defined state "LOW".

Device protection

- ▶ Frequent mains switching (e.g. inching mode via mains contactor) can overload and destroy the input current limitation of the controller.
 - Thus, at least five minutes have to pass between two switch-on processes.
 - In case of frequent, safety-related disconnections use the "safe torque off" safety function (STO).

Motor protection

- ▶ Certain drive controller settings can overheat the connected motor:
 - E. g. long-time operation of the DC injection brake.
 - Long-time operation of self-ventilated motors at low speeds.

Protection of the machine/system

- ▶ Drives can reach dangerous overspeeds (e. g. setting of high output frequencies in connection with motors and machines not suitable for this purpose):
 - The drive controllers do not provide protection against such operating conditions. For this purpose, use additional components.

3 Parameter setting

3.1 Parameter setting with the XT EMZ9371BC keypad

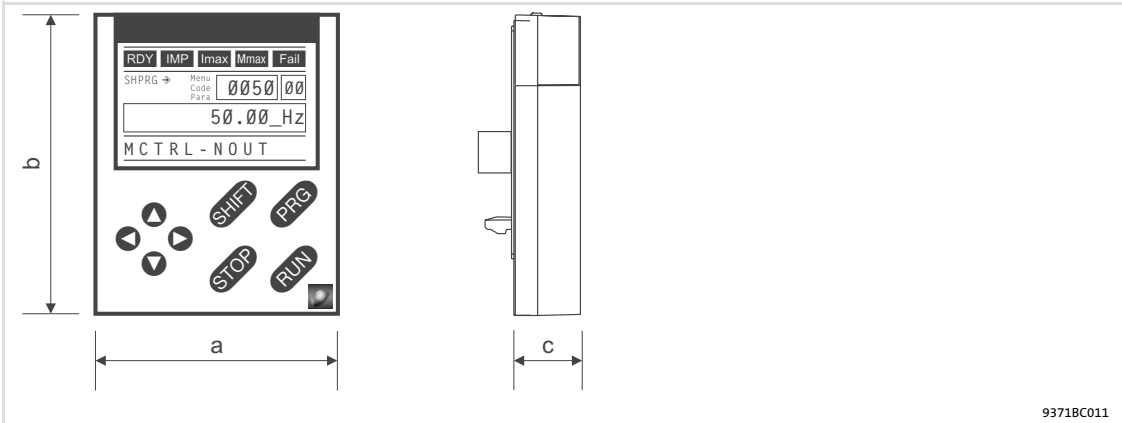
Description

The keypad is available as an accessory. A full description of the keypad can be obtained from the Instructions included in the keypad delivery.

Plugging in the keypad

It is possible to plug the keypad into the AIF interface or remove it during operation.
As soon as the keypad is supplied with voltage, it carries out a self-test. The keypad is ready for operation if it is in display mode.

3.1.1 General data and operating conditions



Feature		Values
Dimensions		
Width	a	60 mm
Height	b	73.5 mm
Depth	c	15 mm
Environmental conditions		
Climate		
Storage	IEC/EN 60721-3-1	1K3 (-25 ... +60 °C)
Transport	IEC/EN 60721-3-2	2K3 (-25 ... +70 °C)
Operation	IEC/EN 60721-3-3	3K3 (-10 ... +60 °C)
Enclosure		IP 20

3.1.2 Installation and commissioning

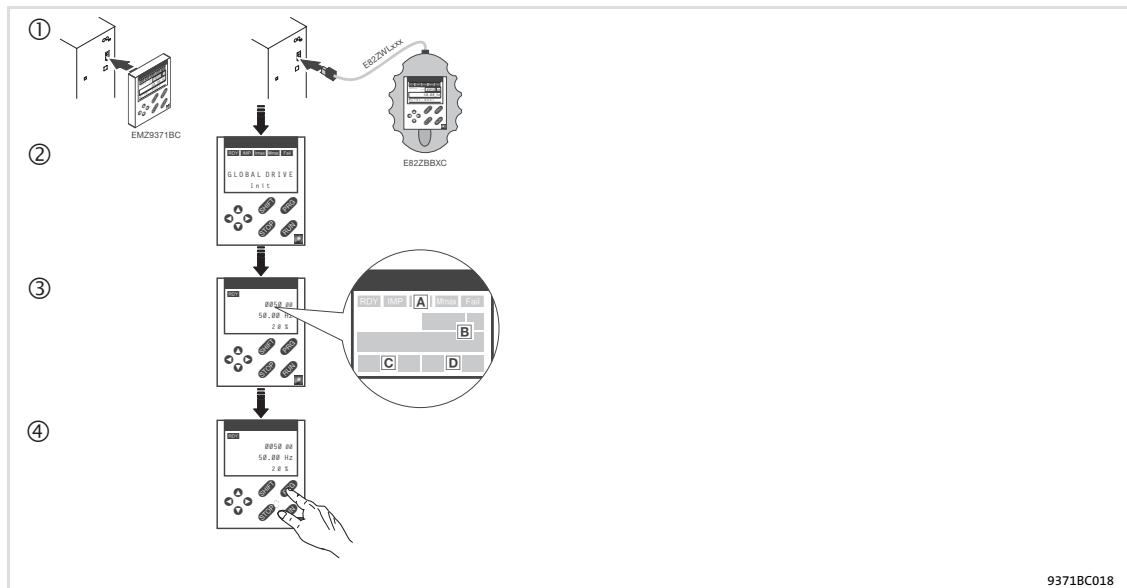


Fig. 3-1 Installation and commissioning of XT EMZ9371BC keypad or E82ZBBXC diagnosis terminal

- ① Connect keypad to the AIF interface on the front of the standard device.
The keypad can be connected/disconnected during operation.
- ② As soon as the keypad is supplied with voltage, it carries out a short self-test.
- ③ The operation level indicates when the keypad is ready for operation:
 - A Current state of the standard device
 - B Memory location 1 of the user menu (C0517):
Code number, subcode number, and current value
 - C Active fault message or additional status message
 - D Actual value in % of the status display defined in C0004
- ④ **PRG** must be pressed to leave the operation level

3.1.3 Display elements and function keys

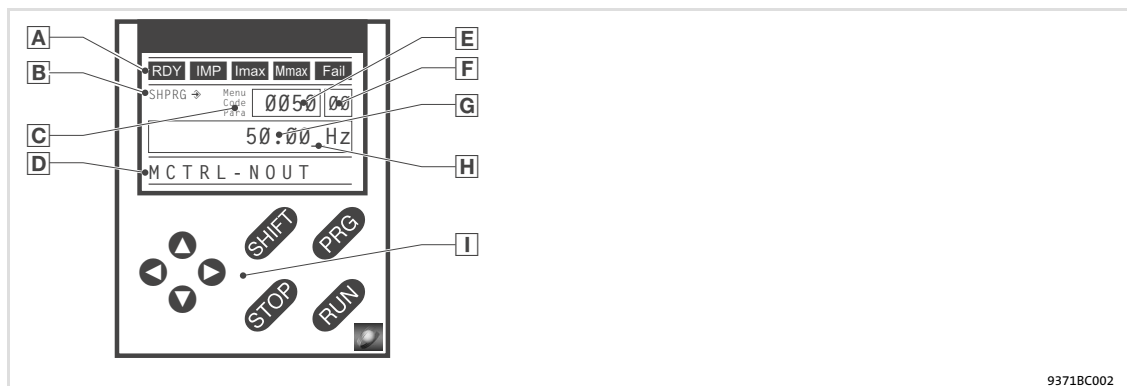


Fig. 3-2 Display elements and function keys of the XT EMZ9371BC keypad

Displays

A Status displays of standard device		
Display	Meaning	Explanation
RDY	Ready for operation	

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Display elements and function keys

IMP	Pulse inhibit is active	Power outputs are inhibited
Imax	The set current limit is exceeded in motor or generator mode	
Mmax	Speed controller 1 in the limitation	Drive is torque-controlled (Only active for operation with standard devices of the 9300 series)
Fault	Active fault	
B Acceptance of the parameters		
Display	Meaning	Explanation
→	Parameter is accepted immediately	Standard device operates immediately with the new parameter value
SHPRG →	Parameter must be acknowledged with SHIFT PRG	Standard device operates with the new parameter value after being acknowledged
SHPRG	Parameter must be acknowledged in case of controller inhibit SHIFT PRG	Standard device operates with the new parameter value after the controller is enabled again
None	Display parameter	Change is not possible
C Active level		
Display	Meaning	Explanation
Menu	Menu level is active	Select main menu and submenus
Code	Code level is active	Select codes and subcodes
Para	Parameter level is active	Change parameters in the codes or subcodes
None	Operating level is active	Display operating parameters
D Short text		
Display	Meaning	Explanation
alphanumeric	Contents of the menus, meaning of the codes and parameters	
	In the operating level display of C0004 in % and the active fault	
E Number		
Active level	Meaning	Explanation
Menu level	Menu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
Code level	Four-digit code number	
F Number		
Active level	Meaning	Explanation
Menu level	Submenu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
Code level	Two-digit subcode number	
G Parameter value		
	Parameter value with unit	
H Cursor		
	In the parameter level, the digit above the cursor can be directly changed	
I Function keys		
	For description see the following table	

Function keys



Note!

Shortcuts with **SHIFT**:

Press and hold **SHIFT**, then press the second key in addition.

Key	Function			
	Menu level	Code level	Parameter level	Operating level
PRG		Change to the parameter level	Change to the operating level	Change to the code level
SHIFT PRG	Go to the "Short setup" menu and load predefined configurations ¹⁾		Accept parameters when SHPRG → or SHPRG is displayed	
▲ ▼	Change between menu items	Change of code number	Change of digit via cursor	
SHIFT ▲ SHIFT ▼	Quick change between menu items	Quick change of code number	Quick change of digit via cursor	
▶ ◀	Change between main menu, submenu and code level		Cursor to the right Cursor to the left	
RUN	Deactivate the function of the key STOP , the LED in the key goes off			
STOP	Inhibit the controller, the LED in the key is lit. Reset fault (TRIP-Reset): 1. Remove the cause of malfunction 2. Press STOP 3. Press RUN			

¹⁾ Only active for operation with standard devices of the 8200 vector or 8200 motec series

3.1.4

Changing and saving parameters



Note!

Your settings have an effect on the current parameters in the main memory. You must save your settings in a parameter set so that they are not lost when the mains are connected.

If you only need one parameter set, save your settings as parameter set 1, since parameter set 1 is loaded automatically after mains connection.

Step	Key sequence	Action
1. Select the menu	▲ ▼ ▶ ◀	Use the arrow keys to select the desired menu
2. Change to the code level	▶	Display of the first code in the menu
3. Select code or subcode	▼ ▲	Display of the current parameter value
4. Change to the parameter level	PRG	
5. When SHPRG is displayed, inhibit the controller	STOP ¹⁾	The drive coasts
6. Change parameter		
	A ▶ ◀	Move cursor below the digit to be changed
	B ▼ ▲	Change of digit
	SHIFT ▼ SHIFT ▲	Quick change of digit
7. Accept the changed parameter		

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Changing and saving parameters

Step		Key sequence	Action
	Display of SHPRG or SHPRG →	SHIFT PRG	Confirm change to accept the parameter Display "OK"
	Display →	-	The parameter has been accepted immediately
8.	Enable the controller, if required	RUN 1)	The drive runs again
9.	Change to the code level		
	A	PRG	Display of the operating level
	B	PRG	Display of the code with changed parameter
10.	Change further parameters		Restart the "loop" with step 1. or 3.
11.	Save changed parameters		
	A	▲ ▼ ► ◀	Select the code C0003 "PAR SAVE" in the menu "Load/Store"
	B	PRG	Change to the parameter level Display "0" and "READY"
	C Select the parameter set in which the parameters are to be saved permanently	▲	Save as parameter set 1: ⇒ Set "1" "Save PS1"
			Save as parameter set 2: ⇒ Set "2" "Save PS2"
			Save as parameter set 3: ⇒ Set "3" "Save PS3"
			Save as parameter set 4: ⇒ Set "4" "Save PS4"
	D	SHIFT PRG	When "OK" is displayed, the settings are permanently saved in the selected parameter set.
12.	Change to the code level		
	A	PRG	Display of the operating level
	B	PRG	Display of C0003 "PAR SAVE"
13.	Set parameters for another parameter set		Restart the "loop" with step 1. or 3.

- 1) The function of the STOP key can be programmed:
C0469 = 1: Controller inhibit
C0469 = 2: Quick stop (Lenze setting)

3.1.5 Loading a parameter set

The keypad serves to load a saved parameter set into the main memory when the controller is inhibited. After the controller is enabled, it operates with the new parameters.



Danger!

- ▶ When a new parameter set is loaded, the controller is reinitialised and acts as if it had been connected to the mains:
 - System configurations and terminal assignments can be changed. Make sure that your wiring and drive configuration comply with the settings of the parameter set.
- ▶ Only use terminal X5/28 as source for the controller inhibit! Otherwise the drive may start in an uncontrolled way when switching over to another parameter set.



Note!

- ▶ After switching on the supply voltage, the controller always loads parameter set 1 into the main memory.
- ▶ It is also possible to load other parameter sets into the main memory via the digital inputs or bus commands.

Step		Key sequence	Action
1.	Inhibit controller		Terminal X5/28 = LOW
2.	Load the saved parameter set into the main memory		
	A	▲ ▼ ▶ ◀	Select the code C0002 "PAR LOAD" in the menu "Load/Store"
	B	PRG	Change to the parameter level The active parameter set is displayed, e. g. display "0" and "Load Default" If you want to restore the delivery status, proceed with D
	Select the parameter set to be loaded	C	▲
			Load parameter set 1: ⇒ Set "1" "Load PS1"
			Load parameter set 2: ⇒ Set "2" "Load PS2"
			Load parameter set 3: ⇒ Set "3" "Load PS3"
			Load parameter set 4: ⇒ Set "4" "Load PS4"
	D	SHIFT PRG	"RDY" goes off. The parameter set is loaded completely into the main memory if "RDY" is displayed again.
3.	Change to the code level		
	A	PRG	Display of the operating level
	B	PRG	Display of C0002 "PAR LOAD"
4.	Enable controller		Terminal X5/28 = HIGH The drive is running with the settings of the loaded parameter set

3.1.6 Transferring parameters to other standard devices

Parameter settings can be easily copied from one standard device to another by using the keypad.

For this purpose use the "Load/Store" menu

**Danger!**

During the parameter transfer from the keypad to the standard device the control terminals can adopt undefined states!

Therefore the plugs X5 and X6 must be disconnected from the standard device before the transfer takes place. This ensures that the controller is inhibited and all control terminals have the defined state "LOW".

Copying parameter sets from the standard device into the keypad**Note!**

After copying the parameter sets into the XT keypad (C0003 = 11), always the parameter set that was loaded last via C0002 is activated.

Like this the current parameters also remain active after copying:

- Save the current parameters in the parameter set before copying and load this parameter set in the controller via C0002.

Step	Key sequence	Action
1. Connect the keypad to standard device 1		
2. Inhibit controller		Terminal X5/28 = LOW The drive coasts.
3. Select C0003 in the "Load/Store" menu	◀ ▶ ◀ ▶	Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys.
4. Change to the parameter level	PRG	Display "0" and "READY"
5. Copy all parameter set into the keypad	▶	The settings saved in the keypad are overwritten. Set "11" "Save extern"
6. Start copying	SHIFT PRG	The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off after approx. one minute, all parameter sets were copied into the keypad. The "RDY" status display is lit.
7. Change to the code level	A PRG	Display of the operating level
	B PRG	Display C0003 and "PAR SAVE"
8. Enable controller		Terminal X5/28 = HIGH
9. Remove keypad from standard device 1		

Copying parameter sets fom keypad into the standard device

Step	Key sequence	Action
1. Connect the keypad to standard device 2		
2. Inhibit controller		Terminal X5/28 = LOW The "IMP" status display is it. The drive coasts
3. Pull the plugs X5 and X6		All control terminals have the defined "LOW" status.
4. Select C0002 in the "Load/Store" menu	▲ ▼ ▶ ◀	Select code C0002 "PAR LOAD" in the "Load/Store" menu using the arrow keys.
5. Change to the parameter level	PRG	The active parameter set is shown, e. g. display "0" and "Load Default"
6. Select the correct copy function		The settings saved in the standard device are overwritten.
Copy all parameter sets available into the EEPROM of the standard device and save them permanently.		- The parameter set that was active before copying is overwritten. - The parameters are not yet active after copying. Select parameter set and load it in the main memory. 19
	▲	Set "20" "ext -> EEPROM"
Copy individual parameter sets into the main memory of the standard device.		
	▲	Copy parameter set 1 into the main memory: Set ⇒ "11" "Load ext PS1"
		Copy parameter set 2 into the main memory: Set ⇒ "12" "Load ext PS2"
		Copy parameter set 3 into the main memory: Set ⇒ "13" "Load ext PS3"
		Copy parameter set 4 into the main memory: Set ⇒ "14" "Load ext PS4"
7. Start copying	SHIFT PRG	The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off, the parameter sets selected were copied into the standard device. The "RDY" status display is lit.
8. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display C0002 and "PAR LOAD"
9. - If the function "Copy all parameter sets into the EEPROM" (C0002 = 20) is selected, they might have to be loaded in the main memory manually. - If the function "Copy individual parameter sets into the main memory" (C0002 = 1x) is selected, they might have to be saved permanently in the EEPROM manually.	▲ ▼ ▶ ◀	Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys and store the contents of the main memory permanently.
10. Plug in plugs X5 and X6		
11. Enable controller		Terminal X5/28 = HIGH The drive is running with the new settings.

3.1.7

Activating password protection

**Note!**

- If the password protection is activated (C0094 = 1 ... 9999), you only have free access to the user menu.
- To access the other menus, you must enter the password. By this, the password protection is annulled until you enter a new password.
- Please observe that the password-protected parameters can be overwritten as well when transferring the parameter sets to other standard devices. The password is not transferred.
- Do not forget your password! If you have forgotten your password, it can only be reset via a PC or a bus system!

Activate password protection

Step	Key sequence	Action
1. Select the "USER menu"	⬅ ➡ ➡ ➡	Change to the user menu using the arrow keys
2. Change to the code level	➡	Display of code C0051 "MCTRL-NACT"
3. Select C0094	⬆	Display of code C0094 "Password"
4. Change to the parameter level	PRG	Display "0" = no password protection
5. Set password		
	A ⬆	Select password (1 ... 9999)
	B SHIFT PRG	Confirm password
6. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"
7. Change to the "USER menu"	⬅ ➡ ➡	

The password protection is active now.

You can only quit the user menu if you re-enter the password and confirm it with SHIFT PRG.

Remove password protection

Step	Key sequence	Action
1. Change to the code level in the user menu	➡	
2. Select C0094	⬆	Display of code C0094 "Password"
3. Change to the parameter level	PRG	Display "9999" = password protection is active
4. Enter password		
	A ⬆	Set valid password
	B SHIFT PRG	Confirm The password protection is deactivated by entering the password once again.
5. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"

The password protection is deactivated now. All menus can be freely accessed again.

3.1.8 Diagnostics

In the "Diagnostic" menu the two submenus "Actual info" and "History" contain all codes for

- monitoring the drive
- fault/error diagnosis

In the operating level, more status messages are displayed. If several status messages are active, the message with the highest priority is displayed.

Priority	Display	Meaning
1	GLOBAL DRIVE INIT	Initialisation or communication error between keypad and controller
2	XXX - TRIP	Active TRIP (contents of C0168/1)
3	XXX - MESSAGE	Active message (contents of C0168/1)
4	Special device states:	
		Switch-on inhibit
5	Source for controller inhibit (the value of C0004 is displayed simultaneously):	
	STP1	9300 servo: Terminal X5/28 ECSxS/P/M/A: Terminal X6/SI1
	STP3	Operating module or LECOM A/B/LI
	STP4	INTERBUS or PROFIBUS-DP
	STP5	9300 servo, ECSxA/E: System bus (CAN) ECSxS/P/M: MotionBus (CAN)
	STP6	C0040
6	Source for quick stop (QSP):	
	QSP-term-Ext	The MCTRL-QSP input of the MCTRL function block is on HIGH signal.
	QSP-C0135	Operating module or LECOM A/B/LI
	QSP-AIF	INTERBUS or PROFIBUS-DP
	QSP-CAN	9300 servo, ECSxA: System bus (CAN) ECSxS/P/M: MotionBus (CAN)
7	XXX - WARNING	Active warning (contents of C0168/1)
8	xxxx	Value below C0004

3.1.9

Menu structure

For simple, user-friendly operation, the codes are clearly arranged in function-related menus:

Main menu	Submenus	Description
Display	Display	
User-Menu		Codes defined in C0517
Code list		All available codes
	ALL	All available codes listed in ascending order (C0001 ... C7999)
	PS 1	Codes in parameter set 1 (C0001 ... C1999)
	PS 2	Codes in parameter set 2 (C2001 ... C3999)
	PS 3	Codes in parameter set 3 (C4001 ... C5999)
	PS 4	Codes in parameter set 4 (C6001 ... C7999)
Load/Store		Parameter set management Parameter set transfer, restore delivery status
Diagnostic		Diagnostic
	Actual info	Display codes to monitor the drive
	History	Fault analysis with history buffer
Short setup		Quick configuration of predefined applications Configuration of the user menu The predefined applications depend on the type of the standard device (frequency inverter, servo inverter, position controller, ...)
Main FB		Configuration of the main function blocks
	NSET	Setpoint processing
	NSET-JOG	Fixed setpoints
	NSET-RAMP1	Ramp function generator
	MCTRL	Motor control
	DFSET	Digital frequency processing
	DCTRL	Internal control
Terminal I/O		Connection of inputs and outputs with internal signals
	AIN1 X6.1/2	Analog input 1
	AIN2 X6.3/4	Analog input 2
	AOUT1 X6.62	Analog output 1
	AOUT2 X6.63	Analog output 2
	DIGIN	Digital inputs
	DIGOUT	Digital outputs
	DFIN	Digital frequency input
	DFOUT	Digital frequency output
	State bus	State bus (not with 9300 frequency inverter)
Controller		Configuration of internal control parameters
	Speed	Speed controller
	Current	Current controller or torque controller
	Phase	Phase controller (not with 9300 frequency inverter)
Motor/Feedb.		Input of motor data, configuration of speed feedback
	Motor adj	Motor data
	Feedback	Configuration of feedback systems
Monitoring		Configuration of monitoring functions

Main menu	Submenus	Description
Display	Display	
LECOM/AIF		Configuration of operation with communication modules
	LECOM A/B	Serial interface
	AIF interface	Process data
	Status word	Display of status words
System bus		Configuration of system bus (CAN)
	Management	CAN communication parameters
	CAN-IN1	CAN object 1
	CAN-OUT1	
	CAN-IN2	CAN object 2
	CAN-OUT2	
	CAN-IN3	CAN object 3
	CAN-OUT3	
	Status word	Display of status words
	FDO	Free digital outputs
	Diagnostic	CAN diagnostic
FB config		Configuration of function blocks
Func blocks		Parameterisation of function blocks The submenus contain all available function blocks
FCODE		Configuration of free codes
Identify		Identification
	Drive	Software version of standard device
	Op Keypad	Software version of keypad

4 Troubleshooting and fault elimination

Display of operating data, diagnostics

Display of operating data

4 Troubleshooting and fault elimination

4.1 Display of operating data, diagnostics

4.1.1 Display of operating data

Description

Important operating parameters are measured by the controller. They can be displayed with the keypad or PC.

Some operating data can be calibrated to be displayed or selected directly with the unit of the process quantity (e.g. pressure, temperature, speed).



Note!

The calibration always affects all specified codes simultaneously.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0051	MCTRL-NACT		-36000	{1 rpm}	36000	Actual speed value, function block MCTRL ● Read only
C0052	MCTRL-Umot		0	{1 V}	800	Motor voltage, function block MCTRL ● Read only ● MCTRL-VACT = 100 % = C0090
C0053	UG-VOLTAGE		0	{1 V}	900	DC-bus voltage, function block MCTRL ● Read only ● MCTRL-DCVOLT = 100 % = 1000 V
C0054	Imot		0.0	{0.1 A}	5000.0	Actual motor current, function block MCTRL ● Read only ● MCTRL-IACT = 100 % = C0022
C0061	Heatsink temp		0	{1 °C}	100	Heatsink temperature ● Read only ● If the temperature of the heatsink > 85 °C, the controller sets TRIP OH ● Early warning is possible via OH4, temperature is set in C0122
C0063	Mot temp		0	{1 °C}	200	Motor temperature ● Read only ● Monitoring of the motor temperature must be activated. ● KTY at X8/5, X8/8: – At 150 °C, TRIP OH3 is set – Early warning is possible via OH7, temperature is set in C0121 ● PTC, thermal contact at T1, T2: – Release sets TRIP or warning OH8

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0064	Utilization		0 {1 %} 150				Device utilisation I×t - Read only - Device utilisation during the last 180 s of operating time - C0064 > 100 % releases warning <i>ÜCS</i> - C0064 > 140 % limits the output current of the controller to 67 % of the maximum current in C0022
C0150	Status word		Bit00	–	Bit08	Status code	Read only Decimal status word for networking via automation interface (AIF) Binary interpretation indicates the bit states
			Bit01	IMP	Bit09	Status code	
			Bit02	–	Bit10	Status code	
			Bit03	–	Bit11	Status code	
			Bit04	–	Bit12	Warning	
			Bit05	–	Bit13	Message	
			Bit06	n = 0	Bit14	–	
			Bit07	CINH	Bit15	–	

4.1.2 Diagnostics

Description

Display codes for diagnostics

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0093	Drive ident					Controller identification	
						Read only	
			0	Invalid		Defective power section	
			1	None		No power section	
			14	9335VC 400V		Display of the controller used	
			...	...			
			20	9383VC 400V			
			21	9334VC 500V			
			...	...			
C0099	S/W version		28	9383VC 500V		Software version	
			9321	9321 VC			
			...	...			
			9333	9333VC			
			x.y			Software version Read only	
			x	Main version			
			y	Subversion			

4 Troubleshooting and fault elimination

Troubleshooting

Status display via LEDs at the controller

4.2 Troubleshooting

Detecting breakdowns

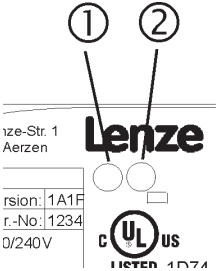
A breakdown can be detected quickly via the LEDs at the controller or via the status information at the keypad.

Analysing errors

Analyse the error using the history buffer. The list of fault messages gives you advice how to remove the fault. (📖 35)

4.2.1 Status display via LEDs at the controller

During operation the operating status of the controller is shown by 2 LEDs.

LED		Operating status	
Red ①	Green ②		
Off	On	Controller is enabled	
On	On	Mains is switched on and automatic start is inhibited	
Off	Blinking slowly	Controller is inhibited	
Off	On	Motor data identification is being performed	
Blinking quickly	Off	Undervoltage	
Blinking slowly	Off	Active fault	

4.2.2 Fault analysis with the history buffer

Retracing faults

Faults can be retraced via the history buffer. Fault messages are stored in the 8 memory locations in the order of their appearance.

The memory locations can be retrieved via codes.

Structure of the history buffer

Code			Memory location	Entry	Note
C0168/1	C0169/1	C0170/1	Memory location 1	Active fault	If the fault is no longer pending or has been acknowledged: - The contents of the memory locations 1 ... 7 are shifted "up" to the next memory location. - The content of memory location 8 is deleted from the history buffer and cannot be retrieved anymore. - Memory location 1 is deleted (= no active fault).
C0168/2	C0169/2	C0170/2	Memory location 2	Last fault	
C0168/3	C0169/3	C0170/3	Memory location 3	Last but one fault	
C0168/4	C0169/4	C0170/4	Memory location 4	Last but two fault	
C0168/5	C0169/5	C0170/5	Memory location 5	Last but three fault	
C0168/6	C0169/6	C0170/6	Memory location 6	Last but four fault	
C0168/7	C0169/7	C0170/7	Memory location 7	Last but five fault	
C0168/8	C0169/8	C0170/8	Memory location 8	Last but six fault	

Explanations regarding the codes

C0168	Fault indication and response - The entry is effected as a LECOM error number - If several faults with different responses occur at the same time: - Only the fault with the highest priority response is entered (1. TRIP, 2. message, 3. warning). - If several faults with the same response (e.g. 2 messages) occur at the same time: - Only the fault which occurred first is entered.
C0169	Time of fault occurrence - The reference time is provided by the power-on time meter (C0179). - If the same fault occurs several times in succession, only the time of the last occurrence is stored.
C0170	Fault frequency Only the time of the last occurrence is stored.

Clear history buffer

Set C0167 = 1 to clear the history buffer.

4.3 Drive behaviour in the event of faults

The controller responds differently to the three possible fault types TRIP, message, or warning:

TRIP

TRIP (display in keypad XT:  )

- ▶ Switches the power outputs U, V, W to a high-resistance state until TRIP reset is executed.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ The drive coasts without any control!
- ▶ After TRIP reset ( 40):
 - The drive travels along the ramps to its setpoint.
 - The fault indication is moved to C0168/2 as "last fault".

Messages

Message (display in keypad XT:  )

- ▶ Switches the power outputs U, V, W to a high-resistance state.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ In case of a fault ≤ 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint with maximum torque.
- ▶ In case of a fault > 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint along the adjusted ramps.
- ▶ If the message is not active anymore, the fault indication is moved to C0168/2 as "last fault".

Warnings

"Heatsink overtemperature" (keypad XT:   )

- ▶ The drive continues to travel in a controlled way!
- ▶ The warning signal goes off when the fault is not active anymore.

"Error in motor phase" (keypad XT: )

"PTC monitoring" (keypad XT: )

- ▶ The drive continues to travel in a controlled way!
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ After TRIP reset, the fault indication is moved to C0168/2 as "last fault".

4.4 Fault elimination

4.4.1 Drive errors

Malfunction	Cause	Remedy
An asynchronous motor with feedback rotates in an uncontrolled manner and with low speed	The motor phases are reversed so that the rotating field of the motor is not identical with the rotating field of the feedback system. The drive shows the following behaviour: • V/f characteristic control (C0006 = 5) – The motor rotates faster than the speed setpoint by the value set in C0074 (influence of the speed controller, Lenze setting 10 % of n_{max}). After the controller is enabled, it does not stop at zero speed setpoint or quick stop (QSP). – The final motor current depends, among other things, on the set value of the V_{min} boost (C0016) and can rise to I_{max} (C0022). This may activate the fault message OC5. • Vector control (C0006 = 1) – The motor rotates slowly with maximum slip speed (depending on motor data and maximum current) and does not react to a speed setpoint. The direction of rotation, however, is determined by the sign of the speed setpoint. – The motor current rises up to I_{max} (C0022). This may activate the fault message OC5 with a time delay.	• Check motor cable for correct phase relation. • If possible, operate the motor with deactivated feedback (C0025 = 1) and check the direction of rotation of the motor.
Motor does not rotate although the controller is enabled (IMP is off) and a speed setpoint has been specified.	The two terminal strips X5 are reversed. Since X5/A1 and X5/28 face each other, the controller can be enabled if the control terminals are internally supplied. All other connections, however, are assigned incorrectly so that the motor cannot start.	Check the position of the terminal strips: • If you look at the connection unit in reading direction, the left terminal strip X5 must be connected with the input signals and the right terminal strip X5 must be connected with the output signals.
The monitoring of the motor phases (LP1) does not respond if a motor phase is interrupted, although C0597 = 0 or 2	The function block MLP1 is not entered into the processing table.	Enter the function block MLP1 into the processing table. The function block MLP1 requires 30 μ s of calculating time.
If during high speeds DC-injection braking (GSB) is activated, the fault OC1 (TRIP) or OU (TRIP) occurs	During DC-injection braking the controller sets pulse inhibit for a short time (DCTRL-IMP) to reduce the magnetisation in the motor before a DC voltage is injected into the motor. At high speeds (e. g. in case of mid-frequency motors) the residual voltage which develops from the residual magnetism and high speed can generate such a high motor current that OC1 or OU are activated.	Prolong the duration of the pulse inhibit: • Connect the output signal DCTRL-IMP to the function block TRANSx and adjust the desired switch-off time there (usually 500 ms). If DCTRL-CINH1 is set to HIGH, the duration of the pulse inhibit is prolonged by the time adjusted.

4.4.2 Controller in clamp operation

The clamp operation is a permissible operating mode. But since, however, pulse inhibit is set again and again, the controller cannot provide the optimum power.

If the output power is optimal, the output current mainly is right below the clamp threshold.

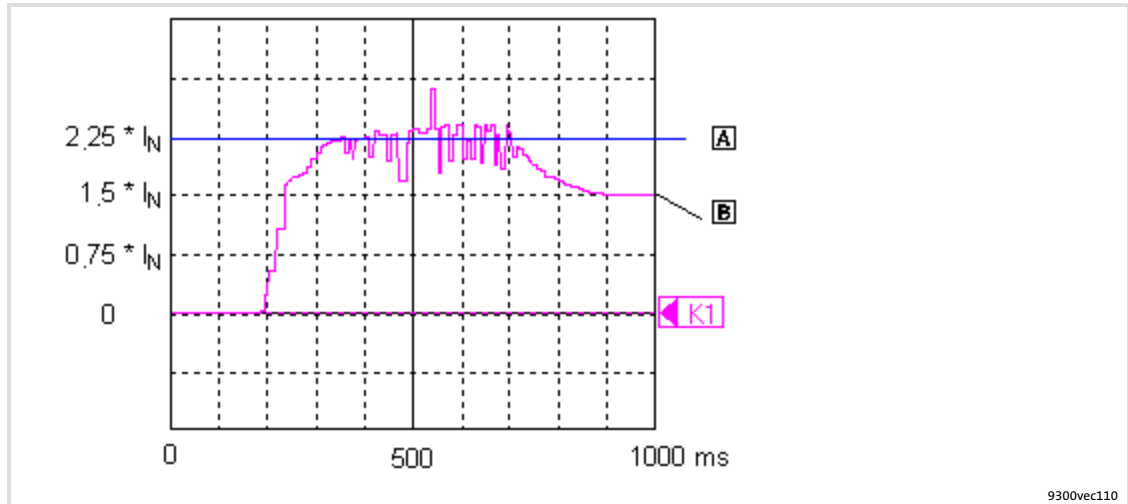


Fig. 4-1 Output current when starting a motor with high load (shown with the oscilloscope in GDC)

- Ⓐ Clamp threshold
- Ⓑ Output current

Function

1. When the output current reaches $2.25 \times I_r$, a software clamp is activated.
2. The controller sets pulse inhibit for a short time. The motor current decreases as a function of the inductance in the motor circuit.
 - An internal counter is increased by the value one.
3. After max. 250 μ s the pulse inhibit is deactivated.
4. If a software clamp reoccurs within 2 s, the internal counter is again increased by the value one. Otherwise the counter is set to zero.
 - If the counter reaches the value 4300, OC3 (TRIP) is activated.

If the DC-bus voltage (U_{DC}) exceeds the switch-off threshold OU, pulse inhibit will be set. At the same time, an internal timer for a delay time (C0912) will be started.

Pulse inhibit will be reset, if the voltage falls below the switch-on threshold OU and the delay time has elapsed.

Thresholds for DC-bus overvoltage (OU)

Types EVF93xx-EVV210, EVF93xx-EVV240, EVF93xx-EVV270 and EVF93xx-EVV300				
Mains voltage range		C0173	Switch-off threshold OU	Switch-on threshold OU
< 400 V	Operation with or without brake transistor	0	770 V	755 V
400 V	Operation with or without brake transistor	1 *	770 V	755 V
460 V	Operation with or without brake transistor	2	770 V	755 V
480 V	Brake transistor	3	770 V	755 V
480 V	Brake transistor	4	800 V	785 V
500 V	Operation with or without brake transistor	5	900 V	885 V

* Lenze setting

Types EVF93xx-EV, EVF93xx-EVV060 and EVF93xx-EVV110				
Mains voltage range		C0173	Switch-off threshold OU	Switch-on threshold OU
400 V	Operation with or without brake transistor	Read only	700 V	685 V

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0912	OV delay time	→	{1 ms}	- Delay time of the pulse enable after an OU message → Depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 - A change of one of the codes resets C0912 to the time of the selected motor • The time is derived from the double rotor time constant

Adjustment

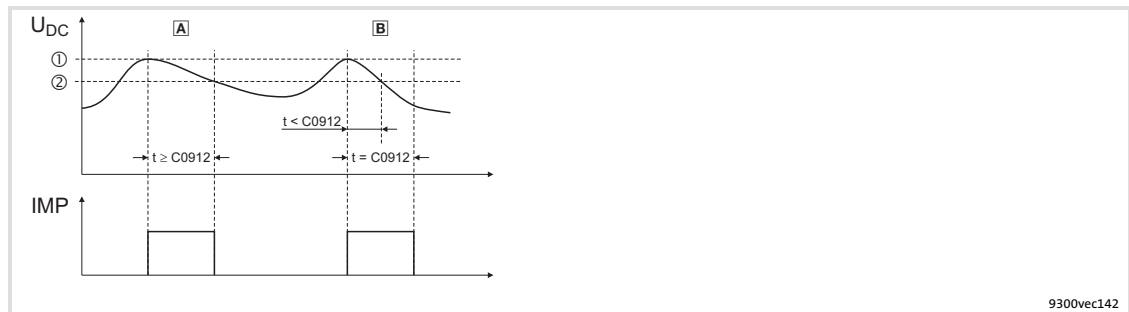


Fig. 4-2 Influence of the delay time (C0912)

① Switch-off threshold OU

② Switch-on threshold OU

A The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU equals or is higher than the delay time set in C0912.

After undershooting the switch-on threshold OU, the pulse inhibit is deactivated.

B The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU is lower than the delay time set in C0912.

The pulse inhibit is deactivated after the delay time in C0912 has elapsed.

- The delay time in [ms] is set under C0912. The Lenze setting can be changed by the factor 0.5 ... 2.

4.5 System error messages

4.5.1 General error messages



Note!

If you use GDC or a fieldbus module to retrieve the fault (C0168/x), the error message will be represented by an error number.

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
---	---	No fault	—	—
CCr	x071	System fault	Processor is overloaded or there is a fault in the program processing	Reduce processor load. Remove function blocks that are not needed from the processing table
			Strong interference on control cables	Shield control cables
			Ground or earth loops in the wiring	Check wiring
CE0	x061	Communication error	Fault during transmission of control commands via automation interface X1	Plug in automation module firmly, bolt down, if necessary
CE1	x062	Communication error at the process data input object CAN-IN1	CAN-IN1 object receives faulty data, or communication is interrupted	• Check cable at X4 • Check sender • Increase monitoring time under C0357/1 if necessary
CE2	x063	Communication error at the process data input object CAN-IN2	CAN-IN2 object receives faulty data, or communication is interrupted	• Check cable at X4 • Check sender • Increase monitoring time under C0357/2 if necessary
CE3	x064	Communication error at the process data input object CAN-IN3	CAN-IN3 object receives faulty data, or communication is interrupted	• Check cable at X4 • Check sender • Increase monitoring time under C0357/3 if necessary
CE4	x065	BUS-OFF state	Controller has received too many incorrect telegrams via system bus X4, and has disconnected from the bus	• Check wiring • Check bus termination (if any) • Check shield contact of the cables • Check PE connection • Check bus load • Reduce baud rate (observe cable length)
EEr	x091	External fault (TRIP-Set)	A digital input assigned with TRIP-set function has been activated (in the most basic configurations the input X5/E4 is LOW-active and linked with the TRIP-set function)	• Check external encoder • Check signal at the digital input X5/E4: – Either connect HIGH level or – Change polarity in C0114 to HIGH-active. CAUTION! When changing to HIGH level, the wire-break protection gets lost.
			The two terminal strips at X5 are reversed	Check the position of the terminal strips: • If you look at the connection unit in reading direction, the left terminal strip X5 must be connected with the input signals and the right terminal strip X5 must be connected with the output signals.
H05	x105	Internal fault		Contact Lenze
H07	x107	Wrong power stage	During initialisation of the controller, a wrong power stage was detected	Contact Lenze

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
H10	x110	Sensor fault - heatsink temperature	Sensor of the heatsink temperature detection indicates undefined values	Contact Lenze Fault message can only be reset by mains switching
H11	x111	Sensor fault - temperature inside the device	Sensor of the internal temperature detection indicates undefined values	Contact Lenze Fault message can only be reset by mains switching
ID1	x140	Error during motor data identification	- No motor connected - Stator resistance too high - Controller inhibited externally	- Check motor connection - Check motor data entry - Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
ID2	x141	Error during motor data identification	Motor too small	- Check entered motor data – When setting parameters with Global Drive Control, use the input assistant for motor data - The measurements for the inverter error characteristic and the stator resistance are correct (save measured values in C0003). In the operating mode U/f characteristic control, the motor data identification can be completed.
			Controller inhibited externally	Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
LP1	x032	Motor phase failure	A current-carrying motor phase has failed	- Check motor - Check supply cables
			The current limit is set too high	Set a lower current limit value under C0599
			This monitoring is not suitable for field frequencies >480 Hz and synchronous servo motors	Deactivate monitoring with C0597= 3
LU	x030	Undervoltage	DC bus voltage is smaller than the value set under C0173	- Check mains voltage - Check supply module
NMAX	x200	Maximum system speed exceeded (C0596)	Active load too high	Check drive dimensioning
			Drive is not speed-controlled, torque excessively limited	If required, increase torque limit
			Current speed is detected incorrectly	Check parameter setting of the incremental encoder (C0025)
OC1	x011	Overcurrent (motor current > 2.25-fold rated controller current, hardware monitoring)	Short circuit/earth fault	- Remove cause of short circuit/earth fault - Check motor and cable - If required, measure the insulation resistance
			Capacitive charging current of the motor cable too high (especially with lower powers)	Use shorter or low-capacitance motor cable
			Acceleration/deceleration times too short in proportion to the load (C0012, C0013, C0105)	- Increase the gain (P component) of the current controller (C0075) - Reduce integral-action time (integral action component) of the I_{max} controller (C0076)

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
			The drive is connected to the coasting machine. The coasting is caused by a short-time pulse inhibit, e.g. at - OU (overvoltage in the DC bus) - external or internal controller inhibit	- Activate flying restart circuit - Operate with speed feedback in the vector control operating mode
			- Encoder error - Tracks for encoder feedback of the motor speed are reversed	- Check wiring of the encoder - In case of drive problems with activated feedback, the feedback can be analysed. Here, the signal of the feedback is not used for control. For this test the function block DFIN must be entered into the processing table. In the Lenze setting, DFIN is entered at position 1 of the processing table (C0465/1 = 200). - Deactivate feedback with C0025 = 1 - Connect feedback at the digital frequency input DFIN (X9) - Set DFIN constant (C0425) to the number of increments of the encoder - In C0426, the speed detected by the encoder is indicated
			DC-injection braking at high speeds	See 31
OC2	x012	Earth fault	One of the motor phases has earth contact	- Check motor - Check supply cables
			Excessive capacitive charging current of the motor cable	Use motor cable which is shorter or of lower capacitance
OC3	x013	Overload during acceleration	Acceleration/deceleration times too short in proportion to the load (C0012, C0013, C0105)	- Increase the gain (P component) of the current controller (C0075) - Reduce integral-action time (integral action component) of the $I_{\max}$ controller (C0076) - Increase ramp times 32, "controller in clamp operation (fault OC3)"
OC5	x015	$I \times t$ overload	The utilisation of the controller exceeds 100 % (C0064 > 100 %)	Check drive dimensioning - The utilisation of the controller is calculated from the mean value of the motor current over a time of 180 s. When operating with rated power (150 % overload capacity), the controller can be operated at a utilisation of up to 100 %. - When C0064 = 95 %, the warning is cancelled.
			The utilisation of the controller exceeds 110 % (C0064 > 110 %) The maximum current is reduced	Check drive dimensioning - When C0064 = 95 %, the reduction of the maximum current is cancelled. The warning is cancelled. - NOTE: Operation at increased rated power (120 % overload capacity) is not possible.
			Reversed motor phases when operating with feedback or reversed encoder tracks so that the direction of rotation has changed	- Check the motor cable connection for correct phase relation - If possible, operate the motor with deactivated feedback (C0025 = 1) and check the direction of rotation of the motor. - See also 31

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
OH	x050	Heatsink temperature is higher than the value set in the controller	Ambient temperature $T_u > 40\text{ °C}$ or 50 °C	- Allow controller to cool and ensure better ventilation - Check ambient temperature in the control cabinet
			Heatsink very dirty	Clean heatsink
			Wrong mounting position	Change mounting position
OH3	x053	Motor temperature is higher than the value set in the controller	Motor too hot because of excessive current or frequent and too long acceleration	Check drive dimensioning
			No KTY is connected to X8	Connect KTY or switch off monitoring (C0583 = 3)
OH4	x054	Heatsink temperature is higher than the value set in C0122	Ambient temperature $T_u > 40\text{ °C}$ or 50 °C .	- Allow controller to cool and ensure better ventilation - Check ambient temperature in the control cabinet
			Heatsink very dirty	Clean heatsink
			Wrong mounting position	Change mounting position
			The value entered in C0122 is too low	Enter higher value
OH7	x057	Motor temperature is higher than the value set in C0121	Motor too hot because of excessive current or frequent and too long acceleration	Check drive dimensioning
			No KTY is connected to X8	Connect KTY or switch off monitoring (C0584 = 3)
			The value entered in C0121 is too low	Enter higher value
OH8	x058	PTC at terminals T1, T2 indicates motor overheating	Motor too hot because of excessive current or frequent and too long acceleration	Check drive dimensioning
			Terminals T1, T2 are not assigned	Connect PTC or thermal contact or switch off monitoring (C0585=3)
OU	x020	Overvoltage in the DC bus	Only for variants V210, V240, V270, V300: - Wrong values in C0173 - Wrong values in C0174	- Set correct values in C0173 - Set correct values in C0174
PEr	x074	Program fault	An error has been detected in the program flow. The parameter set 1 is loaded automatically. Parameter data which has been changed and not has been saved, will get lost.	Contact Lenze
PI	x079	Initialisation error	- A fault was detected during transfer of parameter sets between the controllers - Parameter set does not match the controller	Correct parameter set
PR0	x075	Parameter set error	Error while loading a parameter set. The parameters saved do not match the software version of the controller. CAUTION! The Lenze setting is loaded automatically.	- Correct parameter set - Save all parameter sets with C0003 and reset the fault message by mains switching
PR1 PR2 PR3 PR4	x072 x073 x077 x078	Parameter set error	- Fault while loading a parameter set - The transmission of parameter sets with keypad XT has been interrupted (e.g. by an early disconnection of the keypad XT) CAUTION! The Lenze setting is loaded automatically.	Set the required parameters and save them with C0003
Sd3	x083	Encoder error at X9	Cable interrupted	Check cable for wire breakage

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
			Pin X9/8 is not assigned	Assign pin X9/8 with 5 V or switch off monitoring (C0587 = 3)
Sd5	x085	Encoder at X6/1, X6/2 is defective	Current at X6/1, X6/2 < 2 mA	• Check cable for wire breakage • Check encoder
Sd6	x086	Sensor error at X8	KTY at X8 indicates undefined values	• Check supply cable for firm connection • Switch off monitoring with C0594 = 3 if necessary

4.5.2 Resetting system error messages

Eliminate the cause of TRIP fault message

After you have eliminated the cause of a TRIP fault message, you must reset the fault message with the command "TRIP reset". Only then the drive restarts.

**Note!**

A TRIP fault message can have several causes. Only if all causes of the TRIP have been eliminated, the TRIP reset can be executed.

TRIP reset

- ▶ Keypad XT: Press **STOP**. Then press **RUN** to enable the controller.
- ▶ Fieldbus module: Set C0043 = 0
- ▶ Control word: C0135
- ▶ Terminal: X5/E5 = HIGH
- ▶ Control word via AIF
- ▶ Control word via system bus (CAN)

Mains switching always executes TRIP reset.

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0043	Trip reset	0	0 no/trip reset	Reset actual error
			1 trip active	There is a TRIP error



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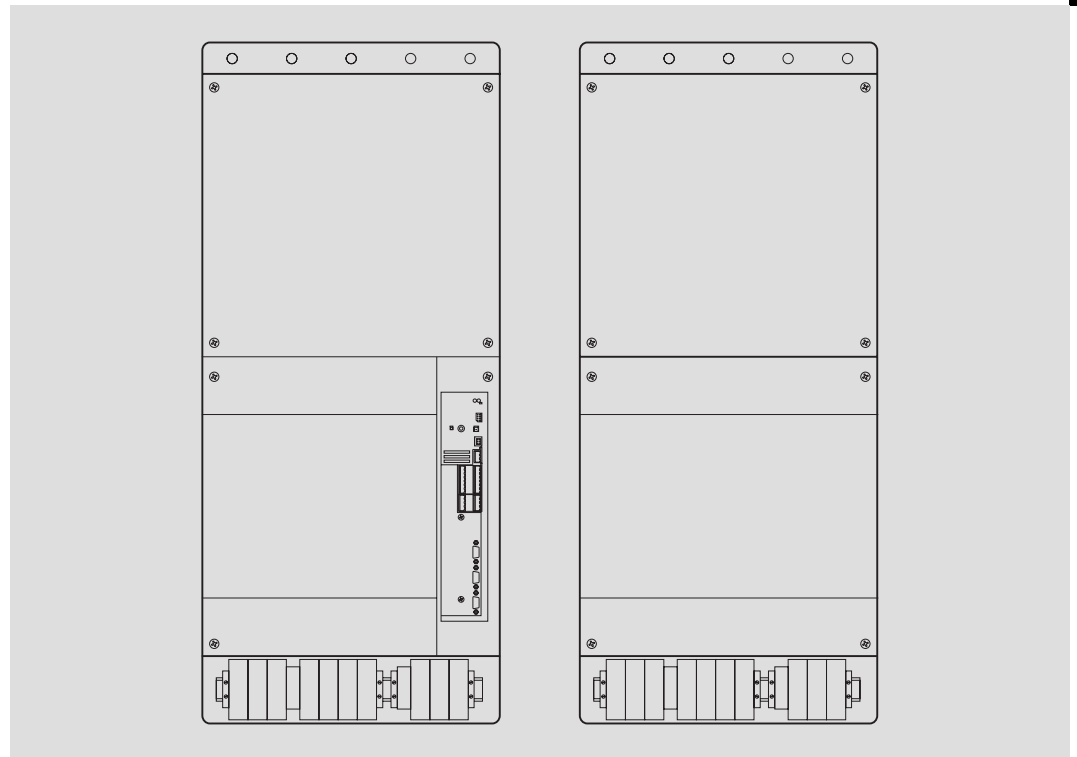
EDKVF93-04 ■ 13334534 ■ EN ■ 2.0 ■ TD23

10 9 8 7 6 5 4 3 2 1



Information for the operator of the machine

9300 vector 250 ... 400 kW



EVF9381-EV ... EVF9383-EV

Frequency inverter

Key for overview

Position	Description
A	9300 vector frequency inverter - master
B	9300 vector frequency inverter - slave

Connections and interfaces

Position	Description
L1, L2, L3, PE	Mains connection
+UG, -UG	DC supply (only for the variants V210, V240, V270, V300)
BR1, BR2	Connection of brake resistor (only for the variants V210, V240, V270, V300)
U, V, W, PE	Motor connection
X1	AIF interface (automation interface) slot for communication module (e.g. keypad XT EMZ9371BC)
X3	Jumper for setting the analog input signal at X6/1, X6/2
X4	Terminal strip for connection of system bus (CAN)
X5	Terminal strips for connection of digital inputs and outputs
X6	Terminal strips for connection of analog inputs and outputs
X8	Sub-D connector (male) for connection of incremental encoder with TTL level or sin/cos encoder and KTY thermal sensor of the motor
X9	Sub-D connector (male) for connection of digital frequency input signal
X10	Sub-D connector (female) for connection of digital frequency output signal
X11	Terminal strip for connection of relay output K _{SR} for "safe standstill"

Status displays

Position	LED red	LED green	Operating status
①	Off	On	Controller is enabled
	On	On	Mains is switched on and automatic start is inhibited
	Off	Blinking slowly	Controller is inhibited
	Off	On	Motor data identification is active
	Blinking quickly	Off	Undervoltage or overvoltage
	Blinking slowly	Off	Active fault

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1 About this documentation



Note!

This documentation contains all the information required by the machine operator to run the drive controllers of the 9300 vector series installed in your machine/system.

You may make further use of the information contained in this documentation without asking Lenze for permission if you do not change the contents.

1.1 Document history

What is new / what has changed?

Materialnummer	Version			Beschreibung
13334896	2.0	04/2010	TD23	New edition due to reorganisation of the company
13218562	1.0	08/2007	TD19	Erstausgabe



Tip!

Documentation and software updates for further Lenze products can be found on the Internet in the "Services & Downloads" area under <http://www.Lenze.com>

1.2 Target group

This documentation is intended for qualified personnel according to IEC 364.

Qualified, skilled personnel are persons who have the qualifications necessary for the work activities to be undertaken during the assembly, installation, commissioning, and operation of the product.

1 About this documentation

Validity information

1.3 Validity information

... 9300 vector frequency inverters as of nameplate data:

Type				①	②	③	Nameplate
EVF	93xx	–	x	V	Vxx	1x	7x
EVF	93xx	–	x	V	Vxx	Vx	6x

Product series			
EVF	Frequency inverter		
	EVM: Master of EVF		
	EVL: Slave of EVF		

Type no. / power			
	400 V	500 V	
9381	250 kW	315 kW	
9382	315 kW	400 kW	
9383	400 kW	500 kW	

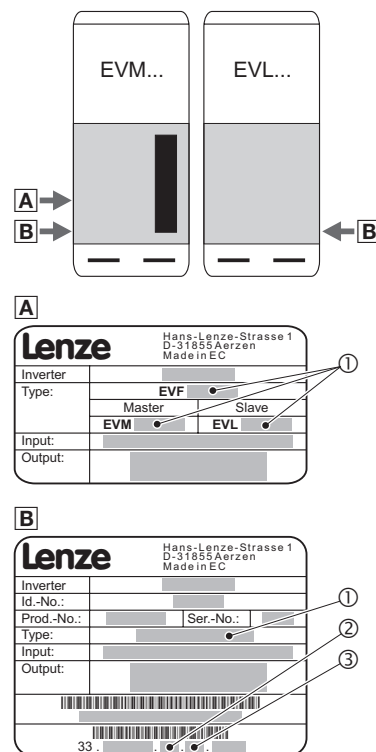
Type			
E	Built-in unit		

Design			
V	Vector-controlled frequency inverter		
X	Slave		

Variant		Integrated RFI filter A		Integrated brake transistor	
–	400 V	–	–	–	–
V030	400 V	•	–	–	–
V060	400 V	–	•	–	–
V110	400 V	•	•	–	–
V210	400 V / 500 V	–	–	–	–
V240	400 V / 500 V	•	–	–	–
V270	400 V / 500 V	–	•	–	–
V300	400 V / 500 V	•	•	–	–

Hardware version			

Software version			
–	Slave (no software version)		



1.4 Conventions used

This documentation uses the following conventions to distinguish between different types of information:

Type of information	Identification	Examples/notes
Spelling of numbers		
Decimal separator	language-dependent	In each case, the signs typical for the target language are used as decimal separators. For example: 1234.56 or 1234,56
Warnings		
UL warnings	Ⓐ	Are only given in English.
UR warnings	Ⓜ	
Text		
Program name	» «	PC software For example: »Engineer«, »Global Drive Control« (GDC)
Icons		
Page reference	📖	Reference to another page with additional information For instance: 📖 16 = see page 16

1.5 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:



Danger!

(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
 Danger!	Danger of personal injury through dangerous electrical voltage. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Danger!	Danger of personal injury through a general source of danger. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Stop!	Danger of property damage. Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
 Note!	Important note to ensure troublefree operation
 Tip!	Useful tip for simple handling
	Reference to another documentation

2 Safety instructions

2.1 General safety and application notes for Lenze controllers

(in accordance with Low-Voltage Directive 2006/95/EC)

For your personal safety

Disregarding the following safety measures can lead to severe injury to persons and damage to material:

- ▶ Only use the product as directed.
- ▶ Never commission the product in the event of visible damage.
- ▶ Never commission the product before assembly has been completed.
- ▶ Do not carry out any technical changes on the product.
- ▶ Only use the accessories approved for the product.
- ▶ Only use original spare parts from Lenze.
- ▶ Observe all regulations for the prevention of accidents, directives and laws applicable on site.
- ▶ Transport, installation, commissioning and maintenance work must only be carried out by qualified personnel.
 - Observe IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE 0110 and all national regulations for the prevention of accidents.
 - According to the basic safety information, qualified, skilled personnel are persons who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.
- ▶ Observe all specifications in this documentation.
 - This is the condition for safe and trouble-free operation and the achievement of the specified product features.
 - The procedural notes and circuit details described in this documentation are only proposals. It is up to the user to check whether they can be transferred to the particular applications. Lenze Automation GmbH does not accept any liability for the suitability of the procedures and circuit proposals described.
- ▶ Lenze controllers (frequency inverters, servo inverters, DC speed controllers) and the accessory components can include live and rotating parts - depending on their type of protection - during operation. Surfaces can be hot.
 - Non-authorised removal of the required cover, inappropriate use, incorrect installation or operation create the risk of severe injury to persons or damage to material assets.
 - For more information, please see the documentation.
- ▶ High amounts of energy are produced in the controller. Therefore it is required to wear personal protective equipment (body protection, headgear, eye protection, ear protection, hand guard).

Application as directed

Controllers are components which are designed for installation in electrical systems or machines. They are not to be used as domestic appliances, but only for industrial purposes according to EN 61000-3-2.

When controllers are installed into machines, commissioning (i.e. starting of the operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 98/37/EC (Machinery Directive); EN 60204 must be observed.

Commissioning (i.e. starting of the operation as directed) is only allowed when there is compliance with the EMC Directive (2004/108/EC).

The controllers meet the requirements of the Low-Voltage Directive 2006/95/EC. The harmonised standard EN 61800-5-1 applies to the controllers.

The technical data and supply conditions can be obtained from the nameplate and the documentation. They must be strictly observed.

Warning: Controllers are products which can be installed in drive systems of category C2 according to EN 61800-3. These products can cause radio interferences in residential areas. In this case, special measures can be necessary.

Transport, storage

Please observe the notes on transport, storage, and appropriate handling.

Observe the climatic conditions according to the technical data.

Installation

The controllers must be installed and cooled according to the instructions given in the corresponding documentation.

The ambient air must not exceed degree of pollution 2 according to EN 61800-5-1.

Ensure proper handling and avoid excessive mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts.

Controllers contain electrostatically sensitive devices which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

Electrical connection

When working on live controllers, observe the applicable national regulations for the prevention of accidents (e.g. VBG 4).

The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). Additional information can be obtained from the documentation.

The documentation contains information on the installation according to EMC (shielding, earthing, arrangement of filters, and installation of the cables). Also observe this information with regard to drive controllers labelled with CE marking. The manufacturer of the system or machine is responsible for the compliance of the limit values required in connection with EMC legislation. In order to observe the limit values for radio interference emissions effective at the installation site, you have to mount the drive controllers into housings (e. g. control cabinets). The housings have to enable an EMC-compliant structure. Particularly observe that, for instance, control cabinet doors preferably are metallically connected to the housing in a circumferential manner. Reduce openings or apertures through the housing to a minimum.

Lenze controllers can cause a DC current in the PE conductor. If a residual current device (RCD) is used for the protection in the case of direct or indirect contact on a three-phase supplied controller, only one residual current device of type B is permissible on the current supply side of the controller. If the controller is supplied with one phase, also a residual current device (RCD) of type A may be used. Apart from the use of a residual current device (RCD) also other protective measures can be used, like for instance isolation from the environment by double or reinforced insulation or isolation from the supply system by a transformer.

Operation

If necessary, systems including controllers must be equipped with additional monitoring and protection devices according to the valid safety regulations (e.g. law on technical equipment, regulations for the prevention of accidents). The controllers can be adapted to your application. Please observe the corresponding information given in the documentation.

After the controller has been disconnected from the supply voltage, all live components and power connections must not be touched immediately because capacitors can still be charged. Please observe the corresponding stickers on the controller.

All protection covers and doors must be shut during operation.

Notes for UL-approved systems with integrated controllers: UL warnings are notes that only apply to UL systems. The documentation contains special UL notes.

Safety functions

Special controller variants support safety functions (e.g. "safe torque off", formerly "safe standstill") according to the requirements of appendix I No. 1.2.7 of the EC Directive "Machinery" 98/37/EC, EN 954-1 category 3 and EN 1037. Strictly observe the notes on the safety functions given in the documentation on the respective variants.

Maintenance and servicing

The controllers do not require any maintenance if the prescribed operating conditions are observed.

Disposal

Recycle metals and plastics. Dispose of printed circuit board assemblies according to the state of the art.

The product-specific safety and application notes given in these instructions must be observed!

2.2 Residual hazards

Protection of persons

- ▶ Before working on the controller, check that no voltage is applied to the power terminals:
 - The power terminals U, V, W, +U_G, -U_G, BR1, BR2 and 101 ... 104 remain live for at least five minutes after disconnecting from the mains.
 - The power terminals L1, L2, L3, U, V, W, +U_G, -U_G, BR1, BR2 and 101 ... 104 remain live when the motor is stopped.
- ▶ The leakage current to earth (PE) is >3.5 mA. EN 50178 requires a fixed installation.
- ▶ The heatsink of the controller has an operating temperature of > 80 °C:
 - Direct skin contact causes burns.
- ▶ During the parameter set transfer, the control terminals of the controller can assume undefined states.
 - For this reason, the connectors X5 and X6 have to be unplugged before the transfer is executed. This ensures that the controller is inhibited and all control terminals are in the defined state "LOW".

Device protection

- ▶ Frequent mains switching (e.g. inching mode via mains contactor) can overload and destroy the input current limitation of the controller.
 - Thus, at least five minutes have to pass between two switch-on processes.
 - In case of frequent, safety-related disconnections use the "safe torque off" safety function (STO).

Motor protection

- ▶ Certain drive controller settings can overheat the connected motor:
 - E. g. long-time operation of the DC injection brake.
 - Long-time operation of self-ventilated motors at low speeds.

Protection of the machine/system

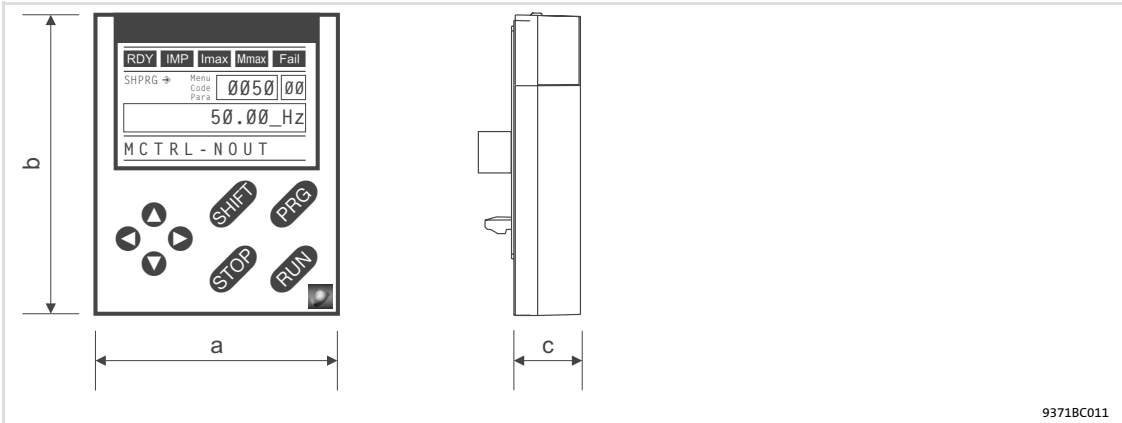
- ▶ Drives can reach dangerous overspeeds (e. g. setting of high output frequencies in connection with motors and machines not suitable for this purpose):
 - The drive controllers do not provide protection against such operating conditions. For this purpose, use additional components.

Description

The keypad is available as an accessory. A full description of the keypad can be obtained from the Instructions included in the keypad delivery.

Plugging in the keypad

It is possible to plug the keypad into the AIF interface or remove it during operation.
As soon as the keypad is supplied with voltage, it carries out a self-test. The keypad is ready for operation if it is in display mode.



Feature		Values
Dimensions		
Width	a	60 mm
Height	b	73.5 mm
Depth	c	15 mm
Environmental conditions		
Climate		
Storage	IEC/EN 60721-3-1	1K3 (-25 ... +60 °C)
Transport	IEC/EN 60721-3-2	2K3 (-25 ... +70 °C)
Operation	IEC/EN 60721-3-3	3K3 (-10 ... +60 °C)
Enclosure		IP 20

3.1.2 Installation and commissioning

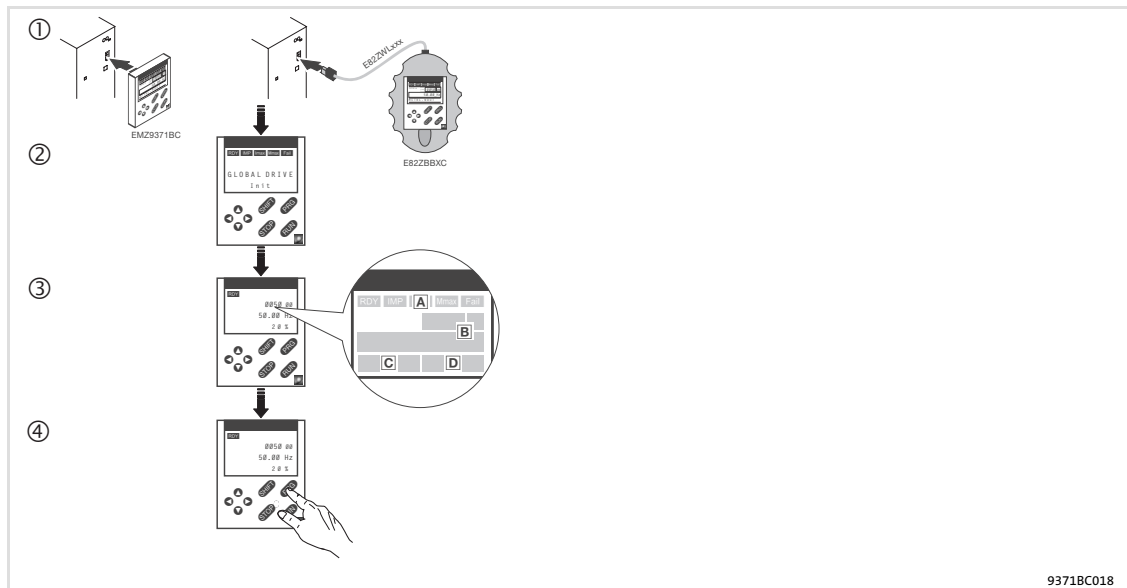


Fig. 3-1 Installation and commissioning of XT EMZ9371BC keypad or E82ZBBXC diagnosis terminal

- ① Connect keypad to the AIF interface on the front of the standard device.
The keypad can be connected/disconnected during operation.
- ② As soon as the keypad is supplied with voltage, it carries out a short self-test.
- ③ The operation level indicates when the keypad is ready for operation:
 - A Current state of the standard device
 - B Memory location 1 of the user menu (C0517):
Code number, subcode number, and current value
 - C Active fault message or additional status message
 - D Actual value in % of the status display defined in C0004
- ④ **PRG** must be pressed to leave the operation level

3.1.3 Display elements and function keys

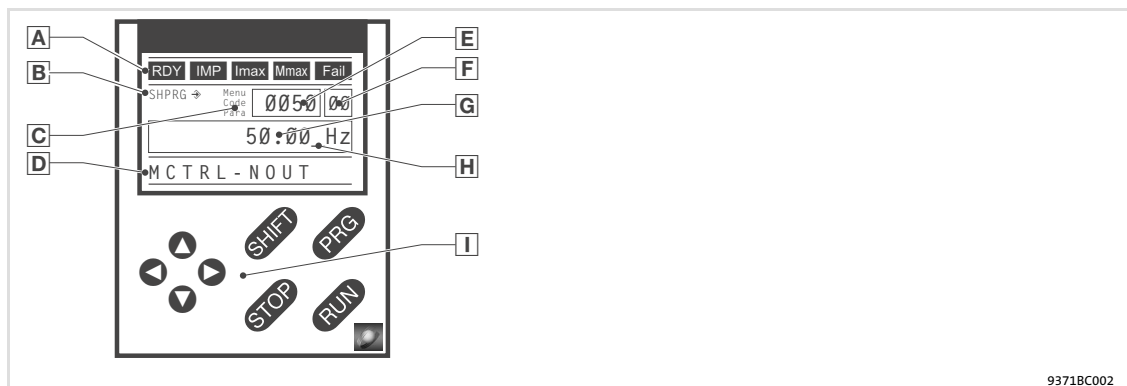


Fig. 3-2 Display elements and function keys of the XT EMZ9371BC keypad

Displays

A Status displays of standard device		
Display	Meaning	Explanation
RDY	Ready for operation	

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Display elements and function keys

IMP	Pulse inhibit is active	Power outputs are inhibited
Imax	The set current limit is exceeded in motor or generator mode	
MinMax	Speed controller 1 in the limitation	Drive is torque-controlled (Only active for operation with standard devices of the 9300 series)
Fault	Active fault	
B Acceptance of the parameters		
Display	Meaning	Explanation
→	Parameter is accepted immediately	Standard device operates immediately with the new parameter value
SHPRG →	Parameter must be acknowledged with SHIFT PRG	Standard device operates with the new parameter value after being acknowledged
SHPRG	Parameter must be acknowledged in case of controller inhibit SHIFT PRG	Standard device operates with the new parameter value after the controller is enabled again
None	Display parameter	Change is not possible
C Active level		
Display	Meaning	Explanation
Menu	Menu level is active	Select main menu and submenus
Code	Code level is active	Select codes and subcodes
Para	Parameter level is active	Change parameters in the codes or subcodes
None	Operating level is active	Display operating parameters
D Short text		
Display	Meaning	Explanation
alphanumeric	Contents of the menus, meaning of the codes and parameters	
	In the operating level display of C0004 in % and the active fault	
E Number		
Active level	Meaning	Explanation
Menu level	Menu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
Code level	Four-digit code number	
F Number		
Active level	Meaning	Explanation
Menu level	Submenu number	Display is only active for operation with standard devices of the 8200 vector or 8200 motec series
Code level	Two-digit subcode number	
G Parameter value		
	Parameter value with unit	
H Cursor		
	In the parameter level, the digit above the cursor can be directly changed	
I Function keys		
	For description see the following table	

Function keys



Note!

Shortcuts with **SHIFT**:

Press and hold **SHIFT**, then press the second key in addition.

Key	Function			
	Menu level	Code level	Parameter level	Operating level
PRG		Change to the parameter level	Change to the operating level	Change to the code level
SHIFT PRG	Go to the "Short setup" menu and load predefined configurations ¹⁾		Accept parameters when SHPRG → or SHPRG is displayed	
▲ ▼	Change between menu items	Change of code number	Change of digit via cursor	
SHIFT ▲ SHIFT ▼	Quick change between menu items	Quick change of code number	Quick change of digit via cursor	
▶ ◀	Change between main menu, submenu and code level		Cursor to the right Cursor to the left	
RUN	Deactivate the function of the key STOP , the LED in the key goes off			
STOP	Inhibit the controller, the LED in the key is lit. Reset fault (TRIP-Reset): 1. Remove the cause of malfunction 2. Press STOP 3. Press RUN			

¹⁾ Only active for operation with standard devices of the 8200 vector or 8200 motec series

3.1.4

Changing and saving parameters



Note!

Your settings have an effect on the current parameters in the main memory. You must save your settings in a parameter set so that they are not lost when the mains are connected.

If you only need one parameter set, save your settings as parameter set 1, since parameter set 1 is loaded automatically after mains connection.

Step	Key sequence	Action
1. Select the menu	▲ ▼ ▶ ◀	Use the arrow keys to select the desired menu
2. Change to the code level	▶	Display of the first code in the menu
3. Select code or subcode	▼ ▲	Display of the current parameter value
4. Change to the parameter level	PRG	
5. When SHPRG is displayed, inhibit the controller	STOP ¹⁾	The drive coasts
6. Change parameter		
	A ▶ ◀	Move cursor below the digit to be changed
	B ▼ ▲	Change of digit
	SHIFT ▼ SHIFT ▲	Quick change of digit
7. Accept the changed parameter		

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Changing and saving parameters

Step		Key sequence	Action
	Display of SHPRG or SHPRG →	SHIFT PRG	Confirm change to accept the parameter Display "OK"
	Display →	-	The parameter has been accepted immediately
8.	Enable the controller, if required	RUN 1)	The drive runs again
9.	Change to the code level		
	A	PRG	Display of the operating level
	B	PRG	Display of the code with changed parameter
10.	Change further parameters		Restart the "loop" with step 1. or 3.
11.	Save changed parameters		
	A	▲ ▼ ► ◀	Select the code C0003 "PAR SAVE" in the menu "Load/Store"
	B	PRG	Change to the parameter level Display "0" and "READY"
	C Select the parameter set in which the parameters are to be saved permanently	▲	Save as parameter set 1: ⇒ Set "1" "Save PS1"
			Save as parameter set 2: ⇒ Set "2" "Save PS2"
			Save as parameter set 3: ⇒ Set "3" "Save PS3"
			Save as parameter set 4: ⇒ Set "4" "Save PS4"
	D	SHIFT PRG	When "OK" is displayed, the settings are permanently saved in the selected parameter set.
12.	Change to the code level		
	A	PRG	Display of the operating level
	B	PRG	Display of C0003 "PAR SAVE"
13.	Set parameters for another parameter set		Restart the "loop" with step 1. or 3.

- 1) The function of the STOP key can be programmed:
C0469 = 1: Controller inhibit
C0469 = 2: Quick stop (Lenze setting)

3.1.5 Loading a parameter set

The keypad serves to load a saved parameter set into the main memory when the controller is inhibited. After the controller is enabled, it operates with the new parameters.



Danger!

- ▶ When a new parameter set is loaded, the controller is reinitialised and acts as if it had been connected to the mains:
 - System configurations and terminal assignments can be changed. Make sure that your wiring and drive configuration comply with the settings of the parameter set.
- ▶ Only use terminal X5/28 as source for the controller inhibit! Otherwise the drive may start in an uncontrolled way when switching over to another parameter set.



Note!

- ▶ After switching on the supply voltage, the controller always loads parameter set 1 into the main memory.
- ▶ It is also possible to load other parameter sets into the main memory via the digital inputs or bus commands.

Step		Key sequence	Action
1.	Inhibit controller		Terminal X5/28 = LOW
2.	Load the saved parameter set into the main memory		
	A	▲ ▼ ▶ ◀	Select the code C0002 "PAR LOAD" in the menu "Load/Store"
	B	PRG	Change to the parameter level The active parameter set is displayed, e. g. display "0" and "Load Default" If you want to restore the delivery status, proceed with D
	Select the parameter set to be loaded	C	▲
			Load parameter set 1: ⇒ Set "1" "Load PS1"
			Load parameter set 2: ⇒ Set "2" "Load PS2"
			Load parameter set 3: ⇒ Set "3" "Load PS3"
			Load parameter set 4: ⇒ Set "4" "Load PS4"
	D	SHIFT PRG	"RDY" goes off. The parameter set is loaded completely into the main memory if "RDY" is displayed again.
3.	Change to the code level		
	A	PRG	Display of the operating level
	B	PRG	Display of C0002 "PAR LOAD"
4.	Enable controller		Terminal X5/28 = HIGH The drive is running with the settings of the loaded parameter set

Parameter setting

Parameter setting with the XT EMZ9371BC keypad
Transferring parameters to other standard devices

3.1.6 Transferring parameters to other standard devices

Parameter settings can be easily copied from one standard device to another by using the keypad.

For this purpose use the "Load/Store" menu



Danger!

During the parameter transfer from the keypad to the standard device the control terminals can adopt undefined states!

Therefore the plugs X5 and X6 must be disconnected from the standard device before the transfer takes place. This ensures that the controller is inhibited and all control terminals have the defined state "LOW".

Copying parameter sets from the standard device into the keypad



Note!

After copying the parameter sets into the XT keypad (C0003 = 11), always the parameter set that was loaded last via C0002 is activated.

Like this the current parameters also remain active after copying:

- Save the current parameters in the parameter set before copying and load this parameter set in the controller via C0002.

Step	Key sequence	Action
1. Connect the keypad to standard device 1		
2. Inhibit controller		Terminal X5/28 = LOW The drive coasts.
3. Select C0003 in the "Load/Store" menu	◀ ▶ ◀ ▶	Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys.
4. Change to the parameter level	PRG	Display "0" and "READY"
5. Copy all parameter set into the keypad	▶	The settings saved in the keypad are overwritten. Set "11" "Save extern"
6. Start copying	SHIFT PRG	The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off after approx. one minute, all parameter sets were copied into the keypad. The "RDY" status display is lit.
7. Change to the code level	A PRG	Display of the operating level
	B PRG	Display C0003 and "PAR SAVE"
8. Enable controller		Terminal X5/28 = HIGH
9. Remove keypad from standard device 1		

Copying parameter sets fom keypad into the standard device

Step		Key sequence	Action
1.	Connect the keypad to standard device 2		
2.	Inhibit controller		Terminal X5/28 = LOW The "IMP" status display is it. The drive coasts
3.	Pull the plugs X5 and X6		All control terminals have the defined "LOW" status.
4.	Select C0002 in the "Load/Store" menu	▲ ▼ ▶ ◀	Select code C0002 "PAR LOAD" in the "Load/Store" menu using the arrow keys.
5.	Change to the parameter level	PRG	The active parameter set is shown, e. g. display "0" and "Load Default"
6.	Select the correct copy function		The settings saved in the standard device are overwritten.
	Copy all parameter sets available into the EEPROM of the standard device and save them permanently.		- The parameter set that was active before copying is overwritten. - The parameters are not yet active after copying. Select parameter set and load it in the main memory. 19
		▲	Set "20" "ext -> EEPROM"
	Copy individual parameter sets into the main memory of the standard device.		
		▲	Copy parameter set 1 into the main memory: Set ⇨ "11" "Load ext PS1"
			Copy parameter set 2 into the main memory: Set ⇨ "12" "Load ext PS2"
			Copy parameter set 3 into the main memory: Set ⇨ "13" "Load ext PS3"
			Copy parameter set 4 into the main memory: Set ⇨ "14" "Load ext PS4"
7.	Start copying	SHIFT PRG	The "RDY" status display goes off. As parameter value "BUSY" is displayed. If "BUSY" goes off, the parameter sets selected were copied into the standard device. The "RDY" status display is lit.
8.	Change to the code level		
	A	PRG	Display of the operating level
	B	PRG	Display C0002 and "PAR LOAD"
9.	- If the function "Copy all parameter sets into the EEPROM" (C0002 = 20) is selected, they might have to be loaded in the main memory manually. - If the function "Copy individual parameter sets into the main memory" (C0002 = 1x) is selected, they might have to be saved permanently in the EEPROM manually.	▲ ▼ ▶ ◀	Select code C0003 "PAR SAVE" in the "Load/Store" menu using the arrow keys and store the contents of the main memory permanently.
10.	Plug in plugs X5 and X6		
11.	Enable controller		Terminal X5/28 = HIGH The drive is running with the new settings.

3.1.7

Activating password protection

**Note!**

- If the password protection is activated (C0094 = 1 ... 9999), you only have free access to the user menu.
- To access the other menus, you must enter the password. By this, the password protection is annulled until you enter a new password.
- Please observe that the password-protected parameters can be overwritten as well when transferring the parameter sets to other standard devices. The password is not transferred.
- Do not forget your password! If you have forgotten your password, it can only be reset via a PC or a bus system!

Activate password protection

Step	Key sequence	Action
1. Select the "USER menu"	⬅ ➡ ➡ ➡	Change to the user menu using the arrow keys
2. Change to the code level	➡	Display of code C0051 "MCTRL-NACT"
3. Select C0094	⬆	Display of code C0094 "Password"
4. Change to the parameter level	PRG	Display "0" = no password protection
5. Set password		
	A ⬆	Select password (1 ... 9999)
	B SHIFT PRG	Confirm password
6. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"
7. Change to the "USER menu"	➡ ➡ ➡	

The password protection is active now.

You can only quit the user menu if you re-enter the password and confirm it with SHIFT PRG.

Remove password protection

Step	Key sequence	Action
1. Change to the code level in the user menu	➡	
2. Select C0094	⬆	Display of code C0094 "Password"
3. Change to the parameter level	PRG	Display "9999" = password protection is active
4. Enter password		
	A ⬆	Set valid password
	B SHIFT PRG	Confirm The password protection is deactivated by entering the password once again.
5. Change to the code level		
	A PRG	Display of the operating level
	B PRG	Display of C0094 and "Password"

The password protection is deactivated now. All menus can be freely accessed again.

3.1.8 Diagnostics

In the "Diagnostic" menu the two submenus "Actual info" and "History" contain all codes for

- monitoring the drive
- fault/error diagnosis

In the operating level, more status messages are displayed. If several status messages are active, the message with the highest priority is displayed.

Priority	Display	Meaning
1	GLOBAL DRIVE INIT	Initialisation or communication error between keypad and controller
2	XXX - TRIP	Active TRIP (contents of C0168/1)
3	XXX - MESSAGE	Active message (contents of C0168/1)
4	Special device states:	
		Switch-on inhibit
5	Source for controller inhibit (the value of C0004 is displayed simultaneously):	
	STP1	9300 servo: Terminal X5/28 ECSxS/P/M/A: Terminal X6/SI1
	STP3	Operating module or LECOM A/B/LI
	STP4	INTERBUS or PROFIBUS-DP
	STP5	9300 servo, ECSxA/E: System bus (CAN) ECSxS/P/M: MotionBus (CAN)
	STP6	C0040
6	Source for quick stop (QSP):	
	QSP-term-Ext	The MCTRL-QSP input of the MCTRL function block is on HIGH signal.
	QSP-C0135	Operating module or LECOM A/B/LI
	QSP-AIF	INTERBUS or PROFIBUS-DP
	QSP-CAN	9300 servo, ECSxA: System bus (CAN) ECSxS/P/M: MotionBus (CAN)
7	XXX - WARNING	Active warning (contents of C0168/1)
8	xxxx	Value below C0004

3.1.9

Menu structure

For simple, user-friendly operation, the codes are clearly arranged in function-related menus:

Main menu	Submenus	Description
Display	Display	
User-Menu		Codes defined in C0517
Code list		All available codes
	ALL	All available codes listed in ascending order (C0001 ... C7999)
	PS 1	Codes in parameter set 1 (C0001 ... C1999)
	PS 2	Codes in parameter set 2 (C2001 ... C3999)
	PS 3	Codes in parameter set 3 (C4001 ... C5999)
	PS 4	Codes in parameter set 4 (C6001 ... C7999)
Load/Store		Parameter set management Parameter set transfer, restore delivery status
Diagnostic		Diagnostic
	Actual info	Display codes to monitor the drive
	History	Fault analysis with history buffer
Short setup		Quick configuration of predefined applications Configuration of the user menu The predefined applications depend on the type of the standard device (frequency inverter, servo inverter, position controller, ...)
Main FB		Configuration of the main function blocks
	NSET	Setpoint processing
	NSET-JOG	Fixed setpoints
	NSET-RAMP1	Ramp function generator
	MCTRL	Motor control
	DFSET	Digital frequency processing
	DCTRL	Internal control
Terminal I/O		Connection of inputs and outputs with internal signals
	AIN1 X6.1/2	Analog input 1
	AIN2 X6.3/4	Analog input 2
	AOUT1 X6.62	Analog output 1
	AOUT2 X6.63	Analog output 2
	DIGIN	Digital inputs
	DIGOUT	Digital outputs
	DFIN	Digital frequency input
	DFOUT	Digital frequency output
	State bus	State bus (not with 9300 frequency inverter)
Controller		Configuration of internal control parameters
	Speed	Speed controller
	Current	Current controller or torque controller
	Phase	Phase controller (not with 9300 frequency inverter)
Motor/Feedb.		Input of motor data, configuration of speed feedback
	Motor adj	Motor data
	Feedback	Configuration of feedback systems
Monitoring		Configuration of monitoring functions

Main menu	Submenus	Description
Display	Display	
LECOM/AIF		Configuration of operation with communication modules
	LECOM A/B	Serial interface
	AIF interface	Process data
	Status word	Display of status words
System bus		Configuration of system bus (CAN)
	Management	CAN communication parameters
	CAN-IN1	CAN object 1
	CAN-OUT1	
	CAN-IN2	CAN object 2
	CAN-OUT2	
	CAN-IN3	CAN object 3
	CAN-OUT3	
	Status word	Display of status words
	FDO	Free digital outputs
	Diagnostic	CAN diagnostic
FB config		Configuration of function blocks
Func blocks		Parameterisation of function blocks The submenus contain all available function blocks
FCODE		Configuration of free codes
Identify		Identification
	Drive	Software version of standard device
	Op Keypad	Software version of keypad

4 Troubleshooting and fault elimination

Display of operating data, diagnostics

Display of operating data

4 Troubleshooting and fault elimination

4.1 Display of operating data, diagnostics

4.1.1 Display of operating data

Description

Important operating parameters are measured by the controller. They can be displayed with the keypad or PC.

Some operating data can be calibrated to be displayed or selected directly with the unit of the process quantity (e.g. pressure, temperature, speed).



Note!

The calibration always affects all specified codes simultaneously.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0051	MCTRL-NACT		-36000	{1 rpm}	36000	Actual speed value, function block MCTRL ● Read only
C0052	MCTRL-Umot		0	{1 V}	800	Motor voltage, function block MCTRL ● Read only ● MCTRL-VACT = 100 % = C0090
C0053	UG-VOLTAGE		0	{1 V}	900	DC-bus voltage, function block MCTRL ● Read only ● MCTRL-DCVOLT = 100 % = 1000 V
C0054	Imot		0.0	{0.1 A}	5000.0	Actual motor current, function block MCTRL ● Read only ● MCTRL-IACT = 100 % = C0022
C0061	Heatsink temp		0	{1 °C}	100	Heatsink temperature ● Read only ● If the temperature of the heatsink > 85 °C, the controller sets TRIP <i>OH</i> ● Early warning is possible via <i>OH4</i> , temperature is set in C0122
C0063	Mot temp		0	{1 °C}	200	Motor temperature ● Read only ● Monitoring of the motor temperature must be activated. ● KTY at X8/5, X8/8: – At 150 °C, TRIP <i>OH3</i> is set – Early warning is possible via <i>OH7</i> , temperature is set in C0121 ● PTC, thermal contact at T1, T2: – Release sets TRIP or warning <i>OH8</i>

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0064	Utilization		0 {1 %} 150				Device utilisation I×t - Read only - Device utilisation during the last 180 s of operating time - C0064 > 100 % releases warning <i>ÜCS</i> - C0064 > 140 % limits the output current of the controller to 67 % of the maximum current in C0022
C0150	Status word		Bit00 – Bit08	Status code			Read only Decimal status word for networking via automation interface (AIF) Binary interpretation indicates the bit states
			Bit01 IMP Bit09	Status code			
			Bit02 – Bit10	Status code			
			Bit03 – Bit11	Status code			
			Bit04 – Bit12	Warning			
			Bit05 – Bit13	Message			
			Bit06 n = 0 Bit14	–			
			Bit07 CINH Bit15	–			

4.1.2 Diagnostics

Description

Display codes for diagnostics

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0093	Drive ident					Controller identification	
						Read only	
			0	Invalid		Defective power section	
			1	None		No power section	
			14	9335VC 400V		Display of the controller used	
			...	...			
			20	9383VC 400V			
			21	9334VC 500V			
			...	...			
C0099	S/W version		28	9383VC 500V		Software version	
			9321	9321 VC			
			...	...			
			9333	9333VC			
			x.y			Software version Read only	
			x	Main version			
			y	Subversion			

4 Troubleshooting and fault elimination

Troubleshooting

Status display via LEDs at the controller

4.2 Troubleshooting

Detecting breakdowns

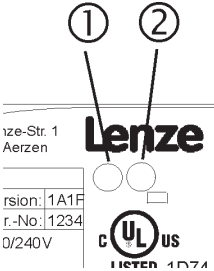
A breakdown can be detected quickly via the LEDs at the controller or via the status information at the keypad.

Analysing errors

Analyse the error using the history buffer. The list of fault messages gives you advice how to remove the fault. (📖 35)

4.2.1 Status display via LEDs at the controller

During operation the operating status of the controller is shown by 2 LEDs.

LED		Operating status	
Red ①	Green ②		
Off	On	Controller is enabled	
On	On	Mains is switched on and automatic start is inhibited	
Off	Blinking slowly	Controller is inhibited	
Off	On	Motor data identification is being performed	
Blinking quickly	Off	Undervoltage	
Blinking slowly	Off	Active fault	

4.2.2 Fault analysis with the history buffer

Retracing faults

Faults can be retraced via the history buffer. Fault messages are stored in the 8 memory locations in the order of their appearance.

The memory locations can be retrieved via codes.

Structure of the history buffer

Code			Memory location	Entry	Note
C0168/1	C0169/1	C0170/1	Memory location 1	Active fault	If the fault is no longer pending or has been acknowledged: - The contents of the memory locations 1 ... 7 are shifted "up" to the next memory location. - The content of memory location 8 is deleted from the history buffer and cannot be retrieved anymore. - Memory location 1 is deleted (= no active fault).
C0168/2	C0169/2	C0170/2	Memory location 2	Last fault	
C0168/3	C0169/3	C0170/3	Memory location 3	Last but one fault	
C0168/4	C0169/4	C0170/4	Memory location 4	Last but two fault	
C0168/5	C0169/5	C0170/5	Memory location 5	Last but three fault	
C0168/6	C0169/6	C0170/6	Memory location 6	Last but four fault	
C0168/7	C0169/7	C0170/7	Memory location 7	Last but five fault	
C0168/8	C0169/8	C0170/8	Memory location 8	Last but six fault	

Explanations regarding the codes

C0168	Fault indication and response - The entry is effected as a LECOM error number - If several faults with different responses occur at the same time: - Only the fault with the highest priority response is entered (1. TRIP, 2. message, 3. warning). - If several faults with the same response (e.g. 2 messages) occur at the same time: - Only the fault which occurred first is entered.
C0169	Time of fault occurrence - The reference time is provided by the power-on time meter (C0179). - If the same fault occurs several times in succession, only the time of the last occurrence is stored.
C0170	Fault frequency Only the time of the last occurrence is stored.

Clear history buffer

Set C0167 = 1 to clear the history buffer.

4.3 Drive behaviour in the event of faults

The controller responds differently to the three possible fault types TRIP, message, or warning:

TRIP

TRIP (display in keypad XT:  )

- ▶ Switches the power outputs U, V, W to a high-resistance state until TRIP reset is executed.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ The drive coasts without any control!
- ▶ After TRIP reset ( 40):
 - The drive travels along the ramps to its setpoint.
 - The fault indication is moved to C0168/2 as "last fault".

Messages

Message (display in keypad XT:  )

- ▶ Switches the power outputs U, V, W to a high-resistance state.
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ In case of a fault ≤ 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint with maximum torque.
- ▶ In case of a fault > 5 s:
 - The drive coasts without any control as long as the message is active!
 - If the message is not active anymore, the drive travels to its setpoint along the adjusted ramps.
- ▶ If the message is not active anymore, the fault indication is moved to C0168/2 as "last fault".

Warnings

"Heatsink overtemperature" (keypad XT:   )

- ▶ The drive continues to travel in a controlled way!
- ▶ The warning signal goes off when the fault is not active anymore.

"Error in motor phase" (keypad XT: )

"PTC monitoring" (keypad XT: )

- ▶ The drive continues to travel in a controlled way!
- ▶ The fault indication is entered into the history buffer as "current fault" in C0168/1.
- ▶ After TRIP reset, the fault indication is moved to C0168/2 as "last fault".

4.4 Fault elimination

4.4.1 Drive errors

Malfunction	Cause	Remedy
An asynchronous motor with feedback rotates in an uncontrolled manner and with low speed	The motor phases are reversed so that the rotating field of the motor is not identical with the rotating field of the feedback system. The drive shows the following behaviour: • V/f characteristic control (C0006 = 5) – The motor rotates faster than the speed setpoint by the value set in C0074 (influence of the speed controller, Lenze setting 10 % of n_{max}). After the controller is enabled, it does not stop at zero speed setpoint or quick stop (QSP). – The final motor current depends, among other things, on the set value of the V_{min} boost (C0016) and can rise to I_{max} (C0022). This may activate the fault message OC5. • Vector control (C0006 = 1) – The motor rotates slowly with maximum slip speed (depending on motor data and maximum current) and does not react to a speed setpoint. The direction of rotation, however, is determined by the sign of the speed setpoint. – The motor current rises up to I_{max} (C0022). This may activate the fault message OC5 with a time delay.	• Check motor cable for correct phase relation. • If possible, operate the motor with deactivated feedback (C0025 = 1) and check the direction of rotation of the motor.
Motor does not rotate although the controller is enabled (IMP is off) and a speed setpoint has been specified.	The two terminal strips X5 are reversed. Since X5/A1 and X5/28 face each other, the controller can be enabled if the control terminals are internally supplied. All other connections, however, are assigned incorrectly so that the motor cannot start.	Check the position of the terminal strips: • If you look at the connection unit in reading direction, the left terminal strip X5 must be connected with the input signals and the right terminal strip X5 must be connected with the output signals.
The monitoring of the motor phases (LP1) does not respond if a motor phase is interrupted, although C0597 = 0 or 2	The function block MLP1 is not entered into the processing table.	Enter the function block MLP1 into the processing table. The function block MLP1 requires 30 µs of calculating time.
If during high speeds DC-injection braking (GSB) is activated, the fault OC1 (TRIP) or OU (TRIP) occurs	During DC-injection braking the controller sets pulse inhibit for a short time (DCTRL-IMP) to reduce the magnetisation in the motor before a DC voltage is injected into the motor. At high speeds (e. g. in case of mid-frequency motors) the residual voltage which develops from the residual magnetism and high speed can generate such a high motor current that OC1 or OU are activated.	Prolong the duration of the pulse inhibit: • Connect the output signal DCTRL-IMP to the function block TRANSx and adjust the desired switch-off time there (usually 500 ms). If DCTRL-CINH1 is set to HIGH, the duration of the pulse inhibit is prolonged by the time adjusted.

4.4.2 Controller in clamp operation

The clamp operation is a permissible operating mode. But since, however, pulse inhibit is set again and again, the controller cannot provide the optimum power.

If the output power is optimal, the output current mainly is right below the clamp threshold.

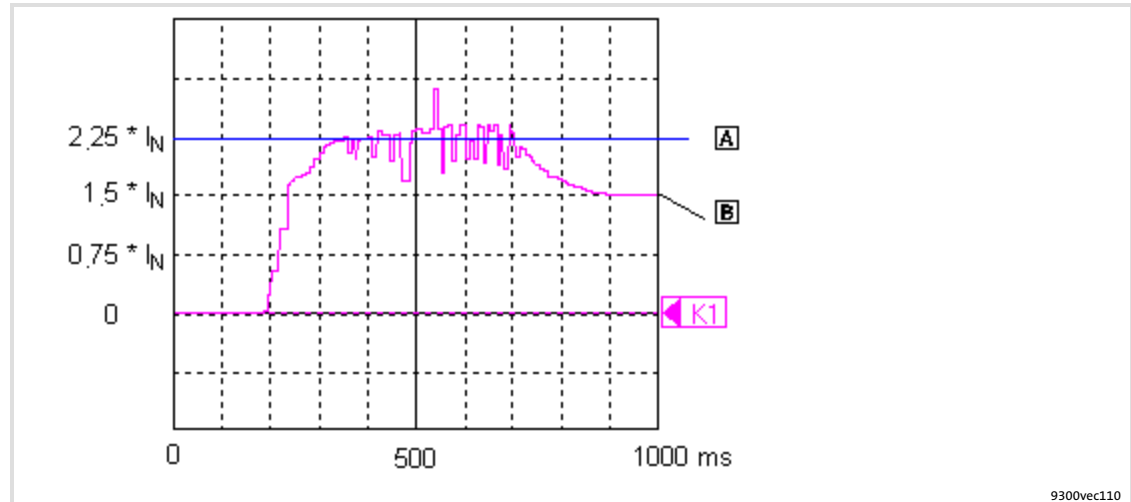


Fig. 4-1 Output current when starting a motor with high load (shown with the oscilloscope in GDC)

- Ⓐ Clamp threshold
- Ⓑ Output current

Function

1. When the output current reaches $2.25 \times I_r$, a software clamp is activated.
2. The controller sets pulse inhibit for a short time. The motor current decreases as a function of the inductance in the motor circuit.
 - An internal counter is increased by the value one.
3. After max. 250 μ s the pulse inhibit is deactivated.
4. If a software clamp reoccurs within 2 s, the internal counter is again increased by the value one. Otherwise the counter is set to zero.
 - If the counter reaches the value 4300, OC3 (TRIP) is activated.

If the DC-bus voltage (U_{DC}) exceeds the switch-off threshold OU, pulse inhibit will be set. At the same time, an internal timer for a delay time (C0912) will be started.

Pulse inhibit will be reset, if the voltage falls below the switch-on threshold OU and the delay time has elapsed.

Thresholds for DC-bus overvoltage (OU)

Types EVF93xx-EVV210, EVF93xx-EVV240, EVF93xx-EVV270 and EVF93xx-EVV300				
Mains voltage range		C0173	Switch-off threshold OU	Switch-on threshold OU
< 400 V	Operation with or without brake transistor	0	770 V	755 V
400 V	Operation with or without brake transistor	1 *	770 V	755 V
460 V	Operation with or without brake transistor	2	770 V	755 V
480 V	Brake transistor	3	770 V	755 V
480 V	Brake transistor	4	800 V	785 V
500 V	Operation with or without brake transistor	5	900 V	885 V

* Lenze setting

Types EVF93xx-EV, EVF93xx-EVV060 and EVF93xx-EVV110				
Mains voltage range		C0173	Switch-off threshold OU	Switch-on threshold OU
400 V	Operation with or without brake transistor	Read only	700 V	685 V

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0912	OV delay time	→	{1 ms}	- Delay time of the pulse enable after an OU message → Depending on C0082, C0086, C0087, C0088, C0089, C0090, C0091, C0092 - A change of one of the codes resets C0912 to the time of the selected motor • The time is derived from the double rotor time constant

Adjustment

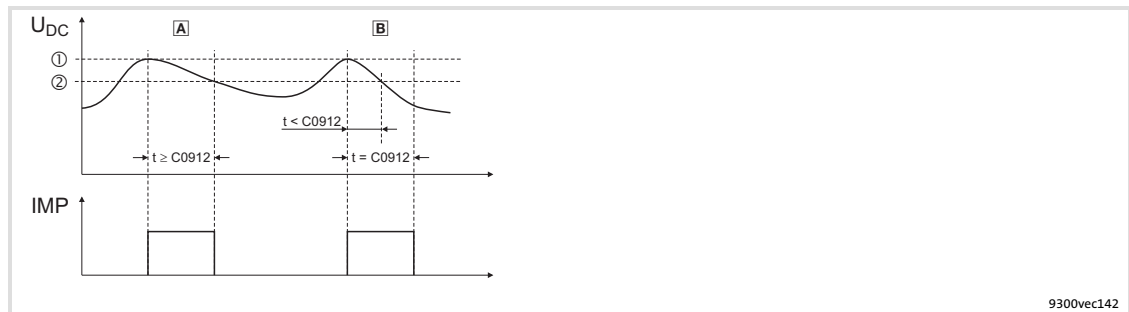


Fig. 4-2 Influence of the delay time (C0912)

① Switch-off threshold OU

② Switch-on threshold OU

A The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU equals or is higher than the delay time set in C0912.

After undershooting the switch-on threshold OU, the pulse inhibit is deactivated.

B The period of time between exceeding the switch-off threshold OU and undershooting the switch-on threshold OU is lower than the delay time set in C0912.

The pulse inhibit is deactivated after the delay time in C0912 has elapsed.

- The delay time in [ms] is set under C0912. The Lenze setting can be changed by the factor 0.5 ... 2.

4.5 System error messages

4.5.1 General error messages



Note!

If you use GDC or a fieldbus module to retrieve the fault (C0168/x), the error message will be represented by an error number.

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
---	---	No fault	—	—
CCr	x071	System fault	Processor is overloaded or there is a fault in the program processing	Reduce processor load. Remove function blocks that are not needed from the processing table
			Strong interference on control cables	Shield control cables
			Ground or earth loops in the wiring	Check wiring
CE0	x061	Communication error	Fault during transmission of control commands via automation interface X1	Plug in automation module firmly, bolt down, if necessary
CE1	x062	Communication error at the process data input object CAN-IN1	CAN-IN1 object receives faulty data, or communication is interrupted	• Check cable at X4 • Check sender • Increase monitoring time under C0357/1 if necessary
CE2	x063	Communication error at the process data input object CAN-IN2	CAN-IN2 object receives faulty data, or communication is interrupted	• Check cable at X4 • Check sender • Increase monitoring time under C0357/2 if necessary
CE3	x064	Communication error at the process data input object CAN-IN3	CAN-IN3 object receives faulty data, or communication is interrupted	• Check cable at X4 • Check sender • Increase monitoring time under C0357/3 if necessary
CE4	x065	BUS-OFF state	Controller has received too many incorrect telegrams via system bus X4, and has disconnected from the bus	• Check wiring • Check bus termination (if any) • Check shield contact of the cables • Check PE connection • Check bus load • Reduce baud rate (observe cable length)
EEr	x091	External fault (TRIP-Set)	A digital input assigned with TRIP-set function has been activated (in the most basic configurations the input X5/E4 is LOW-active and linked with the TRIP-set function)	• Check external encoder • Check signal at the digital input X5/E4: – Either connect HIGH level or – Change polarity in C0114 to HIGH-active. CAUTION! When changing to HIGH level, the wire-break protection gets lost.
			The two terminal strips at X5 are reversed	Check the position of the terminal strips: • If you look at the connection unit in reading direction, the left terminal strip X5 must be connected with the input signals and the right terminal strip X5 must be connected with the output signals.
H05	x105	Internal fault		Contact Lenze
H07	x107	Wrong power stage	During initialisation of the controller, a wrong power stage was detected	Contact Lenze

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
H10	x110	Sensor fault - heatsink temperature	Sensor of the heatsink temperature detection indicates undefined values	Contact Lenze Fault message can only be reset by mains switching
H11	x111	Sensor fault - temperature inside the device	Sensor of the internal temperature detection indicates undefined values	Contact Lenze Fault message can only be reset by mains switching
ID1	x140	Error during motor data identification	- No motor connected - Stator resistance too high - Controller inhibited externally	- Check motor connection - Check motor data entry - Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
ID2	x141	Error during motor data identification	Motor too small	- Check entered motor data – When setting parameters with Global Drive Control, use the input assistant for motor data - The measurements for the inverter error characteristic and the stator resistance are correct (save measured values in C0003). In the operating mode U/f characteristic control, the motor data identification can be completed.
			Controller inhibited externally	Enable controller and repeat motor data identification. The controller enable must be pending continuously until the end of the identification process.
LP1	x032	Motor phase failure	A current-carrying motor phase has failed	- Check motor - Check supply cables
			The current limit is set too high	Set a lower current limit value under C0599
			This monitoring is not suitable for field frequencies >480 Hz and synchronous servo motors	Deactivate monitoring with C0597= 3
LU	x030	Undervoltage	DC bus voltage is smaller than the value set under C0173	- Check mains voltage - Check supply module
NMAX	x200	Maximum system speed exceeded (C0596)	Active load too high	Check drive dimensioning
			Drive is not speed-controlled, torque excessively limited	If required, increase torque limit
			Current speed is detected incorrectly	Check parameter setting of the incremental encoder (C0025)
OC1	x011	Overcurrent (motor current > 2.25-fold rated controller current, hardware monitoring)	Short circuit/earth fault	- Remove cause of short circuit/earth fault - Check motor and cable - If required, measure the insulation resistance
			Capacitive charging current of the motor cable too high (especially with lower powers)	Use shorter or low-capacitance motor cable
			Acceleration/deceleration times too short in proportion to the load (C0012, C0013, C0105)	- Increase the gain (P component) of the current controller (C0075) - Reduce integral-action time (integral action component) of the I_{max} controller (C0076)

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
			The drive is connected to the coasting machine. The coasting is caused by a short-time pulse inhibit, e.g. at - OU (overvoltage in the DC bus) - external or internal controller inhibit	- Activate flying restart circuit - Operate with speed feedback in the vector control operating mode
			- Encoder error - Tracks for encoder feedback of the motor speed are reversed	- Check wiring of the encoder - In case of drive problems with activated feedback, the feedback can be analysed. Here, the signal of the feedback is not used for control. For this test the function block DFIN must be entered into the processing table. In the Lenze setting, DFIN is entered at position 1 of the processing table (C0465/1 = 200). - Deactivate feedback with C0025 = 1 - Connect feedback at the digital frequency input DFIN (X9) - Set DFIN constant (C0425) to the number of increments of the encoder - In C0426, the speed detected by the encoder is indicated
			DC-injection braking at high speeds	See 31
OC2	x012	Earth fault	One of the motor phases has earth contact	- Check motor - Check supply cables
			Excessive capacitive charging current of the motor cable	Use motor cable which is shorter or of lower capacitance
OC3	x013	Overload during acceleration	Acceleration/deceleration times too short in proportion to the load (C0012, C0013, C0105)	- Increase the gain (P component) of the current controller (C0075) - Reduce integral-action time (integral action component) of the $I_{\max}$ controller (C0076) - Increase ramp times 32, "controller in clamp operation (fault OC3)"
OC5	x015	$I \times t$ overload	The utilisation of the controller exceeds 100 % (C0064 > 100 %)	Check drive dimensioning - The utilisation of the controller is calculated from the mean value of the motor current over a time of 180 s. When operating with rated power (150 % overload capacity), the controller can be operated at a utilisation of up to 100 %. - When C0064 = 95 %, the warning is cancelled.
			The utilisation of the controller exceeds 110 % (C0064 > 110 %) The maximum current is reduced	Check drive dimensioning - When C0064 = 95 %, the reduction of the maximum current is cancelled. The warning is cancelled. - NOTE: Operation at increased rated power (120 % overload capacity) is not possible.
			Reversed motor phases when operating with feedback or reversed encoder tracks so that the direction of rotation has changed	- Check the motor cable connection for correct phase relation - If possible, operate the motor with deactivated feedback (C0025 = 1) and check the direction of rotation of the motor. - See also 31

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
OH	x050	Heatsink temperature is higher than the value set in the controller	Ambient temperature $T_u > 40\text{ °C}$ or 50 °C	- Allow controller to cool and ensure better ventilation - Check ambient temperature in the control cabinet
			Heatsink very dirty	Clean heatsink
			Wrong mounting position	Change mounting position
OH3	x053	Motor temperature is higher than the value set in the controller	Motor too hot because of excessive current or frequent and too long acceleration	Check drive dimensioning
			No KTY is connected to X8	Connect KTY or switch off monitoring (C0583 = 3)
OH4	x054	Heatsink temperature is higher than the value set in C0122	Ambient temperature $T_u > 40\text{ °C}$ or 50 °C .	- Allow controller to cool and ensure better ventilation - Check ambient temperature in the control cabinet
			Heatsink very dirty	Clean heatsink
			Wrong mounting position	Change mounting position
			The value entered in C0122 is too low	Enter higher value
OH7	x057	Motor temperature is higher than the value set in C0121	Motor too hot because of excessive current or frequent and too long acceleration	Check drive dimensioning
			No KTY is connected to X8	Connect KTY or switch off monitoring (C0584 = 3)
			The value entered in C0121 is too low	Enter higher value
OH8	x058	PTC at terminals T1, T2 indicates motor overheating	Motor too hot because of excessive current or frequent and too long acceleration	Check drive dimensioning
			Terminals T1, T2 are not assigned	Connect PTC or thermal contact or switch off monitoring (C0585=3)
OU	x020	Overvoltage in the DC bus	Only for variants V210, V240, V270, V300: - Wrong values in C0173 - Wrong values in C0174	- Set correct values in C0173 - Set correct values in C0174
PEr	x074	Program fault	An error has been detected in the program flow. The parameter set 1 is loaded automatically. Parameter data which has been changed and not has been saved, will get lost.	Contact Lenze
PI	x079	Initialisation error	- A fault was detected during transfer of parameter sets between the controllers - Parameter set does not match the controller	Correct parameter set
PR0	x075	Parameter set error	Error while loading a parameter set. The parameters saved do not match the software version of the controller. CAUTION! The Lenze setting is loaded automatically.	- Correct parameter set - Save all parameter sets with C0003 and reset the fault message by mains switching
PR1 PR2 PR3 PR4	x072 x073 x077 x078	Parameter set error	- Fault while loading a parameter set - The transmission of parameter sets with keypad XT has been interrupted (e.g. by an early disconnection of the keypad XT) CAUTION! The Lenze setting is loaded automatically.	Set the required parameters and save them with C0003
Sd3	x083	Encoder error at X9	Cable interrupted	Check cable for wire breakage

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
			Pin X9/8 is not assigned	Assign pin X9/8 with 5 V or switch off monitoring (C0587 = 3)
Sd5	x085	Encoder at X6/1, X6/2 is defective	Current at X6/1, X6/2 < 2 mA	• Check cable for wire breakage • Check encoder
Sd6	x086	Sensor error at X8	KTY at X8 indicates undefined values	• Check supply cable for firm connection • Switch off monitoring with C0594 = 3 if necessary

4.5.2 Resetting system error messages

Eliminate the cause of TRIP fault message

After you have eliminated the cause of a TRIP fault message, you must reset the fault message with the command "TRIP reset". Only then the drive restarts.



Note!

A TRIP fault message can have several causes. Only if all causes of the TRIP have been eliminated, the TRIP reset can be executed.

TRIP reset

- ▶ Keypad XT: Press **STOP**. Then press **RUN** to enable the controller.
- ▶ Fieldbus module: Set C0043 = 0
- ▶ Control word: C0135
- ▶ Terminal: X5/E5 = HIGH
- ▶ Control word via AIF
- ▶ Control word via system bus (CAN)

Mains switching always executes TRIP reset.

Codes for parameter setting

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0043	Trip reset	0	0 no/trip reset	Reset actual error
			1 trip active	There is a TRIP error



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