EDSVS9332S
13181650

Lenze

System Manual

Global Drive

9300 servo inverter

This documentation is valid for the 9300 servo inverters of the versions:

	①				②	③
EVS	**9326**	**-**	**E**	**E**	**2x**	**2x**

Type

Power

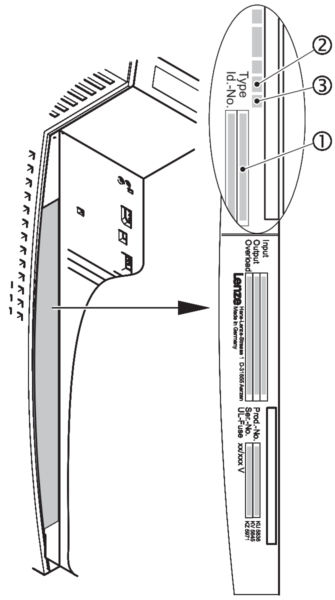
	400 V	480 V
9321 =	0.37 kW	0.37 kW
9322 =	0.75 kW	0.75 kW
9323 =	1.5 kW	1.5 kW
9324 =	3.0 kW	3.0 kW
9325 =	5.5 kW	5.5 kW
9326 =	11 kW	7.1 kW
9327 =	15 kW	18.5 kW
9328 =	22 kW	30 kW
9329 =	30 kW	37 kW
9330 =	45 kW	45 kW
9331 =	55 kW	55 kW
9332 =	75 kW	90 kW

Design
E = Built-in unit
C = Cold Plate

S = 9300 servo inverter

Hardware version

Software version



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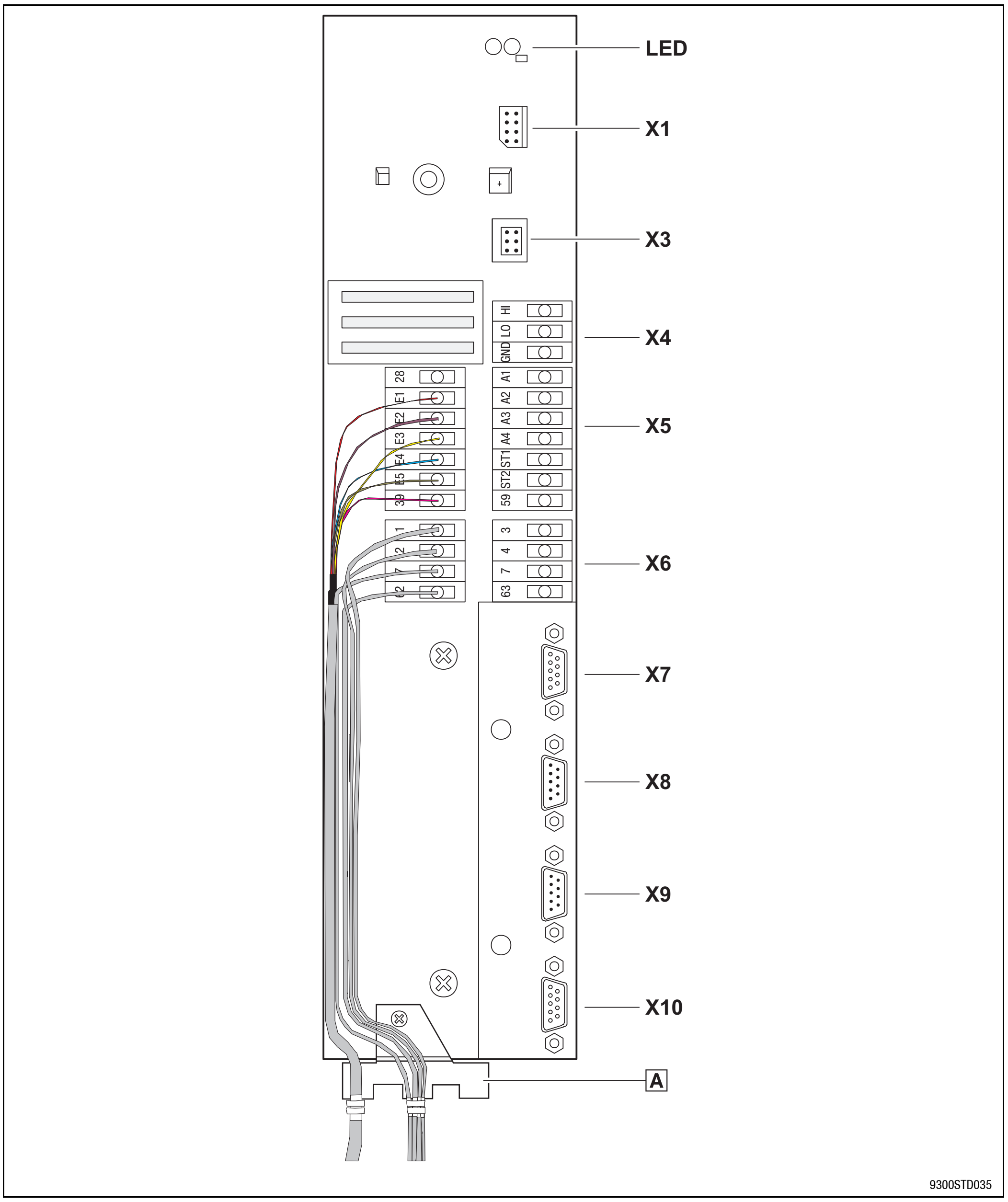
LED
X1
X3
X4
HI
LO
GND
X5
28
E1
E2
E3
E4
E5
39
A1
A2
A3
A4
ST1
ST2
59
X6
1
2
7
62
3
4
7
63
X7
X8
X9
X10
A
9300STD035

Position	Description	Function
X1	AIF interface (automation interface)	Slot for communication modules e.g. keypad XT (EMZ9371BC)
X3	Jumper	Set analog inputs to master voltage or master current
X4	Terminal X4	Connection for system bus (CAN)
X5	Terminal X5	Connection for digital input and output signals
X6	Terminal X6	Connection for analog input and output signals
X7	Sub-D socket	Resolver connection
X8		Connection for incremental encoder
X9		Master frequency input
X10		Master frequency output
LED	2 light-emitting diodes (red, green)	Controller status displays
A	Shield sheet	Shield sheet for control connections The cable shields are connected to the shield sheet by means of cable binders or shield clips (3 pieces enclosed in assembly kit).

EDSVS9332S-A
13181650

Lenze

System Manual
Part A

Contents

Preface and general information

Global Drive
9300 servo inverter

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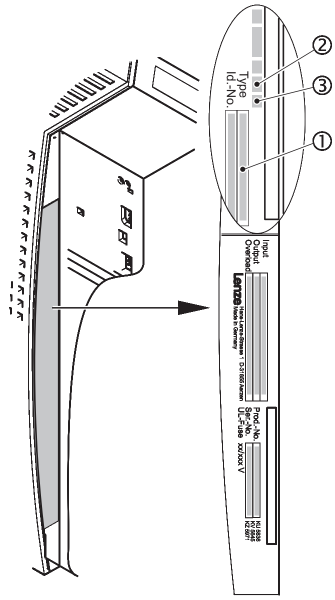

All indications given in this documentation have been selected carefully and comply with the hardware and software described.
Nevertheless, deviations cannot be ruled out. We do not take any responsibility or liability for damage which might possibly occur. Necessary corrections will be included in the next edition.

3.0 11/2006

Part A

Part B

Contents

Contents

Part D1.2

Contents

Part E

Part K

Part L

Part M

1 Preface and general information

1.1 How to use this Manual

- This Manual supplements the Operating Instructions of the 93XX servo inverter.
- It contains the Operating Instructions which were valid at the time of printing of the System Manual and additional information on project planning, functionality and accessories.
  – In case of doubt, the Operating Instructions attached to the 93XX servo inverter are valid.
- The System Manual helps to select and dimension the 93XX servo inverter and accessories to ensure a safe and trouble-free operation. It contains safety information which must be observed.
- The System Manual must always be in a complete and perfectly readable state.

1.1.1 Terminology used

Term	In the following text used for
93XX	Any type of servo inverter (types 9321 ... 9332)
Controller	93XX servo inverter
Drive system	Drive system with 93XX servo inverters and other Lenze drive components

1.1.2 What is new?

ID no.	Version	Modifications
13181650	3.0 11/2006 TD14	• Chapter ”Technical data” is supplemented by information on circuit breakers for the types 9321 and 9322 • Error correction • Extended by functions for software version 6.2 • Error correction

1.1.3 Which information does the System Manual include?

This System Manual is clearly structured thanks to the division into parts. Further information can be found in the folder "Project planning" or in other documentations.

Part		Included in	
		Folder "Project planning"	System Manual of 9300 servo inverter
0	**Contents** **Preface and general information** **Safety information**	•	•
B	**Technical data**	•	•
	Installation		•
c	**Commissioning** **During operation** User Manual "Oscilloscope function"		•
D1.1	**Parameter setting** **Configuration**		•
D1.2	**Code table**		•
E	**Troubleshooting and fault elimination**		•
F	**DC-bus operation** Operating Instructions for 9340 regenerative power supply module	•	
g	**Application of brake units** Operating Instructions for 9350 brake unit	•	
h	**Automation** See Communication Manuals of CAN, INTERBUS, PROFIBUS		
I	**Accessories and motors**	•	
k	**How to select the correct drive**	•	
	Application examples		•
l	**Signal flow diagrams**		•
m	**Glossary** **Table of keywords**	•	•

1.2 Legal regulations

<table>
<tr><td rowspan="2">Identification</td><td>Nameplate</td><td>CE identification</td><td>Manufacturer</td></tr>
<tr><td>Lenze controllers are unambiguously designated by the contents of the nameplate.</td><td>Conforms to the EC Low-Voltage Directive</td><td>Lenze Drive Systems GmbH
Postfach 101352
D-31763 Hameln</td></tr>
<tr><td>Application as directed</td><td colspan="3">The 93XX servo inverter
• must only be operated under the conditions prescribed in these Instructions.
• are components
– for open and closed loop control of variable speed drives with PM synchronous motors, asynchronous servo motors or asynchronous standard motors
– for installation in a machine
– for assembly with other components to form a machine.
• are electric units for the installation into control cabinets or similar enclosed operating housing.
• 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 for industrial purposes only.
Drive systems with 93XX servo 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 inappropriate!</td></tr>
<tr><td>Liability</td><td colspan="3">• The information, data, and notes in these instructions met the state of the art at the time of printing. Claims on modifications referring to controllers which have already been supplied cannot be derived from the information, illustrations, and descriptions.
• The specifications, processes, and circuitry described in these instructions 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 these Instructions describe the product features without guaranteeing them.
• Lenze does not accept any liability for damage and operating interference caused by:
– Disregarding the operating instructions
– Unauthorised modifications to the controller
– Operating errors
– Improper working on and with the controller</td></tr>
<tr><td>Warranty</td><td colspan="3">• Warranty conditions: see Sales and Delivery Conditions of Lenze Drive Systems 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.</td></tr>
<tr><td rowspan="4">Disposal</td><td>Material</td><td>recycle</td><td>dispose</td></tr>
<tr><td>Metal</td><td>●</td><td>-</td></tr>
<tr><td>Plastic</td><td>●</td><td>-</td></tr>
<tr><td>Assembled PCBs</td><td>-</td><td>●</td></tr>
</table>

1.3 EC Directives/Declaration of Conformity

1.3.1 What is the purpose of EC Directives?

The EC Directives are issued by the European Council and are intended for the determination of common technical requirements (harmonisation) and certification procedures with the European Community. At the moment, there are 21 EC Directives for product ranges. The directives are or will be converted into national laws of the member states. A certification issued by one member state is valid automatically without any further approval in all other member states.

The texts of the directives are restricted to the essential requirements. Technical details are or will be determined by European harmonised standards.

1.3.2 What does the CE marking imply?

After a verification, the conformity according to the EC Directives is certified by affixing a CE marking. Within the EC there are no commercial barriers for a product provided with a CE marking.

Attaching a declaration of conformity is not necessary for most of the directives. Users or customers are therefore not aware which of the 21 EC Directives comply with a certain product and which harmonised standards were considered in the evaluation procedure of conformity.

Controllers with the CE marking exclusively correspond to the Low Voltage Directive. So far, only recommendations were given for the compliance with the EMC regulation. In this case, the user himself has to prove the compliance with the CE directives for the installation of a machine. Lenze has already provided evidence of installing CE-typical drive systems and confirmed this by the declaration of conformity to the EMC EC directive.

1.3.3 EC Low-Voltage Directive

(73/23/EEC)

amended by:

- CE Mark Directive (93/68/EWG)

1.3.3.1 General

- The Low-Voltage Directive applies to all electrical equipment for use with a rated voltage between 50 V and 1000 V AC and between 75 and 1500 V DC under normal ambient conditions, except for e.g. the use of electrical equipment in explosive atmospheres and electrical parts in passenger and goods lifts.
- The objective of the Low-Voltage Directive is to ensure that only such electrical equipment is placed on the market which does neither endanger the safety of persons and animals nor the conservation of material assets.

EC Declaration of Conformity for the purpose of the	**EG-Konformitätserklärung im Sinne der**	**Déclaration de conformité CE au sens de la**
EC Low-Voltage Directive (73/ 23/ EWG) Amended by: CE-mark Directive (93/ 68/ EWG)	**EG-Richtlinie Niederspannung (73/23/EWG)** geändert durch: CE-Kennzeichnungsrichtlinie (93/68/EWG)	**directive CE Basse Tension (73/23/CEE)** Modifiée par : Directive sur le marquage CE (93/68/CEE)
The controllers of the types **EVS93xx / EVF93xx** were developed, designed and manufactured in compliance with the above-mentioned EC Directive under the sole responsibility of	Die Antriebsregler der Typen ***EVS93xx / EVF93xx*** wurden entwickelt, konstruiert und gefertigt in Übereinstimmung mit o.g. EG-Richtlinie in alleiniger Verantwortung von	Les variateurs de vitesse types **EVS93xx / EVF93xx** ont été étudiés, conçus et fabriqués conformément à la directive citée ci-dessus en la seule responsabilité de la société
LENZE Drive Systems GmbH, Postfach 10 13 52, D-31763 Hameln		
Considered standards:	Berücksichtigte Norm:	Normes considérées :
DIN EN 50178		
Electronic equipment for use in electrical power installations	Ausrüstung von Starkstromanlagen mit elektronischen Betriebsmitteln	Equipement électronique utilisé dans les installations de puissance
Year of affixing in accordance with the EC Low Voltage Directive: 2002	Jahr der Anbringung der CE-Kennzeichnung nach der Niederspannungsrichtlinie: 2002	Année d'application du marquage CE selon la directive Basse Tension: 2002

Hameln, 01.05.2002

(Dr. Edwin Kiel)
General Manager R&D
Geschäftsführer F&E
Gérant R&D

(i.A. Andreas Tolksdorf)

9300std001

1.3.4 EC Directive on electromagnetic compatibility

(89/336/EWG)

amended by:

- First Amendment Directive (92/31/EWG)
- CE Mark Directive (93/68/EWG)

1.3.4.1 General

- The EC Directive "Electromagnetic Compatibility" applies to "devices" which may cause electromagnetic interferences or the operation of which may be impaired by such interferences.
- The aim is to limit the generation of electromagnetic interferences such that radio and telecommunication systems and other equipment can be operated without interferences. Furthermore the devices must show an appropriate resistance against electromagnetic interference to ensure the application as directed.
- Controllers cannot be operated on their own. Controllers cannot be evaluated on their own in terms of EMC. Only when being integrated into a drive system the compliance with the objectives of the EC Directive "EMC" and the observance of the "Law on electromagnetic compatibility of devices" can be checked.
- Lenze has evaluated the conformity of the controllers in defined drive systems. In the following, these evaluated drive systems are called "CE-typical drive system". Therefore the user of the controllers can
  – either determine the system components and their integration into a drive system and declare the conformity on his own responsibility,
  – or install the drive system according to the CE-typical drive system evaluated by the inverter manufacturer who already proved the conformity.

Components of the CE-typical drive system

System component	Specification
Controller	Controller types 93XX series For type designation see first cover page
Mains filter A/B	For data and filter assignment see chapter "Ratings"
Motor cable	Shielded power cable with tinned E-CU braid with a minimum of 85% optical coverage.
Mains cable between mains filter and controller	From a minimum cable length of 300 mm: Shielded power cable with tinned E-CU braid with a minimum of 85% optical coverage.
Control cables	Shielded signal cable type LIYCY
Motor	Standard three-phase asynchronous motor, servo synchronous motor, servo asynchronous motor Lenze types DXRA, MDXKX or similar

- Controller, RFI filter and mains choke are located on a common mounting plate.
- The system components have been wired according to chapter 4 "Electrical installation".

<table>
<tr><th>EC Declaration of Conformity for the purpose of the EC Directive</th><th>EG-Konformitätserklärung im Sinne der EG-Richtlinie</th><th>Déclaration de conformité CE au sens de la directive CE</th></tr>
<tr><td>Electromagnetic Compatibility (89/336/EEC)
Amended by: First Amendment (92/31/EEC) CE Mark Directive (93/ 68/ EEC)</td><td>Elektromagnetische Verträglichkeit (89/336/EWG)
Geändert durch: 1. Änderungsrichtlinie (92/31/EWG CE-Kennzeichnungsrichtlinie (93/68/EWG)</td><td>Directive CE relative à la compatibilité électromagnétique (89/336/CEE)
Modifiée par : Amendement n° 1 (92/31/CEE) Directive sur le marquage CE (93/68/CEE)</td></tr>
<tr><td>The controllers EVS93xx / EVF93xx cannot be driven in stand-alone operation. For the purposes of the Regulation on Electromagnetic Compatibility (EMVG of 09 November, 1992 and the first Amendment of 08 August, 1995. The EMC can only be verified when the controller is integrated into a drive system.</td><td>Die Antriebsregler EVS93xx / EVF93xx sind keine selbständig betreibbaren Geräte im Sinne des Gesetzes über Elektromagnetische Verträglichkeit (EMVG vom 09.11.92 u. 1. EMVGÄndG vom 30.08.95). Erst nach Einbindung der Antriebsregler in ein Antriebssystem wird dieses bezüglich der EMV bewertbar.</td><td>Les variateurs de vitesse types EVS93xx / EVF93xx ne constituent pas des appareils fonctionnant indépendamment au sens de la loi sur la compatibilité électromagnétique (Loi du 9/11/92 et amendement n° 1 du 30/8/95). La compatibilité électromagnétique ne peut être évaluée qu'après intégration des variateurs de vitesse dans un système d'entraînement. La société</td></tr>
<tr><td colspan="3">LENZE Drive Systems GmbH, Postfach 10 13 52, D-31763 Hameln</td></tr>
<tr><td>declares that the described "CE-typical drive system" with the controllers EVS93xx / EVF93xx complies with the above EC Directive.
The conformity evaluation is based on the product standard for drive systems:</td><td>erklärt die Konformität eines beschriebenen „CE-typischen Antriebssystems“ mit den Antriebsreglern EVS93xx / EVF93xx zur o.g. EG-Richtlinie. Grundlage der Konformitätsbewertung ist die Produktnorm für Antriebssysteme:</td><td>déclare conforme à la directive indiquée ci-dessus le „système d'entraînement de type CE“ décrit, avec les variateurs de vitesse types EVS93xx / EVF93xx. La norme produit pour des systèmes d'entraînement constitue la base de l'évaluation de la conformité :</td></tr>
<tr><td colspan="3">EN61800-3; EN61800-3/A11</td></tr>
<tr><td>Adjustable speed electrical power drive systems, part 3: EMC-product standard including specific test methods</td><td>Drehzahlveränderbare elektrische Antriebe Teil 3: EMV-Produktnorm einschließlich spezieller Prüfverfahren</td><td>Entraînements électriques de puissance à vitesse variable partie 3. Norme de produit relative à la CEM incluant des méthodes d'essais spécifiques</td></tr>
</table>

Hameln, 01.05.2002

(Dr. Edwin Kiel)
General Manager R&D
Geschäftsführer F&E
Gérant R&D

(i.A. Andreas Tolksdorf)

9300std002

1.3.5 EC Machinery Directive

(98/37/EC)

1.3.5.1 General

For the purpose of the Machinery Directive, "machinery" means an assembly of linked parts or components, at least one of which moves, with the appropriate actuators, control and power circuits, etc., joined together for a specific application, in particular for processing, treatment, moving or packaging of a material.

EC Manufacturer`s Declaration for the purpose of the	**EG-Herstellererklärung im Sinne der**	**Déclaration du fabricant au sens de la**
EC Machinery Directive (98/37/EC)	**EG-Richtlinie Maschinen (98/37/EG)**	**directive CE relative aux machines (98/37/CE)**
The controllers of the types **EVS93xx / EVF93xx** were developed, designed and manufactured under the sole responsibility of	Die Antriebsregler der Typen ***EVS93xx / EVF93xx*** wurden entwickelt, konstruiert und in alleiniger Verantwortung von	Les variateurs de vitesse types **EVS93xx / EVF93xx** ont été étudiés, conçus et fabriqués en la seule responsabilité de la société
LENZE Drive Systems GmbH, Postfach 10 13 52, D-31763 Hameln		
Commisioning of the controllers is prohibited before it is proven that the machine corresponds to the EC Machinery Directive.	Die Inbetriebnahme der Antriebsregler ist so lange untersagt, bis festgestellt wurde, dass die Maschine, in die sie eingebaut werden sollen, den Bestimmungen der EG-Richtlinie Maschinen entspricht.	La mise en service des variateurs de vitesse est interdite jusqu`à ce que la machine dans laquelle les variateurs sont intégrés soit déclarée conforme à la directive CE relative aux machines.

Hameln, 01.05.2002

(Dr. Edwin Kiel)
General Manager R&D
Geschäftsführer F&E
Gérant R&D

9300std003

2 Safety instructions

2.1 General safety and application notes for Lenze controllers

(According to: Low-Voltage Directive 73/23/EEC)

General

Lenze controllers (frequency inverters, servo inverters, DC controllers) can include live and rotating parts - depending on their type of protection - 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 detailed information please see the documentation.

All operations concerning transport, installation, and commissioning as well as maintenance must be carried out by qualified, skilled personnel (IEC 364 or CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE 0110 and national regulations for the prevention of accidents must be observed).

According to this basic safety information qualified skilled personnel are persons who are familiar with the installation, assembly, commissioning, and operation of the product and who have the qualifications necessary for their occupation.

Application as directed

Drive controllers are components which are designed for installation in electrical systems or machinery. They are not to be used as household appliances. They are intended exclusively for professional and commercial purposes according to EN 61000-3-2. This documentation includes information about the compliance with the limit values to EN 61000-3-2.

When installing the drive controllers in machines, commissioning (i.e. starting of 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 operation as directed) is only allowed when there is compliance with the EMC Directive (89/336/EEC).

The drive controllers meet the requirements of the Low-Voltage Directive 73/23/EEC. The harmonised standards of the series EN 50178/DIN VDE 0160 apply to the controllers.

The technical data and information on the connection conditions must be obtained from the nameplate and the documentation. They must be observed in any case.

Warning: The availability of controllers is restricted according to EN 61800-3. These products can cause radio interferences in residential areas. In this case, special measures are required.

Transport, storage

Please observe the notes on transport, storage and appropriate handling.

Observe the climatic conditions according to EN 50178.

Installation

The controllers must be installed and cooled according to the regulations given in the documentation.

Ensure proper handling and avoid 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 components 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 drive controllers, the applicable national regulations for the prevention of accidents (e.g. VBG 4) must be observed.

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 about installation in compliance with EMC (shielding, earthing, filters and cables). These notes must also be observed for CE-marked controllers. The manufacturer of the system or machine is responsible for the compliance with the required limit values demanded by the EMC legislation.

Operation

If necessary, systems including controllers must be equipped with additional monitoring and protection devices according to the corresponding standards (e.g. law on technical equipment, regulations for the prevention of accidents, etc.). If necessary, adapt the controllers to your application. Please observe the corresponding information given in the Instructions.

After the controller has been disconnected from the supply voltage, live components and power connection must not be touched immediately since capacitors could be charged. Please observe the corresponding notes on the controller.

All covers and doors must be closed during operation.

Note for UL-approved systems with integrated controllers: UL warnings are notes which apply to UL systems. The documentation contains special information about UL.

Safe standstill

Variant V004 of the controller series 9300 and 9300 vector, variant x4x of the controller series 8200 vector and axis module ECSxAxxx support the function ”Safe standstill”, protection against unintentional restart, according to the requirements of Appendix I, No. 1.2.7 of the EC Directive ”Machinery” 98/37/EC, DIN EN 954-1 category 3 and DIN EN 1037. It is absolutely necessary to observe the information about the function ”Safe standstill” in the corresponding documentation and instructions.

Maintenance and service

The controllers do not require any maintenance, if the application conditions prescribed are observed.

In operating areas with polluted ambient air, the cooling surfaces of the controller can get dirty or the cooling openings can block. Under these conditons a regular cleaning of the cooling surfaces and cooling openings is essential. Do not use sharp or pointed objects for this purpose!

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 in these instructions must also be observed!

2.2 Residual hazards

Protection of persons	After mains voltage disconnection, the power terminals U, V, W and $+U_G$, $-U_G$ carry hazardous voltages for at least 3 minutes. • Before working on the controller, check that the power terminals are dead. The leakage current against earth (PE) is > 3.5 mA. According to EN 50178 • a fixed installation is required. • a double PE connection is required or, if in single design, it must have a cable cross-section of at least 10 mm^2.
Protection of devices	Cyclic connection and disconnection of the controller supply voltage at L1, L2, L3 or +UG, +UG may overload the internal input current limitation: • Allow at least 3 minutes between disconnection and reconnection.
Overspeed	Drive systems can reach a dangerous overspeed (e.g. setting high field frequencies for motors and machines which are not suitable): • The controllers are not protected against those operating conditions. For this purpose use additional components.
Parameter set transfer	During parameter set transfer, the control terminals of the 9300 controller can take on undefined states! Therefore the plugs 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".

2.3 Layout of the safety instructions

All safety notes given in these instructions have the same layout:

Signal word (characterises the severity of danger)

Note (describes the danger and gives information how to avoid it)

	Icons used		Signal words	
Warning of damage to persons		Warning of hazardous electrical voltage	**Danger!**	Warns of **impending danger**. Consequences if disregarded: Death or severe injuries.
		Warning of a general danger	**Warning!**	Warns of **potential, very hazardous situations**. Possible consequences if disregarded: Death or severe injuries.
			Caution!	Warns of **potential, hazardous situations**. Possible consequences if disregarded: Light or minor injuries.
Warning of damage to material	STOP		**Stop!**	Warns of **potential damage to material**. Possible consequences if disregarded: Damage of the controller/drive system or its environment.
Other notes	i		**Tip!**	This note designates general, useful notes. If you observe it, handling of the controller/drive system is made easier.

EDSVS9332S-B
13181650

Lenze

System Manual
Part B

Technical data

Installation

Global Drive

9300 servo inverter

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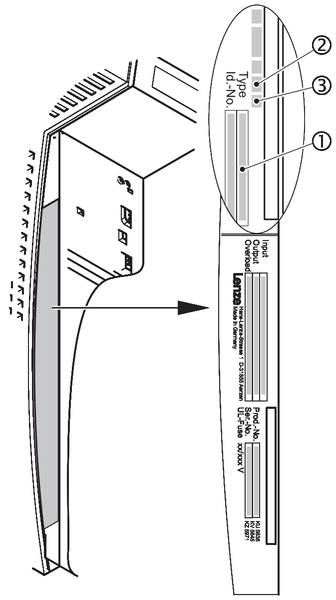
C = Cold Plate

S = 9300 servo inverter

Hardware version

Software version



3.0 11/2006

3 Technical data

3.1 Features

- Single axis in narrow design
  – thus space-saving installation
- Power range: 370 W to 75 kW
  – uniform control module and thus uniform connection for the control cables over the complete power range
- Heatsink can be separated
  – the cooling can be achieved outside the control cabinet (Push-through or ”cold plate” technique)
- Power connections from the top (supply) or from the bottom (motor)
  – simple connection for multi-axis applications
- Direct connection of resolver and encoder feedback
  – simple connection via prefabricated cables (accessories)
  – connecting cables can be plugged
- Integrated phase controller for driftfree standstill
- Field-oriented control for asynchronous and synchronous motors
- Vector modulation
- Digital synchronisation system via digital frequency
  – setpoint transmission without offset and gain errors
  – Synchronisation in speed and rotor position
  – Homing function
- Application configuration for control functions and input/output signals
  – comprehensive function block library
  – high flexibility in the adaptation of the internal control structure to the application
- Integrated automation interface
  – simple extensions of the controller functions
- System bus for connecting servo inverters and for extending input and output terminals
- Approval of standard devices UL 508, File No. 132659 (listed)
- Approval 9371 BB (BAE) UL 508, File No. 132659 (listed)

3.2 General data/operating conditions

Standards and operating conditions				
Conformity		CE	Low-Voltage Directive (73/23/EEC)	
Approvals		UL508	Industrial Control Equipment	
		UL508C	Power Conversion Equipment Underwriter Laboratories (File No. E132659) for USA and Canada	
Vibration resistance		Germanischer Lloyd, general conditions		
Climatic conditions		Class 3K3 to EN50178 (without condensation, average relative humidity 85%)		
Degree of pollution		VDE 0110 part 2 pollution degree 2		
Packaging (DIN 4180)		Delivery packing		
Permissible temperature ranges	Transport		-25 °C ... +70 °C	
	Storage		-20 °C ... +55 °C	
	Operation	Types 9321 ... 9326	0 °C ... +55 °C	reduce the rated output current by 2.5%/°C above +40 °C
		Types 9327 ... 9332	0 °C ... +50 °C	
Permissible installation height		0 ... 4000 m amsl		reduce the rated output current by 5%/1000 m above 1000 m amsl
Mounting positions		Vertical		
DC-bus operation		Possible		

General electrical data			
EMC	Compliance with EN 61800-3/A11		
Noise emission	Requirements to EN 50081-2, EN 50082-1, EN 61800-3 Limit value class A to EN 55011 (industrial area) with mains filter A Limit value class B to EN 55022 (residential area) with mains filter B and installation in control cabinet		
Noise immunity	Limit values maintained using mains filter. Requirements to EN 50082-2, EN 61800-3		
	Requirements	**Standard**	**Severities**
	ESD	EN61000-4-2	3, i.e. 8 kV with air discharge 6 kV with contact discharge
	RF interference (enclosure)	EN61000-4-3	80 MHz ... 1000 MHz, 10 V/m 80 % AM (1 kHz)
	Burst	EN61000-4-4	3/4, i.e. 2 kV/5 kHz
	Surge (Surge on mains cable)	EN61000-4-5	3, i.e. 1.2/50 μs, 1 kV phase-phase, 2 kV phase-PE
Insulation resistance	Overvoltage category III to VDE 0110		
Discharge current to PE (to EN 50178)	> 3.5 mA		
Enclosure	IP20 IP41 on the heatsink side for thermal separation (push-through technique) NEMA 1: Shock protection		
Protective insulation of control circuits	Safe mains isolation: Double/reinforced insulation to EN 50178 for digital inputs and outputs		

Open loop and closed loop control			
Switching frequency		8 ... 16 Nm	
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 Nm
	Offset	±0 %	
Analog inputs/analog outputs		• 2 inputs (bipolar) • 2 outputs (bipolar)	
Digital inputs/digital outputs		• 5 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 resolver input; Design: 9-pole Sub-D socket • 1 master frequency input (500 kHz, TTL level); Design: 9-pole Sub-D socket; Can be optionally used as incremental encoder input (500 kHz, TTL 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: τ = 10 ms)	

3.3 Rated data

3.3.1 Types 9321 to 9325

	Type	**EVS9321-ES**	**EVS9322-ES**	**EVS9323-ES**	**EVS9324-ES**	**EVS9325-ES**
	Order No.	EVS9321-ES	EVS9322-ES	EVS9323-ES	EVS9324-ES	EVS9325-ES
	Type	**EVS9321-CS**	**EVS9322-CS**	**EVS9323-CS**	**EVS9324-CS**	**EVS9325-CS**
	Order No.	EVS9321-CS	EVS9322-CS	EVS9323-CS	EVS9324-CS	EVS9325-CS
Mains voltage	U_r [V]	320 V - 0 % ≤ U_r ≤ 528 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %				
Alternative DC supply	U_G [V]	460 V - 0 % ≤ U_G ≤ 740 V + 0 %				
Mains current with mains filter	I_r [A]	1.5 2.1	2.5 3.5	3.9 5.5	7.0 -	12.0 16.8
Data for the operation on a mains: 3 AC/400 V / 50 Hz/60 Hz						
Motor power (4-pole ASM)	P_r [kW]	0.37	0.75	1.5	3.0	5.5
	P_r [hp]	0.5	1.0	2.0	4.0	7.5
Output power U, V, W (8 kHz*)	S_{r8} [kVA]	1.0	1.7	2.7	4.8	9.0
Output power $+U_G$, $-U_G$ 2)	P_{DC} [kW]	2.0	0.75	2.2	0.75	0
Output current (8 kHz*)	I_{r8} [A]	1.5	2.5	3.9	7.0	13.0
Output current (16 kHz*)	I_{r16} [A]	1.1	1.8	2.9	5.2	9.7
Max. output current (8 kHz*)1)	I_{max8} [A]	2.3	3.8	5.9	10.5	19.5
Max. output current (16 kHz*)1)	I_{max16} [A]	1.7	2.7	4.4	7.8	14.6
Max. standstill current (8 kHz*)	I_{08} [A]	2.3	3.8	5.9	10.5	19.5
Max. standstill current (16 kHz*)	I_{016} [A]	1.7	2.7	4.4	7.8	14.6
Data for the operation on a mains: 3 AC/480 V / 50 Hz/60 Hz						
Motor power (4-pole ASM)	P_r [kW]	0.37	0.75	1.5	3.0	5.5
	P_r [hp]	0.5	1.0	2.0	4.0	7.5
Output power U, V, W (8 kHz*)	S_{r8} [kVA]	1.2	2.1	3.2	5.8	10.8
Output power $+U_G$, $-U_G$ 2)	P_{DC} [kW]	2.0	0.75	2.2	0.75	0
Output current (8 kHz*)	I_{r8} [A]	1.5	2.5	3.9	7.0	13.0
Output current (16 kHz*)	I_{r16} [A]	1.1	1.8	2.9	5.2	9.7
Max. output current (8 kHz*)1)	I_{max8} [A]	2.3	3.8	5.9	10.5	19.5
Max. output current (16 kHz*)1)	I_{max16} [A]	1.7	2.7	4.4	7.8	14.6
Max. standstill current (8 kHz*)	I_{08} [A]	2.3	3.8	5.9	10.5	19.5
Max. standstill current (16 kHz*)	I_{016} [A]	1.7	2.7	4.4	7.8	14.6
Motor voltage	U_M [V]	0 - 3 × U_{Mains}				
Power loss (operation with I_{rx})	P_{loss} [W]	100	110	140	200	260
Weight	m [kg]	3.5	3.5	5.0	5.0	7.5

1) The currents apply to a periodical load cycle with 1 minute overcurrent with the current mentioned here and 2 minutes base load with 75% I_{rx}

2) When operated under rated load, the controller can supply this power additionally.

* Switching frequency of the inverter (C0018)

3.3.2 Types 9321 to 9324 with 200% overcurrent

	Type	EVS9321-ES	EVS9322-ES	EVS9323-ES	EVS9324-ES
	Order No.	EVS9321-ES	EVS9322-ES	EVS9323-ES	EVS9324-ES
Data for the operation on a mains: 3 AC/400 V / 50 Hz/60 Hz					
Motor power (4-pole ASM)	P_r [kW]	0.37	0.75	1.5	3.0
	P_r [hp]	0.5	1.0	2.0	4.0
Output power U, V, W (8 kHz)	S_{r8} [kVA]	1.0	1.7	2.7	4.8
Output current (8 kHz) 2)	I_{r8} [A]	1.5	2.5	3.9	7.0
Output current (16 kHz) 2)	I_{r16} [A]	1.1	1.8	2.9	5.2
Max. output current (8 kHz)1)	I_{max8} [A]	3.0	5.0	7.8	14.0
Max. output current (16 kHz)1)	I_{max16} [A]	2.2	3.6	5.8	10.4
Max. standstill current (8 kHz)	I_{08} [A]	3.0	5.0	7.8	14.0
Max. standstill current (16 kHz)	I_{016} [A]	2.2	3.6	5.8	10.4
Data for the operation on a mains: 3 AC/480 V / 50 Hz/60 Hz					
Motor power (4-pole ASM)	P_r [kW]	0.37	0.75	1.5	3.0
	P_r [hp]	0.5	1.0	2.0	4.0
Output power U, V, W (8 kHz)	S_{r8} [kVA]	1.2	2.1	3.2	5.8
Output current (8 kHz) 2)	I_{r8} [A]	1.5	2.5	3.9	7.0
Output current (16 kHz) 2)	I_{r16} [A]	1.1	1.8	2.9	5.2
Max. output current (8 kHz)1)	I_{max8} [A]	3.0	5.0	7.8	14.0
Max. output current (16 kHz)1)	I_{max16} [A]	2.2	3.6	5.8	10.4
Max. standstill current (8 kHz)	I_{08} [A]	3.0	5.0	7.8	14.0
Max. standstill current (16 kHz)	I_{016} [A]	2.2	3.6	5.8	10.4

1) The currents apply to a periodical load cycle with 10 seconds overcurrent with the current mentioned here and 50 seconds base load with 44 % I_{rx}

Majority in indiv. cases	Setting in C0022	Thermal continuous current	Maximum current phase	Recovery phase
Continuous power	$I_{max} \leq 150$ % I_{rx}	100 % I_{rx}	150 % I_{rx} for 60 s	75 % I_{rx} for 120 s
Peak power	$I_{max} > 150$ % I_{rx}	70 % I_{rx}	200 % I_{rx} for 10 s	44 % I_{rx} for 50 s

2) This output current Irx applies to a maximum current to be set under C022 which has not exceeded 150% of the rated controller current (nameplate).

If the maximum current is higher than this value, the continuous current automatically decreases to 70% of the original value.

Overcurrent diagram: 🕮 6-5
All other data: 🕮 3-4

Tip!

You can switch to $I_{max} > 150$ % I_{rx} only if the controller is inhibited.

3.3.3 Types 9326 to 9332

	Type	**EVS9326-ES**	**EVS9327-ES**	**EVS9328-ES**	**EVS9329-ES**	**EVS9330-ES**	**EVS9331-ES**	**EVS9332-ES**
	Order No.	EVS9326-ES	EVS9327-ES	EVS9328-ES	EVS9329-ES	EVS9330-ES	EVS9331-ES	EVS9332-ES
	Type	**EVS9326-CS**	**EVS9327-CS**	**EVS9328-CS**				
	Order No.	EVS9326-CS	EVS9327-CS	EVS9328-CS				
Mains voltage	U_r [V]	320 V - 0 % ≤ U_r ≤528 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %						
Alternative DC supply	U_G [V]	460 V - 0 % ≤ U_G ≤ 740 V + 0 %						
Mains current with mains filter Mains current without mains filter	I_r [A]	20.5 -	27.0 43.5	44.0 -	53.0 -	78.0 -	100 -	135 -
Data for the operation on a mains: 3 AC/400 V / 50 Hz/60 Hz								
Motor power (4-pole ASM)	P_r [kW]	11.0	15.0	22.0	30.0	45.0	55.0	75.0
	P_r [hp]	15.0	20.5	30.0	40.0	60.0	73.5	100.0
Output power UVW (8 kHz*)	S_{r8} [kVA]	16.3	22.2	32.6	40.9	61.6	76.2	100.5
Output power $+U_G$, $-U_G$ 2)	P_{DC} [kW]	0	10	4	0	5	0	0
Output current (8 kHz*) 1)	I_{r8} [A]	23.5	32.0	47.0	59.0	89.0	110.0	145.0
Output current (16 kHz*) 1)	I_{r16} [A]	15.3	20.8	30.6	38.0	58.0	70.0	90.0
Max. output current (8 kHz*)	I_{max8} [A]	35.3	48.0	70.5	88.5	133.5	165.0	217.5
Max. output current (16 kHz*)	I_{max16} [A]	23.0	31.2	45.9	57.0	87.0	105.0	135.0
Max. standstill current (8 kHz*)	I_{08} [A]	23.5	32.0	47.0	52.0	80.0	110.0	126.0
Max. standstill current (16 kHz*)	I_{016} [A]	15.3	20.8	30.6	33.0	45.0	70.0	72.0
Data for the operation on a mains: 3 AC/480 V / 50 Hz/60 Hz								
Motor power (4-pole ASM)	P_r [kW]	11.0	18.5	30.0	37.0	45.0	55.0	90.0
	P_r [hp]	15.0	25.0	40.0	49.5	60.0	73.5	120.0
Output power UVW (8 kHz*)	S_{r8} [kVA]	18.5	25.0	37.0	46.6	69.8	87.3	104.0
Output power $+U_G$, $-U_G$ 2)	P_{DC} [kW]	0	12	4.8	0	6	0	6
Output current (8 kHz*)	I_{r8} [A]	22.3	30.4	44.7	56.0	84.0	105.0	125.0
Output current (16 kHz*)	I_{r16} [A]	14.5	19.2	28.2	35.0	55.0	65.0	80.0
Max. output current (8 kHz*)1)	I_{max8} [A]	33.5	45.6	67.1	84.0	126.0	157.5	187.5
Max. output current (16 kHz*)1)	I_{max16} [A]	21.8	28.8	42.3	52.5	82.5	97.5	120.0
Max. standstill current (8 kHz*)	I_{08} [A]	22.3	30.4	44.7	49.0	72.0	105.0	111.0
Max. standstill current (16 kHz*)	I_{016} [A]	14.5	19.2	28.2	25.0	36.0	58.0	58.0
Motor voltage	U_M [V]	0 - 3 × U_{mains}						
Power loss	P_{loss} [W]	360	430	640	810	1100	1470	1960
Weight	m [kg]	7.5	12.5	12.5	12.5	36.5	59	59

1) The currents apply to a periodical load cycle with 1 minute overcurrent with the current mentioned here and 2 minutes base load with 75% I_{rx}

2) When operated under rated load, the controller can supply this power additionally.

* Switching frequency of the inverter (C0018)

3.4 Fuses and cable cross-sections

Type	Mains input L1, L2, L3, PE/motor connection U, V, W										Input +UG, -UG		
	Operation without mains filter					Operation with mains filter							
	Fuse		E.l.c.b.	Cable cross-section 2)		Fuse		E.l.c.b.	Cable cross-section 2)		Fuse	Cable cross-section 2)	
	VDE	UL	VDE	mm²	AWG	VDE	UL	VDE	mm²	AWG		mm²	AWG
9321	M6A	5A	B6A C6A 3)	1	17	M6A	5A	B6A C6A 3)	1	17	6 A	1	18
9322	M6A	5A	B6A C6A 3)	1	17	M6A	5A	B6A C6A 3)	1	17	6 A	1	18
9323	M10A	10 A	B10A	1.5	15	M10A	10 A	B10A	1.5	15	12 A	1.5	14
9324	-	-	-	-	-	M10A	10 A	B10A	1.5	15	12 A	1.5	14
9325	M32A	25 A	B32A	6	9	M20A	20 A	B20A	4	11	20 A	4	12
9326	-	-	-	-	-	M32A	25 A	B32A	6	9	40 A	10	8
9327	M63A	63 A	-	16	6	35 A	35 A	-	10	7	80 A	25	3
9328	-	-	-	-	-	50 A	50 A	-	16	5	80 A	25	3
9329	-	-	-	-	-	80 A	80 A	-	25	3	100 A	50	1
9330	-	-	-	-	-	100 A	100 A	-	50	0	2 * 80A 1)	2 * 25	2 * 3
9331	-	-	-	-	-	125 A	125 A	-	70	2/0	2 * 100A 1)	2 * 50	2 * 1
9332	-	-	-	-	-	160 A	175 A	-	95	3/0	3 * 80A 1)	3 * 25	3 * 3

1) The DC bus fuses are connected in parallel
2) The valid local regulations must be observed
3) Use circuit breakers with tripping characteristic C with short-time mains interruptions or low-inductance mains.

For operation of the controllers in a UL-approved plant:

- Use only UL-approved fuses and fuse holders:
  – 500 V to 600 V in the mains input (AC).
  – 700 V in the DC bus.
  – The tripping characteristic is defined by ”H” or ”K5”.
- Use only UL-approved cables.

Tip!

UL-approved fuses and fuse holders can be obtained from, e.g. Bussmann or Ferraz.

Connection of the motor cables

- The protection of the motor cables is not necessary for functional reasons.
- Refer to the data listed in the table ”Operation with mains filters”.

3.5 Mains filters

Type	Rated data (uk ≈6%)		Lenze order number	
	Mains current	Inductance	for RFI level A	for RFI level B
9321	1.5 A	24 mH	EZN3A2400H002	EZN3B2400H002
9322	2.5 A	15 mH	EZN3A1500H003	EZN3B1500H003
9323	4 A	9 mH	EZN3A0900H004	EZN3B0900H004
9324	7 A	5 mH	EZN3A0500H007	EZN3B0500H007
9325	13 A	3 mH	EZN3A0300H013	EZN3B0300H013
9326	24 A	1.5 mH	EZN3A0150H024	EZN3B0150H024
9327	30 A	1.1 mH	EZN3A0110H030	EZN3B0110H030
9328	42 A	0.8 mH	EZN3A0080H042	EZN3B0080H042
9329	60 A	0.54 mH	EZN3A0055H060	EZN3B0055H060
9330	90 A	0.37 mH	EZN3A0037H090	EZN3B0037H090
9331	150 A	0.22 mH	EZN3A0022H150	EZN3B0022H150
9332	150 A	0.22 mH	EZN3A0022H150	EZN3B0022H150

The mains filters for RFI level B contain additional RFI suppression components.

3.6 Dimensions

The dimensions of the controllers depend on the mechanical installation. (📖 4-11)

4 Installation

4.1 Mechanical installation

4.1.1 Important notes

- Use the controllers only as built-in devices!
- If the cooling air contains pollutants (dust, fluff, grease, aggressive gases):
  – Take suitable preventive measures, e.g. separate air duct, installation of filters, regular cleaning, etc.
- Observe free space!
  – You can install several controllers next to each other without free space in a control cabinet.
  – Ensure unimpeded ventilation of cooling air and outlet of exhaust air!
  – Allow a free space of 100 mm at the top and at the bottom.
- Do not exceed the ambient temperature permissible during operation. (📖 3-2)
- With continuous oscillations or vibrations:
  – Check whether shock absorbers are necessary.

Possible mounting positions

Vertically on the control cabinet back panel with mains connections at the top:

- With enclosed fixing rails or fixing brackets.
- Thermally separated with external heatsink:
  – Push-through technique
  – ”Cold Plate technique”

4.1.2 Standard assembly with fixing rails or fixing brackets

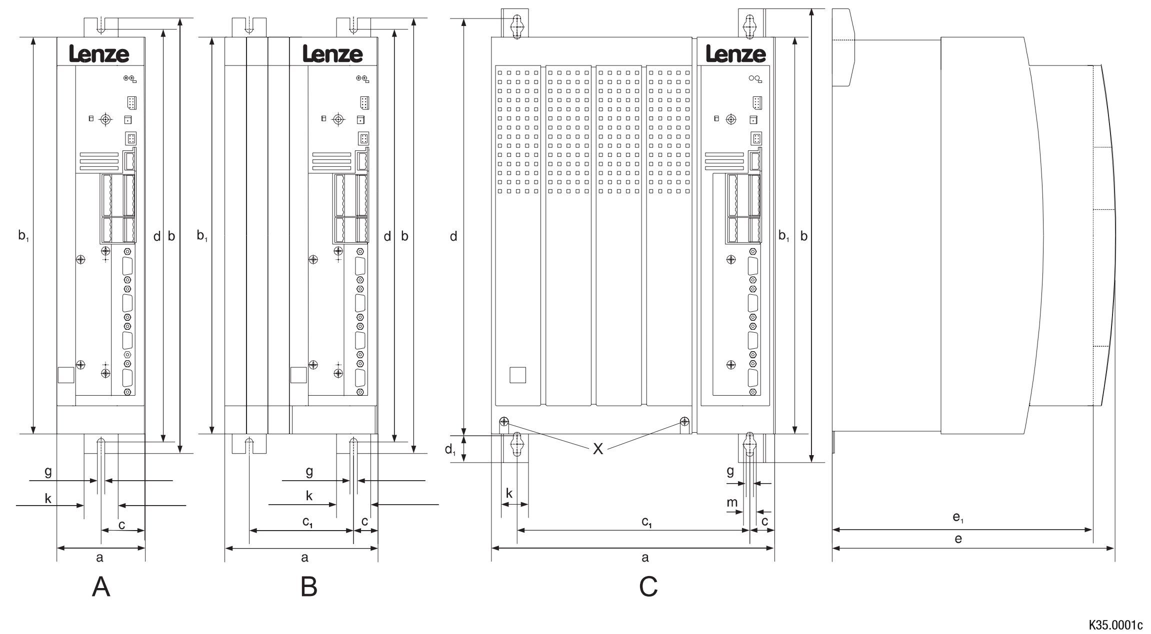


Fig. 4-1 Dimensions for assembly with fixing rails/fixing brackets

Type	Fig.	a	b	b1	c	c1	d	d1	e*	e1	g	k	m
9321, 9322	A	78	384	350	39	-	365	-	250	230	6.5	30	-
9323, 9324	A	97	384	350	48.5	-	365	-	250	230	6.5	30	-
9325, 9326	B	135	384	350	21.5	92	365	-	250	230	6.5	30	-
9327, 9328, 9329	C	250	402	350	22	206	370	24	250	230	6.5	24	11
9330	C	340	672	591	28.5	283	624	38	285	265	11	28	18
9331, 9332	C	450	748.5	680	28.5	393	702	38	285	265	11	28	18

* When using a plug-on fieldbus module, please observe free space required for the connection cable
All dimensions in mm

Controllers 9321 to 9326

- Assembly preparation:
  – Take out fixing rail(s) (assembly kit in the box) and mount it/them to the controller housing

Controllers 9327 to 9332

- Remove cover:
  – Loosen screws (X)
  – Swing cover to the top and detach
  – Take assembly kit out of the interior of the controller
- Assembly preparation:
  – Take out fixing bracket and screws (assembly kit) and mount bracket to the controller housing

4.1.3 Thermally separated mounting (push-through technique)

The heatsink of the controllers 9321 ... 9329 can be installed outside the control cabinet to reduce the development of heat in the control cabinet. You need an assembly frame with a seal (can be ordered from Lenze).

- Distribution of the power loss:
  – approx. 65% via the separated cooler (heatsink + fan)
  – approx. 35% inside the controller
- The class of protection of the separated cooler (heatsink and fan) is IP41.
- The rated data of the controller is still applicable.

Preparation for assembly:

1. Lay the halves of the assembly frame into the slot provided on the controller.
2. Push the frame halves together until the ends lock.
3. Slip the seal over the heatsink and lay into the slot provided.

Types 9321 ... 9326

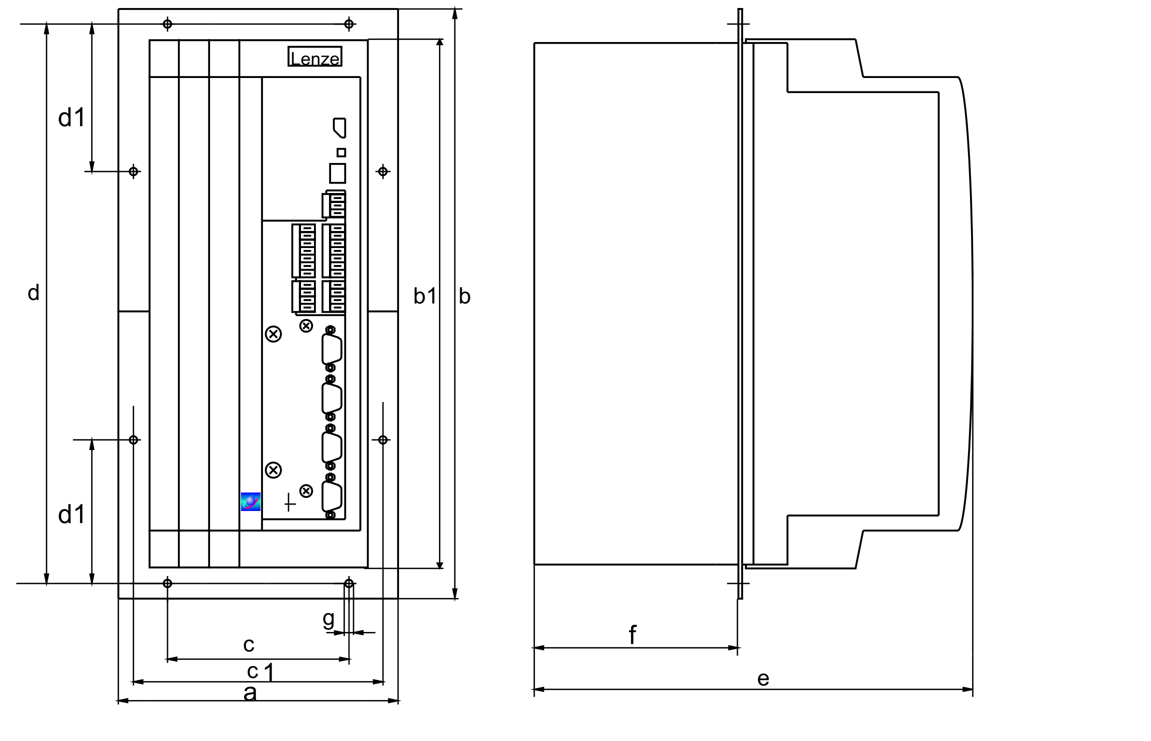


Fig. 4-2 Dimensions for assembly with thermally separated power stage

Type	a	b	b1	c	c1	d	d1	e*	f	g
9321, 9322	112.5	385.5	350	60	95.5	365.5	105.5	250	92	6.5
9323, 9324	131.5	385.5	350	79	114.5	365.5	105.5	250	92	6.5
9325, 9226	169.5	385.5	350	117	152.5	365.5	105.5	250	92	6.5

* When using a plug-on fieldbus module, please observe free space required for the connection cable
All dimensions in mm

Assembly cut-out

Type	Height	Width
9321, 9322	350 mm ±3 mm	82 mm ±3 mm
9323, 9324	350 mm ±3 mm	101 mm ±3 mm
9325, 9326	350 mm ±3 mm	139 mm ±3 mm

Types 9327 ... 9332

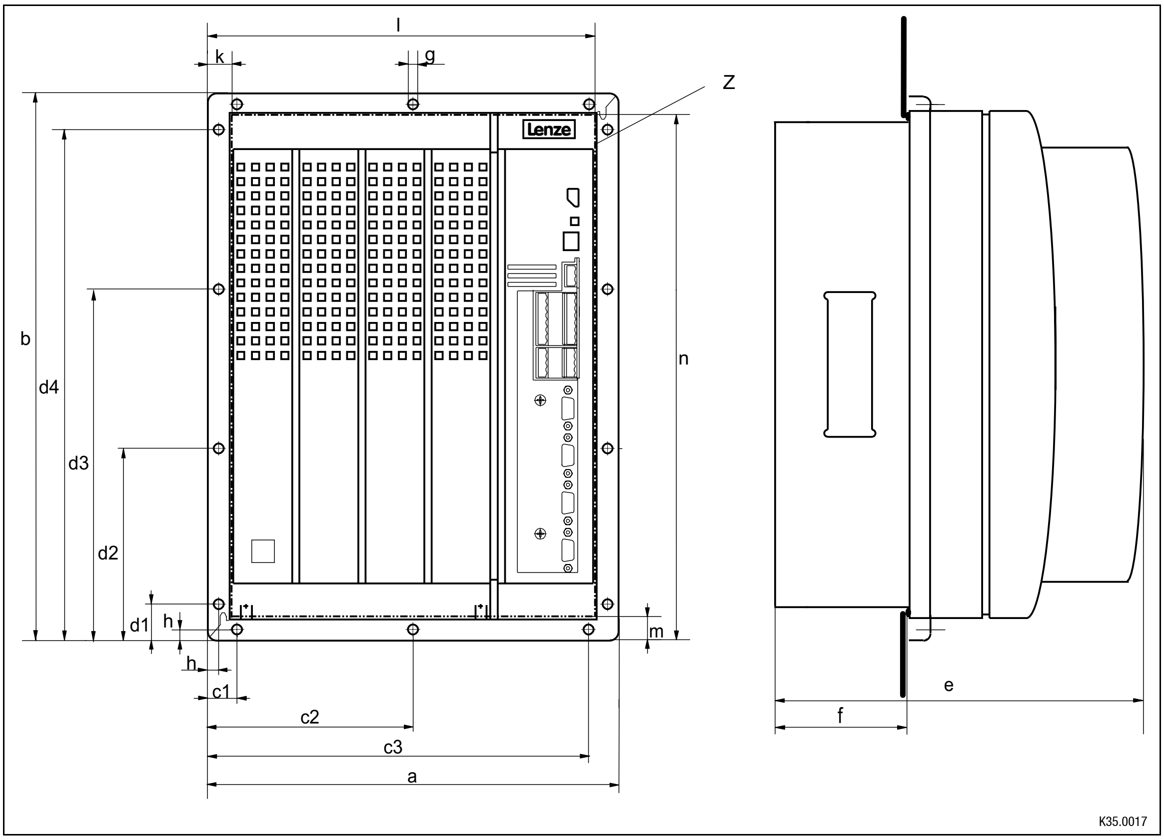


Fig. 4-3 Dimensions for assembly with thermally separated power stage

Type	a	b	c1	c2	c3	d1	d2	d3	d4	e *)	f	g	h
9327, 9328, 9329	280	379	28	140	252	41	141	238	338	250	90	6	9

* When using a plug-on fieldbus module, please observe free space required for the connection cable
All dimensions in mm

Cut-out Z

Type	Height	Width	k	l	m	n
9327, 9328, 9329	338 mm ±1 mm	238 mm ±1 mm	20 mm ±1 mm	259 mm ±1 mm	20 mm ±1 mm	359 mm ±1 mm

4.1.4 Mounting in ”cold plate” technique

Types 9321 ... 9326

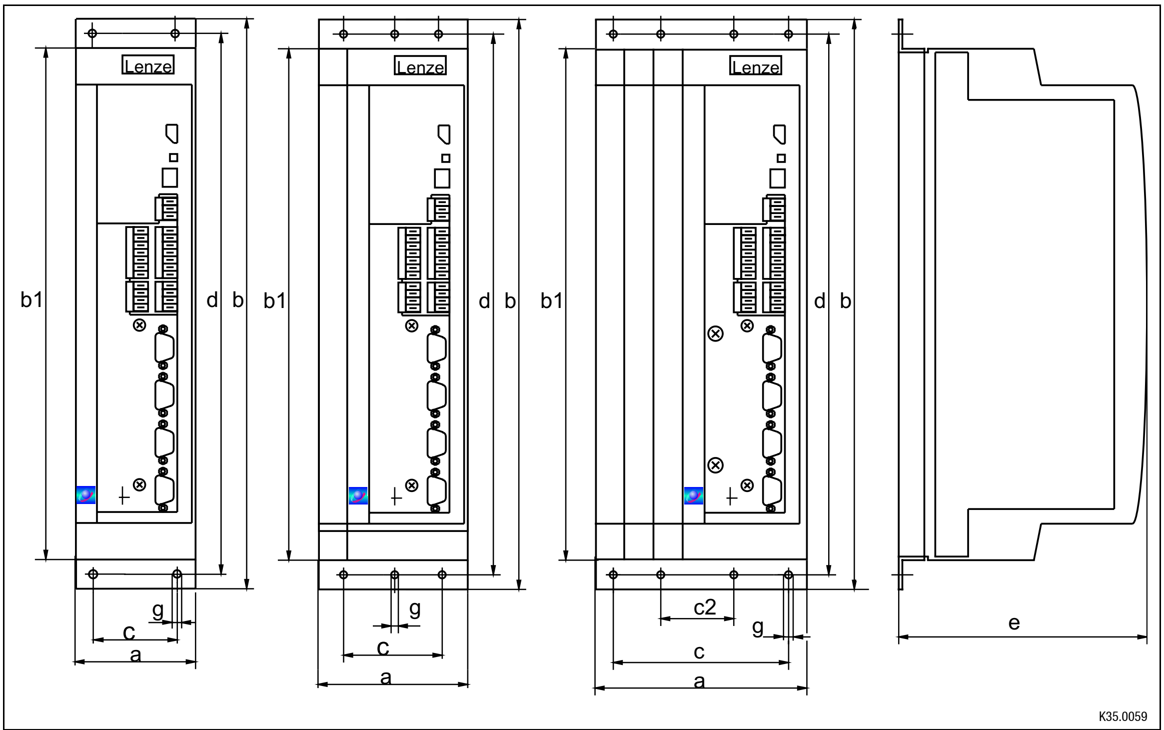


Fig. 4-4 Dimensions for assembly in ”cold plate” technique

Type	a	b	b1	c	c2	d	e*	g
9321-Cx 9322-Cx	78	381	350	48	-	367	168	6.5
9323-Cx 9324-Cx	97	381	350	67	-	367	168	6.5
9325-Cx 9326-Cx	135	381	350	105	38	367	168	6.5

* When using a plug-on fieldbus module, please observe free space required for the connection cable
All dimensions in mm

Types 9327, 9328

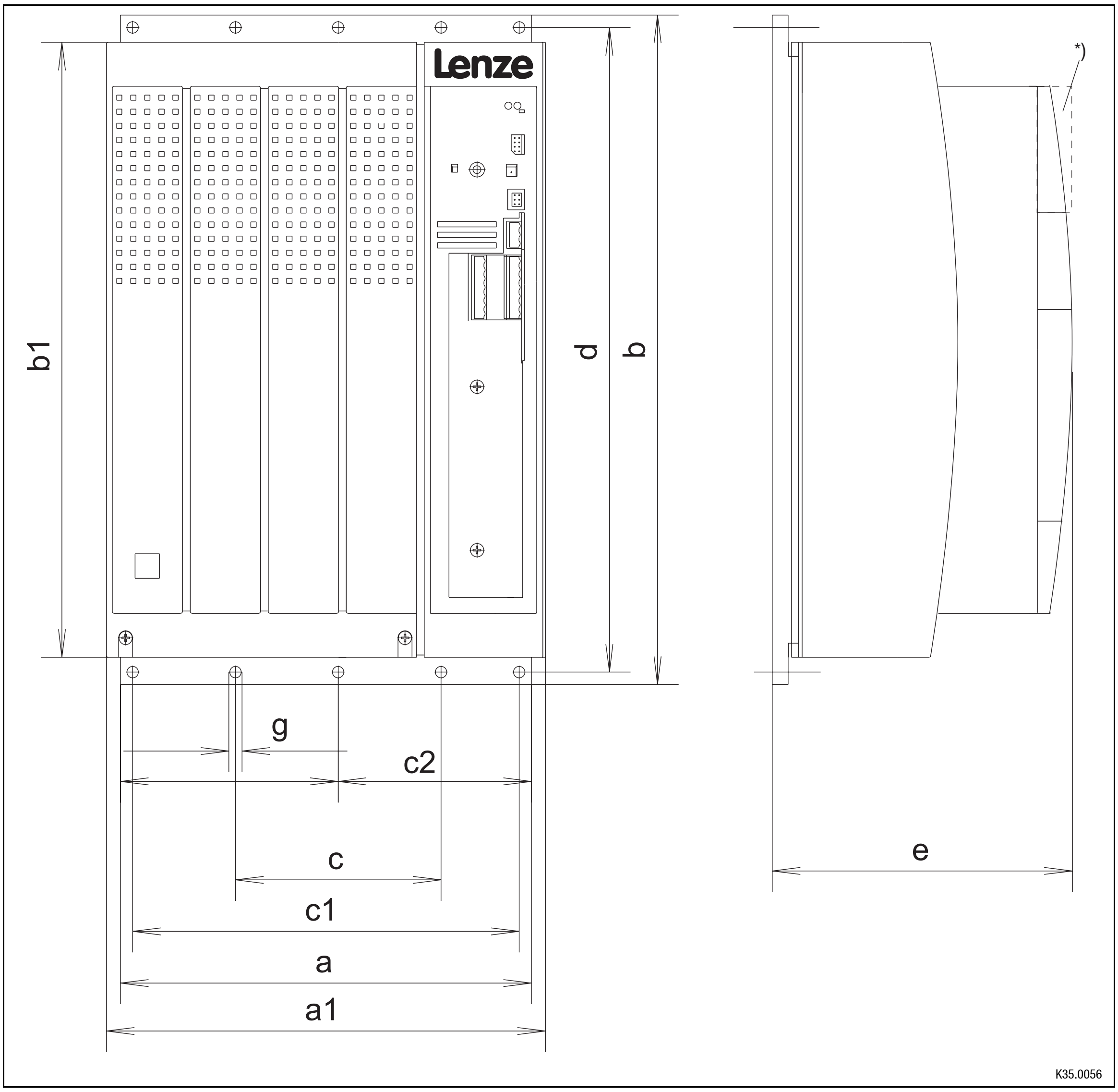


Fig. 4-5 Dimensions for assembly in ”cold plate” technique

Type	a	a1	b	b1	c	c1	c2	d	e*	g
9327-Cx 9328-Cx	234	250	381	350	110	220	117	367	171	6.5

* When using a plug-on fieldbus module, please observe free space required for the connection cable
All dimensions in mm

- Observe the following points to comply with the technical data:
  – Ensure sufficient ventilation of the heatsink.
  – The free space behind the control cabinet back panel must be at least 500 mm.
- If you install several controllers in the control cabinet:
  – Do not install the controllers on top of each other.
- The cooling path must not exceed the thermal resistances in the table:

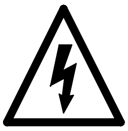
Type	Cooling path	
	Power to be dissipated P_{loss} [W]	$R_{thmax\ heatsink}$ [K/W]
9321-Cx	80	0.50
9322-Cx	80	0.50
9323-Cx	100	0.40
9324-Cx	155	0.25
9325-Cx	210	0.19
9326-Cx	360	0.10
9327-Cx	410	0.09
9328-Cx	610	0.06

- The temperature of the cold plate must not exceed +85 °C.
- For the bore pattern and surface quality of the heatsink please contact Lenze.
- Apply the heat conducting paste (assembly kit) to the cold plate of the controller using a spattle.

4.2 Electrical installation

For information about the installation according to EMC, see chapter 4.3.

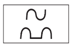
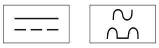
4.2.1 Protection of persons



Danger!

All power terminals carry voltage for up to 3 minutes after mains disconnection.

4.2.1.1 Residual-current circuit breakers

Labelling of RCCBs	Meaning
	AC-sensitive residual-current circuit breaker (RCCB, type AC)
	Pulse-current sensitive residual-current circuit breaker (RCCB, type A)
	All-current sensitive residual-current circuit breaker (RCCB, type B)

Definition

In the following text “RCCB” is used for “residual-current circuit breaker”.

Protection of persons and animals

DIN VDE 0100 with residual-current operated protective devices (RCCB):
- The controllers are internally fitted with a mains rectifier. In case of a short circuit to frame a smooth d.c. fault current can prevent the AC-current-sensitive or pulse-current sensitive residual-current circuit breakers from being activated, thus cancelling the protective function for the entire equipment being operated at this residual-current circuit breaker. Therefore, we recommend:
  – ”pulse-current sensitive RCCBs” or ”all-current RCCBs” in systems equipped with controllers with single-phase mains connection (L1/N).
  – ”all-current sensitive RCCBs” in systems equipped with controllers with three-phase mains connection (L1/L2/L3).

Rated residual current

Please observe the rated residual current for the selection of the RCCB:
- Controller with single-phase mains connection: 30 mA rated residual current
- Controller with three-phase mains connection: 300 mA rated residual current

The RCCB can be activated unintentionally under the following conditions:
- In the event of operational capacitive leakage currents between the cable shields (especially with wall mounting).
- Simultaneous connection of several inverters to the mains.
- If RFI filters are used.

Installation

The RCCB must only be installed between the supplying mains and the controller.

Standards (All-current sensitive RCCB)

All-current sensitive RCCBs are described in the European Standard EN 50178 and in the IEC 755.
The EN 50178 was harmonised and has been effective since October 1997. It replaces the National Standard VDE 0160.

4.2.1.2 Isolation

The controllers have an electrical isolation (isolating distance) between the power terminals and the control terminals as well as to the housing:

- Terminals X1 and X5 have a double basic insulation (double isolating distance, safe electrical isolation to VDE0160, EN50178). The protection against contact is ensured without any further measures.
- The control inputs and outputs of all controllers are electrically isolated.

Danger!

- Terminals X3, X4, X6, X7, X8, X9, X10 have a single basic insulation (single isolating distance).
- Protection against contact in the event of fault is ensured only by additional measures.
- If an external voltage supply (24V DC) is used, the insulation level of the controller depends on the insulation level of the voltage source.

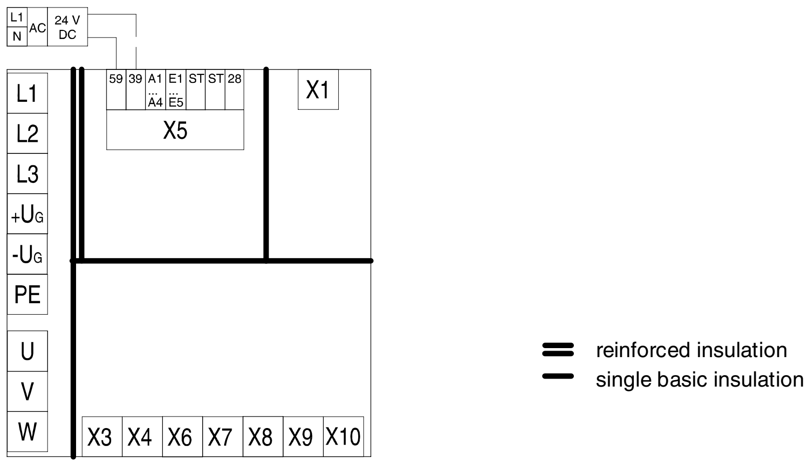


Fig. 4-6 Basic insulation in the controller

4.2.1.3 Replacement of defective fuses

Replace defective fuses with the prescribed type only when no voltage is applied. (📖 3-7)

- For single drives, the controller carries a hazardous voltage for up to three minutes after mains disconnection.
- In a DC-bus connection, all controllers must be inhibited and separated from the mains.

4.2.1.4 Mains disconnection

Make a safety disconnection between the controller and the mains only via a contactor at the input side.

- Please observe that all drives connected to the DC bus must be inhibited.

4.2.2 Controller protection

Stop!

The controllers contain electrostatically sensitive components.

- Prior to assembly and service operations, the personnel must be free of electrostatic charge:
  – Discharge by touching the PE fixing screw or another earthed metal part in the control cabinet.

- Length of the screws for connecting the shield cable/shield sheet for the types 9327 to 9332: < 12 mm
- Controller protection by means of external fuses. (📖 3-7)
- Protect unused control inputs and outputs with plugs or covers (included in the scope of supply) for the Sub-D inputs.
- Frequent mains switching may lead to an overload of the internal starting current limitation. If the mains is switched cyclically, the controller can be switched on every three minutes as a maximum.
- The controllers 9324, 9326, 9328 and 9329 must only be operated with the appropriate mains filters. (📖 3-8)
- In case of condensation, connect the controller to the mains voltage only after the visible humidity has evaporated.

4.2.3 Motor protection

- Extensive protection against overload:
  – By overcurrent relays or temperature monitoring.
  – We recommend to use a PTC thermistor or thermal contact (NC contact) for motor temperature monitoring. (Lenze three-phase AC motors are fitted with thermal contacts as standard)
  – PTC thermistor or thermal contact (NC contact) can be connected to the controller.
- Only use motors with an insulation suitable for the inverter operation:
  – Insulation resistance: Max. û = 1.5 kV, max. du/dt = 5 kV/μs
  – Lenze three-phase AC motors are designed for inverter operation.
  – When using motors with an insulation resistance which is not suitable for the inverter operation, please contact your motor supplier.

4.2.4 Mains types/conditions

Please observe the restrictions for each mains type!

Mains	Operation of the controllers	Notes
With earthed neutral (TT/TN mains)	No restrictions	Observe controller ratings • Mains r.m.s. current: 🕮 3-4
With isolated neutral (IT mains)	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 separated from the mains.	Safe operation in the event of an earth fault at the inverter output cannot be guaranteed.
With earthed phase	Operation is only possible with one variant	Contact Lenze
DC-supply via $+U_G/-U_G$	The DC voltage must be balanced to PE.	The controller will be destroyed when earthing $+U_G$ or $-U_G$.

4.2.5 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 operated at mains with compensation, this equipment must be used with chokes.
  – For this, contact the supplier of the compensation equipment.

4.2.6 Cable specifications

- The cables used must comply with the required approvals of the application site (e. g. UL).
- The regulations concerning the minimum cross-sections of the PE conductors must be maintained in all cases. The cross-section of the PE conductor must be at least as large as the cross-section of the power connections.
- The efficiency of a shielded cable is determined by:
  – A good shield connection
  – A low shield resistance. Only use shields with tin-plated or nickel-plated copper braids! Shields with steel braid are not suitable.
  – The coverage of the braid (at least 70 % to 80 % with a coverage angle of 90 °)

4.2.7 Power connections

Controller	Preparations for the power connection
9321 ... 9326	• Remove the covers of the power connections: – Unlatch to the front by gentle pressure. – Pull upwards (mains connection) or downwards (motor connection).
9327 ... 9332	• Remove cover: – Loosen screws (X) (see Fig. 4-1). – Swing cover to the top and detach. – Take the assembly kit out of the interior of the controller.

4.2.7.1 Mains connection

Types 9321 ... 9326

Stop!

- Always mount the PE connection and the shield sheet in the described order. The corresponding parts can be found in the assembly kit.
- Do not use the clips for strain relief.

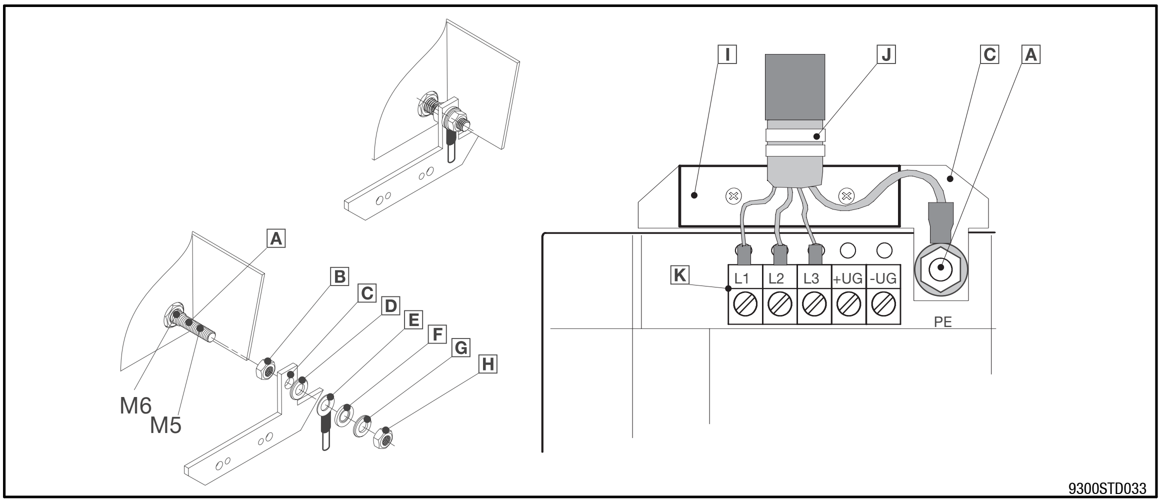


Fig. 4-7 Recommendation for a mains connection

- A PE threaded bolt
- B Screw on M5 nut and tighten hand-tight
- C Fit fixing bracket for shield sheet
- D Fit serrated lock washer
- E Fit PE cable with ring cable lug
- F Fit washer
- G Fit lock washer
- H Screw on M5 nut and tighten with 3.4 Nm (30 lb-in)
- I Use two M4 screws to screw shield sheet onto fixing bracket and clamp shield with clip
- J The cable shielding is only required to comply with existing standards (e. g. VDE 0160, EN50178, EN61800-3).
- K Connect mains cable to screw terminals L1, L2, L3.
  Connect supply cable for DC-bus operated devices to screw terminals +UG, -UG.

Tip!

For an improved shield connection, additionally connect the shield to the PE threaded bolt.

Types 9327 ... 9332

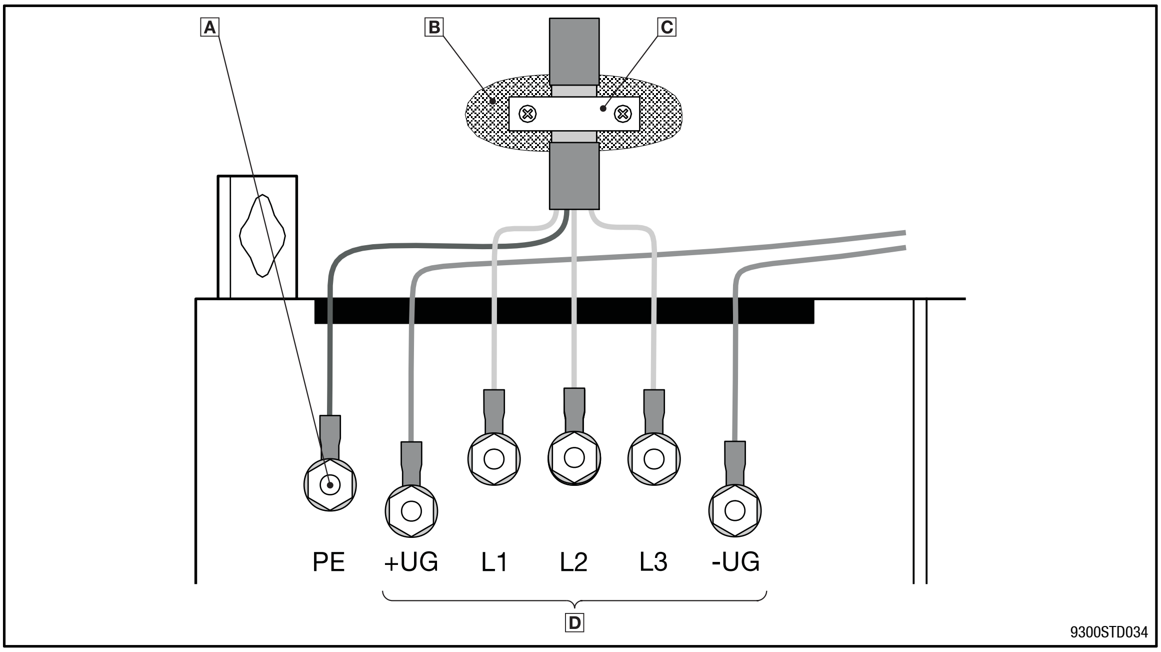


Fig. 4-8 Recommendation for a mains connection

- A PE threaded bolt
- B Metallically conductive surface
- C Connect mains cable shield with a large surface to mounting plate of control cabinet and fasten with shield clamp (shield clamp is not included in the scope of supply).
  The cable shielding is only required to comply with existing standards (e. g. VDE 0160, EN50178, EN61800-3).
- D Connect mains cable to threaded bolts L1, L2, L3.
  Connect supply cable for DC-bus operated devices to threaded bolts +UG, -UG.

Tip!

For an improved shield connection, additionally connect the shield to the PE threaded bolt.

Max. permissible cable cross-sections and screw tightening torques:

Type	Max. permissible cable cross-sections	Screw-tightening torques	
		L1, L2, L3, +UG, -UG	PE connection
9321 ... 9326	4 mm^2	0.5 ... 0.6 Nm (4.4 ... 5.3 lb-in)	3.4 Nm (30 lb-in)
9327 ... 9329	25 mm^2	5 Nm (44 lb-in)	
9330 ... 9331	95 mm^2	15 Nm (132 lb-in)	
9332	120 mm^2	30 Nm (264 lb-in)	

Cable cross-sections	Connection with	Note
Up to 4 mm^2	Wire end ferrules	
Up to 6 mm^2	Pin-end connectors	
>25 mm^2	Ring cable lugs	The cable cross-section is only limited by the cable bushing in the housing.

Fuses

Fuses and cable cross-sections	The specifications in chapter 3.4 are recommendations and refer to the application • in control cabinets and machines, • installation in the cable duct, • max. ambient temperature +40 °C.
Selection of the cable cross-section	For selection take into account the voltage drop when a load is applied (to DIN 18015 Part 1: ≤ 3 %).
Cable and controller protection on the AC side (L1, L2, L3)	• By means of standard commercial fuses. • Fuses in UL-conform plants must have UL-approval. • The rated voltages of the fuses must be rated according to the mains voltage on site. The tripping characteristic is specified with ”H” or ”K5”.
Cable and controller protection on the DC side (+UG, -UG)	• By means of recommended DC fuses. • The fuses/fuse holders recommended by Lenze are UL approved.
For DC group drives or supply using a DC source:	Observe the information given in part F of the Manual.
Connection of a braking unit	When connecting the braking unit to the terminals +UG / -UG, the fuses and cross-section given in chapter 3.4 do not apply. For the corresponding data, please see the documentation of the braking unit.
Further information	For cable and controller protection see the chapter ”Accessories” under “Planning”.
Further standards	The compliance with other standards (e.g.: VDE 0113, VDE 0289, etc.) remains the responsibility of the user.

4.2.7.2 Motor connection

Types 9321 ... 9326

Stop!

- Always mount the PE connection and the shield sheet in the described order. The corresponding parts can be found in the assembly kit.
- Do not use the clips for strain relief.

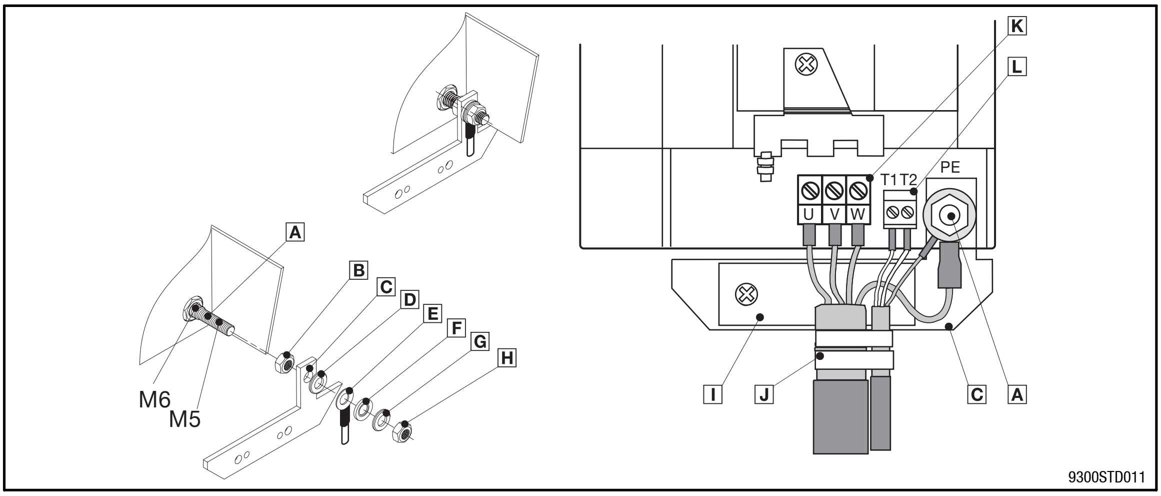


Fig. 4-9 Proposal for motor connection

- A PE threaded bolt
- B Screw on M5 nut and tighten hand-tight
- C Fit fixing bracket for shield sheet
- D Fit serrated lock washer
- E Fit PE cable with ring cable lug
- F Fit washer
- G Fit toothed lock washer
- H Screw on M5 nut and tighten with 3.4 Nm (30 lb-in)
- I Use two M4 screws to screw shield sheet onto fixing bracket.
- J Clamp motor cable shield and cable shield for motor temperature monitoring with clip.
  The shielding of the motor cable is only required to comply with existing standards (e. g. VDE 0160, EN50178, EN61800-3).
- K Connect motor cable to screw terminals U, V, W.
  Observe correct pole connection and maximum motor cable length.
- L Connect cable for motor temperature monitoring to screw terminals T1 and T2.

Tip!

For an improved shield connection, additionally connect the shield to the PE threaded bolt.

Types 9327 ... 9329

Stop!

Do not use clips for strain relief.

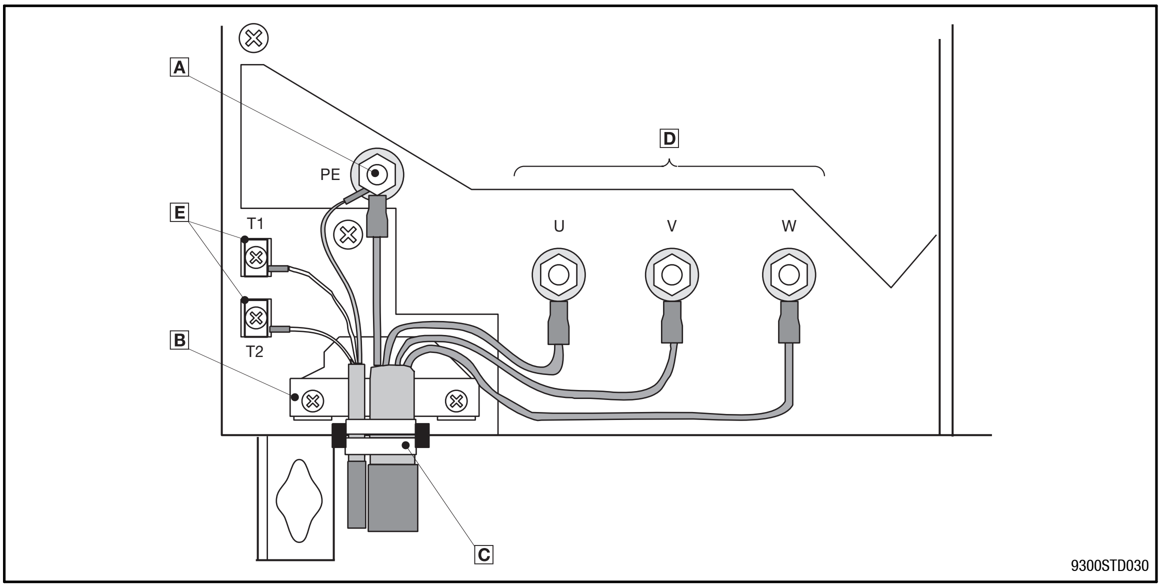


Fig. 4-10 Proposal for motor connection

- A PE threaded bolt
- B Fasten shield sheet with two M4 screws.
- C Clamp motor cable shield and cable shield for motor temperature monitoring with clip.
  The shielding of the motor cable is only required to comply with existing standards (e. g. VDE 0160, EN50178, EN61800-3).
- D Connect motor cable to threaded bolts U, V, W.
  Observe correct pole connection and maximum motor cable length.
- E Connect cable for motor temperature monitoring to screw terminals T1 and T2.

Tip!

For an improved shield connection, additionally connect the shield to the PE threaded bolt.

Types 9330, 9331

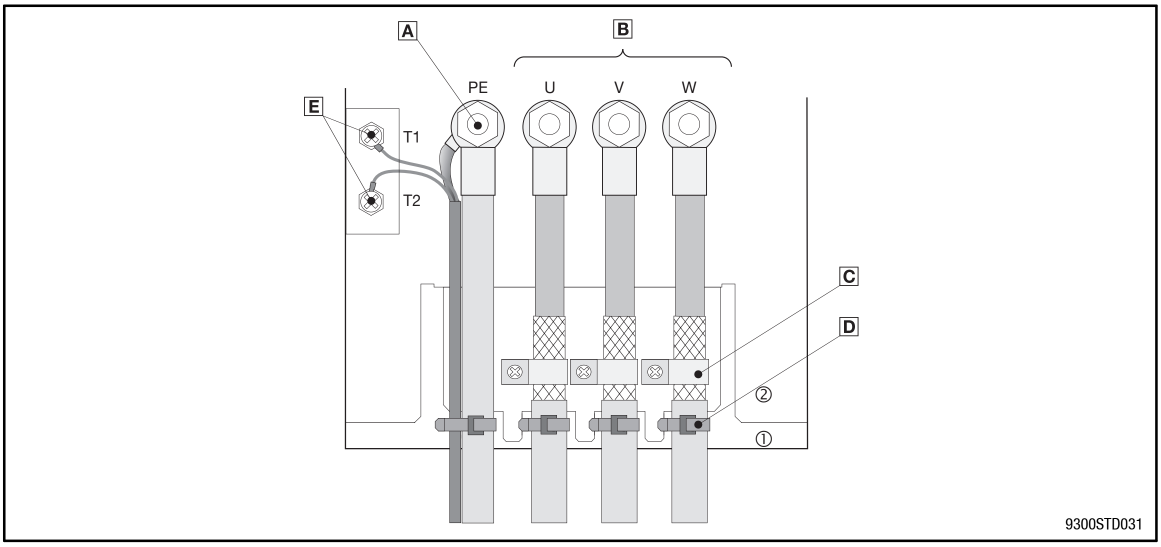


Fig. 4-11 Proposal for motor connection

- A PE threaded bolt
- B Connect motor cable to threaded bolts U, V, W.
  Observe correct pole connection and maximum motor cable length.
- C Connect motor cable shield with a large surface to shield sheet and fasten with shield clamps and M5 x 12 mm screws.
  The shielding of the motor cable is only required to comply with existing standards (e. g. VDE 0160, EN50178, EN61800-3).
- D Use cable ties for strain relief of the motor cables.
- E Connect cable for motor temperature monitoring to screw terminals T1 and T2.
  Connect cable shield for motor temperature monitoring with a large surface to PE threaded bolt.

Type 9332

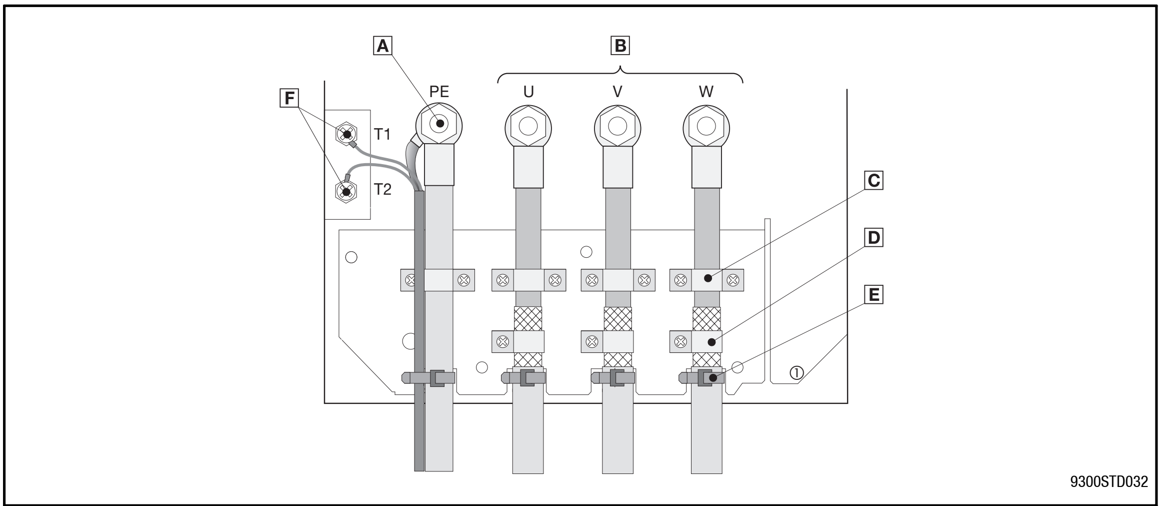


Fig. 4-12 Proposal for motor connection

- A PE threaded bolt
- B Connect motor cable to threaded bolts U, V, W.
  Observe correct pole connection and maximum motor cable length.
- C Use cable clamps for strain relief of the motor cables. Fasten cable clamps with M4 × 12 mm screws.
- D Connect motor cable shield with a large surface to shield sheet and tighten with shield clamps and M5 x 12 mm screws.
  The shielding of the motor cable is only required to comply with existing standards (e. g. VDE 0160, EN50178, EN61800-3).
- E If necessary, use cable tie for additional strain relief of the motor cables.
- F Connect cable for motor temperature monitoring to screw terminals T1 and T2.
  Connect cable shield for motor temperature monitoring with a large surface to PE threaded bolt.

Cable cross-sections and screw-tightening torques

Type	Max. permissible cable cross-sections		Screw-tightening torques			
	U, V, W, PE	T1, T2	U, V, W	PE connection	Shield/ Strain relief	T1, T2
EVS9321 ... EVS9326	4 mm^2	1.5 mm^2	0.5 ... 0.6 Nm (4.4 ... 5.3 lb-in)	3.4 Nm (30 lb-in)	M4: 1.7 Nm (15 lb-in) M5: 3.4 Nm (30 lb-in)	0.5 ... 0.6 Nm (4.4...5.3 lb-in)
EVS9327 ... EVS9329	25 mm^2		5 Nm (44 lb-in)			
EVS9330 ... EVS9331	95 mm^2		15 Nm (132 lb-in)			
EVS9332	120 mm^2		30 Nm (264 lb-in)			

Cable cross-sections	Connection with	Note
Up to 4 mm^2	Wire end ferrules	
Up to 6 mm^2	Pin-end connectors	
>25 mm^2	Ring cable lugs	The cable cross-section is only limited by the cable bushing in the housing.

Motor cable length

	U_r = 400 V (+10%)		U_r = 480 V (+10%)	
Type	f_{chop} = 8 kHz	f_{chop} = 16 kHz	f_{chop} = 8 kHz	f_{chop} = 16 kHz
	Max. permissible cable cross-section		Max. permissible cable cross-section	
EVS9321. EVS9322	up to 50 m	up to 45 m	up to 50 m	up to 25 m
EVS9323 ... EVS9332	up to 50 m	up to 50 m	up to 50 m	up to 50 m

In case of longer motor cables please contact Lenze.

Tip!

- Switching on the motor side of the controller is permitted only for emergency switch-off.
- The max. permissible motor cable length of types 9323 - 9332 will be reduced if the motor cable has more than a single core.
  – Max. length for two parallel single cores: l_{max} = 17 m
  – Max. length for three parallel single cores: l_{max} = 9 m

4.2.8 Motor temperature monitoring

Stop!

- Do not connect an external voltage to the terminals T1, T2. Otherwise the controller will be damaged.
- Do not use the terminals T1, T2 for safety-relevant wiring. Fault messages via this input are only processed after 2 s.

Selection of the measuring sensor	• Continuous temperature sensor KTY – "Linear" temperature sensor in the motor winding (standard for Lenze motors MDXKX, MDXQA and MDXMA) • Temperature sensor PTC – PTC thermistor with defined tripping temperature (acc. to DIN 44081 and DIN 44082) • Thermal contact TKO – Thermostat/normally closed contact
Other monitoring	KTY, PTC and TKO do not offer full protection. In order to improve the monitoring, Lenze recommends the use of a bimetal relay.
Alternative monitoring	Use comparators (CMP1 ... CMP4) to define the maximally permitted motor current (blocking current) at low speeds or when the motor is at standstill. The period of the blocking current can be limited by using a downstream timing element (TRANS1, TRANS2). This function can be implemented by interconnecting the corresponding function blocks.
Reactions	Depending on the type of temperature monitoring, different reactions can be caused. (📖 9-221)

Connection of Lenze motors

	Motors MDXKX, MDXQA and MDXMA		**Motors with thermal contact**
Connection	• Resolver input X7: Pin X7/8 = +, Pin X7/9 = – • Encoder input X8: Pin X8/8 = +, Pin X8/5 = –		Terminals T1/T2 next to the terminals U, V, W
Fault messages	(MONIT-)OH3	(MONIT-)OH7	(MONIT-)OH8
Possible reactions	When selecting a motor via C0086, the following codes are preset:		
	• TRIP: C0583 = 0 • OFF: C0583 = 3	• Warning: C0584 = 2 • OFF: C0584 = 3	• TRIP: C0585 = 0 • Warning: C0585 = 2 • OFF: C0585 = 3
Tripping temperature	Fixed at 150 °C	Adjustable 45°C ... 150°C (C0121)	Fixed, (depending on the PTC/thermal contact): PTC: With Rϑ > 1600 Ω
Notes	• Monitoring is active in the Lenze setting. • When resolver (X7) and encoder (X8) are operated together, connect KTY to X7 **or** X8 only. Do not assign the unused KTY connection. • Further information about connecting a thermal sensor can be found in the description of the feedback system		• Deactivate monitoring via X7 or X8 under C0583 = 3 and C0584 = 3. • Connection is made to DIN 44081 (see Fig. 4-13).

Connection of motors from other manufacturers

	Motors with sensor for continuous temperature detection		Motors with thermal contact or PTC acc. to DIN 44081/44082
Connection	• Resolver input X7: Pin X7/8 = +, Pin X7/9 = – • Encoder input X8: Pin X8/8 = +, Pin X8/5 = –		Terminals T1/T2 next to the terminals U, V, W
Fault messages	(MONIT-)OH3	(MONIT-)OH7	(MONIT-)OH8
Possible reactions	When selecting a motor via C0086, the following codes are preset:		
	• TRIP: C0583 = 0 • OFF: C0583 = 3	• Warning: C0584 = 2 • OFF: C0584 = 3	• TRIP: C0585 = 0 • Warning: C0585 = 2 • OFF: C0585 = 3
Tripping temperature	Fixed at 150 °C	Adjustable 45°C ... 150°C (C0121)	Fixed, (depending on the PTC/thermal contact): PTC: With Rϑ > 1600 Ω
Notes	• Input characteristic. (📖 4-35) • Deactivate monitoring via X7 or X8 under C0583=3 and C0584=3.		• Deactivate monitoring via X7 or X8 under C0583 = 3 and C0584 = 3. • The connection is made according to DIN 44081. • We recommend a PTC (up to 150 °C) of the Ziehl company: K15301075 or a thermostat.

Connection to the controller

Fig. 4-13 Input circuit for the connection of the measuring sensor

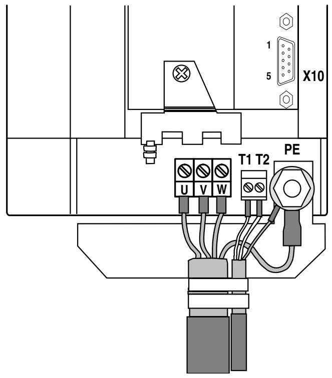
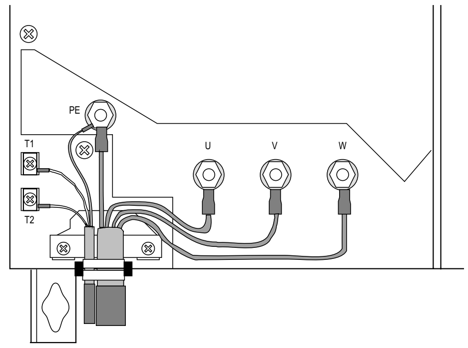
Types 9321 to 9326	Types 9327 and 9329
	

Fig. 4-14 Connections T1 and T2 at the controller

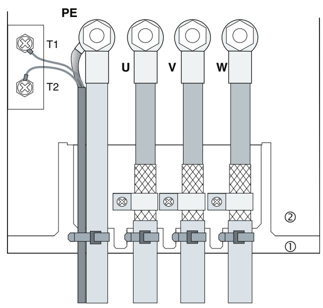
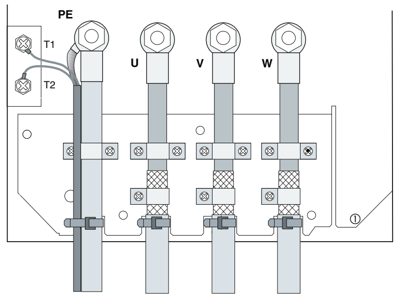
Types 9330 and 9331	Type 9332
	

Fig. 4-15 Connections T1 and T2 at the controller

Tip!

The prefabricated Lenze system cables for **Lenze servo motors** already include the cable for temperature feedback. The cables are designed for a wiring according to EMC.

If you fabricate your own cables, the cables must always be separated from the motor cables.

4.2.8.1 User-specific characteristic for a continuous temperature sensor

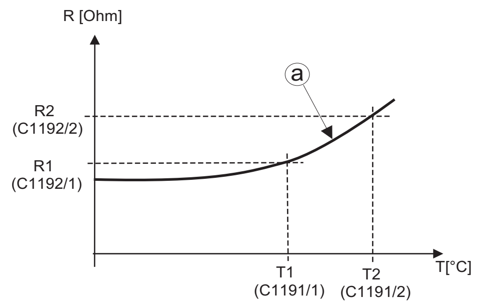


Fig. 4-16 Example of a sensor characteristic for continuous temperature detection

C1190/0	Evaluation of the Lenze standard motor temperature sensor
C1190/1	Evaluation of an application-specific temperature sensor. The operating point is in the almost linear range (a) of the sensor characteristic. The operating range is determined by two vertices. Between these vertices an interpolation takes place.
C1191/1 (100 °C) C1191/2 (150 °C)	Definition of the temperature interpolation points which are assigned to the resistances of the sensor.
C1192/1 (1670 Ω) C1192/2 (2225 Ω)	Definition of the sensor resistances

4.2.9 Connection of a braking unit

- When connecting a braking unit (brake module with internal brake resistor or brake chopper with external brake resistor) observe the corresponding Operating Instructions in all cases.

Stop!

- Design the circuit so that the following happens to all controllers connected to the braking unit via the DC bus if the temperature monitoring of the brake resistor is activated:
  – The controllers are inhibited (X5/28 = LOW),
  – The mains is disconnected.
- Examples:
  – Fig. 4-31 ”Example for wiring in accordance with EMC regulations”.
  – Fig. 4-17 “Decentralised supply for DC-bus operation of several drives”.

4.2.10 DC-bus operation

Decentralised supply with brake module

Stop!

- Set the DC-bus voltage thresholds of controller and braking unit to the same values.
  – Controller using C0173
  – Braking unit using switches S1 and S2
- A bimetal relay is required for the monitoring of the mains supply.

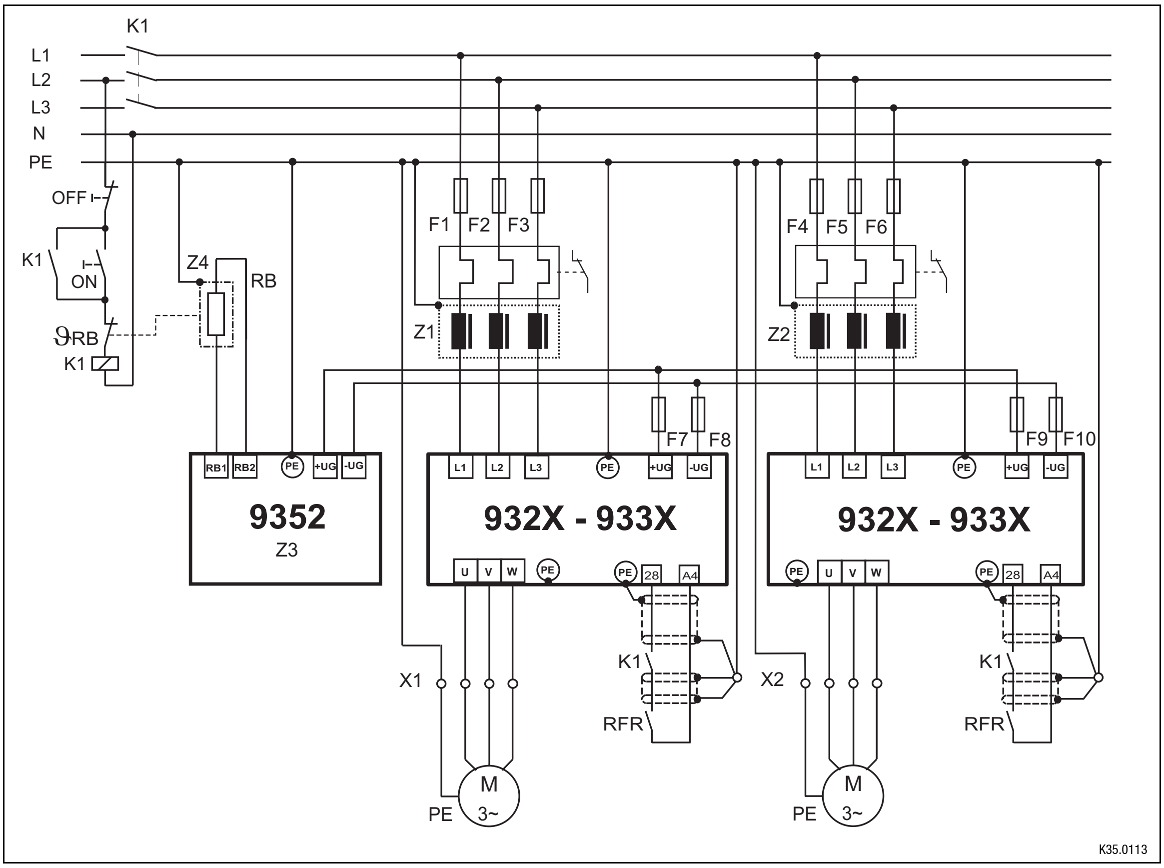


Fig. 4-17 Decentralised supply for DC-bus operation of several drives

Z1, Z2	Mains filter
Z3	Brake chopper
Z4	Brake resistor
F1...F6	Fuse (📖 3-7) and (📖 4-24)
F7...F10	DC bus fuse; fuse holder with/without signalling contact (📖 3-7) and (📖 4-24)
K1	Main contactor

Tip!

Please observe the Application Report “DC-bus operation” for selecting and rating the components.

Central supply with power supply module

Observe the Operating Instructions of the power supply module used!

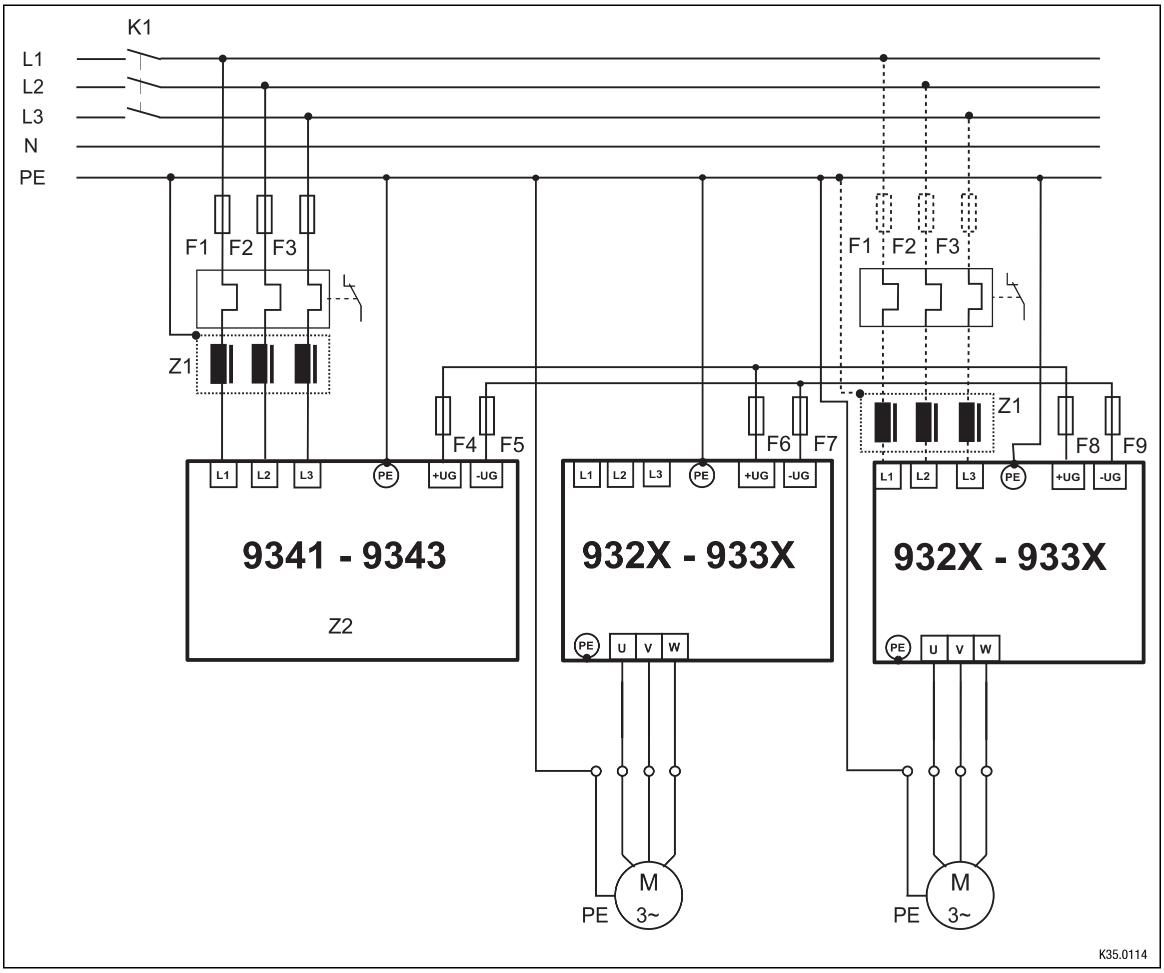


Fig. 4-18 Central supply for DC-bus operation of several drives

Z1	Mains filter
Z2	Power supply module
F1...F6	Fuse (🕮 3-7) and (🕮 4-24)
F7...F10	DC bus fuse; fuse holder with/without signalling contact (🕮 3-7) and (🕮 4-24)
K1	Main contactor

Tip!

If the power output is not sufficient, a parallel supply can be established via the mains input of further controllers. In this case, the controllers must only be operated with assigned mains filters.

4.2.11 Control connections

4.2.11.1 Installation of the control cables

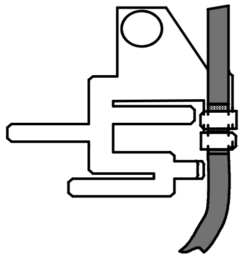


Fig. 4-19 Collective shield sheet for control cables

- We recommend a single-ended shielding of all cables for analog signals to avoid signal distortion.
- Connect the shields of the control cables to the front metal surface using the collective shield sheet (screw length max. 12 mm).

4.2.11.2 Connection of control cables

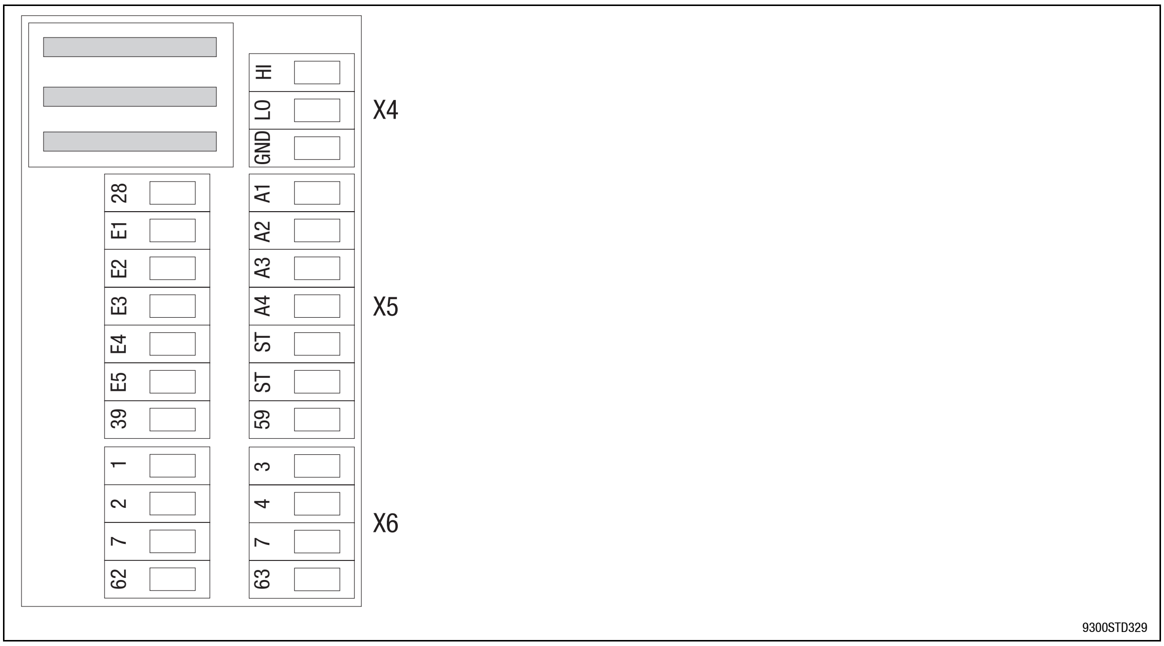


Fig. 4-20 Terminals for control cables

X4	System bus (CAN) connection
X5	Connection of digital input and output signals
X6	Connection of analog input and output signals

Screw terminal data			
Max. cable cross-sections			Tightening torques
rigid	flexible		
2.5 mm^2 (AWG 14)	2.5 mm^2 (AWG 14)	without wire end ferrule	0.5 ... 0.6 Nm (4.4 .. 5.3 lb-in)
	2.5 mm^2 (AWG 14)	with wire end ferrule	
	2.5 mm^2 (AWG 14)	with insulated wire end ferrule	

Note!

The reverse voltage protection of the control terminals prevents the wrong connection of internal control inputs. It is however possible to overcome the protection against polarity reversal by applying great force. In this case, the controller cannot be enabled.

4.2.11.3 Connection of digital signals (X5)

Stop!

- The maximum permitted voltage difference between X5/39 and the PE of the controller is 50 V.
- If required, limit the voltage difference by overvoltage-limiting components or by directly connecting X5/39 to PE.

Supply via internal voltage source

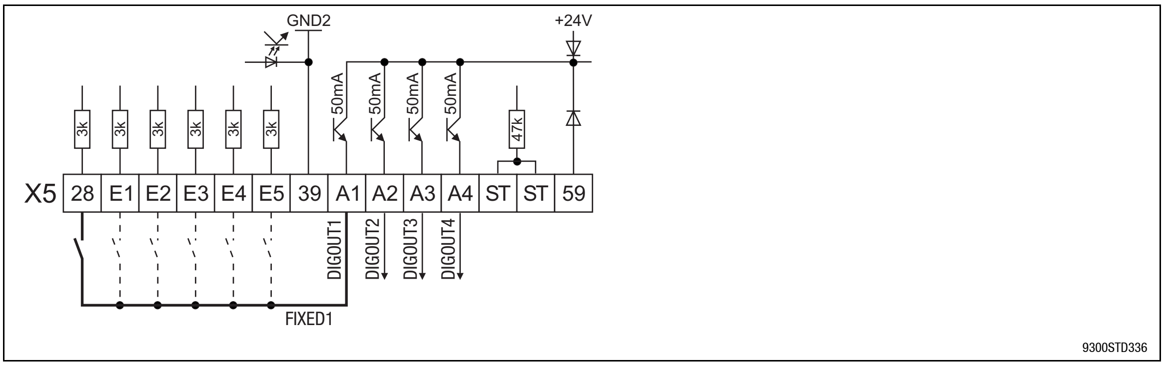


Fig. 4-21 Connection of the digital input signals with supply via internal voltage source

—— Minimum wiring required for operation

- For supplying the digital inputs (X5/E1 ... X5/E5, X5/ST) a freely assignable digital output (DIGOUTx), e.g. X5/A1 must be permanently set to HIGH level.
- Assign C0117/1 with FIXED1 and set C0118/1 = 0 (HIGH active). Then, 24 V DC are applied to X5/A1.

Tip!

Use the predefined configuration in C0005. With C0005 = xx1x (e. g. 1010: Speed control via terminals) X5/A1 is automatically assigned with FIXED1 (24 V).

Supply via external voltage source

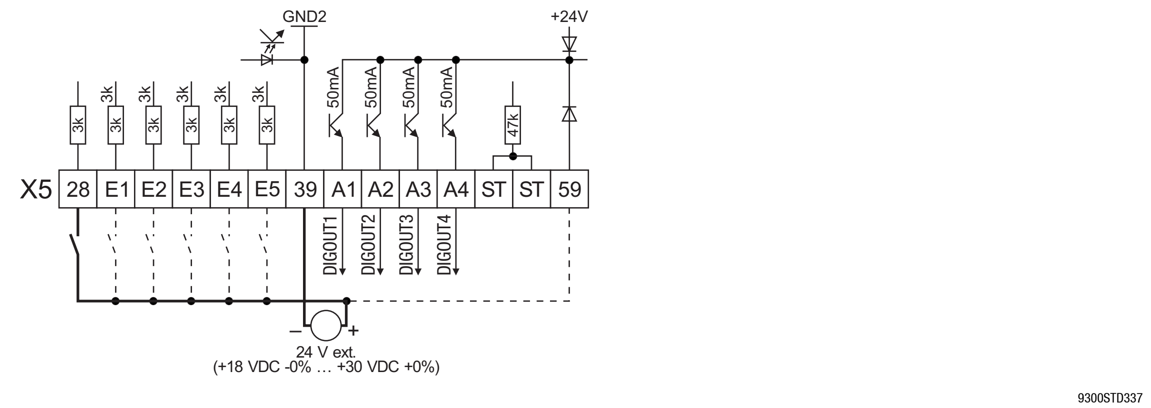


Fig. 4-22 Connection of the digital input signals with supply via external voltage source

—— Minimum wiring required for operation

Tip!

Supplying the digital input signals via an external voltage source enables a **backup operation in 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 supply a current of $\geq$ 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 Ω.

Terminal assignment

	Signal type	Function Bold print = **Lenze setting** (C0005 = 1000)	Level	Technical data
X5/28	Digital inputs	Controller inhibit (CINH)	HIGH = Start	LOW: 0 … +3 V HIGH: +12 … +30 V Input current for +24V: 8 mA per input Reading and processing of the inputs: Once per ms (average value)
X5/E1		Freely assignable **Cancel CW rotation / QSP**	HIGH	
X5/E2		Freely assignable **Cancel CCW rotation / QSP**	HIGH	
X5/E3		Freely assignable **Activate JOG setpoint 1**	HIGH	
X5/E4		Freely assignable **Set error message TRIP**	LOW	
X5/E5		Freely assignable **Reset error message TRIP**	LOW-HIGH edge	
X5/A1	Digital outputs	Freely assignable **Error message TRIP exists**	LOW	LOW: 0 … +3 V HIGH: +12 … +30 V Load capacity: Max. 50 mA per output (external resistance at least 480 Ω at +24 V) Updating of the outputs: Once per ms
X5/A2		Freely assignable **Switching threshold Q_{min}: Actual speed (n_{act}) < Setpoint speed (n_x) in C0017**	LOW	
X5/A3		Freely assignable **Ready for operation**	HIGH	
X5/A4		Freely assignable **Maximum current I_{max} reached**	HIGH	
X5/39	–	GND2, reference potential for digital signals	–	Isolated towards GND1
X5/59	–	DC supply for backup operation of the controller in case of mains failure	+24 V external	Current demand: Min. 1 A

4.2.11.4 Connection of analog signals (X6)

Stop!

- The voltage difference between X5/39 and the PE of the controller must not exceed 50 V.
- If necessary, limit the voltage difference by overvoltage-limiting components or by direct connection of X5/39 to PE.

Internal voltage supply

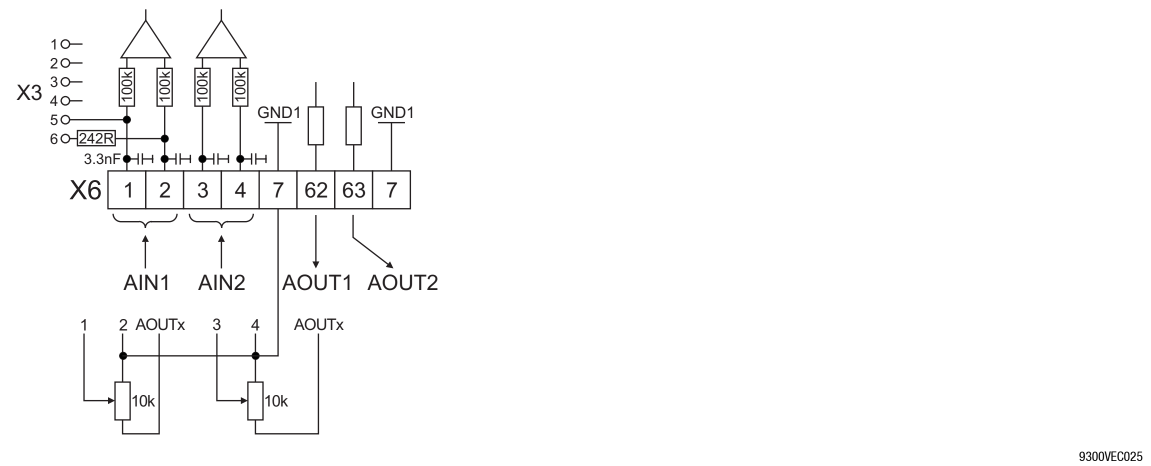


Fig. 4-23 Connection of the analog input signals for internal voltage supply

Configuration of the internal voltage supply:

- Set a freely assignable analog output (AOUTx) to HIGH level.
  – E. g. terminal X6/63: Assign FIXED100% to C0436. Terminal X6/63 is thus set to 10V.

Tip!

Use one of the predefined configurations in C0005 for this application. With C0005 = XX1X (e. g. 1010 for speed control with control via terminals), FIXED100% is automatically assigned to the output signal at terminal X6/63 (corresponds to 10 V).

External voltage supply

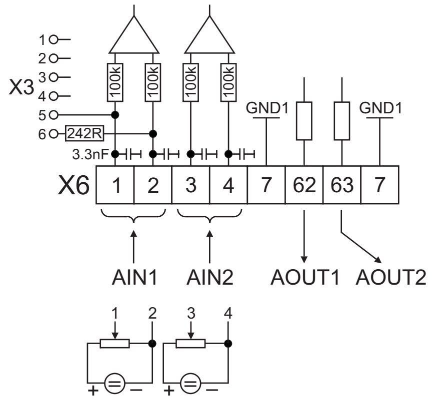
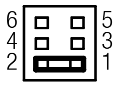
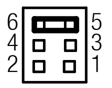


Fig. 4-24 Connection of the analog input signals for external voltage supply

Terminal assignment

	Signal type	Function Bold = **Lenze setting** (C0005 = 1000)		Level	Technical data
X6/1 X6/2	Analog input 1	Differential input master voltage **Main speed setpoint**	 Jumper X3 *	-10 V to +10 V	Resolution: 5 mV (11 bits + sign)
		Differential input master current	 Jumper X3 *	-20 mA to +20 mA	Resolution: 20 µA (10 bits + sign)
X6/3 X6/4	Analog input 2	Differential input master voltage **Additional speed setpoint**	Jumper X3 has no influence	-10 V to +10 V	Resolution: 5 mV (11 bits + sign)
X6/62	Analog output 1	Monitor 1 **Actual speed**		-10 V to +10 V; max. 2 mA	Resolution: 20 mV (9 bits + sign)
X6/63	Analog output 2	Monitor 2 **Torque setpoint**		-10 V to +10 V; max. 2 mA	Resolution: 20 mV (9 bits + sign)
X6/7	–	GND1, reference potential for analog signals		–	–

* To reach the jumpers at X3, remove AIF module from X1, if necessary.

4.2.12 STATE-BUS (X5/ST)

The STATE-BUS is a controller-specific bus system for simple monitoring in a network of drives:

- Controls all drives connected to the network according to the preselected state.
- Up to 20 controllers can be connected (total cable length of STATE-BUS < 5 m).
- Connection of STATE-BUS cables to terminals X5/ST.

Stop!
Do not apply an external voltage across terminals X5/ST.

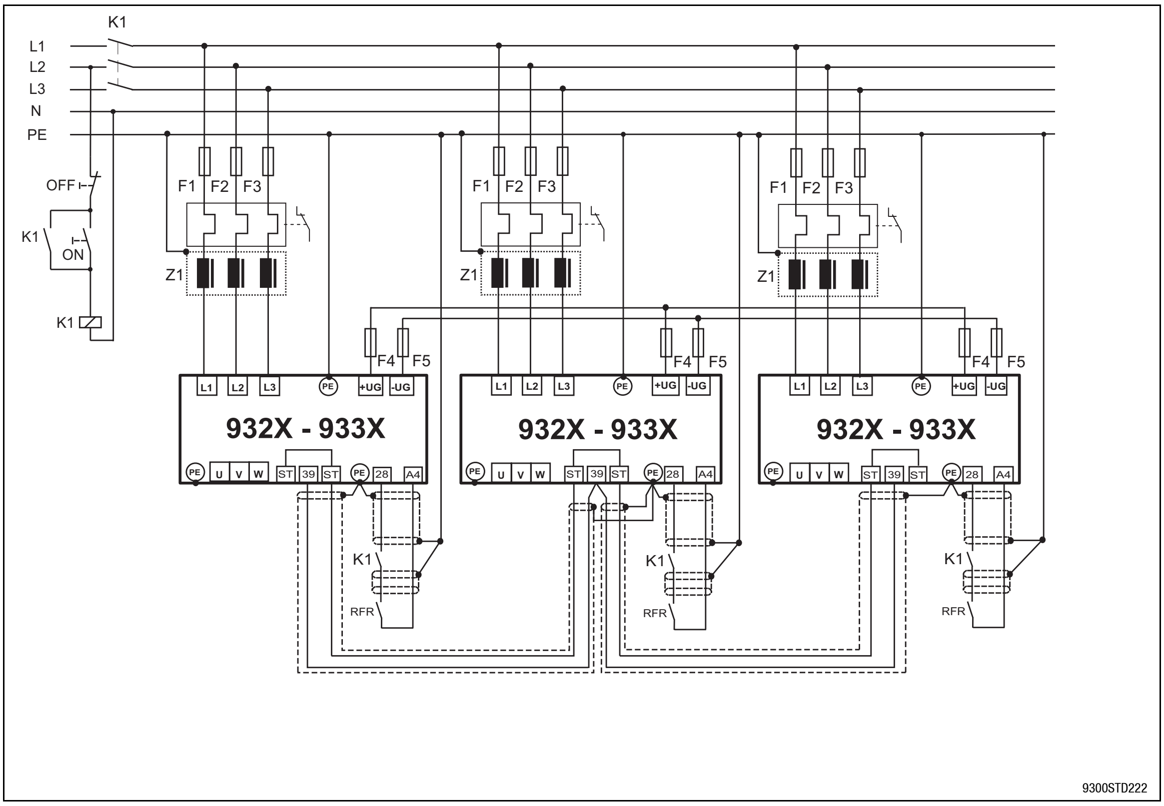


Fig. 4-25 Monitoring of a drive system with the STATE-BUS (block diagram)

Z1	Mains filter
F1...F5	Fuse (📖 3-7) and (📖 4-24)
K1	Main contactor

4.2.13 Connection of feedback systems

Different feedback systems can be connected to the controller:

- Resolver feedback to X7 (Lenze setting)
- Encoder feedback to X8 or X9
  – Incremental encoder TTL
  – Sin/cos encoder
  – Sin/cos encoder with serial communication (single-turn)
  – Sin/cos encoder with serial communication (multi-turn)

Resolver signal or encoder signal can be output for slaves at the master frequency output X10.

The connection must be made as shown in the figures:

- Use twisted pair cables and shielded pair cables.
- Connect the shield at both ends.
- Use indicated cable cross-sections.

The feedback system is activated in code C0025.

Note!

- Use a sin/cos encoder with serial communication (multi-turn) if you cannot reference the drive. Indicate the motor/encoder combination with your order.
- Please observe the notes concerning feedback monitoring in
  – chapter ”Troubleshooting and fault elimination”
  – chapter ”Configuration/monitoring” of the System Manual

4.2.13.1 Resolver connection to X7

- In all configurations pre-defined under C0005 a resolver can be used as feedback system. It does not need to be adjusted.

Features of the resolver

- 2-pole resolver (V = 10 V, f = 4 kHz)
- Resolver and resolver cable are monitored for open circuit (error message Sd2)

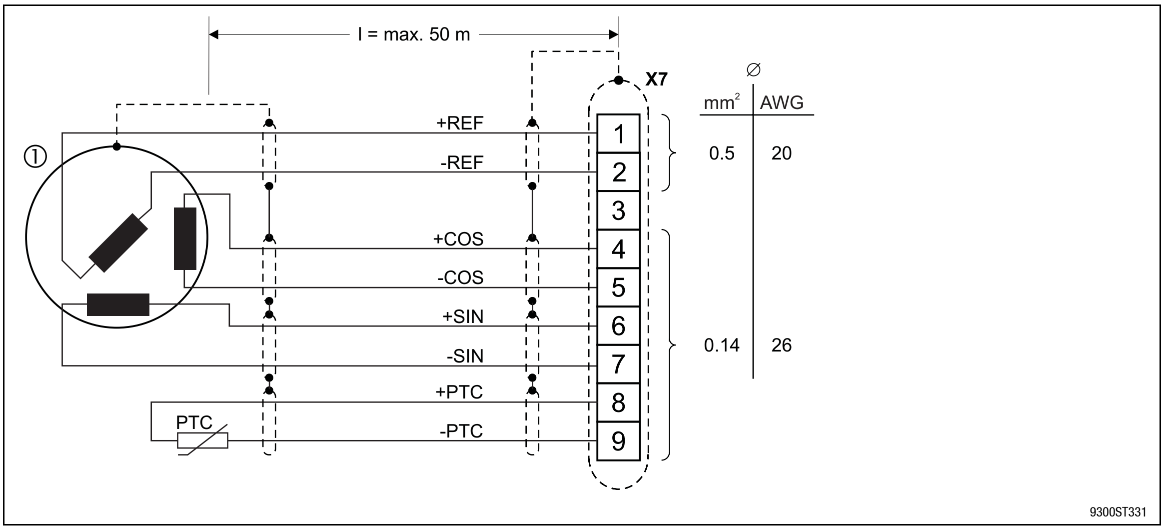


Fig. 4-26 Resolver connection

① Resolver

Assignment of the 9-pole Sub-D socket (X7) at the controller									
Pin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Signal	+Ref	-Ref	GND	+COS	-COS	+SIN	-SIN	+PTC	-PTC

For connection of pin X7/8, pin X7/9 see also 📖 4-32

Note!

- Use prefabricated Lenze system cables to connect the resolver.
- Contact your Lenze representation if you want to use an external resolver.

4.2.13.2 Encoder connection to X8 or X9

Stop!

Please observe the supply voltage of the encoder used. If C0421 is set too high, the encoder may be destroyed.

An incremental encoder or a sin/cos encoder can be connected to this input.

- The controller supplies the encoder with voltage.
- Use C0421 to adjust the supply voltage V_{CC5_E} (5 V ... 8 V) for the encoder to compensate the voltage drop [ΔU] in the encoder cable, if necessary:

$$\Delta U \approx 2 \cdot \text{Cable length [m]} \cdot \frac{\text{Cable resistance } [\Omega]}{\text{[m]}} \cdot I_{\text{Encoder}} \text{ [A]}$$

Note!

Use prefabricated Lenze system cables to connect the encoder.

Incremental encoder

> **Note!**
> - The evaluation of the incremental encoder via X8 cannot be activated if master frequency input X9 **and** master frequency output X10 are used in the signal configuration.
> - This does not apply if the input signals at X8 or X9 are directly output to the master frequency output X10 (C0540 = 4 or 5).

TTL level is required to connect incremental encoders to input X8.

- Activate feedback system:
  - With C0025 = 100. Afterwards, the number of increments (1 ... 8192) must be set with C0420 or
  - with C0025 = 110, 111, 112 or 113. With this setting, the number of increments (512, 1024, 2048 or 4096) is set simultaneously.
- The output V_{CC5_E} (X8/4) can maximally be loaded with 200 mA.

Features of the incremental encoder:

- Incremental encoders with two 5 V complementary signals which are shifted by 90° (TTL encoder) can be connected.
  - The zero track can be connected (as option).
- Connection with 9-pole Sub-D socket
- Input frequency: 0 ... 500 kHz
- Current consumption per channel: 6 mA

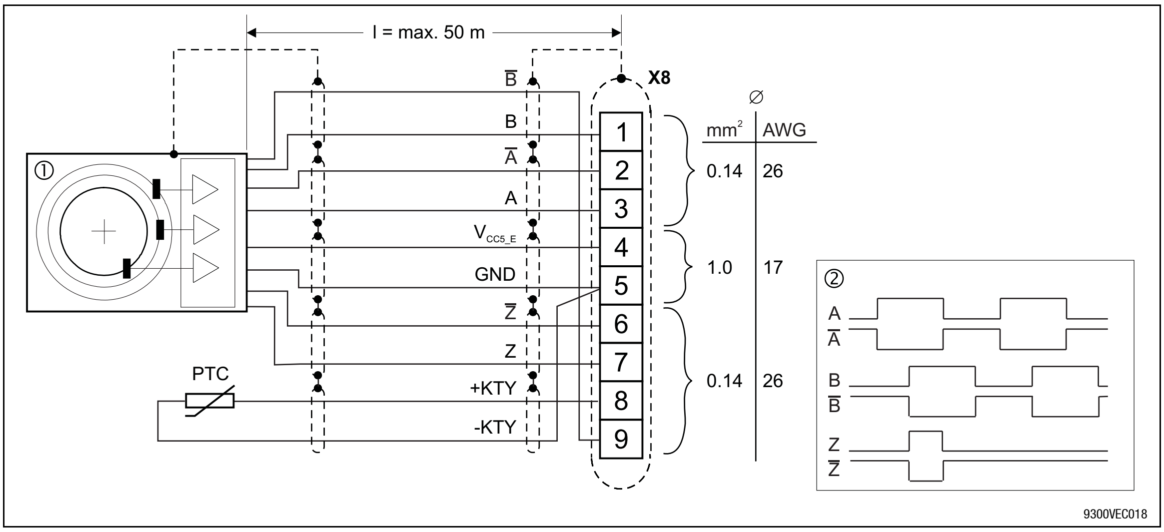


Fig. 4-27 Incremental encoder

① Incremental encoder with TTL level
② Signals during clockwise rotation

Assignment of the 9-pole Sub-D socket (X8, X9) at the controller									
Pin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Signal	B	$\overline{A}$	A	V_{CC5_E}	GND (-KTY)	$\overline{Z}$	Z	+KTY	$\overline{B}$

For connection of pin X8/5 (-PTC), X8/8 (+PTC) also see 🕮 4-32

Sin/cos encoder

Features of the sin/cos encoder:

- The following encoders can be connected
  - – Sin/cos encoders with a rated voltage from 5 V to 8 V.
  - – Sin/cos encoders with a communication interface of type Stegmann SCS/M70xxx (the initialisation time of the controller is increased to approx. 2 seconds).
- Connection with 9-pole Sub-D socket
- Internal resistance R_i = 221 Ω
- Voltage sine and cosine track: 1 Vss ±0.2 V
- Voltage RefSIN and RefCOS: +2.5 V

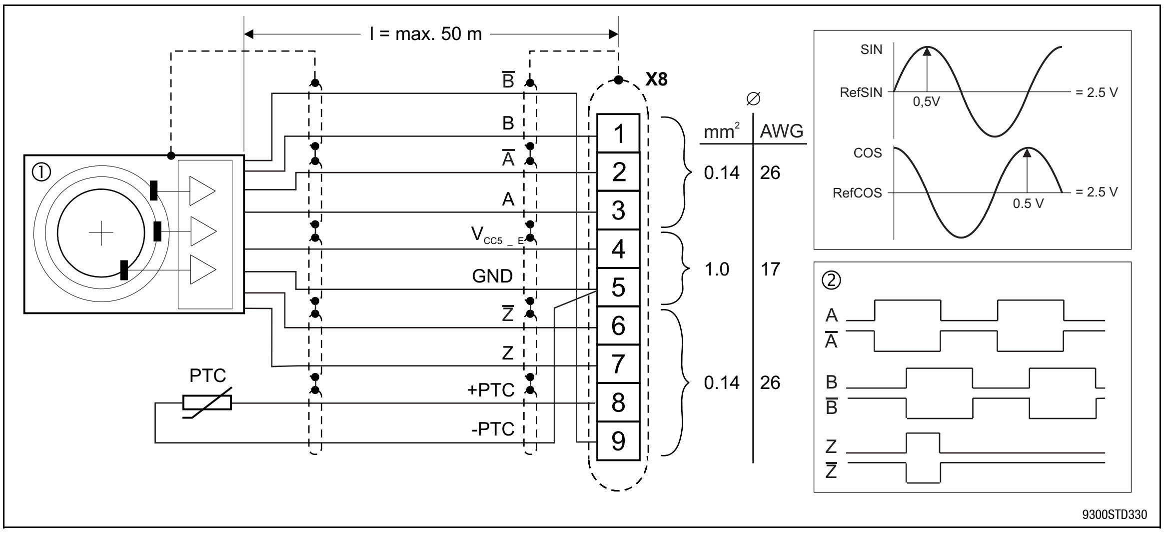


Fig. 4-28 Encoder connection

① Encoder
② Signals during clockwise rotation

Assignment of the 9-pole Sub-D socket (X8, X9) at the controller									
Pin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Signal	SIN	RefCOS	COS	V_{CC5_E}	GND (-PTC)	Z̄ or -RS485	Z or +RS485	+PTC	RefSIN

For connection of pin X8/5 (-PTC), X8/8 (+PTC) also see 4-32

Note!

- For encoders with tracks SIN, $\overline{\text{SIN}}$, COS, $\overline{\text{COS}}$:
  - – Assign RefSIN with $\overline{\text{SIN}}$.
  - – Assign RefCOS with $\overline{\text{COS}}$.

4.2.14 Connection of the master frequency input (X9) / master frequency output (X10)

Note!

Lenze recommends to use prefabricated Lenze cables for the connection to the master frequency input (X9) or master frequency output (X10).

Ensure that the cores of other cables are twisted in pairs and shielded (A, $\overline{A}$ / B, $\overline{B}$ / Z, $\overline{Z}$) (see wiring diagram).

Features of the master frequency output X10	Features of the master frequency input X9
• 9-pole Sub-D socket • Output frequency: 0 ... 500 kHz • Current capacity per channel: max 20mA. • Two-track with inverse 5 V signals (RS422) and zero track • X10 has a different basic setting depending on the selected configuration (C0005) – Lenze setting: Actual speed value • Load capacity: – In case of a parallel connection maximally three slave drives can be connected • LOW level at X10/8 (enable) indicates the initialisation of the master drive (e. g. when the mains has been switched off in the meantime). This enables the slave drive to monitor the master.	• 9-pole Sub-D socket • Can also be used as incremental encoder input • 0 ... 500 kHz input frequency • Current consumption per channel: max. 6 mA • Two-track with inverse 5 V signals and zero track • Possible input signals: – Incremental encoder with two 5V complementary signals shifted by 90° (TTL encoder) – Encoder simulation of the master • Evaluation of the input signals via C0427 • X9/8 serves to monitor the upstream controller. This requires the monitoring SD3 to be active. – In the event of LOW level at X9/8 TRIP or warning (SD3) is activated. – If the monitoring is not required, this input can be connected to +5V.

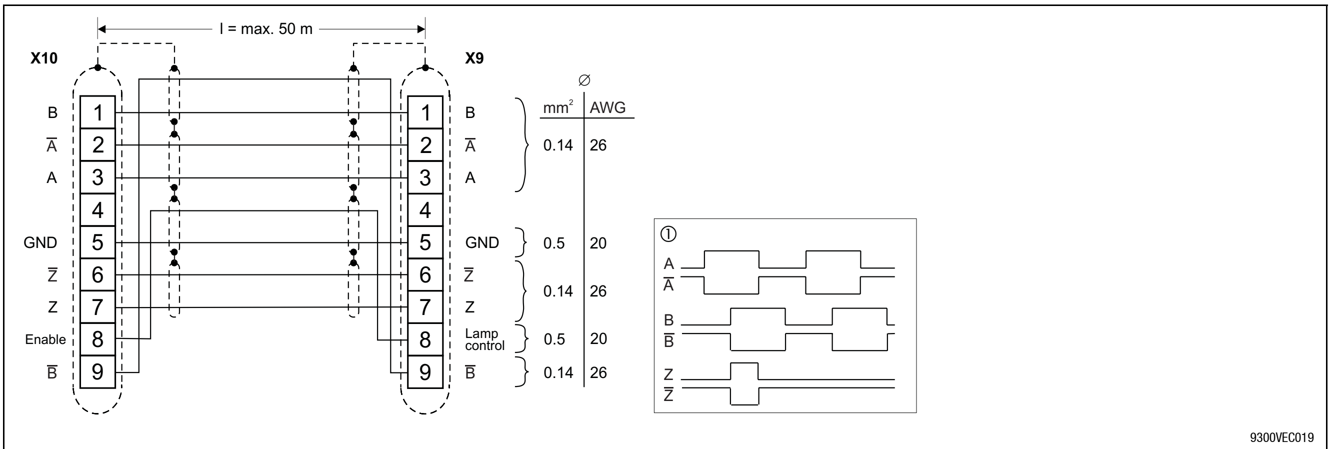


Fig. 4-29 Connection of master frequency input (X9) / master frequency output (X10)

X10 Master drive X9 Slave drive ① Signals during clockwise rotation

Assignment of the 9-pole Sub-D socket (X10) at the controller										Assignment of the 9-pole Sub-D socket (X9) at the controller								
Pin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Signal	B	$\overline{A}$	A	+5 V	GND1	$\overline{Z}$	Z	EN	$\overline{B}$	B	$\overline{A}$	A	+5 V	GND1	$\overline{Z}$	Z	LC	$\overline{B}$

Evaluation of the input signals		
Code	**Function**	
C0427 = 0	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	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	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

4.2.15 System bus connection (CAN) (X4)

Features

The integrated system bus in the 9300 controller serves to extend the controller functions. These are:

- Parameter selections
- Extensions by decentralised terminals
- Data exchange from controller to controller
- Operator and input devices
- External control and host systems

Without having any experience with the bus system, the user is able to carry out e. g. a data exchange from one controller to another with digital control signals, speed signals, and torque signals. If the user knows how to configure the function blocks this can be done with the help provided in chapter ”Working with function blocks”.

Five input channels and five output channels are available for data exchange and can be used independently. Two parameter channels are included (SDO = Service Data Object).

General data and application conditions

Communication profile	Based on CANopen (parts of CANopen are used)				
Communication medium	DIN ISO 11898				
Network topology	Line				
System bus node	Master or slave				
Max. number of nodes	63				
Baud rate [kbit/s]	50	125	250	500	1000
Max. bus length [m]	1000	550	250	120	25
Electrical connection	Pluggable screw terminals				

Communication times

The communication times of the system bus depend on

- data priority
- bus load
- data transmission speed
- processing time in the controller

Telegram runtimes					**Processing times in the controller**	
	Baud rate [kbits/s]				Parameter channel	Process data
	50	125	250	500		
Runtime/processing time [ms]	2.6	1.04	0.52	0.26	< 20	1 ... 2

Wiring

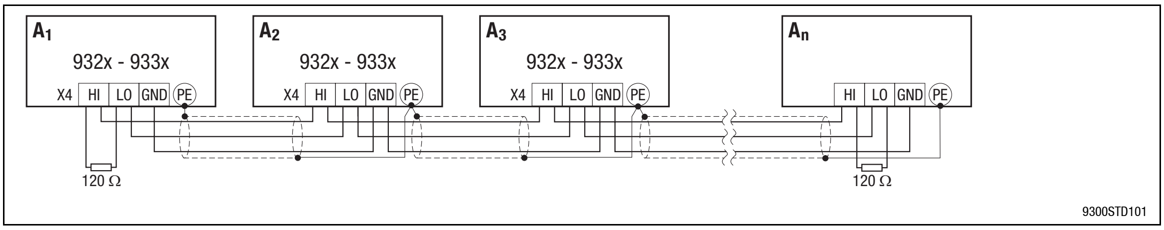


Fig. 4-30 Basic wiring of the system bus (CAN)

A1 Node 1 (controller)
A2 Node 2 (controller)
A3 Node 3 (controller)
A_n Node n (e. g. PLC), n = max. 63

Terminal	Explanation	
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)

Please follow our recommendations on the use of the signal cable:

Total length	≤ 300 m	≤ 1000 m
Cable type	LIYCY 2 x 2 x 0.5 mm^2 (twisted in pairs with shield)	CYPIMF 2 x 2 x 0.5 mm^2 (twisted in pairs with shield)
Cable resistance	≤ 80 Ω/km	≤ 80 Ω/km
Capacitance per unit length	≤ 130 nF/km	≤ 60 nF/km

Tip!

The first and last device in a system bus network must be provided with a terminating resistor of 120 Ω between the terminals CAN-LOW and CAN-HIGH.

4.2.16 Automation interface (X1)

Various modules can be plugged onto the automation interface (X1):

- Keypad 9371BB
- Fieldbus modules:
  – 210X: Serial interfaces (LECOM)
  – 211X: INTERBUS
  – 213X: PROFIBUS-DP modules
  – 217X: System bus (CAN), DeviceNet/CANopen

Tip!
Each fieldbus module is supplied with a documentation which describes the use and handling of the module.

4.3 Wiring according to EMC (installation of a CE-typical drive system)

General notes	• The electromagnetic compatibility of a machine depends on the type of installation and care taken. Special attention should be paid to: – Assembly – Filters – Shielding – Earthing • For diverging installations, the conformity to the CE EMC Directive requires a check of the machine or system regarding the EMC limit values. This is, for instance, required in case of: – Use of unshielded cables – Use of group RFI filters instead of assigned RFI filters – Operation without mains filter • **The compliance of the machine application with the EMC Directive is in the responsibility of the user.** – If you observe the following measures, you can assume that the machine will operate without any EMC problems caused by the drive system, and that compliance with the EMC Directive and the EMC law is achieved. – If devices which do not comply with the CE requirement concerning noise immunity EN 50082-2 are operated close to the controller, these devices may be disturbed electromagnetically by the controllers.
Assembly	• Connect controller, mains choke, and mains filter to the earthed mounting plate with a wire of large a cross-section as possible: – Mounting plates with conductive surfaces (zinc-coated, stainless steel) allow permanent contact. – Painted plates are not suitable for installation in accordance with the EMC. • If you use several mounting plates: – Connect as much surface as possible of the mounting plates (e.g. with copper bands). • Ensure the separation of motor cable and signal or mains cable. • Do not use the same terminal strip for mains input and motor output. • Cables must be routed as close as possible to the reference potential. Freely suspended cables act like aerials.
Filters	• Use mains filters or RFI filters and mains chokes which are assigned to the controller: – RFI filters reduce impermissible high-frequency interference to a permissible value. – Mains chokes reduce low-frequency interferences which depend on the motor cable and its length. – Mains filters combine the functions of mains choke and RFI filter.
Shielding	• Connect the shield of the motor cable to the controller – to the shield connection of the controller. – additionally to the mounting plate with a surface as large as possible. – For the connection we recommend to use earthing clamps on bare metal mounting surfaces. • If contactors, motor-protecting switches or terminals are located in the motor cable: – Connect the shields of the connected cables also to the mounting plate, with a surface as large as possible. • Connect the shield in the motor terminal box or on the motor housing to PE: – Metal glands at the motor terminal box ensure a connection of the shield and the motor housing. • If the mains cable between mains filter and controller is longer than 300 mm: – Shield mains cables. – Connect the shield of the mains cable directly to the inverter and to the mains filter and connect it to the mounting plate with as large a surface as possible. • Use of a brake chopper: – Connect the shield of the brake resistor cable directly to the mounting plate, at the brake chopper and the brake resistor with as large a surface as possible. – Connect the shield of the cable between controller and brake chopper directly to the mounting plate, at the inverter and the brake chopper with a surface as large as possible. • Shield the control cables: – Connect both shield ends of the digital control cables. – Connect one shield end of the analog control cables. – Always connect the shields to the shield connection at the controller over the shortest possible distance. • Application of controllers in residential areas: – Provide an additional shielding attenuation ≥ 10 dB for limiting the interfering radiation. This can be achieved by installing standard, closed, metallic, and earthed control cabinets or boxes.
Earthing	• Earth all metallically conductive components (controller, mains filter, motor filter, mains choke) using suitable cables connected to a central point (PE bar). • Maintain the minimum cross-sections prescribed in the safety regulations: – For the EMC, not the cable cross-section is important, but the surface and the contact with a cross-section as large as possible, i.e. large surface.

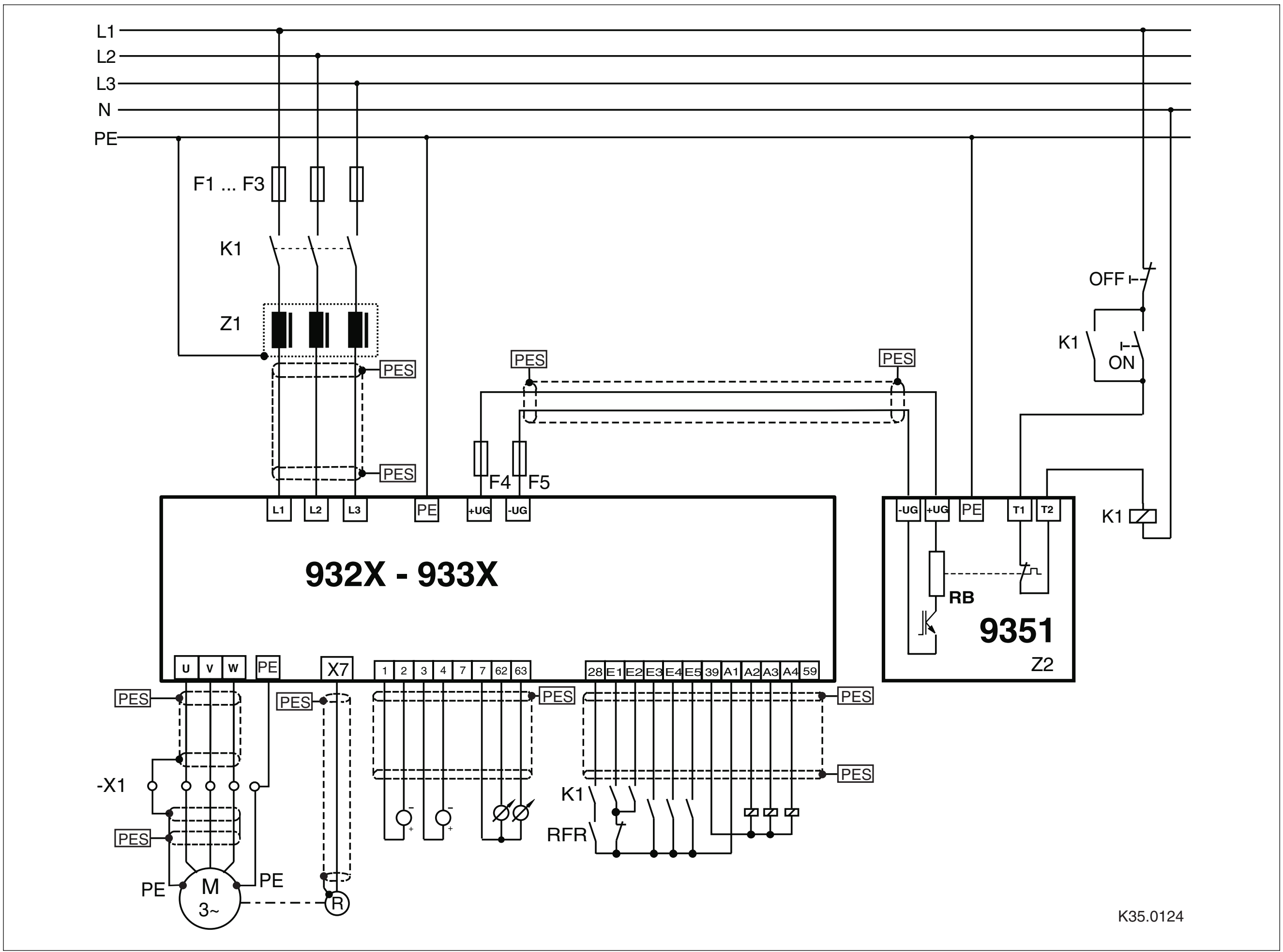


Fig. 4-31 Example for wiring according to EMC

F1...F5	Fuse (📖 3-7) and (📖 4-24)
K1	Mains contactor
Z1	For mains filter “A” or “B” see ”Accessories”.
Z2	Brake module, see ”Accessories”.
-X1	Terminal strip in control cabinet
PES	HF shielding by connection to PE with a surface as large as possible (see ”Shielding” 📖 4-57)

EDSVS9332S-C
13181650

Lenze

System Manual
Part C

Commissioning

During operation

Global Drive
9300 servo inverter

This documentation is valid for the 9300 servo inverters of the versions:

	①				②	③
EVS	**9326**	**-**	**E**	**E**	**2x**	**2x**

Type

Power

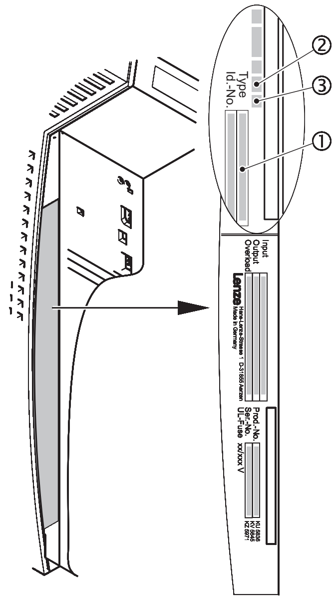
	400 V	480 V
9321 =	0.37 kW	0.37 kW
9322 =	0.75 kW	0.75 kW
9323 =	1.5 kW	1.5 kW
9324 =	3.0 kW	3.0 kW
9325 =	5.5 kW	5.5 kW
9326 =	11 kW	7.1 kW
9327 =	15 kW	18.5 kW
9328 =	22 kW	30 kW
9329 =	30 kW	37 kW
9330 =	45 kW	45 kW
9331 =	55 kW	55 kW
9332 =	75 kW	90 kW

Design
E = Built-in unit
C = Cold Plate

S = 9300 servo inverter

Hardware version

Software version



3.0 11/2006

5 Commissioning

5.1 Initial switch-on

Stop!

Prior to initial switch-on of the controller, check the wiring for completeness, short-circuit, and earth fault:

- Power connection:
  - – Supply via terminals L1, L2 and L3 (direct mains connection) or alternatively via terminals +UG, -UG (DC bus connection, network of drives)
- Motor connection:
  - – In-phase connection to the motor (direction of rotation)
- Feedback system (resolver, incremental encoder, ...)
- Control terminals:
  - – Controller enable: Terminal X5/28 (reference potential: X5/39)
  - – Direction of rotation terminal X5/E1 or X5/E2 (reference potential: X5/39)
  - – With external setpoint selection: Terminals X6/1, X6/2 (reference potential: X6/7)
- Covering the power connections:
  - – Put on cover(s) and fix.
- **Keep to the switch-on sequence!**

Tip!

- All specifications of the parameterisation refer to the application example ”Speed control” in Chapter 12.1.
- Use the convenient short set-up menus for the commissioning with the operating module 9371 BB or the PC and the Global Drive Control or LEMOC2 in which the codes for the most important settings are summarised.

5.1.1 Switch-on sequence

1. X5/28 (controller enable) must be open (LOW).
2. X5/E4 to HIGH signal (+13 V ... +30 V)
3. Switch on mains:
   – The controller is ready for operation after approx. 0.5 s (2 s for drives with sin/cos encoders with serial interface).
4. Adapt controller to the operating conditions under C0173:
   – If the controllers are not adapted, their lives are reduced.

<table>
<tr><th>C0173</th><th>Mains voltage</th><th>upper switch-off threshold</th><th>Operation</th></tr>
<tr><td>0</td><td>< 400 V</td><td rowspan="4">770 V</td><td rowspan="3">with or without braking unit</td></tr>
<tr><td>1 (default setting)</td><td>400 V</td></tr>
<tr><td>2</td><td>400 V < U_{mains} ≤ 460 V</td></tr>
<tr><td>3</td><td>480 V</td><td>without braking unit</td></tr>
<tr><td>4</td><td>480 V</td><td>800 V</td><td>with braking unit</td></tr>
</table>

Tip!

For applications with active loads (e. g. hoists) the code C0172* must be set to C0172 = 0 [Volt] in order to generate an overvoltage message (OU).

As long as the overvoltage message (OU) is applied

- the pulse inhibit is set and
- the drive is torqueless.

The controller inhibit is evaluated by the "holding brake (BRK)" (see chapter in the corresponding System Manual 9300).

*) C0172 = "OV reduce - threshold for activating the braking torque reduction before OU message"

5. Enter motor data:
   – For drives with a Lenze motor: Select motor under C0086.
   – For drives with other motors: See chapter 5.2.
6. Select feedback system:
   – Drives with resolver: no change required.
   – Drives with other feedback systems:
   Select feedback system under C0025,
   set encoder voltage with C0421
   (menu: "Motor / feedb.", submenu: "Feedback" or
   menu: "Motor/feedback system", submenu: "feedback systems")
   – With sensorless control (SSC): C0025 = 1. Do not use this control for new drive tasks.
7. When the digital terminals X5 are supplied with internal voltage:
   – Assign output X5/A1 with "FIXED1". Approx. 24 V are then output on terminal X5/A1.
8. When the analog terminals X6 are supplied with internal voltage:
   – Assign output X6/63 (FB AOUT) with "FIXED100%". 10 V are then output on terminal X6/63.

Tip!

For this application, you may use one of the predefined configurations in C0005.C0005 = XX1X (e.g. 1010 = speed control via terminals) automatically assigns the output X5/A1 to FIXED1.

9. Set the maximum speed under C0011.
10. Select a direction of rotation (see Chapter 5.4):
    – Clockwise rotation: HIGH signal (+13 V ... +30 V)on X5/E1
    – Counter-clockwise rotation: HIGH signal (+13 V ... +30 V) on X5/E2
11. Apply setpoint:
    – Apply a voltage > 0 V (max. 10 V) at X6/1, X6/2.
    – Do not activate a JOG setpoint (X5/E3 LOW).
12. Check whether the controller is ready for operation:
    – When green LED is blinking:
    Controller is ready for operation, proceed with 13.
    – When green LED is OFF and red LED is blinking:
    A fault has occurred. Eliminate the fault before proceeding with the commissioning (see chapter 10 ”Troubleshooting and fault elimination”).
13. Enable controller (see Chapter 5.3):
    – The green LED is lit if a HIGH signal (+13 V ...+30 V) is applied to X5/28 and no other source of the controller inhibit is active.
14. For operation with a fieldbus module, additional settings are necessary (see Operating Instructions for the fieldbus module used).

The motor will now rotate with the setpoint speed and the selected direction of rotation.

Troubleshooting:

	Error	**Cause / remedy**
Feedback system	• Motor rotates CCW with view on motor shaft • C0060 counts down after controller enable	Feedback system is not connected in-phase • Connect feedback system in-phase
Asynchronous motor	Motor • rotates at I_{max} and half slip frequency • does not react on setpoint changes	Motor is not connected in-phase • Connect motor in-phase at the terminals U, V, W
Synchronous motor	• Motor does not follow the setpoint change • Imax follows the setpoint in idle running	
	• Motor rotates CCW with view on the motor shaft.	The rotor angle (offset of electrical and mechanical rotor angle) is not correct • Adjust the rotor position (C0095 = 1). For this purpose, the motor must be operated without any load.

5.2 Input of the motor data

To achieve an optimum speed-torque behaviour of the drive, it is necessary to enter the nameplate data of the connected motor.

- If a LENZE motor is used:
  - Select the motor type under C0086 (see chapter 9.4; code table or chapter 9.5.3; motor selection list). All other motor data are automatically set by the controller.
  - To achieve outstanding accuracy you can enter the eight-digit designation of the motor nameplate "encoder" under C0416 when using motors with resolvers (optional).
- If the motor type is not included in the list under C0086, select a Lenze motor with similar data in C0086 (see chapter 9.4; code table or chapter 9.5.3; motor selection list). The following motor data must be altered manually:
  - C0006: Operating mode of the motor control
  - C0022: Adapt I_{max} to the max. motor current
  - C0081: Rated motor power
  - C0087: Rated motor speed
  - C0088: Rated motor current
  - C0089: Rated motor frequency
  - C0090: Rated motor voltage
  - C0091: Motor cos φ
  - User-specific detection of the motor temperature (see chapter 4.2.8)

  Only for very high demands on the control features:
  - C0084: Stator resistance of the motor
  - C0085: Leakage inductance of the motor

Tip!

- All required inputs are contained in the menu "Motor/feedb."(Motor/feedback system").
- If you select a motor type under C0086 and change one of the above listed motor data subsequently, C0086 = o (COMMON) is set (i.e. no Lenze motor is used).
- Do not operate reluctance motors.

5.2.1 Operation with synchronous motors made by other manufacturers

Tip!
If you use a Lenze synchronous motor with encoder feedback, you may skip this chapter.

Stop!
Please use single pole resolvers and single-turn or multi-turn sin/cos encoders only.

5.2.1.1 Rotor position adjustment

The rotor position must be adjusted, if

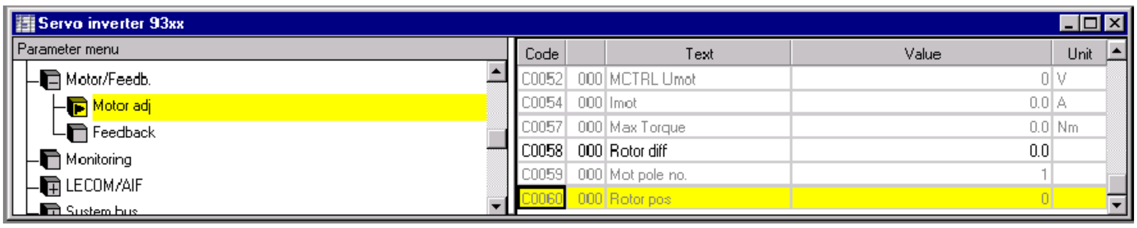
- no Lenze motor is used
- another encoder is mounted to the motor later (motor from another manufacturer but also Lenze motors)
- a defective encoder has been replaced

The following steps are required:

1. Check the resolver polarity
2. Optimise the current controller

Resolver poling

Please open the menu 'Motor adjustment' from the GDC parameter menu under the submenu 'Motor/feedback systems' (see Fig. 5-1).



9300std200

Fig. 5-1 Parameter menu (GDC) for motor setting

Code C0060 indicates the rotational angle of a revolution as a numerical value between 0 ... 2047.

- This value must go up when the rotor rotates in CW direction (when looking at the front of the motor shaft)!
- If the values are falling, the connections Sin+ and Sin- must be exchanged.

Optimising the current controller

Preparations

- Go to the submenu of the code list (GDC) to code C0292 (SSC I_M- setpoint) and enter the rated current of your drive
- Set the feedback of the drive to '1' under C0025 (i.e. drive without feedback)
- For adjusting the current controller use the codes C0075 (V_p) and C0076 (T_n). For this, call the parameter menu shown in Fig. 5-2.

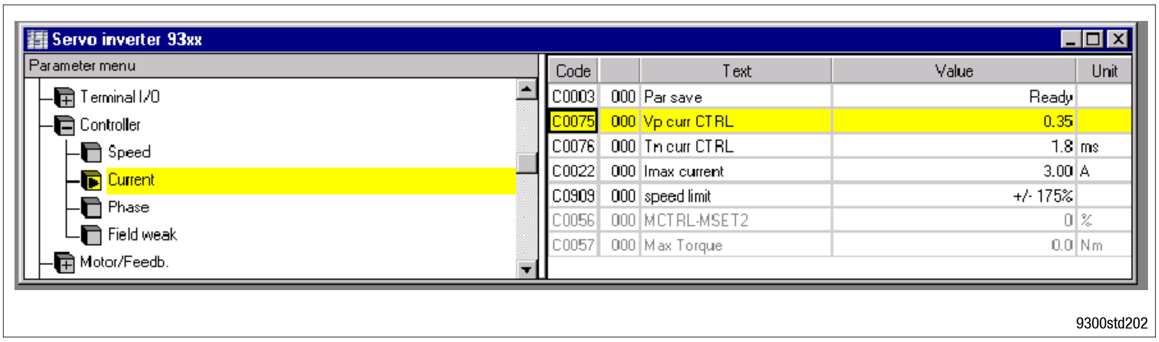


Fig. 5-2 Parameter menu for current controller adjustment

- Lay a motor phase to the current probe connected to an oscilloscope.
- Storage oscilloscope settings:
  – Time basis: 200 or 500 µs/div
  – Auto trigger
- Select minimum speed setpoint at the controller

Optimisation of current controller:

- Enable the controller until the current indicated on the oscilloscope reaches its maximum value.
- Inhibit the controller and switch to quick stop.
- Select the trigger mode for the oscilloscope
- Enable the controller for a short time
- Assess the transient response at the oscilloscope. Use C0075 and C0076 to adapt it as shown in Fig. 5-3.

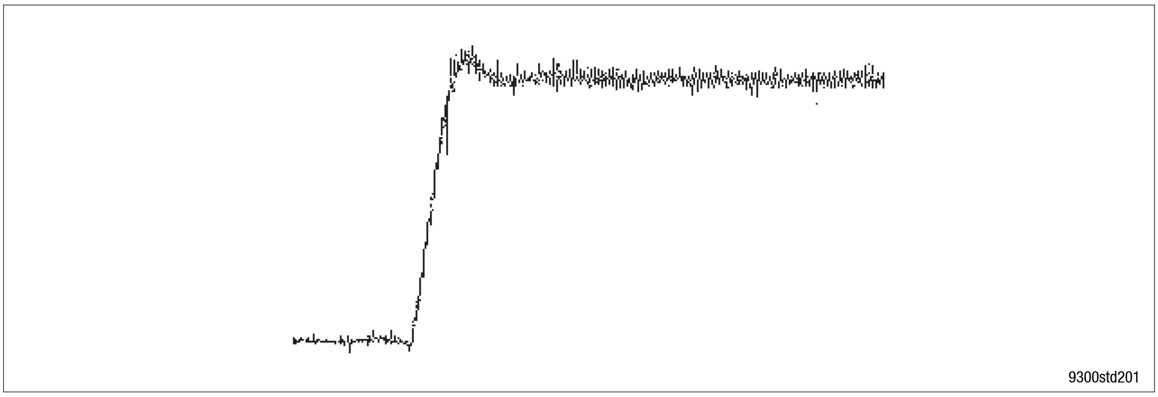


Fig. 5-3 Oscillograph of an optimised current controller

Stop!

After the optimisation has been completed, the original values must be re-entered under C0292 and C0025.

Rotor adjustment

1. Inhibit controller (e.g. with terminal X5/28 = LOW)
2. Unload motor mechanically (separate motor from gearbox or machine).

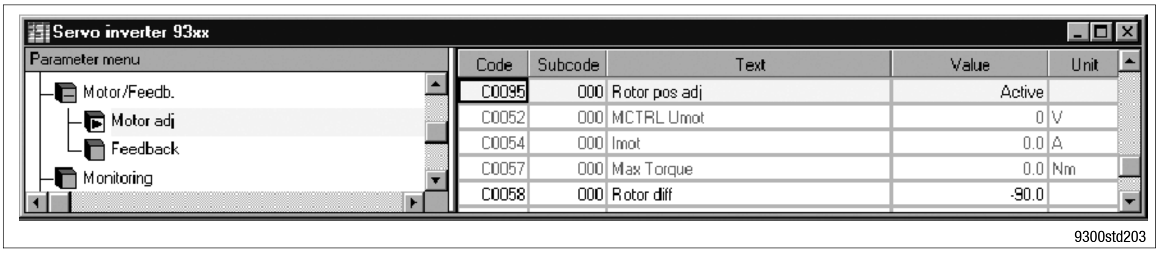


Fig. 5-4 Rotor position adjustment in GDC

3. Activation of the position adjustment with C0095 = 1 (GDC, see Fig. 5-4)
4. Enable controller again

- The position adjustment program of the controller is started.
  – The rotor rotates a full revolution in several steps.
  – C0095 is reset to ’0’ after one revolution
- The rotor displacement angle is displayed in C0058 (see Fig. 5-4).
  Restriction for sin/cos encoders: C0058 is always ’0’, since the value is saved in the encoder.

Tip!

Codes C0095 and C0058 are only displayed in GDC, if the bar cursor is positioned on them and the code is read using [F6].

5. Inhibit controller again
6. Please save the data calculated by the controller with C0003 in the parameter set wanted.
7. Switch-off the mains and, if necessary, mount the motor to the machine again.

5.3 Controller enable

- The controller is enabled only after all sources of controller inhibit have been reset (series connection of all sources).
  – When the controller is enabled, the green LED on the controller is illuminated.
- The active sources of the controller inhibit are displayed under C0183 (see also the menu: Diagnostics; Actual info).

The following table shows the conditions for controller enable:

Source controller inhibit	Controller inhibited	Controller enabled	Note
Terminal X5/28	0 V ... +4 V	+13 V ... +30 V	-
Keypad	STOP key	RUN key	Inhibit with the STOP key is possible only if the STOP key is assigned with ”CINH” under C0469.
Error	In case of TRIP In case of Message	TRIP reset	For check see chapter 10
System bus	Transmission of the control information INHIBIT via C0135	Transmission of the control information ENABLE via C0135	see Manual
Fieldbus module	See Operating Instructions of the corresponding fieldbus module		-

Tip!
All sources act like a series connection of switches which are independent of each other.

5.4 Input of the direction of rotation

Based on the factory setting, the motor direction of rotation depends on

- the sign of the speed setpoint (link of main and additional setpoint).
- the triggering of the digital inputs X5/E1 and X5/E2.

5.5 Quick stop

Using the quick stop function (QSP), you can stop the drive for a time to be set, independently of the setpoint input.

In the factory setting, the quick stop function is active:

- If, during mains connection
  - X5/E1 = HIGH and X5/E2 = HIGH or
  - X5/E1 = LOW and X5/E2 = LOW
- If, during operation
  - X5/E1 = LOW and X5/E2 = LOW
    QSP is recognised by the controller if a LOW signal is applied to X5/E1 and X5/E2 for more than approx. 2 ms.

Function:

- The speed runs with the deceleration time set under C0105 (default setting = 0 s) to zero. The drive stands driftfree.
- The drive accelerates to its setpoint along the set ramps if one of the inputs is triggered with a HIGH level.
  - If the speed was not zero, the controller is synchronised to the actual speed.

5.6 Change of the internal control structure

The internal control structure is adapted to the drive task (e.g. speed control, torque control, phase control, ...) by code C0005 (see chapter 9.4). For this purpose the controller must be inhibited.

STOP

Stop!

When the internal control structure is changed, another terminal assignment may result.

5.7 Change of the terminal assignment

If the configuration is changed via C0005, the assignment of all inputs and outputs is overwritten with the corresponding basic assignment. If necessary, the function assignment must be adapted to the wiring.

Tip!

For this, use the menu ”Terminal I/O” if the 9371BB operating module is used or the menu ”Terminal I/O” with Global Drive Control or LEMOC2.

Stop!

If you reassign an input, the signal source that has been assigned up to now will **not** be overwritten! The active connection that are not required must be removed.

5.7.1 Freely assignable digital inputs

Five freely assignable digital inputs are available (X5/E1 ... X5/E5). You can define a polarity for each input. With this you can determine the input to be HIGH active or LOW active.

Change assignment:

Tip!

Use the submenu ”DIGIN” at the 9371BB operating module or the submenu ”Digital inputs” in Global Drive Control or LEMOC2.

Example:
Menu ”Terminal I/O; DIGIN” (terminal I/O; digital inputs)

Here are the most important aims for digital inputs

Valid for the basic configuration C0005 = 1000.

Code			Controlled by			Note
CFG	Subcode	Signal name	Signal (interface)		Selection list 2	
C0885	000	R/L/Q-R	DIGIN1	(Term. X5/E1)	0051	HIGH = Do not invert main setpoint (CW rotation)
C0886	000	R/L/Q-L	DIGIN2	(Term. X5/E2)	0052	HIGH = Invert main setpoint (CCW rotation)
C0787	001	NSET-JOG*1	DIGIN3	(Term. X5/E3)	0053	HIGH = Main setpoint is substituted by the fixed speed from C0039/x The signals are binary coded.
	002	NSET-JOG*2	FIXED0	-	1000	
	003	NSET-JOG*4	FIXED0	-	1000	
	004	NSET-JOG*8	FIXED0	-	1000	
C0788	001	NSET-TI*1	FIXED0	-	1000	Additional acceleration and deceleration times from C0101/x and C0103/x The signals are binary coded.
	002	NSET-TI*2	FIXED0	-	1000	
	003	NSET-TI*4	FIXED0	-	1000	
	004	NSET-TI*8	FIXED0	-	1000	
C0880	001	DCTRL-PAR*1	FIXED0	-	1000	Parameter set selection: The signals are binary coded
	002	DCTRL-PAR*2	FIXED0	-	1000	
C0881	000	DCTRL-PAR-LOAD	FIXED0	-	1000	Signal LOW-HIGH loads selected parameter set with DCTRL-PAR*x
C0871	000	DCTRL-TRIP-SET	DIGIN4	(Term. X5/E4)	0054	LOW = Controller sets TRIP (EEr)
C0876	-	DCTRL-TRIP-RES	DIGIN5	(Term. X5/E5)	0055	Signal LOW-HIGH = Resets active trip
C0920	000	REF-ON	FIXED0	-	1000	HIGH = Start homing
C0921	000	REF-MARK	FIXED0	-	1000	LOW-HIGH edge = Stop homing

1. Select the input of the function blocks which is to be assigned to a new source under the configuration code CFG in the code level.
   – Example:
   C0787/2 (CFG/subcode) determines the source for the input ”NSET-JOG*2” (signal name) in the function block ”Speed setpoint conditioning” (NSET).
2. Change to the parameter level with PRG. Select the source (signal) from the indicated list. Ask yourself: Where does the signal for controlling this input is to come from?
   – Example:
   ”NSET-JOG*2” is to be controlled by terminal X5/E5 (interface).
   – For this, select DIGIN5 (signal) and acknowledge with SHIFT + PRG.
3. Change to the code level by 2 * PRG.
4. Determine the polarity of the input terminals X5/E1 to X5/E5 (HIGH active or LOW active) under code C0114 and subcode.
   – In the code level the terminal is selected via subcode.
   – Change to the parameter level using PRG and select the polarity.
   – Change to the code level by 2 * PRG.
5. Repeat steps 1. to 4. until all inputs required are assigned.
6. Remove undesired connections. The connection so far of the terminal X5/E5 are not cancelled automatically. If the connection is to be cancelled:
   – Select C0876 in the code level (previous target of terminal X5/E5)
   – Change to the parameter level using PRG.
   – Select FIXED0 (signal) and acknowledge with SHIFT+PRG.

5.7.2 Freely assignable digital outputs

Four freely assignable digital outputs are available (X5/A1 ...X5/A4). You can define a polarity for each input. With this you can determine the input to be HIGH active or LOW active.

The most important codes can be found in the submenu: DIGOUT (digital outputs)

Change assignment:

1. Select the output which is to be assigned to another function via the subcode under C0117.
2. Change to the parameter level with PRG. Select the signal from the indicated list, which is to be output via the selected output terminal. Change to the code level with PRG.
3. Determine the polarity (HIGH active or LOW active) via the subcode of the output under C0118.
4. Repeat step 1. to 3., until all outputs desired are assigned.

5.7.3 Freely assignable analog inputs

The most important codes can be found in the submenu: AIN1 X6.1/2 or AIN2 X6.3/4 (analog input 1 (X6.1/2) or analog input 2 (X6.3/4))

Change assignment:

1. Select the input of the function block to be assigned to a new source in the code level.
   – Example
     Determine the source for the input "Main setpoint" (NSET-N) in the function block "Speed setpoint conditioning" (NSET) under C0780.
2. Change to the parameter level with PRG. Select the signal from the indicated list, which is to be used for the selected input.
3. Repeat steps 1. and 2. until all inputs required are assigned.
4. Remove undesired connections.

5.7.4 Freely assignable monitor outputs

Use the monitor outputs X6/62 and X6/63 to output internal signals as voltage signals.

Under C0108 and C0109 the outputs can be adapted to e.g. a measuring device or a slave drive.

The most important codes can be found in the submenu: AOUT1 X6.62 or AIN2 X6.63 (analog output 1 (X6.62) or analog output 1 (X6.63))

Change assignment:

1. Select the output to be assigned to another signal (source) (e. g. C0431 for output X6/62) in the code level.
2. Change to the parameter level with PRG. Select the signal from the indicated list which is to be output via the monitor output.
3. If necessary, adjust an offset in the hardware under C0109
4. If necessary, the signal gain can be adapted to the hardware under C0108.
5. Repeat steps 1. to 4. to assign the second output.

6 During operation

6.1 Status indications

6.1.1 Display on the controller

Two LEDs at the front of the controller indicate the controller status.

LED green	LED red	Cause	Check
■	□	Controller enabled; no fault	
★	□	Controller inhibit, switch-on inhibit	C0183; or C0168/1
□	★	Fail	C0168/1
■	★	Warning, fail-QSP	C0168/1

■ : on □ : off ★ : blinking

6.1.2 Display on the keypad

Status indications in the display indicate the controller status.

Display	Controller status	Check
RDY	Controller ready for operation, controller can be inhibited	C0183, C0168/1
IMP	Pulses at the power stage inhibited	C0183, C0168/1
I_{max}	Max. current reached	
M_{max}	Max. torque reached	
Fail	Fault through TRIP, message, fail-QSP or warning	C0183, C0168/1

6.1.3 Display in Global Drive Control

1. Click on the "Control" button in the "Basic settings" dialog box.
2. Click on the "Diagnostics" button in the "Control" dialog box.

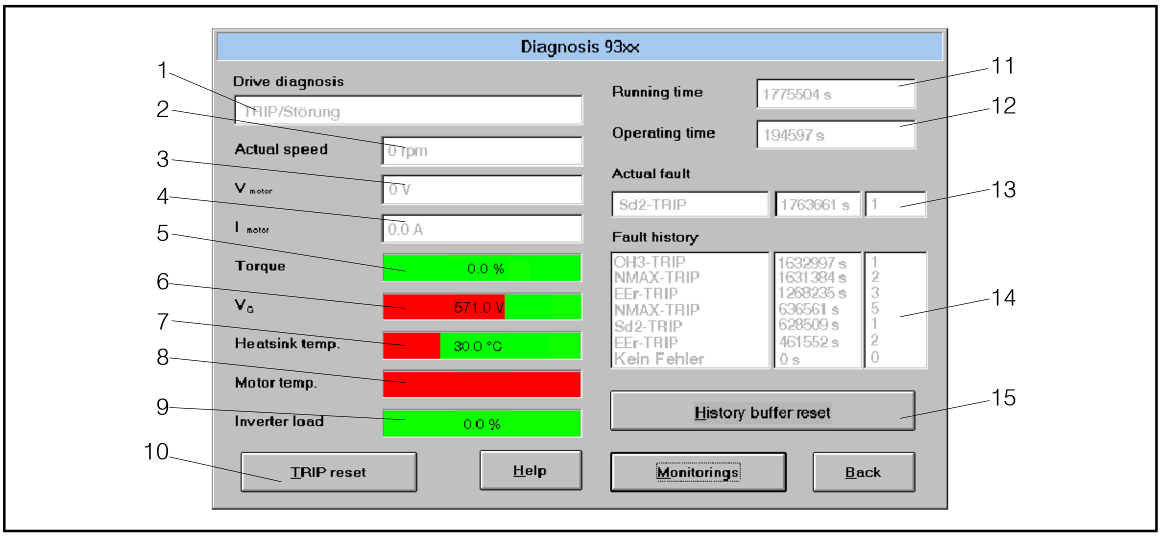


Fig. 6-1 "Diagnosis 93xx" dialog box

1	Type of fault
2	Actual speed
3	Actual motor voltage
4	Actual motor current
5	Motor torque
6	DC bus voltage
7	Heatsink temperature
8	Motor temperature
9	Drive load
10	Reset fault
11	Time for how long the supply voltage was applied
12	Time for how long the controller was enabled
13	Actual fault with time and frequency of the fault. 🕮 10-4
14	Fault history with time and frequency of the fault. 🕮 10-4
15	Reset history buffer. 🕮 10-4

6.1.4 Actual value display via codes

You can read different actual values using the following codes:

Code	Meaning
C0051	Absolute actual speed [rpm]
C0052	Absolute motor voltage [V]
C0053	Absolute DC bus voltage [V]
C0054	Absolute motor current [A]
C0060	Rotor position [Inc/rev]
C0061	Heatsink temperature [°C]
C0063	Absolute motor temperature [°C] Display only if the KTY (PTC) is connected via X7 or X8.
C0064	Controller load [%]

Identification

- You can read the software version of the controller under C0099.
- C0093 indicates the controller type.

6.2 Information on operation

When operating the controller, please observe the following notes:

Stop!

- Cyclic connection and disconnection of the controller supply voltage at L1, L2, L3 or $+U_G$, $-U_G$ may overload the internal input current limitation:
  – Allow at least 3 minutes between disconnection and reconnection.

- During mains switching (L1,L2,L3) it is not important whether further controllers are supplied via the DC bus.

6.2.1 Switching on the motor side

- Switching on the motor side of the inverter is permissible for emergency switch-off.
- Please note:
  – Switching while a controller is enabled may cause the fault message ”OCx” (short-circuit/earth fault in operating mode x).
  – For long motor cables and operation of controllers with smaller output power, leakage currents through interfering cable capacitances may cause the fault message ”OCx”.
  – Switching equipment on the motor side must be dimensioned for DC voltages ($U_{DC\ max}$ = 800 V).

6.2.2 Controller protection by current derating

Valid for the types 9326 to 9332.

For rotating-field frequencies < 5 Hz the controller automatically derates the maximum permissible output current.

- For operation with switching frequency = 8 kHz (C0018=1, power-optimised):
  – The current derating depends on the heatsink temperature (see Fig. 6-2).
- For operation with switching frequency = 16 kHz (C0018=2, noise-optimised):
  – The current is always derated to $I_{r16} = I_{016}$.
- For operation with automatic changeover of the switching frequency (C0018=0):
  – Below the threshold, the controller operates with 16 kHz (noise-optimised). The function of the current derating follows the characteristic ”Imax 16 kHz” (see Fig. 6-2).
  – If a higher torque is required from the machine for example for acceleration, the controller automatically switches to 8 kHz (power-optimised). The function of the current derating follows the characteristic ”Imax 8 kHz” (see Fig. 6-2).

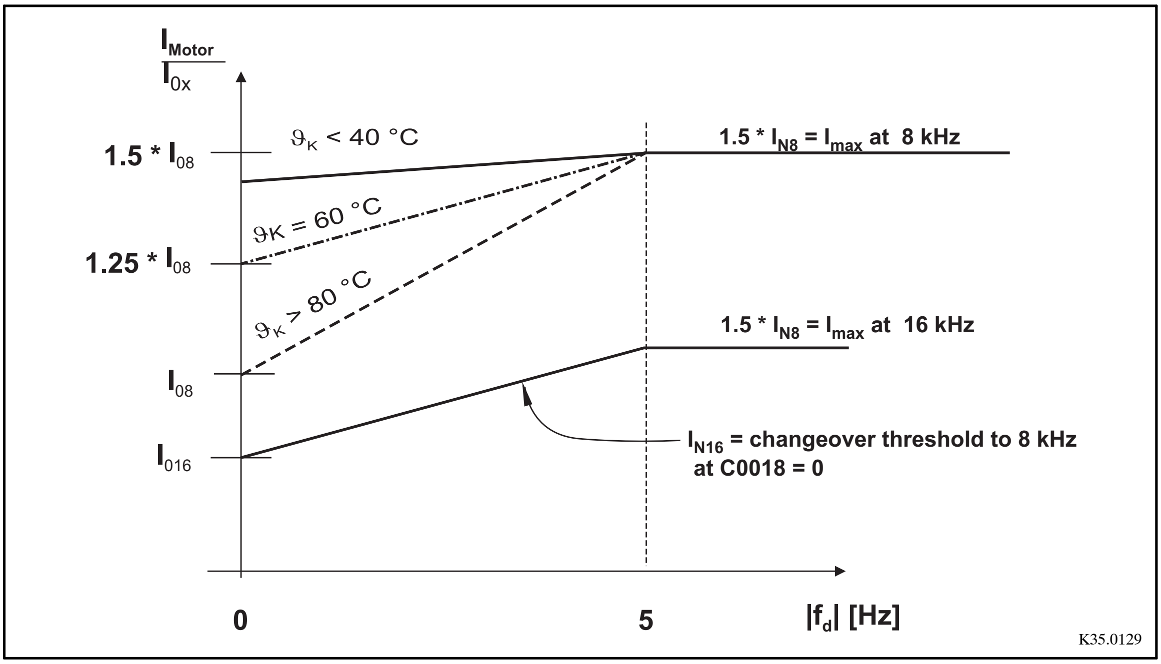


Fig. 6-2 Current derating function of the controllers 9326 to 9332.

ϑ_K	Heatsink temperature
I_{rx}	Rated current at U, V, W depending on the switching frequency
f_d	Rotating-field frequency at output U, V, W
I_{0x}	Max. standstill current for rotating-field frequency = 0 Hz

See chapter “Rated data” (🕮 3-4).

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Lenze

System Manual
Part D1.1

Parameter setting

Configuration

Function library

Global Drive

9300 servo inverter

This documentation is valid for the 9300 servo inverters of the versions:

①					②	③
EVS	**9326**	**-**	**E**	**E**	**2x**	**2x**

Type

Power

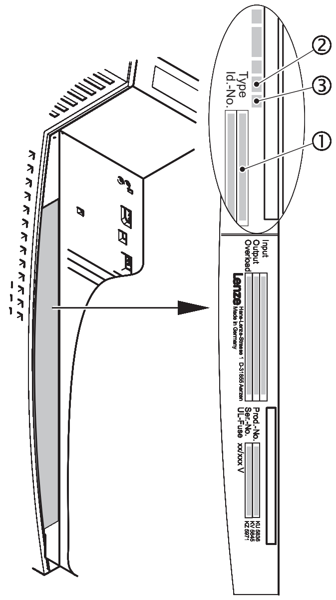
	400 V	480 V
9321 =	0.37 kW	0.37 kW
9322 =	0.75 kW	0.75 kW
9323 =	1.5 kW	1.5 kW
9324 =	3.0 kW	3.0 kW
9325 =	5.5 kW	5.5 kW
9326 =	11 kW	7.1 kW
9327 =	15 kW	18.5 kW
9328 =	22 kW	30 kW
9329 =	30 kW	37 kW
9330 =	45 kW	45 kW
9331 =	55 kW	55 kW
9332 =	75 kW	90 kW

Design
E = Built-in unit
C = Cold Plate

S = 9300 servo inverter

Hardware version

Software version



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Contents

7 Parameter setting

7.1 General information

- The controller can be adapted to your application by setting parameters. A detailed description of the function can be found in the function library.
- The function parameters are stored as numerical codes:
  – Codes are marked in the text with a ”C”.
  – The code table provides a quick overview of all codes. The codes are sorted according to their numbers and can be used as reference.

Parameter setting with the keypad XT or PC

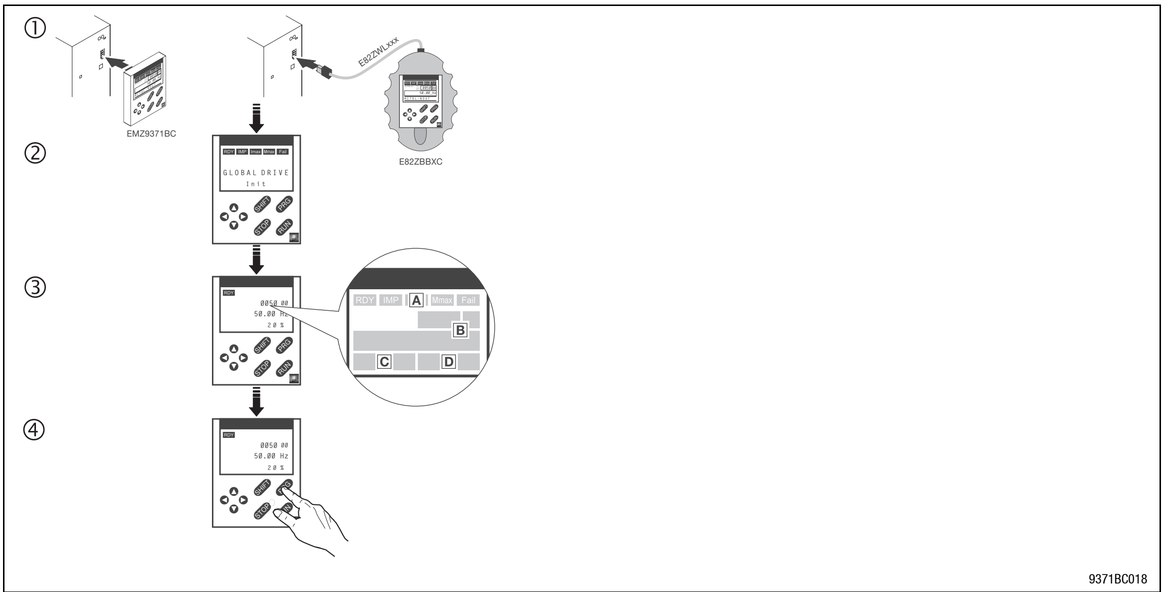
- For more detailed information about parameter setting with the keypad see the following chapters
- For more detailed information about parameter setting with the PC see the Operating Instructions for the communication module LECOM-A/B (RS232/RS485) EMF2102IB-V001.
- Keypad and PC can also be used to
  – control your controller (e. g. inhibit and enable)
  – select setpoints
  – display operating data
  – transfer parameter sets to other controllers

Parameter setting with a bus system

- More detailed information about bus modules can be found in the corresponding Operating Instructions.

7.2 Parameter setting with the XT keypad

7.2.1 Keypad commissioning



① Connect keypad to the AIF interface on the front side of the basic controller.
It is possible to connect the keypad or remove it during operation.

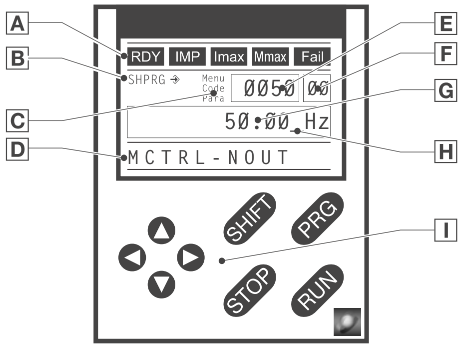
② As soon as the keypad is supplied with voltage, it carries out a short self-test.

③ The keypad is ready for operation if it displays in the operating mode:

- A Current status of the basic controller
- B Memory location 1 of the user menu (C0517):
  Code number, subcode number and current value
- C Active fault indication or additional status message
- D Current value in % of the operating display defined in C0004

④ Press PRG to quit the operating level

7.2.2 Description of the display element



9371BC002

A	**Status display basic device**		
	Display	**Meaning**	**Explanation**
	RDY	Ready for operation	
	IMP	Pulse inhibit active	Power outputs inhibited
	Imax	Adjusted current limitation is exceeded in motor-mode or generator-mode	
	Mmax	Speed controller 1 in limitation	Drive torque-controlled (active only when operating with the basic controllers of the 9300 series)
	Fail	Active fault	
B	**Adoption of parameters**		
	Display	**Meaning**	**Explanation**
	➾	Parameters are adopted immediately	Basic device operates immediately with the new parameter value
	SHPRG ➾	Parameter must be confirmed with SHIFT PRG	Basic device operates with the new parameter value, after it was confirmed
	SHPRG	In case of controller inhibit the parameter must be confirmed with SHIFT PRG	Basic device operates with the new parameter value, after the controller has been enabled
	none	Display parameter	Change not possible
C	**Active level**		
	Display	**Meaning**	**Explanation**
	Menu	Menu level active	Select main menu and submenus
	Code	Code level active	Select codes and subcodes
	Para	Parameter level active	Change parameters in the codes or subcodes
	none	Operation level active	Display operating parameters
D	**Short text**		
	Display	**Meaning**	**Explanation**
	alphanumerical	Contents of menus, meaning of codes and parameters	
		In operation level display of C0004 in % and active fault	
E	**Number**		
	active level	**Meaning**	**Explanation**
	Menu level	Menu number	Display only active when operating with the basic device series 8200 vector or 8200 motec
	Code level	Four-digit code number	
F	**Number**		
	active level	**Meaning**	**Explanation**
	Menu level	Submenu number	Display only active when operating with the basic device series 8200 vector or 8200 motec
	Code level	Two-digit subcode number	

G	**Parameter value**	
		Parameter value with unit
H	**Cursor**	
		In the parameter level the number above the cursor can be directly changed
I	**Function keys**	
		For description see the following table

7.2.3 Description of the function keys

Note!

Press the key combinations with SHIFT:
Press SHIFT and keep it pressed, then additionally press the second key.

Press key	Function			
	Menu level	**Code level**	**Parameter level**	**Operation level**
PRG		Change to the parameter level	Change to the operation level	Change to the code level
SHIFT PRG	Load predefined configurations in the menu "Short setup" [1]		Accept parameter, if SHPRG → or SHPRG is displayed	
▲ ▼	Change between menu points	Change code number	Change number above cursor	
SHIFT ▲ SHIFT ▼	Change quickly between menu points	Change code quickly	Change number above cursor quickly	
▶ ◀	Change between main menu, submenus and code level		Cursor to the right Cursor to the left	
RUN	Cancel function of key STOP, the LED in the key disappears			
STOP	Inhibit the controller, LED in the key lights up			
	Reset fault (TRIP-Reset):	1. Remove cause of malfunction 2. Press STOP 3. Press RUN		

[1] only active when operating with the basic device series 8200 vector or 8200 motec

7.2.4 Changing and saving parameters

All parameters for controller setting or monitoring are saved in codes. The codes are numbered and labelled in the documentation with a "C". Some codes store the parameters in numbered "subcodes", so that a clear parameter setting is ensured (e. g.: C0517 User menu).

The codes are described in detail in the system manual of the drive controller.

> **Note!**
>
> Your settings act on the current parameters in the RAM. You have to save your settings as parameter set, otherwise they will be lost after mains switching!
>
> If you need only one parameter set, save the settings as parameter set 1, as parameter set 1 will be loaded automatically after every mains switching of the basic controller.

Step		Keys	Action
1.	Select menu	▲ ▼ ▶ ◀	Select the desired menu with arrow keys
2.	Change to the code level	▶	Display of first code in the menu
3.	Select code or subcode	▼ ▲	Display of current parameter value
4.	Change to parameter level	PRG	
5.	If SHPRG is displayed, inhibit controller	STOP	The drive is idling
6.	Change parameters		
	A)	▶ ◀	Move cursor under the digit to be changed
	B)	▼ ▲	Change digit
		SHIFT ▼ SHIFT ▲	Change digit quickly
7.	Accept changed parameter		
	Display of SHPRG or SHPRG →	SHIFT PRG	Confirm change to accept parameter Display "OK"
	Display →	-	The parameter was accepted immediately
8.	If necessary, enable controller	RUN	The drive should be running again
9.	Change to the code level		
	A)	PRG	Display of operation level
	B)	PRG	Display of the code with changed parameters
10.	Change further parameters		Restart the "loop" at step 1. or step 3.
11.	Save modified parameters		
	A)	▲ ▼ ▶ ◀	Select code C0003 "PAR SAVE in the menu "Load/Store"
	B)	PRG	Change to parameter level Display "0" and "Ready"
	Select 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 saved non-volatile in the selected parameter set.
12.	Change to the code level		
	A)	PRG	Display of operation level
	B)	PRG	Display C0003 "PAR SAVE"
13.	Set parameters for different parameter set		Restart "loop" at step 1. or step 3.

7.2.5 Parameter set loading

You can use the keypad to load a saved parameter set into the RAM when the controller is inhibited. After controller enable the controller uses the new parameters.

Danger!

- After loading a new parameter set the controller will be initialised again and behaves as if the mains was switched on:
  – System configurations and terminal assignments may be changed. Ensure that your wiring and drive configuration correspond to the settings of the parameter set.
- Only use terminal X5/28 as source for the controller inhibit! Otherwise, the drive can start in an uncontrolled way when changing to another parameter set.

Note!

- After connecting the supply voltage the controller always loads parameter set 1 into the RAM.
- You can also load other parameter sets into the RAM via the digital inputs or bus commands.

Step			Keys	Action
1.	Inhibit controller			Terminal X5/28 = LOW
2.	Load saved parameter set into the RAM			
		A)	▲ ▼ ► ◄	Select code C0002 ”PAR LOAD in the menu ”Load/Store”
		B)	PRG	Change to parameter level Display ”0” and ”Load Default” If you want to return to the state as delivered, proceed with D)
	Select 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” is off. The parameter set has been completely loaded into the RAM when ”RDY” is on again.
3.	Change to the code level			
		A)	PRG	Display of operation level
		B)	PRG	Display C0002 ”PAR LOAD”
4.	Enable the controller.			Terminal X5/28 = HIGH The drive is now running with the settings of the loaded parameter set

7.2.6 Parameter set transfer

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

For this purpose use the menu ”Load/Store”:

Danger!

During the parameter transfer from the keypad to the basic device the control terminals can adopt undefined states!

Therefore the plugs X5 and X6 must be disconnected from the basic 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 basic device into the keypad

Step		Key sequence	Action
1.	Connect the keypad to the basic device 1		
2.	Inhibit controller:		Terminal X5/28 = LOW The drive coasts.
3.	Select C0003 in the menu ”Load/Store” C0003	▲ ▼ ► ◄	Select the code C0003 ”PAR SAVE” in the menu ”Load/Store” 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 stored in the keypad are overwritten.
		►	Set ”11” ”Save extern”
6.	Start copying	SHIFT PRG	”RDY” goes OFF. ”BUSY” is displayed. If ”BUSY” goes OFF after approx. one minute, all parameter sets have been copied into the keypad.
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 the basic device 1		

Copying parameter set from the keypad into the basic device

Step		Key sequence	Action
1.	Connect the keypad to the basic device 2		
2.	Inhibit controller:		Terminal X5/28 = LOW The drive coasts
3.	Pull the plugs X5 and X6		All control terminals have the defined state ”LOW”.
4.	Select C0002 in the menu ”Load/Store”	▲ ▼ ▶ ◀	Select code C0002 ”PAR LOAD” in the menu ”Load/Store” using the arrow keys.
5.	Change to the parameter level	PRG	Display ”0” and ”Load Default”
6.	Select the correct copy function		The settings stored in the basic device are overwritten.
	• Copy all available parameter sets into the basic device and save them permanently.		
		▶	Set ”20” ”ext -> EEPROM”
	• Copy single parameter sets to the main memory.		
		▶	Copy parameter set 1: Set ⇨ ”11” ”Load ext PS1”
			Copy parameter set 2: Set ⇨ ”12” ”Load ext PS2”
			Copy parameter set 3: Set ⇨ ”13” ”Load ext PS3”
			Copy parameter set 4: Set ⇨ ”14” ”Load ext PS4”
7.	Start copying	SHIFT PRG	”RDY” goes OFF. ”BUSY” is displayed. When ”BUSY” goes off, the selected parameter sets are copied to the basic device.
8.	Change to the code level		
	A)	PRG	Display of the operating level
	B)	PRG	Display C0002 and ”PAR LOAD”
9.	If necessary, store separately copied parameter sets	▲ ▼ ▶ ◀	Select code C0003 ”PAR SAVE” in the menu ”Load/Store” using the arrow keys and permanently store the contents of the main memory.
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 Activation of password protection

Note!

- If the password protection is activated (C0094 = 1 ... 9999) only the user menu can be freely accessed.
- Enter a password before you go to other menus. Therefore, the password protection is inactive until you enter a new password.
- Please observe that also the password protected parameters will be overwritten when parameter sets are transferred to to other basic devices. The password will not be transferred.
- Do not forget your password! If you cannot remember the password, it can only be reset via PC or a bus system.

Activate password protection

Step			Keys	Action
1.	Select menu ”USER-Menu”		▲ ▼ ► ◄	Change to the user menu using the arrow keys
2.	Change to code level		►	Display code C0051 ”MCTRL-NACT”
3.	Select C0094		▲	Display code C0094 ”User password”
4.	Change to parameter level		PRG	Display ”0” = no password protection
5.	Password setting			
		A)	▲	Select password (1 ... 9999)
		B)	SHIFT PRG	Confirm password
6.	Change to code level			
		A)	PRG	Display of operating level
		B)	PRG	Display C0094 and ”User password”
7.	Change to menu ”USER-Menu”		◄ ◄ ▼	
The password protection is active now. You can quit the user menu only if you re-enter the password and confirm with SHIFT PRG.				

Cancel password protection

1.	Change to code level in the user menu		►	
2.	Select C0094		▲	Display code C0094 ”User password”
3.	Change to parameter level		PRG	Display”9999” = password protection active
4.	Password entry			
		A)	▼	Set valid password
		B)	SHIFT PRG	Acknowledge The password protection is deactivated by re-entering the password.
5.	Change to code level			
		A)	PRG	Display of operating level
		B)	PRG	Display C0094 and ”User password”
The password protection is inactive now. All menus are accessible again.				

7.2.8 Diagnostics

In the "Diagnostic" menu you will find in 2 submenus all codes for

- Drive monitoring
- Fault diagnostics

The operating level displays additional status messages. If several messages are active, the message with the highest priority is displayed:

Priority	Display	Meaning
1	GLOBAL DRIVE INIT	Initialisation or communication fault between keypad and controller
2	XXX - TRIP	Active TRIP (contents of C0168/1)
3	XXX - MESSAGE	Active message (contents of C0168/1)
4	Special controller status:	
		Power-up inhibit
5	Source for controller inhibit (at the same time value of C0004 is displayed):	
	STP1	Terminal X5/28
	STP3	Keypad or LECOM A/B/LI
	STP4	InterBus-S or Profibus
	STP5	System bus (CAN)
	STP6	C0040
6	Source for quick stop:	
	QSP-term-Ext	Input MCTRL-QSP at function block MCTRL is applied to HIGH signal
	QSP-C0135	Operating module or LECOM A/B/LI
	QSP-AIF	INTERBUS-S or PROFIBUS-DP
	QSP-CAN	System bus (CAN)
7	XXX - WARNING	Active warning (contents of C0168/1)
8	xxxx	Value under C0004

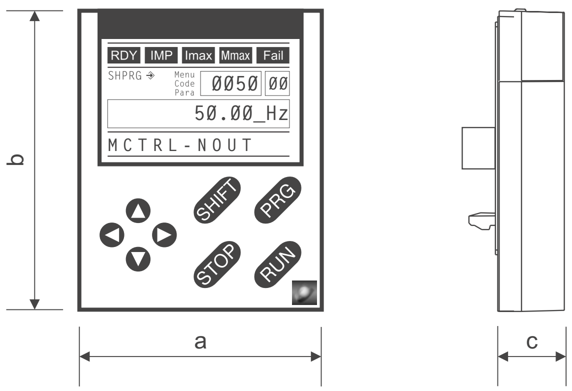
7.2.9 Menu structure

For easy operation, the codes are clearly arranged in function-related menus:

Main menu	Submenus	Description
Display	**Display**	
USER menu		**Defined codes in C0517**
Code list		**All available codes**
	ALL	All available codes 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		**Diagnostics**
	Actual info	Display codes in order to monitor drive
	History	Error 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 basic controller (frequency inverter, servo inverter, position controller, ...)
Main FB		**Configuration of main function blocks**
	NSET	Setpoint processing
	NSET-JOG	Fixed setpoints
	NSET-RAMP1	Ramp generator
	MCTRL	Motor control
	DFSET	Digital frequency processing
	DCTRL	Internal control
Terminal I/O		**Linkage 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
Controller		**Configuration of internal control parameters**
	Speed	Speed controller
	Current	Current controller or torque controller
	Phase	Phase controller
Motor/Feedb.		**Input of motor data, configuration of speed feedback**
	Motor adj	Motor data
	Feedback	Feedback system configuration
Monitoring		**Monitoring function configuration**
LECOM/AIF		**Configuration of operation with communication modules**
	LECOM A/B	Serial interface
	AIF interface	Process data
	Status word	Display of status words

Main menu	Submenus	Description
Display	**Display**	
System bus		**System bus (CAN) configuration**
	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 diagnosis
FB config		**Configuration of function blocks**
Func blocks		**Function block parameterisation** The submenus contain all available function blocks
FCODE		**Configuration of free codes**
Identify		**Identification**
	Drive	Software version of basic controller
	Op keypad	Software version keypad

7.2.10 Technical data



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Dimensions	a b c	60 mm 73.5 mm 15 mm
Type of protection	IP20	
Ambient temperature	Operation: Transport: Storage	- 10°C ... +60 °C -25 °C ... +70 °C -25 °C ... +60 °C
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)	

8 Configuration

In practice, every application requires an adjusted, controller-internal configuration realised with a huge number of different function blocks which must be linked in a suitable way.

8.1 Configuration with Global Drive Control

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.

8.2 Basic configurations

Stop!

Pre-defined basic configuration can be loaded via code C0005. When the configuration is changed via C0005, the assignment of all inputs and outputs is overwritten with the corresponding basic assignment. If necessary, adapt the function assignment to the wiring.

For adapting the function assignment to a certain wiring or for extending the signal processing, see ”Working with function blocks”.

The internal signal processing is adapted to the drive task (e.g. step control or dancer position control) by selecting a pre-defined basic configuration. The default setting can be used to e.g. control the drive speed.

- A detailed description of the basic configurations with terminal assignments, signal flow diagrams, and application examples can be found in chapter ”Application examples”.
- Before loading a basic configuration via C0005, the controller must be inhibited.

Basic configurations already saved can be selected and activated via code C0005. The selection is made via a four-digit number, each digit being assigned to certain properties.

First digit
Defines the basic function of the configuration.

Configuration C0005	Basic function
1xxx	Speed control
4xxx	Torque control with speed limitation
5xxx	Master for digital frequency coupling
6xxx	Slave to digital frequency bus
7xxx	Slave to digital frequency cascade

Second digit
Defines the additional function which expands the basic function.

Configuration C0005	Additional function
x0xx	No additional function
x1xx	Brake control via digital output X5/A2
x9xx	In case of quick stop the complete connection of drives is phase-controlled to zero speed

Third digit
Defines whether the voltage of the analog and digital control inputs is to be supplied internally or externally.

Configuration C0005	Supply voltage
xx0x	External
xx1x	Internal via terminal X5/A1 and X6/63

Fourth digit
Defines the controller interface to read in certain control signals (e. g. speed setpoint).

Configuration C0005	Interface
xxx0	Control terminals
xxx1	RS 232, RS 485 or optical fibre
xxx3	InterBus-S or Profibus
xxx5	System bus (CAN)

Tip!

The most important codes for parameter setting of the basic configuration can be found in the Global Drive Control program and in the keypad in the menu items "Short setup".

8.2.1 Speed control C0005 = 1XXX (1000)

For standard applications, you can immediately commission the drive with the default settings. To adapt it to special requirements, please observe the notes in the following sections.

8.2.1.1 Setpoint input

Main setpoint

The speed is determined via the setpoint n_{set}(display in C0046), related to the adjustable value n_{max} (C0011). The setpoint is provided in bipolar analog form via the input X6/1,2. When a master voltage of 10 V is applied, the drive rotates with the speed set under C0011. If you want to operate the controller with a lower master voltage, you can adapt the system via the codes C0026/1 (offset) and C0027/1 (gain).
Alternatively, you can also enter the setpoints via

- keypad,
- integrated system bus (CAN),
- automation interface (LECOM, InterBus, Profibus DP, RS 232, RS 485, fiber optics).

Which of these inputs is active as setpoint source, depends on the selected configuration C0005. The setpoint source can also be set under the configuration code C0780 in the NSET function block.

Master current

If the analog main setpoint is to be entered as master current via X6/1,2, you can select the current range under code C0034:

- For -20 mA … +20 mA: C0034 = 2
- For 4 … 20 mA: C0034 = 1 (can only be used unipolar)

If the range 4…20 mA is selected, the error code Sd5 is indicated when the value falls below 2 mA.

For this, the signal is conditioned in function block AIN1.

The change from master voltage to master current (load resistor 242R) must be carried out via the jumper setting at X3:

- Master voltage/potentiometer:
  – Jumper X3 in the bottom position (default setting)
- Master curent:
  – Jumper X3 in the top position

JOG setpoints

If you need fixed settings as a main setpoint, you can retrieve setpoints which you have parameterized via the JOG inputs, from the memory. JOG setpoints replace the main setpoint. Enter the JOG setpoints as relative values in % of n_{max}. If you apply a HIGH signal to input E3, the main setpoint is switched off and the first JOG setpoint is activated at the same time. A maximum of 15 JOG setpoints can be selected.

Invert main setpoint

The main setpoint can be inverted via terminals E1 and E2 (i.e. the sign of the input value is changed. Mandatory:

E1	E2	Main setpoint
0	0	Drive performs QSP (quick stop)
1	0	Main setpoint not inverted
0	1	Main setpoint inverted
1	1	Drive maintains its previous state

Acceleration and deceleration times for the main setpoint channel

The main setpoint is led via a ramp generator. Thus, jumps can be converted into a ramp.
The acceleration time and deceleration time refer to a speed change from 0 to n_{max} (0% to 100%). The calculation of the times T_{ir} (C0012) and T_{if} (C0013) to be set is described in the NSET function block description.

Additional acceleration and deceleration times

For the ramp generator of the main setpoint (NSET-N/JOG setpoint), you can call additional acceleration and deceleration times from the memory via the inputs NSET-TI*x, for instance, to change the acceleration time of the drive as from a defined speed. For this, these inputs must be assigned to a signal source. A maximum of 15 additional acceleration and deceleration times can be programmed.

S-shaped acceleration characteristic

Under C0134, you can select two different characteristics for the ramp generator of the main setpoint:

- linear characteristic for all accelerations requiring a constant acceleration
- S-shaped characteristic for all accelerations requiring a jerk-free acceleration

Code	Parameter	Meaning
C0134	0 1	linear characteristic S-shaped characteristic
C0182	0.01 … 50.0 s	T_i-time for the s-shaped ramp generator
C0012	0.00 … 999.9 s	T_{ir}-time for the acceleration
C0013	0.00 … 999.9 s	T_{if}-time for the deceleration

Additional setpoint

An analog additional setpoint (bipolar) can be added via the input X6/3,4 (or another signal source). The additional setpoint (display in C0049) is led to the NSET function block via an analog switch. The additional setpoint is led via an inversion. This inversion is deactivated. The additional setpoint is then passed to a ramp generator (acceleration and deceleration times via C0220/C0221), and finally added to the main setpoint in the arithmetic block. The additional setpoint can be used e.g. as a correction signal for grinding machines (for the control of a constant circumferential speed when the diameter of the grinding wheel is reduced).

If you want to use the additional setpoint, set code C0190 to the desired arithmetic operation. In the default setting, code C0190 is set to 0. This means that the additional setpoint is switched off.

Input of the direction of rotation

The direction of rotation results from the sign of the speed setpoint at the input MCTRL-N-SET of the function block MCTRL.
The sign of this speed setpoint results from

- the sign of main and additional setpoint,
- the level position at terminals E1 and E2,
- the selected logic operation of main and additional setpoint via the arithmetic block in the NSET function block

Limitation of the speed setpoint

The speed setpoint is always limited to 100% n_{max}(C0011) in the MCTRL function block. This means that the maximum speed in C0011 is always defined as the highest-possible speed.

Example:

A speed of 4500 rpm is to be used in this configuration. The speed is to be corrected in the range from 0 to +10 % via the additional setpoint. A master voltage of 0 to +10 V is available at the inputs X6/1,2 and X6/3,4.

The following parameters are set:

- C0011 = 5000 rpm, C0190 = 1 (addition)
- C0027/1 = 90%
- C0027/2 = 10%

The speed limit can also be influenced by code C0909. Here, you can determine the direction of rotation:

- C0909 = 0 → CW and CCW rotation allowed
- C0909 = 1 → only CW rotation allowed
- C0909 = 2 → only CCW rotation allowed

In plants where only one direction of rotation is permitted, a reversing of the drive caused by the setpoint can be avoided.

Additional torque setpoint

In some applications, it may be necessary to add another torque setpoint. Example: adding acceleration in winding and positioning applications
For this, the input MCTRL-M-ADD is available. In the default setting, this input is not active (FIXED0%). To use this input, an analog signal source must be assigned.

Torque limitation

The torque can be limited via code C0472/3 from 0 to +100%.
Every other signal source can also be assigned.

Feedback of actual speed

In this configuration, all specified actual value encoders can be used. The corresponding actual value encoder can be selected under code C0025. An adjustment is not necessary.

Quick stop (QSP)

When the quick stop function is activated, the drive decelerates along the ramp set under C0105 to zero speed and carries out a holding torque with driftfree standstill. The torque limitation and the additional torque setpoint have no effect. This means that the drive provides the maximum possible torque (observe settings of the motor data). When quick stop is reset, the drive synchronizes to the momentary speed.

Controller inhibit (CINH)

When the controller is inhibited, the drive does not supply a torque and is coasting. When controller inhibit is reset, the drive synchronises to the momentary speed.

Stop the controller via trip (TRIP-SET)

The controller can be stopped via the monitoring function when the LOW signal is applied at terminal X5/E4. This input is mainly used to evalulate external binary encoders.
The reaction on this input signal can be programmed.
(see chapter 9.2.24.4)

Fault reset (TRIP-RESET)

After the cause of fault has been eliminated, a trip can be reset with a LOW-HIGH edge at terminal X5/E5.

8.2.2 Torque control with speed limitation 4000

The drive is set to torque control with the configuration C0005 = 4XXX ”Torque control with speed limitation”. The torque can be provided in both directions.

The speed in the different operating cases is monitored using the n-controllers via a speed limitation.

8.2.2.1 Function

If the actual speed is within its limitation, the drive is torque-controlled. If one of the speed limits (CCW or CW rotation) is reached, the drive becomes speed-controlled.

8.2.2.2 Setpoint input

Torque setpoint

The torque setpoint is entered via the analog terminal X6/3,4. When all motor data are entered correctly, the drive provides 100 % of the possible torque (C0057) in the positive direction (CW) with an input voltage of +10 V (corresponding to 100 % in negative direction (CCW) with -10 V).

If you want to operate the controller with a lower master voltage, you can adapt the system via the codes C0026/2 (offset) and C0027/2 (gain).

Alternatively, you can also enter the setpoints via

- keypad,
- integrated system bus (CAN),
- automation interface (LECOM, InterBus, Profibus DP, RS 232, RS 485, fiber optics).

It depends on the selected configuration C0005, which of these inputs is active as a setpoint source. The signal source can also be set under the configuration C0891 (MCTRL-M-ADD) in the MCTRL function block.

Speed setpoint (speed limits)

The speed limitation is carried out via the n-controllers in the MCTRL function block. The first speed controller (main speed controller) is the upper speed limit and the second speed controller is the lower speed limit.

Example:

The speed can be within a range of ±5000 rpm.

+5000rpm (CW rotation) is the upper limit and -5000 rpm (CCW rotation) is the lower limit. The parameter setting is explained below.

The upper speed limit is provided via the analog terminal X6/1,2. This input can be used as a speed setpoint e.g. in the threading in winding systems, wire-drawing machines, etc.

Please observe:

- The torque cannot exceed the input at terminal X6/3,4.
  The input voltage must be set to 10 V, if necessary.
- The value cannot fall below the lower speed limit (code C0472/4).
- The setpoint speed is conditioned in the same way as for speed control (C0005=1000).

Reference values:

- When a master voltage of +10 V is entered, the setting under C0011 is the upper speed limit (CW rotation).
- If -10 V are provided, C0011 is the upper speed limit in CCW rotation.

The lower speed limit is entered under code C0472/4.

Reference values:

- If -100% are entered, the setting under C0011 is the lower speed limit in CCW rotation.

Quick stop (QSP) and controller inhibit (CINH)

See quick stop (QSP) and controller inhibit (CINH).

TRIP-SET and TRIP-RESET

See TRIP-SET and TRIP-RESET.

8.2.3 Master frequency coupling

8.2.3.1 General system description

The master frequency coupling described here provides a digital setpoint transmission and evaluation path between a setpoint source and one or several controllers. Here, the transmission path can either be used as bus or cascade (see later explanation) for:

- phase-synchronous running
- speed-synchronous running
- speed-ratio synchronism
- Positioning control with driftfree standstill

In each controller the setpoint can be evaluated with a factor and, electrically buffered, be output at the corresponding master frequency output.

The master frequency coupling is a purely digital setpoint transmission with all the advantages involved:

- driftfree
- high-precision
- increased interference immunity

A drive system consists of a master and several slaves. For implementing a master frequency coupling, three configurations are offered:

- master, C0005 = 5XXX (master integrator)
- slave for master frequency bus, C0005 = 6XXX (parallel connection)
- slave for master frequency cascade, C0005 = 7XXX (series connection)

Setpoint conditioning

In the setpoint arm the speed and phase setpoints are processed as absolute values.

Gearbox factors (C0032 and C0033)

The weighting factors C0032 and C0033 are in the setpoint channel of the corresponding drive (slave). Here, a gearbox factor can be set.

Setting range of factors:

- C0032 from -32767 ... +32767
- C0033 from +1 ... +32767

The quotient is limited to a maximum of ±32767.

8.2.3.2 Master configuration

Purpose

The master configuration serves to

- activate the phase control, which is upstream to the speed controller and
- configure the drive as master drive for the master frequency coupling for generating the master frequency for the slave drives.

The phase control improves the control properties of the drive so that a driftfree standstill is achieved for e. g. positioning tasks, hoists etc.

Features

The features describe the basic properties of this configuration. Some of them, however, can only be used after reprogramming.

- Master with the option of signal conditioning as in the configurations C0005 = 1XXX, 4XXX except the setpoint inversion via terminal X5/E1, X5/E2
- Master frequency output signal is setpoint for slave 0 (master drive) and other slaves
- Setpoint evaluation for slave 0 with a factor (numerator/denominator) and gearbox adaptation (numerator/denominator). Can be set via
  – automation interface or system bus
  – motor potentiometer
  – other signal source
- External torque limitation possible by means of reconfiguration
- Emergency stop function for the entire drive system possible by means of reconfiguration (C0005 = 5900)
- Controller enable function causes a reloading of the setpoint integrator with the actual value of slave 0 (setpoint = actual value)
- Possible interventions for phase trimming and speed correction via
  – automation interface or system bus
  – analog terminal
  – one of the signal sources (function blocks)
- Message ”following error limit reached” can be set via code
- TRIP when reaching the phase controller limit
- Speed limit of slave 0 = C0011
- Phase controller influence can be set and switched off via the digital input
- Homing function is possible via zero track or touch probe
- Synchronising to a setpoint is possible via zero track or touch probe
- Synchronising characteristic can be set via ramp-function generator

Master integrator (setpoint generation)

The setpoint path is designed according to the configurations 1XXX and 4XXX, but without inverting the main setpoint via the terminals X5/E1,E2. This means:

- Main setpoint is generated by analogy via terminal X6/1, X6/2
- Additional setpoint is generated by analogy via terminal X6/3, X6/4 (when used, the additional setpoint must be enabled via C0190)

In this configuration, the setpoint selection refers to the frequency at the master frequency output X10.

Tip!

The resulting speed setpoint is output at the master frequency output X10. It is the setpoint in terms of amount and direction of rotation for the following slaves. At the same time it is considered to be the setpoint for slave 0 (included in the master drive), i.e. for the entire drive system.

The master drive consists of the master integrator and the slave 0. Slave 0 is the first drive at the master frequency.

Master frequency output X10

The master frequency output simulates an incremental encoder with two 5 V complementary signals shifted by 90°. The encoder constant (inc/rev.) can be set and scaled in code C0030. Here, the encoder type 2048 inc/rev. is set as standard.

The output frequency is determined by the speed set in C0011 (n_{max}) and the encoder constant.

Example:

C0011 = 5000 rpm, C0030 = 4 → 4096 inc/rev. setpoint = 100 %

The output frequency is 341.3 kHz (5000/60s × 4096).

With higher speeds, e. g. 8000 rpm in this setting, the output frequency is 564.1 kHz. In this case, the maximum possible output frequency of 500 kHz would be exceeded. Hence, an encoder constant with a smaller number of increments must be selected.

Tip!

In principle, the highest possible frequencies should be selected since the 400 kHz range provides the best resolution.

Setpoint conditioning

All settings that follow only refer to this drive, not to the entire drive system.

The setpoint is controlled via the function block DFSET. With this, essential adaptations to the drive tasks can be done.

The setpoint is evaluated with a factor (numerator/denominator). With this, the ratio can be set with which the drive is to run to its setpoint. For changing the direction of rotation of the drive, negative values can be set here.

The denominator is preset via code C0533. The numerator in this setting is selected via the free control code C0473/1, but can also be selected by every analog source by reprogramming (reconfiguring).

Another possible adaptation can be done via the gearbox factor (numerator/denominator). With this, the gearbox ratio of the drive can be set. The denominator is selected via C0033. The numerator is selected in this configuration via the free control code C0032, but can be selected by every analog source by reprogramming (reconfiguring).

Speed trimming (additional speed setpoint)

An additional setpoint can be added to the speed setpoint via the control code C0472/5. This serves to accelerate or decelerate the drive. The input is done in % of n_{max}. Here, however, every analog source can be used as signal source.

Purpose:

e. g. input for correction values

Phase trimming

Via the control code C0473/3 an additional setpoint can be added to the phase setpoint. This serves to move the rotor position forwards or backwards compared to the setpoint (leading or lagging). The input is done in increments. One revolution is split up into 65535 increments. The phase trimming can take place in the range ± 32767 (i.e. ± 1/2 revolution). Via C0529 a multiplicator can be set, which serves to expand the setting range.

Example: Phase trimming = DFSET_A_TRIM * C0529

Here, every analog source can also be used as signal source.

100 % correspond to 1/4 revolution = 16383 inc.

Purpose:

e. g. input for correction values

Phase offset

Via C0252 a fixed phase offset can be added to the setpoint of the drive. This can be set in the range ±245760000 inc.

Reference:

see phase trimming

Phase adjustment

In some applications it is necessary that the phase leads or lags with increasing speed. For this, an adjustment of ±1/2 revolution can be entered under C0253. The phase adjustment set is reached at 15000 rpm (linear connection).

QSP at the master

If QSP is set at the master drive, the setpoint (C0050) for all drives is decelerated along the QSP ramp. The complete drive system can thus be stopped, led by the QSP integrator. If QSP is cancelled before the drives come to a standstill, the drive system starts to decelerate or accelerate with the value in C0050 to the speed setpoint at the setpoint integrator.

Unlike the configuration 5900, the phase synchronism between master and slave gets lost in the configuration 5000.

QSP at the slave 0 (master drive)

If the deceleration ramp is very short and can only be reached with I_{max}, the phase synchronism gets lost. A driftfree standstill is obtained. Switching QSP is a continuous operation for the downstream slaves so that a reversal is possible if the deceleration ramp set at the master is too short for one of the slave drives (e. g. to high centrifugal mass for the set deceleration ramp).

CINH at the master

If the master drive is inhibited, the actual value of slave 0 is used as setpoint for the other slaves. This could bring the entire drive system to a standstill led by the coasting slave 0. If the master is re-enabled before reaching the standstill, the drive system starts to accelerate with the actual speed.

When setting CINH, the phase difference is set to zero.

8.2.3.3 Slave for master frequency bus

Purpose

The configuration C0005 = 6XXX for the setpoint bus serves to

- activate the phase control, which is upstream to the speed controller
- change the setpoint signal path to master frequency coupling for phase or speed-synchronous operation

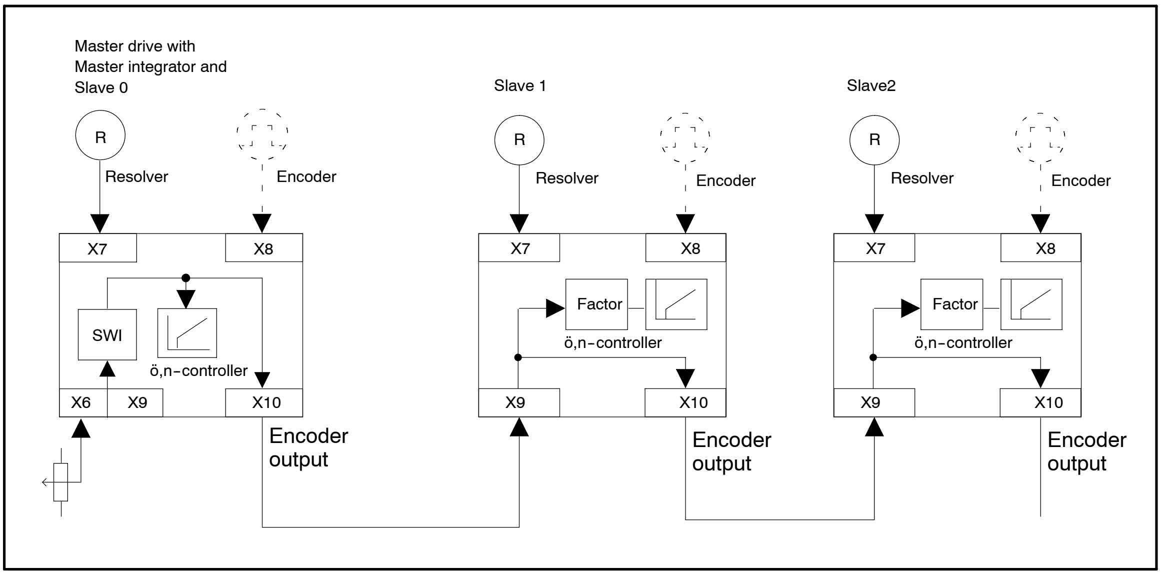


Fig. 8-1 Slave for master frequency bus

Features

The features describe the basic properties of this configuration. Some of them, however, can only be used by reprogramming.

- Hardware connection of the master frequency input with the master frequency output (so that any number of drives can be connected in series)
- Setpoint evaluation with a factor (numerator/denominator) for the corresponding slave (gearbox adaptation). Can be set via an analog signal source:

  – Terminal,
  – code or
  – function block.
- external torque limitation is possible
- QSP function for the individual drive. The setpoint is continued to be output.
- CINH function for the individual drive. The setpoint is continued to be output to the master frequency output.
- Possible interventions for phase trimming and speed correction via
  – LECOM
  – analog terminal
  – one of the signal sources (function blocks)
- Message ”following error limit reached” can be set via code
- TRIP when reaching the phase controller limit
- Speed limit of slave 0 = C0011
- Phase controller influence can be set and switched off via the digital input
- Homing function is possible via zero track or touch probe
- Synchronising to a setpoint is possible via zero track or touch probe
- Synchronising characteristic can be set via ramp-function generator

Cascading factor (C0473/1 and C0533)

This function is valid only if the configuration is not changed.

The following constants for the master frequency input (X9) can be set under C0425:

- 16384 inc/rev.
- 8192 inc/rev.
- 4096 inc/rev.
- 2048 inc/rev.
- 1024 inc/rev.
- 512 inc/rev.
- 256 inc/rev.

Cascading factors which cannot be raised to the power of two can be assigned via C0473/1 and C0533. The following connection applies:

$$\frac{\text{C0425}}{\text{Geberkonstante}} = \frac{\text{C0473/1}}{\text{C0533}}$$

The quotient is limited to a maximum of ±32767.

Setting range of factors:

- C0473/1: -32767 ... +32767
- C0533: +1 ... +32767

Setpoint conditioning of the slave

The value read by the input Dig.-Set (X9) is the setpoint (speed and phase) for the internal control.

Differences compared to the speed control:

- No setpoint integrator in the setpoint channel
- Change to the JOG value is not possible
- The additional setpoint is not active
- The CW/CCW changeover must be performed via the sign of the gearbox factor

QSP at the slave

If you set QSP at the slave drive, the setpoint (C0050) is decelerated along the QSP ramp. Home positions get lost. A driftfree standstill is obtained since the set phase is led by the QSP integrator when switching QSP.

CINH at the slave

If a slave drive is inhibited, the motor is coasting at the friction torque. The master frequency output, however, continues to output the setpoint for the following slave. If the slave is enabled again, the drive accelerates to its setpoint. (possibly at the current limit). When CINH is set, the phase integrators are set to zero. Home positions get lost.

Exception:

If pulse inhibit (IMP) is released due to short-term mains undervoltage (< 500 ms), the phase integrators are not reset. After mains recovery, the drive is able to follow its setpoint again. A phase difference which emerged before is balanced.

8.2.3.4 Slave for master frequency cascade

Purpose

The configuration C0005 = 7XXX for the setpoint cascade serves to

- activate the phase control, which is upstream to the speed controller
- change the setpoint signal path to master frequency coupling for speed ratio synchronism

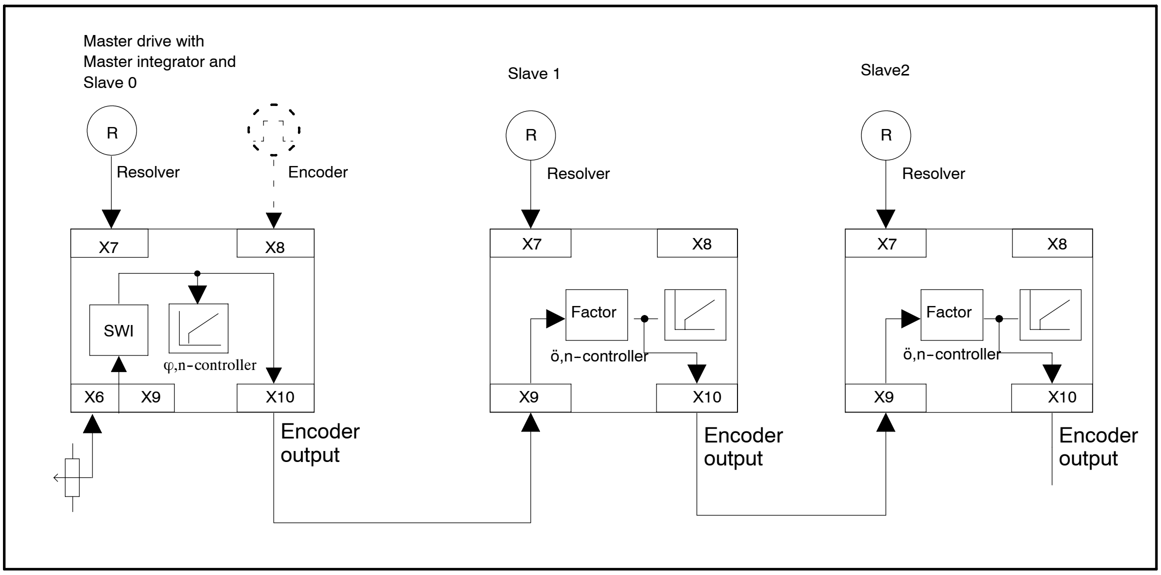


Fig. 8-2 Slave for master frequency cascade

Features

The features describe the basic properties of this configuration. Some of them, however, can only be used by reprogramming.

- **Resolver feedback is possible only**
- Evaluation of the setpoint (cascading factor) is possible with a factor (numerator/denominator) for the master frequency output (and thus for all following drives)
- Other evaluation of the setpoint is possible with a factor (numerator/denominator) for the corresponding slave (gearbox adaptation). Can be set via an analog signal source (standard: code C0032, C0033)
- External torque limitation is possible
- The QSP or CINH function in the individual drive do not influence the setpoint for the cascade.
- Possible interventions for phase trimming and speed correction via
  – LECOM,
  – analog terminal or
  – one of the signal sources (function blocks).
- Message ”following error limit reached” can be set via code
- TRIP when reaching the phase controller limit
- Speed limit of slave 0 = C0011
- Phase controller influence can be set and switched off via the digital input
- Homing function is possible via zero track or touch probe
- Synchronising to a setpoint is possible via zero track or touch probe
- Synchronising characteristic can be set via ramp-function generator

Cascading factor (C0473/1 and C0533)

This function is valid only if the configuration is not changed.

The following constants for the master frequency input (X9) can be set under C0425:

- 16384 inc/rev.
- 8192 inc/rev.
- 4096 inc/rev.
- 2048 inc/rev.
- 1024 inc/rev.
- 512 inc/rev.
- 256 inc/rev.

Cascading factors which cannot be raised to the power of two can be assigned via C0473/1 and C0533. The following connection applies:

The quotient is limited to a maximum of ±32767.

Setting range of factors:

- C0473/1: -32767 ... +32767
- C0533: +1 ... +32767

Setpoint conditioning of the slave

The value read from X9, evaluated with C0425, C0473/1 and C0533, is the setpoint (speed and phase) for the internal control and also the output value at the master frequency output X10.

The setpoint for the corresponding drive can be evaluated via the gearbox factor C0032 and C0033.

The direction of rotation of the corresponding slave can be set via the evaluation factors.

Differences compared to the speed control:

- As standard, there is no setpoint path in the setpoint integrator
- Change to the JOG value is not possible
- The additional setpoint is not active

Feedback system (X7)

Only the resolver can be selected as feedback system.

QSP at the slave

If you set QSP at the slave drive, the setpoint (C0050) is decelerated along the QSP ramp. Home positions get lost. A driftfree standstill is obtained since the set phase is led by the QSP integrator when switching QSP.

If the deceleration ramp is very short and can only be obtained with I_{max}, the phase synchronism gets lost (e.g. too high centrifugal mass for the set deceleration ramp).

The setpoint for the following slave(s) is continued to be output at the master frequency output.

CINH at the slave

If a slave drive is inhibited, the motor is coasting at the friction torque. The master frequency output, however, continues to output the setpoint for the following slave. If the slave is enabled again, the drive accelerates to its setpoint (possibly at the current limit):

The phase difference is set to zero when switching CINH. Home positions get lost.

Exception:

If controller inhibit is released due to short-term mains undervoltage (< 500 ms), the phase difference is not reset. After mains recovery, the drive can follow again its set phase. A phase difference which emerged before is balanced. The setpoint for the slave(s) is continued to be output at the master frequency output.

8.2.4 Speed synchronism

8.2.4.1 How to select the correct configuration

The following slave configurations can be selected for the speed synchronism with the master configuration C0005 = 5XXX:

- Slave for setpoint bus C0005 = 6XXX;
  for only two drives or fixed speed relationships which must be set only once (commissioning)
- Slave for setpoint cascade C0005 = 7XXX;
  for more than two drives or simple change of the speed relationship with stretching factors in the running process

A correction value for the speed synchronism can be changed and displayed via the input DFSET-N-TRIM in the DFSET function block.

The input can be changed by reconfiguration via:

- analog terminal
- motor potentiometer
- keypad
- automation interface or system bus

The correction value is provided in % of C0011 (n_{max}).

Deactivate the phase controller for the speed synchronism. This means that the phase-synchronous running becomes a speed-synchronous running, which results in adding phase errors between the drives. The phase controller can be deactivated by setting code C0254 to zero.

8.2.4.2 Speed-synchronous running

Purpose

For material transports with very low stretching coefficients, such as paper, metal, etc., the tension can be set via the gearbox factor C0032/C0033 by oversynchonism in the ‰ range. A specified tension thus results from the stretching coefficient of the material. For a better operation and higher accuracy in the digital frequency coupling, we recommend the digital frequency cascade C0005 = 7XXX.

8.2.4.3 Speed ratio synchronism

Purpose

- Stretching systems
- Wire-drawing plants

Example

Extruder system with stretching of plastic threads by a speed ratio synchronism. The stretching is performed online during the process via a motor potentiometer function.

8.2.5 Phase synchronism

Purpose

- Drive concept for positive movements (e.g. packing of bottles on conveyor belts)
- Electrical shaft (e.g. vertical shaft, printing machines with embossing or printing rolls depending on the format).

Conditions

Configuration C0005 = 6XXX or 7XXX.

In the configurations C0005 = 5XXX the specifications only apply to the slave 0.

Phase synchronous operation

When the phase controller is active, every controller can perform phase-synchronous, driftfree phase synchronism. Since in the master frequency cascade the setpoint of the second slave is conditioned in the first slave and both systems are not synchronous, a fixed phase offset develops which, however, does not add up over time.

8.2.5.1 Phase controller

Phase controller adaptation

A value at MCTRL-P-ADAPT affects the gain set in C0254.

Special features

The difference between setpoint and actual phase is supplied to the phase controller. With reference to the phase it is designed as P controller. Its influence can be set via C0254. C0254 = 0 means the complete disconnection of the phase controller from the control system.

Setting range of C0254 = 0.0001 ... 3.9999; C0254=1.00 and 16384 INC control difference (1/4 revolution) correspond to a speed change of n_{max}.

The output of the phase controller can be limited via C0472/6. The limitation can also be connected with another analog signal source.

Phase controller limit

The phase controller limit is fixed to a phase difference of 65531 revolutions. If this phase difference is exceeded, the phase controller cannot balance the setpoint anymore. When reaching the phase controller limit, a TRIP P13 is generated. The error message can be evaluated according to its priority.

Tip!

When reaching the phase controller limit and monitoring is switched off, the sign at the phase controller output may reverse.When setting CINH, the phase difference is set to zero.

8.2.5.2 Phase trimming

The phase trimming can be changed via C0473/3. It is displayed via C0536/3. Phase trimming can also be carried out via another analog signal source:

- Analog output of a function block
- Motor potentiometer
- Analog terminal
- Keyboard
- Automation interface or system bus

The input of the phase trimming can be multiplied in C0529.

This serves to change the rotor position by up to 20000 revolutions:

- Negative values = CCW offset
- Positive values = CW offset

Resolution: 65536 INC/rev.. = 1 rev. * C0529

8.2.5.3 Following error limit

The following error limit can be set in absolute values in increments via C0255. The setting range is: 0 … $1.8*10^9$ increments.

When reaching the following error limit a signal is generated which is evaluated via "Monitoring". This signal can be evaluated with the priority (TRIP, MESSAGE or WARNING) required by the user.

When setting CINH, the phase difference is set to zero. Thus, neither the signal "following error limit" is generated any longer.

8.2.5.4 Processing of the zero pulse (flying synchronising)

If the zero pulses are not used for the master frequency processing, a phase synchronism with a constant phase offset is achieved.

Initial situation

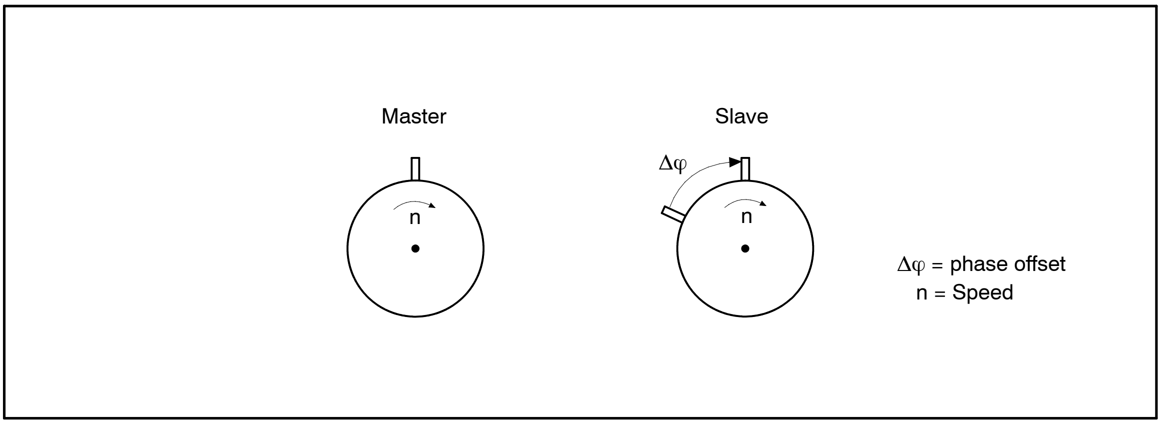


Fig. 8-3 Initial situation when processing the zero pulse ($\Delta\varphi \neq 0$)

If this phase offset is to be corrected to 0, either

- homing is required or
- the zero pulses of the master frequency input and the feedback system are to be processed.

Target situation

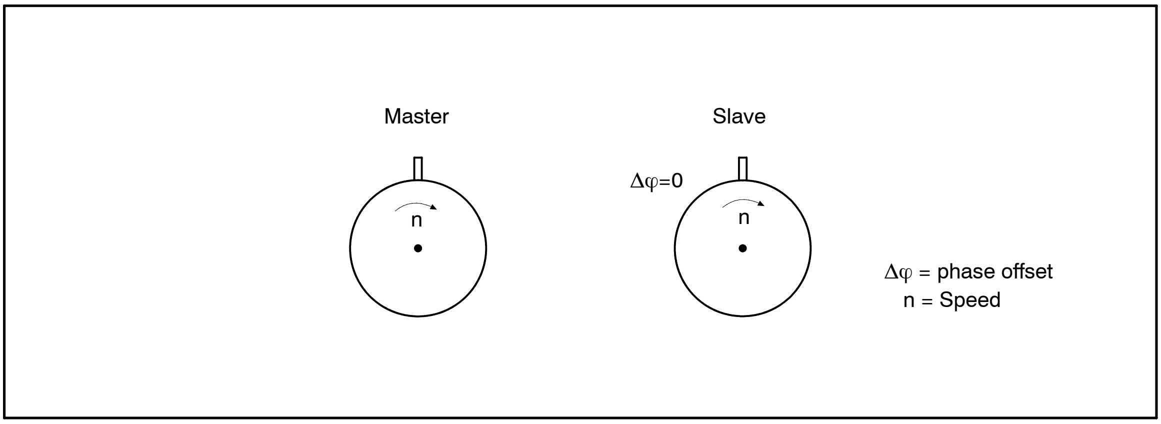


Fig. 8-4 Target situation when processing the zero pulse ($\Delta\varphi = 0$)

Conditions for reaching the target situation:

- The function must be activated via code C0534 (function block DFSET)
- The input DFSET-0-PULSE must be triggered with a HIGH signal when the zero pulse is evaluated once (function block DFSET)
- The phase control must be activated (function block MCTRL)
- The zero pulses must be connected to the SubD connectors X9 and X8 (X8 when using an encoder)

Zero pulse at the setpoint

The set rotor position is specified via the setpoint zero pulse (i.e. when the drive system is running). It is only synchronised if one setpoint zero pulse and actual zero pulse have occurred before, i.e. not before the second zero pulse.

Control mode:

The phase offset is compensated via acceleration or deceleration. The direction (acceleration or deceleration) depends on the detected phase offset. If the rotor is leading in the range from 0° to 180°, the drive is synchronised by deceleration. If the rotor is lagging in the range from 0° to 180°, the drive is synchronised by acceleration.

Different modes of the zero pulse synchronisation

The different modes of the zero pulse synchronisation can be selected via the subcodes of C0534.

The following table assigns the corresponding mode of the zero pulse synchronisation to the subcodes:

Selection of C0534	**Mode of the zero pulse synchronisation**
1	permanent zero pulse synchronisation as described under "zero pulse in case of the setpoint" (see page 8-26)
2	as in selection 1; but DFSET-0-PULSE must be triggered with HIGH signal
10	one-time zero pulse synchronisation; control mode as described under "zero pulse in case of the setpoint" (see page 8-26)
11	one-time zero pulse synchronisation; the drive is always synchronised by clockwise rotation
12	one-time zero pulse synchronisation; the drive is always synchronised by counter-clockwise rotation
13	one-time evaluation of the setpoint and actual zero pulse; the synchronisation is not defined

Use of TOUCH-PROBE

Besides the zero pulses of the inputs X9 and the corresponding feedback system, the zero pulse evaluation can also be derived from the digital inputs X5/E4 (actual value) and X5/E5 (setpoint). The function is switched from zero pulse evaluation of the encoder (or resolver) to the evaluation of the inputs X5/E4 and X5/E5 by C0532 = 2.

IMPORTANT:

The inputs X5/E4 and X5/E5 are assigned with TRIP-Set or TRIP-Reset as standard. In this case, the input terminals must be removed from the function block DCTRL (drive control).

Use of zero pulse for the setpoint and TOUCH-PROBE for the actual value

The zero pulses can also be evaluated via a zero pulse at setpoint input X9 and a TOUCH-PROBE input X5/E4 (actual value). The function is switched on with C0532 = 3.

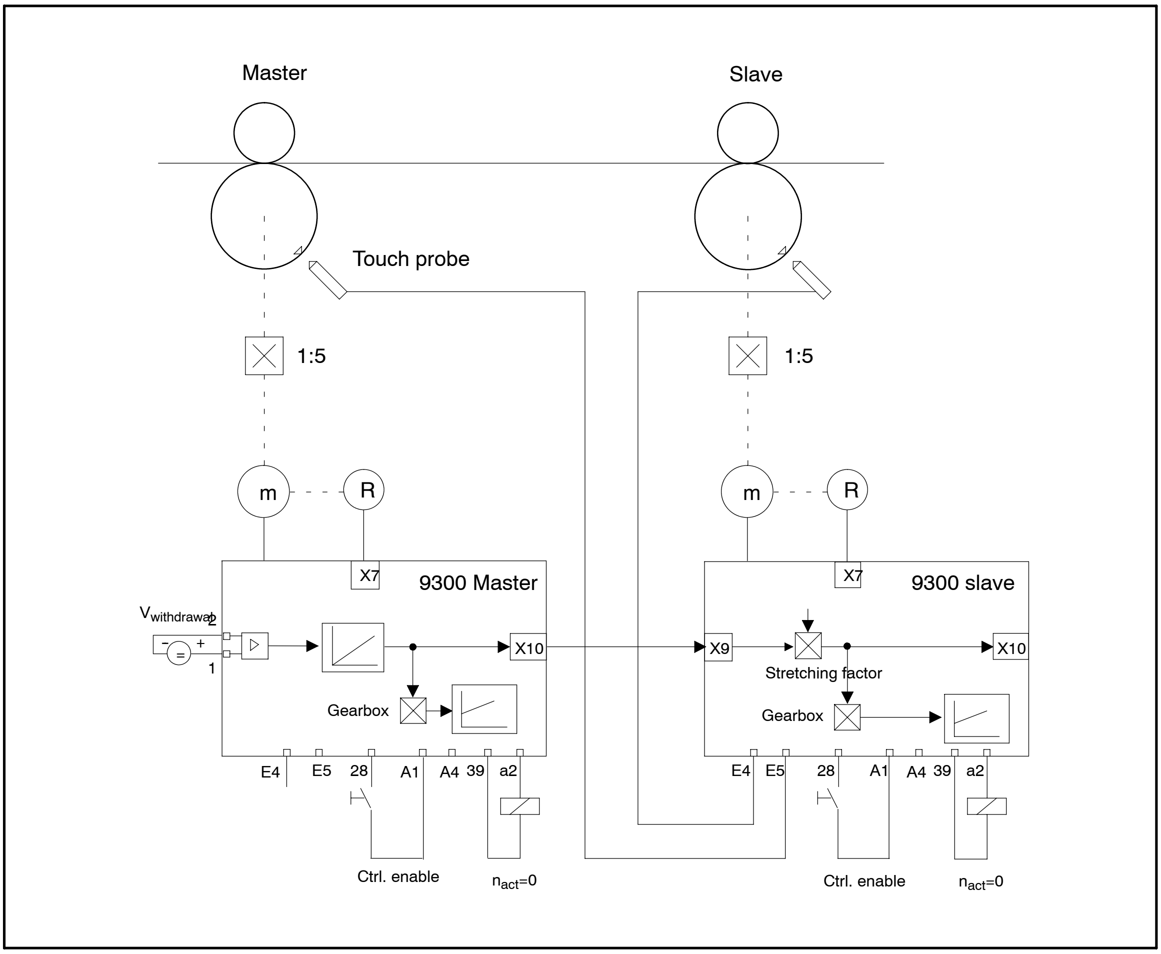


Fig. 8-5 Example for using TOUCH-PROBE

8.2.5.5 Referencing

The homing function is available with the configurations 5XXX, 6XXX and 7XXX.. The drive shaft can be positioned via the homing function. For this purpose, the drive is disconnected from the setpoint path and follows the profile generator.

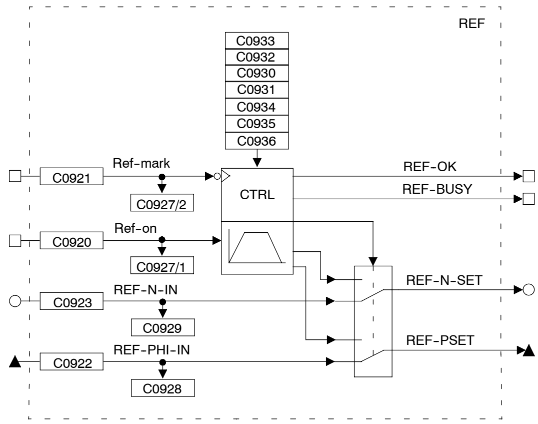


Fig. 8-6 Homing function block (REF)

Homing is started via a rising edge at the digital input ”REF-ON” (default setting is assigned to terminal X5/E3); this input must be applied until the end of the homing process.

After the negative edge has occurred at the input REF-MARK (default setting is assigned to terminal X5/E2), it is positioned to the home position. This input is intended for a reference switch. The speed travel profile is created via a profile generator which is integrated in the REF function block. Via this, the acceleration and deceleration times as well as the speed during the homing process can also be set.

The home position is defined as follows:

Next zero pulse after the negative edge of the reference switch plus the home position offset (C09334).

If the position feedback is done via a resolver, the zero position applies instead of the zero pulse (depending on the resolver connection to the motor). If referencing via touch probe, the touch probe angle applies.

The output signal ”REF-BUSY” indicates with HIGH signal, whether the homing function is active.

The output signal ”REF-OK” indicates with HIGH signal that homing is completed successfully. This signal can be scanned via the output terminal X5/A4.

The setpoint outputs for position and speed of the REF function block are connected with the corresponding setpoint inputs of the function block MCTRL (see signal flow diagram for the configurations 5XXX, 6XXX and 7XXX). If the homing function is active (input REF-ON = HIGH), the drive is disconnected from the setpoint path. The drive then follows the profile generator.

During the homing process the input DFSET-SET of the master frequency processing is active. This is done through the output REF-BUSY of the REF function block. After the homing process is completed, REF-BUSY=LOW is switched back to master frequency without jerk.

A renewed homing process requires an edge at the input REF-ON.

8.2.5.6 Homing modes

Mode 0

Homing with zero pulse/zero position.

Travel in clockwise rotation to the home position. The home position lies at the next zero pulse/zero position after the negative edge of the reference switch REF-MARK plus the home position offset.

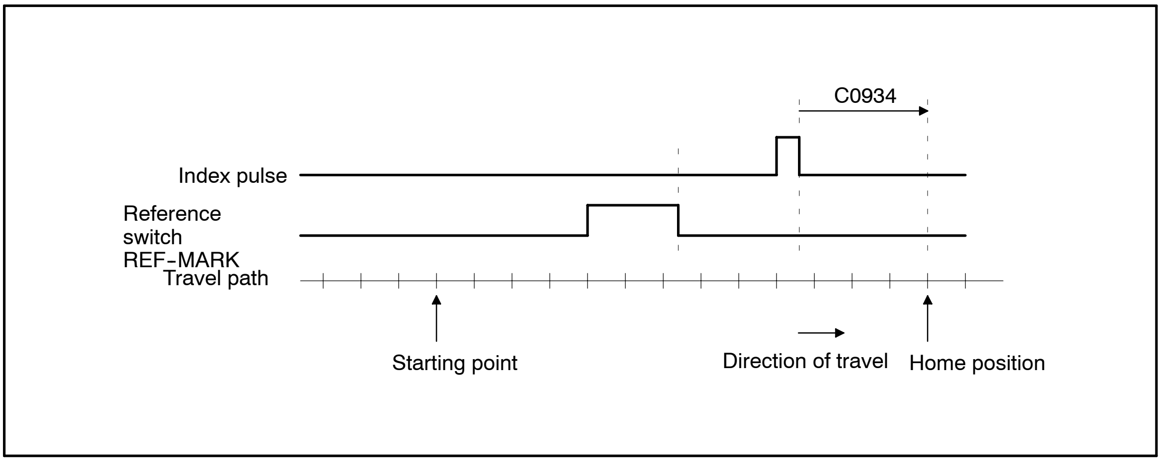


Fig. 8-7 Referencing with zero pulse/zero position; approaching the home position with clockwise rotation

Mode 1

Homing with zero pulse/zero position.

Travel in counter-clockwise rotation to the home position. The home position lies at the next zero pulse/zero position after the negative edge of the reference switch REF-MARK plus the home position offset (C0934).

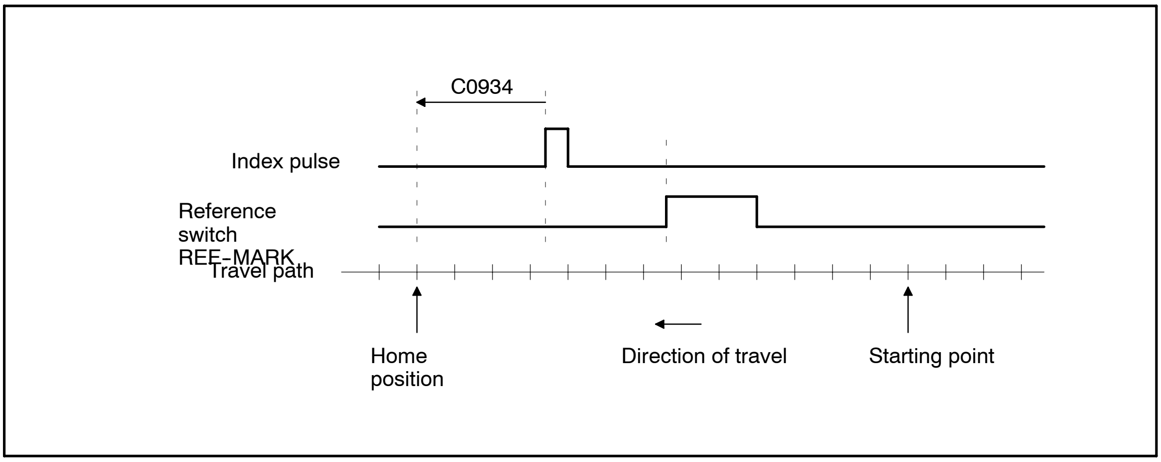


Fig. 8-8 Referencing with zero pulse/zero position; approaching the home position with counter-clockwise rotation

Mode 2…5

Mode 2 to mode 5 are reserved.

Mode 6

Referencing with touch probe.

Travel in clockwise rotation to the home position. The home position lies at the touch probe signal after the negative edge of the reference switch REF-MARK plus the home position offset (C0934).

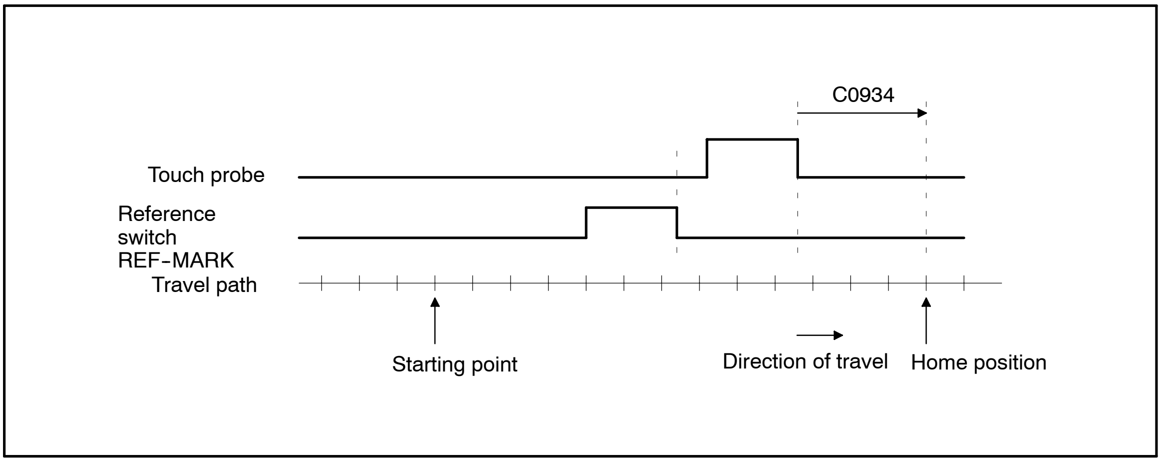


Fig. 8-9 Referencing with touch probe; approaching the home position with clockwise rotation

Mode 7

Referencing with touch probe.

Travel in counter-clockwise rotation to the home position. The home position lies at the TP signal after the negative edge of the reference switch plus the home position offset.

Mode 8

Referencing with touch probe.

Travel in clockwise rotation to the home position. The home position lies at the next TP signal plus the home position offset.

Mode 9

Referencing with touch probe.

Travel in counter-clockwise rotation to the home position. The home position lies at the next touch probe signal plus the home position offset.

Note concerning mode 6 to mode 9

The edge of the zero pulse or touch probe signal (LOW → HIGH or HIGH → LOW) for specifying the home position can be selected under code C0933.

8.2.5.7 Profile generator

The speed travel profile for homing is generated via a profile generator. During the homing process the target can be changed.

The profile generator generates a speed travel profile with linear ramps.

The following parameters must be entered:

Code	Meaning	Input
C0930	Gearbox ratio - numerator	1 … 65535 Numerator of the gearbox ratio between motor and position encoder (motor side)
C0931	Gearbox ratio - denominator	1 … 65535 Denominator of the gearbox ratio between motor and position encoder (encoder side)
C0934	Home position offset	-2,140,000,000 … +2,140,000,000 (incr.) Distance between zero pulse or touch probe and the home position during the homing process
C0935	Homing speed	0.0001 … 100.0000 (% n_{max}) Motor speed during the homing process
C0936	Homing T_i time	0.01 … 990.00 (sec) Acceleration and deceleration time during the homing process. Reference: 0 to n_{max}, or n_{max} to 0

The travel profile for homing is determined by entering a percentage speed and an integration time (T_i) for the ramps. The home position offset is directly entered in increments of the encoder system. (In this way, complex conversions and the entry of e. g. the feed constant can be avoided)

The home position can be approached in three ways:

- Case 1: High home position offset
- Case 2: Home position offset = 0; the zero pulse has not yet occurred during the homing process
- Case 3: Home position offset = 0; the zero pulse has occurred once during the homing process

High home position offset (case 1)

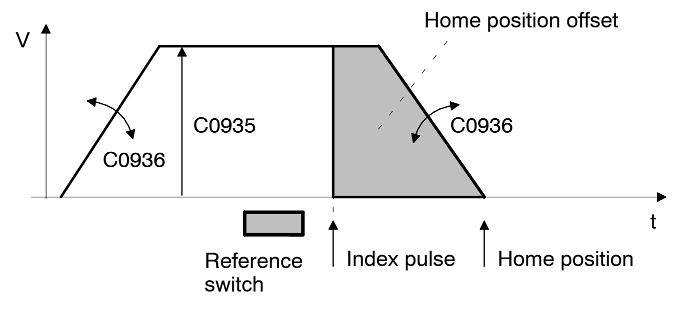


Fig. 8-10 Approaching the home position (case 1)

Home position offset = 0 (case 2)

The zero pulse has not yet occurred during the homing process (e.g. in case of incremental encoders, the position is only determined after one revolution):

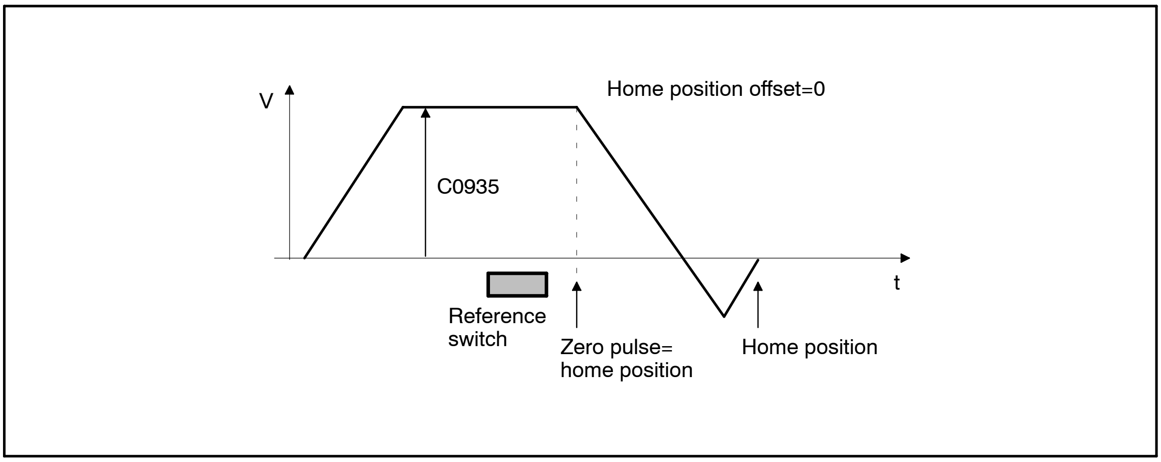


Fig. 8-11 Approaching the home position (case 2)

If the parameter setting or the position of the reference switch have been selected unfavourably, the drive is unable to directly approach the home position due to a too high moment of inertia. This means that the drive travels beyond the home position and then back again.

Reversing during the homing process can be prevented by setting the home position offset so that the path is long enough to decelerate into standstill. The reference switch and the subsequent zero pulse must be brought forward accordingly.

Home position offset = 0 (case 3)

The zero pulse has already occurred once during the homing process.

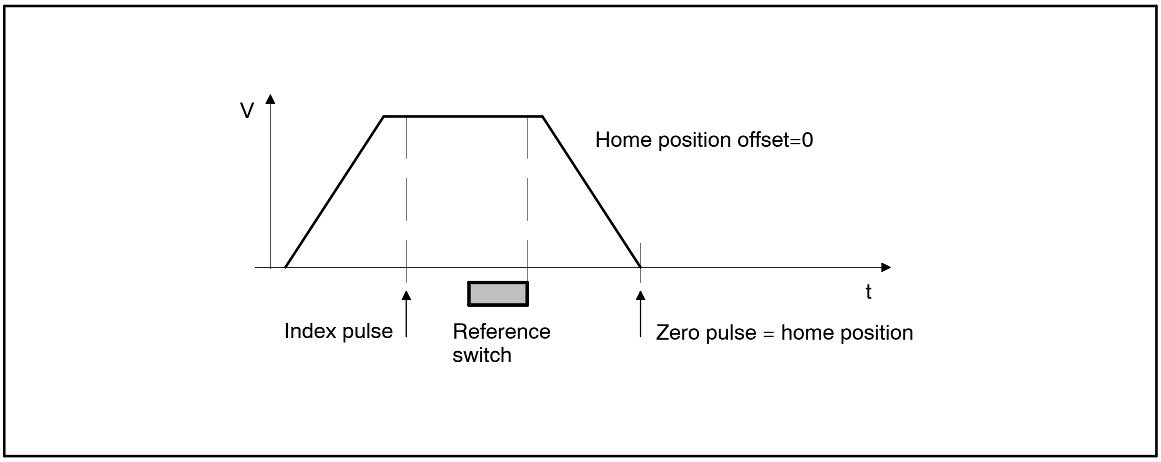
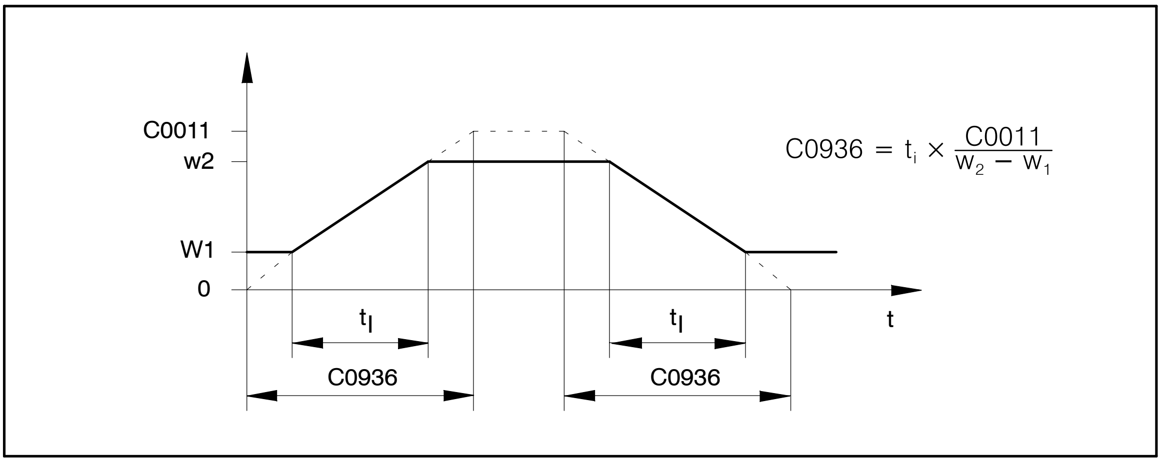


Fig. 8-12 Approaching the home position (case 3)

If the zero pulse has already occurred once or the absolute value encoder (e.g. resolver) is used as actual value encoder, the drive traverses as described in Fig. 8-12 Approaching ... via the set ramp to its home position.

Acceleration and deceleration time

The deceleration and acceleration time refers to a change of the output value from 0 to 100% (C0011). The time C0936 to be set can be calculated as follows:



$$C0936 = t_i \times \frac{C0011}{w_2 - w_1}$$

Fig. 8-13 Calculation of the acceleration and deceleration time

In this case the time desired for the change lies between w_1 and w_2.

The calculated time is to be entered into C0936.

8.3 Operating modes

By selecting the operating mode, the interface you want to use for parameter setting or control of the controller can be determined.

C0005 contains predefined configurations which allow a very easy change of the operating mode.

8.3.1 Parameter setting

Parameters can be set with one of the following modules:

- Communication module
  – 2102 (LECOM A/B/LI)
  – 2111, 2113 (INTERBUS)
  – 2131, 2133 (PROFIBUS)
  – 2175 (CANopen/DeviceNet)
- PC system bus module (CAN)
  – 2173

8.3.2 Control

The drive controller can be controlled via terminals (X5 and X6), via the fieldbus module at X1 or via the system bus (X4). Mixed forms are also possible.

Example: C0005 = 1005

This configuration corresponds to a speed control with control via system bus (CAN).

If more inputs of the function blocks are to be controlled via an interface, proceed as follows:

- Assign the function block inputs to be controlled to ”control objects” depending on the interface used (see System Manual):
  – Free control codes
  in case of control via LECOM A/B/LI (RS232, RS485 or optical fibre interface) or operating module.
  – AIF objects
  in case of control using InterBus S or Profibus DP.
  – CAN objects
  in case of control using system bus.
- Then the inputs can be controlled using these codes or input objects by accessing them via the interface.

Example for a distribution of the control on terminals and RS232:

The main speed setpoint in the configuration C0005=1000 is to be controlled via LECOM A/B/LI. All other inputs remain on terminal control.

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 a selection number.
   – e.g. 19515 (control code C0141)

The main speed setpoint is now controlled by C0141.

8.4 Change of the terminal assignment

(see also chapter 9.1 "Working with function blocks")

If the configuration is changed via C0005, the assignment of all inputs and outputs is overwritten with the corresponding basic assignment. If necessary, the function assignment must be adapted to the wiring.

Tip!

Use the menu "Terminal I/O" for the keypad 9371BB or the menu "Terminal I/O" for Global Drive Control or LEMOC2.

Stop!

If you reassign an input, the signal source that has been assigned up to know will **not** be overwritten! Those active connections that are not required must be removed (see chapter 9.1.3).

8.4.1 Freely assignable digital inputs

Five freely assignable digital inputs are available (X5/E1 … X5/E5). You can define a polarity for each input which serves to determine the input to be HIGH active or LOW active.

Change assignment:

Tip!

Use the submenu "DIGIN" for the keypad 9371BB or the submenu "Digital inputs" for Global Drive Control or LEMOC2.

Example:
Menu ”Terminal I/O; DIGIN” (terminal I/O; digital inputs)

Here are the most important aims for digital inputs

Valid for the basic configuration C0005 = 1000.

Code			controlled by			Note
CFG	Subcode	Signal name	Signal (interface)		Selection list 2	
C0885	000	R/L/Q-R	DIGIN1	(Term. X5/E1)	0051	HIGH = do not invert main setpoint (CW rotation)
C0886	000	R/L/Q-L	DIGIN2	(Term. X5/E2)	0052	HIGH = Invert main setpoint (CCW rotation)
C0787	001	NSET-JOG*1	DIGIN3	(Term. X5/E3)	0053	HIGH = Main setpoint is substituted by the fixed speed from C0039/x The signals are binary coded.
	002	NSET-JOG*2	FIXED0	-	1000	
	003	NSET-JOG*4	FIXED0	-	1000	
	004	NSET-JOG*8	FIXED0	-	1000	
C0788	001	NSET-TI*1	FIXED0	-	1000	Additional acceleration and deceleration times from C0101/x and C0103/x The signals are binary coded.
	002	NSET-TI*2	FIXED0	-	1000	
	003	NSET-TI*4	FIXED0	-	1000	
	004	NSET-TI*8	FIXED0	-	1000	
C0880	001	DCTRL-PAR*1	FIXED0	-	1000	Parameter set selection: The signals are binary coded.
	002	DCTRL-PAR*2	FIXED0	-	1000	
C0881	000	DCTRL-PAR-LOAD	FIXED0	-	1000	Signal LOW-HIGH loads selected parameter set with DCTRL-PAR*x
C0871	000	DCTRL-TRIP-SET	DIGIN4	(Term. X5/E4)	0054	LOW = Controller sets TRIP (EEr)
C0876	-	DCTRL-TRIP-RES	DIGIN5	(Term. X5/E5)	0055	Signal LOW-HIGH = Resets active trip
C0920	000	REF-ON	FIXED0	-	1000	HIGH = Start homing
C0921	000	REF-MARK	FIXED0	-	1000	LOW-HIGH edge = Stop homing

1. Select the input of the function blocks which is to be assigned to a new source under the configuration code CFG in the code level.
   – Example:
   C0787/2 (CFG/subcode) determines the source for the input ”NSET-JOG*2” (signal name) in the function block ”Speed setpoint conditioning” (NSET).
2. Change to the parameter level with PRG. Select the source (signal) from the indicated list. Ask yourself: Where does the signal for controlling this input is to come from?
   – Example:
   ”NSET-JOG*2” is to be controlled by terminal X5/E5 (interface).
   – For this, select DIGIN5 (signal) and confirm with SHIFT + PRG.
3. Change to the code level with 2 * .
4. Determine the polarity of the input terminals X5/E1 to X5/E5 (HIGH active or LOW active) under code C0114 and subcode.
   – In the code level the terminal is selected via subcode.
   – Change to the parameter level using PRG and select the polarity.
   – Change to the code level by 2 * PRG.
5. Repeat steps 1. to 4. until all inputs required are assigned.
6. Remove undesired connections (see chapter 9.1.3). The connection so far of the terminal X5/E5 is not cancelled automatically. If the connection is to be cancelled:
   – Select C0876 in the code level (previous target of terminal X5/E5)
   – Change to the parameter level using PRG.
   – Select FIXED0 (signal) and acknowledge with SHIFT+PRG.

8.4.2 Freely assignable digital outputs

Four freely assignable digital outputs are available (X5/A1 … X5/A4). You can define a polarity for each input which serves to determine the input to be HIGH active or LOW active.

The most important codes can be found in the submenu: DIGOUT (digital outputs).

Change assignment:

1. Select the output which is to be assigned to another function via the subcode under C0117.
2. Change to the parameter level with PRG. Select the signal from the indicated list, which is to be output via the selected output terminal. Change to the code level with PRG.
3. Determine the polarity (HIGH active or LOW active) via the subcode of the output under C0118.
4. Repeat step 1. to 3., until all outputs desired are assigned.

8.4.3 Freely assignable analog inputs

The most important codes can be found in the submenu: AIN1 X6.1/2 or AIN2 X6.3/4 (analog input 1 (X6.1/2) or analog input 2 (X6.3/4))

Change assignment:

1. Select the input of the function block to be assigned to a new source in the code level.
   – Example
     Determine the source for the input "Main setpoint" (NSET-N) in the function block "Speed setpoint conditioning" (NSET) under C0780.
2. Change to the parameter level with PRG. Select the signal from the indicated list, which is to be used for the selected input.
3. Repeat steps 1. and 2. until all inputs required are assigned.
4. Remove unwanted links (see Chapter 9.1.3).

8.4.4 Freely assignable monitor outputs

Use the monitor outputs X6/62 and X6/63 to output internal signals as voltage signals.

Under C0108 and C0109 the outputs can be adapted to e.g. a measuring device or a slave drive.

The most important codes can be found in the submenu: AOUT1 X6.62 or AIN2 X6.63 (analog output 1 (X6.62) or analog output 1 (X6.63))

Change assignment:

1. Select the output to be assigned to another signal (source) (e.g. C0431 for output X6/62) in the code level.
2. Change to the parameter level with PRG. Select the signal from the indicated list which is to be output via the monitor output.
3. If necessary, adjust an offset in the hardware under C0109
4. If necessary, the signal gain can be adapted to the hardware under C0108.
5. Repeat steps 1. to 4. to assign the second output.

9 Function library

9.1 Working with function blocks

The signal flow of the controller can be configured by connecting function blocks. The controller can thus be easily adapted to diverse applications.

9.1.1 Signal types

Each function block is provided with a certain number of inputs and outputs which can be interlinked. Corresponding to its respective function only particular signal types occur at the inputs and outputs:

- Quasi analog signals
  – Symbol: ○
  – Unit: %
  – Designation: a
  – Value range: ±16384 = ±100 %
  – Resolution: 16 bits, rating ±16384 ≙ ±100 %
- Digital signals
  – Symbol: □
  – Unit: binary, with HIGH or LOW level
  – Designation: d
  – Resolution: 1 bit
- Speed signals
  – Symbol: △
  – Unit: rpm (for display, internal representation in [inc/ms])
  – Designation: phd
  – Value range: $\pm 2^{15}$ - 1
  – Resolution: 16 bit
- Phase signals
  – Symbol: ▲
  – Unit: inc
  – Designation: ph
  – Value range: $\pm 2^{31}$ - 1
  – Resolution: 32 bits, rating 1 revolution ≙ 65536 inc

Only the same signal types can be connected with each other. Thus, an analog output signal of one function block can only be connected to the analog output of the other function block. If two different signal types are connected, the connection will be rejected.

9.1.2 Elements of a function block

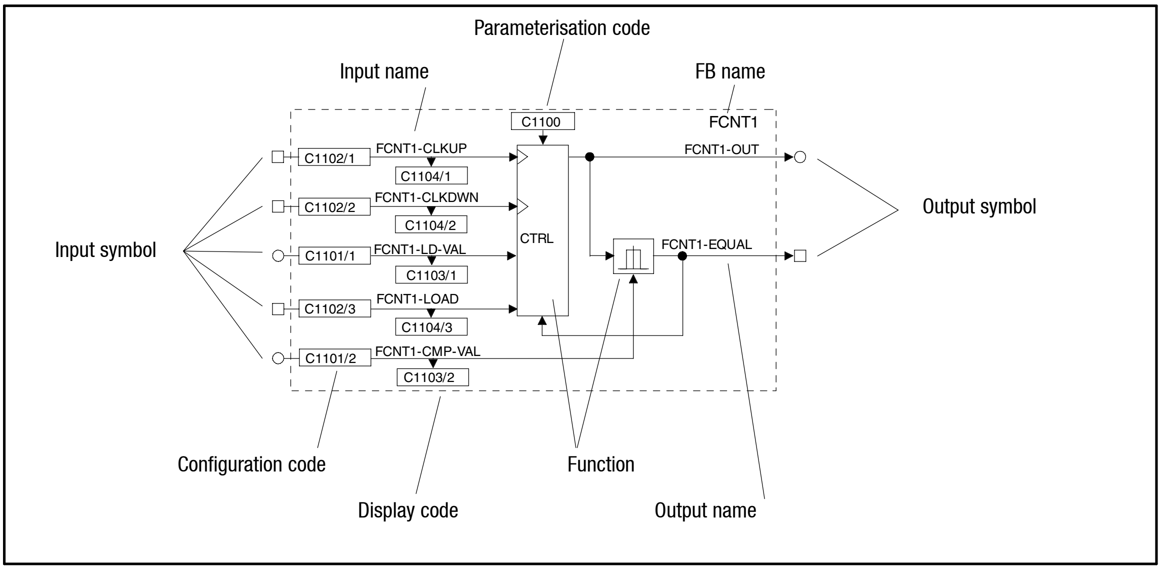


Fig. 9-1 Function block structure - considering as example FCNT1

FB name

Clearly identifies the FB. The FB name is followed by a number distinguishing the function of the FB.

Each FB is defined via its selection number. For calculating the FB the input of the selection number into the processing table is always required. (🕮 9-46)

The selection numbers are listed in selection list 5. (🕮 9-296 ff)

Example:

(FCNT1, see Fig. 9-1)

- FCNT1 ≙ selection number 6400 (selection list 5).

Input symbol

Designates the signal type which is allowed as signal source for this input. (🕮 9-39)

Tip!

Only linked inputs can be configured.

Input name

Consists of the FB name and a designation. Inputs with the same function are distinguished by the number that is added to the designation.

Configuration code

Configures the input with a signal source (e. g. terminal signal, control code, output of an FB, ...). Inputs with identical codes are distinguished by the attached subcode (Cxxxx/1). These codes are configured via the subcode.

It is not possible to connect an input with several signal sources.

Display code

Displays the current input value. Inputs with identical codes are distinguished by the attached subcode (Cxxxx/1). These codes are displayed via the subcode.

Display codes cannot be processed.

Function

Represents the mathematical function as a block diagram (see Fig. 9-1).

Parameter setting code

Adaptation of the function or behaviour to the drive task. Possible settings are described in the text editor and / or the line diagrams. (🕮 9-48)

Output symbol

Designates the signal type. Connections with inputs of the same signal type are possible. (🕮 9-39)

Each output is defined by a selection number. The selection numbers are divided into selection lists (1 ... 4) according to the different signal types. (🕮 9-296 ff)

An output is linked to an input by the selection numbers.

Example:

(FCNT1, see Fig. 9-1)

- FCNT1-OUT ≙ selection number 6400 (analog signal, selection list 1).
- FCNT1-EQUAL ≙ selection number 6400 (digital signal, selection list 2).

Tip!
Only linked outputs can be configured.

Output name

Consists of the FB name and a designation. Outputs with the same function are distinguished by the number that is added to the designation.

9.1.3 Connection of function blocks

General rules

- Assign a signal source to an input.
- One input can have only one signal source.
- Inputs of different function blocks can have the same signal source.
- Only the same types of signals can be connected. Thus, the analog output signal of one function block can only be connected to the analog input of the other function block.

Stop!

Existing connections which are not required must be removed by reconfiguration. Otherwise the drive cannot perform the desired function.

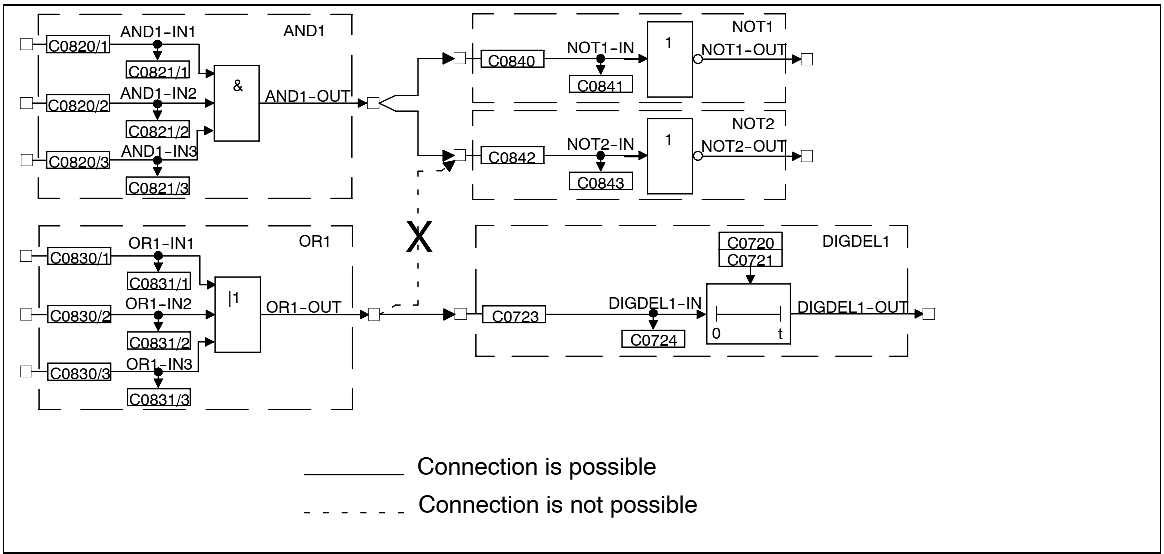


Fig. 9-2 Correct connection of function blocks

Basic procedure

1. Select the configuration code of the function block input which is to be changed.
2. Determine the source of the input signal for the selected input
   (e.g. from the output of another function block).
3. The function block input is assigned via a menu which contains only those signal sources which are of the same type as the function block input to be assigned.
4. Select and confirm the signal source.
5. Remove undesired connections, if any.
   – For this, select the corresponding signal assignment of the input via the configuration code (e.g. FIXED 0, FIXED 1, FIXED 0%, ...).
6. Repeat 1. to 5. until the desired configuration is set.
7. Save modified configuration in the desired parameter set.

Example

- Condition:
  – Default setting
- Task:
  – Square the analog signal of X6/3, X6/4 and output to X6/62.
- Solution:
  – You need the function blocks AIN2, ARIT2 and AOUT2.

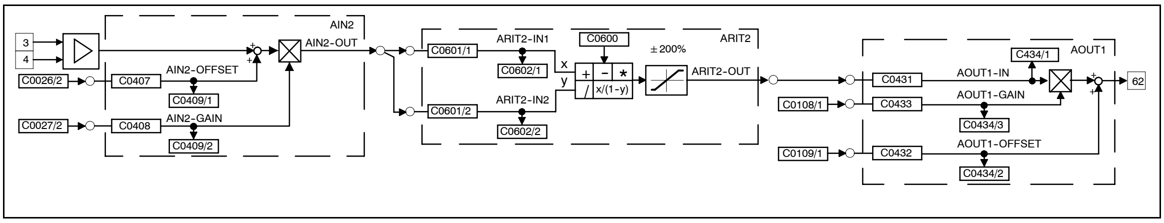


Fig. 9-3 Example of a simple configuration

Establish connections

1. Determine the signal source for ARIT2-IN1:
   – Change to the code level using the arrow keys
   – Select C0601/1 using ▲ or ▼.
   – Change to the parameter level using PRG.
   – Select output AIN2-OUT (selection number 55) using ▲ or ▼.
   – Confirm using SH + PRG
   – Change to the code level again using PRG.
2. Determine signal source for ARIT2-IN2:
   – Select C0601/2 using ▲.
   – Change to the parameter level using PRG.
   – Select output AIN2-OUT (selection number 55) using ▲ or ▼.
   – Confirm using SH + PRG
   – Change to the code level again using PRG.
3. Parameterise ARIT2:
   – Select C0600 using ▼.
   – Change to the parameter level using PRG.
   – Select multiplication (selection number 3).
   – Confirm using SH + PRG
   – Change to the code level again using PRG.
4. Determine signal source for AOUT1:
   – Select C0431 using ▼.
   – Change to the parameter level using PRG.
   – Select output ARIT2-OUT (selection number 5505).
   – Confirm using SH + PRG
   – Change to the code level again using PRG.
5. Enter function block ARIT2 in the processing table:
   – Select C0465 and subcode 8 using ▲.
   – Change to the parameter level using PRG.
   – Enter function block ARIT2 (selection number 5505).
   – Confirm using SH + PRG
   – Change to the code level again using PRG.
   – The sequence of the FB processing is thus determined.

Remove connections

- Since a source can have several targets, there may be further signal connections, which may not be wanted.
- Example:
  – In the default setting of the basic configuration C0005 = 1000 (speed control), ASW1-IN1 and AIN2-OUT are connected.
  – This connection is not automatically removed by the settings described above! If you do not want this connection, remove it.

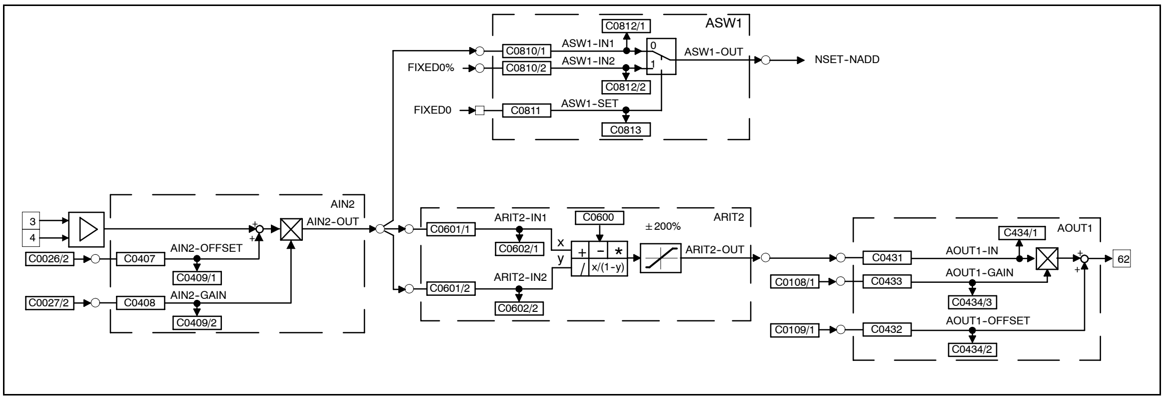


Fig. 9-4 Remove connections in a configuration

6. Remove connection between ASW1-IN1 and AIN2-OUT:
   – Select C0810/1 using ▲ or ▼.
   – Change to the parameter level using PRG.
   – Select the constant FIXED0% (selection number 1000) using ▲ or ▼ .
   – Confirm with SH + PRG
   – Change to the code level again using PRG.

Now, the connection is removed.

7. Save new configuration, if desired:
   – If you do not want to lose the modifications after mains disconnection, save the new signal configuration under C0003 in one of the parameter sets.

9.1.4 Entries into the processing table

The 93XX controller provides a certain time for calculating the processing time of FBs. Since the type and number of FBs to be used depends on the application and can vary strongly, not all available FBs are permanently calculated. A processing table is therefore provided under code C0465, where only the FBs used are listed. This means that the drive system is perfectly matched to the task. If further function blocks are integrated into an existing configuration, these must be listed in the processing table.

Several aspects must be observed:

The number of FBs to be processed is limited

A maximum of 50 FBs can be integrated into a configuration. Every FB requires a certain processing time. Code C0466 displays the residual time for the processing of FBs. If this time has elapsed, no further FBs can be integrated.

Entry sequence into the FBs

Normally, the entry sequence under C0465 is arbitrary, but it may be important for applications with high response. In general, the most favourable sequence is adapted to the signal flow.

Example:

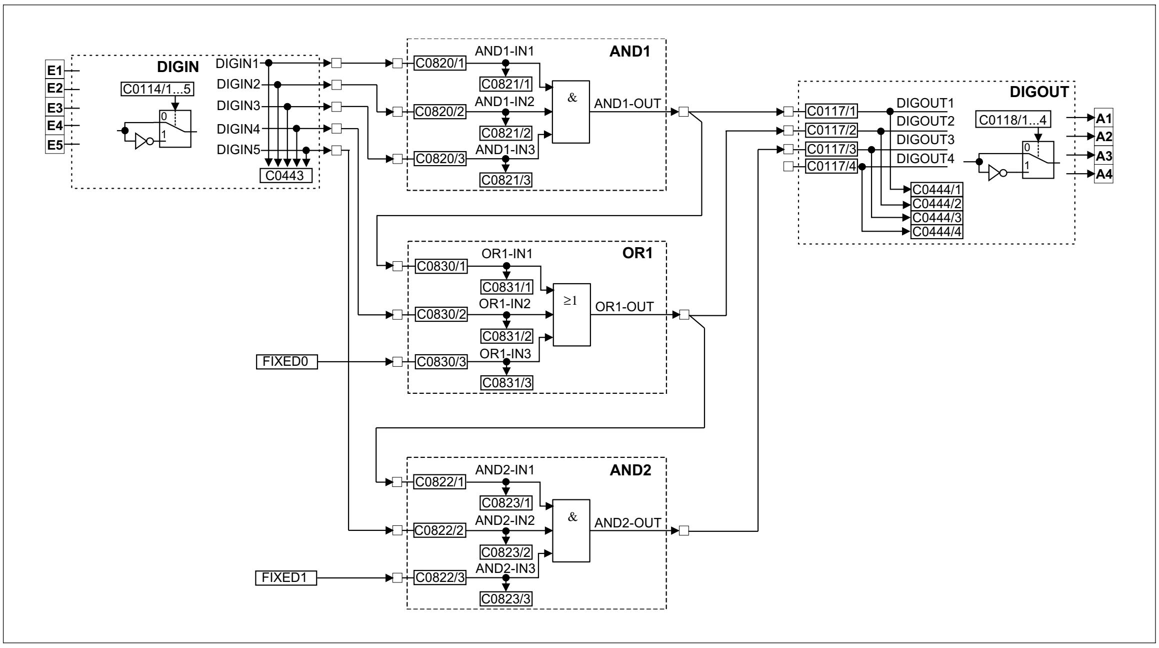


Fig. 9-5 Example of a configuration

Structure of the processing table for the configuration example Fig. 9-5:

1. DIGIN does not have to be entered into the processing table
2. The first FB is AND1, since it receives its input signals from DIGIN and only has successors.
3. The second FB is OR1, since its signal source is the output of AND1 (predecessor). This means that the output signal in AND1 must be generated first, before it can be processed in OR1. At the same time, OR1 has a successor. This means that OR1 must be entered in the processing table before the successor.
4. The third FB is AND2, since it has a predecessor (see 3.)

5. The entries in C0465 are:
   – Position 10: AND1 10500
   – Position 11: OR1 10550
   – Position 12: AND2 10505

This example was started with position 10, because these positions are not assigned in the default setting.

FBs need not to be entered into the processing table one after the other. Empty positions in the processing table are permissible.

Tip!
It is also possible that other FBs are entered between the FBs listed in the example.

FBs which do not have to be entered into the processing table

The following signal sources are always executed and do not have to be entered into the processing table:

- AIF-IN
- CANx-IN
- DIGIN
- DIGOUT
- FCODE (all free codes)
- MCTRL
- fixed signal sources (FIXED0, FIXED0%, etc.)

Frequent faults in the configuration

Malfunction	Cause	Remedy
FB does not supply an output signal	FB was not entered into the processing table C0465	Enter FB
FB only supplies constant signals	FB was deleted from or overwritten in the procesing table C0465.	Enter FB again, possibly under a different subcode (position)
The output signal does not arrive at the following FB.	No connection between the FBs	Make connection (from the view of the next FBs) by the configuration code (CFG)
FB cannot be entered in the table C0465	Residual process time is too short (see C0466)	Remove FBs not used (e.g. inputs and outputs not used) In networked drives, functions may be relocated to other controllers
The controller outputs internally calculated signals with a delay	FBs are processed in an incorrect sequence	Adapt processing table under C0465 to the signal flow

9.2 Function blocks

9.2.1 Table of the function blocks

Function block	Description	CPU time [µs]	used in basic configuration C0005						
			1000	4000	5000	6000	7000	20	21
ABS1	Absolute value generator	4						•	•
ADD1	Addition block	8							•
AIF-IN	Fieldbus	–	•	•	•	•	•		
AIF-OUT	Fieldbus	56	•	•	•	•	•		
AIN1	Analog input X6/1, X6/2	10	•	•	•	•	•	•	•
AIN2	Analog input X6/3, X6/4	28	•	•	•	•	•	•	•
AND1	Logic AND, block1	6						•	•
AND2	Logic AND, block2							•	•
AND3	Logic AND, block3							•	•
AND4	Logic AND, block4								•
AND5	Logic AND, block5								
AND6	Logic AND, block6								
AND7	Logic AND, block7								
ANEG1	Analog inverter 1	3	•	•	•	•	•	•	•
ANEG2	Analog inverter 2								•
AOUT1	Analog output X6/62	12	•	•	•	•	•	•	•
AOUT2	Analog output X6/63		•	•	•	•	•	•	•
ARIT1	Arithmetic block 1	11						•	•
ARIT2	Arithmetic block 2								
ARITPH1	32 Bit arithmetic block	15							
ASW1	Analog changeover 1	4	•		•			•	•
ASW2	Analog changeover 2							•	•
ASW3	Analog changeover 3								
ASW4	Analog changeover 4								
BRK	Trigger holding brake	15							
CAN-IN1	System bus	–							
CAN-IN2	System bus								
CAN-IN3	System bus								
CAN-OUT1	System bus	56	•	•	•	•	•		
CAN-OUT2	System bus								
CAN-OUT2	System bus								
CMP1	Comparator 1	15	•	•	•	•	•	•	•
CMP2	Comparator 2							•	•
CMP3	Comparator 3								•
CONV1	Conversion	8							
CONV2	Conversion								
CONV3	Conversion								•
CONV4	Conversion								
CONV5	Conversion								•
CONV6	Conversion								
CONVPHA1	32 bit conversion	6							
CONVPHPH1	32 bit conversion	80							
CONVPP1	32 bit / 16 bit conversion	55							
CURVE1	Characteristic function	15							
DB1	Dead band	7						•	
DCTRL	Device control	–	•	•	•	•	•	•	•
DFIN	Digital frequency input	5	•	•	•	•	•		•
DFOUT	Digital frequency output	35	•	•	•	•	•	•	•
DFRFG1	Digital frequency ramp function generator	40							
DFSET	Digital frequency processing	85			•	•	•		•
DIGDEL1	Binary delay element 1	9							
DIGDEL2	Binary delay element 2								

Function block	Description	CPU time [μs]	used in basic configuration C0005						
			1000	4000	5000	6000	7000	20	21
DIGIN	Input terminals X5/E1...X5/E5	–	•	•	•	•	•	•	•
DIGOUT	Output terminals X5/A1...X5/A4	–	•	•	•	•	•	•	•
DT1-1	Differential element	12							
FCNT1	Piece counter	11							
FEVAN1	Free analog input variable	4							
FEVAN2	Free analog input variable								
FDO	Free digital outputs	–							
FIXED	Constant signals	–	•	•	•	•	•	•	•
FIXSET1	Fixed setpoints	9							
FLIP1	D-flipflop 1	6						•	•
FLIP2	D-flipflop 2								
GEARCOMP	Gearbox torsion	1							
LIM1	Limiter	5						•	•
MCTRL	Motor control	–	•	•	•	•	•	•	•
MFAIL	Mains failure detection	40						•	•
MLP1	Motor phase failure detection	30							
MONIT	Monitoring	–	•	•	•	•	•	•	•
MPOT1	Motor potentiometer	20							
NOT1	Logic NOT, block1	4		•			•	•	•
NOT2	Logic NOT, block2							•	•
NOT3	Logic NOT, block3							•	•
NOT4	Logic NOT, block4								•
NOT5	Logic NOT, block5								•
NSET	Speed setpoint conditioning	70	•	•	•			•	•
OR1	Logic OR, block1	6			•	•	•	•	•
OR2	Logic OR, block2							•	•
OR3	Logic OR, block3							•	
OR4	Logic OR, block4								•
OR5	Logic OR, block5								•
OSZ	Oscilloscope function	70							
PCTRL1	Process controller	58							
PHADD1	32 bit addition block	10							
PHCMP1	Comparator	8							•
PHCMP2	Comparator								
PHCMP3	Comparator								
PHDIFF	32 bit setpoint/act. value comparison	10							
PHDIV1	Conversion	8							
PHINT1	Phase integrator	7							
PHINT2	Phase integrator								
PHINT3	Phase integrator	10							
PT1-1	1st order delay element	8							
CW/CCW/Q	QSP / setpoint inversion	8	•	•				•	•
REF	Homing function	100			•	•	•	•	•
RFG1	Ramp function generator	16							•
S&H	Sample and Hold	4							
SRFG1	S-shape ramp function generator	15							
STAT	Digital status signals	–	•	•	•	•	•	•	•
STATE-BUS	State bus	–							
STORE1	Memory 1	35							
STORE2	Memory 2	20							
SYNC1	Multi-axis positioning	55							
TRANS1	Binary edge evaluation	7							
TRANS2	Binary edge evaluation								
TRANS3	Binary edge evaluation								
TRANS4	Binary edge evaluation								

9.2.2 Table of the free control codes

Function block	Description	CPU time [μs]	used in basic configuration C0005						
			1000	4000	5000	6000	7000	20	21
FCODE 17	Free control codes	–	•	•	•	•	•	•	•
FCODE 26/1			•	•	•	•	•	•	•
FCODE 26/2			•	•	•	•	•	•	•
FCODE 27/1			•	•	•	•	•	•	•
FCODE 27/2			•	•	•	•	•	•	•
FCODE 32					•	•	•		•
FCODE 37								•	•
FCODE 108/1			•	•	•	•	•	•	•
FCODE 108/2			•	•	•	•	•	•	•
FCODE 109/1			•	•	•	•	•	•	•
FCODE 109/2			•	•	•	•	•	•	•
FCODE 135									
FCODE 141								•	•
FCODE 250								•	•
FCODE 471								•	•
FCODE 472/1									
FCODE 472/2									
FCODE 472/3			•	•	•	•	•		
FCODE 472/4				•					
FCODE 472/5					•	•	•		
FCODE 472/6					•	•	•		
FCODE 472/7									
FCODE 472/8									
FCODE 472/9								•	•
FCODE 472/10								•	•
FCODE 472/11								•	•
FCODE 472/12									
FCODE 472/13									
FCODE 472/14									
FCODE 472/15									
FCODE 472/16									
FCODE 472/17									
“FCODE 472/18									
FCODE 472/19									
FCODE 472/20									
FCODE 473/1					•	•	•		•
FCODE 473/2					•	•	•		
FCODE 473/3					•	•	•		
FCODE 473/4									
FCODE 473/5									
FCODE 473/6									
FCODE 473/7									
FCODE 473/8									
FCODE 473/9									
FCODE 473/10									
FCODE 474/1									
FCODE 474/2									
FCODE 474/3									
FCODE 474/4									
FCODE 474/5									
FCODE 475/2									

9.2.3 Absolute value generator (ABS)

Purpose

This FB is used to convert bipolar signals into unipolar signals.

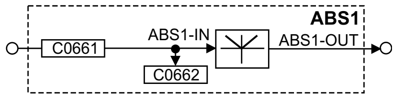


Fig. 9-6 Absolute value generator (ABS1)

Signal				Source			Note
Name	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.

9.2.4 Addition block (ADD)

Purpose

Adds or subtracts "analog" signal depending on the input used.

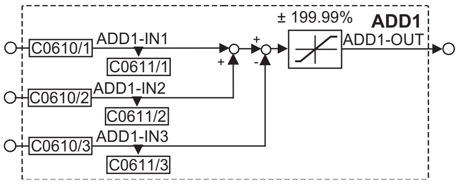


Fig. 9-7 Addition block (ADD1)

Signal				Source			Note
Name	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%

Function

- Input ADD1-IN1 is added to input ADD1-IN2.
- The input ADD-IN3 is subtracted from the calculated result.
- Then, the result of the subtraction is limited to ±199.99 %.

9.2.5 Automation interface (AIF-IN)

Purpose

Interface for input signals of the plug-on fieldbus module (e.g. INTERBUS, PROFIBUS) for setpoints and actual values as binary, analog, or phase information. Please observe the corresponding Operating Instructions for the plug-on fieldbus module.

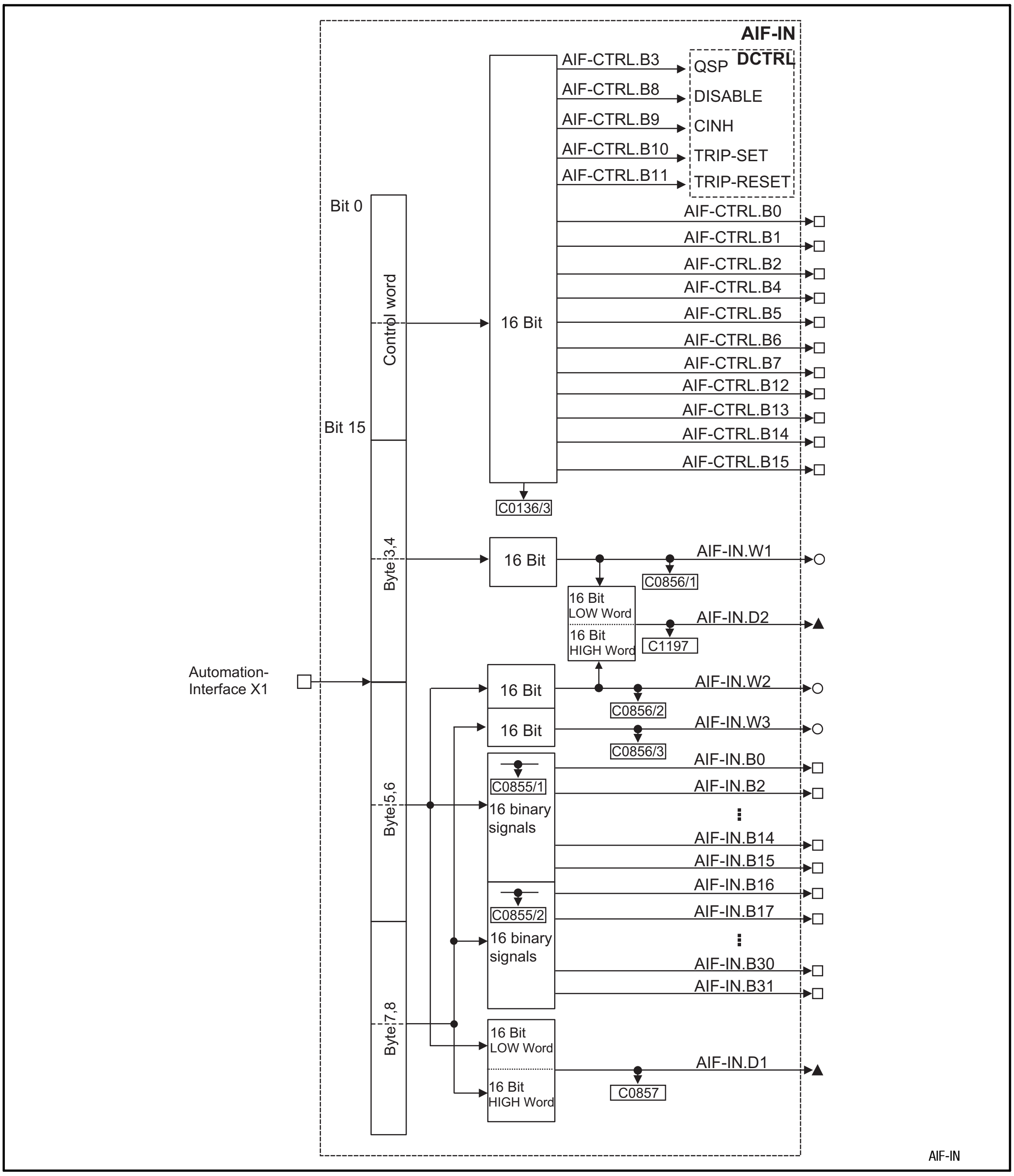


Fig. 9-8 Automation interface (AIF-IN)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
AIF-CTRL.B0	d	C0136/3	bin	-	-	-	
AIF-CTRL.B1	d	C0136/3	bin	-	-	-	
AIF-CTRL.B2	d	C0136/3	bin	-	-	-	
AIF-CTRL.B4	d	C0136/3	bin	-	-	-	
AIF-CTRL.B5	d	C0136/3	bin	-	-	-	
AIF-CTRL.B6	d	C0136/3	bin	-	-	-	
AIF-CTRL.B7	d	C0136/3	bin	-	-	-	
AIF-CTRL.B12	d	C0136/3	bin	-	-	-	
AIF-CTRL.B13	d	C0136/3	bin	-	-	-	
AIF-CTRL.B14	d	C0136/3	bin	-	-	-	
AIF-CTRL.B15	d	C0136/3	bin	-	-	-	
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 rev.
AIF-IN.D2	ph	C1197	dec [inc]	-	-	-	65536 = 1 rev.
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	-	-	-	

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.

Byte 1 and 2

Byte 1 and 2 form the control word for the controller. The bits 3, 8, 9, 10, and 11 of these bytes are directly transferred into the function block DCTRL where they are linked with further signals. The other 11 bits can be used to control further function blocks.

Byte 3 and 4

form the signal to AIF-IN.W1.

Byte 5, 6, 7, and 8

The meaning of these user data can be selected among different signal types. According to the requirement these data can be evaluated as up to two analog signals, 32 digital signals or one phase signal. Mixed forms are also possible.

9.2.6 Automation interface (AIF-OUT)

Purpose

Interface for output signals of the plug-on fieldbus modules (e. g. INTERBUS, PROFIBUS) for setpoints and actual values as binary, analog or phase information. Please observe the corresponding Operating Instructions for the plug-on fieldbus module.

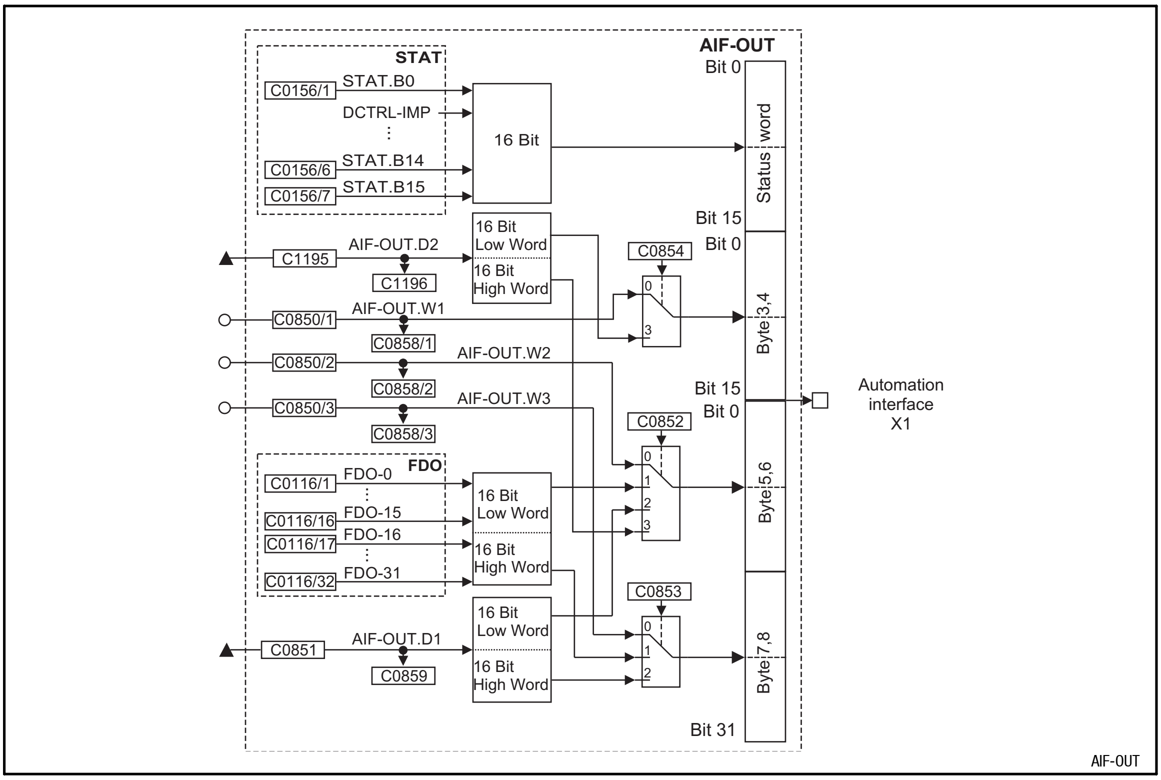


Fig. 9-9 Automation interface (AIF-OUT)

Signal				Source			Note
Name	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 rev. = 65536
AIF-OUT.D2	ph	C1196	abs [inc]	C1195	4	1000	1 rev. = 65536

Function

The input signals of this function block are copied into the 8-byte user data of the AIF object and assigned to the fieldbus module. The meaning of the user data can be determined very easily with C0852 and C0853 and the corresponding configuration code (CFG).

Byte 1 and 2

Here, the status word from the function block STAT is mapped. Some of the bits are freely assignable (see description of the function block STAT in chapter 9.2.61)

Byte 3 and 4

- C0854 = 0
  – The analog signal at AIF-OUT.W1 is output.
- C0854 = 3
  – The LOW-WORD of AIF-OUT.D2 is output.

Byte 5 and 6

- C0852 = 0
  – The analog signal at AIF-OUT.W2 is output to bytes 5 and 6.
- C0852 = 1
  – The bits 0 ... 15 of FDO are output.
- C0852 = 2
  – The LOW-WORD of AIF-OUT.D1 is output.
- C0852 = 3
  – The HIGH-WORD of AIF-OUT.D2 is output.

Byte 7 and 8

- C0853 = 0
  – The analog signal at AIF-OUT.W3 is output.
- C0853 = 1
  – The 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 output of LOW-WORD of AIF-OUT.D1 is only possible on byte 5 and 6.
  – For this purpose, C0852 is set to 2. The phase signal at C0851 is output to the bytes 5 and 6.
- For the digital signals, only the bits 16 ... 31 (bytes 7 and 8) are available (bytes 5 and 6 are assigned):
  – For this purpose, C0853 is set to 1. Bits 16 ... 31 (FDO) are output to bytes 7 and 8.

9.2.7 Analog input via terminal 1,2/3,4 (AIN)

Purpose

This FB is the interface for analog signals as

- setpoint input,
- actual value input and
- parameter control.

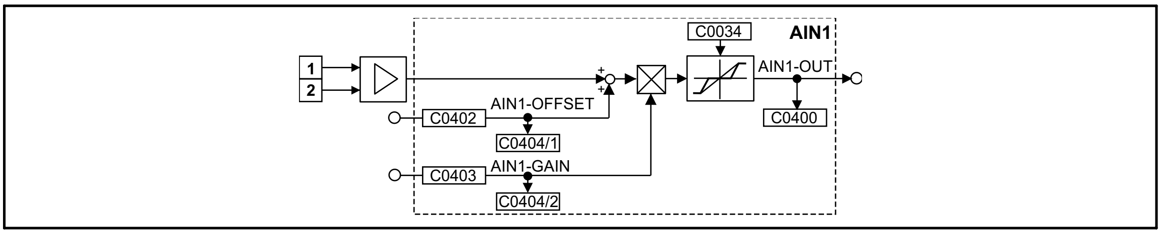


Fig. 9-10 Analog input via terminal 1,2 (AIN1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
AIN1-OFFSET	0	C0404/1	dec [%]	C0402	1	19502	-
AIN1-GAIN	0	C0404/2	dec [%]	C0403	1	19504	-
AIN1-OUT	0	C0400	-	-	-	-	-

Special feature of the input terminals 1,2

- A dead travel element can be integrated into the output signal at AIN1 via code C0034. Together with the jumper position X2 (controller front) the function 4 ... 20 mA can be implemented as current guide value.
- The signal is read cyclically (1 ms).

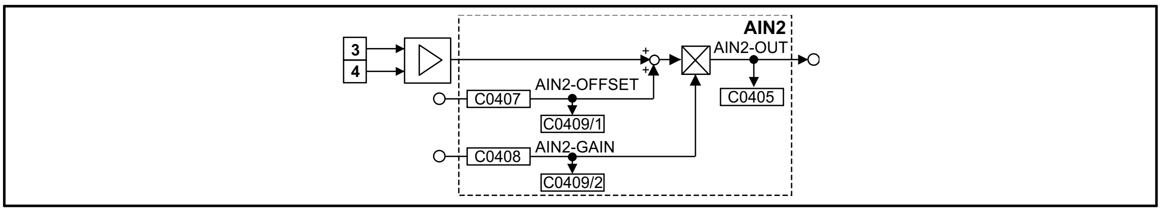


Fig. 9-11 Analog input via terminal 3, 4 (AIN2)

Special feature of AIN2

- The signal is read cyclically every 250 μs.

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
AIN2-OFFSET	0	C0409/1	dec [%]	C0407	1	19503	-
AIN2-GAIN	0	C0409/2	dec [%]	C0408	1	19505	-
AIN2-OUT	0	C0405	-	-	-	-	-

Function

- The analog input value is added to the value at input AINx-OFFSET.
- The result of the subtraction is limited to ±200 %.
- The limited value is multiplied by the value which is applied to input AINx-GAIN.
- Then the signal is limited to ±200%.
- The signal is output at AINx-OUT.

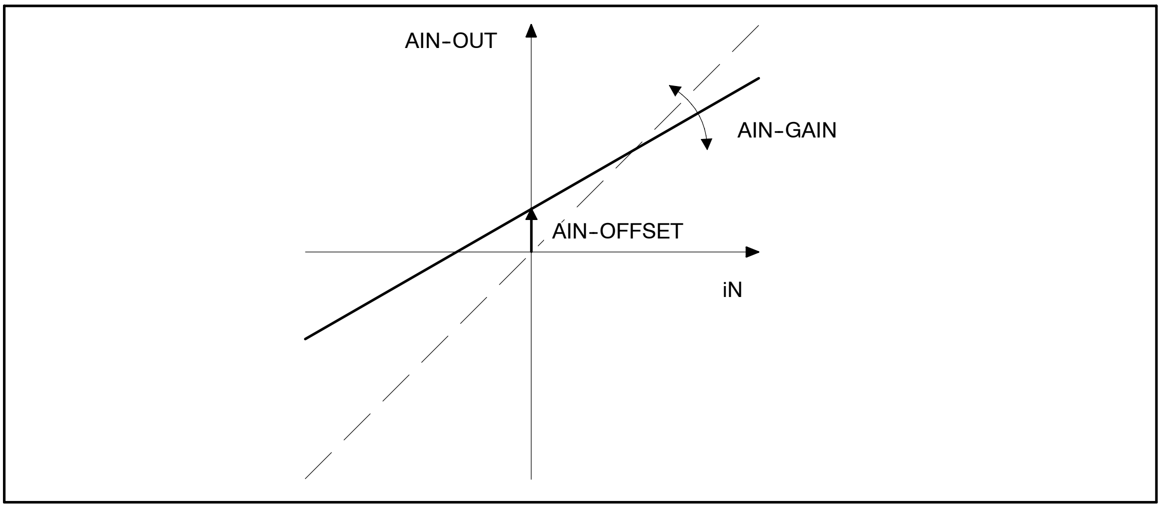


Fig. 9-12 Offset and gain of the analog input

9.2.8 AND operation (AND)

Purpose

With this function digital signals can be logically ANDed. These links can be used to control functions or create status information.

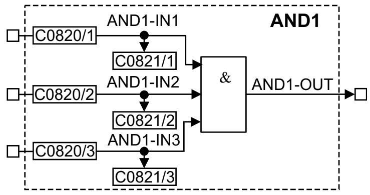


Fig. 9-13 AND function (AND1)

Signal				Source			Note
Name	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	-	-	-	-	-	-

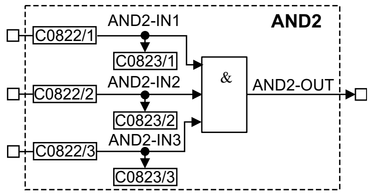


Fig. 9-14 AND function (AND2)

Signal				Source			Note
Name	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	-	-	-	-	-	-

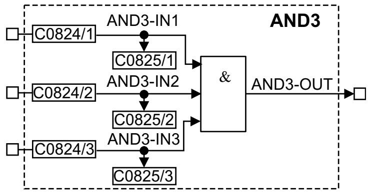


Fig. 9-15 AND function (AND3)

Signal				Source			Note
Name	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	-	-	-	-	-	-

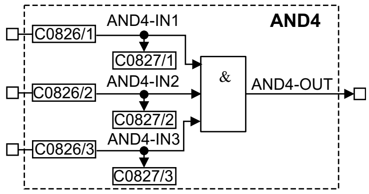


Fig. 9-16 AND function (AND4)

Signal				Source			Note
Name	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	-	-	-	-	-	-

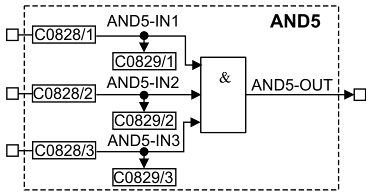


Fig. 9-17 AND function (AND5)

Signal				Source			Note
Name	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	-	-	-	-	-	-

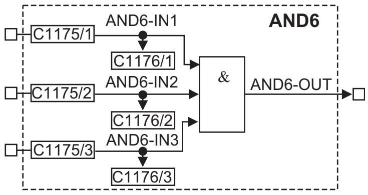


Fig. 9-18 AND function (AND6)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
AND6-IN1	d	C1176/1	bin	C1175/1	2	1000	-
AND6-IN2	d	C1176/2	bin	C1175/2	2	1000	-
AND6-IN3	d	C1176/3	bin	C1175/3	2	1000	-
AND6-OUT	d	-	-	-	-	-	-

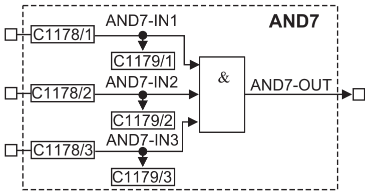


Fig. 9-19 AND function (AND7)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
AND7-IN1	d	C1179/1	bin	C1178/1	2	1000	-
AND7-IN2	d	C1179/2	bin	C1178/2	2	1000	-
AND7-IN3	d	C1179/3	bin	C1178/3	2	1000	-
AND7-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

The function corresponds to a series connection of normally-open contacts in a contactor control.

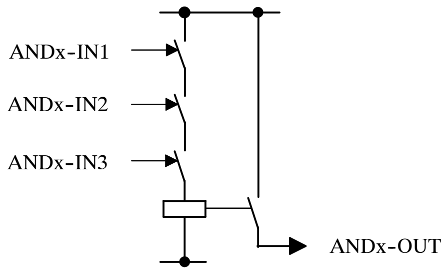


Fig. 9-20 AND function as a series connection of normally-open contacts

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 via the configuration code.

9.2.9 Inverter (ANEG)

Purpose

This FB inverts the sign of an analog signal.

Two inverters are available:

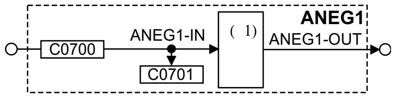


Fig. 9-21 Inverter (ANEG1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
ANEG1-IN	a	C0701	dec [%]	C0700	1	19523	-
ANEG1-OUT	a	-	-	-	-	-	-

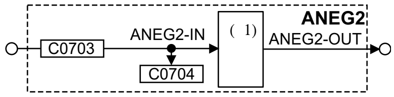


Fig. 9-22 Inverter (ANEG2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
ANEG2-IN	a	C0704	dec [%]	C0703	1	1000	-
ANEG2-OUT	a	-	-	-	-	-	-

Function

The input value is multiplied with -1 and then output again.

9.2.10 Analog output via terminal 62/63 (AOUT)

Purpose

AOUT1 and AOUT2 can be used as monitor outputs.

Internal analog signals can be output as voltage signals and be used e.g. as display values or setpoints for slaves.

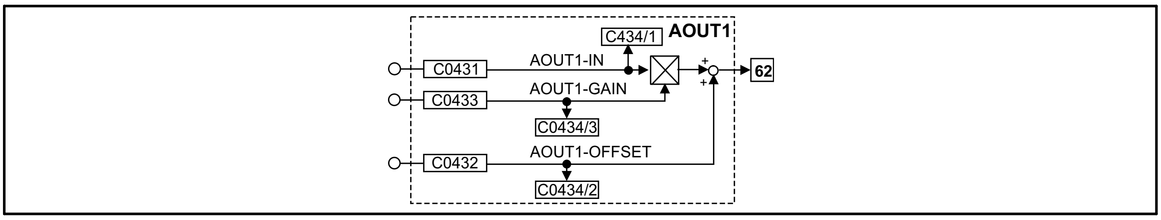


Fig. 9-23 Analog output via terminal X6/62 (AOUT1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
AOUT1-IN	a	C0434/1	dec [%]	C0431	1	5001	-
AOUT1-GAIN	a	C0434/3	dec [%]	C0433	1	19510	-
AOUT1-OFFSET	a	C0434/2	dec [%]	C0432	1	19512	-

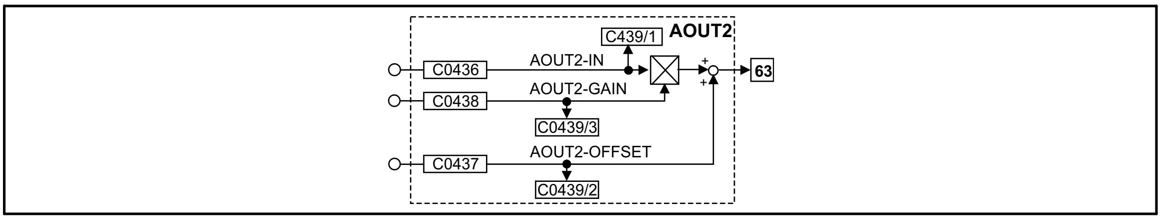


Fig. 9-24 Analog output via terminal X6/63 (AOUT2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
AOUT2-IN	a	C0439/1	dec [%]	C0436	1	5002	-
AOUT2-GAIN	a	C0439/3	dec [%]	C0438	1	19511	-
AOUT2-OFFSET	a	C0439/2	dec [%]	C0437	1	19513	-

Function

- The value at input AOUTx-IN is multiplied by the value at input AOUTx-GAIN.
  – The formula for the multiplication is: 100% * 100% = 100%.
- The result of the multiplication is limited to ±200%.
- The limited value is added to the value which is applied at input AOUTx-OFFSET.
  – The formula for the addition is 50% + 10% = 60%. The result of the calculation is mapped in such a way that 100% = 10 V.
- The result of the addition is limited again to ±200%.
- The result of the calculation is mapped in such a way that 100% = 10 V and is output as a signal at terminal 62 or 63.

Example for an output value

AOUT1-IN = 50%, AOUT1-GAIN = 100%, AOUT1-OFFSET = 10%

Output terminal 62 = ((50% * 100% = 50%) + 10% = 60%) = 6 V

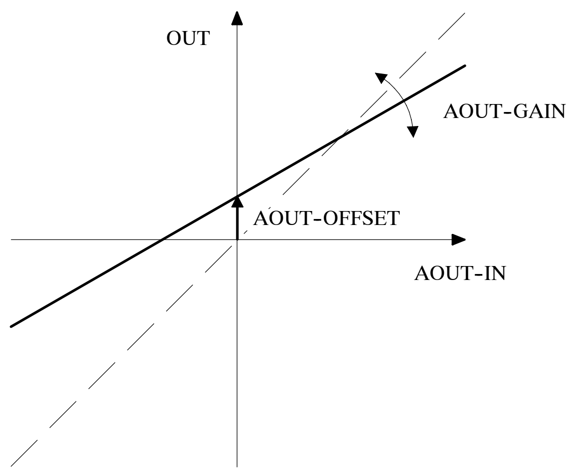
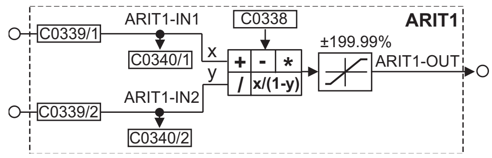


Fig. 9-25 Offset and gain of the analog output

9.2.11 Arithmetic block (ARIT)

Purpose

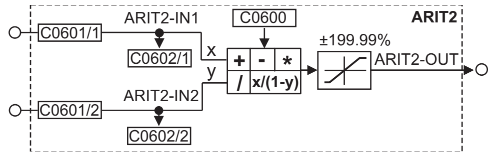
Arithmetic operation of two ”analog” signals.



9300posARIT1

Fig. 9-26 Arithmetic block (ARIT1)

Signal				Source			Note
Name	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 %



9300posARIT2

Fig. 9-27 Arithmetic block (ARIT2)

Signal				Source			Note
Name	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 %

Function

For both arithmetic blocks the following functions can be preselected:

Code	Subcode	Arithmetic function	Example
ARIT1: C0338	0	OUT = IN1 Note: IN2 will not be processed	
	1	OUT = IN1 + IN2	100% = 50% + 50%
	2	OUT = IN1 - IN2	50% = 100% - 50%
	3	OUT [inc] = IN1 [inc] ×IN2 [inc] ÷16384 OUT [%] = IN1 [%] × IN2 [%] ÷100	100% = 100% ×100% ÷(100)
	4	OUT [inc] = IN1 [inc] ×16384÷100 ÷ │IN2│[inc] OUT [%] = IN1 [%] ÷ │ IN2 │[%]	1% = 100% ÷100%
	5	OUT [inc] = IN1 [inc] ×16384 ÷ (16384 - IN2 [inc]) OUT [%] = IN1 [%] × 100 ÷ (100 - IN2 [%])	200% = 100% × (100) ÷ (100 - 50%)

Conversion: [inc] = [%] ÷100 × 16384

9.2.12 Arithmetic block (ARITPH)

Purpose

The FB ARITPH calculates a phase output signal from two phase input signals.

ARITPH1

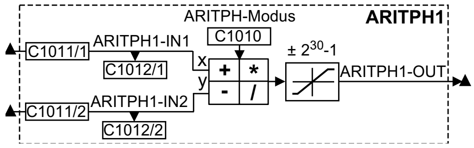


Fig. 9-28 Function block ARITPH1

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
ARITPH1-IN1	ph	C1012/1	dec [inc]	C1011/1	3	-
ARITPH1-IN2	ph	C1012/2	dec [inc]	C1011/2	3	-
ARITPH1-OUT	ph	-	-	-	-	

Function

- Selection of the arithmetic function with the code ARITPH mode.
- The function block limits the result (see table)

ARITPH mode	Arithmetic function	Limitation	
C1010 = 0	OUT = IN1	2^{30} -1	
C1010 = 1	OUT = IN1 + IN2	2^{30} -1	
C1010 = 2	OUT = IN1 - IN2	2^{30} -1	
C1010 = 3	OUT = (IN1 * IN2) / 2^{31}	2^{30} -1	(remainder not considered)
C1010 = 13	OUT = IN1 * IN2	2^{31}	
C1010 = 14	OUT = IN1 / IN2	2^{30} -1	(remainder not considered)
C1010 = 21	OUT = IN1 + IN2	without	with overflow
C1010 = 22	OUT = IN1 - IN2	without	with overflow

- The calculation is performed cyclically in the control program.

9.2.13 Changeover switch for analog signals (ASW)

Purpose

This FB changes between two analog signals.

Therefore, it is possible to change e.g. during winding between an initial diameter and a calculated diameter.

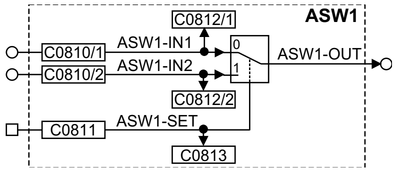


Fig. 9-29 Changeover switch for analog signals (ASW1)

Signal				Source			Note
Name	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	-	-	-	-	-	-

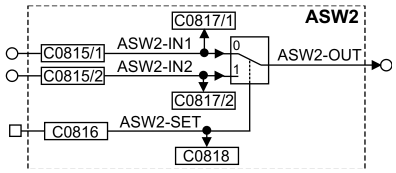


Fig. 9-30 Changeover switch for analog signals (ASW2)

Signal				Source			Note
Name	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	-	-	-	-	-	-

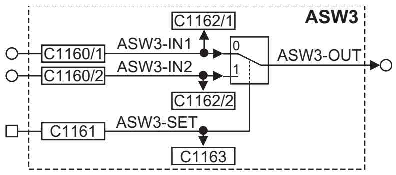


Fig. 9-31 Changeover switch for analog signals (ASW3)

Signal				Source			Note
Name	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	-	-	-	-	-	-

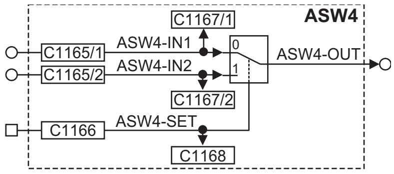


Fig. 9-32 Changeover switch for analog signals (ASW4)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
ASW4-IN2	a	C1167/1	dec [%]	C1165/1	1	1000	-
ASW4-IN1	a	C1167/2	dec [%]	C1165/2	1	1000	-
ASW4-SET	d	C1168	bin	C1166	2	1000	-
ASW4-OUT	a	-	-	-	-	-	-

Function

This FB is controlled via a binary input. Depending on the input signal, different signals are sent to the output:

- If a HIGH signal is applied at the binary input, the signal which is applied at the ASWx-IN2 input is sent to the output.
- If a LOW signal is applied, the signal which is applied at the ASW-IN2 input is sent to the output.

9.2.14 Holding brake (BRK)

Danger!

Condition for applying the BRK function block

Exclusively triggering the holding brake via the function block BRK is not permissible!

The **safe** triggering of the holding brake additionally requires a second switch-off mode. Without the second switch-off mode there is a risk of severe personal injury and danger to material assets!

Applications with active loads

With an increase of the DC-bus voltage (e.g. by braking processes) the torque limitation may intervene due to code C0172. The torque limitation is activated if e.g.

- the brake resistor is damaged.
- the switching threshold set at the brake chopper or brake module is not adapted correctly.

Code C0172 is a pre-stage of the monitoring function “OU” (overvoltage of the DC-bus voltage). Code C0172 defines which differential mode voltage causes a reduction in torque before OU. With the default setting the torque is reduced to ”0” if the DC-bus voltage amounts to 760 V (770 V - 10 V):

- OU threshold = 770V (C0173 = 0...3)*
- C0172 = 10 V
- No message is generated.

Only after the DC-bus voltage is decreased below the OU reclosing threshold the torque is reconnected.

With unchanged basic conditions the continuously ”chopping” drive behaviour may lead to undefined motions.

Remedy:

6. Set C0172 = 0 V
7. MONIT-OU must generate EEr-TRIP (e.g. with C0871/0 = 15011).
   This serves to apply the standstill brake over the controller inhibit (CINH) if the braking energy cannot be dissipated.

*) Exception: OU threshold 800 V with C0173 = 4 (see description in code table)

Purpose

The FB is used to trigger a holding brake.

Possible applications:

- Hoists
- Traversing drives
- Active loads

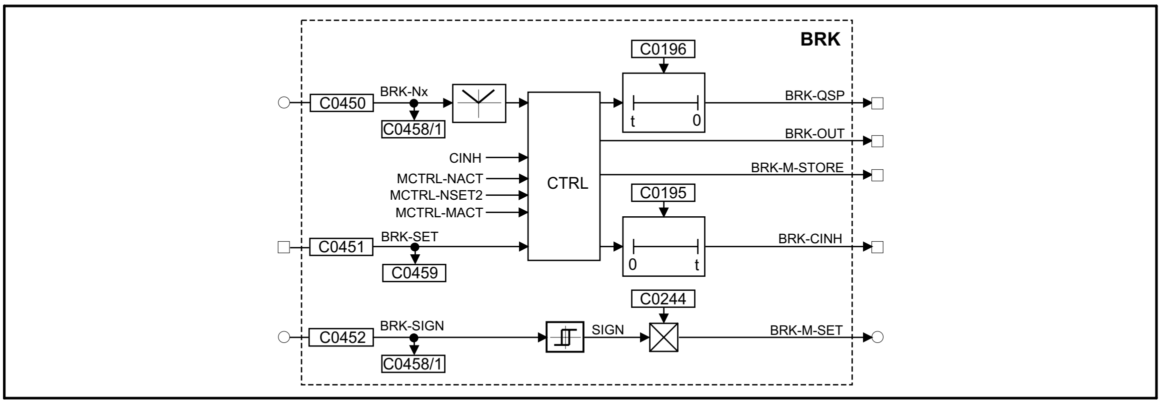


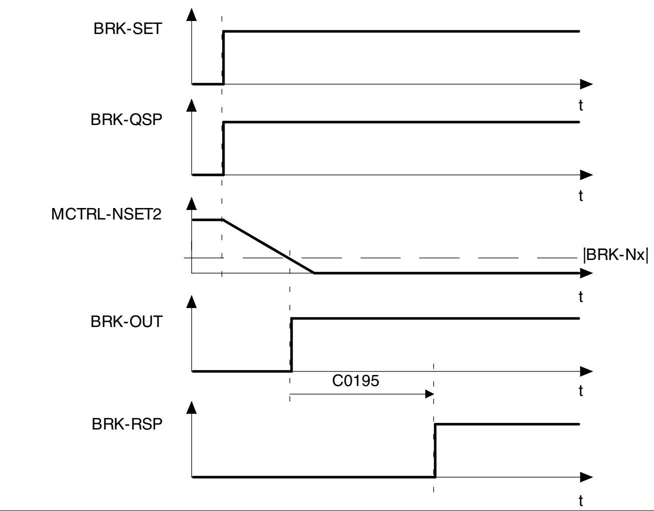
Fig. 9-33 Holding brake (BRK)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
BRK-SET	d	C0459	bin	C0451	2	1000	-
BRK-NX	a	C0458/1	dec [%]	C0450	1	1000	Speed threshold from which the drive may output the signal "Close brake". The signal source for this input can be a control code, a fixed value, or any other analog FB output.
BRK-SIGN	a	C0458/2	dec [%]	C0452	1	1000	Direction of the torque with which the drive is to set up a torque against the brake. The signal source for this input can be a control code, a fixed value, or any other FB output.
BRK-M-SET	a	-	dec [%]	C0244	-	0.00	Holding torque of the DC injection brake 100 % = value of C0057
BRK-T-ACT	a	-	dec	C0195	-	99.9	Brake application time
BRK-T-RELEASE	a	-	dec	C0196	-	0.0	Brake release time

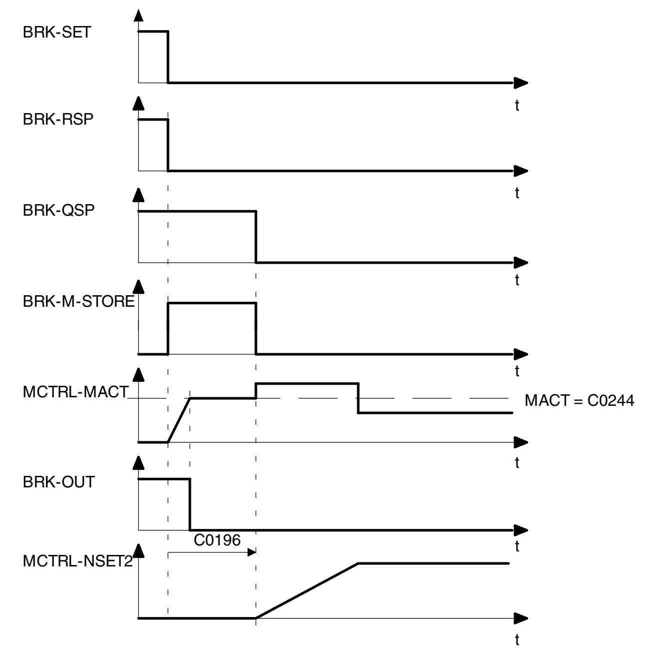
Function

The signals N-ACT, M-ACT, N-SET and BRK-Nx are processed as absolute values within the function block.

9.2.14.1 Applying the brake

Purpose	A HIGH-Signal at the BRK-SET input activates the function. The BRK-QSP output is simultaneously set to HIGH. This signal can be used to decelerate the drive to zero speed via a deceleration ramp.	
Function	If the setpoint speed falls below the value set at the BRK-Nx input, the BRK-OUT output is set to HIGH. In order to ensure a fail-safe design this signal must be inverted at the output (e.g. via C0118).	

9.2.14.2 Opening the brake (release)

Purpose	A LOW signal at the BRK-SET input immediately sets the BRK-CINH output to LOW. At the same time the BRK-M-STORE output is set to HIGH. This signal can be used to generate a defined torque against the brake. The drive thus takes over the torque while the brake is released. The signal is only reset after the time set under C0196 is elapsed.	
Function	The BRK-OUT output signal is set to LOW as soon as the torque reaches the value set under C0244 (holding torque). When the input is reset, a time element is triggered. After the time set under C0196 has elapsed the BRK-QSP output is reset. This signal serves to e.g. release the setpoint integrator after the brake release time has elapsed.	
Note	If an actual value higher than the value at BRK-Nx is detected before the brake release time (C0196) has elapsed, the signals BRK-QSP and BRK-M-STORE are reset immediately. The drive can immediately operate speed or phase-controlled. If the BRK-QSP output acts on the QSP control word the drive is synchronised to the actual speed and follows its setpoint.	

9.2.14.3 Setting controller inhibit

Purpose

Controller inhibit can be set e.g. in case of a fault (LU, OU, …).

Function

When the controller is inhibited (CINH) the BRK-OUT signal is immediately set to HIGH. The drive is then braked via the mechanical brake.

If the fault is eliminated quickly, i.e. the controller inhibit (CINH) is reset before the actual falls below the threshold value BRK-Nx, the BRK-OUT signal is set immediately to LOW. The drive is synchronised to the actual speed and follows its setpoint.

If the value falls below the threshold, the drive starts as described under ”Opening the brake”.

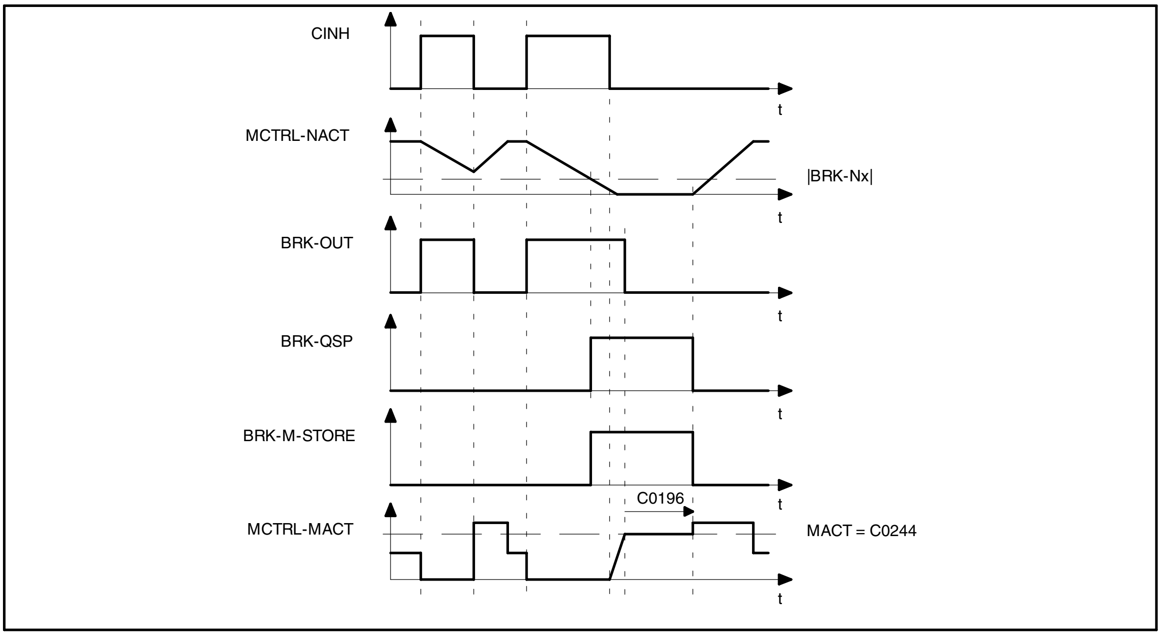


Fig. 9-34 Control brake by CINH

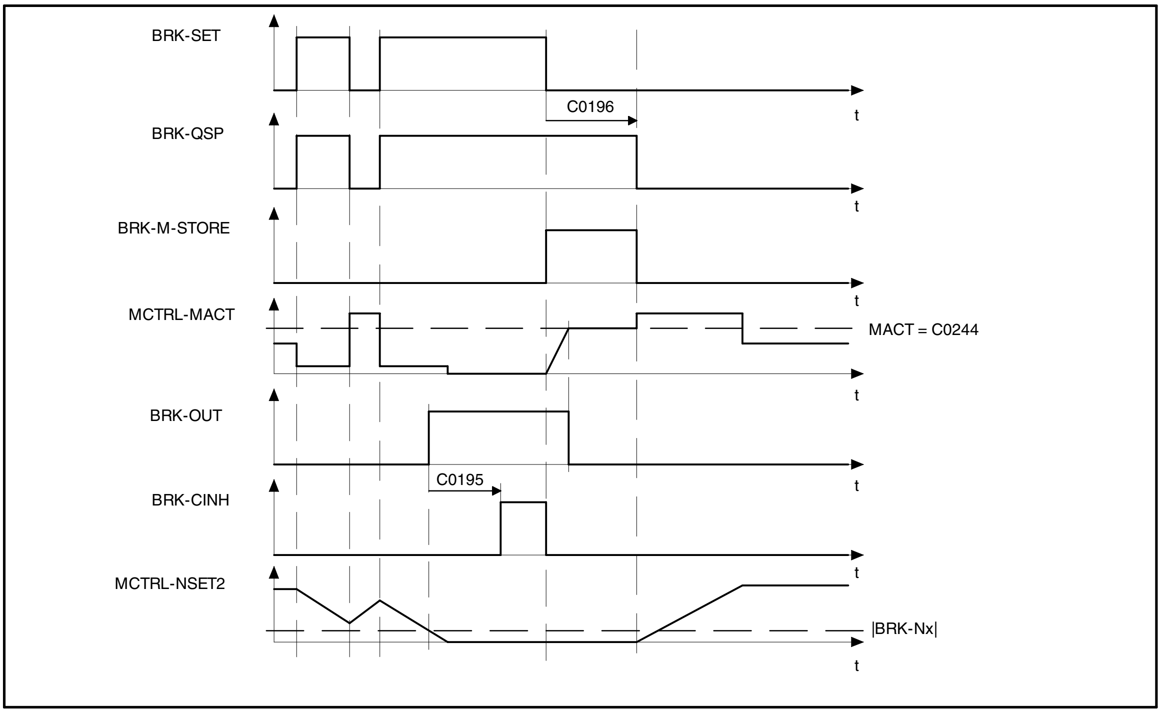


Fig. 9-35 Switching cycle when braking

9.2.15 System bus (CAN-IN)

A detailed description of the system bus (CAN) can be found in the "Communication Manual CAN".

9.2.16 System bus (CAN-OUT)

A detailed description of the system bus (CAN) can be found in the "Communication Manual CAN".

9.2.17 Comparator (CMP)

Purpose

These FBs serve to compare two analog signals.

In order to implement triggers the following three comparators are available:

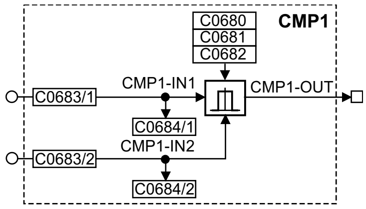


Fig. 9-36 Comparator (CMP1)

Signal				Source			Note
Name	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	a	-	-	-	-	-	-

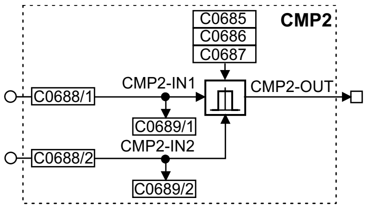


Fig. 9-37 Comparator (CMP2)

Signal				Source			Note
Name	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	a	-	-	-	-	-	-

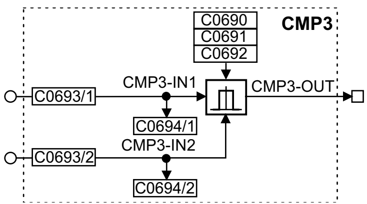


Fig. 9-38 Comparator (CMP3)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CMP3-IN1	a	C0694/1	dec [%]	C0693/1	1	1000	-
CMP3-IN2	a	C0694/2	dec [%]	C0693/2	1	1000	-
CMP3-OUT	a	-		-	-	-	-

Function

The description is an example for CMP1 and also applies to CMP2 and CMP3.

The function of these FBs can be set via code C0680 (CMP1). The following comparison operations 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|

9.2.17.1 Function 1: CMP1-IN1 = CMP1-IN2

This function is used to find out whether two signals are equal.

- Via code C0682 the window of equality can be set.
- Via code C0681 a hysteresis can be set if the input signals are not stable which results in an oscillation of the output.

The exact function can be obtained from the line diagram.

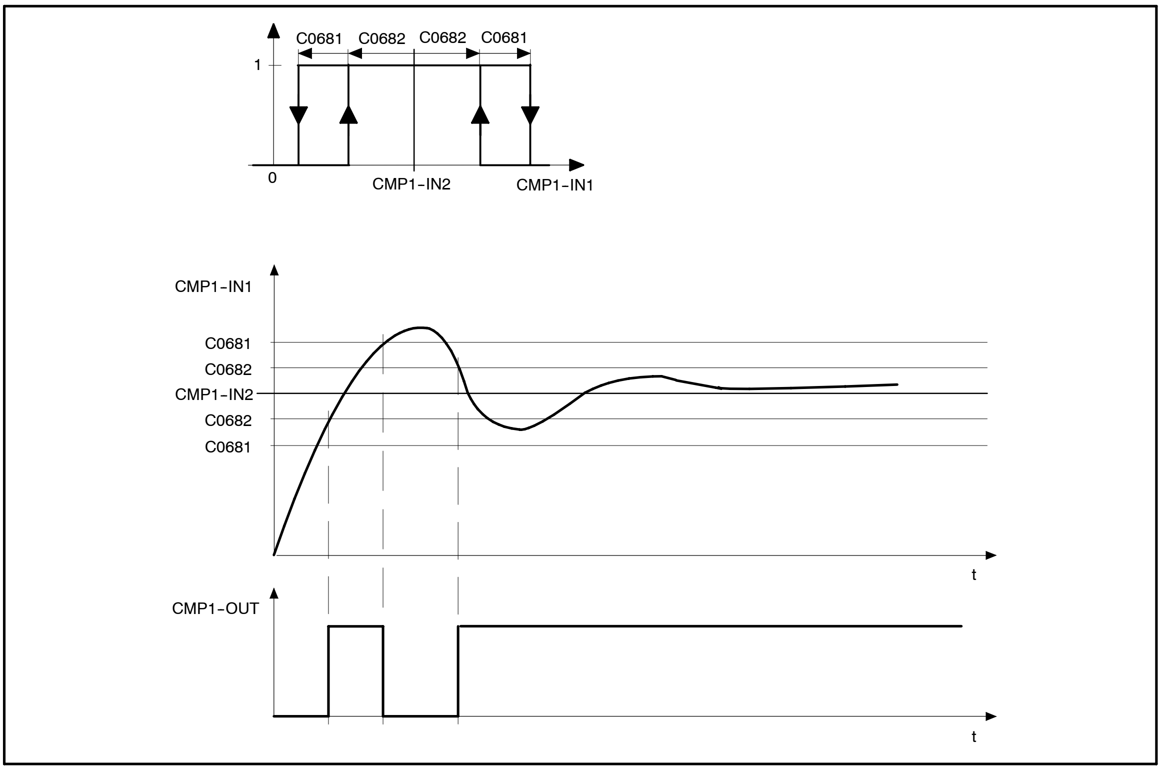


Fig. 9-39 Equality of signals (CMP1-IN1 = CMP1-IN2)

Example:

This function can be used to obtain the comparison ”Actual speed is equal to setpoint speed ($n_{act} = n_{set}$)”.

9.2.17.2 Function 2: CMP1-IN1 > CMP1-IN2

- If the value at input CMP1-IN1 exceeds the value at input CMP1-IN2, the output CMP1-OUT changes from LOW to HIGH.
- Only if the signal at input CMP1-IN1 falls below the value of CMP1-IN2 - C0681 again, the output changes from HIGH to LOW.

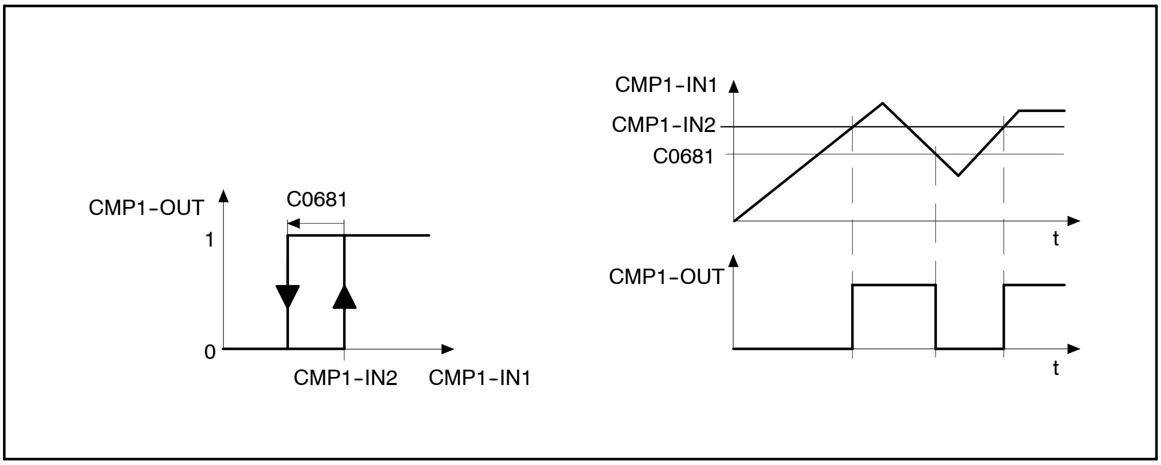


Fig. 9-40 Exceeding signal values (CMP1-IN1 > CMP1-IN2)

Example:

This function is used to obtain the comparison "Actual speed is higher than a limit value ($n_{act} > n_x$)" for a direction of rotation.

9.2.17.3 Function 3: CMP1-IN1 < CMP1-IN2

- If the value at input CMP1-IN1 falls below the value at input CMP1-IN2, the output CMP1-OUT changes from LOW to HIGH.
- Only if the signal at input CMP1-IN1 exceeds the value of CMP1-IN2 - C0681 again, the output changes from HIGH to LOW.

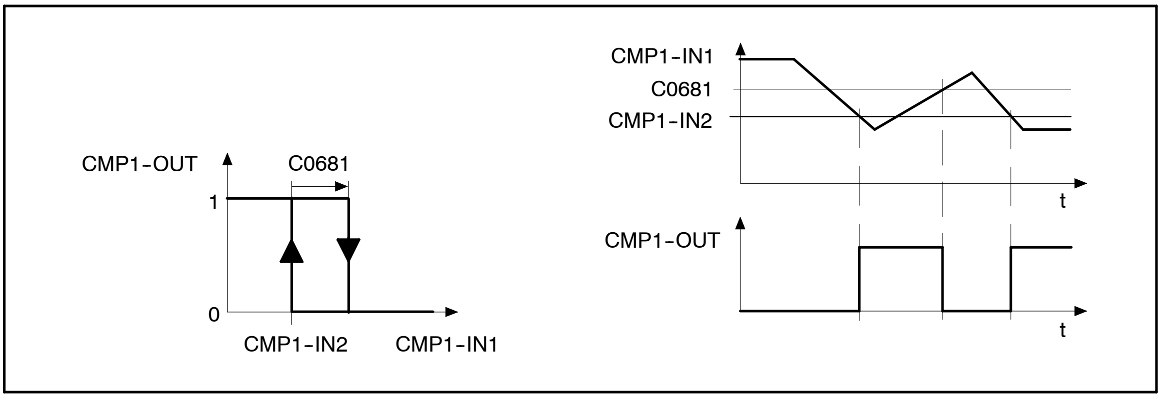


Fig. 9-41 Values falling below signal values (CMP1-IN1 CMP1-IN2)

Example:

This function is used to obtain the comparison "Actual speed is higher than a limit value ($n_{act} < n_x$)" for a direction of rotation.

9.2.17.4 Function 4: |CMP1-IN1| = |CMP1-IN2|

This function is the same as function 1. Before signal processing the amount of the input signals (without sign) is generated.

Example:

This function is used to obtain the comparison "n_{act} = 0".

9.2.17.5 Function 5: |CMP1-IN1| > |CMP1-IN2|

This function is the same as function 3. Before signal processing the amount of the input signals (without sign) is generated.

Example:

This function is used to obtain the comparison "$|n_{act}| > |n_x|$" irrespective of the direction of rotation.

9.2.17.6 Function 6: |CMP1-IN1| < |CMP1-IN2|

This function is the same as function 2. Before signal processing the amount of input signals (without sign) is generated.

Example:

This function is used to obtain the comparison "$|n_{act}<n_x|$" irrespective of the direction of rotation.

9.2.18 Signal conversion (CONV)

Purpose

These function blocks can be used to standardize signals or signal types or to convert signal types into different signal types.The conversion is very precise by providing the conversion factor as numerator and denominator.

CONV1

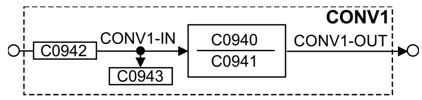


Fig. 9-42 Function block CONV1

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CONV1-IN	a	C0943	dec [%]	C0942	1	1000	
CONV1-OUT	a	-	-	-	-	-	Limited to ±199.99 %

This function block is used to multiply or divide analog signals.

The conversion is done according to the formula:

$$\text{CONV1–OUT} = \text{CONV1–IN} \cdot \frac{\text{C0940}}{\text{C0941}}$$

Example:

An analog signal is to be multiplied with 1.12.
For this, enter C0940 = 112 and C0941 = 100.

CONV2

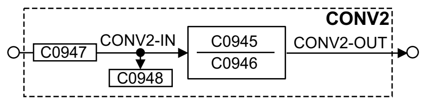


Fig. 9-43 Function block CONV2

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CONV2-IN	a	C0948	dec [%]	C0947	1	1000	
CONV2-OUT	a	-	-	-	-	-	Limited to ±199.99 %

This function block is used to multiply or divide analog signals.

The conversion is done according to the formula:

$$\text{CONV2–OUT} = \text{CONV2–IN} \cdot \frac{\text{C0945}}{\text{C0946}}$$

CONV3

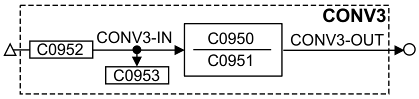


Fig. 9-44 Function block CONV3

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CONV3-IN	phd	C0953	dec [rpm]	C0952	4	1000	
CONV3-OUT	a	-	-	-	-	-	Limited to ±199.99 %

This function block 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

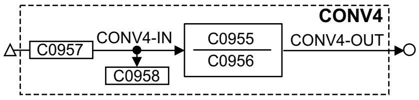


Fig. 9-45 Function block CONV4

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CONV4-IN	phd	C0958	dec [rpm]	C0957	4	1000	
CONV4-OUT	a	-	-	-	-	-	Limited to ±199.99 %

This function block 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

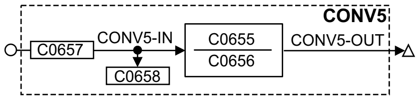


Fig. 9-46 Function block CONV5

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CONV5-IN	a	C0658	dec [%]	C0657	1	1000	
CONV5-OUT	phd	-	-	-	-	-	Limited to ±29999 rpm

This function block is used to convert analog signals into speed signals.

The conversion is done according to the formula:

$$\text{CONV5-OUT} = \text{CONV5-IN} \cdot \frac{15000\,\text{rpm}}{100\,\%} \cdot \frac{\text{C0655}}{\text{C0656}}$$

CONV6

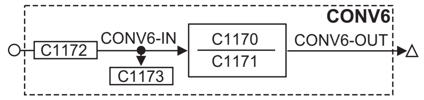


Fig. 9-47 Function block CONV6

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CONV6-IN	a	C1173	dec [%]	C1172	1	1000	
CONV6-OUT	phd	-	-	-	-	-	Limited to ±29999 rpm

This function block is used to convert analog signals into speed signals.

The conversion is done according to the formula:

$$\text{CONV6-OUT} = \text{CONV6-IN} \cdot \frac{15000\,\text{rpm}}{100\,\%} \cdot \frac{\text{C1170}}{\text{C1171}}$$

9.2.19 Phase conversion (CONVPHA)

Purpose

- Converts a phase signal into an analog signal

or

- converts a phase difference signal into a speed signal.

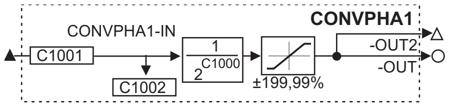


Fig. 9-48 Phase conversion (CONVPHA1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVPHA1-IN	ph	C1002	dec [inc]	C1001	3	-
CONVPHA1-OUT	0	-	-	-	-	Limited to ±199,99 %, remainder considered
CONVPHA1-OUT2	phd	-	-	-	-	Limited to ±32767 rpm, remainder considered

Function

- Conversion with adaptation using a divisor.
- The conversion is performed according to the formula:

$$\text{CONVPHA1-OUT [\%]} = \text{CONVPHA1-IN [inc]} \cdot \frac{100}{2^{14} \cdot 2^{C1000}}$$

$$\text{CONVPHA1-OUT2 [rpm]} = \text{CONVPHA1-IN [inc]} \cdot \frac{15000}{2^{14} \cdot 2^{C1000}}$$

$$\text{CONVPHA1-OUT2 [inc]} = \text{CONVPHA1-IN [inc]} \cdot \frac{1}{2^{C1000}}$$

9.2.20 Phase conversion (CONVPHPH)

Purpose

Conversion of a phase signal with dynamic fracture.

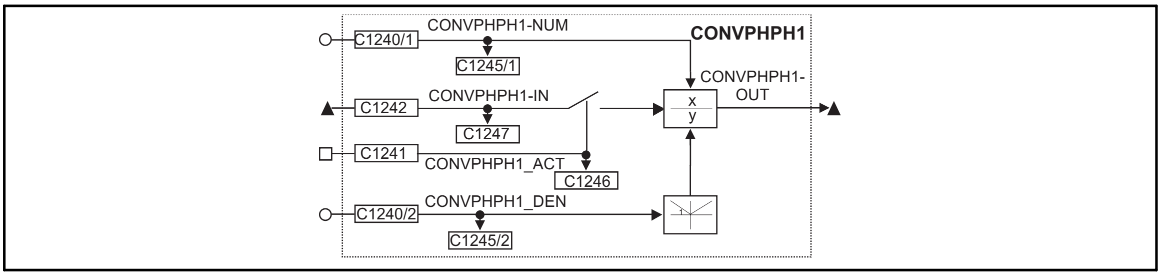


Fig. 9-49 Phase conversion (CONVPHPH1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVPHPH1-IN	ph	C1247	dec [inc]	C1242	3	-
CONVPHPH1-NUM	a	C1245/1	dec	C1240/1	1	Numerator
CONVPHPH1-DEN	a	C1245/2	dec	C1240/2	1	Denominator (with absolute value generation)
CONVPHPH1-ACT	d	C1246	bin	C1241	2	-
CONVPHPH1-OUT	ph	-	-	-	-	Without limitation, remainder considered

Function

Caution!

The conversion result is not limited. The result must therefore not exceed the range of ±2147483647.

- C1241 = HIGH
  – The phase signal at CONVPHPH1-IN is evaluated using the factor from C1245/1 / C1245/2.
- C1241 = LOW
  – The value 0 is evaluated using the factor from C1245/1 / C1245/2.

9.2.21 Speed conversion (CONVPP)

Purpose

Conversion of a speed signal with dynamic fracture.

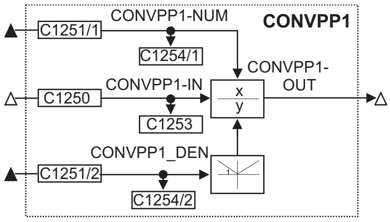


Fig. 9-50 Speed conversion (CONVPP1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVPP1-IN	phd	C1253	dec [rpm]	C1250	4	-
CONVPP1-NUM	ph	C1254/1	dec [inc]	C1251/1	3	Numerator
CONVPP1-DEN	ph	C1254/2	dec [inc]	C1251/2	3	Denominator (with absolute value generation)
CONVPP1-OUT	phd	-	-	-	-	Without limitation, remainder considered

Function

Caution!

The conversion result is not limited. The result must therefore not exceed ±32767.

- The speed signal at CONVPP1-IN is evaluated using the factor from C1251/1 / C1251/2.

9.2.22 Characteristic function (CURVE)

Purpose

Conversion of an analog signal into a characteristic.

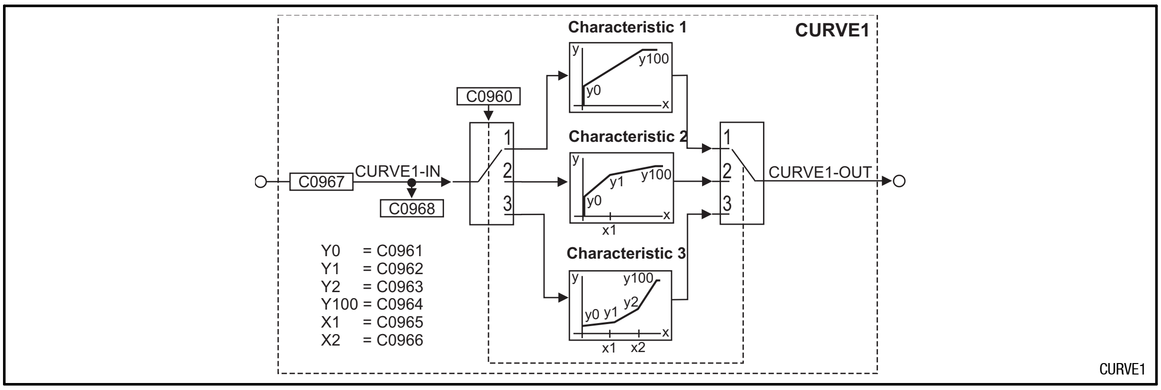


Fig. 9-51 Characteristic function (CURVE1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CURVE1-IN	a	C0968	dec [%]	C0967	1	5001	-
CURVE1-OUT	a	-	-	-	-	-	-

Range of functions

Under C0960, you can select the function:

- Characteristic with two co-ordinates
- Characteristic with three co-ordinates
- Characteristic with four co-ordinates

The codes for entering the co-ordinates can be obtained from the line diagrams.

Linear interpolation between the points.

For negative input values at CURVEx-IN, the settings of the co-ordinates are processed inversely (see line diagrams). If this is not desired:

- Connect absolute value generator (ABS) before or after the CURVE function block

or

- connect limiter (LIM) before or after the CURVE function block

9.2.22.1 Characteristic with two co-ordinates

Set C0960 = 1.

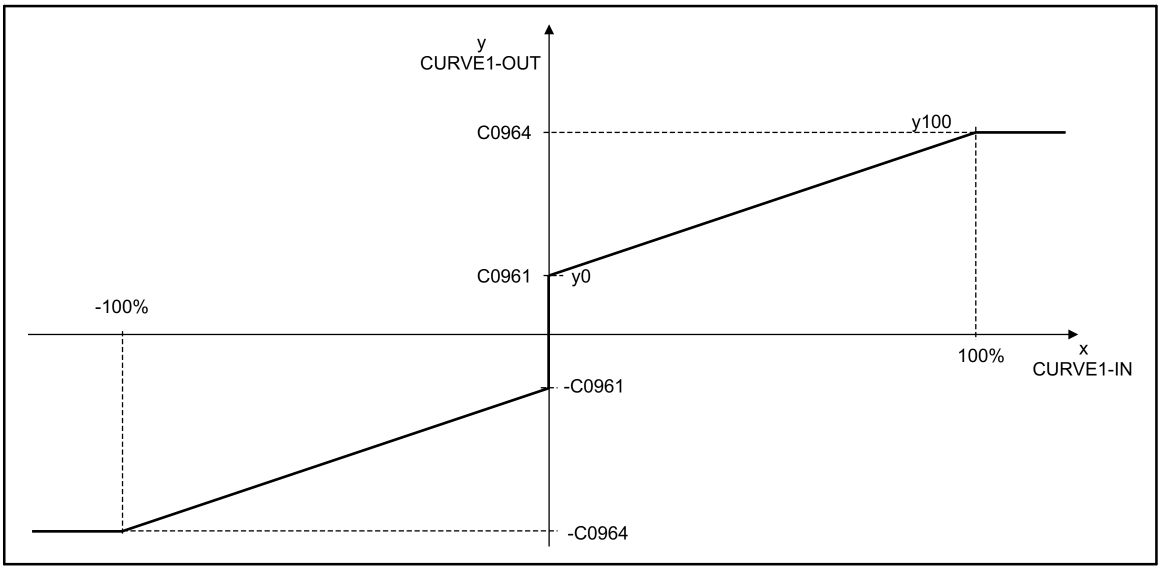


Fig. 9-52 Line diagram with 2 co-ordinates

9.2.22.2 Characteristic with three co-ordinates

Set C0960 = 2.

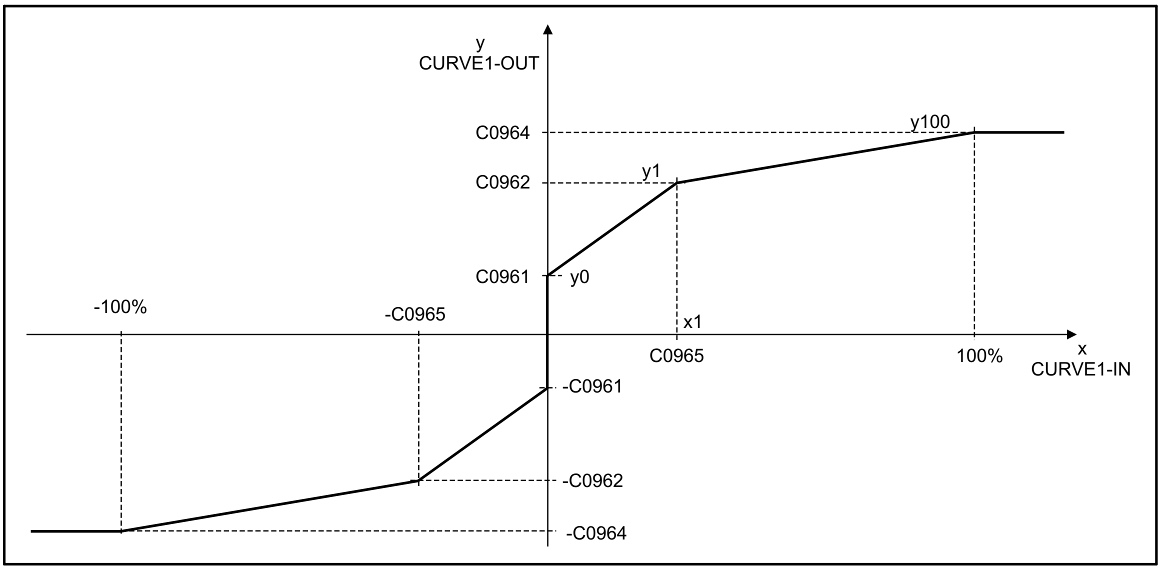


Fig. 9-53 Characteristic with 3 co-ordinates

9.2.22.3 Characteristic with four co-ordinates

Set C0960 = 3.

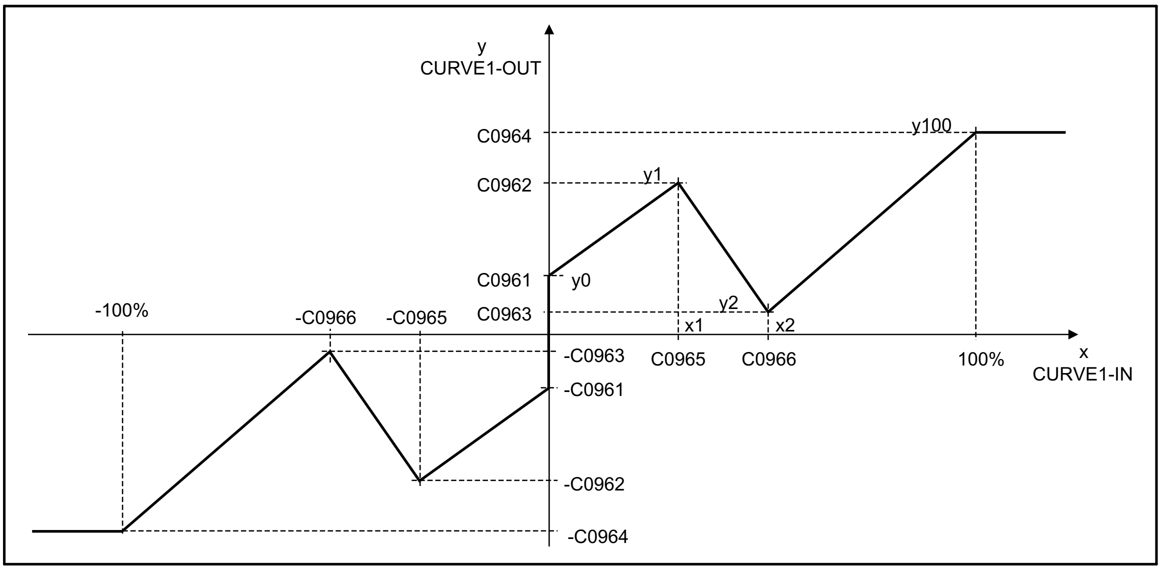


Fig. 9-54 Line diagram characteristic with four co-ordinates

9.2.23 Dead band (DB)

Purpose

The dead band element is used to set interfering influences around zero, e.g. interferences on analog input voltages, to digital zero.

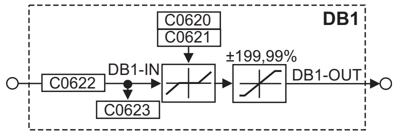


Fig. 9-55 Dead band element (DB1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DB1-IN	a	C0623	dec [%]	C0622	1	1000	-
DB1-OUT	a	-	-	-	-	-	limited to ±199,99 %

Function

- The dead band is parameterised under C0621.
- The gain is set under C0620.

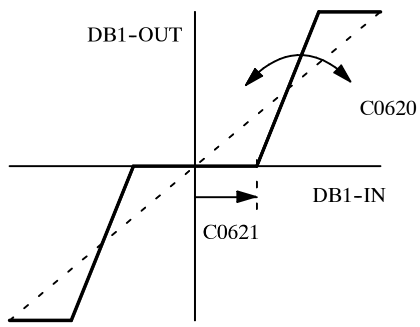


Fig. 9-56 Dead band and gain

9.2.24 Control of the drive controller (DCTRL)

Purpose

Controls the controllers to take over specified states (e.g. trip, trip reset, quick stop or controller inhibit).

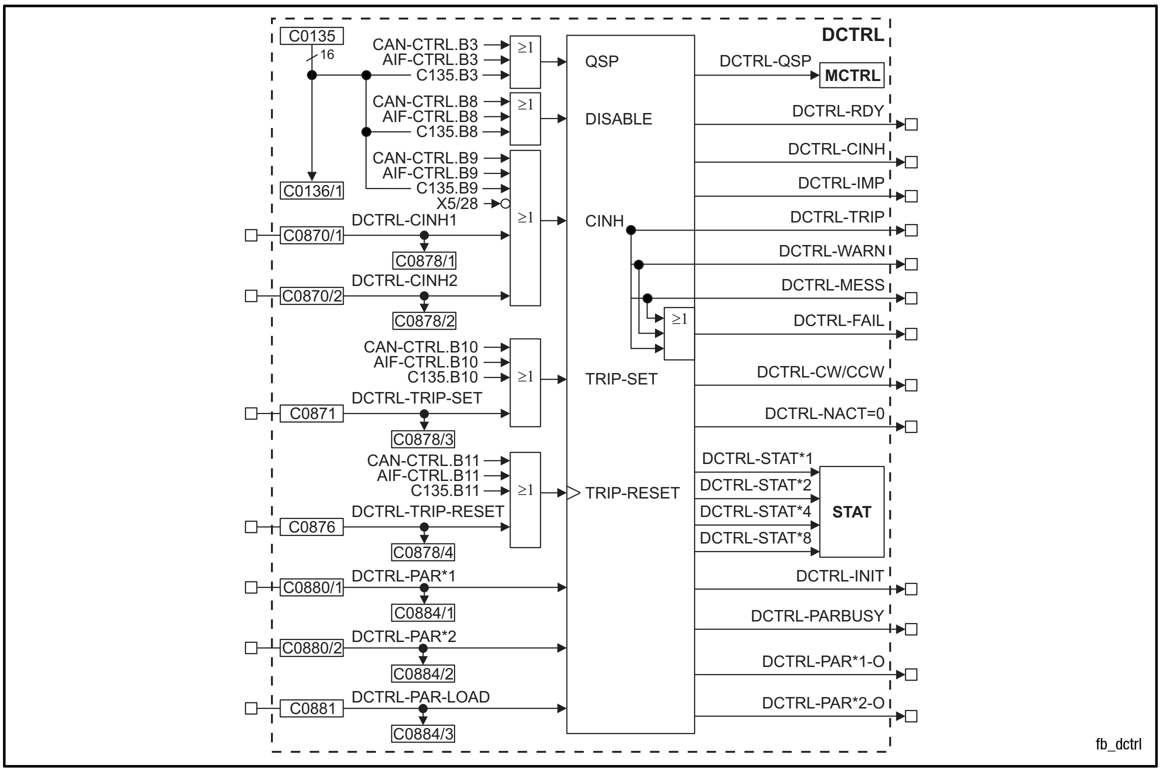


Fig. 9-57 Control of the controller (DCTRL)

Signal				Source			Note
Name	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-TRIP-RESET	d	C0878/4	bin	C0876	2	55	LOW-HIGH signal = Trip reset
DCTRL-PAR*1	d	C0884/1	bin	C0880/1	2	1000	Selecting a parameter set
DCTRL-PAR*2	d	C0884/2	bin	C0880/2	2	1000	Selecting a parameter set
DCTRL-PAR-LOAD	d	C0884/3	bin	C0881	2	1000	LOW-HIGH edge = Loading a parameter set
DCTRL-QSP	d	-	-	-	-	-	HIGH = drive performs quick stop
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 = parameter set changeover is active
DCTRL-PAR*1-0	d	-	-	-	-	-	Parameter set X is active (binary coded)
DCTRL-PAR*2-0	d	-	-	-	-	-	Parameter set X is active (binary coded)

Function

- Quick stop (QSP)
- Operation inhibited (DISABLE)
- Controller inhibit (CINH)
- TRIP-set
- TRIP-RESET
- Change of parameter set (PAR)
- Controller state

9.2.24.1 Quick stop (QSP)

The drive is braked to standstill via the deceleration ramp C105 and generates a holding torque.

- The function can be controlled by three inputs
  – Control word CAN-CTRL bit 3 of CAN-IN1
  – Control word AIF-CTRL bit 3 of AIF-IN
  – Control word C0135 bit 3
- All inputs are linked by an OR-operation.
- C0136/1 displays the control word C0135

9.2.24.2 Operation inhibit (DISABLE)

In this state it is not possible to start the drive by the command "Controller enable". The power output stages will be inhibited. All controllers will be reset.

- The function can be controlled by three inputs
  – Control word CAN-CTRL bit 8 of CAN-IN1
  – Control word AIF-CTRL bit 8 of AIF-IN
  – Control word C0135 bit 8
- All inputs are linked by an OR-operation.
- C0136/1 displays the control word C0135

9.2.24.3 Controller inhibit (CINH)

The power output stages will be inhibited. All controllers will be reset.

- The function can be controlled by six inputs
  – Terminal X5/28 (LOW = controller inhibit)
  – Control word CAN-CTRL bit 9 of CAN-IN1
  – Control word AIF-CTRL bit 9 of AIF-IN
  – Control word C0135 bit 9
  – Free inputs DCTRL-CINH1 and DCTRL-CINH2
- All inputs are linked by an OR-operation.
- C0136/1 displays the control word C0135

9.2.24.4 TRIP-SET

The drive is controlled into the state under code C0581 and indicates EEr (external monitoring).

- The function can be controlled by four inputs
  – Control word CAN-CTRL bit 10 of CAN-IN1
  – Control word AIF-CTRL bit 10 of AIF-IN
  – Control word C0135 bit 10
  – Free input DCTRL-TRIP-SET
- All inputs are linked by an OR-operation.
- C0136/1 displays the control word C0135

9.2.24.5 TRIP-RESET

Resets a pending trip if the fault has been remedied. If the cause of malfunction is still active, no reaction takes place.

- The function can be controlled by four inputs
  – Control word CAN-CTRL bit 11 of CAN-IN1
  – Control word AIF-CTRL bit 11 of AIF-IN
  – Control word C0135 bit 11
  – 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.
- C0136/1 displays the control word C0135

Tip!
If one of the inputs is set to HIGH, no LOW-HIGH edge can occur at the resulting signal.

9.2.24.6 Parameter set changeover (PAR)

The controller loads and operates with the parameter set selected.

- The parameter set to be loaded is selected via the inputs DCTRL-PAR*1 and DCTRL-PAR*2. The inputs are binary coded (1 from 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

- A LOW-HIGH edge at the input DCTRL-PAR-LOAD enables the controller to switch to the new parameter set.

Tip!

If the parameter set to be loaded via the terminal X5/Ex is already selected before switching on the supply voltage, there is no need for the LOW-HIGH edge at the input DCTRL-PAR-LOAD. In this case, the controller loads the selected parameter set automatically.

- The controller is not ready for operation for approx. one second. During this period, DCTRL-RDY displays LOW.

9.2.24.7 Controller state

The status is binary coded via the outputs DCTRL-STAT*x. These outputs are linked with the STAT function block inside the device.

The status can be evaluated via the status word C0150, CAN status word, and AIF status word.

STAT*8	STAT*4	STAT*2	STAT*1	Action of the controller
0	0	0	0	Initialisation after connection of the supply voltage
0	0	0	1	Lock mode, restart protection is 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”

9.2.25 Master frequency input (DFIN)

Purpose

Converting and scaling a power pulse current at the digital frequency input X9 into a speed and phase setpoint. The digital frequency is transferred in a high-precision mode (with offset and gain errors).

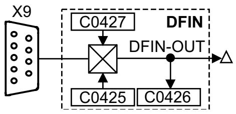


Fig. 9-58 Digital frequency input (DFIN)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
DFIN-OUT	phd	C0426	dec [rpm]	-	-	

Function

- The input is designed for signals with TTL level. (📖 4-52)
- In the event of digital frequency cascade or digital frequency rail, adapt the drive to the connected encoder or controller via C0425.
- The input of a zero track is optional.
- Via C0427 the following input signals can be evaluated:

C0427 = 0

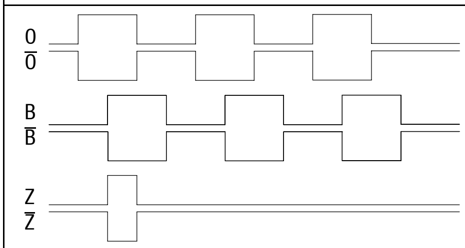


Fig. 9-59 Phase-delayed signal sequence (CW rotation)

CW rotation Track A is leading track B by 90 ° (positive value at DFIN-OUT)
CCW rotation Track A is lagging track B by 90 ° (negative value at DFIN-OUT)

C0427 = 1

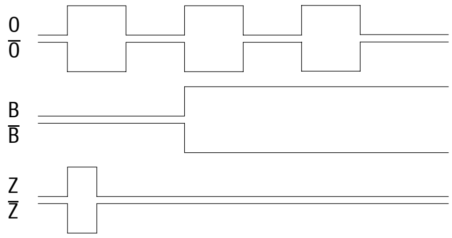


Fig. 9-60 Control of direction of rotation via track B

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

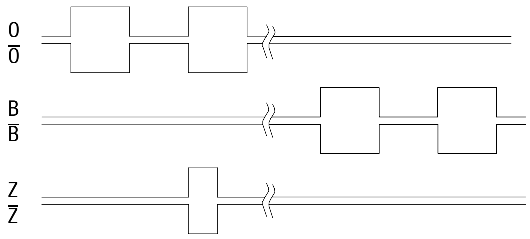


Fig. 9-61 Control of speed and direction of rotation via track A or track B

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

Transfer function

$$\text{DFIN-OUT [rpm]} = \text{f [Hz]} \cdot \frac{60}{\text{C0425}}$$

Example:

Input frequency = 200 kHz

C0425 = 3 (≙ a number of increments of 2048 Inc/rev.)

$$\text{DFIN-OUT [rpm]} = \text{200000 Hz} \cdot \frac{60}{2048} = \text{5859 rpm}$$

Signal adaptation

Finer resolutions than the power-of-two format can be realised by connecting an FB (e.g. CONV3 or CONV4).

Example:

The FB CONV3 converts the speed signal into a quasi-analog signal. The conversion is done according to the following formula:

$$\text{CONV3-OUT}\,[\%] = f\,[\text{Hz}] \cdot \frac{0.4}{\text{C0425}} \cdot \frac{\text{C0950}}{\text{C0951}}$$

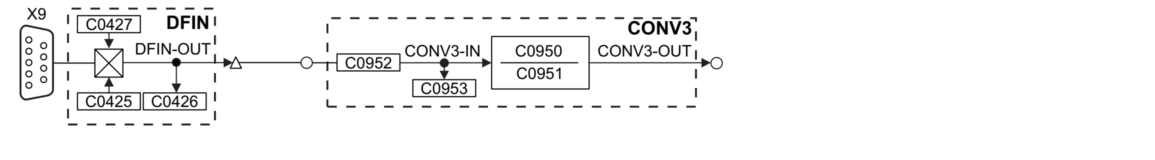


Fig. 9-62 Digital frequency input (DFIN) with connected converter

STOP

Stop!

If C0540 = 0, 1, 2, 3 and a feedback system C0025 > 10, you must not use the digital frequency input X9 anymore.

9.2.26 Digital frequency output (DFOUT)

Purpose

Converts internal speed signals into frequency signals and outputs them to subsequent drives. The transmission is highly precise (without offset and gain errors).

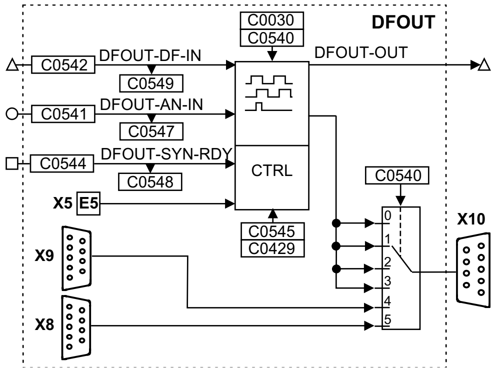


Fig. 9-63 Digital frequency output (DFOUT)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
DFOUT-DF-IN	phd	C0549	dec [rpm]	C0542	4	-
DFOUT-AN-IN	a	C0547	dec [%]	C0541	1	Input in [%] of nmax (C0011)
DFOUT-SYN-RDY	d	C0548	bin	C0544	2	-
DFOUT-OUT	phd	-	-	-	-	-

Function

- Output signals at X10
- Output of an analog signal
- Output of a speed signal
- Encoder simulation of the resolver with internal zero track
- Encoder simulation of the resolver with external zero track
- Direct output of X8
- Direct output of X9

9.2.26.1 Output signals to X10

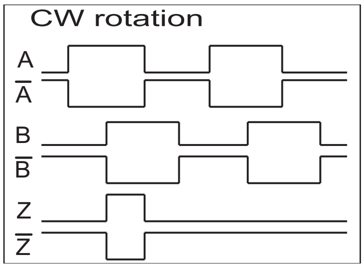


Fig. 9-64 Signal sequence for CW rotation (definition)

- The output signal corresponds to the simulation of an incremental encoder:
  – Track A, B and, if necessary, zero track as well as the corresponding inverted tracks are output with tracks shifted by 90 degrees.
  – The levels are TTL-compatible.
- Positive input values (CW rotation) result in the represented signal sequence.
- With negative input values (CCW rotation) track B is leading track A by 90°.
- The zero track is output according to the function set in C0540
- With C0030 the encoder constant of the encoder simulation is set.
- The function of the digital frequency output X10 is defined via C0540.

Stop!

C0540 = 0 to C0540 = 3 cannot be set if the connection to the digital frequency input DFIN X9 has been established and C0025 > 10 has been selected.

C0540	Signal at X10
0	DFOUT-AN-IN is output at X10; zero track can be input externally
1	DFOUT-DF-IN is output at X10; zero track can be input externally
2	Encoder simulation of the resolver with zero track in resolver zero position (mounted on the motor)
3	Encoder simulation of the resolver with external input of the zero track (terminal X5/E5)
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)

9.2.26.2 Output of an analog signal

For this purpose, set code C0540 = 0. The value applied at input DFOUT-AN-IN is converted into a frequency.

Transfer function

$$f\,[Hz] = DFOUT - AN - IN\,[\%] \cdot \frac{\text{Increments from C0030}}{100} \cdot \frac{C0011}{60}$$

Example:

DFOUT-AN-IN = 50 %

C0030 = 3, this corresponds to a number of increments of 2048 inc/rev.

C0011 = 3000 rpm

$$f\,[Hz] = 50\,\% \cdot \frac{2048}{100} \cdot \frac{3000}{60} = 51200\ Hz$$

Generating an index pulse

An artificial index signal can be generated for the output frequency.

1. Activate function by LOW → HIGH edge at input DFOUT-SYN-RDY.
2. A LOW → HIGH edge at terminal X5/E5 generates 360° later the index pulse. After this, every 360° an index pulse is generated according to C0030.
3. The index pulse is automatically shifted by the value C0545.

Tip!

This procedure must be done after every mains switching.

9.2.26.3 Output of a speed signal

- Set C0540 = 1.
  – This setting only converts the value at input DFOUT-DF-IN into a frequency.

Transfer function

$$f\,[Hz] = DFOUT\text{-}DF\text{-}IN\,[rpm] \cdot \frac{\text{Increments from C0030}}{60}$$

Example:

DFOUT-DF-IN = 3000 rpm

C0030 = 3, this corresponds to a number of increments of 2048 inc/rev.

$$f\,[Hz] = 3000\,[rpm] \cdot \frac{2048}{60} = 102400\,[Hz]$$

Generating an index pulse

An artificial index signal can be generated for the output frequency.

1. Input DFOUT-SYN-RDY = set edge of LOW → HIGH.
2. A LOW-HIGH edge at terminal X5/E5 generates 360° later the index pulse. After this, every 360° an index pulse is generated according to C0030.
3. The index pulse can be shifted by +360° via C0545 (65536 inc = 360°).

9.2.26.4 Encoder simulation of the resolver

Set C0540 = 2 or C0540 = 3 (depending on the desired generation of the zero track)

- The function is used when a resolver is connected to X7.
- The encoder constant for output X10 is set in C0030.

Generating an index pulse in resolver zero position (C0540 = 2)

The output of the index pulse with regard to the rotor depends on how the resolver is mounted to the motor.

- The index pulse can be shifted by +360° via C0545 (65536 inc = 360°).

Generating an external index pulse (C0540 = 3)

An artificial index signal can be generated for the output frequency.

- Set input DFOUT-SYN-RDY to HIGH.
- 360° later, a LOW-HIGH edge generates the index pulse.
  – After this, every 360° an index pulse is generated according to C0030.
- The index pulse can be shifted by +360° via C0545 (65536 inc = 360°).

9.2.26.5 Direct output of X8 (C0540 = 5)

- The input signal at X8 is electrically amplified and directly output.
- The signals depend on the assignment of the input X8.
- C0030 and C0545 have no function.
- The zero track is only output if it is connected to X8.

9.2.26.6 Direct output of X9 (C0540 = 4)

- The input signal at X9 is electrically amplified and directly output.
- The signals depend on the assignment of the input X9.
- C0030 and C0545 have no function.
- The zero track is only output if it is connected to X9.

Tip!

For directly outputting X8 or X9 to the digital frequency output X10 the function block DFOUT does not need to be entered into the processing table.

9.2.27 Digital frequency ramp function generator (DFRFG)

Purpose

The drive (motor shaft) is synchronised to a digital frequency (phase selection). The drive then performs a phase-synchronous operation with the digital frequency.

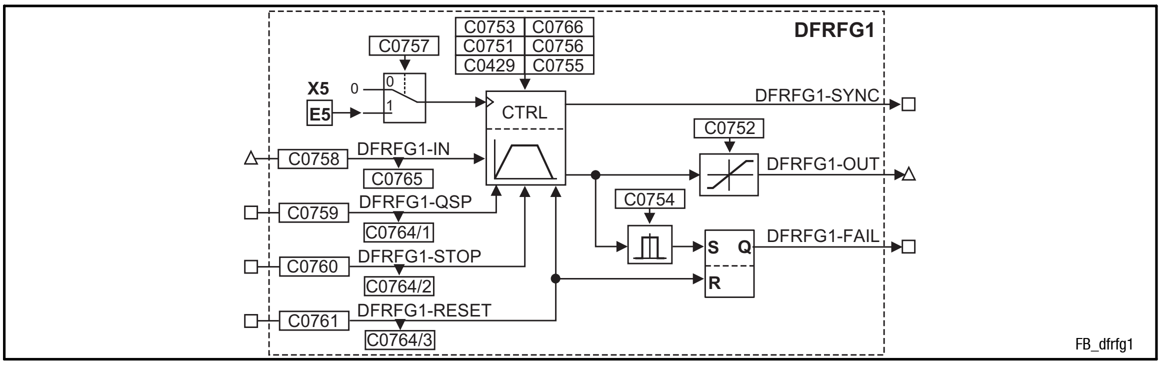


Fig. 9-65 Digital frequency ramp function generator (DFRFG1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
DFRFG1-SET	phd	C0769	-	C0768	-	Initial speed
DFRFG1-IN	phd	C0765	dec [rpm]	C0758	4	Speed/Phase setpoint
DFRFG1-QSP	d	C0764/1	bin	C0759	2	HIGH = quick stop
DFRFG1-STOP	d	C0764/2	bin	C0760	2	HIGH = save setpoint
DFRFG1-RESET	d	C0764/3	bin	C0761	2	HIGH = reset
DFRFG1-OUT	phd	-	-	-	-	Speed/Phase setpoint
DFRFG1-SYNC	d	-	-	-	-	HIGH = drive runs synchronously
DFRFG1-FAIL	d	-	-	-	-	HIGH = phase difference exceeded

Function

- Profile generator
- Quick stop
- Ramp function generator stop
- RESET
- Detect phase difference
- Start via touch probe initiator (terminal X5/E5)
- Correction of the touch probe initiator (terminal X5/E5)

9.2.27.1 Profile generator

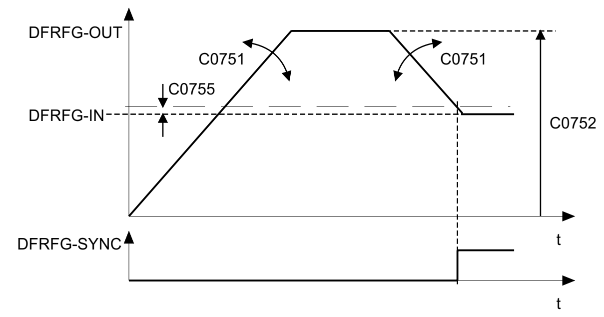


Fig. 9-66 Synchronisation on DFRFG

The profile generator generates ramps which lead the setpoint phase to its target position.

- Set acceleration and deceleration via C0751.
- Set max. speed via C0752.
- When distance and speed reach their setpoints, the output switches DFRFG1-SYNC = HIGH. At the same time the FB switches the profile generator to ”inactive”.
- Set the switching point via C0755.

STOP

Stop!

Do not operate the drive with this function at the torque limitation M_{max}, I_{max}.

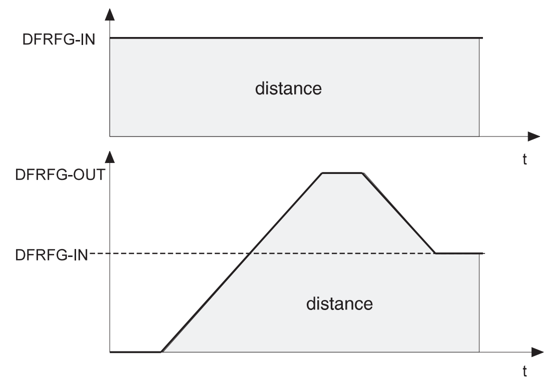


Fig. 9-67 Speed-time diagram DFRFG

The number of increments at DFRFG-IN (master drive) defines the target position. The target 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).

9.2.27.2 Quick stop

Removes the drive from the network and brakes it to standstill.

- Activate with DFRFG-QSP = HIGH.
- Set deceleration time via C0753.
- Store the setpoint phase detected at DFRFG-IN.
- Approach the setpoint phase via the profile generator after resetting the quick stop request.

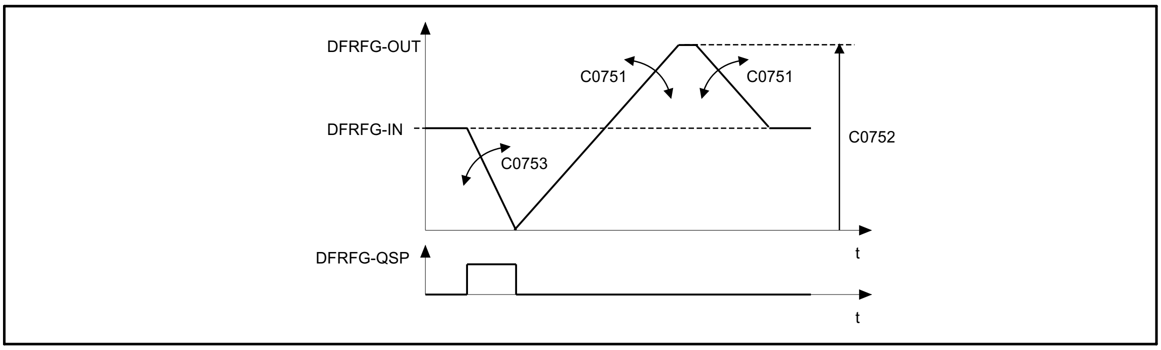


Fig. 9-68 Quick stop DFRFG

9.2.27.3 Ramp function generator stop

Maintains the state of the profile generator during operation.

- Activate with DFRFG-STOP = HIGH.
- Output of the last state at DFRFG-OUT.
- Store the setpoint phase detected at DFRFG-IN.
- Approach the setpoint phase via the profile generator after resetting the stop request.

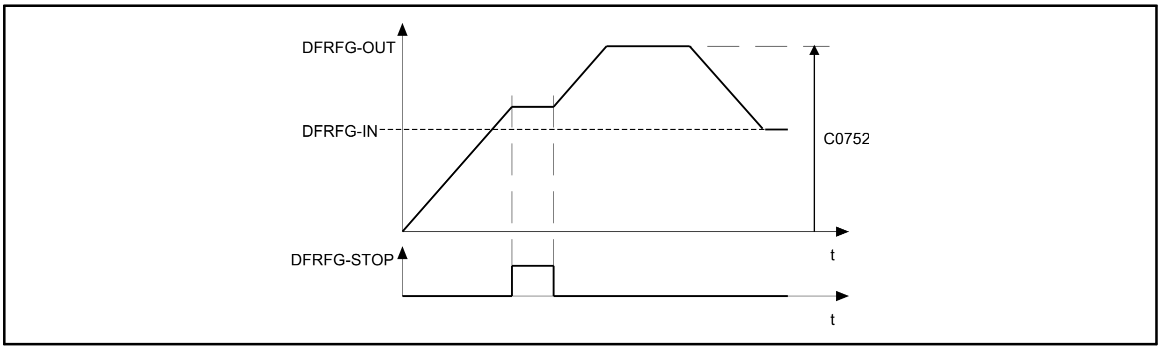


Fig. 9-69 Ramp function generator stop

9.2.27.4 RESET

DFRFG-RESET = HIGH:

- Resets setpoint phases which are internally added.
- Activates the profile generator.
- HIGH-LOW edge at DFRFG-RESET: Detecting the setpoint phase.

9.2.27.5 Detect phase difference

Monitoring the phase difference between input DFRFG-IN and output DFRFG-OUT.

- Set limit value of monitoring via C0754.
- Activate the monitoring: DFRFG-FAIL = HIGH
- Store the signal until DFRFG-RESET = HIGH.
- The profile generator can accept a phase difference of up to ±2140000000 inc (= 32000 revolutions).

9.2.27.6 Start via touch probe initiator (terminal X5/E5)

Stop!
In the default setting the terminal X5/E5 is assigned to another function.

Function

- Set C0757 = 1.
- The function is activated by **simultaneously** setting the inputs:
  – DFRFG-QSP and DFRFG-RESET = HIGH.
- Starting procedure:
  – Signals at DFRFG-QSP and DFRFG-RESET = LOW.
  – Otherwise touch probe signals are ignored.
- A LOW-HIGH edge at terminal X5/E5 starts the process:

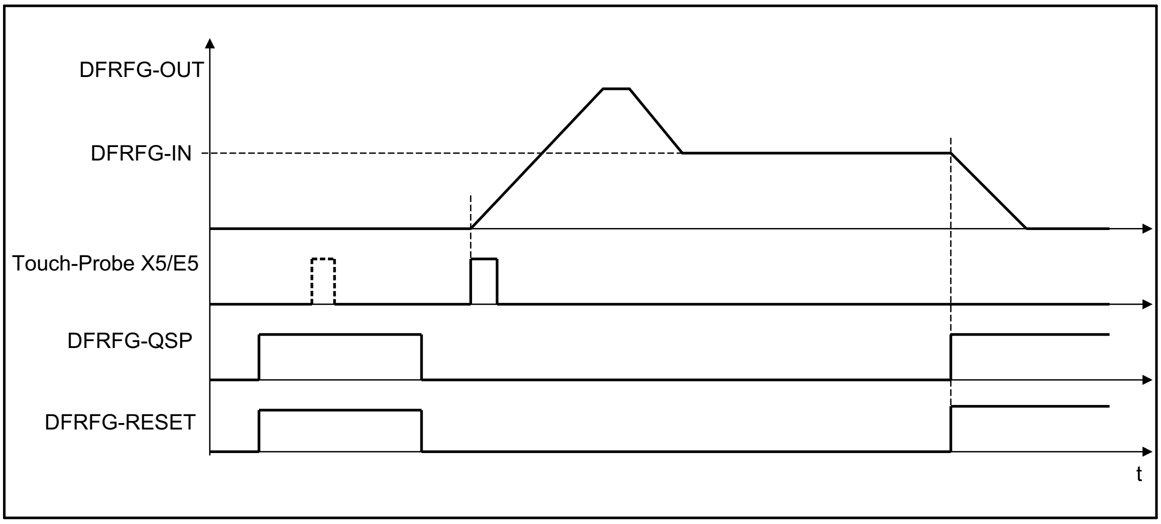


Fig. 9-70 Start via touch probe initiator (terminal X5/E5)

9.2.27.7 Correction of the touch probe initiator (terminal X5/E5)

Delay times during the activation of the initiator cause a speed-dependent phase offset (e.g. during positioning, synchronising).

- Set correction value for the phase offset under C0429.
- Formula for correction value:

$$\text{Correction value C0429} = 16384 \times \text{correction value}$$

- You can take the correction value from the data sheet of the initiator or contact the manufacturer.

9.2.27.8 Offset setting

The offset can be set with the code C0756 (see chapter 9.4; code list). The offset refers to the digital frequency input and is scaled to one revolution (≙ 65536 increments).

The touch probe (TP) initiates the start of the ramp function generator. The leading of the master drive from the moment of starting or the resulting path/phase difference is taken up during the acceleration phase.

- Setting: positive offset values
  – Causes a time shift of the TP
  – This means that less time is necessary - compared to the setting with e.g. offset = 0 - to obtain synchronism with the master drive.

Tip!

With high offsets and low input speeds the drive may reverse. To avoid this, a direction of rotation can be selected for the output via C0766.

9.2.28 Digital frequency processing (DFSET)

Purpose

Conditions the digital frequency for the controller. Input of the stretching factor, gearbox factor, and speed or phase trimming.

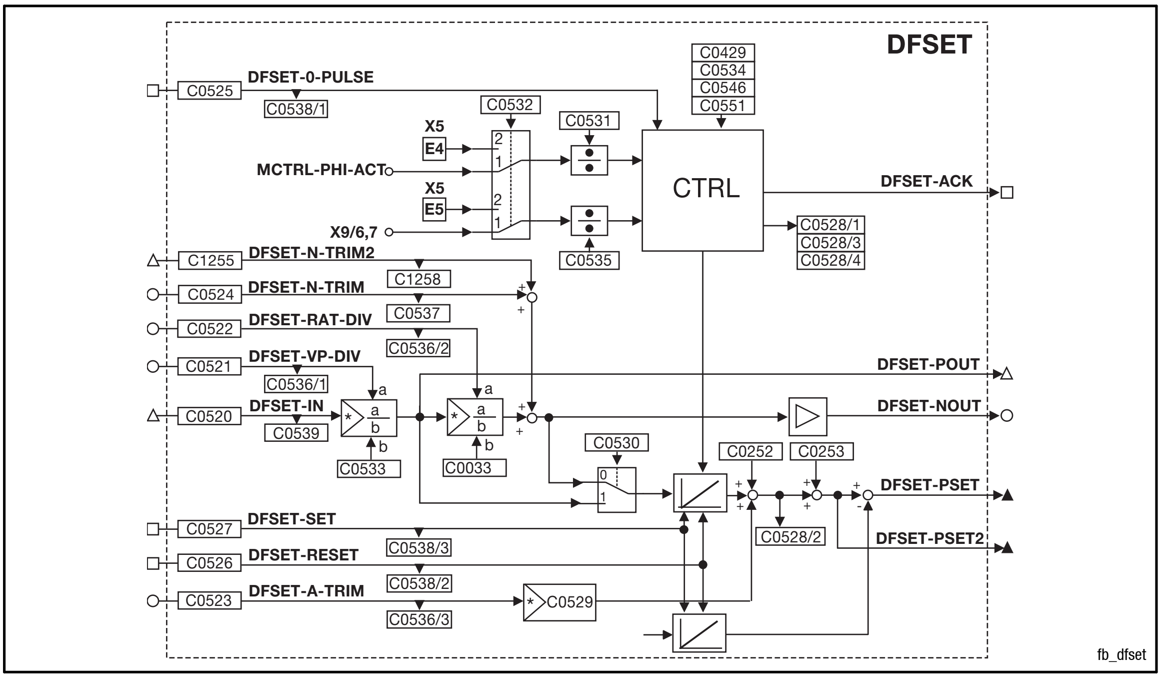


Fig. 9-71 Digital frequency processing (DFSET)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
DFSET-IN	phd	C0539	dec [rpm]	C0520	4	Speed/Phase setpoint
DFSET-N-TRIM	0	C0537	dec [%]	C0524	1	Speed trimming in [%] of C0011
DFSET-N-TRIM2	phd	C1258	dec [rpm]	C1255	4	Speed trimming in [rpm] of C0011
DFSET-A-TRIM	0	C0536/3	dec [inc]	C0523	1	Phase trimming 100% = 16384 inc
DFSET-VP-DIV	0	C0536/1	dec	C0521	1	Numerator of stretching factor 100 % = 16384 inc
DFSET-RAT-DIV	0	C0536//2	dec	C0522	1	Numerator of gearbox factor 100 % = 16384 inc
DFSET-0-PULSE	d	C0538/1	bin	C0525	2	HIGH = Enabling of zero pulse synchronising
DFSET-SET	d	C0538/3	bin	C0527	2	• HIGH = Set phase integrators to equal values • LOW-HIGH edge sets DFSET-PSET = 0 • HIGH-LOW edge sets DFSET-PSET = momentary value of MCTRL-PHI-SET • DFSET-SET has a higher priority than DFSET-RESET
DFSET-RESET	d	C0538/2	bin	C0526	2	• HIGH = sets position difference = 0 • HIGH = sets DFSET-PSET and DFSET-PSET2 = 0
DFSET-NOUT	0	-	-	-	-	in [%] of nmax (C0011)
DFSET-POUT	phd	-	-	-	-	Speed/Phase setpoint
DFSET-PSET	ph	-	-	-	-	Following error for phase controller
DFSET-PSET2	ph	-	-	-	-	Phase setpoint 65536 inc = 1 revolution
DFSET-ACK	d	-	-	-	-	HIGH = Synchronising is performed

Function

- Setpoint conditioning with stretch and gearbox factor
- Processing of correction values
- Synchronising to zero track or touch probe (for resolver feedback touch probe only)
- Suppressing fault signals when synchronising via touch probe

9.2.28.1 Setpoint conditioning with stretching and gearbox factor

Stretching factor

Defines the ratio between the drive and the setpoint.

- The stretching factor evaluates the setpoint at DFSET-IN. DFSET-POUT outputs the result.
- The stretching factor results from numerator and denominator.
  – Numerator is variable from analog signal source or fixed value by the code.
  – Input of the denominator under C0533.
- Relationship:

$$\text{DFSET–POUT} = \text{DFSET–IN} \cdot \frac{\text{DFSET–VP–DIV}}{\text{C0533}}$$

Gearbox factor

Defines the transmission ratio of the drive. Enter the ratio of the drive.

- The gearbox factor evaluates the setpoint at DFSET-IN multiplied by the stretching factor. DFSET-NOUT outputs the result.
- The gearbox factor results from numerator and denominator.
  – Numerator is variable from analog signal source or fixed value by the code.
  – Input of the denominator under C0033.
- Relationship:

$$\text{DFSET–NOUT} = \text{Reckfaktor} \cdot \frac{\text{DFSET–RAT–DIV}}{\text{C0033}}$$

$$\text{DFSET–NOUT} = \text{DFSET–IN} \cdot \frac{\text{DFSET–VP–DIV}}{\text{C0533}} \cdot \frac{\text{DFSET–RAT–DIV}}{\text{C0033}}$$

9.2.28.2 Processing of correction values

Speed trimming

This is used to add correction values, e.g. by a superimposed control loop. This enables the drive to accelerate or decelerate.

- Adds an analog value at DFSET-N-TRIM to the setpoint speed.
- Adds a speed value at DFSET-N-TRIM2 to the setpoint speed.
  – The speed trimming via this input is more precise.

Phase trimming

This 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 (≙ ±1/2 rev.). Every analog signal can be used as a source.

- The input is done in increments (one revolution ≙ 65536 increments).
- When analog values are entered, 100% correspond to 1/4 revolution = 16384 increments.
- Extension of the setting range with a multiplier under C0529.

Phase offset

Addition of a fixed phase offset under C0252 to the setpoint of the drive.

Speed-proportional phase setting

Leading or lagging of the phase with rising speed.

- Enter a suitable setting in increments under code C0253.
- The set phase offset is reached at 15000 rpm of the drive (linear relationship).

9.2.28.3 Synchronising to zero track or touch probe

The synchronisation is selected under C0532.

- C0532 = 1, index pulse
  – zero track of digital frequency input X9 and zero track by the feedback system set under C0490 (not for resolver evaluation).
- C0532 = 2, touch probe
  – via terminals X5/E4 (actual pulse) and X5/E5 (set pulse).

Touch probe initiators can have delay times which cause a speed-dependent phase offset.

- Set correction value for the phase offset under C0429.
- Formula for correction value at C0429:

Correction value at C0429 = 16384 × correction value

- Please take the values from the data sheet of the initiator or contact the manufacturer.

Stop!
When the synchronisation via the terminals X5/E4 and X5/E5 (C0532 = 2) is activated, no further control signals must be taken from these terminals. Changing the configuration via C0005 assigns the terminals with a basic setting.

Synchronisation mode

For the synchronisation, different modes are available which can be set under C0534.

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 edge at DFSET-0-pulse, the zero pulse is synchronised once
10	One-time synchronisation, a phase deviation is corrected in the shortest possible way	After a LOW-HIGH edge at DFSET-0-pulse, the zero pulse is synchronised once
11	One-time synchronisation, a phase deviation is corrected in CW direction	After a LOW-HIGH edge at DFSET-0-pulse, the zero pulse is synchronised once
12	One-time synchronisation, a phase deviation is corrected in CCW direction	After a LOW-HIGH edge at DFSET-0-pulse, the zero pulse is synchronised once
13	One-time 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	After a LOW-HIGH edge at DFSET-0-pulse, the zero pulse is synchronised once

9.2.28.4 Suppressing fault signals when synchronising via touch probe

Interference pulses which act on the actual pulse and setpoint pulse signal at the inputs X5/E4 and X5/E5 can cause unwanted transients and faulty functions.

As of software version 6.2 it is possible to filter interference pulses via masking windows, thus reducing interferences by up to 90%, depending on the application.

The masking windows can be set separately, one for the actual pulses (X5/E4) via C0546 and one for the setpoint pulses (X5/E5) via C0551.

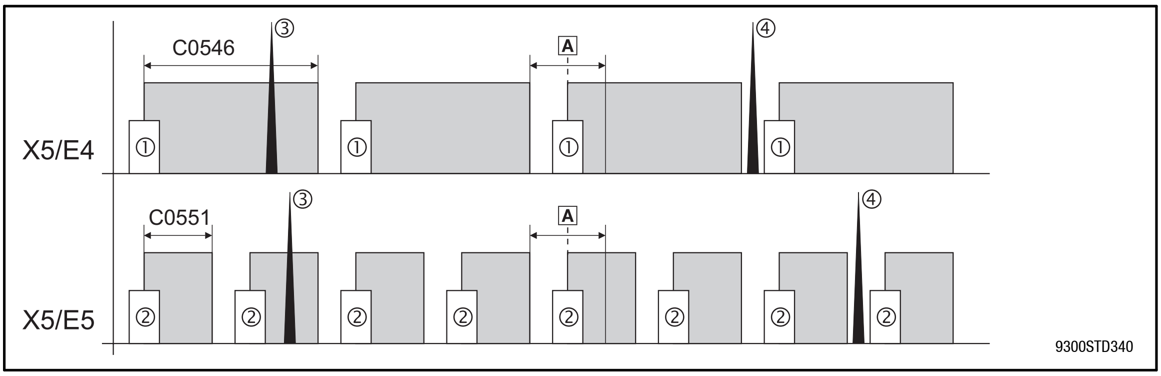


Fig. 9-72 Masking of interference pulses for setpoint and actual pulses

- A Variations of the actual/setpoint pulses
- ① Actual pulses at X5/E4
- ② Setpoint pulses at X5/E5
- ③ Interference pulse in the masked area is filtered out
- ④ Interference pulse in a non-masked area causes transients

Setting of masking window

1. Measure the number of increments between two pulses. Since the number varies depending on the application, the variation limits must be detected and considered when setting the masking windows.
   – Code C0528/4 indicates the number of increments between two actual pulses at X5/E4.
   – Code C0528/3 indicates the number of increments between two setpoint pulses at X5/E5.
2. Set the size of the masking window, considering the variation limits. The higher the limits the smaller the masking window must be set.
   – Via C0546 the size of the masking window between two actual pulses is set by the number of pulses at X5/E4.
   – Via C0551 the size of the masking window between two setpoint pulses is set by the number of pulses at X5/E5.
   – Consider the division factors C0531 and C0535 when setting the masking windows.

9.2.29 Delay elements (DIGDEL)

Purpose

This function is used to delay digital signals. These operations can be used for the control of functions or the generation of status information.

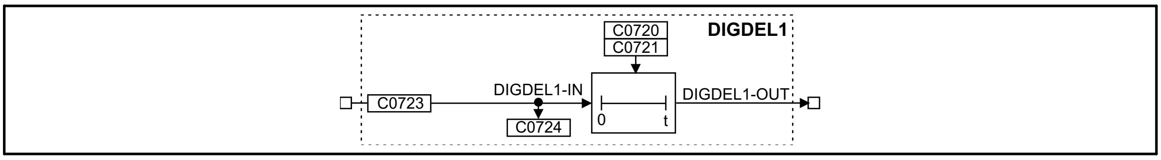


Fig. 9-73 Delay element (DIGDEL1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DIGDEL1-IN	d	C0724	bin	C0723	2	1000	-
DIGDEL1-OUT	d	-	-	-	-	-	-

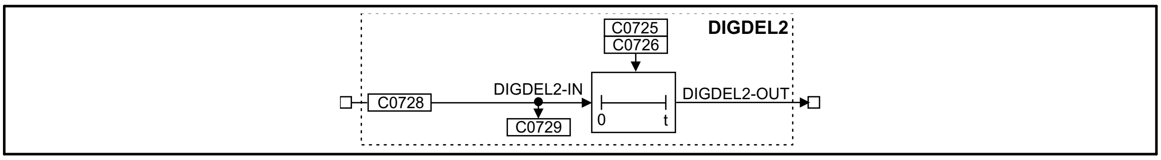


Fig. 9-74 Delay element (DIGDEL2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DIGDEL2-IN	d	C0729	bin	C0728	2	1000	-
DIGDEL-OUT	d	-	-	-	-	-	-

Function

You can select the following functions under C0720 (DIGDEL1) and C0725 (DIGDEL2):

- on-delay
- dropout delay
- general delay

9.2.29.1 On-delay

If the on-delay is set, a signal change at the input DIGDELx-IN from LOW to HIGH is passed on to the DIGDELx-OUT output after the delay time set under C0721 or C0726 has elapsed.

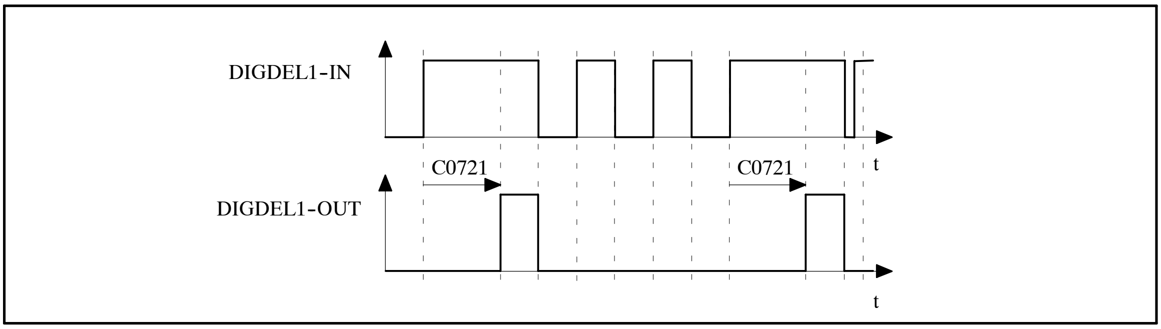


Fig. 9-75 On-delay (DIGDEL1)

In this function, the time-element operates like a retriggerable monoflop:

- A LOW-HIGH edge at the input DIGDELx-IN starts the time element.
- If the delay time set under C0721 or C0726 has elapsed, the output DIGDELx-OUT is set to HIGH.
- The time element is reset and the output DIGDELx-OUT is set to LOW with a HIGH-LOW edge at the input DIGDELx-IN.

9.2.29.2 Dropout delay

A dropout delay causes a signal change at the input DIGDELx-IN from HIGH to LOW to be passed on to the output DIGDELx-OUT if the delay time set under C0721 or C0726 has elapsed.

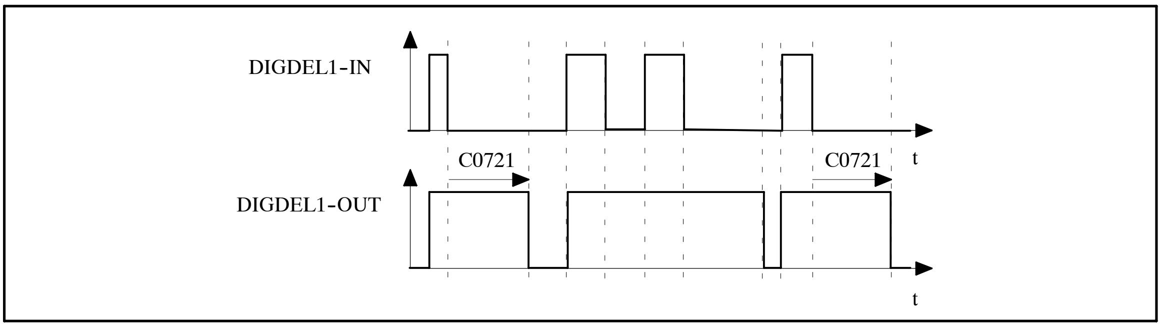


Fig. 9-76 Dropout delay (DIGDEL1)

- A LOW-HIGH edge at the input DIGDELx-IN causes the output DIGDELx-OUT to be set to HIGH and the time element to be reset.
- The time element is started with a HIGH-LOW edge at the input DIGDELx-IN.
- After the delay time set under C0721 or C0726 has elapsed, the output DIGDELx-OUT is set to LOW.

9.2.29.3 General delay

A general delay causes any signal change at the input DIGDELx-IN to be passed to the output DIGDELx-OUT only after the time set under C0721 or C0726 has elapsed.

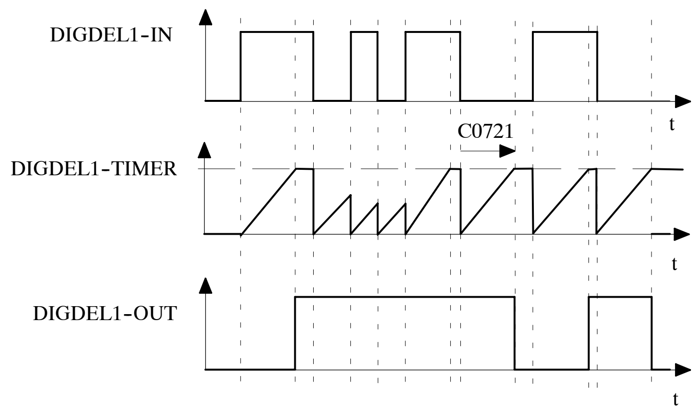


Fig. 9-77 General delay

- The time element is started with any edge at the input DIGDELx-IN.
- When the timer (can be set under C0721 or C0726) has reached the upper limit, the output DIGDELx-OUT is set to the same value as the input DIGDEL1-IN.

9.2.30 Freely assignable digital inputs (DIGIN)

Purpose

Reading and conditioning of the signals at the terminals X5/E1 to X5/E5.

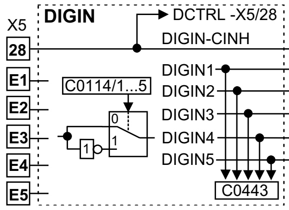


Fig. 9-78 Freely assignable digital inputs (DIGIN)

Signal				Source			Note
Name	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	-	-	-	-

Function

The terminals X5/E1 to X5/E5 are scanned every millisecond. The level for every input can be inverted. For this, proceed as follows:

- Select code C0114 with corresponding subcode (e.g. subcode 3 for input X5/E3)
- Enter the desired level as a parameter:
  – 0 = Level not inverted (HIGH active)
  – 1 = Level inverted (LOW active)

9.2.31 Freely assignable digital outputs (DIGOUT)

Purpose

Conditioning of the digital signals and output to the terminals X5/A1 to X5/A4.

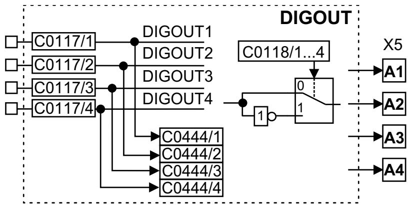


Fig. 9-79 Freely assignable digital outputs (DIGOUT)

Signal				Source			Note
Name	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. For this, proceed as follows:

- Select code C0118 with corresponding subcode (e.g. subcode 3 for output X5/A3)
- Enter the desired level as a parameter:
  – 0 = Level not inverted (HIGH active)
  – 1 = Level inverted (LOW active)

9.2.32 First order derivative-action element (DT1)

Purpose

Derivative action of signals.

For instance, used for the speed injection (dv/dt).

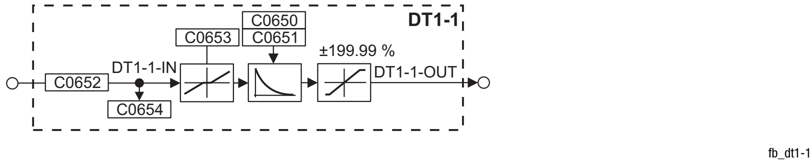


Fig. 9-80 First order derivative-action element (DT1-1)

Signal				Source			Note
Name	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 is set under C0650.
- The delay T_V is set under C0651.
- The input sensitivity of the DT1-1 element can be reduced under C0653.
- The FB only evaluates the specified most significant bits, according to the setting.

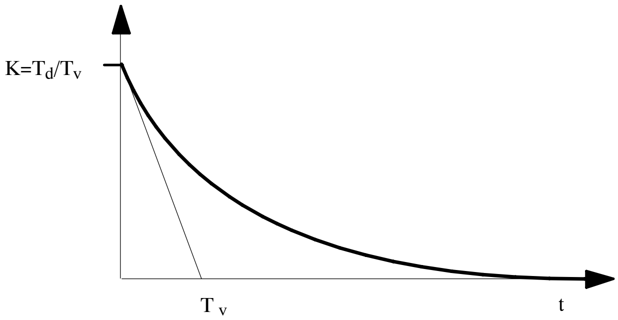


Fig. 9-81 Delay time T_V of the first order derivative-action element

9.2.33 Free piece counter (FCNT)

Purpose

Digital up/down counter

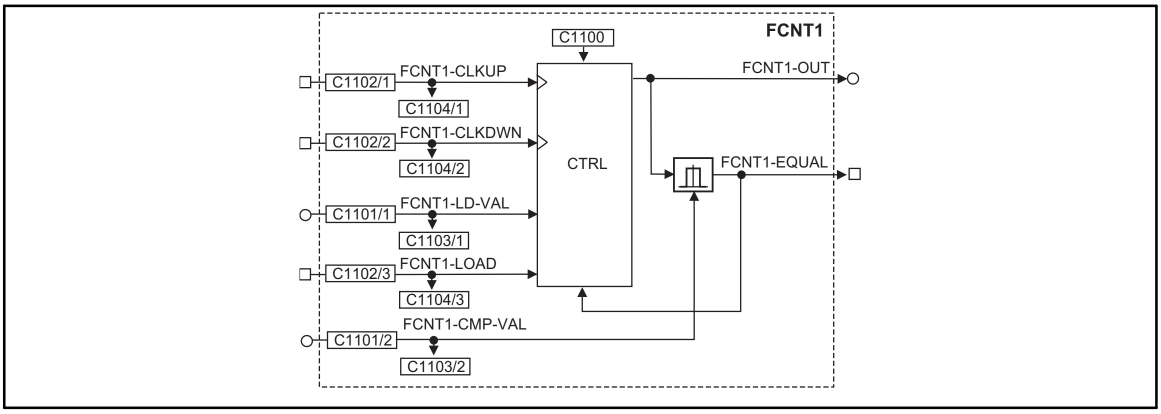


Fig. 9-82 Free piece counter (FCNT1)

Signal				Source		Note
Name	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	Starting 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 ±199.99 % (≙ ±32767)
FCNT1-EQUAL	d	-	-	-	-	HIGH = comparison value reached

Function

C1100 = 1

- For | counter | ≥ | FCNT1-CMP-VAL | (comparison value):
  – For 1 ms FCNT1-EQUAL = HIGH
  – Resets the counter to its start value (FCNT1-LD-VAL)

Note!

If the signal is to be set for a longer time, e.g. when the output is requested by a PLC, you can extend the signal with the TRANS function block.

C1100 = 2

- For | counter | = | FCNT1-CMP-VAL | (comparison value):
  – The counter stops
- FCNT1-LOAD = HIGH resets the counter to the start value (FCNT1-LD-VAL)

9.2.34 Free digital outputs (FDO)

Purpose

This function block can be used to conncet signals via C0151, the function block AIF-OUT and function block CAN-OUT to the connected fieldbus systems.

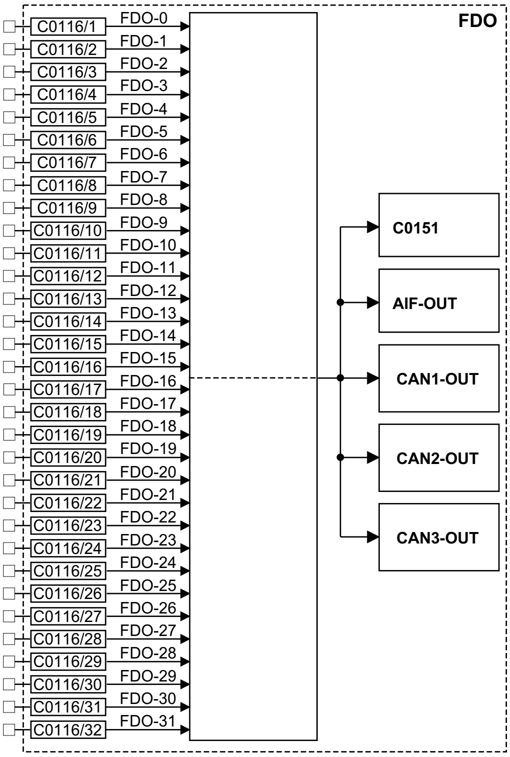


Fig. 9-83 Free digital outputs (FDO)

Signal				Source			Note
Name	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 (DWORD) is marked with FDO-x (e.g. FDO-0 for the LSB and FDO-31 for the MSB).
- The DWORD is transferred to code C0151 and to the function blocks AIF-OUT, CAN-OUT1, CAN-OUT2, and CAN-OUT3.

9.2.35 Freely assignable input variables (FEVAN)

Purpose

Transfer of analog signals to any code. At the same time, the FB converts the signal into the data format of the target code.

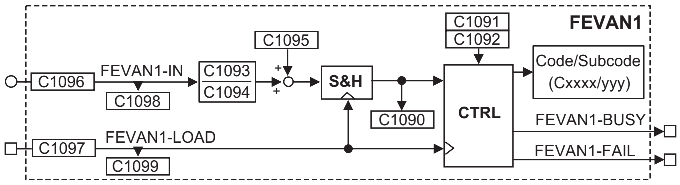


Fig. 9-84 Freely assignable input variables (FEVAN1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
FEVAN1-IN	0	C1098	dec	C1096	1	Input value
FEVAN1-LOAD	d	C1099/1	bin	C1097/1	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 FEFAN1-LOAD sets FEFAN1-FAIL = LOW.
-	-	C1090	-	-	-	Display of the converted signal

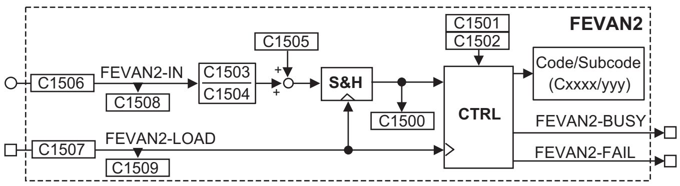


Fig. 9-85 Freely assignable input variables (FEVAN2)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
FEVAN2-IN	0	C1508	dec	C1506	1	Input value
FEVAN2-LOAD	d	C1509/1	bin	C1507/1	2	A LOW-HIGH edge transmits the converted signal to the target code.
FEVAN2-BUSY	d	-	-	-	-	HIGH = transmitting
FEVAN2-FAIL	d	-	-	-	-	HIGH = transmission failed A LOW-HIGH edge at FEFAN2-LOAD switches FEFAN2-FAIL = LOW.
-	-	C1500	-	-	-	Display of the converted signal

Function

- Conversion of the read data via:
  – Numerator, denominator.
  – Offset.
- Selection of a target code for the read data.

Codes for the conversion of the data read and for the selection of the target code

				Selection of the target code		
Function block	Numerator	Denominator	Offset	Code	Subcode	Examples
FEVAN1	C1093	C1094	C1095	C1091	C1092	
FEVAN2	C1503	C1504	C1505	C1501	C1502	

Data transmission

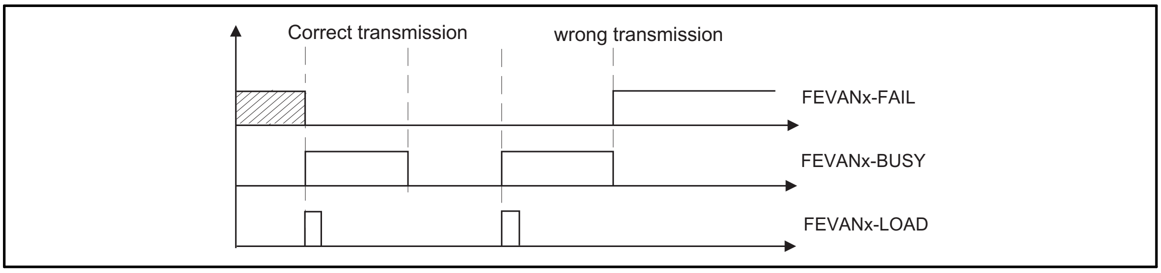


Fig. 9-86 Signal flow

Transmission errors may occur if

- no target code is available,
- no target subcode is available,
- the data transmitted are out of the target code limits,
- the target code is inhibited since it may only be written if the controller is inhibited. Inhibit the controller (see code table).

Cyclic data transmission

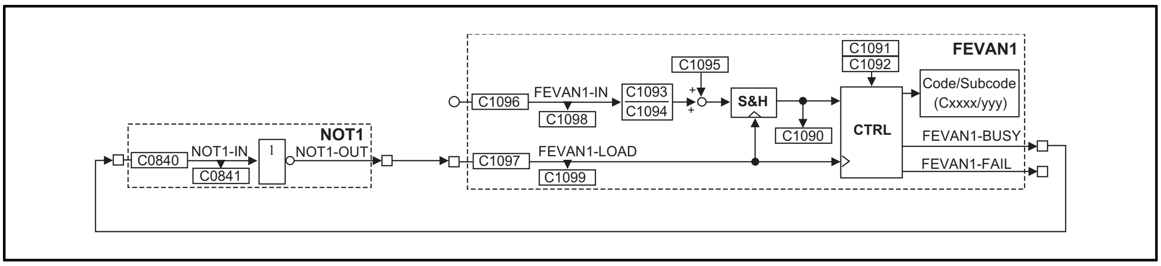


Fig. 9-87 Example for a cyclic data transmission to a target code

Conversion

In the example, the conversion is made at FB FEVAN1.

- The data format of the target code is important for the conversion (see attribute table, chapter 9.5.2).
- Adapt the input signal to the data format of the target code:
  – C1093 (numerator).
  – C1094 (denominator).
- C1094 also fixes the decimal positions of the target code:
  – Set C1094 according to the existing decimal positions of the target code. The number of decimal positions can be obtained from the code table.
  – 0.0001 ≙ no decimal positions.
  – 0.001 ≙ one decimal position.
  – 0.01 ≙ two decimal positions.
  – 0.1 ≙ three decimal positions.
  – 1 ≙ four decimal positions.
- For target codes with % scaling the formula for conversion must include a scaling factor (see example 1).

Example 1 (only for FIX32 format with % scaling):

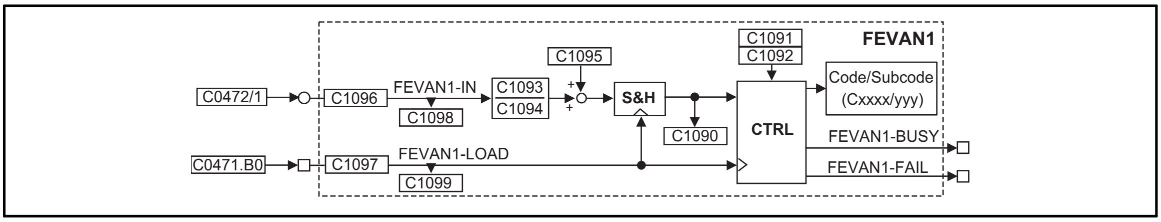


Fig. 9-88 Example of a circuit for FIX32 format with % scaling

Task:

- C0472/1 = 1.05 %. Write this value to C0141.

Configuration:

- Connect FEVAN1-IN (C1096) with FCODE-472/1 (19521).
- Connect FEVAN1-LOAD (C1097/1) with FCODE-471.B0 (19521).

Parameter setting:

- Set C1091 = 141 (≙ C0141)
- Set C1092 = 0 (no subcode available)
- C1093 = calculate numerator
- Set C1094 = 0.01 (two decimal positions)
- Set C1095 = 0 (no offset).

Calculation:

$$\text{FEVAN1–IN [\%]} \cdot \frac{1}{10000} \cdot \frac{16384}{100} \cdot \frac{\text{C1093}}{\text{C1094}} + \text{C1095} = \text{C0141 [\%]}$$

Scaling factor Scaling factor

Control:

- Set C0471.B0 = 1 (≙ 00000001h) so that the data are transmitted to the target code.

Example for converting to C1093:

$$1.05\,\% \cdot 10000 \cdot \frac{100}{16384} \cdot \text{C1094} \cdot \frac{1}{1.05\,\%} = \text{C1093} = 0.6103$$

Setpoint in C0141 FEVAN1-IN

Display:

- C0141 = 1.00 %

Example 2 (only for FIX32 format without % scaling):

Task:

- C0473/1 = 1000. Write this value to C0011.

Configuration:

- Connect FEVAN1-IN (C1096) with FCODE-473/1 (19551).
- Connect FEVAN1-LOAD (C1097/1) with FCODE-471.B0 (19521).

Parameter setting:

- Set C1091 = 11 (≙ C0011)
- Set C1092 = 0 (no subcode available)
- Set C1093 = 1.0
- Set C1094 = 0.0001 (no decimal position)
- Set C1095 = 0 (no offset).

The source code has no unit. The scaling factor is dropped.

Calculation:

$$\text{FEVAN1–IN} \cdot \frac{1}{10000} \cdot \frac{\text{C1093}}{\text{C1094}} + \text{C1095} = \text{C0011 [rpm]}$$

Scaling factor

$$1000 \cdot \frac{1}{10000} \cdot \frac{1,0}{0.0001} + 0 = 1000\ \text{rpm}$$

Control:

- Set C0471.B0 = 1 (≙ 00000001h) so that the data are transmitted to the target code.

Display:

- C0011 displays the value 1000 rpm.

The other formats are calculated with the following formula:

$$\text{FEVAN1–IN} \cdot \frac{\text{C1093}}{\text{C1094}} + \text{C1095} = x$$

9.2.36 Fixed setpoints (FIXSET)

Purpose

This FB serves to program up to 15 fixed setpoints which can be retrieved via digital terminals or control codes.

The fixed setpoints can e.g. be used for:

- different set dancer positions for one dancer position control or
- different stretching ratios (gearbox factor) for a speed ratio control with master frequency coupling

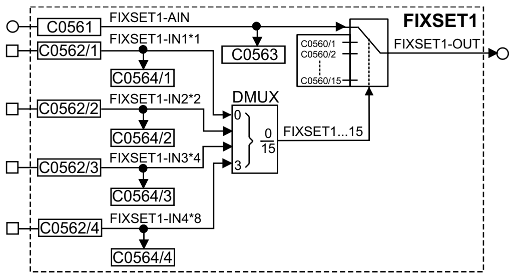


Fig. 9-89 Fixed setpoint (FIXSET1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
FIXSET1-AIN	0	C0563	dec [%]	C0561	1	1000	The input is switched to the output if a LOW level is applied to all selection inputs FIXSET-INx.
FIXSET1-IN1*1	d	C0564/1	bin	C0562/1	2	1000	The number of the inputs to be assigned depends on the number of the FIXSET setpoints required.
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	0	-	-	-	-	-	

Function

The FB output can be used as a setpoint source (signal source) for another FB (e.g. process controller, arithmetic block etc.). Parameter setting and handling are similar to JOG but independent of JOG (cp. FB NSET).

- Parameter setting of the fixed setpoints:
  – The single fixed setpoints are parameterised via the subcodes of C0560.
- Output of the fixed setpoint selected:
  – If the binary inputs are triggered with HIGH signal, a fixed setpoint from the table is switched to the output.
- Value range:
  – The values for the fixed setpoint can be set between -200% and +200%.

9.2.36.1 Release of the FIXSET1 setpoints

Number of the fixed setpoints required	Number of inputs to be assigned
1	at least 1
1 ... 3	at least 2
4 ... 7	at least 3
8 ... 15	4

System for decoding 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

9.2.37 Flipflop element (FLIP)

Purpose

This FB is a D flipflop. This function is used to evaluate and save digital signal transitions.

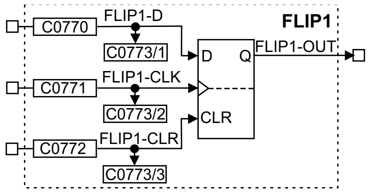


Fig. 9-90 Flipflop element (FLIP1)

Signal				Source			Note
Name	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	-	-	-	-	-	-

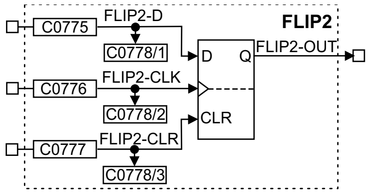


Fig. 9-91 Flipflop element (FLIP2)

Signal				Source			Note
Name	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	-	-	-	-	-	-

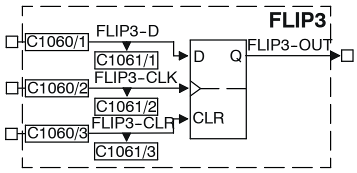


Fig. 9-92 Flipflop element (FLIP3)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
FLIP3-D	d	C1061/1	bin	C1060/1	2	1000	-
FLIP3-CLK	d	C1061/2	bin	C1060/2	2	1000	evaluates LOW-HIGH edges only
FLIP3-CLR	d	C1061/3	bin	C1060/3	2	1000	evaluates the input level only: input has highest priority
FLIP3-OUT	d	-	-	-	-	-	-

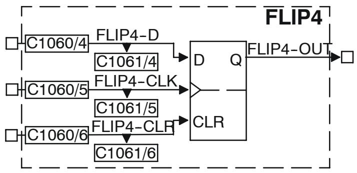


Fig. 9-93 Flipflop element (FLIP4)

Signal				Source	Source		Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
FLIP4-D	d	C1061/4	bin	C1060/4	2	1000	-
FLIP4-CLK	d	C1061/5	bin	C1060/5	2	1000	evaluates LOW-HIGH edges only
FLIP4-CLR	d	C1061/6	bin	C1060/6	2	1000	evaluates the input level only: input has highest priority
FLIP4-OUT	d	-	-	-	-	-	-

Function

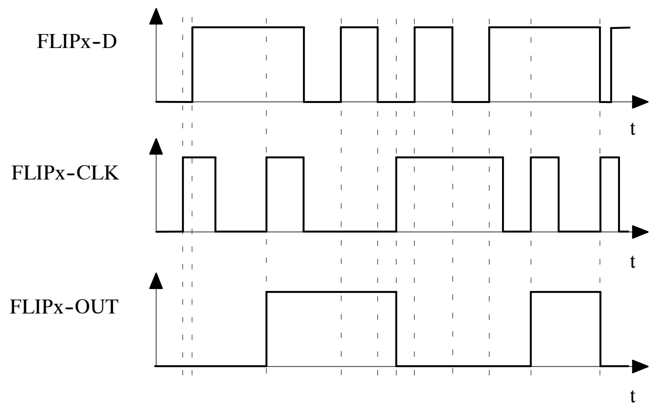


Fig. 9-94 Sequence of a flipflop

- The input FLIPx-CLR always has priority.
- If a HIGH level is applied at the input FLIPx-CLR, the output FLIPx-OUT is set to a LOW level and maintained until this input is applied to a HIGH level.
- With a LOW-HIGH edge at the input FLIPx-CLK, the level at the input FLIPx-D is switched to the output and saved until
  – another LOW-HIGH edge is applied at the input FLIPx-CLK or
  – the input FLIPx-CLR is applied to a HIGH level.

9.2.38 Gearbox compensation (GEARCOMP)

Purpose

Compensates elasticities in the drive train.

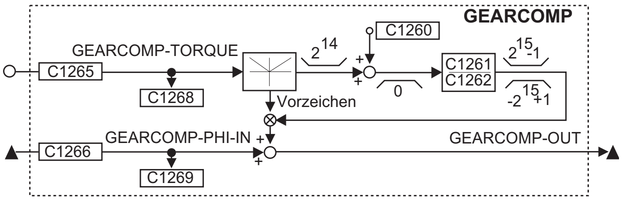


Fig. 9-95 Gearbox compensation (GEARCOMP)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
GEARCOMP-TORQUE	a	C1268	dec [%]	C1265	2	Input value
GEARCOMP-PHI-IN	ph	C1269	dec [inc]	C1266	3	A LOW-HIGH edge transmits the converted signal to the target code.
GEARCOMP-OUT	ph	-	-	-	-	HIGH = transmitting

Function

- The signal at GEARCOMP-TORQUE is divided into the absolute value and the sign.
- The absolute value is converted (via C1260, C1261, C1262).
- The result is evaluated with the sign and added to the signal at GEARCOMP-PHI-IN.

Codes for the conversion of absolute values:

Code	Function	Selection			Note
C1260	Offset	-16383	{1}	16383	
C1261	Numerator	-32767	{1}	32767	Dynamic switch-off at C1261 = 0
C1262	Denominator	1	{1}	32767	

9.2.39 Limiter (LIM)

Purpose

This FB is used to limit signals to adjustable ranges of values.

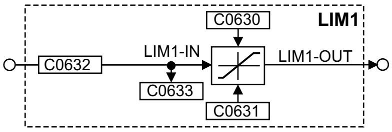


Fig. 9-96 Limiter (LIM1)

Signal				Source			Note
Name	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).

9.2.40 Internal motor control (MCTRL)

Purpose

This function block controls the drive machine consisting of phase controller, speed controller, and motor control.

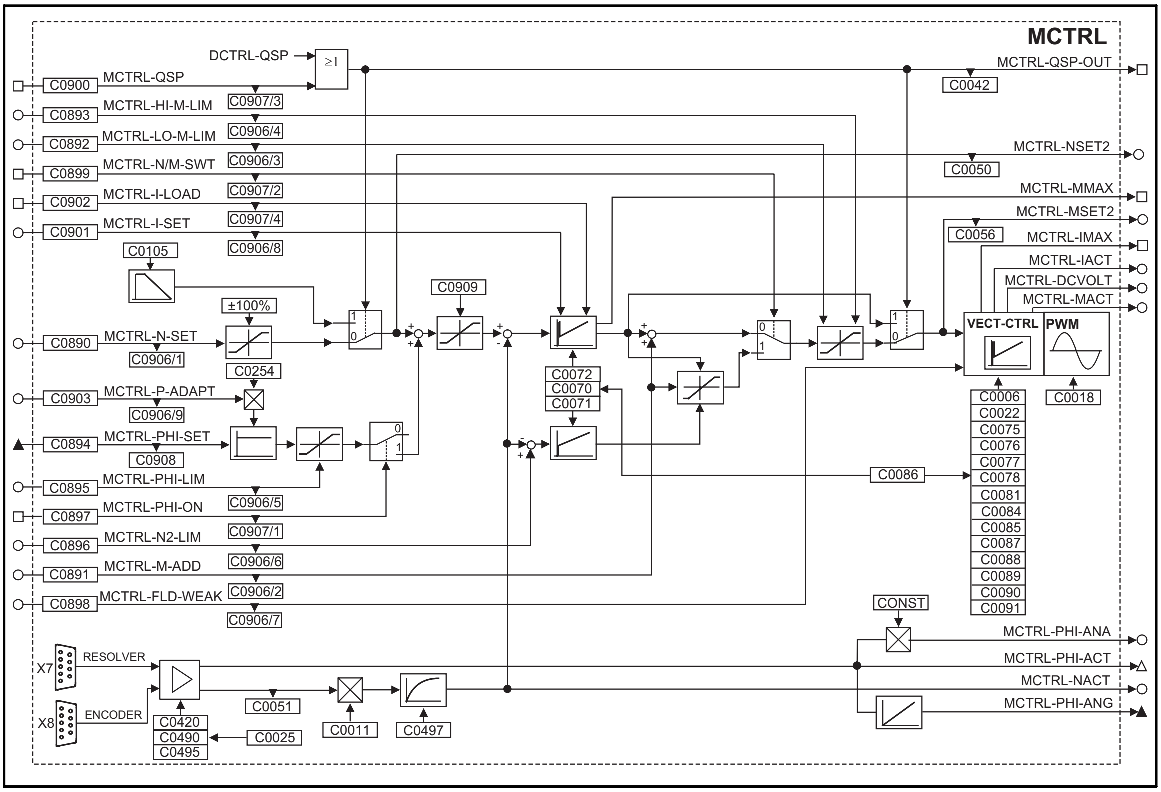


Fig. 9-97 Internal motor control (MCTRL)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
MCTRL-PHI-SET	ph	C0908	dec [inc]	C0894	3	1000	Phase controller input for difference of set phase to actual phase
MCTRL-N-SET	a	C0906/1	dec [%]	C0890	1	5050	Speed setpoint input
MCTRL-M-ADD	a	C0906/2	dec [%]	C0891	1	1000	Additional torque setpoint or torque setpoint
MCTRL-LO-MLIM	a	C0906/3	dec [%]	C0892	1	5700	Lower torque limitation in % of C0057
MCTRL-HI-MLIM	a	C0906/4	dec [%]	C0893	1	19523	Upper torque limitation in % of C0057
MCTRL-PHI-LIM	a	C0906/5	dec [%]	C0895	1	1006	Influence of phase controller in % of nmax C0011
MCTRL-N2-LIM	a	C0906/6	dec [%]	C0896	1	1000	Lower speed limit at speed limitation
MCTRL-FLDWEAK	a	C0906/7	dec [%]	C0898	1	1006	Motor excitation
MCTRL-I-SET	a	C0906/8	dec [%]	C0901	1	1006	Input for setting the I component of the speed controller
MCTRL-P-ADAPT	a	C0906/9	dec [%]	C0903	1	1006	Influence in % on VP of C0254; the absolute value is processed (without sign)
MCTRL-PHI-ON	d	C0907/1	bin	C0897	2	1000	HIGH = Activation of phase controller
MCTRL-N/M-SWT	d	C0907/2	bin	C0899	2	1000	LOW = active speed control HIGH = active torque control
MCTRL-QSP	d	C0907/3	bin	C0900	2	10250	HIGH = drive performs QSP
MCTRL-I-LOAD	d	C0907/4	bin	C0902	2	1000	HIGH = I component of the n-controller is accepted by MCTRL-I-SET
MCTRL-PHI-ACT	phd	-	-	-	-	-	
MCTRL-PHI-ANG	ph	-	-	-	-	-	65536 inc = one revolution
MCTRL-NACT	a	-	-	-	-	-	in % of nmax (C0011)
MCTRL-PHI-ANA	a	-	-	-	-	-	Actual phase value as analog signal 90 degrees = 100%
MCTRL-MACT	a	-	-	-	-	-	in % of Mmax (C0057)
MCTRL-MSET2	a	-	-	-	-	-	in % of Mmax (C0057)
MCTRL-NSET2	a	-	-	-	-	-	in % of nmax (C0011)
MCTRL-DCVOLT	a	-	-	-	-	-	100% = 1000V
MCTRL-QSP-OUT	d	-	-	-	-	-	HIGH = drive performs QSP
MCTRL-MMAX	d	-	-	-	-	-	HIGH = speed controller operates within the limits
MCTRL-IMAX	d	-	-	-	-	-	HIGH = drive operates at the current limit C0022
MCTRL-IACT	a	-	-	-	-	-	-

Function

- Current controller
- Torque limitation
- Additional torque setpoint
- Speed controller
- Torque control with speed limitation
- Speed setpoint limitation
- Phase controller
- Quick stop QSP
- Field weakening
- Switching frequency changeover

9.2.40.1 Current controller

Adapt current controller via C0075 (proportional gain) and C0076 (reset time) to the machine connected.

Tip!

Set a suitable motor from the selection table ”Motors” under C0086. (📖 9-315)
With this the parameters of the current controller are automatically set correctly.

9.2.40.2 Additional torque setpoint

The input MCTRL-M-ADD serves as torque setpoint or additional torque setpoint, depending on the control of the input MCTRL-N/M-SWT. The additional torque setpoint can be used e.g. for friction compensation or speed injection (dv/dt).

- When MCTRL-N/M-SWT = LOW the speed control is active.
  – MCTRL-M-ADD is added to the output of the n-controller.
  – The limits defined by the torque limitations MCTRL-LO-M-LIM and MCTRL-HI-M-LIM cannot be exceeded.
- When MCTRL-N/M-SWT = HIGH, the torque control is active.
  – MCTRL-M-ADD acts as torque setpoint
  – The n-controllers have a monitoring function.
- The torque setpoint is defined in [%] of the max. possible torque (see code C0057).
  – Negative values mean a torque with CCW rotation of the motor.
  – Positive values mean a torque with CW rotation of the motor.

9.2.40.3 Torque limitation

Via the inputs MCTRL-LO-M-LIM and MCTRL-HI-M-LIM an external torque limitation can be set. This serves to set different torques for the quadrants "driving" and "braking".

- MCTRL-HI-M-LIM is the upper torque limit in [%] of the max. possible torque (C0057).
- MCTRL-LO-M-LIM is the lower torque limit in [%] of the max. possible torque (C0057).
- In case of quick stop (QSP) the torque limitation is deactivated.

Stop!

Only set positive values in MCTRL-HI-M-LIM and negative values in MCTRL-LO-M-LIM, otherwise the speed controller may lose control. The drive may accelerate uncontrollably.

9.2.40.4 Speed controller

The speed controller is designed as an ideal PID controller.

Parameter setting

If you select a motor from the table in chapter 5.2 in C0086, the parameters are preset so that only few adaptations to the application are necessary, if any.

- For setting parameters of the proportional gain Vp in C0070
  – enter approx. 50 % of the speed setpoint
  – increase C0070 until the drive becomes unstable (observe motor noises)
  – reduce C0070 until the drive runs stable again
  – reduce C0070 to approx. 50 %
- For parameter setting of the reset time Tn in C0071
  – reduce C0071 until the drive becomes unstable (observe motor noises)
  – increase C0071 until the drive runs stable again
  – set C0071 to the double value
- For parameter setting of the derivative gain Td in C0072
  – increase C0072 during operation until an optimum behaviour is achieved.

Signal limitation

When the drive outputs the max. torque, the speed controller operates within the limits.

- The drive cannot follow the speed setpoint.
- This state is indicated with MCTRL-MMAX = HIGH.

Setting the integral component

To enter defined starting values for the torque the integral component of the n-controller can be set externally (e.g. when using the brake control).

- MCTRL-I-LOAD = HIGH
  – The n-controller accepts the value at input MCTRL-I-SET as its integral component.
  – The value at input MCTRL-I-SET acts as a torque setpoint for the motor control.
- MCTRL-I-LOAD = LOW
  – Function is switched off.

9.2.40.5 Torque control with speed limitation

This function is activated with MCTRL-N/M-SWT = HIGH. A second speed controller (auxiliary speed controller) is connected for the speed limitation.

- MCTRL-M-ADD acts as bipolar torque setpoint.
- The n-controller 1 is used to create the upper speed limit.
  – The upper speed limit is selected at the input MCTRL-N-SET in [%] of nmax (C0011) (pos. sign for CW rotation).
  – The upper speed limit is only to be used for CW rotation.
- The n-controller (auxiliary speed controller) is used to form the lower speed limit
  – The lower speed limit is selected at the input MCTRL-N2-LIM in [%] of nmax (C0011) (neg. sign for CCW rotation).
  – The lower speed limit is only to be used for CCW rotation.

9.2.40.6 Speed setpoint limitation

The speed setpoint in the MCTRL-N-SET input is limited to ±100 % of nmax (C0011).

C0909 is used to set a limitation of the direction of rotation for the speed setpoint.

9.2.40.7 Phase controller

The phase controller is required to achieve phase synchronisation and driftfree standstill.

Tip!

Select a configuration with digital frequency coupling in C0005 since this serves to link all important signals automatically. On this basis the system can be optimised.

Activating the phase controller

1. Configure a signal source with C0894, which provides the phase difference between set and actual phase (see "Digital frequency configuration under C0005).
2. Select a value > 0 at the MCTRL-PHI-LIM input.
3. Trigger the input MCTRL-PHI-ON with HIGH (e.g. with FIXED1).
4. Set gain of the phase controller C0254 > 0 (see chapter 9.2.40.4)
   – Before setting C0254, select a P-gain C0070 of the n-controller as high as possible.
   – Increase C0254 during operation until the drive shows the required control response.

Influence of phase controller

The output of the phase controller is added to the speed setpoint.

- If the actual phase is lagging, the drive is accelerated
- If the actual phase is leading the drive is decelerated until the required phase synchronisation is achieved.

The influence of the phase controller consists of:

- Phase difference multiplied by the P-gain C0254
- Additional influence via analog signal at MCTRL-P-ADAPT
- Limitation of the phase controller output to ±MCTRL-PHI-LIM

Limitation of the phase controller output

This limits the max. speed-up of the drive at high phase differences.

9.2.40.8 Quick stop QSP

The QSP function is used to stop the drive within an adjustable time independently of the setpoint selection.

The QSP function is active

- if the input MCTRL-QSP is triggered with HIGH.
- if the controller is triggered via the control words (DCTRL).

Function:

- If torque control has been selected, it will be deactivated. The drive is controlled by the speed controller.
- The speed runs with the deceleration time set under C0105 to zero speed.
- The torque limitations MCTRL-LO-M-LIM and MCTRL-HI-M-LIM are deactivated.
- The phase controller is activated. If the rotor position is shifted actively, the drive generates a torque against this displacement if:
  – C0254 is not zero
  – The input MCTRL-PHI-LIM is triggered with a value > 0 %.

STOP

Stop!

If the field is weakened manually (MCTRL-FLD-WEAK < 100%), the drive is unable to generate the max. torque.

9.2.40.9 Field weakening

The field weakening range does not have to be set if the motor type was set in C0086. All required settings are done automatically. The motor is operated in the field weakening mode if:

- The output voltage of the controller exceeds the rated motor voltage set in C0090.
- The controller is no longer able to increase the output voltage with rising speed due to the mains voltage or DC-bus voltage.

Manual field weakening

A manual field weakening is possible via the input MCTRL-FLD-WEAK. For reaching the maximum excitation this input must be triggered with +100 % (e.g. FIXED100%).

STOP

Stop!

The available torque is reduced by the field weakening.

9.2.40.10 Switching frequency changeover

The switching frequency of the inverter can be selected:

- 8 kHz fixed, for power-optimised operation (C0018 = 1)
  – maximum power output of the controller, but with audible pulse operation
- 16 kHz fixed, for noise-optimised operation (C0018 = 2)
  – inaudible pulse operation of the controller, but with reduced power output (torque)
- Automatic changeover between power-optimised and noise-optimised operation (C0018 = 0)

Automatic switching frequency changeover

The automatic switching frequency changeover can be used if the drive is to be operated in the noise-optimised range, but the available torque is not sufficient for acceleration processes.

Condition M = f(I)	Function
$M < M_{N16}$ (I_{N16})	Controller is operated with 16 kHz (noise-optimised)
M_{N16} (I_{N16}) $< M < M_{N8}$ (I_{N8})	Controller switches over to 8 kHz (power-optimised)
$M > M_{max8}$ (I_{max8})	Controller operates with 8 kHz in the current limitation

9.2.41 Mains failure control (MFAIL)

Purpose

If the supply voltage via L1, L2, L3 or +UG, -UG fails, the drive (drive network) can be decelerated (braked) in a controlled way. Without this function, the drive would coast.

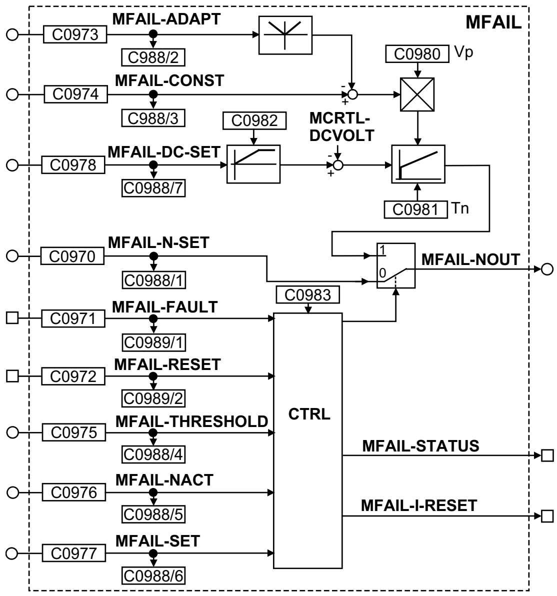


Fig. 9-98 Mains failure control (MFAIL)

Signal				Source			Note
Name	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 UGset controller in [%] of C0980
MFAIL-CONST	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 start point for the deceleration in [%] of C0011
MFAIL-DC-SET	a	C0988/7	dec [%]	C0978	1	1000	Voltage setpoint on which the DC bus voltage is to be maintained, 100% = 1000V
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 active
MFAIL-I-RESET	d	-	-	-	-	-	HIGH = mains failure control active, the drive is braking

Range of functions

- Mains failure detection
- Mains failure detection
- Restart protection
- Reset of the mains failure control
- Dynamic adaptation of the control parameters
- Fast mains recovery (KU)
- Application examples

9.2.41.1 Mains failure detection

A failure of the power supply can be detected by

5. evaluating the DC-bus voltage or
6. an external system for mains failure detection (e.g. 934X module or voltage measuring relay).

It is possible to combine the two methods.

The type of the mains failure detection to be used depends on the drive system used.

DC-bus voltage evaluation

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 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 function of the comparator CMP2 with C0685 = 3

Enter the function blocks CMP2 and MFAIL into free positions of the processing table in C0465.

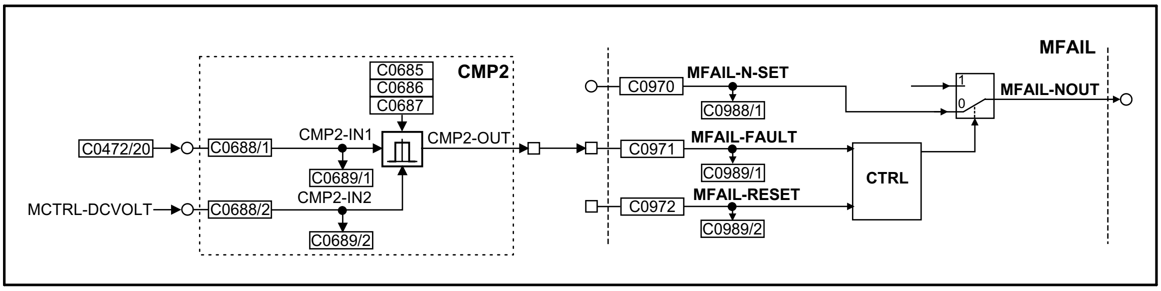


Fig. 9-99 Example of a mains failure detection with internal function blocks (section)

External system for mains failure detection (934x supply module)

- A digital output of the supply module 934x 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 signal link:
  – C0971 = 54 (DIGIN4 to MFAIL-FAULT)
  – C0871 = 1000 (remove DCTRL-TRIP-SET from terminal X5/E4)
  – Select level (HIGH or LOW active) with C0114/4

Enter the function block MFAIL into a free position of the processing table in C0465.

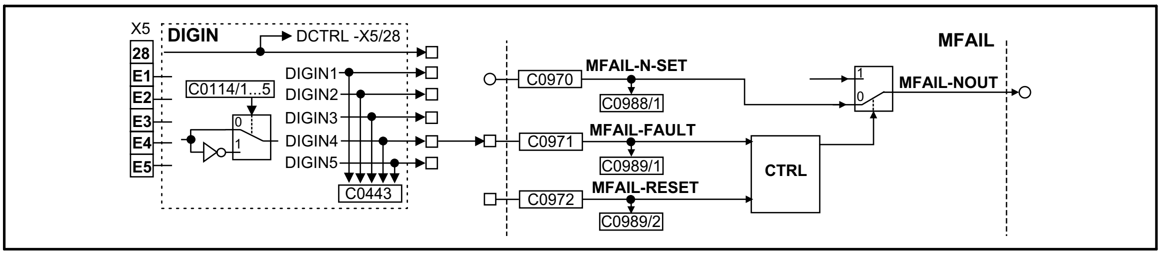


Fig. 9-100 Example of a mains failure detection by an external monitoring system

Combination of the two methods

- The methods are combined by means of an OR link and an internal function block. OR5 is used in the example. Set the signal links:
  – C0688/1 = 5005 (MCTRL-DCVOLT to CMP2-IN1)
  – C0688/2 = 19540 (free code C0472/20 to CMP2-IN2)
  – Set function of the comparator 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 into free positions of the processing table in C0465.

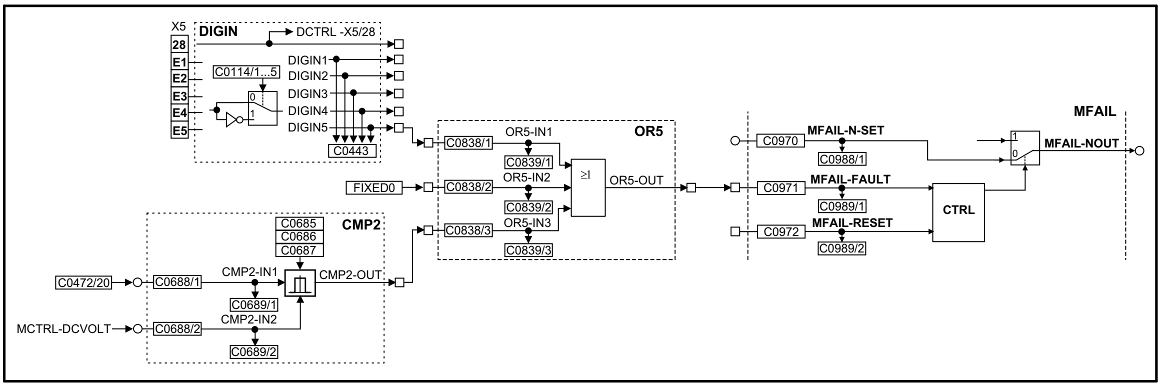


Fig. 9-101 Example of a mains failure detected by different sources

9.2.41.2 Mains failure control

Integration of the function block into the signal flow of the controller

As an example, the function block is integrated into the basic configuration C0005 = 1000 (speed control).

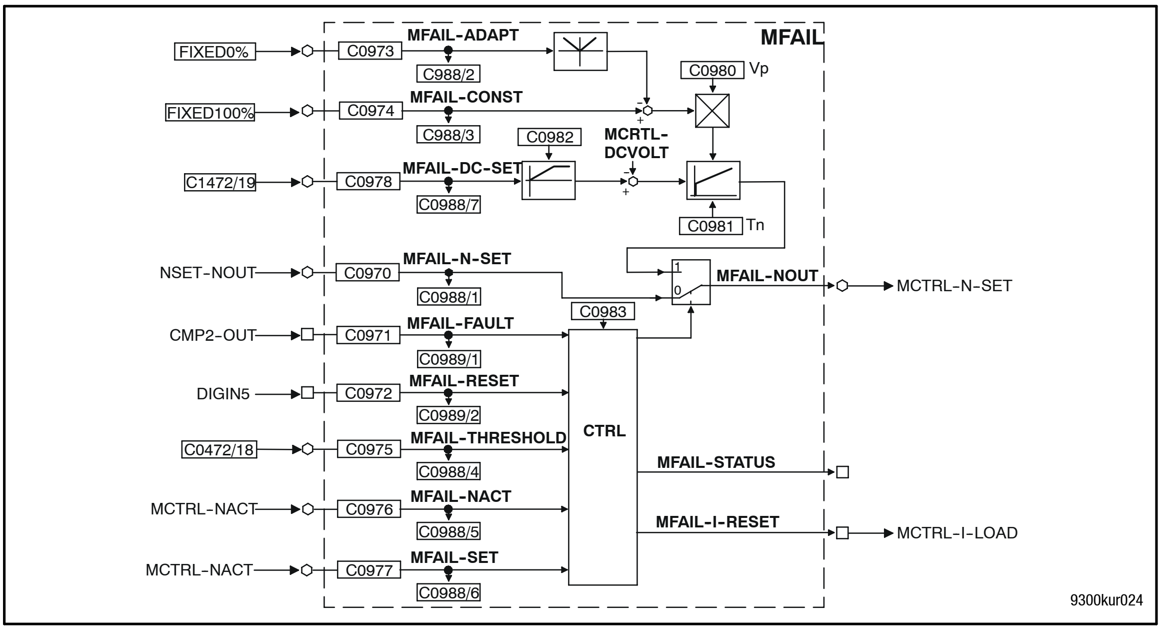


Fig. 9-102 Link for the basic configuration C0005 = 1000

1. Create speed setpoint channel	• C0970 = 5050 (NSET-NOUT to MFAIL-N-SET) • C0890 = 6100 (MFAIL-NOUT to MCTRL-N-SET)
2. Start value selection (here: act. speed value)	• C0977 = 6100 (MFAIL-NOUT to MFAIL-SET)
3. Selection of setpoint source for DC-bus voltage (here: by the freely connectable code FCODE C0472/19)	• C0978 = 19539 (C0472/19 to MFAIL-DC-SET)
4. Selection of source which activates the mains failure control	• see chapter 9.2.41.1
5. Adaptation of proportional gain and DC-bus voltage controller	• C0974 = 1006 (FIXED100% to MFAIL-CONST) • C0973 = 1000 (FIXED0% to MFAIL-ADAPT)
6. Achieve restart protection	• C0976 = 6100 (MFAIL-NACT auf MCTRL-NACT) • C0975 = 19538 (C0472/18 to MFAIL-THRESHLD) • First enter approx. 2 % under C0472/18 (reference: nmax C0011)
7. Connect reset input (here with terminal X5/E5 TRIP-RESET)	• C0972 = 55 (DIGIN5 to MFAIL-RESET)
8. Enter all function blocks used (except for codes and digital inputs DIGIN) into free positions of the processing table in C0465.	

Note!

All settings must be stored non-volatilely in a parameter set under C0003.

Activation

- MFAIL-FAULT = HIGH activates the mains failure control.
- MFAIL-FAULT = LOW triggers a timing element. After the time set under C0983 has elapsed, the mains failure control is completed/cancelled (see description of mains recovery, Chapter 9.2.41.6).
  – The drive is accelerated to the speed setpoint if the restart protection is not active.
  – The drive is still decelerated to zero speed, if the restart protection is active (see description about the restart protection, Chapter 9.2.41.3).
  – If the restart protection is active, the drive can only be reset by a HIGH level signal at the MFAIL-RESET input.

Function

The controller gains the required energy from the rotational energy of the driven machine. The driven machine is braked via the power loss of the controller and the motor. The speed deceleration ramp is shorter than for an uncontrolled system (coasting drive).

With the activation,

- the DC bus voltage is controlled to the value at the MFAIL-DC-SET input.
- an internally generated speed setpoint is output at the MFAIL-N-OUT output. The drive can thus be braked to zero speed (via the speed setpoint).
  – The value at input MFAIL-SET is the start value for the controlled deceleration. This input is generally connected to the output MCTRL-NACT (actual speed) or MCTRL-NSET2, MFAIL-NOUT (speed setpoint).
  – The speed deceleration ramp (and thus the brake torque) results from the moment of inertia of the driven machine(s), the power loss, and the parameterization.

STOP

Stop!

- If a connected brake unit is activated, the drive is braked with the maximum possible torque (Imax). In this case, it may be necessary to adapt the parameterization (see description of the parameterization).
- 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 depend strongly 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 Chapter 9.2.41.1

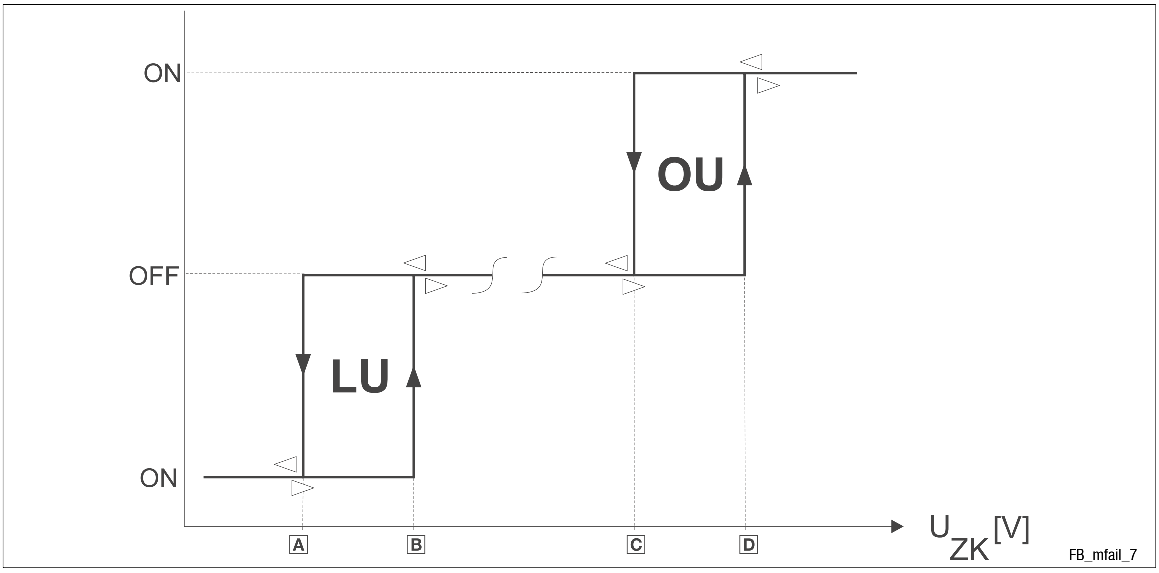
Important settings prior to the initial set-up:

1. Save the previous setting in a parameter set (e.g. parameter set 4)

Stop!

For internal voltage supply of the terminals (C0005 = xx1x) terminal X6/63 is used as a voltage source for external potentiometers. In case, measure across terminals +UG, -UG.

2. Measure the DC bus voltage with an oscilloscope (channel 1)
   – with a suitable voltage divider across terminals +UG, -UG. or
   – by providing the DC bus voltage e.g. at terminal X6/62. For this ,set C0436 = 5005 (MCTRL-DCVOLT). 1 V at terminal X6/63 = 100 V at +UG, -UG.
3. Measure the speed with an oscilloscope (channel 2)
   – by supplying the speed on terminal X6/62 for instance (standard setting). For this, set C0431 = 5001 (MCTRL-NACT). 10 V at terminal X6/62 = nmax (C0011).
4. Provide the threshold for the mains failure detection in C0472/20. The provision depends on the setting in C0173.
   – Set the threshold approx. 50 V above the threshold LU (example for C0173 = 0.1; C0472/20 = 48 % ≙ 480 V).



Mains voltage range	C0173	Message LU		Message OU	
		A	B	C	D
< 400 V	0	285 V	430 V	755 V	770 V
400 V	1	285 V	430 V	755 V	770 V
400 V ... 460 V	2	328 V	473 V	755 V	770 V
480 V without brake chopper	3	342 V	487 V	755 V	770 V
Operation with brake chopper (up to 480 V)	4	342 V	487 V	785 V	800 V
		DC-bus voltage (U_{ZK})			

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 (Imax). The desired operating behaviour is lost.

5. Set the setpoint on which the DC bus voltage is to be controlled:
   – Set the setpoint to approx. 700 V (C0472/19 = 70 %).

Commissioning

The commissioning should be carried out with motors without load.

1. The drive can be started with a LOW-HIGH edge at X5/E5.
2. Set the acceleration time Tir:
   – Set speed setpoint to 100%, operate controller with maximum speed.
   – Inhibit controller via terminal X5/28 (you can also use any other controller inhibit source, CINH) and measure deceleration time until standstill.
   – Set approx. 1/10 of the deceleration time in C0982.
3. Setting the retrigger time

- In case of mains failure detection by detecting the DC bus voltage level:
  – Set measured deceleration time from item 2. under C0983.
- In case of mains failure detection via an external system (e.g. supply module 934X):
  – Under C0983, set the time in which the drive is to be continued to be braked in a controlled way for short-term mains recovery.

4. Switch off supply voltage (mains or DC bus).

The oscilloscope should display the following characteristic:

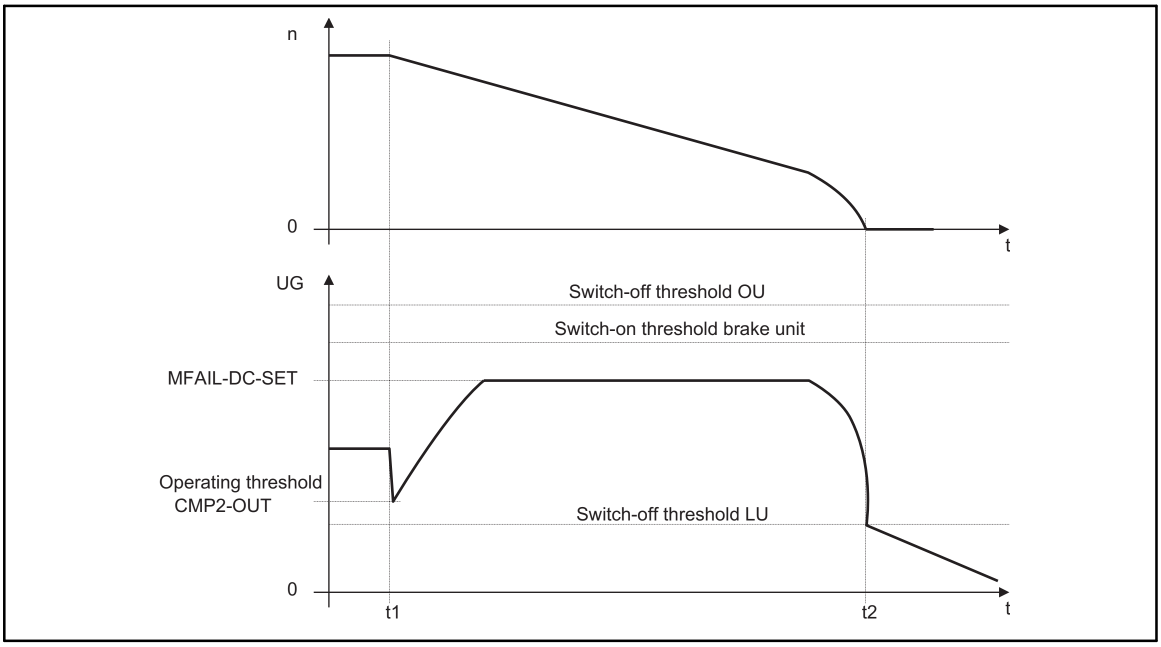


Fig. 9-103 Schematic representation with activated mains failure control (ideal characteristic)
t1 Mains failure
t2 Zero speed reached

Fine setting

Repeat the following steps several times.

1. Obtain a very low final speed before the controller reaches the undervoltage threshold LU:
   – Increase the proportional gain MFAIL V_p (C0980).
   – Reduce the adjustment time MFAIL T_n (C0981).
2. Avoid activation of the brake unit or the overvoltage threshold:
   – Increase the adjustment time MFAIL T_n (C0981) until the characteristic in Fig. 9-103 is almost reached.
   – Reduce additionally the setpoint of the DC bus voltage at the input MFAIL-DC-SET (in the example C0472/19), if necessary.
3. Increase of the deceleration time or reduction of the brake torque (see Fig. 9-104) is only possible with restrictions:
   – An increase of the acceleration time MFAIL T_{ir} (C0982) reduces the initial brake torque and increases the deceleration time.
   – An increase of the adjustment time MFAIL T_n (C0981) reduces the brake torque and increases the deceleration time. If the adjustment times under C0981 are too long, the controller reaches the LU threshold before zero speed is reached. The drive is therefore no longer controlled.
4. Re-establish signal connections which may be used, to the outputs of the controller (terminals X6).

Note!

All settings must be stored non-volatilely in a parameter set under C0003.

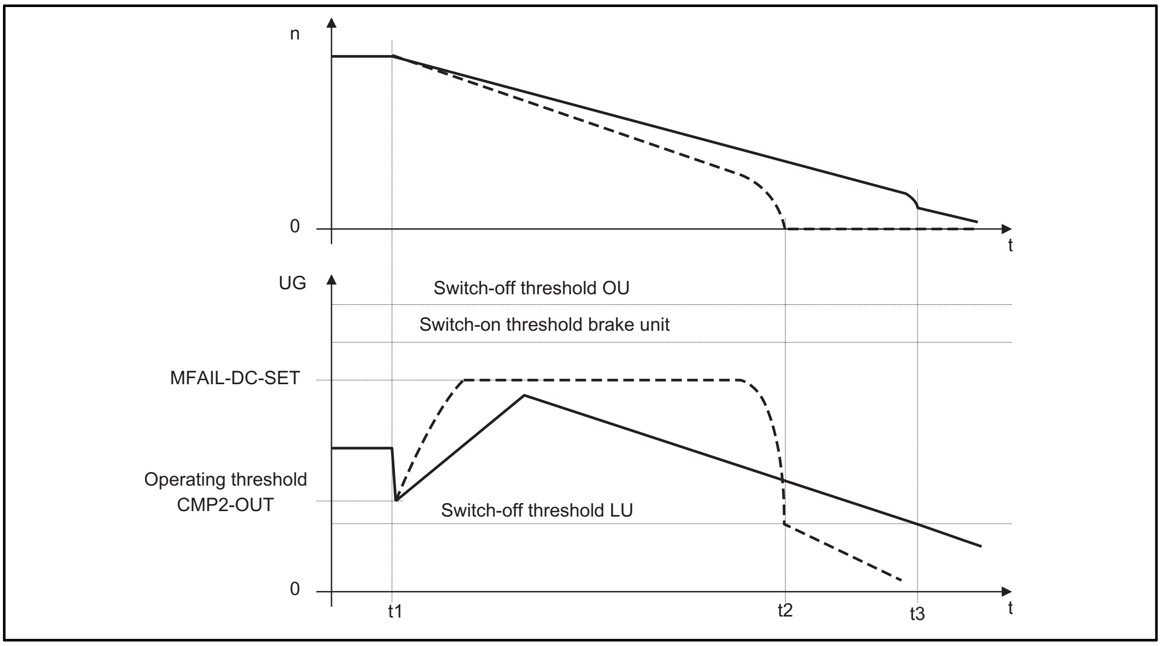


Fig. 9-104 Schematic with different brake torques

t = t1 Mains failure
t = t2 Zero speed with higher brake torque (short adjustment time)
t = t3 Drive reaches the LU switch-off threshold with lower brake torque (high adjustment time), without reaching zero speed
t > t3 Drive is no longer controlled (is braked by friction)

9.2.41.3 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).

- How to protect the drive from a restart is explained in chapter 9.2.41.2.
- Go to C0472/18 and enter the threshold in [%] of nmax (C0011) if you do not want an automatic restart below this threshold after mains recovery.
  – Speed after mains recovery < threshold in C0472/18: Drive is still braked in a controlled way. This function can only be completed by MFAIL-RESET = HIGH.
  – Speed after mains recovery > threshold in C0472/18: Drive accelerates to its setpoint along the set ramps.
- The function is deactivated by:
  – C0472/18 = 0 % or
  – C0975 = 1000 (FIXED0% to MFAIL-THRESHLD)
- Reset with MFAIL-RESET = HIGH
  – is required after every mains connection
  – is displayed by MFAIL-STATUS = HIGH, if MFAIL-FAULT = LOW

9.2.41.4 Reset of the mains failure control

- The mains failure control is reset with MFAIL-RESET = HIGH (in the example with 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.

9.2.41.5 Dynamic adaptation of the control parameters

In special cases, a dynamic modification of the proportional gain may be useful. For this, two inputs (MFAIL-CONST and MFAIL-ADAPT) are available at the function block MFAIL. The resulting proportional gain results from:

$$V_p = C0980 \cdot \frac{\text{MFAIL-CONST} - |\text{MFAIL-ADAPT}|}{100\ \%}$$

9.2.41.6 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, the restart can be delayed via the retrigger time C0983, or avoided together 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 (see Chapter 9.2.41.1).
- because of a ”short interrupt” (KU) of the utility company (e.g. in case of thunderstorms)
- because of faulty components in the supply cables (e.g. slip rings)

Set the retrigger time C0983 higher than the measured deceleration time during braking.

9.2.41.7 Application example

Drive network with master frequency coupling

Stop!

In drive networks which are connected via master frequency (a master and one or more slaves):

- the mains failure detection may only be activated for the master.
  – the mains failure control must be integrated correspondingly into the signal flow.
- All controllers must be operated in the DC bus connection via the terminals +UG, -UG. Observe the specifications in the Chapter Dimensionsioning.

Note!

Further information and predefined configurations can be obtained from Lenze.

9.2.42 Motor phase failure detection (MLP)

Purpose

Motor phase monitoring.

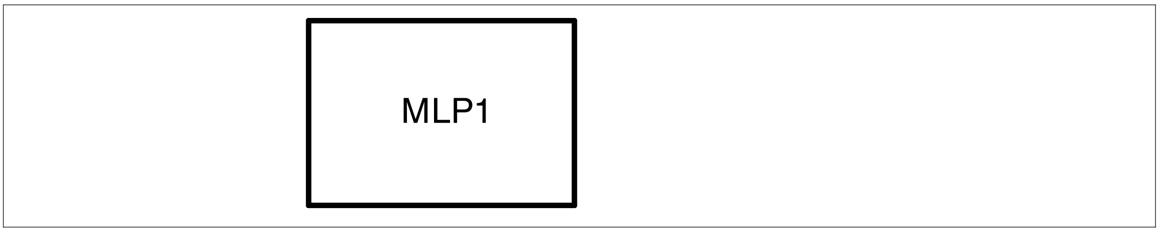


Fig. 9-105 Motor phase failure detection (MLP1)

Code	LCD	Possible settings		Important
		Lenze	Selection	
C0597	MONIT LP1	3	0 Trip 2 Warning 3 Off	**Conf. LP1** Configuration of monitoring motor phase failure
C0599	LIMIT LP 1	5.0	1.0 {0.1} 10.0	**Current limit LP1** Current limit for motor phase failure monitoring

Function

Detailed descriptions concerning monitoring / fault messages can be found in part E (Troubleshooting and fault elimination) of the System Manual.

The function block MLP1 must be entered into the processing table if the motor phase failure detection is to be used.

9.2.43 Monitor outputs of monitoring system (MONIT)

Purpose

The monitoring functions output digital monitor signals.

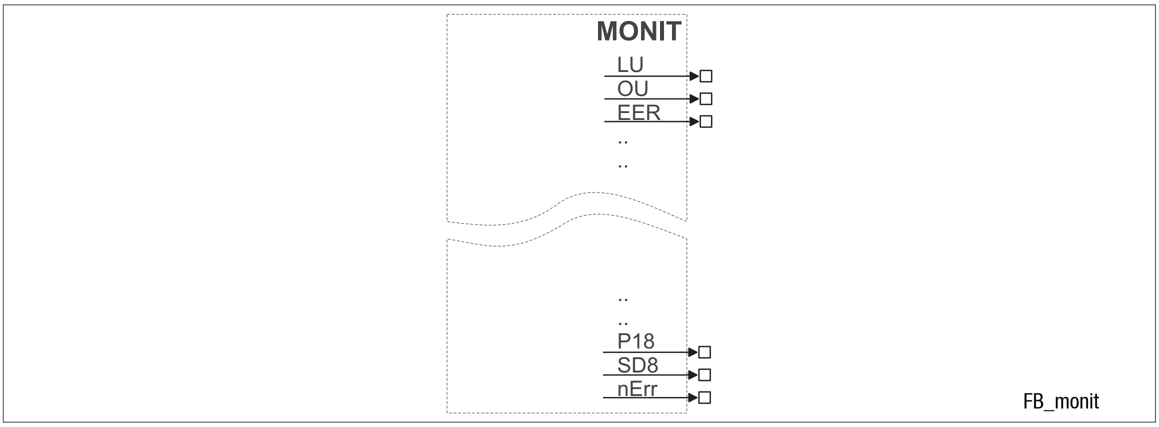


Fig. 9-106 Monitor outputs of the monitoring system (MONIT)

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 (trip, fail-QSP, ...).

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”.

9.2.44 Motor potentiometer (MPOT)

Purpose

The FB replaces a hardware motor potentiometer.

The motor potentiometer is used as an alternative setpoint source, which is controlled via two terminals.

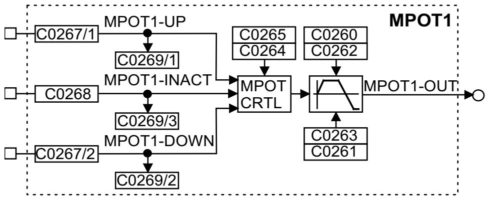


Fig. 9-107 Motor potentiometer (MPOT1)

Signal				Source			Note
Name	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	-	-	-	-		-

Function

Control of the motor potentiometer:

- MPOT1-UP = HIGH
  – The motor potentiometer approaches its upper limit value.
- MPOT1-DOWN = HIGH
  – The motor potentiometer approaches its lower limit value.
- MPOT1-UP = LOW and MPOT1-DOWN = LOW or
  MPOT1-UP = HIGH and MPOT1-DOWN = HIGH:
  – The motor potentiometer does not change the output signal.

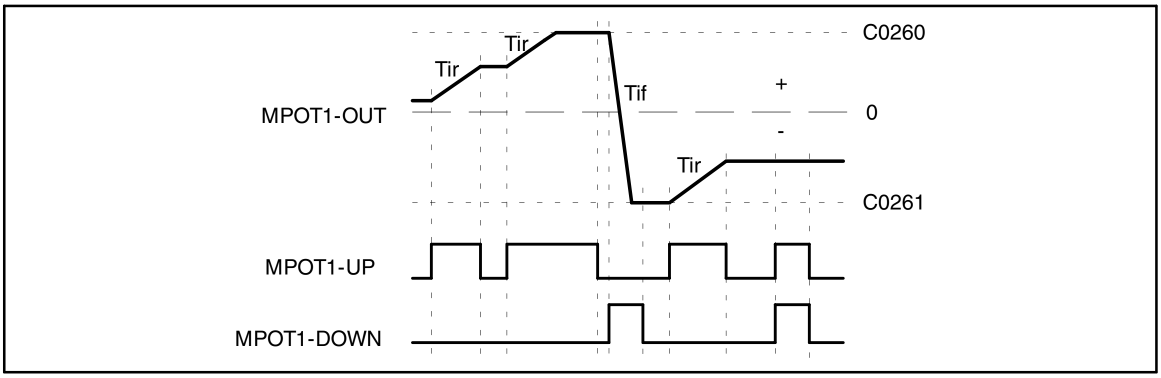


Fig. 9-108 Control signals of the motor potentiometer

In addition to the digital signals MPOT1-UP and MPOT1-DOWN another digital input exists (MPOT1-INACT). The input MPOT1-INACT is used to activate or deactivate the motor potentiometer function. Logic 1 at this input deactivates the motor potentiometer function. The input MPOT1-INACT has priority over the inputs MPOT1-UP and MPOT1-DOWN.

When the motor potentiometer is deactivated, the motor potentiometer output (MPOT1-OUT) follows the function set under C0264. The following functions can be set 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 deceleration time
2	The motor potentiometer approaches the lower limit value with the corresponding deceleration time (C0261)
3	The motor potentiometer immediately changes its output to 0%. **(Important for EMERGENCY-OFF function)**
4	The motor potentiometer immediately changes its output to the lower limit value (C0261)
5	The motor potentiometer approaches the upper limit value with the corresponding acceleration time (C0260)

If the motor potentiometer is activated (input MPOT1-INACT = 0), the subsequent function depends on

- the current output signal,
- the set limit values of the MPOT,
- the control signals UP and DOWN.

If the output value is out of the set limits, the MPOT approaches the next limit with the set T_i times. This function is independent of the control inputs MPOT1-UP and MPOT1-DOWN

If the output value is within the set limits, the output follows the selected control function UP, DOWN or no action.

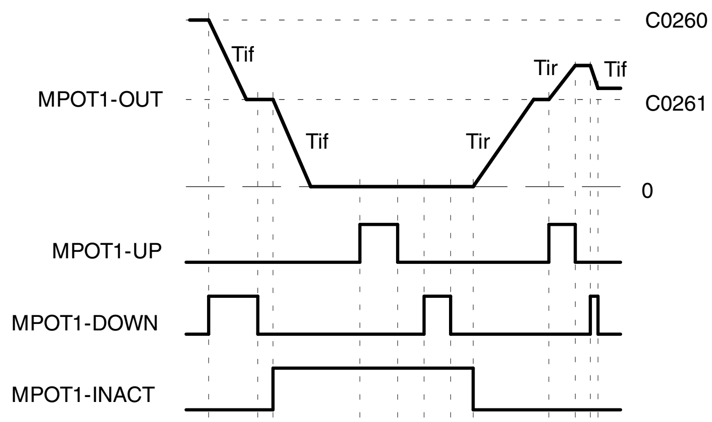


Fig. 9-109 Deactivation of the motor potentiometer via the input MPOT1-INACT

Initialisation

This function is used to store the output value of the MPOT non-volatilely in the internal memory of the device, when the mains is switched off. The value is saved automatically if this function was selected via the code. When the mains is switched on, the value is reloaded into the MPOT.

C0265 can be used to activate other initialisation functions (see code table).

When the initialisation is completed, the MPOT follows the applied control function.

9.2.45 Logic NOT

Purpose

Logic inversion of digital signals. The inversion can be used to control functions or generate status information.

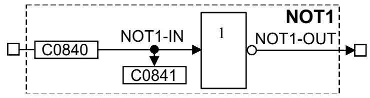


Fig. 9-110 Logic NOT (NOT1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NOT1-IN	d	C0841	bin	C0840	2	1000	-
NOT1-OUT	d	-	-	-	-	-	-

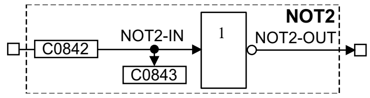


Fig. 9-111 Logic NOT (NOT2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NOT2-IN	d	C0843	bin	C0842	2	1000	-
NOT2-OUT	d	-	-	-	-	-	-

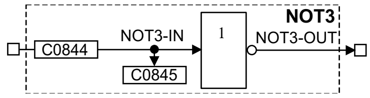


Fig. 9-112 Logic NOT (NOT3)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NOT3-IN	d	C0845	bin	C0844	2	1000	-
NOT3-OUT	d	-	-	-	-	-	-

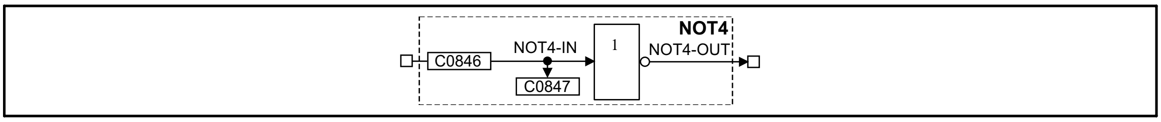


Fig. 9-113 Logic NOT (NOT4)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NOT4-IN	d	C0847	bin	C0846	2	1000	-
NOT4-OUT	d	-	-	-	-	-	-

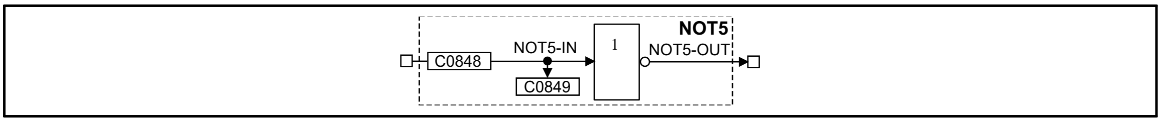


Fig. 9-114 Logic NOT (NOT5)

Signal				Source			Note
Name	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

The function corresponds to a change from an NO contact to an NC contact in a contactor control.

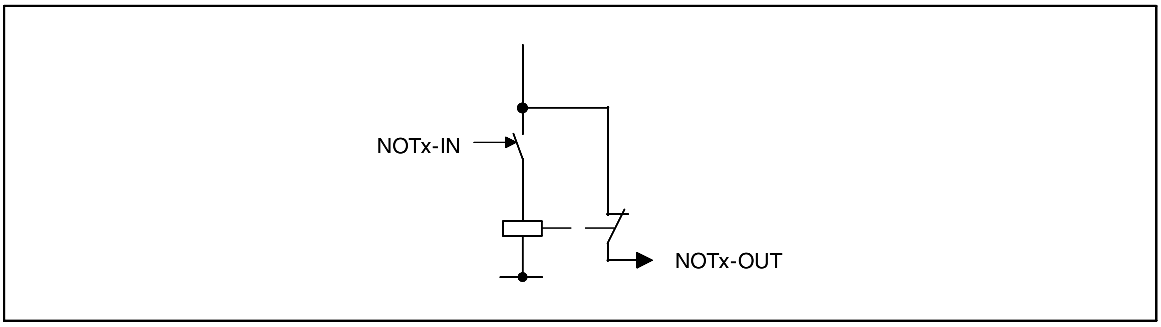


Fig. 9-115 Function of NOT when changing an NO contact to an NC contact.

9.2.46 Speed setpoint conditioning (NSET)

Purpose

This FB conditions

- the main speed setpoint and
- an additional setpoint (or other signals as well)

for the following control structure via ramp function generator or fixed speeds.

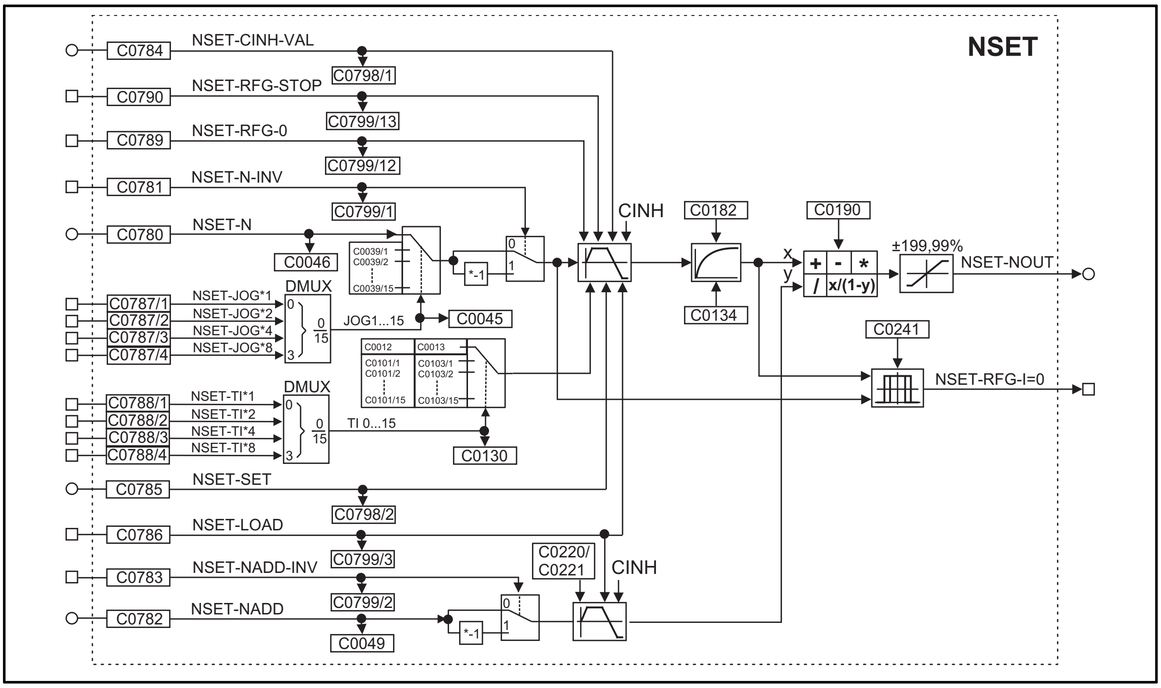


Fig. 9-116 Speed setpoint conditioning (NSET)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NSET-N	0	C0046	dec [%]	C0780	1	50	Intended for main setpoint, other signals are permissible
NSET-NADD	0	C0047	dec [%]	C0782	1	5650	Intended 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 acceleration and deceleration times 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	The main setpoint integrator is led to zero via the current T_i times.
NSET-RFG-STOP	d	C0799/13	bin	C0790	2	1000	Keeping (freezing) of the main setpoint integrator to its actual value.
NSET-CINH-VAL	0	C0798/1	dec [%]	C0784	1	5001	Here, the signal is applied which is to be accepted by the main setpoint integrator when the controller is inhibited
NSET-SET	0	C0798/2	dec [%]	C0785	1	5000	Here, the signal is applied which is to be accepted by the main setpoint integrator when the NSET-LOAD input 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	0	-	-	-	-	-	-
NSET-RFG-I=0	d	-	-	-	-	-	-

Function

- Main setpoint path
- JOG setpoints
- Setpoint inversion
- S ramp

9.2.46.1 Main setpoint path

- The signals in the main setpoint path are limited to the value range ±199.99 %.
- The signal at input NSET-N is led via the function JOG selection.
- The JOG function has priority over the setpoint input NSET-N. This means a selected JOG value deactivates the input. The subsequent signal conditioning the JOG value instead.

9.2.46.2 JOG setpoints

- Are fixed values which are stored in the memory.
- JOG values can be called from the memory via the inputs NSET-JOG*x.
- The inputs NSET-JOG*x are binary coded so that 15 JOG values can be called.
- The decoding for enabling the JOG values (called from the memory) 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

- When all inputs are assigned with 0, the input NSET-N is active.
- The number of inputs that must be assigned depends on the required number of JOG values. Four inputs and thus 15 possible selections are available. A digital signal source is assigned via C0787 and the corresponding subcode.

Number of required JOG setpoints	Number of inputs to be assigned
1	at least 1
1 ... 3	at least 2
4 ... 7	at least 3
8 ... 15	4

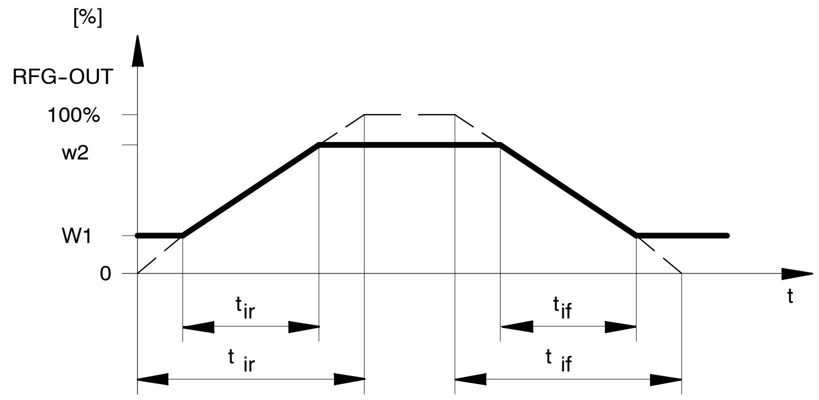
9.2.46.3 Setpoint inversion

The output signal of the JOG function is led via an inverter.

The sign of the setpoint is inverted, if the input NSET-N-INV is triggered with HIGH signal.

Ramp function generator for the main setpoint

The setpoint is then led via a ramp function generator with linear characteristic. Setpoint step-changes at the input are thus led into a ramp.



$$T_{ir} = t_{ir}\frac{100\%}{w2 - w1} \qquad T_{if} = t_{if}\frac{100\%}{w2 - w1}$$

Fig. 9-117 Acceleration and deceleration times of the ramp function generator

- The ramps can be set separately for acceleration and deceleration.
  - – Different acceleration and deceleration times can be activated via the inputs NSET-TI*x 16 (for table and function see JOG setpoints; the decoding must be done according to the signal graphic).
  - – The T_i times can only be activated in pairs.
- When the controller is inhibited (CINH) the ramp function generator accepts the value that was applied to the input NSET-CINH-VAL and transmits it to the next 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.
- NSET-RFG-0 = HIGH
  - – The ramp function generator decelerates to zero along the deceleration ramp.
- It is also possible to load the ramp function generator online with a defined value. For this, the input NSET-LOAD must be set to HIGH. As long as this input is set, the value at input NSET-SET is accepted by the ramp function generator and provided 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 time
0	0	1	1	
0	1	0	0	RFG accepts the value applied to 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 applied to input 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	

9.2.46.4 S ramp

The linear ramp function generator is connected to a PT1 element. This arrangement implements an S ramp for an almost jerk-free acceleration and deceleration.

- The PT1 element is switched on and off via C0134.
- The time constant is set via C0182.

9.2.46.5 Arithmetic operation

The output value is led to an arithmetic module. This module links the main setpoint and the additional setpoint arithmetically. The arithmetic operation is selected via 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 %)

9.2.46.6 Additional setpoint

- An additional setpoint (e.g. a correction signal) can be linked with the main setpoint via the input NSET-NADD.
- The input signal can be inverted via the input NSET-NADD-INV before affecting the ramp function generator. The ramp function generator has a linear characteristic and an acceleration time and deceleration time each.
- With NSET-LOAD = HIGH the ramp function generator is set to zero and kept there without considering the T_i times.The same applies when the controller is inhibited.

9.2.47 OR operation (OR)

Purpose

Logic OR operation of digital signals. The operations are used for controlling functions or creating status information.

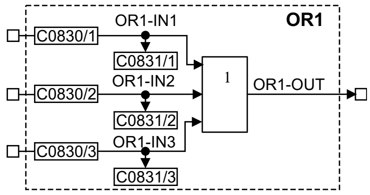


Fig. 9-118 OR operation (OR1)

Signal				Source			Note
Name	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	-	-	-	-	-	-

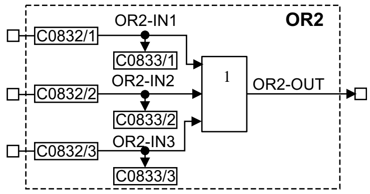


Fig. 9-119 OR operation (OR2)

Signal				Source			Note
Name	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	-	-	-	-	-	-

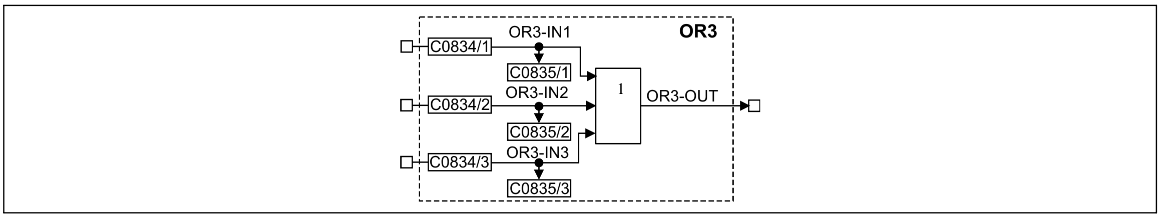


Fig. 9-120 OR operation (OR3)

Signal				Source			Note
Name	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	-	-	-	-	-	-

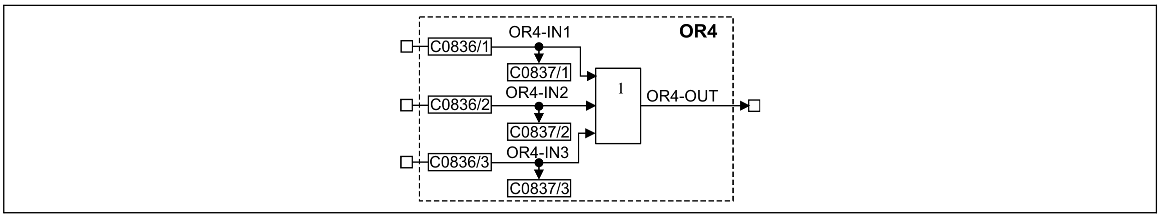


Fig. 9-121 OR operation (OR4)

Signal				Source			Note
Name	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	-	-	-	-	-	-

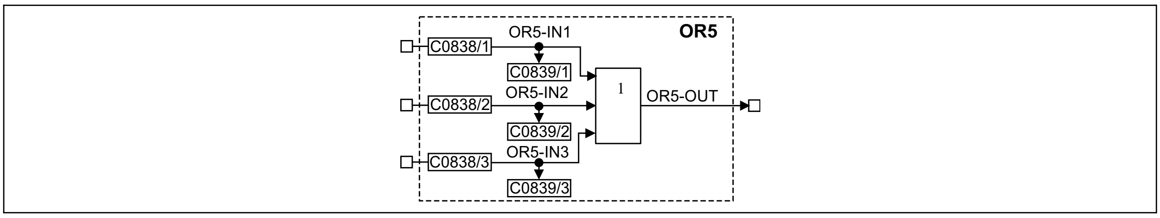


Fig. 9-122 OR operation (OR5)

Signal				Source			Note
Name	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	1
0	1	0	1
1	1	0	1
0	0	1	1
1	0	1	1
0	1	1	1
1	1	1	1

The function corresponds to a connection in parallel of NO contacts in a contactor control.

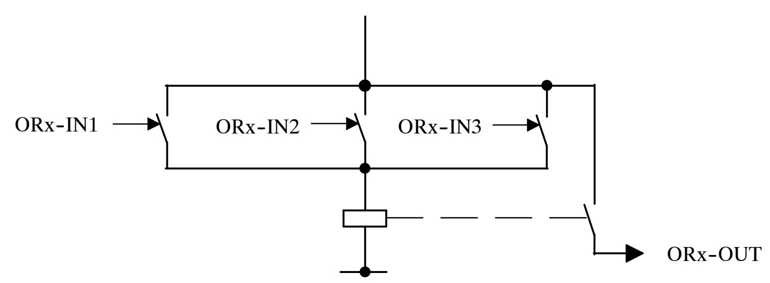


Fig. 9-123 Function of the OR operation as a parallel connection of NO contacts.

Tip!

If only two inputs are needed, use the inputs ORx-IN1 and ORx-IN2. Assign the input ORx-IN3 with the signal source FIXED0.

9.2.48 Oscilloscope function (OSC)

Purpose

Detection of any measured variable (e. g. speed setpoint, actual speed, torque etc.). They are visualised in Global Drive Control.

Supports the commissioning of controllers and the troubleshooting.

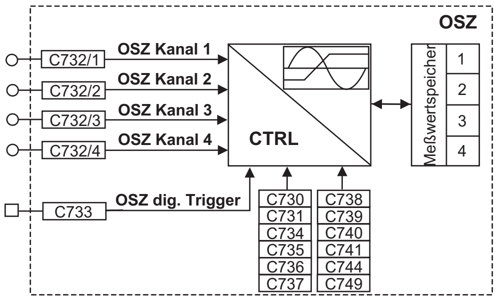


Fig. 9-124 Oscilloscope function (OSZ)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
OSC CHANNEL1	a	-	-	C0732/1	1	-	-
OSC CHANNEL2	a	-	-	C0732/2	1	-	-
OSC CHANNEL3	a	-	-	C0732/3	1	-	-
OSC CHANNEL4	a	-	-	C0732/4	1	-	-
OSC-DIG-TRIGGER	d	-	-	C0733/1	2	-	-

Function

The FB has three function units:

- Trigger check
  – Monitoring of the digital trigger source for a valid trigger result
- Processing of the measured signal
  – Linking the measurement inputs
  – Calculating the time
  – Monitoring of the analog trigger source for a valid trigger event.
- Memory of the measured values
  – Scaling the ring buffer
  – Filing the measured data in the ring buffer
  – Saving the measuring points for image restoration

Functional description

Function	Code	Selection	Description
OSC mode			Controls the measurement in the controller
	C0730	1	• Starts the recording of the measured values
		0	• Cancels a running measurement
OSC status			Displays five different operating states
	C0731	1	• Measurement completed – The memory of the measured values is completely filled with measured data. The measured values can be accessed via the PC.
		2	• Measurement active – A measurement was started with C0730 = 1. The FB is waiting for a valid trigger event.
		3	• Trigger detected – The FB has detected a valid trigger event. Depending on the trigger delay the saving of the measured data is not yet completed. It is automatically completed with the entry of the last memory unit.
		4	• Measurement cancelled – Cancel of a running recording of the measured values (C0730 = 0). The memory of the measured values is filled with the data that has just been measured. The data can be accessed via the PC.
		5	• Read data memory – The measured data memory is being read at the moment. No settings are possible in this operating state.
Configuration OSC channel 1 ... 4	C0732/1 to C0732/4		• Links the measuring channels of the FB with the signals of the process environment – The four measuring channels can be assigned with any analog signal. Enter the corresponding signal number into C0732/1 ... C0732/4. – Always start linking with channel 1, then channel 2 and so on. Unused channels are automatically assigned with signal FIXED 0%.
Configuration OSC trigger	C0733/1		Links the digital trigger input with a digital signal in the process environment. – The trigger input can be assigned with any digital signal. Enter the corresponding signal number into C0733/1.
Trigger source			Defines the trigger source
	C0734	1	Source is one of the four measuring channels (C0734/1 ... C0734/4
		0	Source is the digital trigger input (C0733/1)
Trigger level	C0735	-32767 ... 32767	• Defines the trigger level which activates the triggering when the threshold is exceeded. – The trigger level is only monitored when the triggering is done on one of the four channels. – The trigger level is not effective with digital triggering.
Trigger edge			Defines the trigger edge which activates the triggering. • Triggering on an analog input channel – With a LOW-HIGH trigger edge the analog trigger signal must exceed a defined trigger level to activate the triggering. – With a HIGH-LOW trigger edge the analog trigger signal must fall below a defined trigger level to activate the triggering. • Triggering on a digital trigger input – With a LOW-HIGH trigger edge the digital trigger signal must change from LOW to HIGH to activate the triggering. – With a HIGH-LOW trigger edge the digital trigger signal must change from HIGH to LOW to activate the triggering. Fig. 9-125 shows the triggering of an analog signal with a positive edge.
	C0736	1	– HIGH-LOW trigger edge
		0	LOW-HIGH trigger edge

Function	Code	Selection	Description
Trigger delay			The trigger delay defines when to begin with the saving of the measured values with regard to the trigger time.
	C0737	-100.0 % ... 0 %	• Negative trigger delay (pre-triggering) – Defines a percentage of the whole memory content. This part of the memory content is filled with measured values **before** the triggering (see Fig. 9-126).
		0 % ... 999.9 %	• Positive trigger delay (post triggering) – Defines a percentage of the whole memory content. The saving of the measured values **after** triggering is delayed by this part of the memory content (Fig. 9-125).
Sampling period	C0738	1 ms ... 10 min	• Setting of the sampling period – The sampling period is the time between two measurements – The measurements are carried out simultaneously for all channels (e. g. is measured value at channel 1 is measured at the same time as a measured value at channel 2, 3 or 4. – The sampling period can be set in steps of 1, 2 and 5.
Number of Channels	C0739		Number of channels used for measurements.
Read data memory			The code is required if the GDC is not used for the visualisation.
	C0740/1	0 ... 16383	• Defines the starting point for reading the data memory and thus enables the memory array to be deliberately accessed. – In order to read the data memory bit by bit (e. g. reading only the measured value of a channel or reading with reduced memory depth), the starting point can be changed.
	C0740/2	1	• Enable "Read memory" – Enables the access to the memory to read the data
		0	• Inhibit "Read memory" – Inhibits the access to the memory. The access must be inhibited after every reading of the data
Information about the function block			Provides information on the function block
	C0741/1		Version of the function block (e. g. 120: Version 1.20)
	C0741/2		Data memory size (1024 ... 16384 bytes)
	C0741/3		Data width of the measured values (1 byte / 2 bytes)
	C0741/4		Number of the available measuring channels (1 ... 4)

Function	Code	Selection	Description
Memory size	C0744	0 ... 6	Set memory depth of the data memory – Max. size of the data memory: 8192 measured values ≙ 16384 bytes (C0744 = 6) – Min. size of the data memory: 512 measured values ≙ 1024 bytes (C0744 = 0) – Changing the memory depth of 512 ... 8192 measured values/step – A memory depth which is optimally adapted to the corresponding measuring task reduces the data transmission time.
Information on saving			Information on saving the measured values in the data memory The FB saves the data in a ring format. For reconstructing the chronological signal sequence the following three ”graphic points” are marked.
	C0749/1		Measured value no. of the instant of abortion
	C0749/2		Measured value no. of the instant of triggering
	C0749/3		Measured value no. of the instant of completion

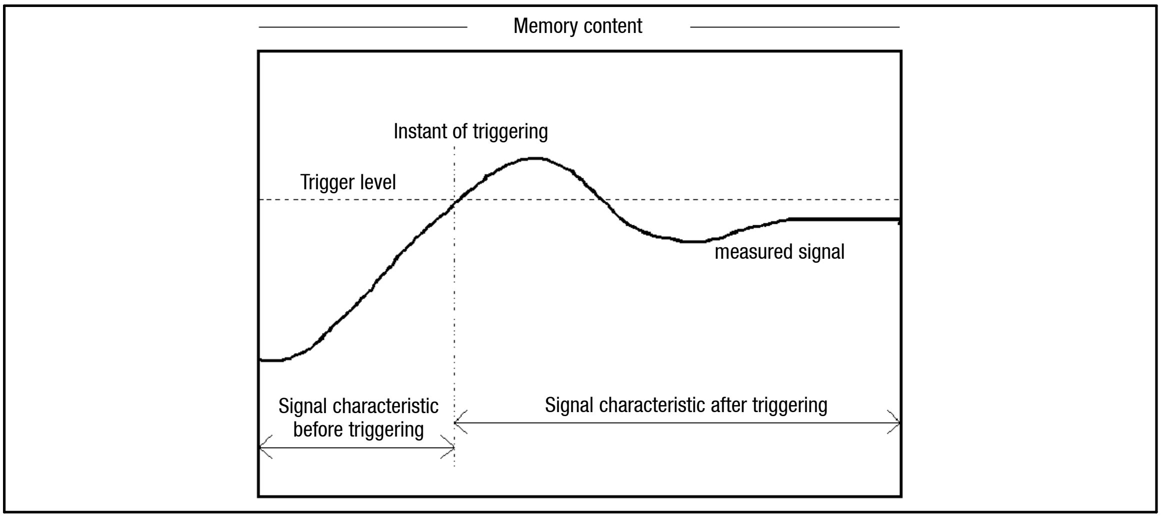


Fig. 9-125 Example: Trigger level and trigger delay with approx. -30 % of pre-triggering

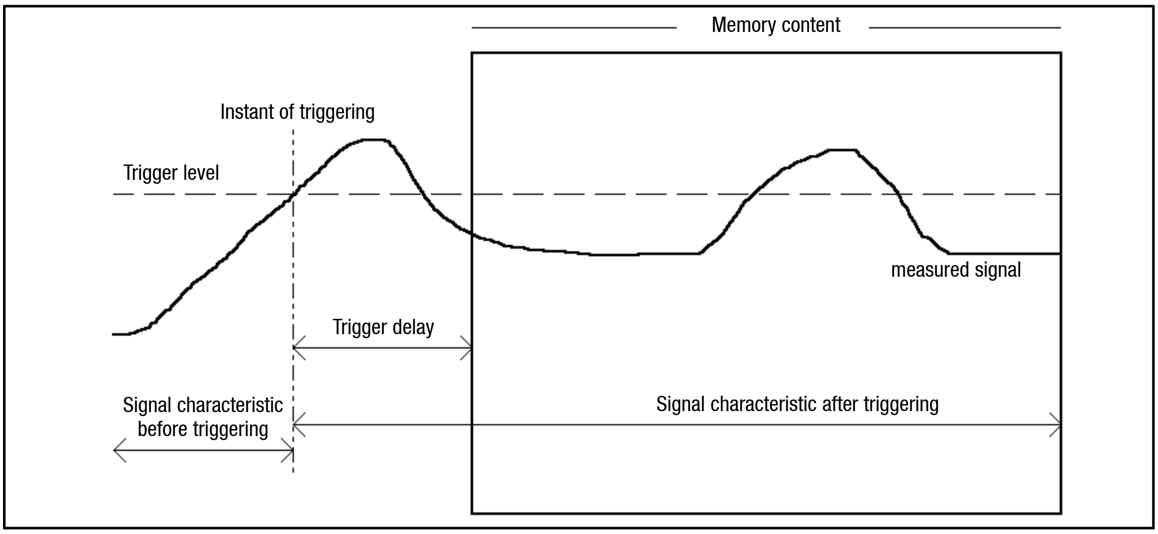


Fig. 9-126 Example: Trigger level and trigger delay with approx. -30 % of post-triggering

9.2.49 Process controller (PCTRL1)

Purpose

The FB is used, for instance, as a higher-level controller (dancer position controller, tension controller, pressure controller etc.).

The control characteristic follows the ideal PID algorithm, but it can also be changed over to a PI or P characteristic.

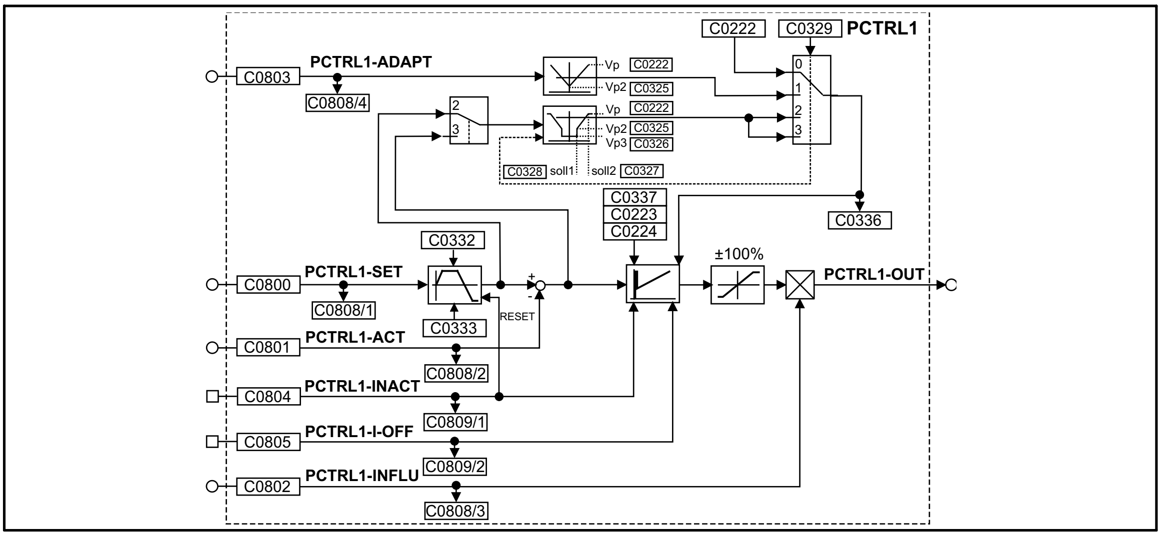


Fig. 9-127 Process controller (PCTRL1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
PCTRL1-SET	a	C0808/1	dec [%]	C0800	1	1000	Input of the 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	Actual value input; value range ±200%
PCTRL1-INFLU	a	C0808/3	dec [%]	C0802	1	1000	Evaluation or suppression of the output signal; value range ±200%
PCTRL1-ADAPT	a	C0808/4	dec [%]	C0803	1	1000	Online change of the P gain; value range ±200%
PCTRL1-INACT	d	C0809/1	bin	C0804	2	1000	Online deactivation of the process controller
PCTRL1-I-OFF	d	C0809/2	bin	C0805	2	1000	Online setting of the I component to zero
PCTRL1-OUT	a	-	-	-	-	-	-

Function

Setpoint and actual value are sent to the process controller via the corresponding inputs and processed according to the selected control algorithm (control chararacteristic).

9.2.49.1 Control characteristic

- In the default setting, the PID algorithm is active.
- The D-component can be deactivated by setting code C0224 to zero. Thus, the controller becomes a PI-controller (or P-controller if the I-component is also switched off).
- The I-component can be switched on or off online via the PCTRL-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".
  – PCTRL-I-OFF = HIGH switches off the I-component
  – PCTRL-I-OFF = LOW switches on the I-component
- The adjustment time is parameterised via C0223.
- The P-gain can be set in different ways. The function for the provision of the P-gain is selected under C0329:
  – C0329 = 0
  The P-gain is entered under C0222.
  – C0329 = 1
  The P-gain is entered via the PCTRL-ADAPT input. 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 applies if the input value is 0 %.

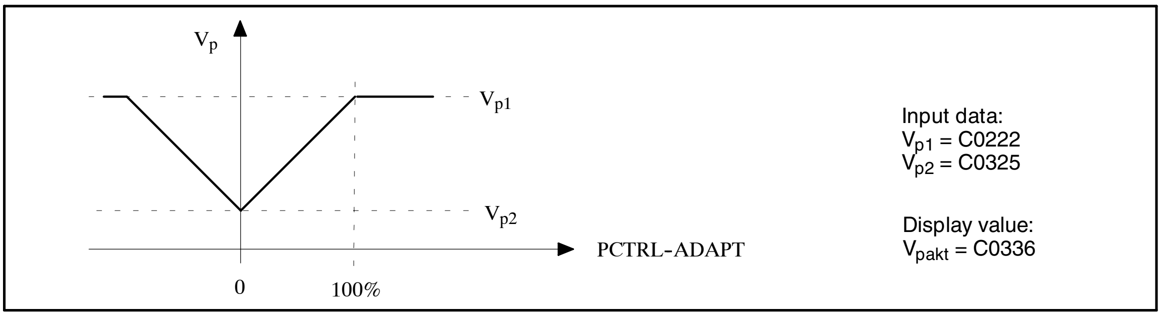


Fig. 9-128 Input of the P-gain via PCTRL-ADAPT input

  – C0329 = 2
  The P-gain is derived from the process setpoint PCTRL-SET. The setpoint is measured after the ramp function generator and calculated by means of a curve with three coordinates.

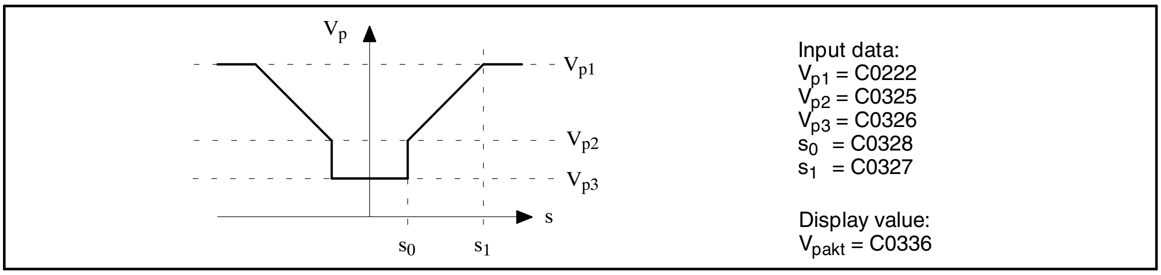
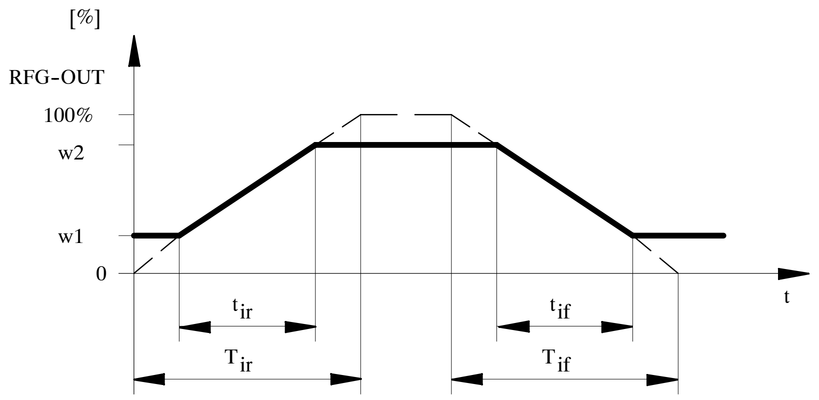


Fig. 9-129 Input of the P-gain derived from the PCTRL-SET process setpoint

  – C0329 = 3
  The input of the P-gain is derived from the control difference and led by the characteristic generation as C0329 = 2.

9.2.49.2 Ramp function generator

The setpoint PCTRL-SET is led by a ramp generator with linear characteristic. Thus, setpoint step-changes at the input can be transformed into a ramp.



$$T_{ir} = t_{ir}\frac{100\%}{w2 - w1} \qquad T_{if} = t_{if}\frac{100\%}{w2 - w1}$$

Fig. 9-130 Acceleration and deceleration times of the ramp generator

- The ramps can be adjusted separately for acceleration and deceleration.
  - – Acceleration time t_{ir} with C0332.
  - – Deceleration time t_{if} with C0333.
- PCTRL-INACT = HIGH
  - – The ramp generator is immediately set to zero.

9.2.49.3 Value range of the output signal

- The process controller operates in bipolar mode in the default setting.
  - – The output value is limited to ±100 %.
- The function can be set in unipolar mode under C0337.
  - – The output value is limited to 0 ... +100 %.

9.2.49.4 Evaluation of the output signal

- The output signal can be evaluated after the limitation block via PCTRL-INFLU.
  - – The process controller can be used or suppressed with this evaluation.
  - – The calcuation is done according to the following formula:
    100 % (PCTRL-OUT) = 100 % * 100 % (PCTRL-INFLU).

9.2.49.5 Deactivation of the process controller

- PCTRL-INACT = HIGH deactivates the process controller
  - – PCTRL-OUT is set to zero.
  - – The I-component is set to zero.
  - – The ramp generator is set to zero.

9.2.50 Phase addition block (PHADD)

Purpose

Adds or subtracts phase signals depending on the input used.

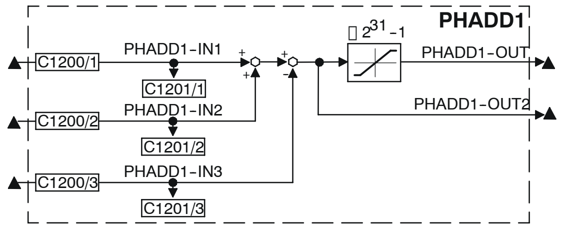


Fig. 9-131 Phase addition block (PHADD1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
PHADD1-IN1	ph	C1200/1	dec [inc]	C1201/1	3	1000	Addition input
PHADD1-IN2	ph	C1200/2	dec [inc]	C1201/2	3	1000	Addition input
PHADD1-IN3	ph	C1200/3	dec [inc]	C1201/3	3	1000	Subtraction input
PHADD1-OUT	ph	-	-	-	-	-	Limited to ±2147483647
PHADD1-OUT2	ph	-	-	-	-	-	-

Function

- Input PHADD1-IN1 is added to input PHADD1-IN2.
- The input PHADD-IN3 is subtracted from the calculated result.
- Then the result of the subtraction
  – is limited to ±2147483647 and output at PHADD1-OUT.
  – is output at PHADD1-OUT2 without limitations.

9.2.51 Phase comparator (PHCMP)

Purpose

Compares two phase signals (distances) with each other.

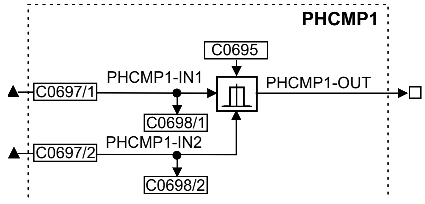


Fig. 9-132 Phase comparator (PHCMP1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
PHCOMP1-IN1	ph	C0698/1	dec [inc]	C0697/1	3	1000	Signal to be compared
PHCOMP1-IN2	ph	C0698/2	dec [inc]	C0697/2	3	1000	Comparison value
PHCOMP1-OUT	d	-	-	-	-	-	

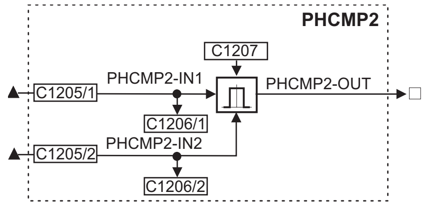


Fig. 9-133 Phase comparator (PHCMP2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
PHCOMP2-IN1	ph	C1206/1	dec [inc]	C1205/1	3	1000	Signal to be compared
PHCOMP2-IN2	ph	C1206/2	dec [inc]	C1205/2	3	1000	Comparison value
PHCOMP2-OUT	d	-	-	-	-	-	

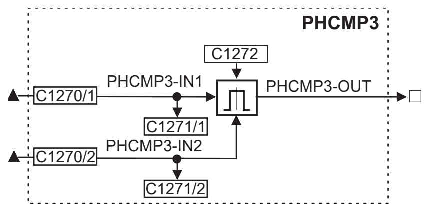


Fig. 9-134 Phase comparator (PHCMP3)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
PHCOMP3-IN1	ph	C1271/1	dec [inc]	C1270/1	3	1000	Signal to be compared
PHCOMP3-IN2	ph	C1271/2	dec [inc]	C1270/2	3	1000	Comparison value
PHCOMP3-OUT	d	-	-	-	-	-	

Function

Function block	Code	Function	Note
PHCMP1	C0695 = 0	• If PHCMPx-IN1 < PHCMPx-IN2, PHCMPx-OUT = HIGH • If PHCMPx-IN1 ≥ PHCMPx-IN2, PHCMPx-OUT = LOW	
PHCMP2	C1207 = 0		
PHCMP3	C1272 = 0		
PHCMP1	C0695 = 1	• If ǀ PHCMPx-IN1 ǀ < ǀ PHCMPx-IN2 ǀ, PHCMPx-OUT = HIGH • If ǀ PHCMPx-IN1 ǀ ≥ ǀ PHCMPx-IN2 ǀ, PHCMPx-OUT = LOW	Compares the amount of the inputs
PHCMP2	C1207 = 1		
PHCMP3	C1272 = 1		

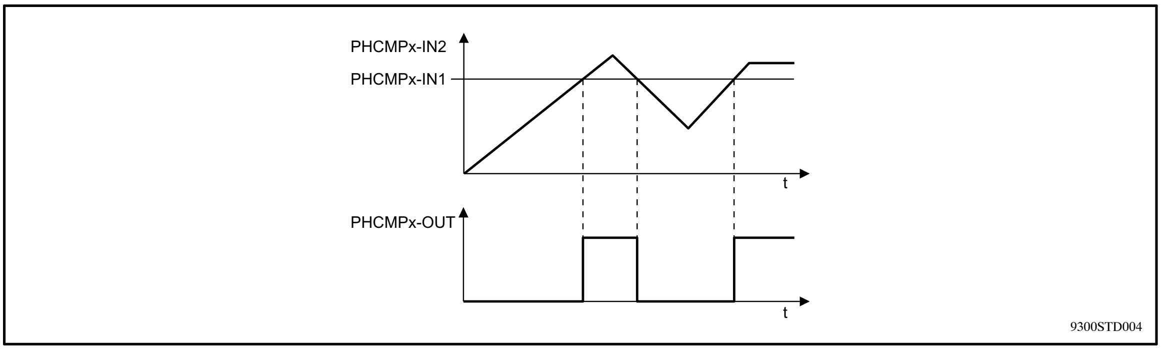


Fig. 9-135 Function diagram

9.2.52 Actual phase integrator (PHDIFF)

Purpose

Deliberate addition of a phase signal to the setpoint phase.

It is also possible to compare setpoint and actual phase signals.

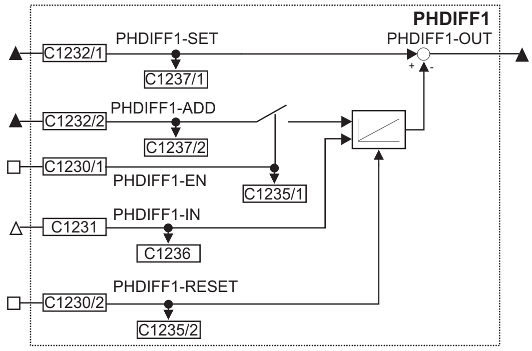


Fig. 9-136 Actual phase integrator (PHDIFF1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
PHDIFF1-IN	phd	C1236	dec [rpm]	C1231	4	-
PHDIFF1-SET	ph	C1237/1	dec [inc]	C1232/1	3	-
PHDIFF1-ADD	ph	C1237/2	dec [inc]	C1232/2	3	-
PHDIFF1-EN	d	C1235/1	bin	C1230/1	2	-
PHDIFF1-RESET	d	C1235/2	bin	C1230/2	2	HIGH = sets the actual phase integrator = 0
PHDIFF1-OUT	ph	-	-	-	-	without limit

Function

C1230/1 = HIGH

- The speed signal at PHDIFF1-IN is integrated by the actual phase integrator.
- The phase signal at PHDIFF1-ADD is added to the integrated speed signal.
- The result of the actual phase integrator is subtracted from the phase signal at PHDIFF1-SET.

C1230/1 = LOW

- The speed signal at PHDIFF1-IN is integrated by the actual phase integrator.
- The result of the actual phase integrator is subtracted from the phase signal at PHDIFF1-SET.

9.2.53 Signal adaptation for phase signals (PHDIV)

Purpose

Division or multiplication of phase signals as a power of two.

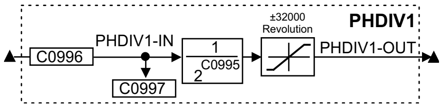


Fig. 9-137 Signal adaptation for phasae signals (PHDIV1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
PHDIV1-IN	ph	C0997	dec [inc]	C0996	3	1000	
PHDIV1-OUT	ph	-	-	-	-	-	65536 inc = one encoder revlution

Function

- Arithmetic function:

$$\text{PHDIV1-OUT} = \frac{\text{PHDIV1-IN}}{2^{\text{C0995}}}$$

  – positive values in C0995 result in a division
  – negative values in C0995 result in a multiplication
- The output value is limited to ±32000 encoder revolutions.
  – If the limit is exceeded, the output is kept at the limit value.

9.2.54 Phase integrator (PHINT)

Purpose

Integrates a speed or a velocity to a phase (distance). The integrator can maximally accept ±32000 encoder revolutions.

PHINT3 can recognise a relative distance.

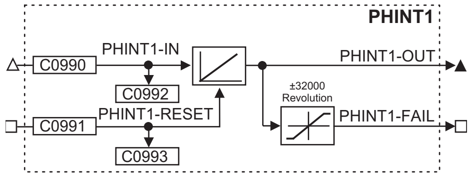


Fig. 9-138 Phase integrator (PHINT1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
PHINT1-IN	phd	C0992	dec [rpm]	C0990	4	1 revolution = 65536 increments
PHINT1-RESET	d	C0993	bin	C0091	2	HIGH = sets the phase integrator to 0 and PHINT1-FAIL = LOW
PHINT1-OUT	ph	-	-	-	-	65536 inc = 1 encoder revolution, overflow is possible
PHINT1-FAIL	d	-	-	-	-	HIGH = overflow

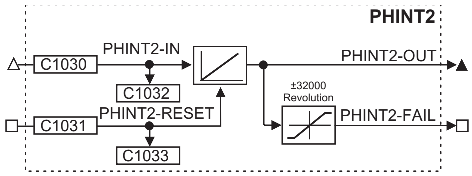


Fig. 9-139 Phase integrator (PHINT2)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
PHINT2-IN	phd	C1032	dec [rpm]	C1030	4	1 revolution = 65536 increments
PHINT2-RESET	d	C1033	bin	C1031	2	HIGH = sets the phase integrator to 0 and PHINT2-FAIL = LOW
PHINT2-OUT	ph	-	-	-	-	65536 inc = 1 encoder revolution, overflow is possible
PHINT2-FAIL	d	-	-	-	-	HIGH = overflow

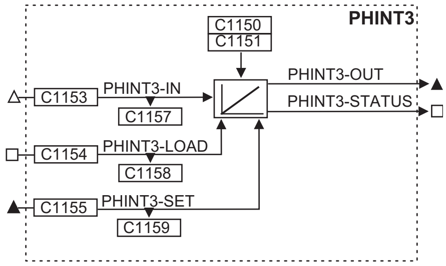


Fig. 9-140 Phase integrator (PHINT3)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
PHINT3-IN	phd	C1157	dec [rpm]	C1153	4	1 revolution = 65536 increments
PHINT3-LOAD	d	C1158	bin	C1154	2	HIGH = sets the phase integrator to the input signals of PHINT3-IN and PHINT3-STATUS = LOW
PHINT3-SET	ph	C1159	dec [inc]	C1155	3	
PHINT3-OUT	ph	-	-	-	-	65536 inc = 1 encoder revolution, overflow is possible
PHINT3-STATUS	d	-	-	-	-	HIGH = Overflow or distance is processed

Function

- Constant input value (PHINT1, PHINT2 and PHINT3)
- Input value with sign reversal (PHINT3)
- Scaling of PHINTx-OUT

9.2.54.1 Constant input value (PHINT1 and PHINT2)

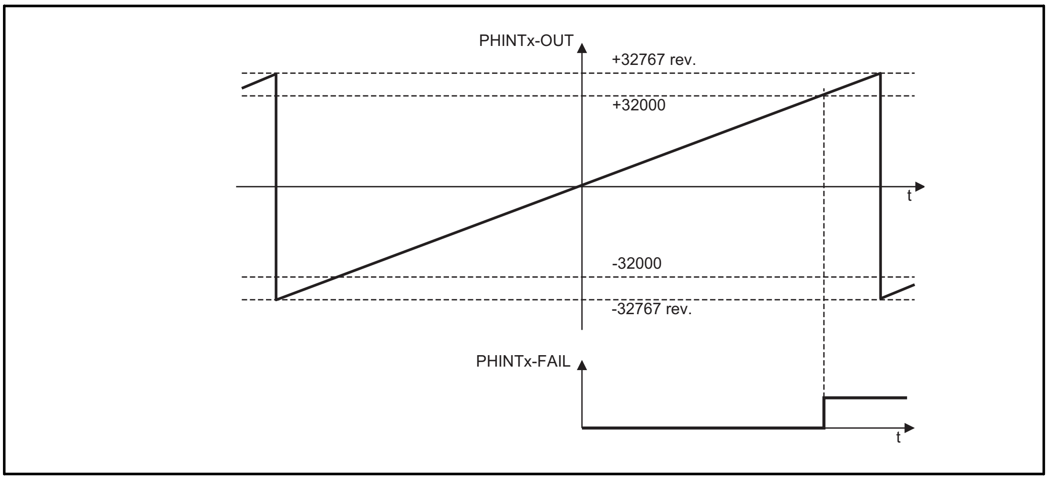


Fig. 9-141 Function of PHINTx with constant input value

- The FB integrates speed or velocity values at PHINTx-IN to a phase (distance).
- PHINTx-OUT outputs the count of the bipolar integrator.
  – A positive value at PHINTx-IN increments the integrator (count is increased).
  – A negative value at PHINTx-IN decrements the integrator (count is reduced).
- If the count exceeds the value of +32767 encoder revolutions (≙ +2147483647 inc)
  – an overflow occurs. The counting is continued with the value -32768.
  – PHINTx-FAIL switches to HIGH when the value ≥ +32000 is reached. PHINTx-FAIL = HIGH.
- If the count falls below the value of -32768 encoder revolutions (≙ -2147483648 inc)
  – an overflow occurs. The counting starts at the value +32767.
  – PHINTx-FAIL switches to HIGH when the value ≤ -32000 is reached.
- PHINTX-RESET = HIGH
  – sets the integrator to 0
  – sets PHINTx-OUT = 0, as long as a HIGH level is applied to PHINTx-IN.
  – sets PHINTx-FAIL = LOW.

9.2.54.2 Constant input value (PHINT3)

The FB PHINT3 has three modes which can be set via C1150.

Mode C1150 = 2 is in chapter. 9.2.54.3.

C1150 = 0	C1150 = 1
The input PHINT3-LOAD is state-controlled (HIGH level). • PHINT3-LOAD = HIGH – The integrator is loaded with the input value at PHINT3-SET. – Sets the output PHINT3-STATUS = LOW	The input PHINT3-LOAD is edge-triggered (LOW-HIGH edge). • PHINT3-LOAD = LOW-HIGH edge – The integrator is loaded with input value at PHINT3-SET and immediately starts to integrate – Sets the output PHINT3-STATUS = LOW

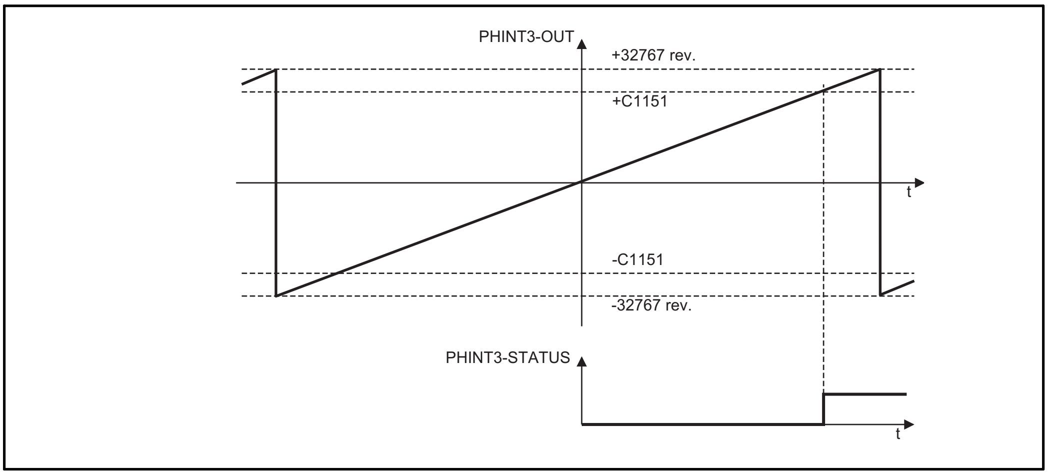


Fig. 9-142 Function of PHINT3 with constant input value at C1150 = 0 and C1150 = 1

- The FB integrates speed or velocity values at PHINT3-IN to a phase (distance).
- PHINT3-OUT outputs the count of the bipolar integrator.
  – A positive value at PHINT3-IN increments the integrator (count is increased).
  – A negative value at PHINT3-IN decrements the integrator (count is reduced).
- If the count exceeds the value of +32767 encoder revolutions (≙ +2147483647 inc)
  – an overflow occurs. The counting is continued with the value -32768,
  – PHINT3-STATUS switches to HIGH when the value of (+) C1151 is reached.
- If the count falls below the value of -32768 encoder revolutions (≙ -2147483648 inc)
  – an overflow occurs. The counting starts at the value +32767,
  – PHINT3-STATUS switches to HIGH when the value of (-) C1151 is reached.

9.2.54.3 Input value with sign reversal (PHINT3)

C1150 = 2

The input PHINT3-LOAD is state-controlled (HIGH level).

- PHINT3-LOAD = HIGH
  – The integrator is loaded with the input value at PHINT3-SET.
  – Sets the output PHINT3-STATUS = LOW.

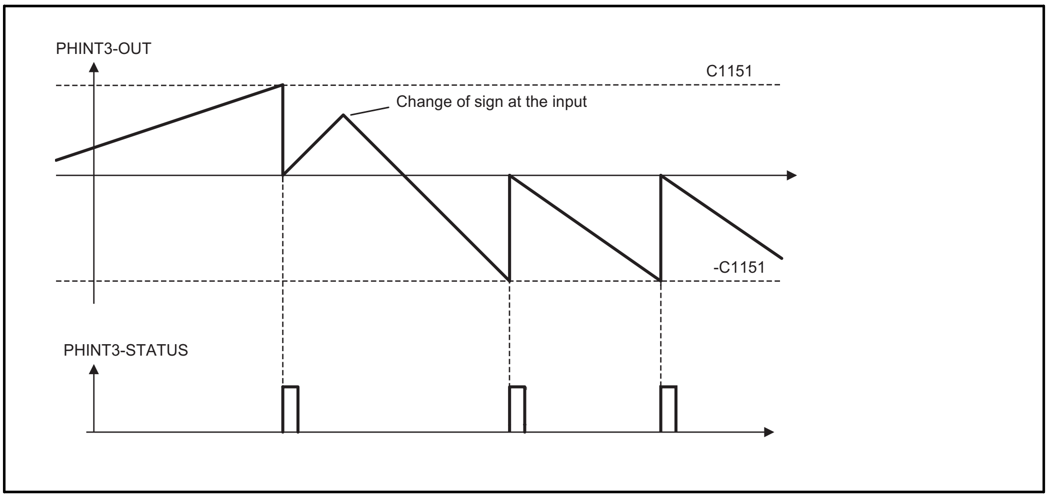


Fig. 9-143 Function of PHINT3 with sign reversal of the input value at C1150 = 2

- The FB integrates speed or velocity values at PHINT3-IN to a phase (distance).
- PHINT3-OUT outputs the count of the bipolar integrator.
  – A positive value at PHINT3-IN increments the integrator (count is increased).
  – A negative value at PHINT3-IN decrements the integrator (count is reduced).
- If the counter content exceeds the value of (+) C1151
  – the value of C1151 is subtracted from the counter content,
  – switches PHINT3-STATUS = HIGH for 1 ms.
- If the counter content falls below the value of () C1151
  – the value of C1151 is added to the counter content,
  – switches PHINT3-STATUS = HIGH for 1 ms.

9.2.54.4 Scaling of PHINTx-OUT

Mathematical description of PHINTx-OUT:

$$PHINTx-OUT[inc] = PHINTx-IN[rpm] \cdot t[s] \cdot 65536[inc/rev.]$$

t Integration time

Example:

You want to determine the count of the integrator with a certain speed at the input and a certain integration time.

- Given values:
  - PHINTx-IN = 1000 rpm
  - t = 10 s
  - Start value of the integrator = 0
- Solution:
  - Conversion of PHINTx-IN:

$$1000\ rpm = \frac{1000\ rev.}{60\ s}$$

  - Calculation of PHINTx-OUT:

$$PHINTx-OUT = \frac{1000\ rev.}{60\ s} \cdot 10\ s \cdot \frac{65536\ inc}{rev.} = 10922666\ inc$$

9.2.55 First order delay element (PT1)

Purpose

Filter and delay analog signals.

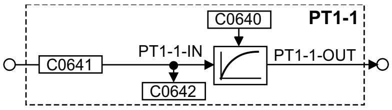


Fig. 9-144 First order delay element (PT1-1)

Signal				Source			Note
Name	**Type**	**DIS**	**DIS format**	**CFG**	**List**	**Lenze**	
PT1-1-IN	a	C0642	dec [%]	C0641	1	1000	-
PT1-1-OUT	a	-	-	-	-	-	-

Function

- The delay T is set under C0640.
- The proportional value is fixed at K = 1.

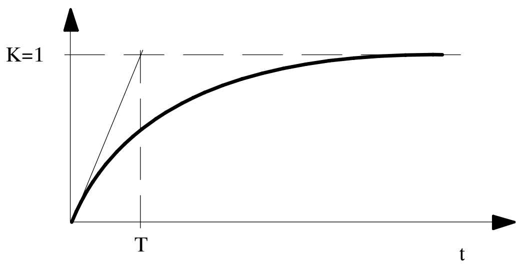


Fig. 9-145 Delay T of the first order delay element

9.2.56 CW/CCW-QSP link (R/L/Q)

Purpose

The FB links the input of the direction of rotation and the QSP function and is protected against open circuit.

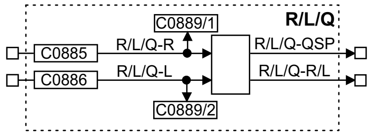


Fig. 9-146 CW-CCW-QSP link (R/L/Q)

Signal				Source			Note
Name	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 and simultaneous HIGH level at both inputs, the outputs are used as follows:

Inputs		Outputs	
R/L/Q-R	R/L/Q-L	CW/CCW/Q-CW/CCW	CW/CCW/Q-QSP
1	1	0	1

- The following table results, if the inputs were set to LOW once:

Inputs		Outputs	
R/L/Q-R	R/L/Q-L	CW/CCW/Q-CW/CCW	CW/CCW/Q-QSP
0	0	0	1
1	0	0	0
0	1	1	0
1	1	unchanged	unchanged

- If both inputs are set to HIGH during operation, both outputs still have their previously output value.

9.2.57 Homing function (REF)

Purpose

The homing function serves to position the drive shaft.

Tip!
At first, select the predefined configuration in C0005, which already contains the REF function block. This ensures that all important signal connections are restored automatically. Then, adapt the configuration to your application.

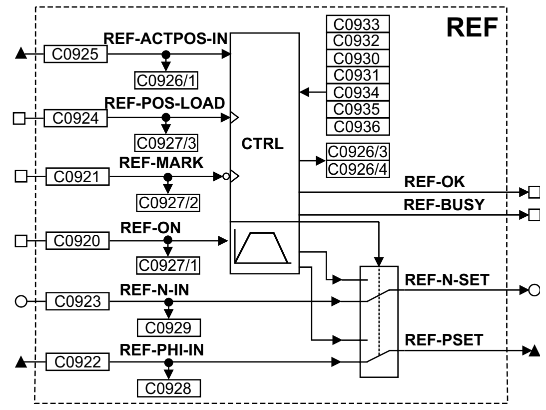


Fig. 9-147 Homing function (REF)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
REF-N-IN	0	C0929	dec [%]	C0923	1	1000	Speed setpoint in [%] of nmax C0011
REF-PHI-IN	ph	C0928 C0926/2	dec [inc]	C0922	3	1000	Phase setpoint (following error for phase controller in the FB MCTRL)
REF-ACTPOS-IN	ph	C0926/1	dec [inc]	C0925	3	1000	Value to be loaded for the current position (REF-ACTPOS)
REF-ON	d	C0927/1	bin	C0920	2	1000	HIGH = start homing
REF-MARK	d	C0927/2	bin	C0921	2	1000	Home position switch
REF-POS-LOAD	d	C0927/3	bin	C0924	2	1000	LOW-HIGH edge = phase at the input REF-ACTPOS-IN is loaded in REF-ACTPOS (starting value)
REF-OK	d	-	-	-	-	-	HIGH = homing completed/homing known
REF-BUSY	d	-	-	-	-	-	HIGH = homing function is active
REF-N-SET	0	-	-	-	-	-	Speed setpoint for n-controller
REF-PSET	ph	-	-	-	-	-	Phase setpoint (following error for phase controller in the FB MCTRL)

Functional range

- Profile generator
- Homing modes
- Control via input signals
- Output of status signals

9.2.57.1 Profile generator

The speed profile for homing can be adapted to the application.

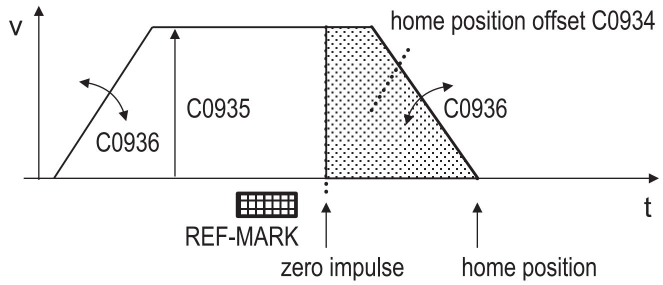


Fig. 9-148 Speed profile for homing

Code	Meaning	Note
C0930	Gearbox factor - numerator, circumference of the pinion on the motor side	Setting is only required if the actual value encoder is not connected to the motor.
C0931	Gearbox factor - denominator, circumference of the pinion on the encoder side	
C0933	Calculating the position of the rising or falling edge of the zero track or touch probe	Depending on the mode selected
C0934	Home position offset = Number of increments after the zero pulse has occurred	The reference is: 65536 inc = 1 revolution. Selection is possible up to 2140000000 inc
C0935	Maximum traversing speed	Input in [%] of nmax C0011
C0936	Acceleration / deceleration time	Linear ramp
C0926/3	REF-ACTPOS, actual position value	Display only
C0926/4	REF-TARGET, actual target position	Display only

The profile generator calculates the speed profile from the set profile parameters.

- The parameters can be changed during homing.
  – C0935 and C0936 become active if REF-ON = LOW.
- The drive should not be driven at the torque limit (MCTRL-MMAX = HIGH), otherwise the drive cannot follow the speed profile.
  – Prolonging the acceleration / deceleration time until MCTRL-MMAX does not respond anymore.
- The phase controller in the function block MCTRL must be active.

9.2.57.2 Homing modes

The home position is defined via:

- the homing mode C0932
- the signal edge of the zero pulse or touch probe signal C0933
- the home position offset C0934

Tip!
If the position feedback is done via a resolver, the zero position applies instead of the zero pulse (depending on the resolver connection to the motor). If referencing via touch probe, the touch probe angle applies.

Referencing with reference switch to zero pulse/zero position

The home position is after the negative edge of the reference switch REF-MARK, at the next zero pulse/zero position plus the home position offset:

- Mode 0 (C0932 = 0):
  – Move to the home position in CW rotation.
  – Select a positive home position offset C0934.

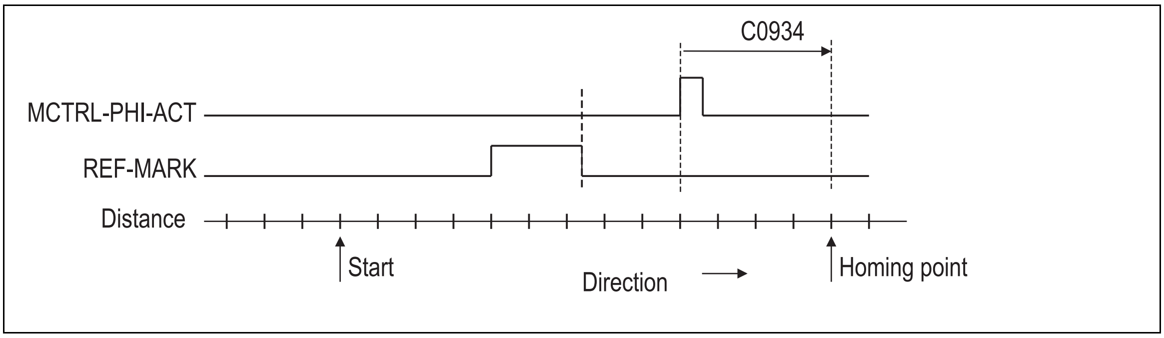


Fig. 9-149 Referencing with zero pulse/zero position; approach the home position with clockwise rotation

- Mode 1 (C0932 = 1):
  – Move to the home position in CCW rotation.
  – Select a negative home position offset C0934.

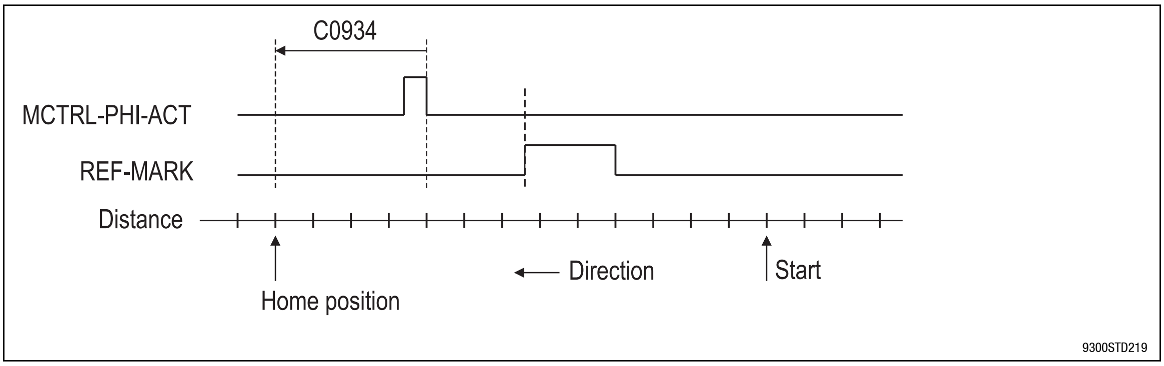


Fig. 9-150 Referencing with zero pulse/zero position; approach the home position with counter-clockwise rotation

Referencing with reference switch and touch probe (TP)

The home position is after the negative edge of the reference switch REF-MARK, at the touch probe signal (terminal X5/E4) plus the home position offset:

- Mode 6 (C0932 = 6):
  – Move to the home position in CW rotation.
  – Select a positive home position offset C0934.

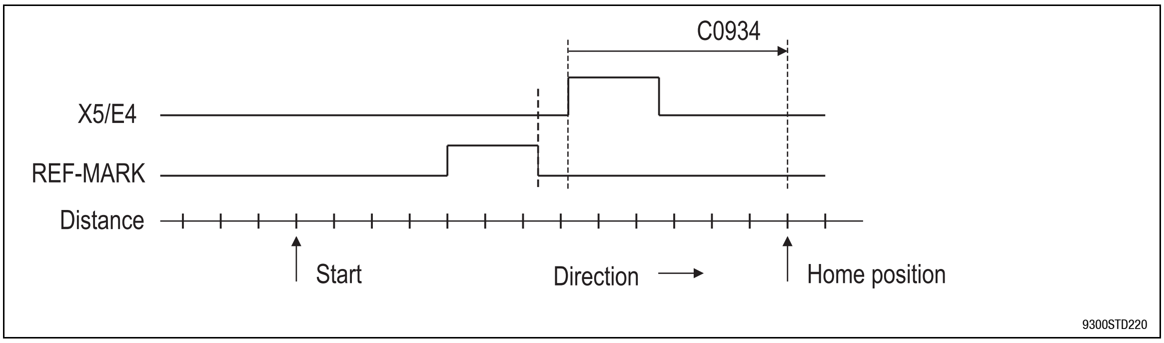


Fig. 9-151 Referencing with touch probe; approach the home position with clockwise rotation

- Mode 7 (C0932 = 7):
  – Move to the home position in CCW rotation.
  – Select a negative home position offset C0934.

Referencing with touch probe (TP)

The home position is at the next touch probe signal (terminal X5/E4) plus the home position offset.

- Mode 8 (C0932 = 8):
  – Move to the home position in CW rotation.
  – Select a positive home position offset C0934.
- Mode 9 (C0932 = 9):
  – Move to the home position in CCW rotation.
  – Select a negative home position offset C0934.

Direct referencing

The home position is at the home position offset.

- Mode 20 (C0932 = 20):
  – Directly after the activation (REF-ON = HIGH), the drive traverses from the actual position (REF-ACTPOS) to the home position.
  – Before that, the actual position (REF-ACTPOS) can be loaded with the input value REF-ACTPOS-IN (see chapter 9.2.57.3).
  – The route and direction of travel results from the actual position (REF-ACTPOS) and the home position offset (C0934) set.

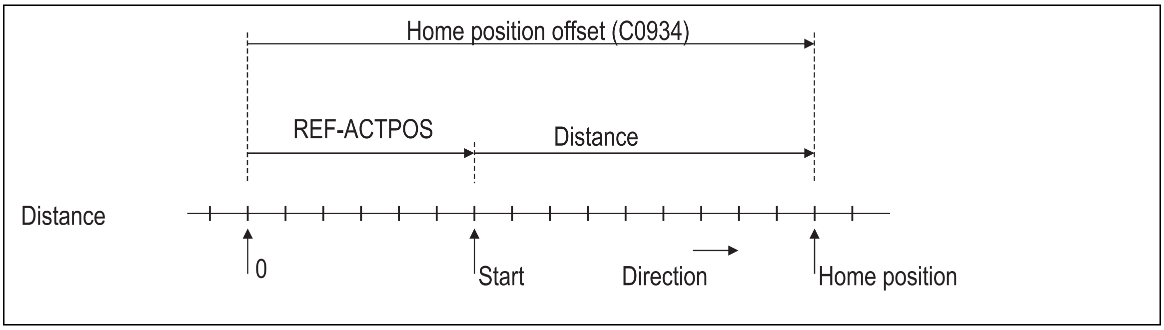


Fig. 9-152 Direct referencing; approach the home position with clockwise rotation

- Mode 21 (C0932 = 21) like mode 20, but in addition:
  – The actual position value (REF-ACTPOS) is stored when the mains is disconnected and reloaded when the mains is connected.

9.2.57.3 Control via input signals

- REF-ON = LOW-HIGH edge starts homing:
  – The input must remain on HIGH until the end of the homing process. Homing is aborted if the input is set to LOW before the home position is reached.
- REF-ON = LOW interrupts homing:
  – The drive decelerates to speed 0 at the adjusted ramp C0936.
  – The inputs REF-N-IN and REF-PHI-IN are switched to the outputs REF-N-SET and REF-PSET.
  – Has no effect if homing is already completed (REF-BUSY = LOW).
- REF-POS-LOAD = LOW-HIGH edge
  – The profile generator accepts the phase at the input REF-ACTPOS-IN as starting value in the actual position value REF-ACTPOS.
  – The function is only active if REF-ON = LOW
  – The function is only active in the modes 20 and 21.

9.2.57.4 Output of status signals

- REF-BUSY = HIGH: the homing function is active:
  - – The profile generator is switched to the outputs REF-PSET and REF-N-SET.
- REF-BUSY = LOW: the homing function is not active nor completed:
  - – The inputs REF-N-IN and REF-PHI-IN are switched to the outputs REF-N-SET and REF-PSET.
- REF-OK = HIGH: homing has been completed successfully:
  - – Homing is completed when the setpoint of the profile generator has reached the home position.
  - – If a following error is present, it is transferred into the function block DFSET and corrected (see chapter 9.2.57.5), provided that the drive is not operated within the torque limitation.
- REF-OK = LOW:
  - – Homing is just being executed or
  - – the home position is not known anymore, e.g. due to a fault or
  - – homing has been aborted.

9.2.57.5 Wiring of the function blocks

- REF-PSET provides the phase setpoint belonging to REF-N-SET (following error) for the phase controller in the function block MCTRL.
  - – Faultless homing requires a processing of both signals (REF-PSET and REF-N-SET).
- The homing function must be wired with the function block DFSET (see signal flow diagram for the configurations 5000, 6000 and 7000).
  - – Otherwise accumulating phase errors may occur.

9.2.58 Ramp function generator (RFG)

Purpose

The ramp function generator limits the rise of signals.

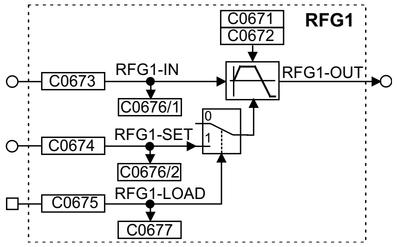


Fig. 9-153 Ramp function generator (RFG1)

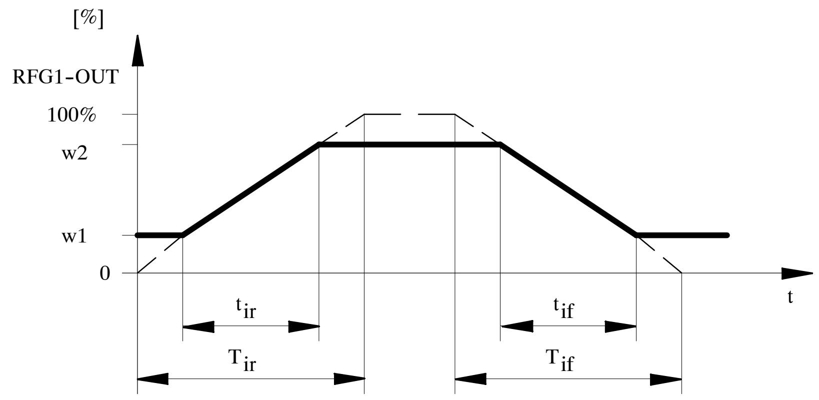
Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
RFG1-IN	a	C0676/1	dec [%]	C0673	1	1000	-
RFG1-SET	a	C0676/2	dec [%]	C0674	1	1000	-
RFG1-LOAD	d	C0677	-	C0675	2	1000	-
RFG1-OUT	a	-	-	-	-	-	-

Function

- Calculation and setting of the times T_{ir} and T_{if}
- Loading of the ramp generator

9.2.58.1 Calculation and setting of the times T_{ir} and T_{if}

The acceleration time and deceleration time refer to a change of the output value from 0 to 100 %. The times T_{ir} and T_{if} can be calculated as follows:



$$T_{ir} = t_{ir}\frac{100\%}{w2 - w1} \qquad T_{if} = t_{if}\frac{100\%}{w2 - w1}$$

Fig. 9-154 Acceleration and deceleration times of the ramp generator

t_{ir} and t_{if} are the times for the change between w_1 and w_2.The values for T_{ir} and T_{if} can be set under C0671 and C0672.

9.2.58.2 Loading of the ramp function generator

The ramp function generator can be initialised with defined values via the inputs RFG1-SET and RFG1-LOAD.

- As long as the input RFG1-LOAD = HIGH, the input RFG1-SET is switched to the output.
- If the input RFG1-LOAD = LOW, the ramp function generator accelerates from this value to its input value along the set T_i times.

9.2.59 Sample and hold function (S&H)

Purpose

The FB can save analog signals. The saved value is also available after mains switching.

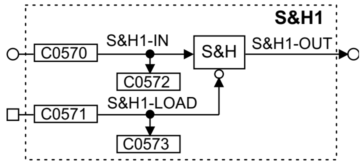


Fig. 9-155 Sample and hold function (S&H1)

Signal				Source			Note
Name	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.

Saving in the case of mains disconnection:

- Keep S&H1-LOAD to LOW level when disconnecting the supply voltage (mains, DC bus or terminal 59).
- Keep S&H1-LOAD to LOW level when connecting the supply voltage (mains, DC bus or terminal 59).

9.2.60 S-shape ramp function generator (SRFG)

Purpose

The function block serves to evaluate a setpoint via an S shape (sin^2 shape).

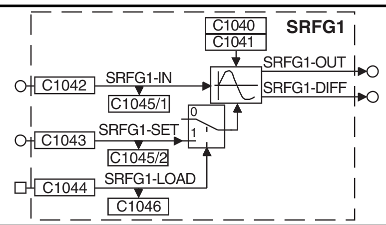


Fig. 9-156 S-shape ramp function generator (SRFG1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
SRFG1-IN	0	C1045/1	dec [%]	C1042	1	Input
SRFG1-SET	0	C1045/2	dec [%]	C1043	1	Starting 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 outputs it at SRFG1-OUT; SRFG1-DIFF remains on 0 %
SRFG1-OUT	0	-	-	-	-	Output is limited to ±100 %
SRFG1-DIFF	0	-	-	-	-	Output is limited to ±100 %, outputs the acceleration of the ramp function generator

SRFG1-LOAD

- Via the digital input SRFG1-LOAD the ramp function generator is loaded with the signal of SRFG1-SET (set).
- This value is accepted immediately , i.e. no acceleration or deceleration via an S shape takes place (the output jumps to this value).
- As long as SRFG-LOAD = HIGH, the ramp function generator remains inhibited.

Function

The maximum acceleration and the jerk can be adjusted separately.

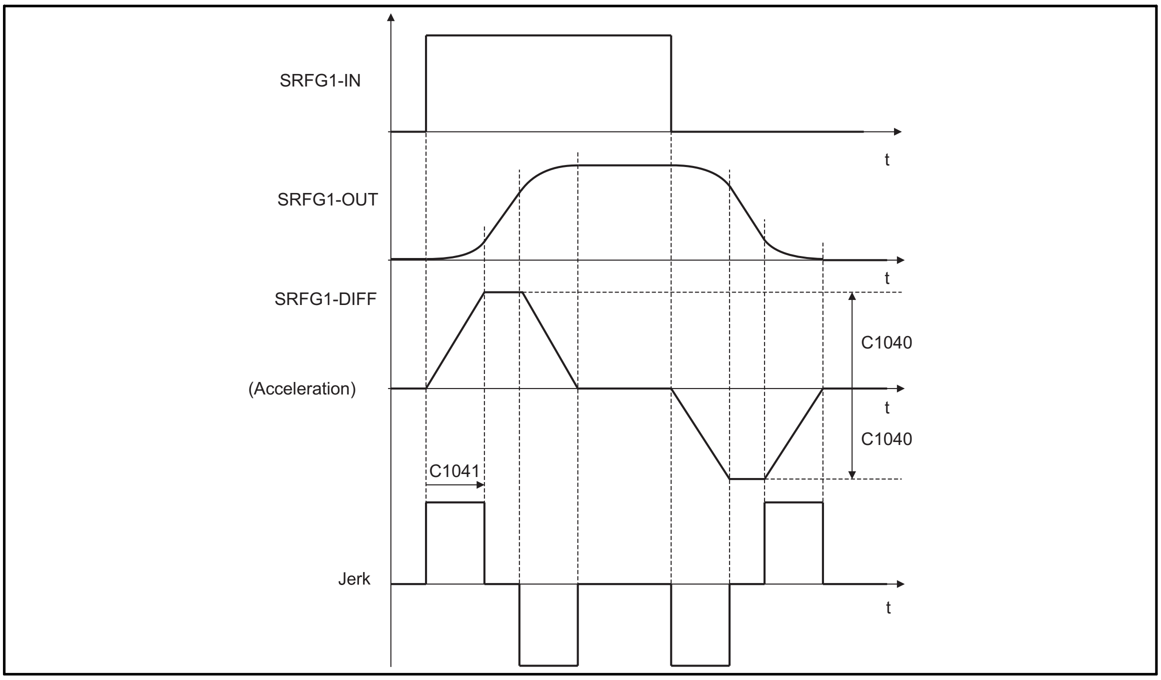
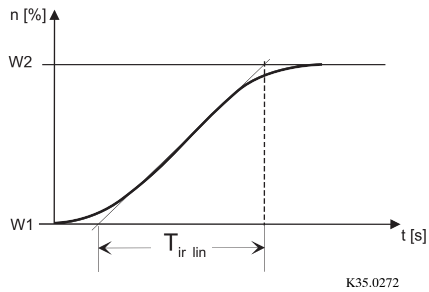


Fig. 9-157 Line graph

- Max. acceleration:
  - C1040 applies to the positive and negative acceleration.
  - The setting is performed according to the formula:

$$T_{ir\,lin} = 1s \cdot \frac{W_2\,[\%] - W_1\,[\%]}{C1040\,[\%]}$$



- Jerk (C1041):
  - The jerk is specified in [s] until the ramp function generator operates with max. acceleration (see Fig. 9-157).

9.2.61 Output of digital status signals (STAT)

Purpose

The FB evaluates digital signals of function blocks and the status of the controller and passes them on to C0150 and FB AIF-OUT and CAN-OUT1.

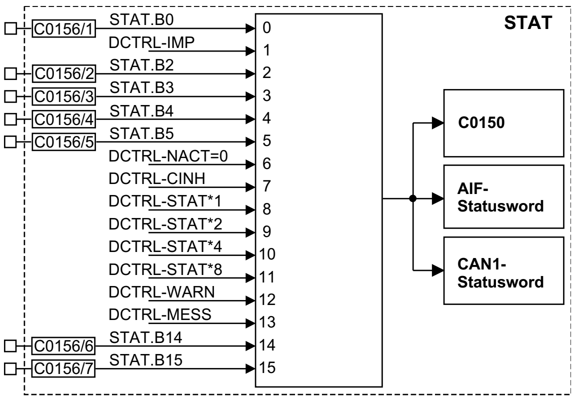


Fig. 9-158 Output of digital status signals (STAT)

Signal				Source			Note
Name	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 LSB)
- 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. (🕮 9-92)

9.2.62 Control of a drive network (STATE-BUS)

Purpose

The FB controls the controllers to specified states (e.g. trip, trip reset, quick stop or controller inhibit).

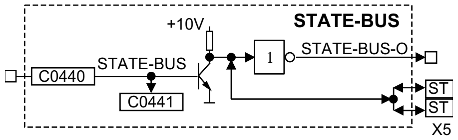


Fig. 9-159 Control of a function block STATE-BUS

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
STATE-BUS	d	C0441	bin	C0440	2	1000	
STATE-BUS-O	d	-	-	-	-	-	
TERMINA X5/ST	d	-	-	-	-	-	

Function

The STATE-BUS is a device-specific bus system which is designed for Lenze controllers only. The function block STATE-BUS acts on the terminals X5/ST or reacts on a LOW signal at these terminals (multimaster ability).

- Every connected controller can set these terminals to LOW signal.
- All connected controllers evaluate the signal level at these terminals and control the function blocks which are internally configured.
- Up to 20 controllers can be connected.

STOP

Stop!

Do not apply an external voltage at terminal X5/ST.

9.2.63 Storage block (STORE)

Purpose

Stores a set phase signal created from a speed signal. The storage process is activated via the TP input Ex.

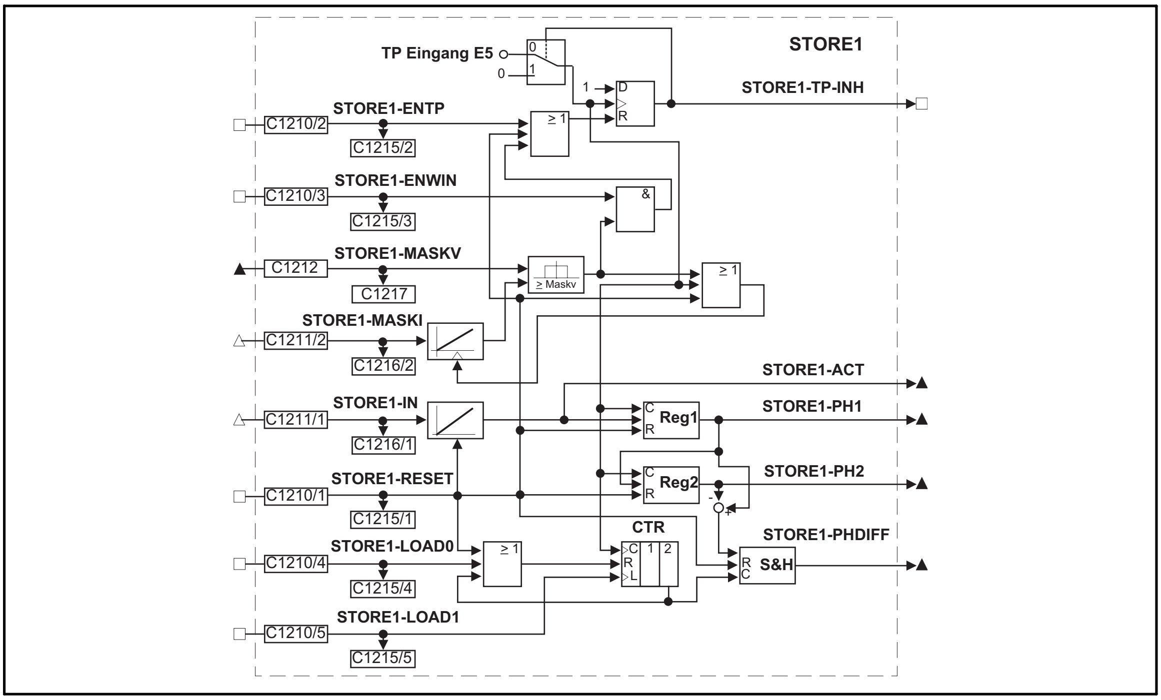


Fig. 9-160 Storage block (STORE1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
STORE1-IN	phd	C1216/1	dec [rpm]	C1211/1	4	1000	-
STORE1-RESET	d	C1215/1	bin	C1210/1	2	1000	HIGH = resets all functions
STORE1-ENTP	d	C1215/2	bin	C1210/2	2	1000	HIGH = enables the triggering via the TP input E5
STORE1-MASKI	phd	C1216/2	dec [rpm]	C1211/2	4	1000	-
STORE1-MASKV	ph	C1217	dec [inc]	C1212	3	1000	-
STORE1-ENWIN	d	C1215/3	bin	C1210/3	2	1000	HIGH = signal enable when I STORE1-MASKI I ≥ STORE1-MASKV
STORE1-LOAD0	d	C1215/4	bin	C1210/4	2	1000	HIGH = resets the counter which controls the output at STORE1-PHDIFF
STORE1-LOAD1	d	C1215/5	bin	C1012/5	2	1000	LOW-HIGH edge = sets the counter = 1 which controls the output to STORE1-PHDIFF

Name	Type	DIS	DIS format	CFG	List	Lenze	
STORE1-ACT	ph	-	-	-	-	-	Outputs the currently integrated value
STORE1-PH1	ph	-	-	-	-	-	Outputs the last value stored by X5/E5
STORE1-PH2	ph	-	-	-	-	-	Outputs the last but one value stored by X5/E5
STORE1-PHDIFF	ph	-	-	-	-	-	Outputs the difference of STORE1-PH1 and STORE1-PH2
STORE1-TP-INH	d	-	-	-	-	-	HIGH = triggering via TP input E5 has been done. For another triggering a positive edge must be activated at the input STORE1-ENTP.

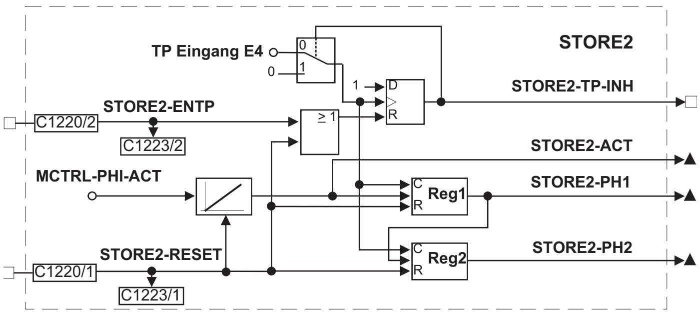


Fig. 9-161 Storage block (STORE2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
STORE2-RESET	d	C1223/1	bin	C1220/1	2	1000	HIGH = resets all functions
STORE2-ENTP	d	C1223/2	bin	C1220/2	2	1000	HIGH = enables the triggering via the TP input E4 free
STORE2-ACT	ph	-	-	-	-	-	Outputs the currently integrated value
STORE2-PH1	ph	-	-	-	-	-	Outputs the last value stored by X5/E5
STORE2-PH2	ph	-	-	-	-	-	Outputs the last but one value stored by X5/E5
STORE2-TP-INH	d	-	-	-	-	-	HIGH = triggering via TP input E4 has been done. For another triggering a positive edge must be activated at the input STORE1-ENTP.

Function

- STORE1 control via TP input E5
- Storing STORE1 phase signal
- Storing STORE2 phase signal

9.2.63.1 STORE1 control via TP input E5

The trigger signal STORE1-TP-INH indicates a triggering done via the TP input E5 with a HIGH signal (LOW-HIGH edge at X5/E5). At the same time it is signalled with STORE1-TP-INH that the triggering is deactivated and must be reset to the active state. This can be done via

- STORE1-RESET = HIGH
- STORE1-ENTP = LOW-HIGH edge
- STORE1-ENWIN = HIGH **and** the comparison of phase signals

Comparison of phase signals

A phase signal is created from the speed signal at STORE1-MASKI and is compared with the phase signal at STORE1-MASKV.

If the condition | STORE1-MASKI | $\geq$ STORE1-MASKV

is fulfilled,

- the TP input E5 is enabled for the next triggering with STORE1-ENWIN = HIGH,
- the integrator for the speed signal at STORE1-MASKI is reset.

9.2.63.2 Storing STORE1 phase signal

A phase signal is created from a speed signal at STORE1-IN. The following sequence shows, in addition to storing, the options of signal output

- The actual phase signal is output at STORE1-ACT.

1. A LOW-HIGH edge at the TP input E5 stores the last phase signal and outputs it at STORE1-PH1.
2. STORE1-ENTP = LOW-HIGH edge enables the TP input E5 for the next triggering.
3. A renewed LOW-HIGH edge at the TP input E5 stores the last phase signal.
   – STORE1-PH1 outputs this last phase signal.
   – STORE1-PH2 outputs the last but one phase signal.
   – STORE1-PHDIFF outputs the difference of STORE1-PH1 and STORE1-PH2.

- STORE1-RESET = HIGH resets memory, counter and integrators and activates the TP input for triggering.

Output of the difference between both phase signals stored

- A two-stage counter controls the output to STORE1-PHDIFF.
- Every second triggering via the TP input results in a new output to STORE1-PHDIFF.
- STORE1-LOAD0 = HIGH resets the counter.

Additional control

1. STORE1-LOAD1 = LOW-HIGH edge, sets the counter to the first stage (preparation for the output to STORE1-PHDIFF).
2. Triggering via TP input E5 sets the counter to the second stage (output to STORE1-PHDIFF is done).

Tip!

If STORE1-LOAD1 is set cyclically, STORE1-PHDIFF outputs a new difference signal after every triggering.

9.2.63.3 Storing STORE2 phase signal

A phase signal is created from a speed signal at MCTRL-PHI-ACT. The following sequence shows, in addition to storing, the options of signal output.

- The actual phase signal is output to STORE2-ACT.

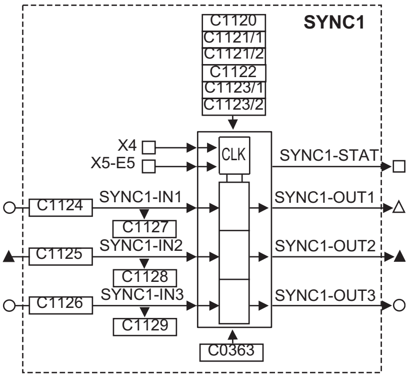
1. A LOW-HIGH edge at the TP input E4 stores the last phase signal and outputs it at STORE2-PH1.
2. STORE2-ENTP = LOW-HIGH edge activates the TP input E4 for the next triggering.
3. A renewed LOW-HIGH edge at the TP input E4 stores the last phase signal.
   – STORE2-PH1 outputs this last phase signal.
   – STORE2-PH2 outputs the last but one phase signal.

- STORE2-RESET = HIGH resets the memory and integrator and activates the TP input E4 for triggering.

9.2.64 Multi-axis synchronisation (SYNC1)

Purpose

Synchronises the control program cycle of the drives to the cycle of a master control.



Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
SYNC1-IN1	a	C1127	dec [inc]	C1124	1	1000	-
SYNC1-IN2	ph	C1128	dec [inc]	C1125	3	1000	-
SYNC1-IN3	a	1129	dec	C1126	1	1000	
SYNC1-STAT	d	-	-	-	-	-	After the synchronisation is completed, SYNC1-STAT switches to HIGH. If the synchronisation is quit, SYNC1-STAT switches to LOW.
SYNC1-OUT1	phd	-	-	-	-	-	Cannot be used for accurate speed/phase difference transmission
SYNC1-OUT2	ph	-	-	-	-	-	With interpolation, for cyclically synchronised position information
SYNC1-OUT3	a	-	-	-	-	-	With interpolation, for analog values

Function

- Possible axis synchronisations (chapter 9.2.64.1)
- Cycle times (chapter 9.2.64.2)
- Phase displacement (chapter 9.2.64.3)
- Synchronisation window for synchronisation via terminal (SYNC WINDOW) (chapter 9.2.64.4)
- Correction value of phase controller (SYNC CORRECT) (chapter 9.2.64.5)
- Fault indications (chapter 9.2.64.6)
- Configuration examples (chapter 9.2.64.7)
- Scaling (chapter 9.2.64.8)

9.2.64.1 Possible axis synchronisations

Operating mode

Code	Value	Function
C1120	0	FB without function. Assigns the data at the inputs directly to the outputs.
	1	CAN Sync active Synchronises the controllers to the sync telegram of the system bus.
	2	Terminal Sync active Synchronises the controllers to the sync signal of terminal X5/E5.

Synchronisation time

After mains connection and initialisation time of the controller, the FB SYNC1 also requires a synchronisation time.

The synchronisation time depends on

- the baud rate of the system bus (CAN-SYNC),
- the starting time (input of the first SYNC telegram / signal),
- the time between the SYNC telegrams,
- the SYNC correction factor (C0363),
- the operating mode of the FB SYNC1.

Axis synchronisation via system bus (CAN)

The system bus (CAN) transmits the sync telegram and the process signals.

Application examples:

- Selection of cyclic, synchronised position setpoint information for multi-axis positioning via the system bus (CAN).

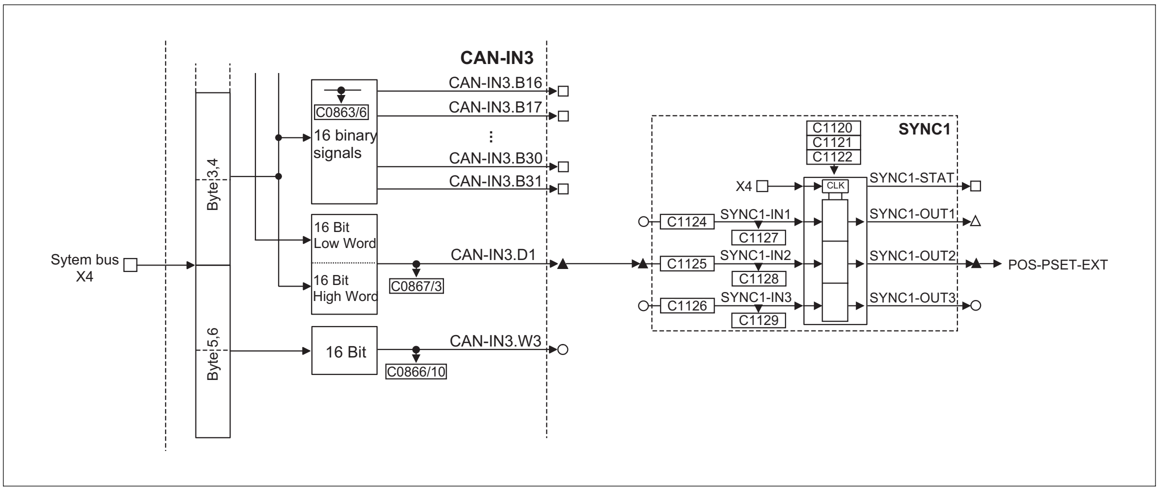


Fig. 9-162   Example for linking the FB SYNC1

Axis synchronisation via terminal control (X5/E5)

The transmission paths for the sync signal and the process signals are separated.

- The process signals are connected via a freely selectable input channel (e. g. AIF interface, DF input).
- The sync signal is injected via terminal X5/E5.

Application examples:

- Selection of cyclic, synchronised position setpoint information for multi-axis positioning via other bus systems (e. g. Interbus).
- Synchronisation of the internal processing cycles of the FB to higher-level process controls.

9.2.64.2 Cycle times

Sync cycle time (SYNC CYCLE)

The master (e. g. PLC) sends the periodic sync telegram1) (Sync signal2)).

The controllers (slaves) receive the sync telegram and compare the time between two LOW-HIGH edges of the signal with the selected cycle time (1121/1).

The cycle time is entered in integers (1 ms, 2 ms, 3 ms, ...).

1) Designation for the synchronisation via system bus (CAN)

2) Designation for the synchronisation via terminal

Code	Value	Function
C1121/1	1 ... 13 ms	Definition of the cycle time of the sync telegram (sync signal). Parameters must only be set for the slave. • C1120 = 1 (CAN Sync) – Time between two sync telegrams of the master. Adapt the time to the master SYNC. C0362 indicates the time (CAN sync cycle) for the slave. Set the value in C1121/1 higher than the value in C0362. • C1120 = 2 (terminal SYNC) – Time between two sync signals of the master at X5/E5. Adapt the time to the master SYNC. Set the value in C1121/1 ≥ the cycle time of the master.

Interpolation cycle time (INTPOL. CYCLE)

The FB interpolates the input signals (C1124, C1125, C1126) between the sync telegrams or sync signals and transmits them to the corresponding output. This ensures an optimum signal course with regard to the internal processing cycle (e. g. minimising signal jumps in the output variable when operating with high sync cycles).

The interpolation is restarted with every sync signal (LOW-HIGH edge).

Code	Value	Function
C1121/2	1 ... 13 ms	Definition of the interpolation cycle / steps • C1120 = 1 – C1121/2 has no effect. – The interpolation cycles are derived from the sync cycle (C1121/1). • C1120 = 2 – The interpolation cycle can be selected irrespective of the sync cycle. – The parameter setting of C1121/2 must be selected according to the cycle of the process value input.

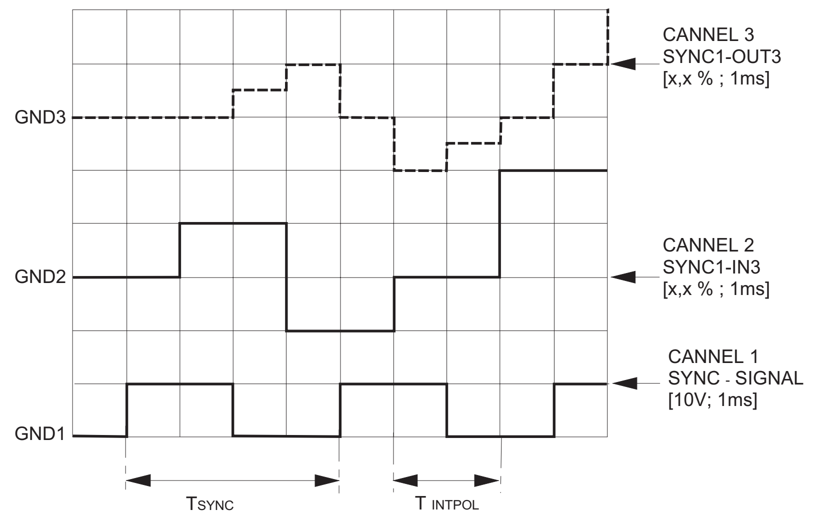


Fig. 9-163 Interpolation example

See Fig. 9-163:

An analog value at SYNC1-IN3 is output as an interpolated value at SYNC1-OUT3.

- Sync cycle (C1121/1) = 4 ms
- Interpol. cycle (C1121/2) = process cycle = 2 ms
- Phase displacement (C1123/1) = 0 ms

9.2.64.3 Phase displacement

Phase displacement for synchronisation via system bus (SYNC TIME)

Code	Value	Function
C1122	0 ...10.000 µs	• C1120 = 1 – Phase displacement between the sync telegram and the start of the internal control program. – The parameters are set automatically depending on the parameter setting of the system bus (CAN). • C1120 = 2 – C1122 has no effect.

Phase displacement for synchronisation via terminal (PHASESHIFT)

Code	Value	Function
C1123/1	-1.000 ms to +1.000 ms	• C1120 = 1 – C1123/1 has no effect. • C1120 = 2 – Phase displacement between the sync signal and the start of the internal control program (e. g. for compensating the effects of signal propagation delays /dead times for the sync signal of the single slave drives).

9.2.64.4 Time slot for synchronisation via terminal

Code	Value	Function
C1123/2	0 ... 1.000 ms	• C1120 = 1 – C1123/2 has no effect. • C1120 = 2 – Definition of a "time slot" for the LOW-HIGH edges of the sync signal for the slave (defined via C1121/1). – If the sync signal sent by the master is inside the "time slot", the SYNC1-STAT is switched to HIGH.

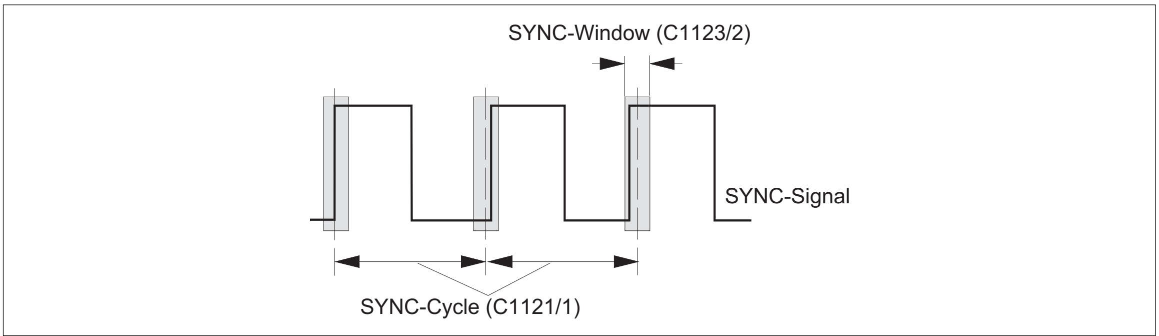


Fig. 9-164 "Time slot" for the LOW-HIGH edges of the sync signal

Tip!

A jitter of up to ±200 µs on the LOW-HIGH edges of the sync signal is permissible. The size of the jitter affects the parameter setting of the "time slot".

9.2.64.5 Correction value of the phase controller

Code	Value	Function
C0363	1 ... 5	• Correction values for C0363 = 1 → 0.8 µs 2 → 1.6 µs 3 → 2.4 µs 4 → 3.2 µs 5 → 4.0 µs • C1120 = 1 – The value is automatically derived from the internal parameters of the system bus (CAN). • C1120 = 2 – Optimising the control time of the phase controller depending on the frequency of the sync signal. – Increase the value if the frequency of the sync signal decreases. – A stable signal at SYNC1-STAT is an indicator for an optimal parameter setting.

9.2.64.6 Fault indications

Fault indications for the synchronisation via system bus

Fault	Cause	Remedy
P16	Controller was enabled in an unsynchronised state (SYNC1-STAT = LOW)	Only enable the controller when SYNC1-STAT = HIGH
	The time between two sync telegrams is faulty	C0362 indicates the time between two sync telegrams • Set the time in C1121/1 to the time in C0362 • Adapt the time interval of the sync telegram from the master

Fault indications for the synchronisation via terminal

Fault	Cause	Remedy
P16	Controller was enabled in an unsynchronised state (SYNC1-STAT = LOW)	Only enable the controller when SYNC1-STAT = HIGH
	Sync signal is missing	Connect sync signal with terminal X5/E5
	The period of the sync signal is not a multiple of 1 ms	Adapt the period
	Sync window is too small	Adapt C1123/2 to the ratios

9.2.64.7 Configuration examples

Configuration example CAN-SYNC

Observe the following order for commissioning:

Step	Where	Operation
1.	-	Commission controller and system bus without FB SYNC1
2.	-	Inhibit controller
3.	CAN master	Define the sequence of the telegrams 1. Send new setpoints to all slaves 2. Send sync telegram 3. All slaves must respond
4.	CAN slave drives	Enter FB SYNC1 into the first position of the processing table
5.		Parameterise the signal assignment of the inputs at FB SYNC1
6.		Select C1120 = 1 (Sync mode for FB SYNC1)
7.	CAN master	Start communication, send sync telegrams
8.	CAN slave drives	FB SYNC1 (CAN SYNC-CYCLE) • Retrieve cycle time of the SYNC telegram from the master via C0362
9.		FB SYNC1 (SYNC CYCLE) • Set C1121 according to the time of the sync telegrams from the control • Set C1121 $\geq$ C0362
10.		Parameterise the monitoring function P16 via C1290
11.		Connect the output signals of SYNC1 with the required inputs of the corresponding FB
12.		Via FB DIGOUT • detect signal of SYNC1-STAT
13.		Only enable the controller when SYNC1-STAT = HIGH

Configuration example TERMINAL-SYNC

Observe the following order for commissioning:

Step	Where	Operation
1.	-	Commission controller without FB SYNC1
2.	-	Inhibit controller
3.	Slave drives	Enter FB SYNC1 into the first position of the processing table
4.		Apply sync signal to terminal X5/E5
5.		Parameterise the signal assignment of the inputs at FB SYNC1
6.		Select C1120 = 2 (Sync mode for FB SYNC1)
7.	Sync master	Start communication, send sync signals
8.	Slave drives	FB SYNC1 (SYNC CYCLE) • Parameterise the sync cycle time of the sending source via C1121
9.		Parameterise the monitoring function P16 via C1290
10.		Connect the output signals of SYNC1 with the required inputs of the corresponding FB
11.		Via FB DIGOUT • Output signal of SYNC1-STAT
12.		FB SYNC1 (SYNC WINDOW) • Enter the optimal size of the "time slot" via C1123/2 • If the sync signal jitters strongly, increase the "time slot"
13.		Only enable the controller when SYNC1-STAT = HIGH

9.2.64.8 Scaling

The signal at input is transmitted in a scaled form to SYNC1-OUT1.

Scaling formula:

$$\text{SYNC1-OUT1 [rpm]} = \text{SYNC1-IN1 [inc]} \cdot \frac{1875\ \text{rpm}}{2048\ \text{inc}}$$

The inputs SYNC1-IN2 and SYNC1-IN3 are not scaled. The FB transmits the data to SYNC1-OUT2 or SYNC1-OUT3 without any evaluation.

9.2.65 Edge evaluation (TRANS)

Purpose

This function is used to evaluate digital signal edges and convert them into pulses with a defined time.

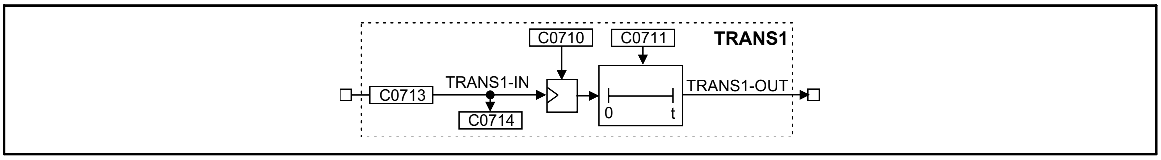


Fig. 9-165 Edge evaluation (TRANS1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TRANS1-IN	d	C0714	bin	C0713	2	1000	-
TRANS1-OUT	d	-	-	-	-	-	-

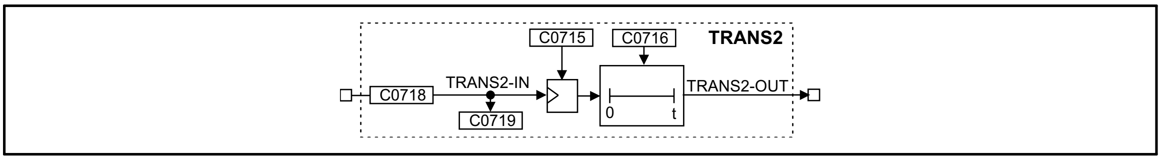


Fig. 9-166 Edge evaluation (TRANS2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TRANS2-IN	d	C0719	bin	C0718	2	1000	-
TRANS2-OUT	d	-	-	-	-	-	-

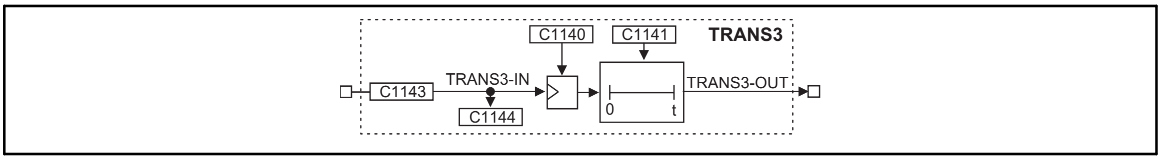


Fig. 9-167 Edge evaluation (TRANS3)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TRANS3-IN	d	C1144	bin	C1143	2	1000	-
TRANS3-OUT	d	-	-	-	-	-	-

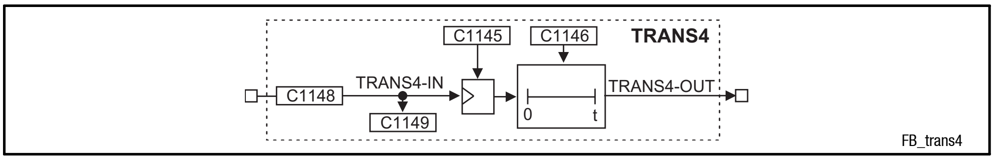


Fig. 9-168 Signal evaluation (TRANS4)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TRANS4-IN	d	C1149	bin	C1148	2	1000	-
TRANS4-OUT	d	-	-	-	-	-	-

Function

This FB is an edge evaluator which can be retriggered. This FB can react to different events. The following functions can be selected under code C0710 or C0716:

- Positive edge
- Negative edge
- Positive or negative edge

9.2.65.1 Evaluate positive edge

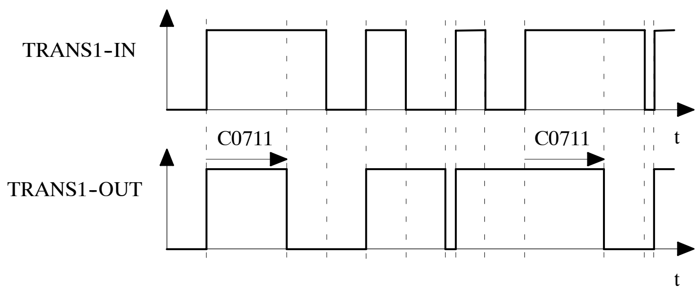


Fig. 9-169 Evaluation of positive edges (TRANS1)

- The output TRANSx-OUT is set to HIGH as soon as a LOW-HIGH edge is sent to the input.
- After the time set under C0711 or C0716 has elapsed, the output changes again to LOW unless there is another LOW-HIGH edge at the input.

9.2.65.2 Evaluate negative edge

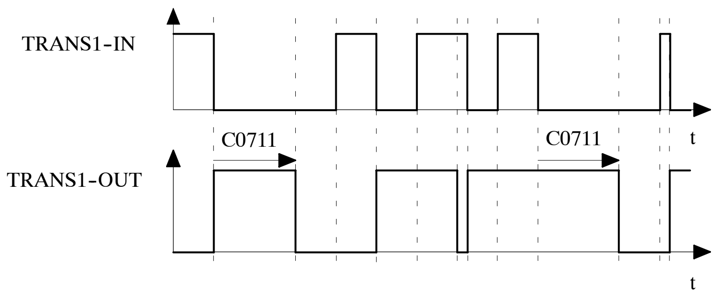


Fig. 9-170 Evaluation of negative edges (TRANS1)

- The output TRANSx-OUT is set to HIGH as soon as a HIGH-LOW edge is sent to the input.
- After the time set under C0711 or C0716 has elapsed, the output changes again to LOW, unless there is another HIGH-LOW edge at the input.

9.2.65.3 Evaluate positive or negative edge

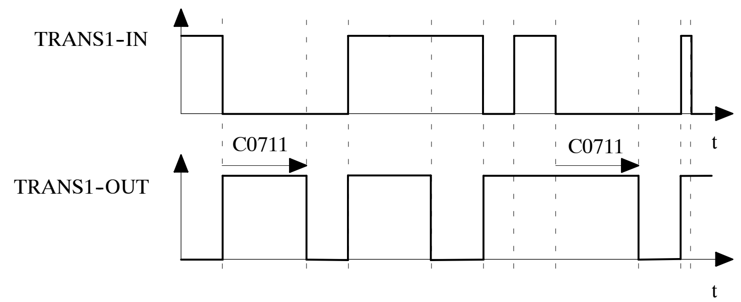


Fig. 9-171 Evaluation of positive and negative edges (TRANS1)

- The output TRANSx-OUT is set to HIGH as soon as a HIGH-LOW edge or a LOW-HIGH edge is sent to the input.
- After the time set under C0711 or C0716 has elapsed, the output changes again to LOW unless there is another HIGH-LOW edge or LOW-HIGH edge at the input.

9.3 Monitoring

Various monitoring functions protect the drive from impermissible operating conditions.

If a monitoring function is activated,

- a reaction to protect the drive will be activated (configuration (📖 9-220)).
- a digital output is set if it is assigned to the corresponding reaction.
- the fault message is entered at the first position in the history buffer. (📖 10-4)

9.3.1 Reactions

According to the interferences one or several of the following reactions are possible via the monitoring function:

Reaction	Effects on drive or controller		Danger notes
TRIP (highest priority)	• Switches the power outputs U, V, W to a high resistance until TRIP is reset • The drive is idling (no control!). • After TRIP reset the drive accelerates to its setpoint along the set ramps. (📖 10-10)		
Message	• Switches the power outputs U, V, W to a high resistance as long as the message is active.		The drive restarts automatically if the message is removed.
	• Short-time message ≤ 0.5 s	The drive is idling (no control!) as long as the message is active If the message is removed, the drive accelerates to its setpoint with maximum torque.	
	• Long-term message > 0.5 s	The drive is idling (because of internal controller inhibit!) as long as the message is active. If necessary, restart positioning program.	
Warning	• Only display of the operating fault • The drive operates under control.		Since these reactions have no effect on the drive behaviour, the drive may be destroyed.
Off	• No reaction to operating faults! Monitoring is deactivated.		

9.3.2 Set reactions

1. Click on the "Parameter menu" button in the "Basic settings" dialog box.
2. Open the "Dialog diagnosis" menu by a double-click.

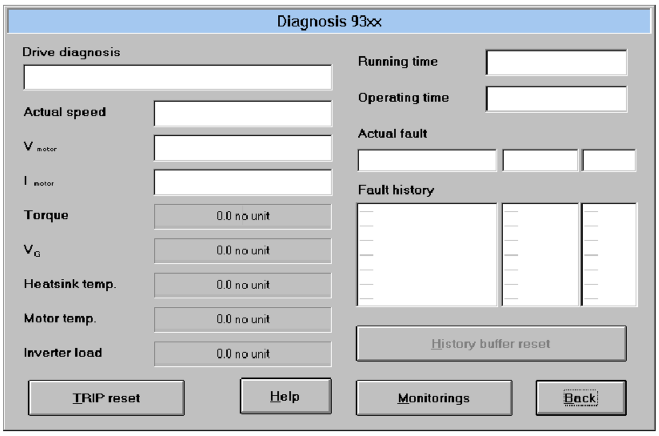


Fig. 9-172 Dialog box "Diagnosis 93xx"

3. Click the button "Monitorings...".

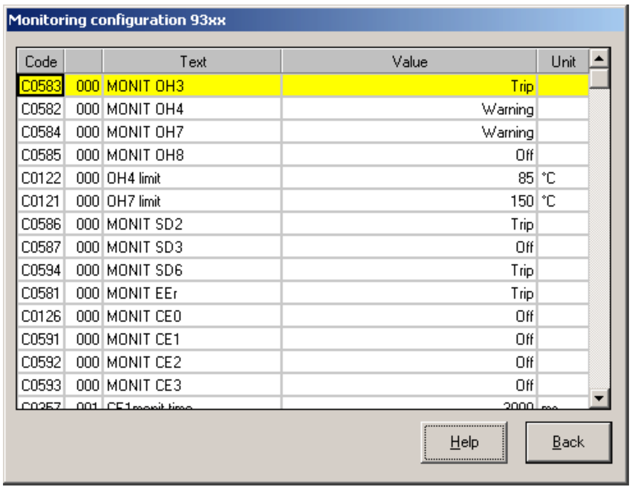


Fig. 9-173 "Monitoring configuration 93xx" dialog box

4. Click on the required monitoring function.
5. Select possible or permitted reaction and confirm with "OK".

An overview of the monitoring functions and the settings can be obtained from the following chapter.

9.3.3 Monitoring functions

Overview of the error sources detected by the controller and the corresponding reactions

Error code	Meaning	TRIP	Message	Warning	Off	Code
CCr	System error	•	-	-	-	-
CE0	Communication error (AIF)	✓	-	✓	•	C0126
CE1	Communication error at the process data input object CAN-IN1 (time monitoring can be set under C0357/1)	✓	-	✓	•	C0591
CE2	Communication error at the process data input object CAN-IN2 (time monitoring can be set under C0357/2)	✓	-	✓	•	C0592
CE3	Communication error at the process data input object CAN-IN3 (time monitoring can be set under C0357/3)	✓	-	✓	•	C0593
CE4	BUS-OFF state (many communication errors have occurred)	✓	-	✓	•	C0595
EEr	External monitoring	•	✓	✓	✓	C0581
H05, H07	Internal error	•	-	-	-	-
H10	Sensor error - heatsink temperature	•	-	✓	✓	C0588
H11	Sensor error - internal temperature	•	-	✓	✓	
LP1	Motor phase failure detection (function block must be entered in C0465)	✓	-	✓	•	C0597
LU	Undervoltage	-	•	-	-	-
Nmax	Maximum speed exceeded (C0596)	•	-	-	-	-
nErr	Speed monitoring	✓	✓	✓	•	C0576
OC1	Short circuit	•	-	-	-	-
OC2	Earth fault	•	-	-	-	-
OC5	I x t overload	•	-	-	-	-
OH	Heatsink temperature 1 (max. permissible, fixed)	•	-	-	-	-
OH3	Motor temperature 1 (max. permissible, fixed)	•	-	-	✓	C0583
OH4	Heatsink temperature 2 (adjustable; C0122)	-	-	•	✓	C0582
OH7	Motor temperature 2 (can be set; code: C0121)	-	-	•	✓	C0584
OH8	Motor temperature (fixed) via inputs T1/T2	✓	-	✓*	•	C0585
OU	Overvoltage in the DC bus	-	•	-	-	-
P01	Limit switch negative = LOW	✓	-	-	-	C1285/1
P02	Limit switch positive = LOW	✓	-	-	-	C1285/2
P03	Following error - digital frequency > C0255	✓	-	•	✓	C0589
P04	Position limit exceeded in negative direction	✓	-	-	-	C1285/3
P05	Position limit exceeded in positive direction	✓	-	-	-	C1285/4
P06	No reference	✓	-	-	-	C1287/1
P07	Parameter set mode absolute	✓	-	-	-	C1291/1
P08	Actual offset out of range	✓	-	-	-	C1291/2
P09	Impermissible programming	✓	-	-	-	C1291/3
P12	Encoder range exceeded	✓	-	-	-	C1288/1
P13	Phase overflow	•	-	✓	✓	C0590
P14	1st following error POS > C1218/1	✓	-	✓	✓	C1286/1
P15	2nd following error POS > C1218/2	✓	-	✓	•	C1286/2
P16	Sync error	✓	-	✓	✓	C1290/1
P17	TP control error	✓	-	✓	✓	C1289/1
P18	Internal limitation	✓	-	•	✓	C1289/2

Error code	Meaning	TRIP	Message	Warning	Off	Code
PEr	Program error	•	-	-	-	-
PI	Fault during initialisation	•	-	-	-	-
PR0	General fault in parameter sets	•	-	-	-	-
PR1	Fault in parameter set 1	•	-	-	-	-
Sd2	Resolver error	•	-	✓*	✓	C0586
Sd3	Encoder error at X9 PIN 8	✓	-	✓*	•	C0587
Sd5	Encoder error at X6/1 X6/2 (C0034 = 1)	✓	-	✓	•	C0598
Sd6	Sensor error: motor temperature (X7 or X8)	•	-	✓	✓	C0594
Sd7	Error in the absolute value encoder at X8	✓	-	-	•	C0025
Sd8	Error in the sine / cosine encoder	✓	-	-	•	C0580

• default setting
✓ possible
- not possible
✓* possible, but the drive can be destroyed if the fault is not removed immediately.

9.3.3.1 System fault CCr

Purpose

Controller protection

Function

The processor was disturbed in its program sequence. For safety reasons the operation is interrupted.

Remedy:

- Check PE connections
- Shield control cables and motor cables, if necessary

Features:

- LECOM no.: 71
- Reaction: TRIP (cannot be modified)

9.3.3.2 Communication error CE0

Purpose

Process monitoring

Function

The communication between an automation interface X1 and a fieldbus module is interfered.

Remedy:

Plug in fieldbus module correctly and bolt.

Features:

- LECOM no.: 61
- Reaction: TRIP (cannot be modified)

9.3.3.3 External error EEr

Purpose

Process monitoring

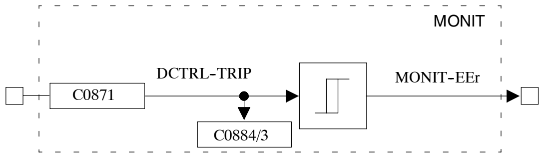


Fig. 9-174 External error EEr

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DCTRL-TRIP	d	C0884/3	bin	C0871	2	54	-
MONIT-EEr	d	-	-	-	-	-	-

Function

The signal EEr is obtained from the signal at the input DCTRL-TRIP-SET (level evaluation). With default setting, this signal is obtained from terminal X5/E4 . Here, external encoders can be connected which control the controller in the desired direction.

Any other binary signal source can also be used.

Features:

- LECOM no.: 91, 1091, 2091
- Reaction: TRIP, MESSAGE, WARNING or OFF

9.3.3.4 Fault in the resolver driver H06

Purpose

Controller protection.

Function

This monitoring is only effective if a control system with history buffer is used. It does not provide an additional binary output.

This message is generated if a fault occurs in the resolver driver during mains connection. In this case, please contact Lenze.

A reset is only possible by mains switching.

Features:

- LECOM No.: 106
- Reaction: TRIP (cannot be modified)

9.3.3.5 Power stage identification H07

Purpose

Controller protection

Function

This monitoring is only effective if a control type with history buffer is used. It does not provide an additional binary output.

If this monitoring reacts, the controller has detected an incorrect power stage. This indication can only be reset by mains switching.

If this indication should occur again, please contact Lenze.

Features:

- LECOM no.: 107
- Reaction: TRIP (cannot be modified)

9.3.3.6 Fault after automatic adjustment H30

Purpose

Controller protection

Function

This monitoring is only effective if a control type with history buffer is used. It does not provide an additional binary output.

This indication is generated if an internal automatic adjustment has failed during mains switching.

Please contact Lenze.

The controller can only be reset by mains switching.

Features:

- LECOM no.: 130
- Reaction: TRIP (cannot be modified)

9.3.3.7 Monitoring for failure of a motor phase LP1

Purpose

Motor protection

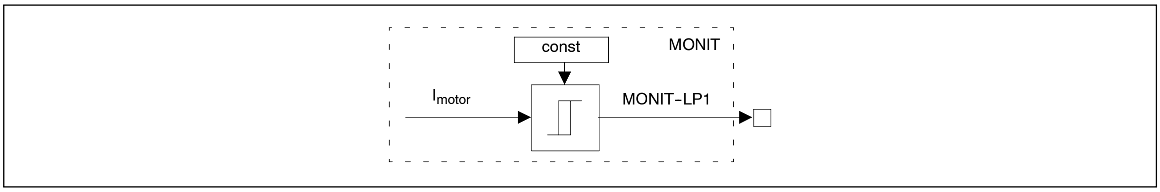


Fig. 9-175 Monitoring for failure of a motor phase LP1

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
I_{MOTOR}	-	-	-	-	-	-	-
MONIT-LP1	d	-	-	-	-	-	-

Function

This monitoring reacts if a power interrupt is recognised in a phase of the motor connection.

Tip!

This can also be an interrupt in the motor winding.

Features:

- LECOM No.: 32
- Reaction: TRIP (cannot be modified)

9.3.3.8 Low voltage LU

Purpose

DC bus monitoring, controller protection.

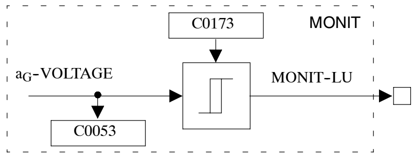


Fig. 9-176 Low voltage LU

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
A_G-VOLTAGE	-	C0053	dec	-	-	-	cannot be reassigned
MONIT-LU	d	-	-	-	-	-	-

Mains voltage range	Selection number (C0173)	Switch-off threshold LU	Switch-on threshold LU
< 400 V	0	285 V	430 V
400 V	1	285 V	430 V
400 … 460 V	2	328 V	473 V
480 V without brake chopper	3	342 V	487 V
Operation with brake chopper (up to 480 V)	4	342 V	487 V

Function

The monitoring indicates a message if the DC bus voltage (terminals $+U_G$and $-U_G$) falls below the threshold (switch-off threshold LU) set under code C0173.

The message is reset if the switch-off threshold LU is exceeded again .

The switch-off threshold LU determines the voltage level of the DC bus voltage, where the pulse inhibit is activated.

The selection number is also effective for the overvoltage monitoring (OU).

Adapt the setting of the codes to the available mains voltage (also for operation via $+U_G$/$-U_G$ terminals). When the controller is operated in a network of drives, all controllers must have the same setting.

If the LU message is applied for more than 3 seconds or if the mains is connected, this is entered into the history buffer. This can be the case if the control module is supplied externally by terminals X5/39 and X5/59 and the mains is switched off.

If the signal is reset (mains is reconnected) this is not entered in the history buffer, but only deleted (this is not a fault, but a controller state).

If the low voltage messages appear only for less than 3 seconds this is interpreted as an interference (e.g. mains fault) and entered into the history buffer. In this case, the history buffer is continued.

Features:

- LECOM no.: 1030
- Reaction: MESSAGE (cannot be modified)

9.3.3.9 System speed monitoring N_{Max}

Purpose

Process monitoring

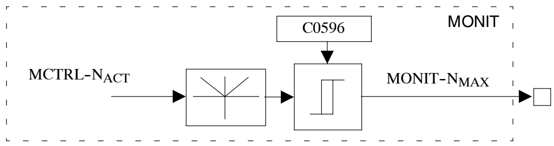


Fig. 9-177 System speed monitoring N_{Max}

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
MCTRL-N_{ACT}	-	-	-	-	-	-	cannot be reassigned
MONIT-N_{MAX}	d	-	-	-	-	-	-

Function

A maximum system speed can be entered under code C0596, independent of the direction of rotation. The monitoring is released, if:

- the actual speed exceeds the limit C0596
- the actual speed exceeds the double value of (n_{max}).

Stop!

- For active loads (e.g. hoists) make sure that no torque is applied at the drive. Special, system-specific measures are required.
- If the actual speed encoder fails, it is not ensured that this monitoring reacts.

Features:

- LECOM no.: 200
- Reaction: TRIP (cannot be modified)

9.3.3.10 Monitoring for short-circuit OC1

Purpose

Controller protection

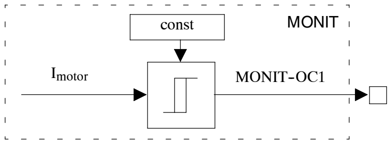


Fig. 9-178 Monitoring for short-circuit OC1

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
I_{MOTOR}	-	-	-	-	-	-	-
MONIT-OC1	d	-	-	-	-	-	-

Function

This monitoring reacts when the motor phases are short-circuited. It can also be a short-circuit of the windings in the machine.

This monitoring, however, also reacts during mains connection, if there is an earth fault.

When the monitoring reacts, the controller must be disconnected from the mains and the short-circuit must be eliminated.

Features:

- LECOM no.: 11
- Reaction: TRIP (cannot be modified)

9.3.3.11 Monitoring for earth fault OC2

Purpose

Controller protection

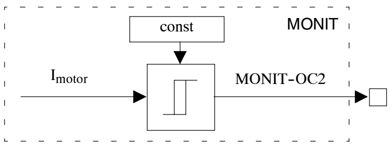


Fig. 9-179 Monitoring for earth fault OC2

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
I_{MOTOR}	-	-	-	-	-	-	-
MONIT-OC2	d	-	-	-	-	-	-

Function

The controllers of the 93XX series are equipped with an earth fault detection as a standard.

When the monitoring reacts, the controller must be disconnected from the mains and the earth fault must be eliminated.

Features:

- LECOM no.: 12
- Reaction: TRIP (cannot be modified)

Possible earth fault causes:

- Short-circuit to frame of the machine
- Short-circuit of a phase to the shield
- Short-circuit of a phase to PE

9.3.3.12 Fault message (OC5)

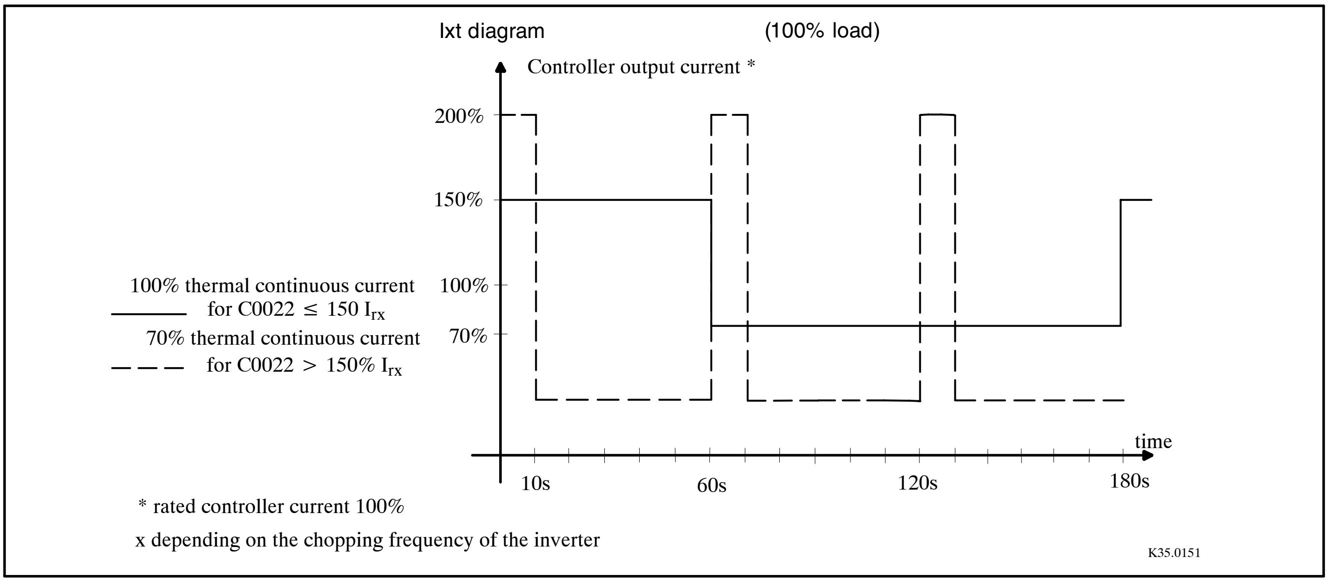


Fig. 9-180 Max. permitted overcurrent depending on the time

9.3.3.13 Heatsink monitoring OH (fixed)

Purpose

Controller protection

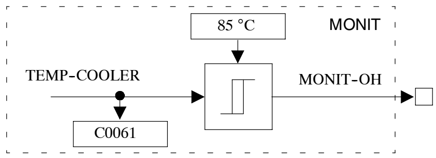


Fig. 9-181 Heatsink monitoring OH

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TEMP-COOLER	-	C0061	dec	-	-	-	cannot be reassigned
MONIT-OH	d	-	-	-	-	-	-

Function

The signal OH is derived from a comparator with hysteresis. The switch-off threshold is 85°C and is fixed. The hysteresis is also fixed and amounts to 5K, i.e. the reclosing point is 80°C.

Features:

- LECOM no.: 50
- Reaction: TRIP (cannot be modified)

Tripping can have the following causes:

- The ambient temperature is too high.
  Remedy:
  – Install a fan into the control cabinet.
- The controller is overloaded in its arithmetic mean, i.e. overload and recovery phase exceed 100 %.
  Remedy:
  – Reduce overload phase
  – Use more powerful controller

9.3.3.14 Motor temperature monitoring OH3 (fixed)

Purpose

Protects the motor from overheating

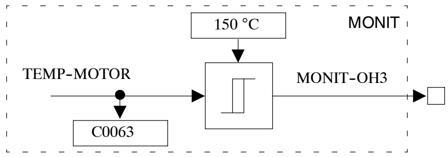


Fig. 9-182 Motor temperature monitoring OH3 with fixed threshold

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TEMP-MOTOR	-	C0063	dec	-	-	-	-
MONIT-OH3	d	-	-	-	-	-	-

Function

The signal OH3 is derived from a comparator with hysteresis. The switch-off threshold is 150 °C and is fixed. The hysteresis is also fixed and amounts to 15 K (i.e. the reclosing temperature is 135 °C. This monitoring is only effective for the thermal sensor specified by Lenze as it is included in the standard Lenze servo motor. The Sub-D connectors X7 or X8 serve as inputs.

Stop!

Only one of the inputs can be used. The other input must not be assigned (must remain open). This monitoring is activated by default setting. This means that the monitoring reacts if no Lenze servo motor is used.

Features:

- LECOM no.: 53
- Reaction: TRIP or OFF

9.3.3.15 Heatsink monitoring OH4 (adjustable)

Purpose

Controller protection

This monitoring is designed as a warning before the final disconnection of the controller via the OH-TRIP.
Thus, the process can be influenced to avoid a final disconnection of the controller at an inconvenient time.
For example, fans which would cause an inacceptable noise in continuous operation, can also be triggered.

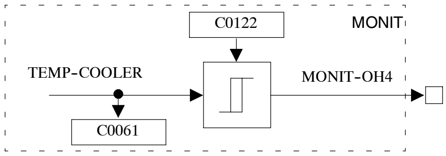


Fig. 9-183 Heatsink monitoring OH4 with adjustable threshold

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TEMP-COOLER	-	C0061	dec	-	-	-	cannot be reassigned
MONIT-OH4	d	-	-	-	-	-	-

Function

The signal OH4 is derived from a comparator with hysteresis.The threshold can be set under code C0122. The hysteresis is fixed and amounts to 5 K. The signal is thus reset below a threshold of 5 K.

Features:

- LECOM no.: 2054
- Reaction: WARNING or OFF

9.3.3.16 Motor temperature monitoring OH7 (adjustable)

Purpose

Process monitoring

This monitoring is designed as a warning before the final disconnection via the OH3-TRIP.

Thus, the process can be influenced to avoid a final disconnection of the motor at an inconvenient time.

For example, blowers which would cause an inacceptable noise in continuous operation, can also be triggered.

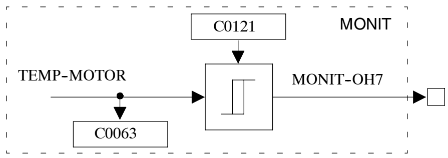


Fig. 9-184 Motor temperature monitoring OH7 with adjustable threshold

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TEMP-MOTOR	-	C0063	dec	-	-	-	-
MONIT-OH7	d	-	-	-	-	-	-

Function

The signal OH7 is derived from a comparator with hysteresis.

Here, the same conditions apply as for the OH3 monitoring, since here the same inputs are used.

The threshold is set under code C0121. The hysteresis is fixed and amounts to 15 K. The signal is thus reset below a threshold of 15 K.

Features:

- LECOM no.: 2057
- Reaction: WARNING or OFF

9.3.3.17 Motor temperature monitoring OH8

Purpose

Motor protection

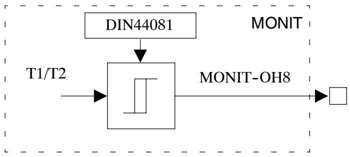


Fig. 9-185 Motor temperature monitoring OH8

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
T1/T2	-	-	-	-	-	-	-
MONIT-OH8	d	-	-	-	-	-	-

Function

The signal OH8 is derived from the digital signal via the terminals T1, T2 next to the power terminals UVW. The threshold and the hysteresis depend on the encoder system (DIN 44081) (see Chapter 4.2.8).

Stop!

When using this input as a motor protection: If the monitoring is set to WARNING or OFF, the motor can be destroyed in case of further overload.

Features:

- LECOM no.: 58, 2058
- Reaction: TRIP, WARNING or OFF

9.3.3.18 Overvoltage OU

Purpose

DC bus monitoring. Controller protection.

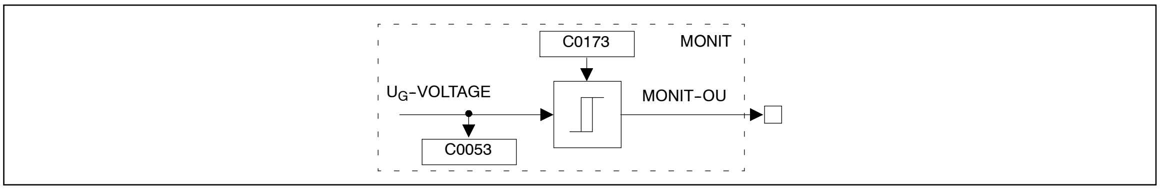


Fig. 9-186 Overvoltage OU

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
U_G-VOLTAGE	-	C0053	dec	-	-	-	-
MONIT-OU	d	-	-	-	-	-	-

Mains voltage range	Selection number (C0173)	Switch-off threshold OU	Switch-on threshold OU
< 400 V	0	770 V	755 V
400 V	1	770 V	755 V
400 … 460 V	2	770 V	755 V
480 V without brake chopper	3	770 V	755 V
Operation with brake chopper (up to 480 V)	4	800 V	785 V

Function

The monitoring indicates a message if the DC bus voltage (terminals $+U_G$ and $-U_G$) exceeds the threshold (switch-off threshold OU) set under C0173.

The message is reset if the voltage falls below the switch-off threshold OU again.

The table above shows the setting of the switching thresholds according to the selection number.

The switch-off threshold OU determines the voltage level of the DC bus voltage, where the pulse inhibit is activated.

The selection number is also effective for the low voltage monitoring (LU).

Features

- LECOM No.: 1020
- Reaction: MESSAGE (cannot be modified)

Information on drive dimensioning

A frequent overvoltage message indicates an incorrect drive dimensioning. This means that the braking energy is too high.

Remedy:

- Use supply module 934X or
- use (additional) brake choppers type 935X

When several controllers are operated simultaneously, an operation as DC bus connection may be useful.

Here, the generated brake energy of one drive can serve as drive energy for another drive.

The mains connections only supply the energy difference.

9.3.3.19 Following error P03

Purpose

Process monitoring

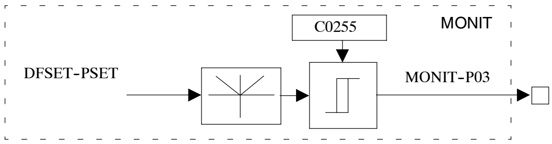


Fig. 9-187 Following error P03

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DFSET-PSET	-	-	-	-	-	-	-
MONIT-P03	d	-	-	-	-	-	-

Function

The monitoring reacts if the drive is not able to follow its set phase, because e.g.

- the centrifugal mass is too large for the set acceleration or deceleration time

or

- the torque limit is reached (load torque > drive torque)

Remedy:

- Unload drive

or

- increase torque limit at the servo controller (if the power limits of the controller are not yet achieved)

The monitoring is derived from the phase difference of set-value integrator minus actual phase integrator. The comparison value (following error limit C0255) can be set by a code. Homing points are only lost if a TRIP reaction was set.

Features:

- to monitor the process
- LECOM no.: 153, 2153
- Reaction: TRIP, WARNING or OFF

9.3.3.20 Phase controller overflow P13

Purpose

Process monitoring

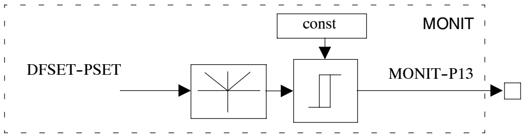


Fig. 9-188 Phase controller overflow P13

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DFSET-PSET	-	-	-	-	-	-	-
MONIT-P13	d	-	-	-	-	-	-

Function

If this monitoring reacts, the phase deviation which can be represented internally, is exceeded. Homing points get lost.

When the monitoring is switched off, the homing points get also lost.

Features:

- LECOM no.: 163
- Reaction: TRIP or OFF

9.3.3.21 Parameter error PRO

Purpose

Controller protection

Function

Function of LECOM no. 79 (PI)

Some parameters are used for internal calculation of further data for the servo controllers. The monitoring reacts if incorrect values are recognized internally due to this calculation.

The cause may be:

Data of a powerful controller were transmitted to a less powerful controller, e.g. the settings of the motors do not match with the controller.

In this case, please contact Lenze. The values of the codes C0300 and C0301 should be communicated to Lenze.

Function of LECOM no. 75 (PR0)

This fault indication is displayed if the stored parameters do not match with the loaded software version. In this case, the factory setting is loaded automatically. To acknowledge the PR0, all parameter sets must be saved again manually (C0003). Only after the values have been saved, the fault indication can be acknowledged.

Stop!
It is not sufficient to save only one parameter again.

Features:

- LECOM
  - No.: 79 (PI)
  - No.: 75 (PR0)
- Reaction: TRIP (cannot be modified)

9.3.3.22 Parameter set error PR1, PR2, PR3, PR4

Purpose

Controller protection

Function

During load, each of the parameter sets is checked if it is complete and correct. If a difference should be recognized, the controller changes to the TRIP state. The incorrect parameter set is displayed (C0168; PR1 = parameter set1 etc.).

At the same time, the default setting is loaded, but not saved (after TRIP-RESET the controller operates with the default settings, until the setting is changed).

The cause can be a transmission error during the transmission of parameter sets to the controller.

Remedy:

The corresponding parameter set must be reset or transmitted to the controller again.

This interference can also be caused by an interrupt of the transmission of parameter sets by the operating unit (e.g. by an early disconnection of the operating unit).

Features:

- LECOM
  - No.: 72 (PR1)
  - No.: 73 (PR2)
  - No.: 77 (PR3)
  - No.: 78 (PR4)
- Reaction: TRIP (cannot be modified)

9.3.3.23 Resolver monitoring for wire breakage Sd2

Purpose

Motor protection

Monitors the cable and the resolver for wire breakage.

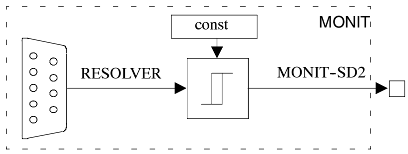


Fig. 9-189 Resolver monitoring for wire breakage Sd2

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
RESOLVER	-	-	-	-	-	-	-
MONIT-SD2	d	-	-	-	-	-	-

Function

Warning!

During commissioning this monitoring should not be switched off, since the machine may reach very high speeds (potential destruction of the motor and the driven machine) in case of fault (e.g. system cables disconnected or incorrectly bolted). The same applies if this monitoring is changed to WARNING. The possibility of disconnection should only be used if the monitoring reacts without obvious reasons (very long cables, strong noises of other devices).

This monitoring is activated automatically if the resolver is selected as actual speed encoder (C0025).

This monitoring is deactivated automatically if another actual speed encoder is selected.

Stop!

If there is a fault in the actual speed detection, it is not ensured that the monitoring reacts to overspeed NMAX.

Features:

- LECOM no.: 82, 2082
- Reaction: TRIP, WARNING or OFF

9.3.3.24 Dig-Set monitoring Sd3

Purpose

Process monitoring

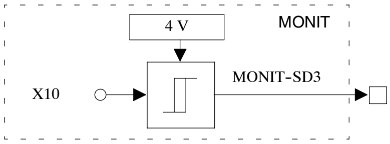


Fig. 9-190 Dig-Set monitoring Sd3

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
X10	-	-	-	-	-	-	-
MONIT-SD3	d	-	-	-	-	-	-

Function

The monitoring Sd3 reacts if pin 8 at the digital frequency input X9 is not supplied. Therefore, an interrupt of the digital frequency coupling can be displayed.

Features:

- LECOM no.: 83, 2083
- Reaction: TRIP, WARNING or OFF

9.3.4 Fault indication via digital output

In the function block DIGOUT the fault messages TRIP, message and warning can be assigned to the digital outputs (e. g. terminals X5/A1… X5/A4).

Display TRIP or Message or Warning individually (individual indication):

1. Select digital output in the code level under C0117 and subcode.
2. Assign TRIP or Message or Warning in the parameter level.

Display TRIP, Message, Warning collectively (collective indication):

1. Assign TRIP, message and warning to an OR-element.
2. Select digital output in the code level under C0117 and subcode.
3. Assign output of the OR-element in the parameter level.

Display monitoring functions individually:

1. Select digital output in the code level under C0117 and subcode.
2. Assign monitoring function (e.g. MONIT-OH7).

EDSVS9332S-D12
13181650

Lenze

System Manual
Part D1.2

Code table

Selection lists

Global Drive
9300 servo inverter

This documentation is valid for the 9300 servo inverters of the versions:

	①				②	③
EVS	**9326**	**-**	**E**	**E**	**2x**	**2x**

Type

Power

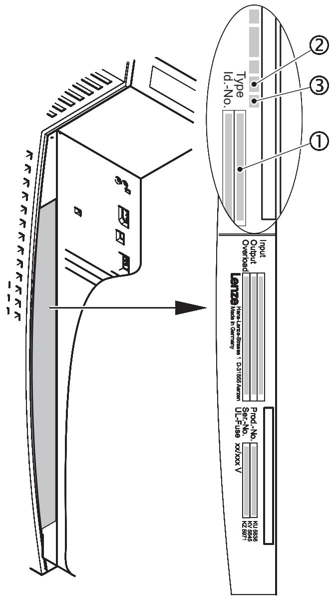
	400 V	480 V
9321 =	0.37 kW	0.37 kW
9322 =	0.75 kW	0.75 kW
9323 =	1.5 kW	1.5 kW
9324 =	3.0 kW	3.0 kW
9325 =	5.5 kW	5.5 kW
9326 =	11 kW	7.1 kW
9327 =	15 kW	18.5 kW
9328 =	22 kW	30 kW
9329 =	30 kW	37 kW
9330 =	45 kW	45 kW
9331 =	55 kW	55 kW
9332 =	75 kW	90 kW

Design
E = Built-in unit
C = Cold Plate

S = 9300 servo inverter

Hardware version

Software version



3.0 11/2006

9.4 Code table

How to read the code table:

Column	Abbreviation	Meaning
Code	C0039 1 2 ... 14 15	Code C0039 Subcode 1 of code C0039 Subcode 2 of code C0039 ... Subcode 14 of code C0039 Subcode 15 of code C0039
	[C0005]	Parameter value of the code can only be modified when the controller is inhibited
LCD		Keypad LCD
Lenze		Default setting of the code
	→	The column "Important" contains further information
	Disp	Codes only display values. They cannot be configured.
Selection	1 {1 %} 99	Minimum value {smallest step/unit} maximum value
Important	-	Additional, important explanation of the code
		Printed in bold: Code number in GDC
	🕮 9-253	Reference on page with further information on the code.

Code		Possible settings		Important
No.	**LCD**	**Lenze**	**Selection**	
[C0002]	PAR LOAD	0		**Load parameter set**
			0 Default setting	Load default setting into RAM
			1 Load parameter set 1 2 Load parameter set 2 3 Load parameter set 3 4 Load parameter set 4	Load parameter set x into the RAM and activate it Parameter set 1 is loaded automatically after every mains connection.
			11 Load parameter set 1 externally 12 Load parameter set 2 externally 13 Load parameter set 3 externally 14 Load parameter set 4 externally	Load parameter set x from the keypad into the RAM and activate it
			20 Load parameter sets externally	Load all parameter sets from the keypad into the RAM and activate them
C0003	PAR SAVE	0		**Save parameter set**
			0 Executed	Saving completed
			1 Save parameter set 1 2 Save parameter set 2 3 Save parameter set 3 4 Save parameter set 4	Save current parameter set x non-volatilely
			11 Parameter sets → external	Transmit all parameter sets to the operating module
C0004	OP DISPLAY	56	1 {1} 1999	**Operating display** Keypad shows selected code in the operating level if no other status indications of C0183 are active

Code		Possible settings			Important
No.	LCD	Lenze	Selection		
[C0005]	SIGNAL CFG	1000			**Signal configuration** (Predefined basic configurations) The **first** digit indicates the predefined basic function 1xxx: Speed control 4xxx: Torque control with speed limitation 5xxx: Master for digital frequency coupling 6xxx: Slave for digital frequency bus 7xxx: Slave for digital frequency cascade The **second** digit indicates additional functions x0xx: No additional function x1xx: Brake control x9xx: In case of quick stop, the complete drive system is phase-controlled to zero speed The **third** digit indicates the predefined voltage source for the control terminals xx0x: External supply voltage xx1x: Internal supply voltage The **fourth** digit indicates the predefined device control xxx0: Terminal control xxx1: RS232, RS485 or optical fibre xxx3: INTERBUS or PROFIBUS-DP xxx5: System bus (CAN)
			0	COMMON	Modified basic configuration
			1 2 11	86xx -1- 86xx -2- 86xx -11-	Compatible to frequency inverter 86xx: C005 = -1-/-2-/-11-
			20 21	922x -20- 922x -21-	Compatible to frequency inverter 92xx: C005 = -20-/-21-
			100	empty	All internal connections are removed
			1000 1001 1003 1005 1010 1011 1013 1015 1100 1101 1103 1105 1110 1111 1113 1115	Speed mode Speed 1 Speed 3 Speed 5 Speed 10 Speed 11 Speed 13 Speed 15 Speed 100 Speed 101 Speed 103 Speed 105 Speed 110 Speed 111 Speed 113 Speed 115	Speed control
			4000 4001 4003 4005 4010 4011 4013 4015	Torque mode Torque 1 Torque 3 Torque 5 Torque 10 Torque 11 Torque 13 Torque 15	Torque control with speed limitation

Code No.	LCD	Possible settings Lenze	Selection			Important
			5000 DF mst 5001 DF mst 1 5003 DF mst3 5005 DF mst5 5010 DF mst10 5011 DF mst11 5013 DF mst13 5015 DF mst15 5900 DF mst900 5901 DF mst901 5903 DF mst903 5905 DF mst905 5910 DF mst910 5911 DF mst911 5913 DF mst913 5915 DF mst915			Master for digital frequency coupling
			6000 DF slv bus 6001 DF slv bus 1 6003 DF slv bus 3 6005 DF slv bus 5 6010 DF slv bus 10 6011 DF slv bus 11 6013 DF slv bus 13 6015 DF slv bus 15			Slave to digital frequency bus
			7000 DF slv cas 7001 DF slv cas 1 7003 DF slv cas 3 7005 DF slv cas 5 7010 DF slv cas 10 7011 DF slv cas 11 7013 DF slv cas 13 7015 DF slv cas 15			Slave to digital frequency cascade
[C0006]	OP MODE	→	1 SSC standard motor, sensorless, in star connection 2 Servo control asynchronous motors in star connection 3 Servo control synchronous motors in star connection 11 SSC standard motor, sensorless, in delta connection 22 Servo control asynchronous motors in star connection			**Motor control operation** → depending on C0086 Change of C0086 resets value to the assigned default setting Change of C0006 sets C0086 = 0!
C0009	LECOM ADDRESS	1	1	{1}	99	**LECOM device address** Bus device number when operated via interface 10, 20, ..., 90 reserved for broadcast to device groups for RS232, RS485, optical fibre.
C0011	NMAX	3000	500	{1 rpm}	16000	**Max. speed Nmax** Reference value for the absolute and relative setpoint selection for the acceleration and deceleration times. Parameter setting via interface: Large changes in one step should only be made when the controller is inhibited.
C0012	TIR (ACC)	0.000	0.000	{0.001 s}	999.900	**NSET acceleration time T_{ir}** for the main setpoint of NSET (ref. to speed change 0 ... n_{max})
C0013	TIF (DEC)	0.000	0.000	{0.001 s}	999.900	**NSET deceleration time Tif** for the main setpoint of NSET (ref. to speed change $n_{max\ ...}$ 0)
C0017	FCODE (QMIN)	50	-16000	{1 rpm}	16000	**FCODE (Qmin)** switching threshold $n_{act} < n_x$ n_{act} < C0017 activates the comparator output CMP1-OUT

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0018	Switching frequency fchop	0	0	16/8 kHz		Optimum noise reduction with automatic changeover to 8 kHz
			1	8 kHz sine		Power-optimised operation
			2	16 kHz sine		Noise-optimised operation
C0019	THRESH NACT=0	0	0	{1 rpm}	16000	**Threshold n_{act} =0** Threshold detection at $n_{act} = 0$
C0021	SLIPCOMP	0.00	0.00	{0.01 %}	20.00	**Slip compensation** Only active with sensorless control below the value of C0291
C0022	IMAX CURRENT	→	0	{0.01 A}	1.50 I_N	**I_{max} limit current** → depending on C0086 Change of C0086 resets value to the assigned default setting (1.5×Imotor)
[C0025]	FEEDBACK TYPE	10				**Feedback** Input of the encoder specified on the nameplate of the Lenze motor: C0025 automatically changes C0420, C0490, C0495
			0	COMMON		C0420, C0490 or C0495 was changed subsequently
			10	RSx (Resolver)		The resolver is designated with RSxxxxxxxx.
			110	IT-512-5V		Incremental encoder with TTL level
			111	IT-1024-5V		
			112	IT-2048-5V		
			113	IT-4096-5V		
			210	IS-512-5V		Sin/cos encoder
			211	IS-1024-5V		
			212	IS-2048-5V		
			213	IS-4096-5V		
			310	AS-512-8V		Stegmann single-turn sine-cosine encoder with RS485 interface (voltage must be entered manually)
			410	AM-512-8V		Multi-turn sin/cos encoder by Stegmann company (the voltage must be entered manually)
C0026			-199.99	{0.01 %}	199.99	**FCODE (OffsetAIN)** Freely assignable code for relative analog signals Used for: – Offset for terminal X6/1,2 – Offset for terminal X6/3,4
1	FCODE (OFFSET)	0.00				
2	FCODE (OFFSET)	0.00				
C0027			-199.99	{0.01 %}	199.99	**FCODE (GAIN)** Freely assignable code for relative analog signals Used for: – Gain X6/1,2 – Gain X6/3,4
1	FCODE (GAIN)	100.00				
2	FCODE (GAIN)	100.00				
C0030	DFOUT CONST	3	0 1 2 3 4 5 6	256 inc/rev 512 inc/rev 1024 inc/rev 2048 inc/rev 4096 inc/rev 8192 inc/rev 16384 inc/rev		**DFOUT constant** Constant for the digital frequency output in increments per revolution
C0032	FCODE GEARBOX	1	-32767	{1}	32767	**FCODE (gearbox factor numerator)** Freely configurable code
C0033	GEARBOX DENOM	1	1	{1}	32767	**Denominator of gearbox factor**

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0034	MST CURRENT	0	0 -10 V ... + 10 V 1 +4 mA ... +20 mA 2 -20 mA ... +20 mA			**Master reference voltage / current** Selection for setpoint selection
C0037	SET-VALUE RPM	0	-16000	{1 rpm}	16000	**Setpoint selection (rpm)**
C0039			-199.99	{0.01 %}	199.99	**NSET JOG setpoints** Fixed speeds (JOG setpoints) can be selected for NSET using digital inputs
1	JOG SET-VALUE	100.00				
2	JOG SET-VALUE	75.00				
3	JOG SET-VALUE	50.00				
4	JOG SET-VALUE	25.00				
5	JOG SET-VALUE	0.00				
...	...	...				
14	JOG SET-VALUE	0.00				
15	JOG SET-VALUE	0.00				
C0040	CTRL ENABLE	1	0 Controller inhibited 1 Controller enabled			**Controller enable RFR**
C0042	QSP	Disp	1 QSP: Not active 2 QSP: Active			**Quick stop**
C0043	TRIP RESET	0	0 TRIP RESET 1 Active error			**Error reset** Reset of an active trip: Set C0043 = 0
C0045	ACT JOG	Disp	0 Nset active 1 JOG 1 2 JOG 2 ... ... 15 JOG 15			**NSET** JOG selection
C0046	NSET-N	Disp	-199.99	{0.01 %}	199.99	**NSET** Main setpoint
C0049	NSET-NADD	Disp	-199.99	{0.01 %}	199.99	**NSET** Additional setpoint
C0050	MCTRL-NSET2	Disp	-100.00	{0.01 %}	100.00	**MCTRL** n_{set} at speed controller input
C0051	MCTRL-NACT	Disp	-30000	{1 rpm}	30000	**Actual speed value**
C0052	MCTRL-UMOT	Disp	0	{1 V}	800	**Motor voltage**
C0053	UG-VOLTAGE	Disp	0	{1 V}	900	**DC-bus voltage**
C0054	IMOT	Disp	0.0	{0.1 A}	500.0	**Imot (motor current)**
C0056	MCTRL-MSET2	Disp	-100.00	{0.01 %}	100.00	**MCTRL** Torque setpoint (controller output with torque precontrol (MCTRL-M-ADD)
C0057	MAX TORQUE	Disp	0	{1 Nm}	500	**Maximum torque (C0086/C0022)** Maximum possible torque of the drive configuration depending on C0022, C0086
C0058	ROTOR DIFF	-90.o	-180.0	{0.1 °}	179.9	**Rotor displacement angle** Zero phase of the rotor for synchronous motors (C0095)
C0059	MOT POLE NO.	Disp	1	{1}	50	**Number of motor pole pairs**
C0060	ROTOR POS	Disp	0	{1}	2048	**Motor rotor position** 1 rev. = 2048 inc
C0061	HEATSINK TEMP	Disp	0	{1 °C}	100	**Heatsink temperature**
C0063	MOT TEMP	Disp	0	{1 °C}	200	**Motor temperature**
C0064	UTILISATION	Disp	0	{1 %}	150	**Device load Ixt** during the last 180 s C0064 > 100 % releases OC5 Trip reset is possible only if C0064 < 95 %
C0067	ACT TRIP	Disp	All fault indications		→ Selection list 10	**Error message TRIP** Momentary fault indication

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0070	VP SPEED CTRL	→	0.0	{0.5 }	255.0	**V_{pn} speed controller** → depending on C0086 Change of C0086 resets value to the assigned default setting
C0071	TN SPEED CTRL	→	1.0	{0.5 ms}	600.0	**T_{nn} speed controller** >512 ms switched off → depending on C0086 Change of C0086 resets value to the assigned default setting
C0072	TD SPEED CTRL	0.0	0.0	{0.1 ms}	32.0	**T_{dn} speed controller**
C0075	VP CURR CTRL	0.35	0.00	{0.01 }	15.99	**V_{pi} current controller**
C0076	TN CURR CTRL	1.8	0.5	{0.1 ms}	2000.0	**T_{ni} current controller** 2000 ms switched off
C0077	VP FIELD CTRL	0.25	0.00	{0.01 }	15.99	**V_{pF} field controller**
C0078	TN FIELD CTRL	15.0	1.0	{0.5 ms}	8000.0	**T_{nF} field controller** 8000 ms switched off
[C0081]	MOT POWER	→	0.01	{0.01 kW}	150.00	**Rated motor power** acc. to nameplate → depending on C0086 Change of C0086 resets value to the assigned default setting Change of C0081 sets C0086 = 0
[C0084]	MOT RS	→	0.00	{0.01 Ω}	100.00	**Motor stator resistance** → depending on C0086 Change of C0086 resets value to the assigned default setting
[C0085]	MOT LS	→	0.00	{0.01 mH}	200.00	**Motor leakage inductance** → depending on C0086 Change of C0086 resets value to the assigned default setting
[C0086]	MOT TYPE	→			See motor selection list	**Motor type selection** → depending on the controller used Change of C0086 resets C0006, C0022, C0070, C0071, C0081, C0084, C0085, C0087, C0088, C0089, C0090, C0091 to the assigned default setting
[C0087]	MOT SPEED	→	300	{1 rpm}	16000	**Rated motor speed** → depending on C0086 Change of C0086 resets value to the assigned default setting
[C0088]	MOT CURRENT	→	0.5	{0.1 A}	300.0	**Rated motor current** → depending on C0086 Change of C0086 resets value to the assigned default setting
[C0089]	MOT FREQUENCY	→	10	{1 Hz}	1000	**Rated motor frequency**
[C0090]	MOT VOLTAGE	→	50	{1 V}	500	**Rated motor voltage** → depending on C0086 Change of C0086 resets value to the assigned default setting
[C0091]	MOT COS PHI	→	0.50	{0.01 }	1.00	**Motor cos** φ → depending on C0086 Change of C0086 resets value to the assigned default setting
C0093	DRIVE IDENT	Disp	0 1 93xx	damaged power section no power section 93xx		**Controller identification** 93xx: Lenze servo inverter
C0094	PASSWORD	0	0	{1}	9999	**Password** Parameter access protection for the keypad XT. If the password is activated, only the codes of the user menu can be accessed. For further possible selections see C0096

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
[C0095]	ROTOR POS ADJ	0	0 Not active 1 Active			**Rotor position adjustment** of a synchronous motor C0058 displays the zero angle of the rotor C0095 = 1 starts position adjustment
[C0096]			0 No password protection 1 Read protection 2 Write protection 3 Read/write protection			Extended password protection for bus systems with activated password (C0094). All codes in the user menu can be accessed.
1	AIF PROTECT.	0				AIF access protection
2	CAN PROTECT.	0				CAN access protection
C0099	S/W VERSION	Disp	x.xx			**Software version**
C0101			0.000	{0.001 s}	999.900	**NSET** Additional acceleration for the main setpoint (referring to speed variation of 0 ... $n_{max.}$)
1	ADD-TIR	0.000				
2	ADD-TIR	0.000				
...	...	...				
15	ADD-TIR	0.000				
C0103			0.000	{0.001 s}	999.900	**NSET** Additional deceleration times for the main setpoint (referring to speed variation of 0 ... $n_{max.}$)
1	ADD-TIF	0.000				
2	ADD-TIF	0.000				
...	...	...				
15	ADD-TIF	0.000				
C0105	QSP TIF	0.000	0.000	{0.001 s}	999.900	**QSP deceleration time** Deceleration time for quick stop (QSP) Ref. to speed change 0...$n_{max.}$
C0108		100.00	-199.99	{0.01 %}	199.99	**FCOD (gain AOUT)**
1	FCODE (GAIN)					
2	FCODE (GAIN)					
C0109			-199.99	{0.01 %}	199.99	**FCODE (Offs.AOUT)**
	FCODE (OFFSET)	0.00				
	FCODE (OFFSET)	0.00				
C0114			0 HIGH active 1 LOW active			**DIGIN polarity** Terminal polarity
1	DIGIN1 POL	0				X5/E1
2	DIGIN2 POL	0				X5/E2
3	DIGIN3 POL	0				X5/E3
4	DIGIN4 POL	1				X5/E4
5	DIGIN5 POL	0				X5/E5
[C0116]					→ Selection list 2	Signal configuration **FDO-xx** Free digital outputs can only be evaluated when networked with automation interfaces.
1	FDO-00	1000	FIXED0			
...	...	...	...			
32	FDO -31	1000	FIXED0			
[C0117]		→			→ Selection list 2	Signal configuration **DIGOUT-x** → depending on C0005
1	DIGOUT1	15000	DCTRL-TRIP			X5/A1
2	DIGOUT2	10650	CMP1-OUT			X5/A2
3	DIGOUT3	500	DCTRL-RDY			X5/A3
4	DIGOUT4	5003	MCTRL-MMAX			X5/A4
C0118			0 High active 1 LOW active			**DIGOUTx polarity** Terminal polarity
1	DIGOUT1 POL	1				X5/A1
2	DIGOUT2 POL	1				X5/A2
3	DIGOUT3 POL	0				X5/A3
4	DIGOUT4 POL	0				X5/A4
C0121	OH7 LIMIT	150	45	{1 °C}	150	**Temperature for OH7** Threshold for motor temperature warning

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0122	OH4 LIMIT	85	45 {1 °C} 85	**Temperature for OH4** Warning threshold - heatsink temperature
C0125	BAUD RATE	0	0 9600 baud 1 4800 baud 2 2400 baud 3 1200 baud 4 19200 baud	**LECOM baud rate** LECOM baud rate for 2102 module
C0126	MONIT CE0	3	0 TRIP 2 Warning 3 Off	**Conf. CE0** Configuration of communication error monitoring with automation interface CE0
C0130	ACT TI	Disp		**NSET act. Ti times** active T_i times of NSET
C0134	RFG CHARAC	0	0 linear 1 S-shaped	**NSET RFG characteristic** Ramp characteristic for main setpoint
C0135	CONTROL WORD	0	0 {1} 65535	**Control word** Controller control word for LECOM-A/B/LI or operating module.
C0136		Disp		
1	CTRLWORD C135			**Control word C135**
2	CTRLWORD CAN			**Control word CAN**
3	CTRLWORD AIF			**Control word AIF**
C0141	FCODE (SETPOINT)	0.0	-199.9 {0.1 } 199.9	**Main setpoint**
C0142	START OPTIONS	1	0 Start lock 1 Auto start	**Start option** Start conditions are executed: after mains connection after message (t > 0.5s) after TRIP
C0150	STATUS WORD	Disp	0 {1} 65535	**Status word** when networked with automation interfaces Binary interpretation indicates the bit states
C0151	FDO (DW)	Disp		Display (hex.) of the free digital output signals configured with C0116 Binary interpretation indicates the bit states
C0155	STATUS WORD 2	Disp	Bit00 Fail Bit08 R/L Bit01 Mmax Bit09 – Bit02 Imax Bit10 – Bit03 IMP Bit11 – Bit04 RDY Bit12 – Bit05 CINH Bit13 – Bit06 TRIP Bit14 – Bit07 Init Bit15 –	Status word 2 Extended decimal status word Binary interpretation indicates the bit states
[C0156]			→ Selection list 2	Configuration of the free bits of the status word
1	STAT.B0	2000	DCTRL-PAR*1-0	
2	STAT.B2	5002	MCTRL-IMAX	
3	STAT.B3	5003	MCTRL-MMAX	
4	STAT.B4	5050	NSET-RFG I=0	
5	STAT.B5	10650	CMP1-OUT	
6	STAT.B14	505	DCTRL-CW/CCW	
7	STAT.B15	500	DCTRL-RDY	
C0157	(C0156)	Disp	0 1	
C0161	ACT TRIP	Disp	All fault indications	**Error message TRIP** Momentary fault indication (as under C0168/1)
C0167	RESET FAILMEM	0	0 No reset 1 Reset	**History buffer reset** Clears the history buffer

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0168		Disp	All fault indications			List of errors occurred
1	FAIL NO. ACT					Currently active fault
2	FAIL NO: OLD1					Last fault
...	...					...
8	FAIL NO: OLD7					Last but six fault
C0169		Disp	Corresponding mains switch-on time			List of the times when the faults occurred under C0168 (referring to C0179)
1	FAILTIME ACT					Currently active fault
2	FAILTIME OLD1					Last fault
...	...					...
8	FAILTIME OLD7					Last but six fault
C0170		Disp	Corresponding mains switch-on time			List which indicates how often the faults have occurred consecutively under C0168 History buffer
1	COUNTER ACT					Currently active fault
2	COUNTER OLD1					Last fault
...	..					...
8	COUNTER OLD7					Last but six fault
C0172	OV REDUCE	0	0	{10 V}	100	**OV reduce** Threshold to activate the brake torque reduction before OU fault
[C0173]	UG LIMIT	1				**Overvoltage shutdown-threshold (OU)** Check during commissioning and adapt, if necessary All drive components in DC bus connections must have the same thresholds
			0	Mains < 400V, ±B LU = 285 V, OU = 770 ... 755 V		Operation on mains <400 V with or without brake unit
			1	Mains = 400V, ±B LU = 285 V, OU = 770 ... 755 V		Operation on 400 V mains with or without brake unit
			2	Mains = 460V, ±B LU = 328 V, OU = 770 ... 755 V		Operation on 460 V mains with or without brake unit
			3	Mains = 480V, B, OU = 770 V LU = 342 V, OU = 770 ... 755 V		Operation on 480 V mains without brake unit
			4	Mains = 480V, B, OU = 800 V LU = 342 V, OU = 800 ... 785 V		Operation on 480 V mains with brake unit
C0178	OP TIMER	Disp	0	{1 s}	4294967295	**Elapsed time meter** Time when the controller was enabled
C0179	MAINS TIMER	Disp	0	{1 s}	4294967295	**Power-on time meter** Time when the mains was switched on
C0182	TI S-SHAPED	20.00	0.01	{0.01 s}	50.00	**NSET** T_i time of the S-shaped ramp function generator (determines the shape of the S curve) Small values ⇒small S rounding Large values ⇒large S rounding

Code No.	Code LCD	Possible settings Lenze	Possible settings Selection			Important
C0183	DIAGNOSTICS	Disp				**Drive diagnostics** • Indicates fault or status information • If several items of fault or status information are to be shown, the information with the smallest number is displayed
			0	OK		No fault
			101	Initialisation		Initialisation phase
			102	TRIP/fault		TRIP active
			103	Emergency stop		Emergency stop has been carried out
			104	IMP message		Message active
			105	Power OFF		Function is not supported
			111	BSP C135 operation inhibit		Operation inhibited
			112	BSP AIF operation inhibit		
			113	BSP CAN operation inhibit		
			121	CINH terminal 28 controller inhibit		Controller inhibited via X5/28
			122	CINH internal 1 controller inhibit		DCTRL-CINH1
			123	CINH internal 2 controller inhibit		DCTRL-CINH2
			124	CINH C135/STOP controller inhibit		STOP key at the keypad
			125	CINH AIF controller inhibit		Controller inhibited through AIF
			126	CINH CAN controller inhibit		Controller inhibited through CAN
			141	Switch-on inhibit		Restart protection active
			142	IMP inhibit Pulse inhibit		High resistance power outputs
			151	QSP terminal Ext. quick stop		QSP via MCTRL-QSP
			152	QSP C135 quick stop		QSP via STOP key at the keypad
			153	QSP AIF quick stop		QSP via AIF
			154	QSP CAN quick stop		QSP via system bus
			250	Warning C168		Warning active
C0190	NSET ARIT	0	0 1 2 3 4 5	OUT = C46 C46 + C49 C46 - C49 C46 * C49 C46 / C49 C46/(100 - C49)		**NSET** Arithmetic block in NSET function block. Connects main setpoint C0046 and additional setpoint C0040
C0195	BRK1 T ACT	99.9	0.0	{0.1 s}	99.9	**BRK1** Brake closing time Engagement time of the mechanical holding brake After the time elapsed under C0195, the status "mechanical brake closed" is reached
C0196	BRK T RELEASE	0.0	0.0	{0.1 s}	60.0	**BRK1** Brake opening time Disengagement time of the mechanical holding brake (see technical data of the brake). After time has elapsed under C0195, the status "mechanical brake closed" is reached
C0200	S/W ID	Disp				**Software ID** Software identification
C0201	S/W DATE	Disp				**Software generation** Creation date
C0203	COMM. NO.	Disp	x / xxxx / xxxxx			**Commission number**
C0204	SERIAL-NO.	Disp	0	{1}	65535	**Serial number**
C0207	DL INFO 1	Disp				**Download info 1**
C0208	DL INFO 2	Disp				**Download info 2**
C0209	DL INFO 3	Disp				**Download info 3**

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0220	NSET TIR ADD	0.000	0.000	{0.001 s}	999.900	**NSET** Additional setpoint Tir Acceleration time T_{ir} of the additional setpoint for NSET (referring to speed variation of 0 ... $n_{max.}$)
C0221	NSET TIF ADD	0.000	0.000	{0.001 s}	999.900	**NSET** Additional setpoint Tif Deceleration time T_{if} of the additional setpoint for NSET (referring to speed variation of 0 ... $n_{max.}$)
C0222	PCTRL VP	1.0	0.1	{0.1 }	500.0	**PCTRL** Vp gain
C0223	PCTRL TN	400	20	{1 ms}	99999	**PCTRL** Integral component Tn 99999 ms: Switched off
C0224	PCTRL KD	0.0	0.0	{0.1 }	5.0	**PCTRL** Kd differential component
C0241	NSET RFG-I = O	1.00	0.00	{0.01 %}	100.00	**NSET** Threshold ramp function generator for main setpoint Input = output , (100 % = n_{max})
C0244	BRK M SET	0.00	-100.00	{0.01 %}	100.00	**BRK1** Holding torque of the DC injection brake 100 % = value of C0057
C0250	FCODE 1BIT	0	0 1	Lower limit Upper limit		**FCODE 1bit digital**
C0252	ANGLE OFFSET	0	-245760000	{1 inc}	245760000	**DFSET** Phase offset Fixed phase offset for digital frequency configuration 1 rev. = 65536 inc
C0253	ANGLE N-TRIM	→	-32767	{1 inc}	32767	**DFSET** Speed-dependent phase trimming → depending on C0005, C0025, C0490 Change of C0005, C0025, or C0490 resets C0253 to the default setting 1 rev. = 65536 inc C0253 is reached at 15000 rpm
C0254	VP ANGLE CTRL	0.4000	0.0000	{0.0001 }	3.9999	**MCTRL** Vp phase controller
C0255	THRESHOLD P03	327680	10	{1 inc}	1800000000	**Following error limit P03** 1 rev. = 65536 inc Following error > C0255 releases fault "P03"
C0260	MPOT1 HIGH	100.00	-199.99	{0.01 %}	199.99	**MPOT1** Upper limit (condition: C0260 > C0261)
C0261	MPOT1 LOW	-100.0	-199.99	{0.01 %}	199.99	**MPOT1** Lower limit (condition: C0261 < C0260)
C0262	MPOT1 TIR	10.0	0.1	{0.1 s}	6000.0	**MPOT1** Acceleration time (referring to change 0 ... 100 %)
C0263	MPOT1 TIF	10.0	0.1	{0.1 s}	6000.0	**MPOT1** Deceleration time (referring to change 0 ... 100 %)
C0264	MPOT1 ON/OFF	0	0 1 2 3 4 5	no change Deceleration with T_{if} to 0% Deceleration with T_{if} to C0261 Jump with T_{if} = 0 to 0% Jump with T_{if} = 0 to C0261 Acceleration with T_{ir} to C0260		**MPOT1** Deactivation function of motor pot Function which is executed when motor pot is deactivated via the input MPOT1-INACTIVE.

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0265	MPOT1 INIT	0	0 1 2	Value during mains failure lower limit of C0261 0 %		**MPOT1** Initialisation. Value which is accepted during mains switching and activated motor potentiometer.
[C0267]					→ Selection list 2	Digital inputs motor potentiometers C0267/1: Mpot-UP C0267/2: MPOT-Down
1	UP	1000	FIXED0			
2	DOWN	1000	FIXED0			
[C0268]	MPOT1-INACT	1000	FIXED0		→ Selection list 2	**MPOT1** Input signal configuration
C0269		Disp				
1	(C0267/1)					
2	(C0267/2)					
3	(C0268)					
C0291	SSC override	0	0	{1 rpm}	16000	**SSC override frequency**
C0292	SSC IM SET	0.00	0.00	{0.01 A}	500.00	**SSC Im setpoint** Motor current. Set approx. 1.0 to 1.1- fold rated motor current for sensorless control. Setpoint
C0293	SSC dynamic		0.00	{0.01 %}	199.00	**SSC Dynamic constant**
C0294	VP FRQ CTRL	→	0.0	{0.1 }	99.9	**SSC V_p frequency controller** Proportional gain of frequency controller → depending on C0086
C0295	TN FRQ CTRL	→	2	{1 ms}	20000	**Tn frequency controller** Adjustment time frequency controller → depending on C0086
C0296	DYNAMIC CONST	100	0	{0.1 }	32767	**Dynamic constant**
C0325	VP2 ADAPT	1.0	0.1	{0.1 }	500.0	**PCTRL** Process controller adaptation gain (V_{p2})
C0326	VP3 ADAPT	1.0	0.1	{0.1 }	500.0	**PCTRL** Process controller adaptation gain (V_{p3})
C0327	SET2 ADAPT	100.00	0.00	{0.01 %}	100.00	**PCTRL** Set speed threshold nset2 of the process controller adaptation (condition: C0327 > C0328)
C0328	SET1 ADAPT	0.00	0.00	{0.01 %}	100.00	**PCTRL** Set speed threshold nset1 of the process controller adaptation (condition: C0328 < C0327)
C0329	ADAPT ON/OFF	0	0 1 2 3	No process controller adaptation External via input Adaptation via setpoint Adaptation via control difference		**PCTRL** Activate process controller adaptation
C0332	PCTRL TIR	0.000	0.000	{0.001 s}	999.900	**PCTRL** Acceleration time Tir Refers to setpoint change 0...100 %
C0333	PCTRL TIF	0.000	0.000	{0.001 s}	999.900	**PCTRL** Deceleration time Tif Refers to setpoint change 0...100 %
C0336	ACT VP	Disp	0.0	{0.1 }	500.0	**PCTRL** Current Vp
C0337	BI/UNIPOLAR	0	0 1	Bipolar Unipolar		**PCTRL** Bipolar/unipolar range of action
C0338	ARIT1 FUNCT	1	0 1 2 3 4 5	OUT = IN1 OUT = IN1 + IN2 OUT = IN1 - IN2 OUT = IN1 * IN2 OUT = IN1 / IN2 OUT = IN1/(100% - IN2)		**ARIT1** Function selection

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
[C0339]					→Selection list 1	**ARIT1** Input signal configuration
1	ARIT1-IN1	1000	FIXED0%			
2	ARIT1-IN2	1000	FIXED0%			
C0340		Disp				
1	(C0339/1)					
2	(C0339/2)					
[C0350]	CAN ADDRESS	1	1	{1}	63	**CAN node address**
C0351	CAN BAUD RATE	0	0 1 2 3 4	500 kbits/s 250 kbits/s 125 kbits/s 50 kbits/s 1000 kbits/s		**CAN baud rate**
C0352	CAN MST	0	0 1	Slave Master		**CAN** Establishing a master operation
C0353			0 1	C0350 C0354		**CAN** Source for CAN bus IN/OUT addresses
1	CAN ADDR SEL1	0				CAN IN1/OUT1 addresses
2	CAN ADDR SEL2	0				CAN IN2/OUT2 addresses
3	CAN ADDR SEL3	0				CAN IN3/OUT3 addresses
C0354			1	{1}	512	**CAN** CAN bus IN/OUT node addresses 2
1	IN1 ADDR2	1				
2	OUT2 ADDR2	129				
3	IN2 ADDR2	257				
4	OUT2 ADDR2	258				
5	IN3 ADDR2	385				
6	OUT2 ADDR2	386				
C0355		Disp	0	{1}	2047	**CAN** CAN bus identifier
1	IN1 ID					
2	OUT1 ID					
3	IN2 ID					
4	OUT2 ID					
5	IN3 ID					
6	OUT3 ID					
C0356			0	{1 ms}	65000	**CAN** Time settings
1	CAN BOOT UP	3000				CAN Boot up
2	OUT2 CYCLE	0				CAN-OUT2 cycle
3	OUT3 CYCLE	0				CAN-OUT3 cycle
4	CAN DELAY	20				CAN OUT 2/3 delay time
C0357			0	{1 ms}	65000	**CAN** CAN bus monitoring time for I_{ratedx}
1	CE1MONIT TIME	3000				CE1 monitoring time
2	CE2MONIT TIME	3000				CE2 monitoring time
3	CE3MONIT TIME	3000				CE3 monitoring time
C0358	RESET NODE	0	0 1	No function CAN reset		**CAN** Install CAN bus reset node
C0359	CAN STATE	Disp	0 1 2 3	Operational Pre-Operational Warning Bus off		**CAN** Status display

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0360		Disp	0 65535	**CAN** Telegram counter (number of telegrams) Count values > 65535: Restart with 0
1	MESSAGE OUT			all sent
2	MESSAGE IN			all received
3	MESSAGE OUT1			sent to CAN-OUT1
4	MESSAGE OUT2			sent to CAN-OUT2
5	MESSAGE OUT3			sent to CAN-OUT3
6	MESSAGE POUT1			sent to parameter channel 1
7	MESSAGE POUT2			sent to parameter channel 2
8	MESSAGE IN1			received from CAN-IN1
9	MESSAGE IN2			received from CAN-IN2
10	MESSAGE IN3			received from CAN-IN3
11	MESSAGE PIN1			received from parameter channel 1
12	MESSAGE PIN2			received from parameter channel 2
C0361		Disp	0 {1 %} 100	**CAN** Bus load To ensure a perfect operation, the total bus load (all connected devices) should be less than 80%
1	LOAD OUT			all sent
2	LOAD IN			all received
3	LOAD OUT1			sent to CAN-OUT1
4	LOAD OUT2			sent to CAN-OUT2
5	LOAD OUT3			sent to CAN-OUT3
6	LOAD POUT1			sent to parameter channel 1
7	LOAD POUT2			sent to parameter channel 2
8	LOAD IN1			received from CAN-IN1
9	LOAD IN2			received from CAN-IN2
10	LOAD IN3			received from CAN-IN3
11	LOAD PIN1			received from parameter channel 1
12	LOAD PIN2			received from parameter channel 2
C0362	SYNC CYCLE	Disp	0 {0.1 ms} 32.0	**CAN** Time between two sync telegrams on the system bus
C0363	SYNC CORR	1	1 0.8 µs 2 1.6 µs 3 2.4 µs 4 3.2 µs 5 4.0 µs	**CAN** Correction value for C0362
[C0364]	CAN ACTIVE	1000	FIXED0 → Selection list 2	**Pre-operat. after operat.** Activate process data externally Change over from pre-operation to operation
C0365	(C0364)	Disp		Input signal CAN active
C0366	SYNC RESPONSE	1	0 no sync response 1 sync response	**CAN Sync Response**
C0367	SYNC RX ID	128	1 {1} 256	**CAN Sync Rx Identifier**
C0368	SYNC TX ID	128	1 {1} 256	**CAN Sync Tx Identifier**
C0369	SYNC TX TIME	0	0 {1} 65000	**CAN Sync Tx Time**
C0400	OUT	Disp	-199.99 {0.01 %} 199.99	**AIN1** Output signal display
[C0402]	OFFSET	19502	FCODE-26/1 →Selection list 1	**AIN1** Configuring offset of AIN1
[C0403]	GAIN	19504	FCODE-27/1 →Selection list 1	**AIN1** Configuring gain of AIN1

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0404		Disp	-199.99 {0.01 %} 199.99	**AIN1** Input signals
1	(C0402)			
2	(C0403)			
C0405	OUT	Disp	-199.99 199.99	**AIN2** Output signal display
[C0407]	OFFSET	19503	FCODE-26/2 →Selection list 1	**AIN2** Offset configuration
[C0408]	GAIN	19505	FCODE-27/2 →Selection list 1	**AIN2** Gain configuration
C0409		Disp	-199.99 {0.01 %} 199.99	**AIN2** Input signal display
1	(C0407)			
2	(C0408)			
[C0416]	RESOLVER ADJ	0	0 {1} 99999999	Correction of **resolver error** For Lenze motors: Read resolver error from the nameplate
[C0420]	ENCODER CONST	512	1 {1 inc/rev} 8192	**Encoder input X8/X9** Encoder constant in increments per revolution
[C0421]	ENC VOLTAGE	5.00	5.00 {0.1V} 8.00	**Encoder voltage supply** Adjust supply voltage for the encoder used CAUTION: incorrect input may destroy the encoder
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	**DFIN** Increment of the digital frequency input
C0426	DFIN-OUT	Disp	-32767 {1 rpm} 32767	Output signal of DFIN
C0427	DFIN FUNCTION	0	0 2 phases 1 A pulse / B dir 2 Pulse A or B	**DFIN** Selection of master frequency signal
C0429	TP5 DELAY	0	-32767 {1 inc} 32767	Dead time compensation for the TP function of DFSET and DFRFG
[C0431]	IN	5001	MCTRL-NACT →Selection list 1	**AOUT1** Input signal configuration
[C0432]	OFFSET	19512	FCODE-109/1 →Selection list 1	**AOUT1** Offset setting
[C0433]	GAIN	19510	FCODE-108/1 →Selection list 1	**AOUT1** Gain setting
C0434		Disp	-199.99 {0.01 %} 199.99	
1	(C0431)			
2	(C0432)			
3	(C0433)			
[C0436]	IN	5002	MCTRL-MSET2 →Selection list 1	**AOUT2** Input signal configuration
[C0437]	OFFSET	19513	FCODE-109/2 →Selection list 1	**AOUT2** Offset setting
[C0438]	GAIN	19511	FCODE-108/2 →Selection list 1	**AOUT2** Gain setting
C0439		Disp	-199.99 {0.01 %} 199.99	
1	(C0436)			
2	(C0437)			
3	(C0438)			
[C0440]	STATE-BUS	1000	FIXED0 → Selection list 2	Configuration - state bus X5/ST
C0441	(C0440)	Disp		

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0443	DIGIN-OUT	Disp	0 {1} 255	Signals at X5/E1 ... X5/E5, decimal value. Binary interpretation indicates terminal signals
C0444		Disp	0 1	Signals at X5/A1 .... X5/A4
1	(C0118/1)			
2	(C0118/2)			
3	(C0118/3)			
4	(C0118/4)			
[C0450]	NX	1000	FIXED0% →Selection list 1	**BRK1** Configuration - analog input signal
[C0451]	ON	1000	FIXED0 → Selection list 2	**BRK1** Configuration - digital input signal
[C0452]	SIGN	1000	FIXED0% →Selection list 1	**BRK1** Configuration - analog input signal
C0458		Disp	-199.99 {0.01 %} 199.99	
1	(C0450)			
2	(C0452)			
C0459	(C0451)	Disp		
C0464	CUSTOMER I/F	Disp	0 original 1 changed	**Customer interface** Status of selected basic configuration Reassignment of terminals in a basic configuration from C0005 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 of C0005 sets C0005 = 0 and C0464= 1

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[C0465]	FB LIST	→	→ Selection list 5	**FB processing list** Contains the program for signal processing (sequence in which the function blocks are processed) → depending on C0005 Changing C0005 loads assigned processing list → Valid for C0005 = 1000 After changing the signal flow the processing list must be adapted. Otherwise the device may work with wrong signals! The function blocks DIGIN, DIGOUT, AIF-IN, CAN-IN, and MCTRL are always processed and do not have to be entered into the list.
1		200		
2		0		
3		50		
4		0		
5		0		
6		55		
7		0		
8		0		
9		10250		
10		0		
11		0		
12		0		
13		5650		
14		0		
15		0		
16		5050		
...		0		
19		5700		
...		0		
22		10650		
...		0		
25		70		
..		0		
28		75		
...		0		
31		250		
...		0		
41		25000		
42		20000		
...		0		
49		0		
50		0		
C0466	CPU T REMAIN	Disp		**Remaining processing time** Remaining for processing function blocks
[C0469]	FCT STOP KEY	2	0 switched off 1 Set CINH (controller inhibit) 2 Set QSP (Quick stop)	**Operating module** STOP key function. Function is executed while pressing the key.
C0470			0 {1} 255	Freely configurable code for digital signals The data words C0470 and C0471 are in parallel and are identical.
0	FCODE 8 BIT DIGITAL	0		
1	FCODE BIT 0-7	0		
2	FCODE BIT8-15	0		
3	FCODE BIT16-23	0		
4	FCODE BIT24-31	0		
C0471	FCODE 32 BIT	0	0 {1} 4294967296	**FCODE 32Bit DIGITAL** Freely configurable codes for digital signals. The data words C0470 and C0471 are in parallel and identical.

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0472	FCODE ANALOG		-199.99	{0.01 %}	199.99	Freely assignable code for relative analog signals
1		0.00				
2		0.00				
3		100.00				
6		100.00				
...		...				
19		0.00				
20		0.00				
C0473	FCODE ABS		-32767	{1}	32767	**FCODE** Freely configurable code for absolute analog signals
1		1				
2		1				
3		0				
...		...				
9		0				
10		0				
C0474	FCODE PH		-2147483648	{1}	2147483647	**FCODE** Freely assignable code for phase signals 1 rev. = 65536 inc
1		0				
...		...				
5		0				
C0475	FCODE DF		-16000	{1 rpm}	16000	**FCODE** Freely configurable code for phase difference signals 1 rev. = 65536 inc
1		0				
2		0				
[C0490]	FEEDBACK POS	0				**Position feedback system** Feedback system for position controller
			0 1 2	Resolver at X7 Encoder TTL at X8 Encoder sin at X8		Feedback system can be mixed with C0495 = 0, 1, 2
			3 4	Absolute value encoder ST at X8 Absolute value encoder MT at X8		Feedback system also sets C0495 to the same value
[C0495]	FEEDBACK N	0				**Speed feedback system** Feedback system for the speed controller
			0 1 2	Resolver at X7 Encoder TTL at X8 Encoder sin at X8		Feedback system can be mixed with C0490 = 0, 1, 2
			3 4	Absolute value encoder ST at X8 Absolute value encoder MT at X8		Feedback system also sets C0490 to the same value
C0497	NACT FILTER	2.0	0.0	{0.1 ms}	50.0	**Nact-filter time constant** Time constant for actual speed C0497 = 0 ms: Switched off

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0517			0.00 {0.01 } 1999.00	**User menu** Up to 32 entries • Under the subcodes the numbers of the desired codes are entered. • 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	C0051/0 MCTRL-NACT	
2	USER MENU	54.00	C0054/0 Imot	
3	USER MENU	56.00	C0056/0 MCTRL-MSET2	
4	USER MENU	46.00	C0046/0 N	
5	USER MENU	49.00	C0049/0 NADD	
6	USER MENU	183.00	C0183/0 Diagnostics	
7	USER MENU	168.01	C0168/1 Fail no. act	
8	USER MENU	86.00	C0086/0 Mot type	
9	USER MENU	22.00	C0022/0 Imax current	
10	USER MENU	5.00	C0005/0 Signal cfg	
11	USER MENU	11.00	C0011/0 Nmax	
12	USER MENU	12.00	C0012/0 Tir	
13	USER MENU	13.00	C0013/0 Tif	
14	USER MENU	105.00	C0105/0 QSP Tif	
15	USER MENU	39.01	C0039/1 JOG setpoint	
16	USER MENU	70.00	C0070/0 Vp speed CTRL	
17	USER MENU	71.00	C0071/0 Tn speed CTRL	
18	USER MENU	0	not assigned	
...	...	0	not assigned	
31	USER MENU	94.00	C0094/0 Password	
32	USER MENU	3.00	C0003/0 Par save	
[C0520]	IN	1000	FIXEDPHI-0 → Selection list 4	**DFSET** Input signal configuration
[C0521]	VP-DIV	1000	FIXED0% →Selection list 1	**DFSET** Configuration - gain factor of numerator
[C0522]	RAT-DIV	1000	FIXED0% →Selection list 1	**DFSET** Configuration - gearbox factor of numerator
[C0523]	A-TRIM	1000	FIXED0% →Selection list 1	**DFSET** Configuration - phase trimming
[C0524]	N-TRIM	1000	FIXED0% →Selection list 1	**DFSET** Speed trimming of DFSET
[C0525]	0-PULSE	1000	FIXED0 → Selection list 2	**DFSET** Configuration - one-time zero pulse activation
[C0526]	RESET	1000	FIXED0 → Selection list 2	**DFSET** Configuration - integrator resetting
[C0527]	SET	1000	FIXED0 → Selection list 2	**DFSET** Configuration - integrator setting
C0528		Disp	$-2 \cdot 10^9$ {1} $2 \cdot 10^9$	**DFSET**
1	0-PULSE A			Phase difference between two zero pulses
2	OFFSET			Offset from C0523 × C0529 + C0252
3	PULSE DIST SET	Disp		Number of increments between two set pulses at X5/E5. Code is available as of software version 6.2.
4	PULSE DIST ACT	Disp		Number of increments between two actual pulses at X5/E4. Code is available as of software version 6.2.
C0529	MULTIP OFFSET	1	-20000 {1} 20000	**DFSET** Offset multiplier
C0530	DF EVALUATION	0	0 with gearbox factor	**DFSET** Master frequency evaluation
			1 without gearbox factor	Evaluation of the setpoint integrator (with/without gearbox factor)
C0531	ACT 0 DIV	1	1 {1} 16384	**DFSET** Actual zero pulse divider

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0532	0-PULSE/TP	1	1 2 3	Index pulse Touch probe Index pulse and touch probe		**DFSET** Selection of index pulse and/or touch probe of the feedback system
C0533	VP DENOM	1	1	{1}	32767	**DFSET** Gain factor denominator
C0534	0 PULSE FCT	0	0 1 2 10 11 12 13	Not active Continuous Cont. switchable Once, fast way Once, + direction Once, - direction Once, 2*zero pulse		**DFSET** Zero pulse function
C0535	SET 0 DIV	1	1	{1}	16384	**DFSET** Set zero pulse divider
C0536		Disp	-32767	{1}	32767	**DFSET** Absolute analog input signals
1	VP-DIV					
2	RAT-DIV					
3	A-TRIM					
C0537	N-TRIM	Disp	-199.99	{0.01 %}	199.99	**DFSET** Relative analog input signal
C0538		Disp				**DFSET**
1	0-PULSE					
2	RESET					
3	SET					
C0539	IN	Disp	-32767	{1 rpm}	32767	**DFSET**
C0540	FUNCTION	2	0 1 2 3 4 5	Analog input Phase difference input Resolver simulation - index pulse Resolver simulation without index pulse X10 = X9 X10 = X8		**DFOUT** Function of the encoder outputs • X9 is inhibited, if 0, 1, 2 or 3 are selected • The input signals are buffered
[C0541]	AN-IN	5001	MCTRL-NACT		→Selection list 1	**DFOUT** Configuration - analog input signal
[C0542]	DF-IN	1000	FIXEDPHI-0		→ Selection list 4	**DFOUT** Configuration - master frequency input
[C0544]	SYN-RDY	1000	FIXED0		→ Selection list 2	**DFOUT** Synchronisation signal for the zero pulse
C0545	PH OFFSET	0	0	{1 inc}	65535	**DFOUT** Phase offset
C0546	MIN INC/REV	1000	1	{1 inc}	2147483647	**DFSET** Masking (suppressing) interference pulses at X5/E4 (actual pulse of touch probe signal). The size of the masking window between two actual pulses is set.
C0547	(C0541)	Disp	-199.99	{0.01 %}	199.99	
C0548	(C0544)	Disp	0		1	
C0549	(C0542)	Disp	-32767	{1 rpm}	32767	
C0551	MIN INC/REV	1000	1	{1 inc}	2147483647	**DFSET** Masking (suppressing) interference pulses at X5/E5 (set pulse of touch probe signal). The size of the masking window between two set pulses is set. Code is available as of software version 6.2.

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0560			-199.99 {0.01 %} 199.99	**FIXSET1** Fixed setpoints
1	FIX SET-VALUE	100		**FIXSET1** Fixed setpoints
2	FIX SET-VALUE	75		
3	FIX SET-VALUE	50		
4	FIX SET-VALUE	25		
5	FIX SET-VALUE	0		
...	...	...		
15	FIX SET-VALUE	0		
[C0561]	AIN	1000	FIXED0% →Selection list 1	**FIXSET1** Configuration - analog input signal
[C0562]			→ Selection list 2	**FIXSET1** Configuration - digital input signals
1	IN1	1000	FIXED0	
2	IN2	1000	FIXED0	
3	IN3	1000	FIXED0	
4	IN4	1000	FIXED0	
C0563	(C0561)	Disp	-199.99 {0.01 %} 199.99	
C0564	(C0562)	Disp		
[C0570]	IN	1000	FIXED0% →Selection list 1	**S&H1** Configuration - analog input signal
[C0571]	LOAD	1000	FIXED0 → Selection list 2	**S&H1** Configuration - digital input signal
C0572	(C0570)	Disp	-199.99 {0.01 %} 199.99	
C0573	(C0571)	Disp		
C0576	NERR WINDOW	100.00	0.00 {0.01 %} 100.00	Depending on C0011 Max. permissible system deviation between actual speed and speed setpoint
C0577	VP FLD WEAK	3.00	0.00 {0.01] 15.99	**Field weakening controller** V_{pgain}
C0578	TN FLD WEAK	50.0	2.0 {0.5 ms} 8192.0	**Field weakening controller** Reset time Tn C0578 = 8000 ms: Switched off
C0579	MONIT NEER	3	0 TRIP 1 Message 2 Warning 3 Off 4 Fault QSP	**NEER monitoring** Configuration - speed monitoring
C0580	MONIT SD8	3	0 TRIP 3 Off	**SD3 monitoring** Configuration - sine-cosine encoder monitoring
C0581	MONIT EER	0	0 TRIP 1 Message 2 Warning 3 Off	**Monitoring EER** Configuration - monitoring of external faults
C0582	MONIT OH4	2	2 Warning 3 Off	**OH4 monitoring** Configuration - heatsink temperature monitoring
C0583	MONIT OH3	→	0 TRIP 3 Off	**OH3 monitoring** Configuration - ”fixed motor temperature” monitoring → depending on C0086
C0584	MONIT OH7	→	2 Warning 3 Off	**OH7 monitoring** Configuration - ”adjustable motor temperature” monitoring → depending on C0086 Temperature monitoring via resolver input
C0585	MONIT OH8	3	0 TRIP 2 Warning 3 Off	**Monitoring OH8** Configuration - ”adjustable motor temperature” monitoring Temperature monitoring via PTC input

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0586	MONIT SD2	0	0 2 3	TRIP Warning Off		**Monitoring SD2** Configuration - resolver monitoring
C0587	MONIT SD3	3	0 2 3	TRIP Warning Off		**Monitoring SD3** Configuration - ”Encoder at X9”
C0588	MONIT H10/H11	0	0 2 3	TRIP Warning Off		**Monitoring H10 / H11** Configuration - ”temperature sensors in controller” monitoring
C0589	MONIT P03	2	0 2 3	TRIP Warning Off		**P03 monitoring** Configuration - following error monitoring
C0590	MONIT P13	0	0 2 3	TRIP Warning Off		**P13 monitoring** Configuration - phase error monitoring
C0591	MONIT CE1	3	0 2 3	TRIP Warning Off		**CE1 monitoring** Configuration - monitoring of ”CAN-IN1 fault”
C0592	MONIT CE2	3	0 2 3	TRIP Warning Off		**CE2 monitoring** Configuration - ”CAN-IN2 error”monitoring
C0593	MONIT CE3	3	0 2 3	TRIP Warning Off		**CE3 monitoring** Configuration - monitoring of ”CAN-IN3 fault”
C0594	MONIT SD6	→	0 2 3	TRIP Warning Off		**SD6 monitoring** Configuration - monitoring of ”motor temperature sensor” → depending on C0086
C0595	MONIT CE4	3	0 2 3	TRIP Warning Off		**CE4 monitoring** Configuration - ”CAN bus Off” monitoring
C0596	NMAX LIMIT	5500	0	{1 rpm}	16000	**Speed monitoring** Configuration - monitoring of ”machine speed”
C0597	MONIT LP1	3	0 2 3	TRIP Warning Off		**LP1monitoring** Configuration - monitoring of motor phase failure
C0598	MONIT SD5	3	0 2 3	TRIP Warning Off		**SD5 monitoring** Configuration - monitoring of ”master current at X5/1.2 < 2 mA”
C0599	LIMIT LP 1	5.0	1.0	{0.1 %}	10.0	**Current limit LP1** Current limit for motor phase failure monitoring
C0600	FUNCTION	1	0 1 2 3 4 5	OUT = IN1 IN1 + IN2 IN1 - IN2 IN1 * IN2 IN1 / IN2 IN1/(100% - IN2)		**ARIT2** Function selection
[C0601]					→Selection list 1	**ARIT2** Configuration - analog input signals
1	IN	1000	FIXED0%			
2	IN	1000	FIXED0%			
C0602	(C0602)	Disp	-199.99	{0.01 %}	199.99	
[C0610]					→ Selection list 1	**ADD1** Configuration - analog input signals
1	IN	1000	FIXED0%			
2	IN	1000	FIXED0%			
3	IN	1000	FIXED0%			

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0611		Disp	-199.99	{0.01 %}	199.99	
1	(C0610/1)					
2	(C0610/2)					
3	(C0610/3)					
C0620	DB1 GAIN	1.00	-10.00	{0.01 }	10.00	**DB1** Gain
C0621	DB1 VALUE	1.00	0.00	{0.01 %}	100.00	**DB1** Dead band
[C0622]	IN	1000	FIXED0%		→Selection list 1	**DB1** Configuration - analog input signal
C0623	(C0622)	Disp	-199.99	{0.01 %}	199.99	
C0630	MAX LIMIT	100.00	-199.99	{0.01 %}	199.99	**LIM1** Setting the upper limitation
C0631	MIN LIMIT	-100.0	-199.99	{0.01 %}	199.99	**LIM1** Setting the lower limitation
[C0632]	IN	1000	FIXED0%		→Selection list 1	**LIM1** Configuration - analog input signal
C0633	(C0632)	Disp	-199.99	{0.01 %}	199.99	
C0640	DELAY T	20.00	0.01	{0.01 s}	50.00	**PT1-1** Setting the time constant
[C0641]	IN	1000	FIXED0%		→ Selection list 1	**PT1-1** Configuration - analog input signal
C0642	(C0641)	Disp	-199.99	{0.01 %}	199.99	
C0650	DT1-1 GAIN	1.00	-320.00	{0.01 }	320.00	**DT1-1** Gain
C0651	DELAY T	1.00	0.005	{0.01 s}	5.000	**DT1-1** Time constant
[C0652]	IN	1000	FIXED0%		→Selection list 1	**DT1-1** Configuration - analog input signal
C0653	SENSIBILITY	1	1 15-bit 2 14-bit 3 13-bit 4 12-bit 5 11-bit 6 10-bit 7 9-bit			**DT1-1** Input sensitivity
C0654	(C0652)	Disp	-199.99	{0.01 %}	199.99	
C0655	NUMERATOR	1	-32767	{1}	32767	**CONV5** Numerator
C0656	DENOMINATOR	1	1	{1}	32767	**CONV5** Denominator
[C0657]	IN	1000	FIXED0%		→Selection list 1	**CONV5** Configuration - analog input signal
C0658	(C0657)	Disp	-199.99	{0.01 %}	199.99	
[C0661]	IN	1000	FIXED0%		→Selection list 1	**ABS1** Configuration - analog input signal
C0662	(C0661)	Disp	-199.99	{0.01 %}	199.99	
C0671	RFG1 TIR	0.000	0.000	{0.01 s}	999.900	**RFG1** Setting the acceleration time T_{ir}
C0672	RFG1 TIF	0.000	0.000	{0.01 s}	999.900	**RFG1** Setting the deceleration time T_{if}
[C0673]	IN	1000	FIXED0%		→Selection list 1	**RFG1** Configuration - analog input signal
[C0674]	SET	1000	FIXED0%		→Selection list 1	**RFG1** Configuration - analog input signal
[C0675]	LOAD	1000	FIXED0		→ Selection list 2	**RFG1** Configuration - digital input signal

Code		Possible settings				Important
No.	**LCD**	**Lenze**	**Selection**			
C0676		Disp	-199.99	{0.01 %}	199.99	
1	(C0673)					
2	(C0674)					
C0677	(C0675)	Disp				
C0680	FUNCTION	6	1 IN1 = IN 2 2 IN 1 > IN2 3 IN 1 < IN2 4 |IN1| = |IN2| 5 |IN1| > |IN2| 6 |IN1| < |IN2|			**CMP1** Function selection (compares the inputs IN1 and IN2)
C0681	HYSTERESIS	1.00	0.00	{0.01 %}	100.00	**CMP1** Hysteresis
C0682	WINDOW	1.00	0.00	{0.01 %}	100.00	**CMP1** Window
[C0683]					→Selection list 1	**CMP1** Configuration - analog input signals
1	CMP1-IN1	5001	MCTRL-NACT			
2	CMP1-IN2	19500	FCODE-17			
C0684	(C0683)	Disp	-199.99	{0.01 %}	199.99	
C0685	FUNCTION	1	1 IN1 = IN2 2 IN 1 > IN2 3 IN 1 < IN2 4 |IN1| = |IN2| 5 |IN1| > |IN2| 6 |IN1| < |IN2|			**CMP2** Function selection (compares the inputs IN1 and IN2)
C0686	HYSTERESIS	1.00	0.00	{0.01 %}	100.00	**CMP2** Hysteresis
C0687	WINDOW	1.00	0.00	{0.01 %}	100.00	**CMP2** Window
[C0688]					→Selection list 1	**CMP2** Configuration - analog input signals
1	CMP2-IN1	1000	FIXED0%			
2	CMP2-IN2	1000	FIXED0%			
C0689		Disp	-199.99	{0.01 %}	199.99	
1	(C0688/1)					
2	(C0688/2)					
C0690	FUNCTION	1	1 IN1 = IN 2 2 IN 1 > IN2 3 IN 1 < IN2 4 |IN1| = |IN2| 5 |IN1| > |IN2| 6 |IN1| < |IN2|			**CMP3** Function selection (compares the inputs IN1 and IN2)
C0691	HYSTERESIS	1.00	0.00	{0.01 %}	100.00	**CMP3** Hysteresis
C0692	WINDOW	1.00	0.00	{0.01 %}	100.00	**CMP3** Window
[C0693]					→Selection list 1	**CMP3** Configuration - analog input signals
1	CMP3-IN1	1000	FIXED0%			
2	CMP3-IN2	1000	FIXED0%			
C0694		Disp	-199.99	{0.01 %}	199.99	
1	(C0693/1)					
2	(C0693/2)					
C0695	FUNCTION	2	1 IN 1 < IN2 2 |IN1| < |IN2|			**PHCMP1** Function selection (compares the inputs IN1 and IN2)
[C0697]					→ Selection list 3	**PHCMP1** Input signal configuration
1	IN	1000	FIXED0INC			
2	IN	1000	FIXED0INC			

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0698		Disp	-2147483647 {1} 2147483647	
1	(C0697/1)			
2	(C0697/2)			
[C0700]	IN	19523	FCODE-472/3 →Selection list 1	**ANEG1** Configuration - analog input signal
C0701	(C0700)	Disp	-199.99 {0.01 %} 199.99	
[C0703]	IN	1000	FIXED0% →Selection list 1	**ANEG2** Configuration - analog input signal
C0704	(C0703)	Disp	-199.99 {0.01 %} 199.99	
C0710	FUNCTION	0	0 Rising edge 1 Falling edge 2 Both edges	**TRANS1** Function selection (signal evaluation)
C0711	PULSE T	0.001	0.001 {0.001 s} 60.000	**TRANS1** Pulse time of TRANS1
[C0713]	IN	1000	FIXED0 → Selection list 2	**TRANS1** Configuration - digital input signal
C0714	(C0713)	Disp		
C0715	FUNCTION	0	0 Rising edge 1 Falling edge 2 Both edges	**TRANS2** Function selection (signal evaluation)
C0716	PULSE T	0.001	0.001 {0.001 s} 60.000	**TRANS2** Pulse duration
[C0718]	IN	1000	FIXED0 → Selection list 2	**TRANS2** Configuration - digital input signal
C0719	(C0718)	Disp		
C0720	FUNCTION	2	0 On delay 1 Off delay 2 On/off delay	**DIGDEL1** Function selection
C0721	DELAY T	1.000	0.001 {0.001 s} 60.000	**DIGDEL1** Delay time
[C0723]	IN	1000	FIXED0 → Selection list 2	**DIGDEL1** Configuration - digital input signal
C0724	(C0723)	Disp		
C0725	FUNCTION	2	0 On delay 1 Off delay 2 On/off delay	**DIGDEL2** Function selection
C0726	DELAY T	1.000	0.001 {0.001 s} 60.000	**DIGDEL2** Delay time
[C0728]	IN	1000	FIXED0 → Selection list 2	**DIGDEL2** Configuration - digital input signal
C0729	(C0728)	Disp		
C0730	MODE	0	0 Start measurement 1 Stop measurement	**OSZ** Start / stop of the measuring value recording
C0731	STATUS		0 Measurement completed 1 Measurement active 2 Trigger detected 3 Cancel 4 Cancel after trigger 5 Read memory	**OSZ** Current operating status
C0732			→Selection list 1	**OSZ** Configuration - analog input signals
1	CHANNEL1	1000	FIXED0%	
2	CHANNEL2	1000	FIXED0%	
3	CHANNEL3	1000	FIXED0%	
4	CHANNEL4	1000	FIXED0%	
C0733			→ Selection list 2	**OSZ** Trigger input Configuration - digital input signal
1	DIG. TRIGGER	1000	FIXED0	

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0734	TRIG SOURCE	1	0 1 2 3 4	Digital trigger input Measuring channel 1 Measuring channel 2 Measuring channel 3 Measuring channel 4		**OSZ** Selection of trigger source
C0735	TRIGGER LEVEL	0	-32767	{1}	32767	**OSZ** Adjust trigger level to channel 1 ... 4
C0736	TRIGGER EDGE	0	0 1	LOW-HIGH edge HIGH-LOW edge		**OSZ** Selection of trigger signal
C0737	TRIGGER DELAY	0.0	-100.0	{0.1 %}	999.99	**OSZ** Setting of pre- and post-triggering
C0738	SAMPLING PERIOD	3	3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	1 ms 2 ms 5 ms 10 ms 20 ms 50 ms 100 ms 200 ms 500 ms 1 s 2 s 5 s 10 s 20 s 50 s 1 min 2 min 5 min 10 min		**OSZ** Selection of the sampling period
C0739	NUMBER OF CHANNELS	4	1	{1}	4	**OSZ** Number of channels to be measured
C0740		0				**OSZ**
1	START	0	0	{1}	16383	Defining the starting point for reading the data memory. This makes a selective access to a memory block possible
2	ENABLED/INHIBITED	0	0 1	Inhibit "read data" Enable "read data"		Enable/inhibit The data memory must be enabled for reading
C0741						**OSZ**
1	VERSION OSZ	Disp				Version
2	MEMORY SIZE					Memory size
3	DATA WIDTH					Data width
4	NUMBER OF CHANNELS					Number of channels
C0742	LENGTH OF DB	Disp				**OSZ** Display of data block length
C0743	READ DB	Disp				**OSZ** Reading an 8 byte data block
C0744	MEMORY SIZE	3	0 1 2 3 4 5 6	512 measured values 1024 measured values 1536 measured values 2048 measured values 3072 measured values 4096 measured values 8192 measured values		**OSZ** Adapt memory capacity to the measurement task
C0749		Disp				**OSZ** Information on storing the measured values
1	INDEX ABORT					
2	NDEX TRIGGER					
3	INDEX END					

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0750	VP DENOM	16	1 2 4 8 16 34 64 128 256 512 1024 2048 4096 8192 16384	Vp = 1 Vp = 1/2 Vp = 1/4 Vp = 1/8 Vp = 1/16 Vp = 1/32 Vp = 1/64 Vp = 1/128 Vp = 1/256 Vp = 1/512 Vp = 1/1024 Vp = 1/2048 Vp = 1/4096 Vp = 1/8192 Vp = 1/16384		**DFRFG1** Denominator - position controller gain
C0751	DFRFG1 TIR	1.000	0.001	{0.001 s}	999.900	**DFRFG1** Tir (acceleration time)
C0752	MAX SPEED	3000	1	{1 rpm}	16000	**DFRFG1** Max. speed (here: maximum make-up speed)
C0753	DFRFG1 QSP	0.000	0.000	{0.001 s}	999.900	**DFRFG1** Deceleration time when activating the deceleration ramp
C0754	PH ERROR	$2 \cdot 10^9$	10	{1}	$2 \cdot 10^9$	**DFRFG1** Following error • 1 rev. = 65535 inc
C0755	SYN WINDOW	100	0	{1 inc}	65535	**DFRFG1** Synchronisation window
C0756	OFFSET	0	$-1 \cdot 10^9$	{1 inc}	$1 \cdot 10^9$	**DFRFG1** offset
C0757	FUNCTION	0	0 1	No TP start With TP start		**DFRFG1** Function selection
[C0758]	IN	1000	FIXEDPHI-0		→ Selection list 4	**DFRFG1** Input signal configuration
[C0759]	QSP	1000	FIXED0		→ Selection list 2	**DFRFG1** Triggering QSP
[C0760]	STOP	1000	FIXED0		→ Selection list 2	**DFRFG1** Ramp function generator stop
[C0761]	RESET	1000	FIXED0		→ Selection list 2	**DFRFG1** Reset integrators
C0764		Disp				
1	(C0759)					
2	(C0760)					
3	(C0761)					
C0765	(C0758)	Disp	-32767	{1 rpm}	32767	
C0766	SPEED DIR	1	1 2 3	Direction of rotation cw/ccw (R/L) Direction of rotation cw (to the right) Direction of rotation ccw (to the left)		**DFRFG1** Selecting direction of rotation
[C0770]	D	1000	FIXED0		→ Selection list 2	**FLIP1** Configuration - digital input signal
[C0771]	CLK	1000	FIXED0		→ Selection list 2	**FLIP1** Configuration - digital input signal
[C0772]	CLR	1000	FIXED0		→ Selection list 2	**FLIP1** Configuration - digital input signal
C0773		Disp				
1	(C0770)					
2	(C0771)					
3	(C0772)					

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[C0775]	D	1000	FIXED0 → Selection list 2	**FLIP2** Configuration - digital input signal
[C0776]	CLK	1000	FIXED0 → Selection list 2	**FLIP2** Configuration - digital input signal
[C0777]	CLR	1000	FIXED0 → Selection list 2	**FLIP2** Configuration - digital input signal
C0778		Disp		
1	(C0775)			
2	(C0776)			
3	(C0777)			
[C0780]	N	50	AIN1-OUT →Selection list 1	**NSET** Configuration - main setpoint input
[C0781]	N-INV	10251	R/L/Q-R/L → Selection list 2	**NSET** Configuration - main setpoint inversion
[C0782]	NADD	5650	ASW1-OUT →Selection list 1	**NSET** Configuration - additional setpoint input
[C0783]	NADD-INV	1000	FIXED0 → Selection list 2	**NSET** Configuration - additional setpoint inversion
[C0784]	CINH-VAL	5001	MCTRL-NACT →Selection list 1	**NSET** Configuration - output signal with controller inhibited
[C0785]	SET	5000	MCTRL-NSET2 →Selection list 1	**NSET** Configuration - ramp function generator
[C0786]	LOAD	5001	MCTRL-QSP-OUT → Selection list 2	**NSET** Digital input (load ramp function generator)
[C0787]			→ Selection list 2	**NSET** Configuration - JOG selection and JOG activation Binary interpretation
1	JOG*1	53	DIGIN3	
2	JOG*2	1000	FIXED0	
3	JOG*4	1000	FIXED0	
4	JOG*8	1000	FIXED0	
[C0788]			→ Selection list 2	**NSET** Configuration - Ti selection and Ti activation Binary interpretation Tir and Tif pairs are identical
1	TI*1	1000	FIXED0	
2	TI*2	1000	FIXED0	
3	TI*4	1000	FIXED0	
4	TI*8	1000	FIXED0	
[C0789]	RFG-0	1000	FIXED0 → Selection list 2	**NSET** Configuration - digital input (ramp function generator 0)
[C0790]	RFG-STOP	1000	FIXED0 → Selection list 2	**NSET** Configuration - digital input (ramp function generator stop)
C0798		Disp	-199.99 {0.01 %} 199.99	**NSET** Display of analog input signals
1	CINH-VAL			
2	SET			

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0799		Disp		NSET
1	N-INV			
2	NADD-INV			
3	LOAD			
4	JOG*1			
5	JOG*2			
6	JOG*4			
7	JOG*8			
8	TI*1			
9	TI*2			
10	TI*4			
11	TI*8			
12	RFG-0			
13	RFG-STOP			
[C0800]	SET	1000	FIXED0% →Selection list 1	**PCTRL1** Configuration - setpoint input signal
[C0801]	ACT	1000	FIXED0% →Selection list 1	**PCTRL1** Configuration - actual value input signal
[C0802]	INFLU	1000	FIXED0% →Selection list 1	**PCTRL1** Configuration - evaluation input signal
[C0803]	ADAPT	1000	FIXED0% →Selection list 1	**PCTRL1** Configuration - adaptation input signal
[C0804]	INACT	1000	FIXED0 → Selection list 2	**PCTRL1** Configuration - inactivation input signal
[C0805]	I-OFF	1000	FIXED0 → Selection list 2	**PCTRL1** Configuration - input signal (switch off I component)
C0808		Disp	-199.99 {0.01 %} 199.99	
1	(C0800)			
2	(C0801)			
3	(C0802)			
4	(C0803)			
C0809		Disp		
1	(C0804)			
2	(C0805)			
[C0810]			→Selection list 1	**ASW1** Configuration - analog input signals
1	IN	55	AIN2-OUT	
2	IN	1000	FIXED0%	
[C0811]	SET	1000	FIXED0 → Selection list 2	**ASW1** Configuration - digital input signal
C0812	(C0810)	Disp	-199.99 {0.01 %} 199.99	
C0813	(C0811)	Disp		
[C0815]			→Selection list 1	**ASW2** Configuration - analog input signals
1	IN	1000	FIXED0%	
2	IN	1000	FIXED0%	
[C0816]	SET	1000	FIXED0 → Selection list 2	**ASW2** Configuration - digital input signal
C0817		Disp	-199.99 {0.01 %} 199.99	
1	(C0815/1)			
2	(C0815/2)			
C0818	(C0816)	Disp		
[C0820]			→ Selection list 2	**AND1** Configuration - digital input signals
1	IN	1000	FIXED0	
2	IN	1000	FIXED0	
3	IN	1000	FIXED0	

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0821		Disp		
1	(C0820/1)			
2	(C0820/2)			
3	(C0820/3)			
[C0822]		1000	→ Selection list 2	**AND2** Configuration - digital signals
1	IN	1000	FIXED0	
2	IN	1000	FIXED0	
3	IN	1000	FIXED0	
C0823		Disp		
1	(C0822/1)			
2	(C0822/2)			
3	(C0822/3)			
[C0824]			→ Selection list 2	**AND3** Configuration - digital input signals
1	IN	1000	FIXED0	
2	IN	1000	FIXED0	
3	IN	1000	FIXED0	
C0825		Disp		
1	(C0824/1)			
2	(C0824/2)			
3	(C0824/3)			
[C0826]			→ Selection list 2	**AND4** Configuration - digital input signals
1	IN	1000	FIXED0	
2	IN	1000	FIXED0	
3	IN	1000	FIXED0	
C0827		Disp		
1	(C0826/1)			
2	(C0826/2)			
3	(C0826/3)			
[C0828]			→ Selection list 2	**AND5** Configuration - digital signals
1	IN	1000	FIXED0	
2	IN	1000	FIXED0	
3	IN	1000	FIXED0	
C0829		Disp		
1	(C0828/1)			
2	(C0828/2)			
3	(C0828/3)			
[C0830]			→ Selection list 2	**OR1** Configuration - digital input signals
1	IN	1000	FIXED0	
2	IN	1000	FIXED0	
3	IN	1000	FIXED0	
C0831		Disp		
1	(C0830/1)			
2	(C0830/2)			
3	(C0830/3)			
[C0832]			→ Selection list 2	**OR2** Configuration - digital input signals
1	IN	1000	FIXED0	
2	IN	1000	FIXED0	
3	IN	1000	FIXED0	
C0833		Disp		
1	(C0832/1)			
2	(C0832/2)			
3	(C0832/3)			

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[C0834]			→ Selection list 2	**OR3** Configuration - digital input signals
1	IN	1000	FIXED0	
2	IN	1000	FIXED0	
3	IN	1000	FIXED0	
C0835		Disp		
1	(C0834/1)			
2	(C0834/2)			
3	(C0834/3)			
[C0836]			→ Selection list 2	**OR4** Configuration - digital input signals
1	IN	1000	FIXED0	
2	IN	1000	FIXED0	
3	IN	1000	FIXED0	
C0837		Disp		
1	(C0836/1)			
2	(C0836/2)			
3	(C0836/3)			
[C0838]			→ Selection list 2	**OR5** Configuration - digital input signals
1	IN	1000	FIXED0	
2	IN	1000	FIXED0	
3	IN	1000	FIXED0	
C0839		Disp		
1	(C0838/1)			
2	(C0838/2)			
3	(C0838/3)			
[C0840]	IN	1000	FIXED0 → Selection list 2	**NOT1** Configuration - digital input signals
C0841	(C0840)	Disp		
[C0842]	IN	1000	FIXED0 → Selection list 2	**NOT2** Configuration - digital input signals
C0843	(C0842)	Disp		
[C0844]	IN	1000	FIXED0 → Selection list 2	**NOT3** Configuration - digital input signals
C0845	(C0844)	Disp		
[C0846]	IN	1000	FIXED0 → Selection list 2	**NOT4** Configuration - digital input signals
C0847	(C0846)	Disp		
[C0848]	IN	1000	FIXED0 → Selection list 2	**NOT5** Configuration - digital input signals
C0849	(C0848)	Disp		
[C0850]			→Selection list 1	**AIF-OUT** Configuration - process output words for automation interface AIF (X1)
1	OUT.W1	1000	FIXED0%	
2	OUT.W2	1000	FIXED0%	
3	OUT.W3	1000	FIXED0%	
[C0851]	OUT.D1	1000	FIXED0INC → Selection list 3	**AIF-OUT** Configuration - 32-bit phase information
C0852	TYPE OUT.W2	0	0 Analog signal 1 digital 0-15 2 Low phase 3 High phase	**AIF-OUT** Configuration - process output word 2 for automation interface AIF (X1)
C0853	TYPE OUT.W3	0	0 Analog signal 1 Digital 16-31 2 High phase	**AIF-OUT** Configuration - process output word 3 for automation interface AIF (X1)
C0854	TYPE OUT.W1	0	0 Analog signal 3 D2: LOW phase	**AIF-OUT** Configuration - process output word 1 for automation interface AIF (X1)

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0855		Disp				**AIF-IN** Process input words hexadecimal for automation interface X1
1	IN (0-15)		Bit 00	{1}	Bit15	AIF-IN
2	IN (16-31)		16 bit	{1}	Bit 31	AIF-IN
C0856		Disp	-199.99	{0.01 %}	199.99	**AIF-IN** Decimal process input words Display: 100 % = 16384
1	IN.W1					
2	IN.W2					
3	IN.W3					
C0857	IN.D1	Disp	-2147483648	{1}	2147483647	**AIF-IN** 32-bit phase information
C0858		Disp	-199.99	{0.01 %}	199.99	**AIF-OUT** Process output words Display: 100 % = 16384
1	OUT.W1					
2	OUT.W2					
3	OUT.W3					
C0859	OUT.D1	Disp	-2147483648	{1}	2147483647	**AIF-OUT** 32-bit phase information
[C0860]					→Selection list 1	**CANx-OUT** Configuration - process output words
1	OUT1.W1	5001				
2	OUT1.W2	1000	FIXED0%			
3	OUT1.W3	1000	FIXED0%			
4	OUT2.W1	1000	FIXED0%			
5	OUT2.W2	1000	FIXED0%			
6	OUT2.W3	1000	FIXED0%			
7	OUT2.W4	1000	FIXED0%			
8	OUT3.W1	1000	FIXED0%			
9	OUT3.W2	1000	FIXED0%			
10	OUT3.W3	1000	FIXED0%			
11	OUT3.W4	1000	FIXED0%			
[C0861]					→ Selection list 3	**CANxOUT** Configuration - 32-bit phase information
1	OUT1.D1	1000	FIXED0INC			
2	OUT2.D1	1000	FIXED0INC			
3	OUT3.D1	1000	FIXED0INC			
C0863		Disp	0		1	**CANx-IN** Hexadecimal process input words
1	IN1 (0-15)					
2	IN1 (16-31)					
3	IN2 (0-15)					
4	IN2 (16-31)					
5	IN3 (0-15)					
6	IN3 (16-31)					
C0864			0 1 2	Analog signal Digital 0-15 Low phase		**CANx-OUT** Configuration - process output words
1	TYPEOUT1.W2	0				
2	TYPEOUT2.W1	0				
3	TYPEOUT3.W1	0				
C0865			0 1 2	Analog signal Digital 16-31 High phase		**CANx-OUT** Configuration - process output words
1	TYPEOUT1.W3	0				
2	TYPEOUT2.W2	0				
3	TYPEOUT3.W2	0				

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0866		Disp	-32768.00 {0.01 %} 32767.00	**CANx-IN** Process input words Display: 100 % = 16384
1	IN1.W1			
2	IN1.W2			
3	IN1.W3			
4	IN2.W1			
5	IN2.W2			
6	IN2.W3			
7	IN2.W4			
8	IN3.W1			
9	IN3.W2			
10	IN3.W3			
11	IN3.W4			
C0867		Disp		**CANx-IN** 32-bit phase information
1	IN1.D1			
2	IN2.D1			
3	IN3.D1			
C0868		Disp	-199.99 {0.01 %} 199.99	**CANx-OUT** Process output words Display: 100 % = 16384
1	OUT1.W1			
2	OUT1.W2			
3	OUT1.W3			
4	OUT2.W1			
5	OUT2.W2			
6	OUT2.W3			
7	OUT2.W4			
8	OUT3.W1			
9	OUT3.W2			
10	OUT3.W3			
11	OUT3.W4			
C0869		Disp	-2147483648 {1} 2147483647	**CANx-OUT** 32-bit phase information
1	OUT1.D1			
2	OUT2.D1			
3	OUT3.D1			
[C0870]			→ Selection list 2	**DCTRL** Inhibit controller Configuration - digital input signals
1	CINH1	1000	FIXED0	
2	CINH2	1000	FIXED0	
[C0871]	TRIP-SET	54	DIGIN4 → Selection list 2	**DCTRL** Configuration - digital input signals
[C0876]	TRIP-RES	55	DIGIN5 → Selection list 2	**DCTRL** Configuration - digital input signals
C0878		Disp		
1	(C0870/1)			
2	(C0870/2)			
3	(C0871)			
4	(C0876)			
C0879			0 No reset 1 Reset	Reset control words C0879 = 1 performs one reset
1	RESET C135	0		
2	RESET AIF	0		
3	RESET CAN	0		
C0880			→ Selection list 2	Select parameter set
1	PAR*1	1000	FIXED0	
2	PAR*2	1000	FIXED0	
C0881	PAR-LOAD	1000	FIXED0 → Selection list 2	Load parameter set

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0884		Disp		
1	PAR*1			
2	PAR*2			
2	PAR-LOAD			
[C0885]	R	51	DIGIN1 → Selection list 2	**R/L/Q** Clockwise rotation Configuration - digital input signal
[C0886]	L	52	DIGIN2 → Selection list 2	**R/L/Q** Counter-clockwise rotation Configuration - digital input signal
C0889		Disp		
1	(C0885)			
2	(C0886)			
[C0890]	N-SET	5050	NSET-NOUT →Selection list 1	**MCTRL** Configuration - speed setpoint input
[C0891]	M-ADD	1000	FIXED0% →Selection list 1	**MCTRL** Configuration - torque setpoint input
[C0892]	LO-M-LIM	5700	ANEG1-OUT →Selection list 1	**MCTRL** Configuration - lower torque limit
[C0893]	HI-M-LIM	19523	FCODE-472/3 →Selection list 1	**MCTRL** Configuration - upper torque limit
[C0894]	PHI-SET	1000	FIXED0INC → Selection list 3	**MCTRL** Configuration - rotor position setpoint
[C0895]	PHI-LIM	1006	FIXED100% →Selection list 1	**MCTRL** Configuration phase controller limit
[C0896]	N2-LIM	1000	FIXED0% →Selection list 1	**MCTRL** Configuration - 2nd speed limitation value
[C0897]	PHI-ON	1000	FIXED0 → Selection list 2	**MCTRL** Configuration - switch-on signal of phase controller
[C0898]	FLD-WEAK	1006	FIXED100% →Selection list 1	**MCTRL** Signal for field weakening
[C0899]	N/M-SWT	1000	FIXED0 → Selection list 2	**MCTRL** Changeover between n and M control
[C0900]	QSP	10250	R/L/Q-QSP → Selection list 2	**MCTRL** Control signal for release
[C0901]	I-SET	1000	FIXED0% →Selection list 1	**MCTRL** Load I-component of the speed controller
[C0902]	I-LOAD	1000	FIXED0 → Selection list 2	**MCTRL** Trigger signal for loading the I-component of speed controller
[C0903]	P-ADAPT	1006	FIXED100% →Selection list 1	**MCTRL** Phase controller adaptation
C0906		Disp	-199.99 {0.01 %} 199.99	**MCTRL** Analog input signals
1	N-SET			
2	M-ADD			
3	LO-M-LIM			
4	HI-M-LIM			
5	PHI-LIM			
6	N2-LIM			
7	FLD-WEAK			
8	I-SET			
9	P-ADAPT			

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0907		Disp		**MCTRL** Digital input signals
1	PHI-ON			
2	N/M-SWT			
3	QSP			
4	I-LOAD			
C0908	PHI-SET	Disp	-2147483647 {1 inc} 2147483647	**MCTRL** Set phase signal 1 rev. = 65536 inc
C0909	SPEED LIMIT	1	1 +/- 175 % 2 0 ... +175 % 3 -175 ... 0 %	**Limitation of direction of rotation** for speed setpoint
[C0920]	REFC-ON	1000	FIXED0 → Selection list 2	**REFC** Activation of homing function
[C0921]	REFC-MARK	1000	FIXED0 → Selection list 2	**REFC** Digital reference switch
[C0922]	REFC-PHI-IN	100	DFSET-PSET → Selection list 3	**REFC** Phase input
[C0923]	REFC-N-IN	100	DFSET-NOUT →Selection list 1	**REFC** Speed input
[C0924]	REFC-POS-LOAD	1000	FIXED0 → Selection list 2	**REFC** Control ”set position”
[C0925]	REFC-ACTPOS-I	1000	FIXED0INC → Selection list 3	**REFC** Position ”set position”
C0926		Disp	-2147483647 {1 inc} 2147483647	
1	(C0925)			
2	(C0922)			
3	ACTPOS			Actual position
4	TARGET			Target position
C0927		Disp		
1	(C0920)			
2	(C0921)			
3	(C0924)			
C0928	(C0922)	Disp	-2147483647 {1 inc} 2147483647	Phase signal (contouring error) of REF 1 rev. = 65536 inc
C0929	(C0923)	Disp	-199.99 {0.01 %} 199.99	
[C0930]	GEARBOX MOT	1	1 {1} 65535	**REFC** Gearbox factor on motor side (numerator)
[C0931]	GEARBOX ENC	1	1 {1} 65535	**REFC** Gearbox factor on encoder side (denominator)
C0932	REF MODE	0	0 Mode 0 1 Mode 1 6 Mode 6 7 Mode 7 8 Mode 8 9 Mode 9 20 Mode 20 21 Mode 21	**REFC** Homing function mode
C0933	REF TRANS	0	0 Rising edge 1 Falling edge	**REFC** Reference signal transition
C0934	REF OFFSET	0	-2140000000 {1 inc} 2140000000	**REFC** Home position offset
C0935	REF SPEED	2.0000	0.0001 {0.0001 %} 100.0000	**REFC homing function speed** Homing speed The value set is the percentage value of N_{max}
C0936	REF TI	1.00	0.01 {0.01 s} 990.00	**REFC homing Ti time** Tir and Tif are identical

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0940	NUMERATOR	1	-32767	{1}	32767	**CONV1** Numerator
C0941	DENOMINATOR	1	1	{1}	32767	**CONV1** Denominator
[C0942]	CONV1-IN	1000	FIXED0%		→Selection list 1	**CONV1** Configuration - analog input
C0943	(C0942)	Disp	-199.99	{0.01 %}	199.99	
C0945	NUMERATOR	1	-32767	{1}	32767	**CONV2** Numerator
C0946	DENOMINATOR	1	1	{1}	32767	**CONV2** Denominator
[C0947]	IN	1000	FIXED0%		→Selection list 1	**CONV2** Configuration - analog input
C0948	(C0947)	Disp	-199.99	{0.01 %}	199.99	
C0950	NUMERATOR	1	-32767	{1}	32767	**CONV3** Numerator
C0951	DENOMINATOR	1	1	{1}	32767	**CONV3** Denominator
[C0952]	IN	1000	FIXEDPHI-0		→ Selection list 4	**CONV3** Configuration - analog input
C0953	(C0952)	Disp	-32767	{1 rpm}	32767	
C0955	NUMERATOR	1	-32767	{1}	32767	**CONV4** Numerator
C0956	DENOMINATOR	1	1	{1}	32767	**CONV4** Denominator
[C0957]	IN	1000	FIXEDPHI-0		→ Selection list 4	**CONV4** Configuration - analog input
C0958	(C0957)	Disp	-32767	{1 rpm}	32767	
C0960	FUNCTION	1	1 2 3	Characteristic 1 Characteristic 2 Characteristic 3		**CURVE1** Selection of the characteristic function
C0961	Y0	0.00	0.00	{0.01 %}	199.99	**CURVE1** Configuration - base point Ordinate of the pair (x = 0 % / y0)
C0962	Y1	50.00	0.00	{0.01 %}	199.99	**CURVE1** Configuration - base point Ordinate of the value pair (x1 / y1)
C0963	Y2	75.00	0.00	{0.01 %}	199.99	**CURVE1** Configuration - base point Ordinate of the value pair (x2 / y2)
C0964	Y100	100.00	0.00	{0.01 %}	199.99	**CURVE1** Configuration - base point Ordinate of the value pair (x 100 % / y100)
C0965	X1	50.00	0.01	{0.01 %}	99.99	**CURVE1** Configuration - base point Abscissa of the pair (x1 / y1)
C0966	X2	75.00	0.01	{0.01 %}	99.99	**CURVE1** Configuration - base point Abscissa of the pair (x2 / y2)
[C0967]	IN	1000	FIXED0%		→Selection list 1	**CURVE1** Configuration - analog input
C0968	(C0967)	Disp	-199.99	{0.01 %}	199.99	
[C0970]	N-SET	1000	FIXED0%		→Selection list 1	**MFAIL** Configuration - speed input (setpoint path)
[C0971]	FAULT	1000	FIXED0		→ Selection list 2	**MFAIL** Configuration - digital input (activating the mains failure control)

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
[C0972]	RESET	1000	FIXED0		→ Selection list 2	**MFAIL** Configuration - digital input (reset mains failure control)
[C0973]	ADAPT	1000	FIXED0%		→Selection list 1	**MFAIL** Adaptation of P-gain of the voltage controller
[C0974]	CONST	1000	FIXED0%		→Selection list 1	**MFAIL** Adaptation of P-gain of the voltage controller
[C0975]	THRESHOLD	1000	FIXED0%		→Selection list 1	**MFAIL** Restart protection when the value falls below the speed threshold
[C0976]	NACT	1000	FIXED0%		→Selection list 1	**MFAIL** Comparison of threshold function Start for V_2 controller
[C0977]	SET	1000	FIXED0%		→Selection list 1	**MFAIL** Configuration - speed starting value
[C0978]	DC-SET	1000	FIXED0%		→Selection list 1	**MFAIL** Setpoint DC-bus voltage
C0980	MFAIL VP	0.500	0.001	{0.001 }	31.000	**MFAIL** Setting of gain V_p
C0981	MFAIL TN	100	20	{1 ms}	2000	**MFAIL** Setting of reset time T_n
C0982	MFAIL TIR	2.000	0.001	{0.001 s}	16.000	**MFAIL** Setting the acceleration time T_{ir}
C0983	RETRIGGER T	1.000	0.001	{0.001 s}	60.000	**MFAIL** Retrigger time
C0988		Disp	-199.99	{0.01 %}	199.99	
1	(C0970)					
2	(C0973)					
3	(C0974)					
4	(C0975)					
5	(C0976)					
6	(C0977)					
7	(C0978)					
C0989		Disp				
1	(C0971)					
2	(C0972)					
[C0990]	IN	1000	FIXEDPHI-0		→ Selection list 4	**PHINT1** Input signal configuration
[C0991]	RESET	1000	FIXED0		→ Selection list 2	**PHINT1** Configuration - reset signal
C0992	(C0990)	Disp	-32767	{1 rpm}	32767	
C0993	(C0991)	Disp				
C0995	DIVISION	0	-31	{1}	31	**PHDIV** Divisor in the power-of-two-format (2^{C0995})
[C0996]	IN	1000	FIXED0INC		→ Selection list 3	**PHDIV** Input signal configuration
C0997	(C0996)	Disp	-2147483647	{1}	2147483647	
C1000	DIVISION	1	0	{1}	31	**CONVPHA1** Divisor in the power-of-two-format (2^{C0995})
[C1001]	IN	1000	FIXED0INC		→ Selection list 3	**CONVPHA1** Input signal configuration
C1002	(C1001)	Disp	-2147483647	{1 inc}	2147483647	

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C1010	FUNCTION	1	0 OUT = IN1 1 IN1 + IN2 2 IN1 - IN2 3 IN1 * IN2 / 2^{30} 13 IN1 * IN2 14 IN1 / IN2 21 IN1 + IN2 (no limit) 22 IN1 - IN2 (no limit)	**ARITPH1** Arithmetic function selection
[C1011]			→ Selection list 3	**ARITPH1** Input signal configuration
1	IN	1000	FIXED0INC	
2	IN	1000	FIXED0INC	
C1012		Disp	-2147483647 {1} 2147483647	
1	(C1011/1)			
2	(C1011/2)			
[C1030]	IN	1000	FIXEDPHI-0 → Selection list 4	**PHINT2** Input signal configuration
[C1031]	RESET	1000	FIXED0 → Selection list 2	**PHINT2** Reset input
C1032	(C1030)	Disp	-32767 {1 rpm} 32767	
C1033	(C1031)	Disp		
C1040	ACCELERATION	100.00	0.001 {0.001 } 5000.000	**SRFG1** Setting of acceleration
C1041	JERK	0.200	0.001 {0.001 s} 999.999	**SRFG1** Setting of jerk
[C1042]	IN	1000	FIXED0% →Selection list 1	**SRFG1** Input signal configuration
[C1043]	SET	1000	FIXED0% →Selection list 1	**SRFG1** Input signal configuration
[C1044]	LOAD	1000	FIXED0 → Selection list 2	**SRFG1** Input signal configuration
C1045		Disp	-199.99 {0.01 %} 199.99	
1	(C1042)			
2	(C1043)			
C1046	(C1044)	Disp		
C1090	OUTPUT SIGNAL		-2147483648 {1} 2147483647	**FEVAN1** Signal output
C1091	CODE	141	2 {1} 2000	**FEVAN1** Selection of the target code
C1092	SUBCODE	0	0 {1} 255	**FEVAN1** Selection of the target subcode
C1093	NUMERATOR	1.0000	0.0001 {0.0001 } 100000.0000	**FEVAN1** Numerator
C1094	DENOMINATOR	0.0001	0.0001 {0.0001 } 100000.0000	**FEVAN1** Denominator
C1095	OFFSET	0	0 {1} 1000000000	**FEVAN1** Offset setting
[C1096]	IN	1000	FIXED0% →Selection list 1	**FEVAN1** Configuration - analog input signal
[C1097]	LOAD	1000	FIXED0 → Selection list 2	**FEVAN1** Configuration - digital input signals
C1098	(C1096)	Disp	-32768 {1} 32767	
C1099	(C1097)	Disp		
C1100	FUNCTION	1	1 Return 2 Hold	**FCNT1** Function selection
[C1101]			→Selection list 1	**FCNT1** Configuration - analog input signals
1	LD-VAL	1000	FIXED0%	
2	CMP-VAL	1000	FIXED0%	

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[C1102]			→ Selection list 2	**FCNT1** Configuration - digital input signals
1	CLKUP	1000	FIXED0	
2	CLKDWN	1000	FIXED0	
3	LOAD	1000	FIXED0	
C1103		Disp	-32768 {1} 32768	
1	(C1101/1)			
2	(C1101/2)			
C1104		Disp		
1	(C1102/1)			
2	(C1102/2)			
3	(C1102/3)			
C1120	SYNC MODE	2	0 Sync switched off 1 CAN Sync activated 2 Terminal Sync activated	**SYNC1** Function selection
[C1121]			0 {1 ms} 13	**SYNC1**
1	SYNC CYCLE	2		Definition for the cycle time of sync signals (slave); • for system bus only
2	INTERPOL. CYCL	2		Definition of the interpolation time between the sync signals (in the slave) • only for terminal • the interpolation is restarted with every sync signal
C1122	SYNC TIME	0.460	0.000 {0.001 ms} 10.000	**SYNC1** Phase shift between CAN Sync and internal control program cycle • for system bus only • depending on the baud rate and bus load
C1123			-0.450 {0.001 ms} 0.450	**SYNC1**
1	PHASE SHIFT	0.000		Phase shift between Terminal Sync and internal control program cycle • for Terminal Sync only
2	SYNC WINDOW	0.000		Synchronisation window for synchronisation edge of the Terminal Sync (LOW-HIGH edge) • for Terminal Sync only • if the sent sync signal is in the window, SYNCx-STAT = HIGH
[C1124]	IN1	1000	FIXED0% →Selection list 1	**SYNC1** Configuration - analog input signal
[C1125]	IN2	1000	FIXED0INC → Selection list 3	**SYNC1** Input signal configuration
[C1126]	IN3	1000	FIXED0% →Selection list 1	**SYNC1** Configuration - analog input signal
C1127	(C1124)	Disp	-2147483648 {1} 2147483647	
C1128	(C1125)	Disp	-2147483648 {1 inc} 2147483647	
C1129	(C1126)	Disp	-2147483648 {1 inc} 2147483647	
C1140	FUNCTION	0	0 Rising edge 1 Falling edge 2 Both edges	**TRANS3** Selection of the edge evaluation
C1141	PULSE T	0.001	0.001 {0.001 s} 60.000	**TRANS3** Setting of the pulse period
[C1143]	IN	1000	FIXED0 → Selection list 2	**TRANS3** Configuration - digital input signal
C1144	(C1143)	Disp		
C1145	FUNCTION	0	0 Rising edge 1 Falling edge 2 Both edges	**TRANS4** Selection of the edge evaluation

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C1146	PULSE T	0.001	0.001	{0.001 s}	60.000	**TRANS4** Setting of the pulse period
[C1148]	IN	1000	FIXED0		→ Selection list 2	**TRANS4** Configuration - digital input signal
C1149	(C1148)	Disp				
C1150	FUNCTION	0	0 Load permanent 1 Load edge 2 Compare & subtract			**PHINT3** Function selection
C1151	CMP. VALUE	$2\cdot10^9$	0	{1 inc}	2000000000	**PHINT3** Setting of a comparison value
[C1153]	IN	1000	FIXEDPHI-0		→ Selection list 4	**PHINT3** Configuration - speed input signal
[C1154]	LOAD	1000	FIXED0		→ Selection list 2	**PHINT3** Configuration - digital input signal
[C1155]	SET	1000	FIXED0INC		→ Selection list 3	**PHINT3** Configuration - phase input signal
C1157	(C1153)	Disp	-32767	{1 rpm}	32767	
C1158	(C1154)	Disp				
C1159	(C1155)	Disp	-2147483647	{1}	2147483647	
[C1160]					→Selection list 1	**ASW3** Configuration - analog input signals
1	IN1	1000	FIXED0%			
2	IN2	1000	FIXED0%			
[C1161]	SET	1000	FIXED0		→ Selection list 2	**ASW3** Configuration - digital input signal
C1162		Disp	-199.99	{0.01 %}	199.99	
1	(C1160/1)					
2	(C1160/2)					
C1163	(C1161)	Disp				
[C1165]					→Selection list 1	**ASW4** Configuration - analog input signals
1	IN1	1000	FIXED0%			
2	IN2	1000	FIXED0%			
[C1166]	SET	1000	FIXED0		→ Selection list 2	**ASW4** Configuration - digital input signal
C1167		Disp	-199.99	{0.01 %}	199.99	
1	(C1165/1)					
2	(C1165/2)					
C1168	(C1166)	Disp				
C1170	NUMERATOR	1	-32767		32767	**CONV6** Numerator
C1171	DENOMINATOR	1	1	{1}	32767	**CONV6** Denominator
[C1172]	IN	1000	FIXED0%		→Selection list 1	**CONV6** Configuration - analog input signal
C1173	(C1172)	Disp	-199.99	{0.01 %}	199.99	
[C1175]					→ Selection list 2	**AND6** Configuration - digital input signals
1	IN1	1000	FIXED0			
2	IN2	1000	FIXED0			
3	IN3	1000	FIXED0			
C1176	(C1175)	Disp				
[C1178]					→ Selection list 2	**AND7** Configuration - digital input signals
1	IN1	1000	FIXED0			
2	IN2	1000	FIXED0			
3	IN3	1000	FIXED0			
C1179	(C1178)	Disp				

Code No.	LCD	Possible settings: Lenze	Possible settings: Selection	Important
C1190	MOT. PTC-SEL.	0	0 Standard 1 Characteristic	**Motor PTC selection**
C1191			0 {1 °C} 255	
1		100		Characteristic: Temperature 1
2		150		Characteristic: Temperature 2
C1192			0 {1 Ω} 3000	
1		1670		Characteristic: Resistor 1
2		2225		Characteristic: Resistor 2
[C1195]	OUT.D2	1000	FIXED0INC → Selection list 3	**AIF-OUT** Configuration - phase input signal
C1196	(C1195)	Disp	-2147483648 {1} 2147483647	
C1197	IN.D2	Disp		**AIF-IN** Input signal display
[C1200]			→ Selection list 3	**PHADD1** Configuration - phase input signals
1	IN1	1000	FIXED0INC	
2	IN2	1000	FIXED0INC	
3	IN3	1000	FIXED0INC	
C1201		Disp	-2147483647 {1} 2147483647	
1	(C1200/1)			
2	(C1200/2)			
3	(C1200/3)			
[C1205]			→ Selection list 3	**PHCMP2** Input signal configuration
1	PHCMP2-IN1	1000	FIXED0INC	
2	PHADD1-IN2	1000	FIXED0INC	
C1206		Disp	-2147483647 {1} 2147483647	
1	(C1205/1)			
2	(C1205/2)			
C1207	FUNCTION	2	1 IN1 < IN2 2 lIN1l < lIN2l	**PHCMP2** Function selection
[C1210]			→ Selection list 2	**STORE1** Configuration - digital input signals
1	RESET	1000	FIXED0	
2	ENTP	1000	FIXED0	
3	ENWIN	1000	FIXED0	
4	LOAD0	1000	FIXED0	
5	LOAD1	1000	FIXED0	
[C1211]			→ Selection list 4	**STORE1** Input signal configuration
1	IN	1000	FIXEDPHI-0	
2	MASKI	1000	FIXEDPHI-0	
[C1212]	MASKV	1000	FIXED0INC → Selection list 3	**STORE1** Input signal configuration
C1215		Disp		
1	(C1210/1)			
2	(C1210/2)			
3	(C1210/3)			
4	(C1210/4)			
5	(C1210/5)			
C1216		Disp	-32767 {1 rpm} 32767	
1	(C1211/1)			
2	(C1211/2)			
C1217	(C1212)	Disp	-2147483647 2147483647	
[C1220]			→ Selection list 2	**STORE2** Configuration - digital input signals
1	STORE2-RESET	1000	FIXED0	
2	STORE2-ENTP	1000	FIXED0	
C1223	C1220/1 ... 2	Disp		

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[C1230]			→ Selection list 2	**PHDIFF1** Configuration - digital input signals
1	PHDIFF1-EN	1000	FIXED0	
2	PHDIFF1-RES	1000	FIXED0	
[C1231]	IN	1000	FIXEDPHI-0 → Selection list 4	**PHDIFF1** Input signal configuration
[C1232]			→ Selection list 3	**PHDIFF1** Input signal configuration
1	PHDIFF1-SET	1000	FIXED0INC	
2	PHDIFF1-ADD	1000	FIXED0INC	
C1235	(C1230)	Disp		
C1236	(C1231)	Disp	-32767 {1 rpm} 32767	
C1237	(C1232)	Disp	-2147483647 2147483647	
[C1240]			→Selection list 1	**CONVPHPH1** Input signal configuration
1	CONVPHPH1-NUM	1000	FIXED0%	
2	CONVPHPH1-DEN	1000	FIXED0%	
[C1241]	CONVPHPH1-ACT	1000	FIXED0 → Selection list 2	**CONVPHPH1** Input signal configuration
[C1242]	CONVPHPH1-IN	1000	FIXED0INC → Selection list 3	**CONVPHPH1** Input signal configuration
C1245		Disp	-199.99 {0.01 %} 1999.99	
1	(C1240/1)			
2	(C1240/2)			
C1246	(C1241)	Disp		
C1247	(C1242)	Disp	-2147483647 2147483647	
[C1250]	IN	1000	FIXEDPHI-0 → Selection list 4	**CONVPP1** Input signal configuration
[C1251]		1000	→ Selection list 3	**CONVPP1** Input signal configuration
1	CONVPP1-NUM		FIXED0INC	
2	CONVPP1-DEN		FIXED0INC	
C1253	(C1250)	Disp	-32767 {1 rpm} 32767	
C1254		Disp	-2147483647 {1} 2147483647	
1	(C1251/1)			
2	(C1251/2)			
[C1255]	N-TRIM2	1000	FIXEDPHI-0 → Selection list 4	**DFSET** Input signal configuration
C1258	(C1255)	Disp	-32767 {1 rpm} 32767	
C1260	OFFSET	0	-16383 {1} 16383	**GEARCOMP** Offset
C1261	NUM	1	-32767 {1} 32767	**GEARCOMP** Numerator
C1262	DENUM	1	1 {1} 32767	**GEARCOMP** Denominator
[C1265]	TORQUE	1000	FIXED0% →Selection list 1	**GEARCOMP** Configuration - correction input signal
[C1266]	PHI-IN	1000	FIXED0INC → Selection list 3	**GEARCOMP** Input signal configuration
C1268	(C1265)	Disp	-199.99 {0.01 %} 199.99	
C1269	(C1266)	Disp	-2147483648 {1 inc} 2147483647	
[C1270]			→ Selection list 3	**PHCMP3** Input signal configuration
1	PHCMP3-IN1	1000	FIXED0INC	
2	PHCMP3-IN2	1000	FIXED0INC	
C1271	(C1270)	Disp	-2147483647 {1} 2147483647	
C1272	FUNCTION	2	1 IN1 < IN2 2 |IN1| < |IN2|	**PHCMP3** Function selection

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C1290	MONIT P16	3	0 TRIP 2 Warning 3 Off			**Conf. P16 (Sync error)** Monitoring of the synchronisation test
C1500	OUTPUT SIGNAL		-2147483648	{1}	2147483647	**FEVAN2** Signal output
C1501	CODE	141	2	{1}	2000	**FEVAN2** Target code of FEVAN2
C1502	SUBCODE	0	0	{1}	255	**FEVAN2** Target subcode FEVAN2
C1503	NUMERATOR	1	1	{1}	100000	**FEVAN2** Numerator
C1504	DENOMINATOR	0.0001	0.0001	{0.0001 }	100000.0000	**FEVAN2** Denominator
C1505	OFFSET	0	0		1000000000	**FEVAN2** Offset
[C1506]	IN	1000	FIXED0%		→Selection list 1	**FEVAN2** Configuration - analog input signal
[C1507]	LOAD	1000	FIXED0		→ Selection list 2	**FEVAN2** Configuration - digital input signals
C1508	(C1506)	Disp	-32768	{1}	32767	
C1509	(C1507)	Disp				
C1799	DFOUT F_{MAX} [KHZ]	1250	20	{1}	1250	**DFOUT f_{max} (kHz)**
C1810	S/W ID KEYPAD	Disp				**SW-ID LECOM**
C1811	S/W DATE KEYPAD	Disp				**SW generation**

9.5 Selection lists

9.5.1 Selection list of signal links

Selection list 1, analog output signals (○)					
000050	AIN1-OUT	010000	BRK-M-SET	020101	CAN-IN1.W1
000055	AIN2-OUT	015028	UTILIZATION	020102	CAN-IN1.W2
000100	DFSET-NOUT	019500	FCODE-17	020103	CAN-IN1.W3
001000	FIXED0%	019502	FCODE-26/1	020201	CAN-IN2.W1
001006	FIXED100%	019503	FCODE-26/2	020202	CAN-IN2.W2
001007	FIXED-100%	019504	FCODE-27/1	020203	CAN-IN2.W3
005000	MCTRL-NSET2	019505	FCODE-27/2	020204	CAN-IN2.W4
005001	MCTRL-NACT	019506	FCODE-32	020301	CAN-IN3.W1
005002	MCTRL-MSET2	019507	FCODE-37	020302	CAN-IN3.W2
005003	MCTRL-MACT	019510	FCODE-108/1	020303	CAN-IN3.W3
005004	MCTRL-IACT	019511	FCODE-108/2	020304	CAN-IN3.W4
005005	MCTRL-DCVOLT	019512	FCODE-109/1	025101	AIF-IN.W1
005009	MCTRL-PHI-ACT	019513	FCODE-109/2	025102	AIF-IN.W2
005050	NSET-NOUT	019515	FCODE-141	025103	AIF-IN.W3
005051	NSET-RFG-I	019521	FCODE-472/1		
005100	MPOT1-OUT	019522	FCODE-472/2		
005150	PCTRL1-OUT	019523	FCODE-472/3		
005200	REF-N-SET	019524	FCODE-472/4		
005500	ARIT1-OUT	019525	FCODE-472/5		
005505	ARIT2-OUT	019526	FCODE-472/6		
005550	ADD1-OUT	019527	FCODE-472/7		
005600	RFG1-OUT	019528	FCODE-472/8		
005610	SRFG1-OUT	019529	FCODE-472/9		
005611	SRFG1-DIFF	019530	FCODE-472/10		
005650	ASW1-OUT	019531	FCODE-472/11		
005655	ASW2-OUT	019532	FCODE-472/12		
005660	ASW3-OUT	019533	FCODE-472/13		
005665	ASW4-OUT	019534	FCODE-472/14		
005700	ANEG1-OUT	019535	FCODE-472/15		
005705	ANEG2-OUT	019536	FCODE-472/16		
005750	FIXSET1-OUT	019537	FCODE-472/17		
005800	LIM1-OUT	019538	FCODE-472/18		
005850	ABS1-OUT	019539	FCODE-472/19		
005900	PT1-1-OUT	019540	FCODE-472/20		
005950	DT1-1-OUT	019551	FCODE-473/1		
006100	MFAIL-NOUT	019552	FCODE-473/2		
006150	DB1-OUT	019553	FCODE-473/3		
006200	CONV1-OUT	019554	FCODE-473/4		
006205	CONV2-OUT	019555	FCODE-473/5		
006210	CONV3-OUT	019556	FCODE-473/6		
006215	CONV4-OUT	019557	FCODE-473/7		
006230	CONVPHA1-OUT	019558	FCODE-473/8		
006300	S&H1-OUT	019559	FCODE-473/9		
006350	CURVE1-OUT	019560	FCODE-473/10		
006400	FCNT1-OUT				
006600	SYNC1-OUT3				

Selection list 2, digital output signals (☐)							
000051	DIGIN1	010000	BRK1-OUT	015000	DCTRL-TRIP	019500	FCODE-250
000052	DIGIN2	010001	BRK1-CINH	015001	DCTRL-MESS	019521	FCODE-471.B0
000053	DIGIN3	010002	BRK1-QSP	015002	DCTRL-WARN	019522	FCODE-471.B1
000054	DIGIN4	010003	BRK1-M-STORE	015003	DCTRL-FAIL	019523	FCODE-471.B2
000055	DIGIN5	010250	R/L/Q-QSP	015010	MONIT-LU	019524	FCODE-471.B3
000060	STATE-BUS-O	010251	R/L/Q-R/L	015011	MONIT-OU	019525	FCODE-471.B4
000065	DIGIN-CINH	010500	AND1-OUT	015012	MONIT-EEr	019526	FCODE-471.B5
000100	DFSET-ACK	010505	AND2-OUT	015013	MONIT-OC1	019527	FCODE-471.B6
000500	DCTRL-RDY	010510	AND3-OUT	015014	MONIT-OC2	019528	FCODE-471.B7
000501	DCTRL-CINH	010515	AND4-OUT	015015	MONIT-LP1	019529	FCODE-471.B8
000502	DCTRL-INIT	010520	AND5-OUT	015016	MONIT-OH	019530	FCODE-471.B9
000503	DCTRL-IMP	010525	AND6-OUT	015017	MONIT-OH3	019531	FCODE-471.B10
000504	DCTRL-NACT=0	010530	AND7-OUT	015018	MONIT-OH4	019532	FCODE-471.B11
000505	DCTRL-CW/CCW	010550	OR1-OUT	015019	MONIT-OH7	019533	FCODE-471.B12
001000	FIXED0	010555	OR2-OUT	015020	MONIT-OH8	019534	FCODE-471.B13
001001	FIXED1	010560	OR3-OUT	015021	MONIT-Sd2	019535	FCODE-471.B14
002000	DCTRL-PAR*1-O	010565	OR4-OUT	015022	MONIT-Sd3	019536	FCODE-471.B15
002001	DCTRL-PAR*2-O	010570	OR5-OUT	015023	MONIT-P03	019537	FCODE-471.B16
002002	DCTRL-PARBUSY	010600	NOT1-OUT	015024	MONIT-P13	019538	FCODE-471.B17
005001	MCTRL-QSP-OUT	010605	NOT2-OUT	015026	MONIT-CE0	019539	FCODE-471.B18
005002	MCTRL-IMAX	010610	NOT3-OUT	015027	MONIT-NMAX	019540	FCODE-471.B19
005003	MCTRL-MMAX	010615	NOT4-OUT	015028	MONIT-OC5	019541	FCODE-471.B20
005050	NSET-RFG-I=0	010620	NOT5-OUT	015029	MONIT-SD5	019542	FCODE-471.B21
005200	REF-OK	010650	CMP1-OUT	015030	MONIT-SD6	019543	FCODE-471.B22
005201	REF-BUSY	010655	CMP2-OUT	015031	MONIT-SD7	019544	FCODE-471.B23
006000	DFRFG1-FAIL	010660	CMP3-OUT	015032	MONIT-H07	019545	FCODE-471.B24
006001	DFRFG1-SYNC	010680	PHCMP1-OUT	015033	MONIT-H10	019546	FCODE-471.B25
006100	MFAIL-STATUS	010685	PHCMP2-OUT	015034	MONIT-H11	019547	FCODE-471.B26
006101	MFAIL-I-RESET	010690	PHCMP3-OUT	015040	MONIT-CE1	019548	FCODE-471.B27
006400	FCNT1-EQUAL	010700	DIGDEL1-OUT	015041	MONIT-CE2	019549	FCODE-471.B28
006600	SYNC1-STAT	010705	DIGDEL2-OUT	015042	MONIT-CE3	019550	FCODE-471.B29
		010750	TRANS1-OUT	015043	MONIT-CE4	019551	FCODE-471.B30
		010755	TRANS2-OUT			019552	FCODE-471.B31
		010760	TRANS3-OUT			019751	FCODE-135.B0
		010765	TRANS4-OUT			019752	FCODE-135.B1
		010900	FLIP1-OUT			019753	FCODE-135.B2
		010905	FLIP2-OUT			019755	FCODE-135.B4
		012000	PHINT1-FAIL			019756	FCODE-135.B5
		012005	PHINT2-FAIL			019757	FCODE-135.B6
		012010	PHINT3-STAT			019758	FCODE-135.B7
		013000	FEVAN1-BUSY			019763	FCODE-135.B12
		013001	FEVAN1-FAIL			019764	FCODE-135.B13
		013005	FEVAN2-BUSY			019765	FCODE-135.B14
		013006	FEVAN2-FAIL			019766	FCODE-135.B15
		014050	STORE1-TP-INH				
		014055	STORE2-TP-INH				

Selection list 2, digital output signals (☐), continued							
020001	CAN-CTRL.B0	020201	CAN-IN2.B0	020301	CAN-IN3.B0	025001	AIF-CTRL.B0
020002	CAN-CTRL.B1	020202	CAN-IN2.B1	020302	CAN-IN3.B1	025002	AIF-CTRL.B1
020003	CAN-CTRL.B2	020203	CAN-IN2.B2	020303	CAN-IN3.B2	025003	AIF-CTRL.B2
020005	CAN-CTRL.B4	020204	CAN-IN2.B3	020304	CAN-IN3.B3	025005	AIF-CTRL.B4
020006	CAN-CTRL.B5	020205	CAN-IN2.B4	020305	CAN-IN3.B4	025006	AIF-CTRL.B5
020007	CAN-CTRL.B6	020206	CAN-IN2.B5	020306	CAN-IN3.B5	025007	AIF-CTRL.B6
020008	CAN-CTRL.B7	020207	CAN-IN2.B6	020307	CAN-IN3.B6	025008	AIF-CTRL.B7
020013	CAN-CTRL.B12	020208	CAN-IN2.B7	020308	CAN-IN3.B7	025013	AIF-CTRL.B12
020014	CAN-CTRL.B13	020209	CAN-IN2.B8	020309	CAN-IN3.B8	025014	AIF-CTRL.B13
020015	CAN-CTRL.B14	020210	CAN-IN2.B9	020310	CAN-IN3.B9	025015	AIF-CTRL.B14
020016	CAN-CTRL.B15	020211	CAN-IN2.B10	020311	CAN-IN3.B10	025016	AIF-CTRL.B15
020101	CAN-IN1.B0	020212	CAN.IN2.B11	020312	CAN-IN3.B11	025101	AIF-IN.B0
020102	CAN-IN1.B1	020213	CAN-IN2.B12	020313	CAN-IN3.B12	025102	AIF-IN.B1
020103	CAN-IN1.B2	020214	CAN-IN2.B13	020314	CAN-IN3.B13	025103	AIF-IN.B2
020104	CAN-IN1.B3	020215	CAN-IN2.B14	020315	CAN-IN3.B14	025104	AIF-IN.B3
020105	CAN-IN1.B4	020216	CAN-IN2.B15	020316	CAN-IN3.B15	025105	AIF-IN.B4
020106	CAN-IN1.B5	020217	CAN-IN2.B16	020317	CAN-IN3.B16	025106	AIF-IN.B5
020107	CAN-IN1.B6	020218	CAN-IN2.B17	020318	CAN-IN3.B17	025107	AIF-IN.B6
020108	CAN-IN1.B7	020219	CAN-IN2.B18	020319	CAN-IN3.B18	025108	AIF-IN.B7
020109	CAN-IN1.B8	020220	CAN-IN2.B19	020320	CAN-IN3.B19	025109	AIF-IN.B8
020110	CAN-IN1.B9	020221	CAN-IN2.B20	020321	CAN-IN3.B20	025110	AIF-IN.B9
020111	CAN-IN1.B10	020222	CAN-IN2.B21	020322	CAN-IN3.B21	025111	AIF-IN.B10
020112	CAN-IN1.B11	020223	CAN-IN2.B22	020323	CAN-IN3.B22	025112	AIF-IN.B11
020113	CAN-IN1.B12	020224	CAN-IN2.B23	020324	CAN-IN3.B23	025113	AIF-IN.B12
020114	CAN-IN1.B13	020225	CAN-IN2.B24	020325	CAN-IN3.B24	025114	AIF-IN.B13
020115	CAN-IN1.B14	020226	CAN-IN2.B25	020326	CAN-IN3.B25	025115	AIF-IN.B14
020116	CAN-IN1.B15	020227	CAN-IN2.B26	020327	CAN-IN3.B26	025116	AIF-IN.B15
020117	CAN-IN1.B16	020228	CAN-IN2.B27	020328	CAN-IN3.B27	025117	AIF-IN.B16
020118	CAN-IN1.B17	020229	CAN-IN2.B28	020329	CAN-IN3.B28	025118	AIF-IN.B17
020119	CAN-IN1.B18	020230	CAN-IN2.B29	020330	CAN-IN3.B29	025119	AIF-IN.B18
020120	CAN-IN1.B19	020231	CAN-IN2.B30	020331	CAN-IN3.B30	025120	AIF-IN.B19
020121	CAN-IN1.B20	020232	CAN-IN2.B31	020332	CAN-IN3.B31	025121	AIF-IN.B20
020122	CAN-IN1.B21					025122	AIF-IN.B21
020123	CAN-IN1.B22					025123	AIF-IN.B22
020124	CAN-IN1.B23					025124	AIF-IN.B23
020125	CAN-IN1.B24					025125	AIF-IN.B24
020126	CAN-IN1.B25					025126	AIF-IN.B25
020127	CAN-IN1.B26					025127	AIF-IN.B26
020128	CAN-IN1.B27					025128	AIF-IN.B27
020129	CAN-IN1.B28					025129	AIF-IN.B28
020130	CAN-IN1.B29					025130	AIF-IN.B29
020131	CAN-IN1.B30					025131	AIF-IN.B30
020132	CAN-IN1.B31					025132	AIF-IN.B31

Selection list 3, Phase signals (▲)		**Selection list 4, Phase difference signals (△)**		**Selection list 5, Function blocks**			
000100	DFSET-PSET	000050	DFIN-OUT	000000	empty	010000	BRK1
000101	DFSET-PSET2	000100	DFSET-POUT	000050	AIN1	010250	CW/CCW/Q
001000	FIXED0INC	000250	DFOUT-OUT	000055	AIN2	010500	AND1
005000	MCTRL-PHI-ANG	001000	FIXEDPHI-0	000070	AOUT1	010505	AND2
005200	REF-PSET	005000	MCTRL-PHI-ACT	000075	AOUT2	010510	AND3
005520	ARITPH1-OUT	006000	DFRFG-OUT	000100	DFSET	010515	AND4
005580	PHADD1-OUT	006220	CONV5-OUT	000200	DFIN	010520	AND5
005581	PHADD1-OUT2	006225	CONV6-OUT	000250	DFOUT	010525	AND6
006235	CONVPHPH1-OUT	006230	CONVPHA1-OUT2	005050	NSET	010530	AND7
006600	SYNC1-OUT2	006240	CONVPP1-OUT	005100	MPOT1	010550	OR1
012000	PHINT1-OUT	006600	SYNC1-OUT1	005150	PCTRL1	010555	OR2
012005	PHINT2-OUT	019521	FCODE-475/1	005200	REF	010560	OR3
012010	PHINT3-OUT	019522	FCODE-475/2	005500	ARIT1	010565	OR4
012050	PHDIV1-OUT			005505	ARIT2	010570	OR5
014000	PHDIFF1-OUT			005520	ARITPH1	010600	NOT1
014050	STORE1-PHACT			005550	ADD1	010605	NOT2
014051	STORE1-PH1			005580	PHADD1	010610	NOT3
014052	STORE1-PH2			005600	RFG1	010615	NOT4
014053	STORE1-PHDIFF			005610	SRFG1	010620	NOT5
014055	STORE2-PHACT			005650	ASW1	010650	CMP1
014056	STORE2-PH1			005655	ASW2	010655	CMP2
014057	STORE1-PH2			005660	ASW3	010660	CMP3
014100	GEARCOMP-OUT			005665	ASW4	010680	PHCMP1
019521	FCODE-474/1			005700	ANEG1	010685	PHCMP2
019522	FCODE-474/2			005705	ANEG2	010690	PHCMP3
019523	FCODE-474/3			005750	FIXSET1	010700	DIGDEL1
019524	FCODE-474/4			005800	LIM1	010705	DIGDEL2
019525	FCODE-474/5			005850	ABS1	010750	TRANS1
020103	CAN-IN1.D1			005900	PT1-1	010755	TRANS2
020201	CAN-IN2.D1			005950	DT1-1	010760	TRANS3
020301	CAN-IN3.D1			006000	DFRFG1	010765	TRANS4
025103	AIF-IN.D1			006100	MFAIL	010900	FLIP1
				006150	DB1	010905	FLIP2
				006200	CONV1	012000	PHINT1
				006205	CONV2	012005	PHINT2
				006210	CONV3	012010	PHINT3
				006215	CONV4	012050	PHDIV1
				006220	CONV5	013000	FEVAN1
				006225	CONV6	013005	FEVAN2
				006230	CONVPHA1	013100	TR
				006235	CONVPHPH1	014000	PHDIFF1
				006240	CONVPP1	014050	STORE1
				006300	S&H1	014055	STORE2
				006350	CURVE1	014100	GEARCOMP
				006420	FCNT1	015100	MLP1
				006600	SYNC1	020000	CAN-OUT
						025000	AIF-OUT

Selection list 10, error list			
000000 No fail	000105 H05 trip	000070 U15 trip	002061 CE0 warning
000011 OC1 trip	000107 H07 trip	000071 CCr trip	002062 CE1 warning
000012 OC2 trip	000110 H10 trip	000072 Pr1 trip	002063 CE2 warning
000015 OC5 trip	000111 H11 trip	000073 Pr2 trip	002064 CE3 warning
000022 LUQ trip	000153 P03 trip	000074 PEr trip	002065 CE4 warning
000032 LP1 trip	000163 P13 trip	000075 Pr0 trip	002082 Sd2 warning
000050 OH trip	000166 P16 trip	000077 Pr3 trip	002083 Sd3 warning
000053 OH3 trip	000200 NMAX trip	000078 Pr4 trip	002085 Sd5 warning
000057 OH7 trip	001020 OU message	000079 PI trip	002086 Sd6 warning
000058 OH8 trip	001030 LU message	000082 Sd2 trip	002091 EER warning
000061 CE0 trip	001091 EEr message	000083 Sd3 trip	002153 P03 warning
000062 CE1 trip	002032 LP1 warning	000085 Sd5 trip	002163 P13 warning
000063 CE2 trip	002054 OH4 warning	000086 Sd6 trip	002166 P16 warning
000064 CE3 trip	002057 OH7 warning	000087 Sd7 trip	
000065 CE4 trip	002058 OH8 warning	000091 EEr trip	

9.5.2 Table of attributes

If you want to create programs on your own, you need the data given in the table of attributes. It contains all information on communication to the controller via parameters.

How to read the table of attributes:

Column		Meaning	Entry	
Code		Name of the Lenze code	Cxxxx	
Index	dec	Index, under which the parameter is addressed. The subindex of array variables corresponds to the Lenze subcode number	24575 - Lenze code number	Is only required for control via INTERBUS-S, PROFIBUS-DP or system bus (CAN).
	hex		5FFFh - Lenze code number	
Data	DS	Data structure	E	Single variable (only one parameter element)
			A	Array variable (several parameter elements)
	DA	Number of array elements (subcodes)	xx	
	DT	Data type	B8	1 byte bit-coded
			B16	2 bytes bit-coded
			B32	4 bytes bit-coded
			FIX32	32-bit value with sign; decimal with four decimal positions
			I32	4 bytes with sign
			U32	4 bytes without sign
			VS	ASCII string
	Format	LECOM format (see also Operating Instructions of the corresponding fieldbus module 2102)	VD	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	Access authorisation for LECOM	Ra	Reading is always permitted
			Wa	Writing is always permitted
			W	Writing is restricted
	Condition	Condition for writing	CINH	Writing permitted only when controller is inhibited

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0002	24573	5FFDh	E	1	FIX32	VD	4	Ra/W	CINH
C0003	24572	5FFCh	E	1	FIX32	VD	4	Ra/Wa	
C0004	24571	5FFBh	E	1	FIX32	VD	4	Ra/Wa	
C0005	24570	5FFAh	E	1	FIX32	VD	4	Ra/W	CINH
C0006	24569	5FF9h	E	1	FIX32	VD	4	Ra/W	CINH
C0009	24566	5FF6h	E	1	FIX32	VD	4	Ra/Wa	
C0011	24564	5FF4h	E	1	FIX32	VD	4	Ra/Wa	
C0012	24563	5FF3h	E	1	FIX32	VD	4	Ra/Wa	
C0013	24562	5FF2h	E	1	FIX32	VD	4	Ra/Wa	
C0017	24558	5FEEh	E	1	FIX32	VD	4	Ra/Wa	
C0018	24557	5FEDh	E	1	FIX32	VD	4	Ra/Wa	
C0019	24556	5FECh	E	1	FIX32	VD	4	Ra/Wa	
C0021	24554	5FEAh	E	1	FIX32	VD	4	Ra/Wa	
C0022	24553	5FE9h	E	1	FIX32	VD	4	Ra/Wa	
C0025	24550	5FE6h	E	1	FIX32	VD	4	Ra/W	CINH
C0026	24549	5FE5h	A	2	FIX32	VD	4	Ra/Wa	
C0027	24548	5FE4h	A	2	FIX32	VD	4	Ra/Wa	
C0030	24545	5FE1h	E	1	FIX32	VD	4	Ra/Wa	
C0032	24543	5FDFh	E	1	FIX32	VD	4	Ra/Wa	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0033	24542	5FDEh	E	1	FIX32	VD	4	Ra/Wa	
C0034	24541	5FDDh	E	1	FIX32	VD	4	Ra/Wa	
C0037	24538	5FDAh	E	1	FIX32	VD	4	Ra/Wa	
C0039	24536	5FD8h	A	15	FIX32	VD	4	Ra/Wa	
C0040	24535	5FD7h	E	1	FIX32	VD	4	Ra/Wa	
C0042	24533	5FD5h	E	1	FIX32	VD	4	Ra	
C0043	24532	5FD4h	E	1	FIX32	VD	4	Ra/Wa	
C0045	24530	5FD2h	E	1	FIX32	VD	4	Ra	
C0046	24529	5FD1h	E	1	FIX32	VD	4	Ra	
C0049	24526	5FCEh	E	1	FIX32	VD	4	Ra	
C0050	24525	5FCDh	E	1	FIX32	VD	4	Ra	
C0051	24524	5FCCh	E	1	FIX32	VD	4	Ra	
C0052	24523	5FCBh	E	1	FIX32	VD	4	Ra	
C0053	24522	5FCAh	E	1	FIX32	VD	4	Ra	
C0054	24521	5FC9h	E	1	FIX32	VD	4	Ra	
C0056	24519	5FC7h	E	1	FIX32	VD	4	Ra	
C0057	24518	5FC6h	E	1	FIX32	VD	4	Ra	
C0058	24517	5FC5h	E	1	FIX32	VD	4	Ra/Wa	
C0059	24516	5FC4h	E	1	FIX32	VD	4	Ra	
C0060	24515	5FC3h	E	1	FIX32	VD	4	Ra	
C0061	24514	5FC2h	E	1	FIX32	VD	4	Ra	
C0063	24512	5FC0h	E	1	FIX32	VD	4	Ra	
C0064	24511	5FBFh	E	1	FIX32	VD	4	Ra	
C0067	24508	5FBCh	E	1	FIX32	VD	4	Ra	
C0070	24505	5FB9h	E	1	FIX32	VD	4	Ra/Wa	
C0071	24504	5FB8h	E	1	FIX32	VD	4	Ra/Wa	
C0072	24503	5FB7h	E	1	FIX32	VD	4	Ra/Wa	
C0075	24500	5FB4h	E	1	FIX32	VD	4	Ra/Wa	
C0076	24499	5FB3h	E	1	FIX32	VD	4	Ra/Wa	
C0077	24498	5FB2h	E	1	FIX32	VD	4	Ra/Wa	
C0078	24497	5FB1h	E	1	FIX32	VD	4	Ra/Wa	
C0081	24494	5FAEh	E	1	FIX32	VD	4	Ra/W	CINH
C0084	24491	5FABh	E	1	FIX32	VD	4	Ra/W	CINH
C0085	24490	5FAAh	E	1	FIX32	VD	4	Ra/W	CINH
C0086	24489	5FA9h	E	1	FIX32	VD	4	Ra/W	CINH
C0087	24488	5FA8h	E	1	FIX32	VD	4	Ra/W	CINH
C0088	24487	5FA7h	E	1	FIX32	VD	4	Ra/W	CINH
C0089	24486	5FA6h	E	1	FIX32	VD	4	Ra/W	CINH
C0090	24485	5FA5h	E	1	FIX32	VD	4	Ra/W	CINH
C0091	24484	5FA4h	E	1	FIX32	VD	4	Ra/W	CINH
C0093	24482	5FA2h	E	1	FIX32	VD	4	Ra	
C0094	24481	5FA1h	E	1	FIX32	VD	4	Ra/Wa	
C0095	24480	5FA0h	E	1	FIX32	VD	4	Ra/W	CINH
C0096	24479	5F9Fh	A	2	FIX32	VD	4	Ra/Wa	
C0099	24476	5F9Ch	E	1	FIX32	VD	4	Ra	
C0101	24474	5F9Ah	A	15	FIX32	VD	4	Ra/Wa	
C0103	24472	5F98h	A	15	FIX32	VD	4	Ra/Wa	
C0105	24470	5F96h	E	1	FIX32	VD	4	Ra/Wa	
C0108	24467	5F93h	A	2	FIX32	VD	4	Ra/Wa	
C0109	24466	5F92h	A	2	FIX32	VD	4	Ra/Wa	
C0114	24461	5F8Dh	A	5	FIX32	VD	4	Ra/Wa	
C0116	24459	5F8Bh	A	32	FIX32	VD	4	Ra/W	CINH

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0117	24458	5F8Ah	A	4	FIX32	VD	4	Ra/W	CINH
C0118	24457	5F89h	A	4	FIX32	VD	4	Ra/Wa	
C0121	24454	5F86h	E	1	FIX32	VD	4	Ra/Wa	
C0122	24453	5F85h	E	1	FIX32	VD	4	Ra/Wa	
C0125	24450	5F82h	E	1	FIX32	VD	4	Ra/Wa	
C0126	24449	5F81h	E	1	FIX32	VD	4	Ra/Wa	
C0130	24445	5F7Dh	E	1	FIX32	VD	4	Ra	
C0134	24441	5F79h	E	1	FIX32	VD	4	Ra/Wa	
C0135	24440	5F78h	E	1	B16	VH	2		
C0136	24439	5F77h	A	3	B16	VH	2	Ra	
C0141	24434	5F72h	E	1	FIX32	VD	4	Ra/Wa	
C0142	24433	5F71h	E	1	FIX32	VD	4	Ra/Wa	
C0150	24425	5F69h	E	1	B16	VH	2	Ra	
C0151	24424	5F68h	E	1	B32	VH	4	Ra	
C0155	24420	5F64h	E	1	B16	VH	2	Ra	
C0156	24419	5F63h	A	7	FIX32	VD	4	Ra/W	CINH
C0157	24418	5F62h	A	7	FIX32	VD	4	Ra	
C0161	24414	5F5Eh	E	1	FIX32	VD	4	Ra	
C0167	24408	5F58h	E	1	FIX32	VD	4	Ra/Wa	
C0168	24407	5F57h	A	8	FIX32	VD	4	Ra	
C0169	24406	5F56h	A	8	U32	VH	4	Ra	
C0170	24405	5F55h	A	8	FIX32	VD	4	Ra	
C0172	24403	5F53h	E	1	FIX32	VD	4	Ra/Wa	
C0173	24402	5F52h	E	1	FIX32	VD	4	Ra/Wa	
C0178	24397	5F4Dh	E	1	U32	VH	4	Ra	
C0179	24396	5F4Ch	E	1	U32	VH	4	Ra	
C0182	24393	5F49h	E	1	FIX32	VD	4	Ra/Wa	
C0183	24392	5F48h	E	1	FIX32	VD	4	Ra	
C0190	24385	5F41h	E	1	FIX32	VD	4	Ra/Wa	
C0195	24380	5F3Ch	E	1	FIX32	VD	4	Ra/Wa	
C0196	24379	5F3Bh	E	1	FIX32	VD	4	Ra/Wa	
C0200	24375	5F37h	E	1	VS	VS	14	Ra	
C0201	24374	5F36h	E	1	VS	VS	20	Ra	
C0202	24373	5F35h	E	1	FIX32	VD	4	Ra	
C0203	24372	5F34h	E	1	VS	VS	12	Ra	
C0204	24371	5F33h	E	1	FIX32	VD	4	Ra	
C0206	24369	5F31h	E	1	VS	VS	13	Ra	
C0207	24368	5F30h	E	1	VS	VS	14	Ra	
C0208	24367	5F2Fh	E	1	VS	VS	14	Ra	
C0209	24366	5F2Eh	E	1	VS	VS	14	Ra	
C0220	24355	5F23h	E	1	FIX32	VD	4	Ra/Wa	
C0221	24354	5F22h	E	1	FIX32	VD	4	Ra/Wa	
C0222	24353	5F21h	E	1	FIX32	VD	4	Ra/Wa	
C0223	24352	5F20h	E	1	FIX32	VD	4	Ra/Wa	
C0224	24351	5F1Fh	E	1	FIX32	VD	4	Ra/Wa	
C0241	24334	5F0Eh	E	1	FIX32	VD	4	Ra/Wa	
C0244	24331	5F0Bh	E	1	FIX32	VD	4	Ra/Wa	
C0250	24325	5F05h	E	1	FIX32	VD	4	Ra/Wa	
C0252	24323	5F03h	E	1	I32	VH	4	Ra/Wa	
C0253	24322	5F02h	E	1	FIX32	VD	4	Ra/Wa	
C0254	24321	5F01h	E	1	FIX32	VD	4	Ra/Wa	
C0255	24320	5F00h	E	1	U32	VH	4	Ra/Wa	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0260	24315	5EFBh	E	1	FIX32	VD	4	Ra/Wa	
C0261	24314	5EFAh	E	1	FIX32	VD	4	Ra/Wa	
C0262	24313	5EF9h	E	1	FIX32	VD	4	Ra/Wa	
C0263	24312	5EF8h	E	1	FIX32	VD	4	Ra/Wa	
C0264	24311	5EF7h	E	1	FIX32	VD	4	Ra/Wa	
C0265	24310	5EF6h	E	1	FIX32	VD	4	Ra/Wa	
C0267	24308	5EF4h	A	2	FIX32	VD	4	Ra/W	CINH
C0268	24307	5EF3h	E	1	FIX32	VD	4	Ra/W	CINH
C0269	24306	5EF2h	A	3	FIX32	VD	4	Ra	
C0291	24284	5EDCh	E	1	FIX32	VD	4	Ra/Wa	
C0292	24283	5EDBh	E	1	FIX32	VD	4	Ra/Wa	
C0293	24282	5EDAh	E	1	FIX32	VD	4	Ra/Wa	
C0294	24281	5ED9h	E	1	FIX32	VD	4	Ra/Wa	
C0295	24280	5ED8h	E	1	FIX32	VD	4	Ra/Wa	
C0296	24279	5ED7h	E	1	FIX32	VD	4	Ra/Wa	
C0325	24250	5EBAh	E	1	FIX32	VD	4	Ra/Wa	
C0326	24249	5EB9h	E	1	FIX32	VD	4	Ra/Wa	
C0327	24248	5EB8h	E	1	FIX32	VD	4	Ra/Wa	
C0328	24247	5EB7h	E	1	FIX32	VD	4	Ra/Wa	
C0329	24246	5EB6h	E	1	FIX32	VD	4	Ra/Wa	
C0332	24243	5EB3h	E	1	FIX32	VD	4	Ra/Wa	
C0333	24242	5EB2h	E	1	FIX32	VD	4	Ra/Wa	
C0336	24239	5EAFh	E	1	FIX32	VD	4	Ra	
C0337	24238	5EAEh	E	1	FIX32	VD	4	Ra/Wa	
C0338	24237	5EADh	E	1	FIX32	VD	4	Ra/Wa	
C0339	24236	5EACh	A	2	FIX32	VD	4	Ra/W	CINH
C0340	24235	5EABh	A	2	FIX32	VD	4	Ra	
C0350	24225	5EA1h	E	1	FIX32	VD	4	Ra/Wa	
C0351	24224	5EA0h	E	1	FIX32	VD	4	Ra/Wa	
C0352	24223	5E9Fh	E	1	FIX32	VD	4	Ra/Wa	
C0353	24222	5E9Eh	A	3	FIX32	VD	4	Ra/Wa	
C0354	24221	5E9Dh	A	6	FIX32	VD	4	Ra/Wa	
C0355	24220	5E9Ch	A	6	FIX32	VD	4	Ra	
C0356	24219	5E9Bh	A	4	FIX32	VD	4	Ra/Wa	
C0357	24218	5E9Ah	A	3	FIX32	VD	4	Ra/Wa	
C0358	24217	5E99h	E	1	FIX32	VD	4	Ra/Wa	
C0359	24216	5E98h	E	1	FIX32	VD	4	Ra	
C0360	24215	5E97h	A	12	FIX32	VD	4	Ra	
C0361	24214	5E96h	A	12	FIX32	VD	4	Ra	
C0362	24213	5E95h	E	1	FIX32	VD	4	Ra	
C0363	24212	5E94h	E	1	FIX32	VD	4	Ra/Wa	
C0364	24211	5E93h	E	1	FIX32	VD	4	Ra/W	CINH
C0365	24210	5E92h	E	1	FIX32	VD	4	Ra	
C0366	24209	5E91h	E	1	FIX32	VD	4	Ra/Wa	
C0367	24208	5E90h	E	1	FIX32	VD	4	Ra/Wa	
C0368	24207	5E8Fh	E	1	FIX32	VD	4	Ra/Wa	
C0369	24206	5E8Eh	E	1	FIX32	VD	4	Ra/Wa	
C0400	24175	5E6Fh	E	1	FIX32	VD	4	Ra	
C0402	24173	5E6Dh	E	1	FIX32	VD	4	Ra/W	CINH
C0403	24172	5E6Ch	E	1	FIX32	VD	4	Ra/W	CINH
C0404	24171	5E6Bh	A	2	FIX32	VD	4	Ra	
C0405	24170	5E6Ah	E	1	FIX32	VD	4	Ra	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0407	24168	5E68h	E	1	FIX32	VD	4	Ra/W	CINH
C0408	24167	5E67h	E	1	FIX32	VD	4	Ra/W	CINH
C0409	24166	5E66h	A	2	FIX32	VD	4	Ra	
C0416	24159	5E5Fh	E	1	U32	VH	4	Ra/W	CINH
C0420	24155	5E5Bh	E	1	FIX32	VD	4	Ra/W	CINH
C0421	24154	5E5Ah	E	1	FIX32	VD	4	Ra/W	CINH
C0425	24150	5E56h	E	1	FIX32	VD	4	Ra/Wa	
C0426	24149	5E55h	E	1	FIX32	VD	4	Ra	
C0427	24148	5E54h	E	1	FIX32	VD	4	Ra/Wa	
C0429	24146	5E52h	E	1	FIX32	VD	4	Ra/Wa	
C0431	24144	5E50h	E	1	FIX32	VD	4	Ra/W	CINH
C0432	24143	5E4Fh	E	1	FIX32	VD	4	Ra/W	CINH
C0433	24142	5E4Eh	E	1	FIX32	VD	4	Ra/W	CINH
C0434	24141	5E4Dh	A	3	FIX32	VD	4	Ra	
C0436	24139	5E4Bh	E	1	FIX32	VD	4	Ra/W	CINH
C0437	24138	5E4Ah	E	1	FIX32	VD	4	Ra/W	CINH
C0438	24137	5E49h	E	1	FIX32	VD	4	Ra/W	CINH
C0439	24136	5E48h	A	3	FIX32	VD	4	Ra	
C0440	24135	5E47h	E	1	FIX32	VD	4	Ra/W	CINH
C0441	24134	5E46h	E	1	FIX32	VD	4	Ra	
C0443	24132	5E44h	E	1	B8	VH	1	Ra	
C0444	24131	5E43h	A	4	FIX32	VD	4	Ra	
C0450	24125	5E3Dh	E	1	FIX32	VD	4	Ra/W	CINH
C0451	24124	5E3Ch	E	1	FIX32	VD	4	Ra/W	CINH
C0452	24123	5E3Bh	E	1	FIX32	VD	4	Ra/W	CINH
C0458	24117	5E35h	A	2	FIX32	VD	4	Ra	
C0459	24116	5E34h	E	1	FIX32	VD	4	Ra	
C0464	24111	5E2Fh	E	1	FIX32	VD	4	Ra	
C0465	24110	5E2Eh	A	50	FIX32	VD	4	Ra/W	CINH
C0466	24109	5E2Dh	E	1	FIX32	VD	4	Ra	
C0469	24106	5E2Ah	E	1	FIX32	VD	4	Ra/W	CINH
C0470	24105	5E29h	A	4	B8	VH	1	Ra/Wa	
C0471	24104	5E28h	E	1	B32	VH	4	Ra/Wa	
C0472	24103	5E27h	A	20	FIX32	VD	4	Ra/Wa	
C0473	24102	5E26h	A	10	FIX32	VD	4	Ra/Wa	
C0474	24101	5E25h	A	5	I32	VH	4	Ra/Wa	
C0475	24100	5E24h	A	2	FIX32	VD	4	Ra/Wa	
C0490	24085	5E15h	E	1	FIX32	VD	4	Ra/W	CINH
C0495	24080	5E10h	E	1	FIX32	VD	4	Ra/W	CINH
C0497	24078	5E0Eh	E	1	FIX32	VD	4	Ra/Wa	
C0517	24058	5DFAh	A	32	FIX32	VD	4	Ra/Wa	
C0520	24055	5DF7h	E	1	FIX32	VD	4	Ra/W	CINH
C0521	24054	5DF6h	E	1	FIX32	VD	4	Ra/W	CINH
C0522	24053	5DF5h	E	1	FIX32	VD	4	Ra/W	CINH
C0523	24052	5DF4h	E	1	FIX32	VD	4	Ra/W	CINH
C0524	24051	5DF3h	E	1	FIX32	VD	4	Ra/W	CINH
C0525	24050	5DF2h	E	1	FIX32	VD	4	Ra/W	CINH
C0526	24049	5DF1h	E	1	FIX32	VD	4	Ra/W	CINH
C0527	24048	5DF0h	E	1	FIX32	VD	4	Ra/W	CINH
C0528	24047	5DEFh	A	4	I32	VH	4	Ra	
C0529	24046	5DEEh	E	1	FIX32	VD	4	Ra/Wa	
C0530	24045	5DEDh	E	1	FIX32	VD	4	Ra/Wa	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0531	24044	5DECh	E	1	FIX32	VD	4	Ra/Wa	
C0532	24043	5DEBh	E	1	FIX32	VD	4	Ra/Wa	
C0533	24042	5DEAh	E	1	FIX32	VD	4	Ra/Wa	
C0534	24041	5DE9h	E	1	FIX32	VD	4	Ra/Wa	
C0535	24040	5DE8h	E	1	FIX32	VD	4	Ra/Wa	
C0536	24039	5DE7h	A	3	FIX32	VD	4	Ra	
C0537	24038	5DE6h	E	1	FIX32	VD	4	Ra	
C0538	24037	5DE5h	A	3	FIX32	VD	4	Ra	
C0539	24036	5DE4h	E	1	FIX32	VD	4	Ra	
C0540	24035	5DE3h	E	1	FIX32	VD	4	Ra/Wa	
C0541	24034	5DE2h	E	1	FIX32	VD	4	Ra/W	CINH
C0542	24033	5DE1h	E	1	FIX32	VD	4	Ra/W	CINH
C0544	24031	5DDFh	E	1	FIX32	VD	4	Ra/W	CINH
C0545	24030	5DDEh	E	1	FIX32	VD	4	Ra/Wa	
C0546	24029	5DDDh	E	1	U32	VH	4	Ra/Wa	
C0547	24028	5DDCh	E	1	FIX32	VD	4	Ra	
C0548	24027	5DDBh	E	1	FIX32	VD	4	Ra	
C0549	24026	5DDAh	E	1	FIX32	VD	4	Ra	
C0551	24024	5DD8h	E	1	U32	VH	4	Ra/Wa	
C0560	24015	5DCFh	A	15	FIX32	VD	4	Ra/Wa	
C0561	24014	5DCEh	E	1	FIX32	VD	4	Ra/W	CINH
C0562	24013	5DCDh	A	4	FIX32	VD	4	Ra/W	CINH
C0563	24012	5DCCh	E	1	FIX32	VD	4	Ra	
C0564	24011	5DCBh	A	4	FIX32	VD	4	Ra	
C0570	24005	5DC5h	E	1	FIX32	VD	4	Ra/W	CINH
C0571	24004	5DC4h	E	1	FIX32	VD	4	Ra/W	CINH
C0572	24003	5DC3h	E	1	FIX32	VD	4	Ra	
C0573	24002	5DC2h	E	1	FIX32	VD	4	Ra	
C0577	23998	5DBEh	E	1	FIX32	VD	4	Ra/Wa	
C0578	23997	5DBDh	E	1	FIX32	VD	4	Ra/Wa	
C0581	23994	5DBAh	E	1	FIX32	VD	4	Ra/Wa	
C0582	23993	5DB9h	E	1	FIX32	VD	4	Ra/Wa	
C0583	23992	5DB8h	E	1	FIX32	VD	4	Ra/Wa	
C0584	23991	5DB7h	E	1	FIX32	VD	4	Ra/Wa	
C0585	23990	5DB6h	E	1	FIX32	VD	4	Ra/Wa	
C0586	23989	5DB5h	E	1	FIX32	VD	4	Ra/Wa	
C0587	23988	5DB4h	E	1	FIX32	VD	4	Ra/Wa	
C0588	23987	5DB3h	E	1	FIX32	VD	4	Ra/Wa	
C0589	23986	5DB2h	E	1	FIX32	VD	4	Ra/Wa	
C0590	23985	5DB1h	E	1	FIX32	VD	4	Ra/Wa	
C0591	23984	5DB0h	E	1	FIX32	VD	4	Ra/Wa	
C0592	23983	5DAFh	E	1	FIX32	VD	4	Ra/Wa	
C0593	23982	5DAEh	E	1	FIX32	VD	4	Ra/Wa	
C0594	23981	5DADh	E	1	FIX32	VD	4	Ra/Wa	
C0595	23980	5DACh	E	1	FIX32	VD	4	Ra/Wa	
C0596	23979	5DABh	E	1	FIX32	VD	4	Ra/Wa	
C0597	23978	5DAAh	E	1	FIX32	VD	4	Ra/Wa	
C0598	23977	5DA9h	E	1	FIX32	VD	4	Ra/Wa	
C0599	23976	5DA8h	E	1	FIX32	VD	4	Ra/Wa	
C0600	23975	5DA7h	E	1	FIX32	VD	4	Ra/Wa	
C0601	23974	5DA6h	A	2	FIX32	VD	4	Ra/W	CINH
C0602	23973	5DA5h	A	2	FIX32	VD	4	Ra	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0610	23965	5D9Dh	A	3	FIX32	VD	4	Ra/W	CINH
C0611	23964	5D9Ch	A	3	FIX32	VD	4	Ra	
C0620	23955	5D93h	E	1	FIX32	VD	4	Ra/Wa	
C0621	23954	5D92h	E	1	FIX32	VD	4	Ra/Wa	
C0622	23953	5D91h	E	1	FIX32	VD	4	Ra/W	CINH
C0623	23952	5D90h	E	1	FIX32	VD	4	Ra	
C0630	23945	5D89h	E	1	FIX32	VD	4	Ra/Wa	
C0631	23944	5D88h	E	1	FIX32	VD	4	Ra/Wa	
C0632	23943	5D87h	E	1	FIX32	VD	4	Ra/W	CINH
C0633	23942	5D86h	E	1	FIX32	VD	4	Ra	
C0640	23935	5D7Fh	E	1	FIX32	VD	4	Ra/Wa	
C0641	23934	5D7Eh	E	1	FIX32	VD	4	Ra/W	CINH
C0642	23933	5D7Dh	E	1	FIX32	VD	4	Ra	
C0650	23925	5D75h	E	1	FIX32	VD	4	Ra/Wa	
C0651	23924	5D74h	E	1	FIX32	VD	4	Ra/Wa	
C0652	23923	5D73h	E	1	FIX32	VD	4	Ra/W	CINH
C0653	23922	5D72h	E	1	FIX32	VD	4	Ra/Wa	
C0654	23921	5D71h	E	1	FIX32	VD	4	Ra	
C0655	23920	5D70h	E	1	FIX32	VD	4	Ra/Wa	
C0656	23919	5D6Fh	E	1	FIX32	VD	4	Ra/Wa	
C0657	23918	5D6Eh	E	1	FIX32	VD	4	Ra/W	CINH
C0658	23917	5D6Dh	E	1	FIX32	VD	4	Ra	
C0661	23914	5D6Ah	E	1	FIX32	VD	4	Ra/W	CINH
C0662	23913	5D69h	E	1	FIX32	VD	4	Ra	
C0671	23904	5D60h	E	1	FIX32	VD	4	Ra/Wa	
C0672	23903	5D5Fh	E	1	FIX32	VD	4	Ra/Wa	
C0673	23902	5D5Eh	E	1	FIX32	VD	4	Ra/W	CINH
C0674	23901	5D5Dh	E	1	FIX32	VD	4	Ra/W	CINH
C0675	23900	5D5Ch	E	1	FIX32	VD	4	Ra/W	CINH
C0676	23899	5D5Bh	A	2	FIX32	VD	4	Ra	
C0677	23898	5D5Ah	E	1	FIX32	VD	4	Ra	
C0680	23895	5D57h	E	1	FIX32	VD	4	Ra/Wa	
C0681	23894	5D56h	E	1	FIX32	VD	4	Ra/Wa	
C0682	23893	5D55h	E	1	FIX32	VD	4	Ra/Wa	
C0683	23892	5D54h	A	2	FIX32	VD	4	Ra/W	CINH
C0684	23891	5D53h	A	2	FIX32	VD	4	Ra	
C0685	23890	5D52h	E	1	FIX32	VD	4	Ra/Wa	
C0686	23889	5D51h	E	1	FIX32	VD	4	Ra/Wa	
C0687	23888	5D50h	E	1	FIX32	VD	4	Ra/Wa	
C0688	23887	5D4Fh	A	2	FIX32	VD	4	Ra/W	CINH
C0689	23886	5D4Eh	A	2	FIX32	VD	4	Ra	
C0690	23885	5D4Dh	E	1	FIX32	VD	4	Ra/Wa	
C0691	23884	5D4Ch	E	1	FIX32	VD	4	Ra/Wa	
C0692	23883	5D4Bh	E	1	FIX32	VD	4	Ra/Wa	
C0693	23882	5D4Ah	A	2	FIX32	VD	4	Ra/W	CINH
C0694	23881	5D49h	A	2	FIX32	VD	4	Ra	
C0695	23880	5D48h	E	1	FIX32	VD	4	Ra/Wa	
C0697	23878	5D46h	A	2	FIX32	VD	4	Ra/W	CINH
C0698	23877	5D45h	A	2	I32	VH	4	Ra	
C0700	23875	5D43h	E	1	FIX32	VD	4	Ra/W	CINH
C0701	23874	5D42h	E	1	FIX32	VD	4	Ra	
C0703	23872	5D40h	E	1	FIX32	VD	4	Ra/W	CINH

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0704	23871	5D3Fh	E	1	FIX32	VD	4	Ra	
C0710	23865	5D39h	E	1	FIX32	VD	4	Ra/Wa	
C0711	23864	5D38h	E	1	FIX32	VD	4	Ra/Wa	
C0713	23862	5D36h	E	1	FIX32	VD	4	Ra/W	CINH
C0714	23861	5D35h	E	1	FIX32	VD	4	Ra	
C0715	23860	5D34h	E	1	FIX32	VD	4	Ra/Wa	
C0716	23859	5D33h	E	1	FIX32	VD	4	Ra/Wa	
C0718	23857	5D31h	E	1	FIX32	VD	4	Ra/W	CINH
C0719	23856	5D30h	E	1	FIX32	VD	4	Ra	
C0720	23855	5D2Fh	E	1	FIX32	VD	4	Ra/Wa	
C0721	23854	5D2Eh	E	1	FIX32	VD	4	Ra/Wa	
C0723	23852	5D2Ch	E	1	FIX32	VD	4	Ra/W	CINH
C0724	23851	5D2Bh	E	1	FIX32	VD	4	Ra	
C0725	23850	5D2Ah	E	1	FIX32	VD	4	Ra/Wa	
C0726	23849	5D29h	E	1	FIX32	VD	4	Ra/Wa	
C0728	23847	5D27h	E	1	FIX32	VD	4	Ra/W	CINH
C0729	23846	5D26h	E	1	FIX32	VD	4	Ra	
C0750	23825	5D11h	E	1	FIX32	VD	4	Ra/Wa	
C0751	23824	5D10h	E	1	FIX32	VD	4	Ra/Wa	
C0752	23823	5D0Fh	E	1	FIX32	VD	4	Ra/Wa	
C0753	23822	5D0Eh	E	1	FIX32	VD	4	Ra/Wa	
C0754	23821	5D0Dh	E	1	U32	VH	4	Ra/Wa	
C0755	23820	5D0Ch	E	1	FIX32	VD	4	Ra/Wa	
C0756	23819	5D0Bh	E	1	I32	VH	4	Ra/Wa	
C0757	23818	5D0Ah	E	1	FIX32	VD	4	Ra/Wa	
C0758	23817	5D09h	E	1	FIX32	VD	4	Ra/W	CINH
C0759	23816	5D08h	E	1	FIX32	VD	4	Ra/W	CINH
C0760	23815	5D07h	E	1	FIX32	VD	4	Ra/W	CINH
C0761	23814	5D06h	E	1	FIX32	VD	4	Ra/W	CINH
C0764	23811	5D03h	A	3	FIX32	VD	4	Ra	
C0765	23810	5D02h	E	1	FIX32	VD	4	Ra	
C0766	23809	5D01h	E	1	FIX32	VD	4	Ra/Wa	
C0770	23805	5CFDh	E	1	FIX32	VD	4	Ra/W	CINH
C0771	23804	5CFCh	E	1	FIX32	VD	4	Ra/W	CINH
C0772	23803	5CFBh	E	1	FIX32	VD	4	Ra/W	CINH
C0773	23802	5CFAh	A	3	FIX32	VD	4	Ra	
C0775	23800	5CF8h	E	1	FIX32	VD	4	Ra/W	CINH
C0776	23799	5CF7h	E	1	FIX32	VD	4	Ra/W	CINH
C0777	23798	5CF6h	E	1	FIX32	VD	4	Ra/W	CINH
C0778	23797	5CF5h	A	3	FIX32	VD	4	Ra	
C0780	23795	5CF3h	E	1	FIX32	VD	4	Ra/W	CINH
C0781	23794	5CF2h	E	1	FIX32	VD	4	Ra/W	CINH
C0782	23793	5CF1h	E	1	FIX32	VD	4	Ra/W	CINH
C0783	23792	5CF0h	E	1	FIX32	VD	4	Ra/W	CINH
C0784	23791	5CEFh	E	1	FIX32	VD	4	Ra/W	CINH
C0785	23790	5CEEh	E	1	FIX32	VD	4	Ra/W	CINH
C0786	23789	5CEDh	E	1	FIX32	VD	4	Ra/W	CINH
C0787	23788	5CECh	A	4	FIX32	VD	4	Ra/W	CINH
C0788	23787	5CEBh	A	4	FIX32	VD	4	Ra/W	CINH
C0789	23786	5CEAh	E	1	FIX32	VD	4	Ra/W	CINH
C0790	23785	5CE9h	E	1	FIX32	VD	4	Ra/W	CINH
C0798	23777	5CE1h	A	2	FIX32	VD	4	Ra	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0799	23776	5CE0h	A	13	FIX32	VD	4	Ra	
C0800	23775	5CDFh	E	1	FIX32	VD	4	Ra/W	CINH
C0801	23774	5CDEh	E	1	FIX32	VD	4	Ra/W	CINH
C0802	23773	5CDDh	E	1	FIX32	VD	4	Ra/W	CINH
C0803	23772	5CDCh	E	1	FIX32	VD	4	Ra/W	CINH
C0804	23771	5CDBh	E	1	FIX32	VD	4	Ra/W	CINH
C0805	23770	5CDAh	E	1	FIX32	VD	4	Ra/W	CINH
C0808	23767	5CD7h	A	4	FIX32	VD	4	Ra	
C0809	23766	5CD6h	A	2	FIX32	VD	4	Ra	
C0810	23765	5CD5h	A	2	FIX32	VD	4	Ra/W	CINH
C0811	23764	5CD4h	E	1	FIX32	VD	4	Ra/W	CINH
C0812	23763	5CD3h	A	2	FIX32	VD	4	Ra	
C0813	23762	5CD2h	E	1	FIX32	VD	4	Ra	
C0815	23760	5CD0h	A	2	FIX32	VD	4	Ra/W	CINH
C0816	23759	5CCFh	E	1	FIX32	VD	4	Ra/W	CINH
C0817	23758	5CCEh	A	2	FIX32	VD	4	Ra	
C0818	23757	5CCDh	E	1	FIX32	VD	4	Ra	
C0820	23755	5CCBh	A	3	FIX32	VD	4	Ra/W	CINH
C0821	23754	5CCAh	A	3	FIX32	VD	4	Ra	
C0822	23753	5CC9h	A	3	FIX32	VD	4	Ra/W	CINH
C0823	23752	5CC8h	A	3	FIX32	VD	4	Ra	
C0824	23751	5CC7h	A	3	FIX32	VD	4	Ra/W	CINH
C0825	23750	5CC6h	A	3	FIX32	VD	4	Ra	
C0826	23749	5CC5h	A	3	FIX32	VD	4	Ra/W	CINH
C0827	23748	5CC4h	A	3	FIX32	VD	4	Ra	
C0828	23747	5CC3h	A	3	FIX32	VD	4	Ra/W	CINH
C0829	23746	5CC2h	A	3	FIX32	VD	4	Ra	
C0830	23745	5CC1h	A	3	FIX32	VD	4	Ra/W	CINH
C0831	23744	5CC0h	A	3	FIX32	VD	4	Ra	
C0832	23743	5CBFh	A	3	FIX32	VD	4	Ra/W	CINH
C0833	23742	5CBEh	A	3	FIX32	VD	4	Ra	
C0834	23741	5CBDh	A	3	FIX32	VD	4	Ra/W	CINH
C0835	23740	5CBCh	A	3	FIX32	VD	4	Ra	
C0836	23739	5CBBh	A	3	FIX32	VD	4	Ra/W	CINH
C0837	23738	5CBAh	A	3	FIX32	VD	4	Ra	
C0838	23737	5CB9h	A	3	FIX32	VD	4	Ra/W	CINH
C0839	23736	5CB8h	A	3	FIX32	VD	4	Ra	
C0840	23735	5CB7h	E	1	FIX32	VD	4	Ra/W	CINH
C0841	23734	5CB6h	E	1	FIX32	VD	4	Ra	
C0842	23733	5CB5h	E	1	FIX32	VD	4	Ra/W	CINH
C0843	23732	5CB4h	E	1	FIX32	VD	4	Ra	
C0844	23731	5CB3h	E	1	FIX32	VD	4	Ra/W	CINH
C0845	23730	5CB2h	E	1	FIX32	VD	4	Ra	
C0846	23729	5CB1h	E	1	FIX32	VD	4	Ra/W	CINH
C0847	23728	5CB0h	E	1	FIX32	VD	4	Ra	
C0848	23727	5CAFh	E	1	FIX32	VD	4	Ra/W	CINH
C0849	23726	5CAEh	E	1	FIX32	VD	4	Ra	
C0850	23725	5CADh	A	3	FIX32	VD	4	Ra/W	CINH
C0851	23724	5CACh	E	1	FIX32	VD	4	Ra/W	CINH
C0852	23723	5CABh	E	1	FIX32	VD	4	Ra/Wa	
C0853	23722	5CAAh	E	1	FIX32	VD	4	Ra/Wa	
C0854	23721	5CA9h	E	1	FIX32	VD	4	Ra/Wa	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0855	23720	5CA8h	A	2	B16	VH	2	Ra	
C0856	23719	5CA7h	A	3	I32	VH	4	Ra	
C0857	23718	5CA6h	E	1	I32	VH	4	Ra	
C0858	23717	5CA5h	A	3	I32	VH	4	Ra	
C0859	23716	5CA4h	E	1	I32	VH	4	Ra	
C0860	23715	5CA3h	A	11	FIX32	VD	4	Ra/W	CINH
C0861	23714	5CA2h	A	3	FIX32	VD	4	Ra/W	CINH
C0863	23712	5CA0h	A	6	B16	VH	2	Ra	
C0864	23711	5C9Fh	A	3	FIX32	VD	4	Ra/Wa	
C0865	23710	5C9Eh	A	3	FIX32	VD	4	Ra/Wa	
C0866	23709	5C9Dh	A	11	FIX32	VD	4	Ra	
C0867	23708	5C9Ch	A	3	I32	VH	4	Ra	
C0868	23707	5C9Bh	A	11	FIX32	VD	4	Ra	
C0869	23706	5C9Ah	A	3	I32	VH	4	Ra	
C0870	23705	5C99h	A	2	FIX32	VD	4	Ra/W	CINH
C0871	23704	5C98h	E	1	FIX32	VD	4	Ra/W	CINH
C0876	23699	5C93h	E	1	FIX32	VD	4	Ra/W	CINH
C0878	23697	5C91h	A	4	FIX32	VD	4	Ra	
C0879	23696	5C90h	A	3	FIX32	VD	4	Ra/Wa	
C0880	23695	5C8Fh	A	2	FIX32	VD	4	Ra/W	CINH
C0881	23694	5C8Eh	E	1	FIX32	VD	4	Ra/W	CINH
C0884	23691	5C8Bh	A	3	FIX32	VD	4	Ra	
C0885	23690	5C8Ah	E	1	FIX32	VD	4	Ra/W	CINH
C0886	23689	5C89h	E	1	FIX32	VD	4	Ra/W	CINH
C0889	23686	5C86h	A	2	FIX32	VD	4	Ra	
C0890	23685	5C85h	E	1	FIX32	VD	4	Ra/W	CINH
C0891	23684	5C84h	E	1	FIX32	VD	4	Ra/W	CINH
C0892	23683	5C83h	E	1	FIX32	VD	4	Ra/W	CINH
C0893	23682	5C82h	E	1	FIX32	VD	4	Ra/W	CINH
C0894	23681	5C81h	E	1	FIX32	VD	4	Ra/W	CINH
C0895	23680	5C80h	E	1	FIX32	VD	4	Ra/W	CINH
C0896	23679	5C7Fh	E	1	FIX32	VD	4	Ra/W	CINH
C0897	23678	5C7Eh	E	1	FIX32	VD	4	Ra/W	CINH
C0898	23677	5C7Dh	E	1	FIX32	VD	4	Ra/W	CINH
C0899	23676	5C7Ch	E	1	FIX32	VD	4	Ra/W	CINH
C0900	23675	5C7Bh	E	1	FIX32	VD	4	Ra/W	CINH
C0901	23674	5C7Ah	E	1	FIX32	VD	4	Ra/W	CINH
C0902	23673	5C79h	E	1	FIX32	VD	4	Ra/W	CINH
C0903	23672	5C78h	E	1	FIX32	VD	4	Ra/W	CINH
C0906	23669	5C75h	A	9	FIX32	VD	4	Ra	
C0907	23668	5C74h	A	4	FIX32	VD	4	Ra	
C0908	23667	5C73h	E	1	I32	VH	4	Ra	
C0909	23666	5C72h	E	1	FIX32	VD	4	Ra/Wa	
C0920	23655	5C67h	E	1	FIX32	VD	4	Ra/W	CINH
C0921	23654	5C66h	E	1	FIX32	VD	4	Ra/W	CINH
C0922	23653	5C65h	E	1	FIX32	VD	4	Ra/W	CINH
C0923	23652	5C64h	E	1	FIX32	VD	4	Ra/W	CINH
C0924	23651	5C63h	E	1	FIX32	VD	4	Ra/W	CINH
C0925	23650	5C62h	E	1	FIX32	VD	4	Ra/W	CINH
C0926	23649	5C61h	A	4	I32	VH	4	Ra	
C0927	23648	5C60h	A	3	FIX32	VD	4	Ra	
C0928	23647	5C5Fh	E	1	I32	VH	4	Ra	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0929	23646	5C5Eh	E	1	FIX32	VD	4	Ra	
C0930	23645	5C5Dh	E	1	FIX32	VD	4	Ra/W	CINH
C0931	23644	5C5Ch	E	1	FIX32	VD	4	Ra/W	CINH
C0932	23643	5C5Bh	E	1	FIX32	VD	4	Ra/Wa	
C0933	23642	5C5Ah	E	1	FIX32	VD	4	Ra/Wa	
C0934	23641	5C59h	E	1	I32	VH	4	Ra/Wa	
C0935	23640	5C58h	E	1	FIX32	VD	4	Ra/Wa	
C0936	23639	5C57h	E	1	FIX32	VD	4	Ra/Wa	
C0940	23635	5C53h	E	1	FIX32	VD	4	Ra/Wa	
C0941	23634	5C52h	E	1	FIX32	VD	4	Ra/Wa	
C0942	23633	5C51h	E	1	FIX32	VD	4	Ra/W	CINH
C0943	23632	5C50h	E	1	FIX32	VD	4	Ra	
C0945	23630	5C4Eh	E	1	FIX32	VD	4	Ra/Wa	
C0946	23629	5C4Dh	E	1	FIX32	VD	4	Ra/Wa	
C0947	23628	5C4Ch	E	1	FIX32	VD	4	Ra/W	CINH
C0948	23627	5C4Bh	E	1	FIX32	VD	4	Ra	
C0950	23625	5C49h	E	1	FIX32	VD	4	Ra/Wa	
C0951	23624	5C48h	E	1	FIX32	VD	4	Ra/Wa	
C0952	23623	5C47h	E	1	FIX32	VD	4	Ra/W	CINH
C0953	23622	5C46h	E	1	FIX32	VD	4	Ra	
C0955	23620	5C44h	E	1	FIX32	VD	4	Ra/Wa	
C0956	23619	5C43h	E	1	FIX32	VD	4	Ra/Wa	
C0957	23618	5C42h	E	1	FIX32	VD	4	Ra/W	CINH
C0958	23617	5C41h	E	1	FIX32	VD	4	Ra	
C0960	23615	5C3Fh	E	1	FIX32	VD	4	Ra/Wa	
C0961	23614	5C3Eh	E	1	FIX32	VD	4	Ra/Wa	
C0962	23613	5C3Dh	E	1	FIX32	VD	4	Ra/Wa	
C0963	23612	5C3Ch	E	1	FIX32	VD	4	Ra/Wa	
C0964	23611	5C3Bh	E	1	FIX32	VD	4	Ra/Wa	
C0965	23610	5C3Ah	E	1	FIX32	VD	4	Ra/Wa	
C0966	23609	5C39h	E	1	FIX32	VD	4	Ra/Wa	
C0967	23608	5C38h	E	1	FIX32	VD	4	Ra/W	CINH
C0968	23607	5C37h	E	1	FIX32	VD	4	Ra	
C0970	23605	5C35h	E	1	FIX32	VD	4	Ra/W	CINH
C0971	23604	5C34h	E	1	FIX32	VD	4	Ra/W	CINH
C0972	23603	5C33h	E	1	FIX32	VD	4	Ra/W	CINH
C0973	23602	5C32h	E	1	FIX32	VD	4	Ra/W	CINH
C0974	23601	5C31h	E	1	FIX32	VD	4	Ra/W	CINH
C0975	23600	5C30h	E	1	FIX32	VD	4	Ra/W	CINH
C0976	23599	5C2Fh	E	1	FIX32	VD	4	Ra/W	CINH
C0977	23598	5C2Eh	E	1	FIX32	VD	4	Ra/W	CINH
C0978	23597	5C2Dh	E	1	FIX32	VD	4	Ra/W	CINH
C0980	23595	5C2Bh	E	1	FIX32	VD	4	Ra/Wa	
C0981	23594	5C2Ah	E	1	FIX32	VD	4	Ra/Wa	
C0982	23593	5C29h	E	1	FIX32	VD	4	Ra/Wa	
C0983	23592	5C28h	E	1	FIX32	VD	4	Ra/Wa	
C0988	23587	5C23h	A	7	FIX32	VD	4	Ra	
C0989	23586	5C22h	A	2	FIX32	VD	4	Ra	
C0990	23585	5C21h	E	1	FIX32	VD	4	Ra/W	CINH
C0991	23584	5C20h	E	1	FIX32	VD	4	Ra/W	CINH
C0992	23583	5C1Fh	E	1	FIX32	VD	4	Ra	
C0993	23582	5C1Eh	E	1	FIX32	VD	4	Ra	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0995	23580	5C1Ch	E	1	FIX32	VD	4	Ra/Wa	
C0996	23579	5C1Bh	E	1	FIX32	VD	4	Ra/W	CINH
C0997	23578	5C1Ah	E	1	I32	VH	4	Ra	
C1000	23575	5C17h	E	1	FIX32	VD	4	Ra/Wa	
C1001	23574	5C16h	E	1	FIX32	VD	4	Ra/W	CINH
C1002	23573	5C15h	E	1	I32	VH	4	Ra	
C1010	23565	5C0Dh	E	1	FIX32	VD	4	Ra/Wa	
C1011	23564	5C0Ch	A	2	FIX32	VD	4	Ra/W	CINH
C1012	23563	5C0Bh	A	2	I32	VH	4	Ra	
C1030	23545	5BF9h	E	1	FIX32	VD	4	Ra/W	CINH
C1031	23544	5BF8h	E	1	FIX32	VD	4	Ra/W	CINH
C1032	23543	5BF7h	E	1	FIX32	VD	4	Ra	
C1033	23542	5BF6h	E	1	FIX32	VD	4	Ra	
C1040	23535	5BEFh	E	1	FIX32	VD	4	Ra/Wa	
C1041	23534	5BEEh	E	1	FIX32	VD	4	Ra/Wa	
C1042	23533	5BEDh	E	1	FIX32	VD	4	Ra/W	CINH
C1043	23532	5BECh	E	1	FIX32	VD	4	Ra/W	CINH
C1044	23531	5BEBh	E	1	FIX32	VD	4	Ra/W	CINH
C1045	23530	5BEAh	A	2	FIX32	VD	4	Ra	
C1046	23529	5BE9h	E	1	FIX32	VD	4	Ra	
C1090	23485	5BBDh	E	1	I32	VH	4	Ra	
C1091	23484	5BBCh	E	1	FIX32	VD	4	Ra/Wa	
C1092	23483	5BBBh	E	1	FIX32	VD	4	Ra/Wa	
C1093	23482	5BBAh	E	1	FIX32	VD	4	Ra/Wa	
C1094	23481	5BB9h	E	1	FIX32	VD	4	Ra/Wa	
C1095	23480	5BB8h	E	1	I32	VH	4	Ra/Wa	
C1096	23479	5BB7h	E	1	FIX32	VD	4	Ra/W	CINH
C1097	23478	5BB6h	E	1	FIX32	VD	4	Ra/W	CINH
C1098	23477	5BB5h	E	1	FIX32	VD	4	Ra	
C1099	23476	5BB4h	E	1	FIX32	VD	4	Ra	
C1100	23475	5BB3h	E	1	FIX32	VD	4	Ra/Wa	
C1101	23474	5BB2h	A	2	FIX32	VD	4	Ra/W	CINH
C1102	23473	5BB1h	A	3	FIX32	VD	4	Ra/W	CINH
C1103	23472	5BB0h	A	2	FIX32	VD	4	Ra	
C1104	23471	5BAFh	A	3	FIX32	VD	4	Ra	
C1120	23455	5B9Fh	E	1	FIX32	VD	4	Ra/Wa	
C1121	23454	5B9Eh	A	2	FIX32	VD	4	Ra/Wa	
C1122	23453	5B9Dh	E	1	FIX32	VD	4	Ra/Wa	
C1123	23452	5B9Ch	A	2	FIX32	VD	4	Ra/Wa	
C1124	23451	5B9Bh	E	1	FIX32	VD	4	Ra/W	CINH
C1125	23450	5B9Ah	E	1	FIX32	VD	4	Ra/W	CINH
C1126	23449	5B99h	E	1	FIX32	VD	4	Ra/W	CINH
C1127	23448	5B98h	E	1	I32	VH	4	Ra	
C1128	23447	5B97h	E	1	I32	VH	4	Ra	
C1129	23446	5B96h	E	1	I32	VH	4	Ra	
C1140	23435	5B8Bh	E	1	FIX32	VD	4	Ra/Wa	
C1141	23434	5B8Ah	E	1	FIX32	VD	4	Ra/Wa	
C1143	23432	5B88h	E	1	FIX32	VD	4	Ra/W	CINH
C1144	23431	5B87h	E	1	FIX32	VD	4	Ra	
C1145	23430	5B86h	E	1	FIX32	VD	4	Ra/Wa	
C1146	23429	5B85h	E	1	FIX32	VD	4	Ra/Wa	
C1148	23427	5B83h	E	1	FIX32	VD	4	Ra/W	CINH

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C1149	23426	5B82h	E	1	FIX32	VD	4	Ra	
C1150	23425	5B81h	E	1	FIX32	VD	4	Ra/Wa	
C1151	23424	5B80h	E	1	I32	VH	4	Ra/Wa	
C1153	23422	5B7Eh	E	1	FIX32	VD	4	Ra/W	CINH
C1154	23421	5B7Dh	E	1	FIX32	VD	4	Ra/W	CINH
C1155	23420	5B7Ch	E	1	FIX32	VD	4	Ra/W	CINH
C1157	23418	5B7Ah	E	1	FIX32	VD	4	Ra	
C1158	23417	5B79h	E	1	FIX32	VD	4	Ra	
C1159	23416	5B78h	E	1	I32	VH	4	Ra	
C1160	23415	5B77h	A	2	FIX32	VD	4	Ra/W	CINH
C1161	23414	5B76h	E	1	FIX32	VD	4	Ra/W	CINH
C1162	23413	5B75h	A	2	FIX32	VD	4	Ra	
C1163	23412	5B74h	E	1	FIX32	VD	4	Ra	
C1165	23410	5B72h	A	2	FIX32	VD	4	Ra/W	CINH
C1166	23409	5B71h	E	1	FIX32	VD	4	Ra/W	CINH
C1167	23408	5B70h	A	2	FIX32	VD	4	Ra	
C1168	23407	5B6Fh	E	1	FIX32	VD	4	Ra	
C1170	23405	5B6Dh	E	1	FIX32	VD	4	Ra/Wa	
C1171	23404	5B6Ch	E	1	FIX32	VD	4	Ra/Wa	
C1172	23403	5B6Bh	E	1	FIX32	VD	4	Ra/W	CINH
C1173	23402	5B6Ah	E	1	FIX32	VD	4	Ra	
C1175	23400	5B68h	A	3	FIX32	VD	4	Ra/W	CINH
C1176	23399	5B67h	A	3	FIX32	VD	4	Ra	
C1178	23397	5B65h	A	3	FIX32	VD	4	Ra/W	CINH
C1179	23396	5B64h	A	3	FIX32	VD	4	Ra	
C1190	23385	5B59h	E	1	FIX32	VD	4	Ra/Wa	
C1191	23384	5B58h	A	2	FIX32	VD	4	Ra/Wa	
C1192	23383	5B57h	A	2	FIX32	VD	4	Ra/Wa	
C1195	23380	5B54h	E	1	FIX32	VD	4	Ra/W	CINH
C1196	23379	5B53h	E	1	I32	VH	4	Ra	
C1197	23378	5B52h	E	1	I32	VH	4	Ra	
C1200	23375	5B4Fh	A	3	FIX32	VD	4	Ra/W	CINH
C1201	23374	5B4Eh	A	3	I32	VH	4	Ra	
C1205	23370	5B4Ah	A	2	FIX32	VD	4	Ra/W	CINH
C1206	23369	5B49h	A	2	I32	VH	4	Ra	
C1207	23368	5B48h	E	1	FIX32	VD	4	Ra/Wa	
C1210	23365	5B45h	A	5	FIX32	VD	4	Ra/W	CINH
C1211	23364	5B44h	A	2	FIX32	VD	4	Ra/W	CINH
C1212	23363	5B43h	E	1	FIX32	VD	4	Ra/W	CINH
C1215	23360	5B40h	A	5	FIX32	VD	4	Ra	
C1216	23359	5B3Fh	A	2	FIX32	VD	4	Ra	
C1217	23358	5B3Eh	E	1	I32	VH	4	Ra	
C1220	23355	5B3Bh	A	2	FIX32	VD	4	Ra/W	CINH
C1223	23352	5B38h	A	2	FIX32	VD	4	Ra	
C1230	23345	5B31h	A	2	FIX32	VD	4	Ra/W	CINH
C1231	23344	5B30h	E	1	FIX32	VD	4	Ra/W	CINH
C1232	23343	5B2Fh	A	2	FIX32	VD	4	Ra/W	CINH
C1235	23340	5B2Ch	A	2	FIX32	VD	4	Ra	
C1236	23339	5B2Bh	E	1	FIX32	VD	4	Ra	
C1237	23338	5B2Ah	A	2	I32	VH	4	Ra	
C1240	23335	5B27h	A	2	FIX32	VD	4	Ra/W	CINH
C1241	23334	5B26h	E	1	FIX32	VD	4	Ra/W	CINH

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C1242	23333	5B25h	E	1	FIX32	VD	4	Ra/W	CINH
C1245	23330	5B22h	A	2	FIX32	VD	4	Ra	
C1246	23329	5B21h	E	1	FIX32	VD	4	Ra	
C1247	23328	5B20h	E	1	I32	VH	4	Ra	
C1250	23325	5B1Dh	E	1	FIX32	VD	4	Ra/W	CINH
C1251	23324	5B1Ch	A	2	FIX32	VD	4	Ra/W	CINH
C1253	23322	5B1Ah	E	1	FIX32	VD	4	Ra	
C1254	23321	5B19h	A	2	I32	VH	4	Ra	
C1255	23320	5B18h	E	1	FIX32	VD	4	Ra/W	CINH
C1258	23317	5B15h	E	1	FIX32	VD	4	Ra	
C1260	23315	5B13h	E	1	FIX32	VD	4	Ra/W	CINH
C1261	23314	5B12h	E	1	FIX32	VD	4	Ra/W	CINH
C1262	23313	5B11h	E	1	FIX32	VD	4	Ra/W	CINH
C1265	23310	5B0Eh	E	1	FIX32	VD	4	Ra/W	CINH
C1266	23309	5B0Dh	E	1	FIX32	VD	4	Ra/W	CINH
C1268	23307	5B0Bh	E	1	FIX32	VD	4	Ra	
C1269	23306	5B0Ah	E	1	I32	VH	4	Ra	
C1270	23305	5B09h	A	2	FIX32	VD	4	Ra/W	CINH
C1271	23304	5B08h	A	2	I32	VH	4	Ra	
C1272	23303	5B07h	E	1	FIX32	VD	4	Ra/Wa	
C1290	23285	5AF5h	E	1	FIX32	VD	4	Ra/Wa	
C1500	23075	5A23h	E	1	I32	VH	4	Ra	
C1501	23074	5A22h	E	1	FIX32	VD	4	Ra/Wa	
C1502	23073	5A21h	E	1	FIX32	VD	4	Ra/Wa	
C1503	23072	5A20h	E	1	FIX32	VD	4	Ra/Wa	
C1504	23071	5A1Fh	E	1	FIX32	VD	4	Ra/Wa	
C1505	23070	5A1Eh	E	1	I32	VH	4	Ra/Wa	
C1506	23069	5A1Dh	E	1	FIX32	VD	4	Ra/W	CINH
C1507	23068	5A1Ch	E	1	FIX32	VD	4	Ra/W	CINH
C1508	23067	5A1Bh	E	1	FIX32	VD	4	Ra	
C1509	23066	5A1Ah	E	1	FIX32	VD	4	Ra	
C1799	22776	58F8h	E	1	FIX32	VD	4	Ra/Wa	

9.5.3 Motor selection lists

Servo motors

The following table contains all servo motors which can be selected via code C0086.

The "Reference list of servo motors" contains the servo motors, the data of which must be entered manually. (9-317)

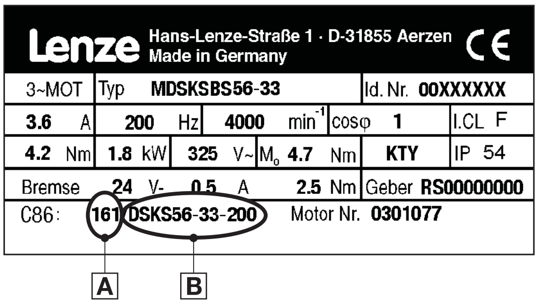


Fig. 9-191 Nameplate of a Lenze motor

A	B	Lenze type designation	C0081 P_r [kW]	C0087 n_r [rpm]	C0088 I_r [A]	C0089 f_r [Hz]	C0090 U_r [V]	Motor type	Temperature sensor
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 designation	C0081 P_r [kW]	C0087 n_r [rpm]	C0088 I_r [A]	C0089 f_r [Hz]	C0090 U_r [V]	Motor type	Temperature sensor
50	DSVA56-140	DSVAXX056-22	0.80	3950	2.4	140	390	Asynchronous servo motor	(Thermal contact)
51	DFVA71-120	DFVAXX071-22	2.20	3410	6.0	120			
52	DSVA71-140	DSVAXX071-22	1.70	4050	4.4	140			
53	DFVA80-60	DFVAXX080-22	2.10	1635	4.8	60			
54	DSVA80-70	DSVAXX080-22	1.40	2000	3.3	70			
55	DFVA80-120	DFVAXX080-22	3.90	3455	9.1	120			
56	DSVA80-140	DSVAXX080-22	2.30	4100	5.8	140			
57	DFVA90-60	DFVAXX090-22	3.80	1680	8.5	60			
58	DSVA90-80	DSVAXX090-22	2.60	2300	5.5	80			
59	DFVA90-120	DFVAXX090-22	6.90	3480	15.8	120			
60	DSVA90-140	DSVAXX090-22	4.10	4110	10.2	140	350		
61	DFVA100-60	DFVAXX100-22	6.40	1700	13.9	60	390		
62	DSVA100-80	DSVAXX100-22	4.00	2340	8.2	80			
63	DFVA100-120	DFVAXX100-22	13.20	3510	28.7	120			
64	DSVA100-140	DSVAXX100-22	5.20	4150	14.0	140	330		
65	DFVA112-60	DFVAXX112-22	11.00	1710	22.5	60	390		
66	DSVA112-85	DSVAXX112-22	6.40	2490	13.5	85			
67	DFVA112-120	DFVAXX112-22	20.30	3520	42.5	120			
68	DSVA112-140	DSVAXX112-22	7.40	4160	19.8	140	320		
108	DSKS36-13-200	MDSKSXX036-13	0.25	4000	0.9	200	245	Synchronous servo motor	KTY
109	DSKS36-23-200	MDSKSXX036-23	0.54	4000	1.1	200	345		
110	MDSKS56-23-150	MDSKSXX056-23	0.60	3000	1.25	150	350		
111	MDSKS56-33-150	MDSKSXX056-33	0.91	3000	2.0	150	340		
112	MDSKS71-13-150	MDSKSXX071-13	1.57	3000	3.1	150	360		
113	MDFKS71-13-150	MDFKSXX071-13	2.29	3000	4.35	150	385		
114	MDSKS71-23-150	MDSKSXX071-23	2.33	3000	4.85	150	360		
115	MDFKS71-23-150	MDFKSXX071-23	3.14	3000	6.25	150	375		
116	MDSKS71-33-150	MDSKSXX071-33	3.11	3000	6.7	150	330		
117	MDFKS71-33-150	MDFKSXX071-33	4.24	3000	9.1	150	345		
160	DSKS56-23-190	MDSKSXX056-23	1.1	3800	2.3	190	330		
161	DSKS56-33-200	MDSKSXX056-33	1.8	4000	3.6	200	325		
162	DSKS71-03-170	MDSKSXX071-03	2.0	3400	4.2	170	330		
163	DFKS71-03-165	MDFKSXX071-03	2.6	3300	5.6	165	330		
164	DSKS71-13-185	MDSKSXX071-13	3.2	3700	7.0	185	325		
165	DFKS71-13-180	MDFKSXX071-13	4.1	3600	9.2	180	325		
166	DSKS71-33-180	MDSKSXX071-33	4.6	3600	10.0	180	325		
167	DFKS71-33-175	MDFKSXX071-33	5.9	3500	13.1	175	325		

Reference list of servo motors

The motors listed under “Nameplate data” are not available in Global Drive Control (GDC) and the device software.

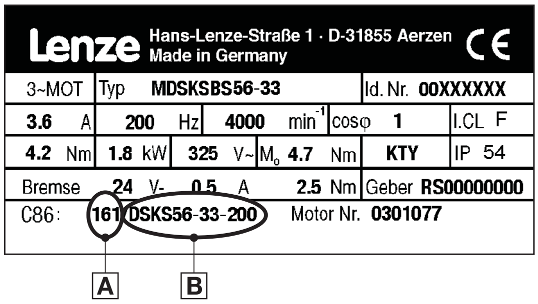
1. Enter the corresponding value listed under ”C0086” into the code C0086.
2. Compare the codes for the motor data with the values in the table.
   – If necessary, adapt the values in the controller to the values in the table.
3. If necessary, optimise the dynamic behaviour of your machine with the codes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

Nameplate data		**Data input**													
Field: C86	Field: Type	**C0086**	**C0022** Imax [A]	**C0081** P_r [kW]	**C0084** R_s [Ω]	**C0085** $L\sigma$ [mH]	**C0087** n_r [rpm]	**C0088** I_r [A]	**C0089** f_r [Hz]	**C0090** U_r [V]	**C0091** cos φ	**C0070** V_{pn}	**C0071** T_{nn}	**C0075** V_{pi}	**C0076** T_{ni}
1000	MDSKA-71-22	54	3.75	0.88	8.4	34.98	1950	2.50	70	390	0.82	2	100	1.5	1.5
1001	MDFQA-112-12	33	42.60	12.90	0.45	4.3	1660	28.40	58	360	0.85	20	21	2	1
1002	MDFQA-112-12	41	70.50	21.80	0.45	4.3	2930	47.00	100	360	0.83	14	21	1.3	1
1003	MDSKA-56-22	50	6.75	1.57	2.25	6.5	6000	4.50	202	280	0.72	3	50	1.3	1.5
1004	MDSKS071-33-39	112	5.10	0.95	7.2	34.5	780	3.40	39	325	1.00	3	20	2.5	1.5
1005	MDSKS071-33-41	112	2.25	0.45	16.3	68	820	1.50	41	330	1.00	2	20	2.5	1.5
1076	MDSKS071-33-90	112	5.85	1.60	3.67	17.7	1800	3.90	90	310	1.00	10	20	0.7	1.7
1077	MDSKA-71-22	51	2.18	0.33	35.7	131.8	725	1.45	30	360	0.78	10	70	1.5	2
1103	SDSGA056-22	50	1.20	0.24	29.3	123	2790	0.80	100	390	0.71	14	150	0.35	1.8
1104	SDSGA056-22	40	2.55	0.24	29.3	123	2790	1.70	100	230	0.71	14	150	0.35	1.8
1105	SDSGA063-22	50	1.80	0.40	29.3	123	2800	1.20	100	390	0.70	14	150	0.35	1.8
1106	SDSGA063-22	40	3.15	0.40	29.3	123	2800	2.10	100	230	0.70	14	150	0.35	1.8
1107	SDSGA063-32	50	2.55	0.60	29.3	123	2800	1.70	100	390	0.70	14	150	0.35	1.8
1108	SDSGA063-32	40	4.50	0.6	29.3	123	2800	3	100	230	0.70	14	150	0.35	1.8
1109	MDSKS056-23-280	114	8.00	1.10	6.72	8.34	5600	2.30	280	320	1.00	10	20	1.3	1.5
1110	MDSKS056-23-310	114	9.00	1.10	5.42	6.78	6200	2.30	310	320	1.00	10	20	1.3	1.5
1111	MDSKS056-33-300	114	10.00	1.75	3.31	4.62	6000	3.60	300	320	1.00	10	20	1.3	1.5
1112	MDSKS056-33-265	114	8.00	1.72	4.1	5.73	5300	3.60	265	320	1.00	10	20	1.3	1.5
1113	MDSKS071-13-265	114	23.00	3.20	0.54	2.56	5300	7.00	265	320	1.00	10	20	1.3	1.5
1116	MDSKS071-33-270	114	25.00	5.70	0.38	1.91	5400	12.50	270	320	1.00	10	20	1.3	1.5

Three-phase asynchronous motors

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

The ”Reference list of asynchronous motors” contains the asynchronous motors, the data of which must be entered manually. (📖 9-320)



9300VEC058

Fig. 9-192 Nameplate of a Lenze motor

A	B	Lenze type designation	C0081 P_r [kW]	C0087 n_r [rpm]	C0088 I_r [A]	C0089 f_r [Hz]	C0090 U_r [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				

A	B	Lenze type designation	C0081 P_r [kW]	C0087 n_r [rpm]	C0088 I_r [A]	C0089 f_r [Hz]	C0090 U_r [V]	Motor type	Temperature sensor
250	DXRAXX071-12-87	DXRAXX071-12	0.43	2525	1.5				
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				Thermal contact
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	87	400	Asynchronous inverter motor (delta connection)	
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-50	-	52.00	2546	90.0				
266	37kW-ASM-50	-	64.00	2546	114.0				
267	45kW-ASM-50	-	78.00	2563	142.0				–
268	55kW-ASM-50	-	95.00	2563	161.0				
269	75kW-ASM-50	-	130.00	2563	228.0				

Reference list of asynchronous motors

The motors listed under “Nameplate data” 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 with the codes C0070 and C0071.

Nameplate data		Data input													
Field: C86	Field: Type	C0086	C0022 Imax [A]	C0081 P_r [kW]	C0084 R_s [Ω]	C0085 $L\sigma$ [mH]	C0087 n_r [rpm]	C0088 I_r [A]	C0089 f_r [Hz]	C0090 U_r [V]	C0091 cos φ	C0070 V_{pn}	C0071 T_{nn}	C0075 V_{pi}	C0076 T_{ni}
410	MDXMAXM-071-12	210	1.23	0.25	35.80	116.80	1400	0.82	50	400	0.70	6	300	1.5	10
411	MDXMAXM-071-32	211	1.80	0.37	27.00	112.70	1400	1.20	50	400	0.71	6	300	1.5	10
412	MDXMAXM-080-12	212	2.40	0.55	16.30	78.60	1400	1.60	50	400	0.72	6	300	1.5	10
413	MDXMAXM-080-32	213	3.00	0.75	11.20	59.30	1380	2.00	50	400	0.76	6	300	1.5	10
414	MDXMAXM-090-12	214	3.90	1.10	9.14	41.80	1410	2.60	50	400	0.80	6	300	1.5	10
415	MDXMAXM-090-32	215	5.25	1.50	5.10	27.70	1420	3.50	50	400	0.80	6	300	1.5	10
416	MDXMAXM-100-12	216	8.40	2.20	2.96	18.20	1400	5.60	50	400	0.78	6	300	1.5	10
417	MDXMAXM-100-32	217	10.95	3.00	2.20	13.40	1400	7.30	50	400	0.81	6	300	1.5	10
418	MDXMAXM-112-22	218	12.75	4.00	1.50	10.80	1430	8.50	50	400	0.85	6	300	1.5	10
440	MDXMAXM-071-12	250	2.10	0.43	35.8	116.80	2510	1.40	87	400	0.70	6	300	1.5	10
441	MDXMAXM-071-32	251	3.15	0.64	27.0	112.70	2510	2.10	87	400	0.71	6	300	1.5	10
442	MDXMAXM-080-12	252	4.20	0.95	16.3	78.60	2510	2.80	87	400	0.72	6	300	1.5	10
443	MDXMAXM-080-32	253	5.25	1.30	11.2	59.30	2490	3.50	87	400	0.76	6	300	1.5	10
444	MDXMAXM-090-12	254	6.75	2.00	9.14	41.80	2520	4.50	87	400	0.80	6	300	1.5	10
445	MDXMAXM-090-32	255	9.15	2.70	5.1	27.70	2530	6.10	87	400	0.78	6	300	1.5	10
446	MDXMAXM-100-12	256	14.55	3.90	2.96	18.20	2510	9.70	87	400	0.81	6	300	1.5	10
447	MDXMAXM-100-32	257	19.05	5.40	2.2	13.40	2510	12.70	87	400	0.85	6	300	1.5	10
448	MDXMAXM-112-22	258	22.20	7.10	1.5	10.80	2540	14.80	87	400	0.78	6	300	1.5	10
449	MDXMAXM-112-32	259	18.75	5.50	2.45	21.40	1440	12.50	50	400	0.78	6	300	1.5	10
450	MDXMAXM-132-22	259	25.20	7.50	1.42	15.00	1460	16.80	50	400	0.77	6	300	1.5	10
451	MDXMAXM-132-32	259	29.25	9.20	1.34	14.00	1450	19.50	50	400	0.85	6	300	1.5	10
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

Nameplate data		Data input													
Field: C86	Field: Type	C0086	C0022 Imax [A]	C0081 P_r [kW]	C0084 R_s [Ω]	C0085 $L\sigma$ [mH]	C0087 n_r [rpm]	C0088 I_r [A]	C0089 f_r [Hz]	C0090 U_r [V]	C0091 cos φ	C0070 V_{pn}	C0071 T_{nn}	C0075 V_{pi}	C0076 T_{ni}
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
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
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

Nameplate data		Data input													
Field: C86	Field: Type	**C0086**	**C0022** Imax [A]	**C0081** P_r [kW]	**C0084** R_s [Ω]	**C0085** $L\sigma$ [mH]	**C0087** n_r [rpm]	**C0088** I_r [A]	**C0089** f_r [Hz]	**C0090** U_r [V]	**C0091** cos φ	**C0070** V_{pn}	**C0071** T_{nn}	**C0075** V_{pi}	**C0076** T_{ni}
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

EDSVS9332S-E
13181650

Lenze

System Manual
Part E

Troubleshooting and fault elimination

Global Drive
9300 servo inverter

This documentation is valid for the 9300 servo inverters of the versions:

	①				②	③
EVS	**9326**	**-**	**E**	**E**	**2x**	**2x**

Type

Power

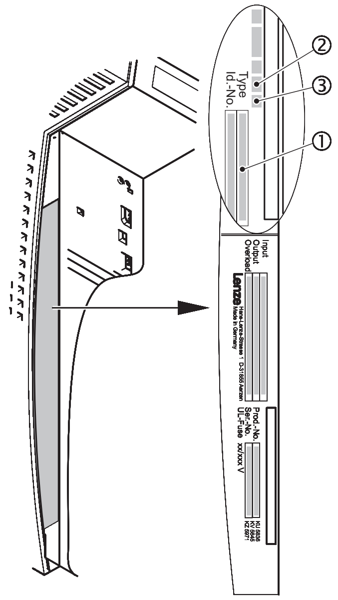
	400 V	480 V
9321 =	0.37 kW	0.37 kW
9322 =	0.75 kW	0.75 kW
9323 =	1.5 kW	1.5 kW
9324 =	3.0 kW	3.0 kW
9325 =	5.5 kW	5.5 kW
9326 =	11 kW	7.1 kW
9327 =	15 kW	18.5 kW
9328 =	22 kW	30 kW
9329 =	30 kW	37 kW
9330 =	45 kW	45 kW
9331 =	55 kW	55 kW
9332 =	75 kW	90 kW

Design
E = Built-in unit
C = Cold Plate

S = 9300 servo inverter

Hardware version

Software version



3.0 11/2006

10 Troubleshooting and fault elimination

- You can see immediately if a fault has occurred from the display elements or status information.
- The fault can be analysed with
  – the history buffer in Global Drive Control (GDC) (📖 10-3) or
  – the XT keypad (📖 7-10)
  – and by means of the list “Fault indications” (📖 10-6)
- The list “Fault indications” indicates how to eliminate faults.

10.1 Troubleshooting

Display on the controller

Two LEDs at the front of the controller indicate the controller status.

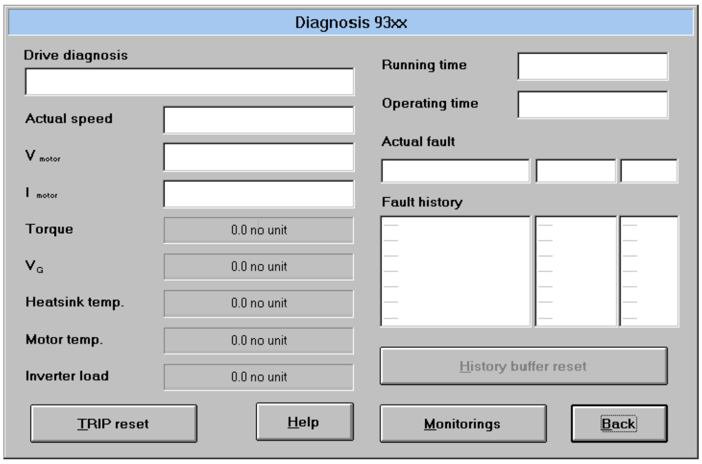
LED green	LED red	Cause	Check
■	□	Controller enabled; no fault	
★	□	Controller inhibit, switch-on inhibit	C0183; or C0168/1
□	★	Fail	C0168/1
■	★	Warning, fail-QSP	C0168/1

■ : on □ : off ★: blinking

Display in Global Drive Control

Double-click ”Dialog Diagnostics” in the Parameter menu of the GDC to open the dialog box *Diagnosis 93xx*.

- The dialog box *Diagnosis 93xx* informs about the controller status:



Display on the keypad

Status messages in the display indicate the controller status.

Display	Controller status	Check
RDY	Controller ready for operation, controller can be inhibited	C0183, C0168/1
IMP	Pulses at the power stage inhibited	C0183, C0168/1
I_{max}	Max. current reached	
M_{max}	Max. torque reached	
Fail	Fault through TRIP, message, fail QSP or warning	C0183, C0168/1

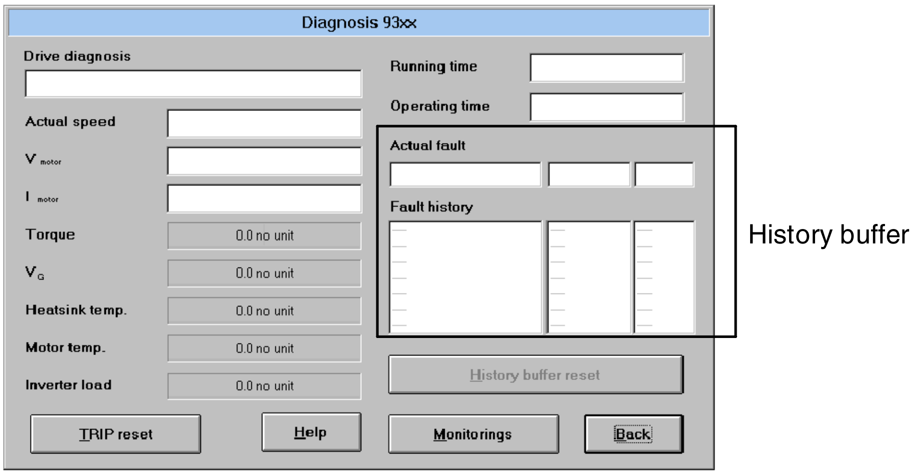
Display via the LECOM status word C0150

<table>
<tr><th>Bit</th><th colspan="4">Meaning</th></tr>
<tr><td>0</td><td>FREE 0</td><td colspan="3">freely linkable</td></tr>
<tr><td>1</td><td>IMP (pulse inhibit)</td><td colspan="3">0 = enables pulses for power stage
1 = inhibits pulses for power stage</td></tr>
<tr><td>2</td><td>FREE 2</td><td colspan="3">freely linkable</td></tr>
<tr><td>3</td><td>FREE 3</td><td colspan="3">freely linkable</td></tr>
<tr><td>4</td><td>FREE 4</td><td colspan="3">freely linkable</td></tr>
<tr><td>5</td><td>FREE 5</td><td colspan="3">freely linkable</td></tr>
<tr><td>j6</td><td>$f_d = 0$ (act. speed = 0)</td><td colspan="3">0 = [n ≠ 0]
1 = [n = 0]</td></tr>
<tr><td>7</td><td>Ctrl. inhibit (controller inhibit)</td><td colspan="3">0 = no controller inhibit
1 = controller inhibit</td></tr>
<tr><td rowspan="9">8-11</td><td rowspan="9">Controller status</td><th>hex</th><th>bin</th><th></th></tr>
<tr><td>0</td><td>0000</td><td>Device initialisation</td></tr>
<tr><td>2</td><td>0010</td><td>Switch-on inhibit</td></tr>
<tr><td>3</td><td>0011</td><td>Operation inhibited (controller inhibit)</td></tr>
<tr><td>6</td><td>0110</td><td>Operation enabled</td></tr>
<tr><td>7</td><td>0111</td><td>Message active</td></tr>
<tr><td>8</td><td>1000</td><td>Fault active</td></tr>
<tr><td>9</td><td>1001</td><td>Power off</td></tr>
<tr><td>A</td><td>1010</td><td>Fail-QSP</td></tr>
<tr><td>12</td><td>Warning</td><td colspan="3">0 = no warning
1 = warning</td></tr>
<tr><td>13</td><td>Message</td><td colspan="3">0 = no message
1 = message</td></tr>
<tr><td>14</td><td>FREE 14</td><td colspan="3">freely linkable</td></tr>
<tr><td>15</td><td>FREE 15</td><td colspan="3">freely linkable</td></tr>
</table>

10.2 Fault analysis with the history buffer

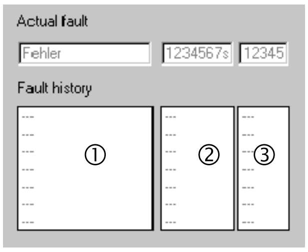
- The history buffer is used to trace faults.
- Fault messages are stored in the order of their occurrence.

Double click "Dialog Diagnostics" in the parameter menu of the GDC to open the dialog box *Diagnosis 93xx*:



10.2.1 Structure of the history buffer

- The history buffer has eight memory locations. The fields below ”Fault history” indicate the memory locations 2 to 7.
- The fields below ”Actual fault” show the memory location 1. This location contains information about the active fault.
  – The entry in the memory location 2 is only done when the active fault is not present anymore or has been acknowledged. With this entry, the last fault drops out of the history buffer and cannot be called anymore.
- The history buffer contains three information items for every fault occurred:

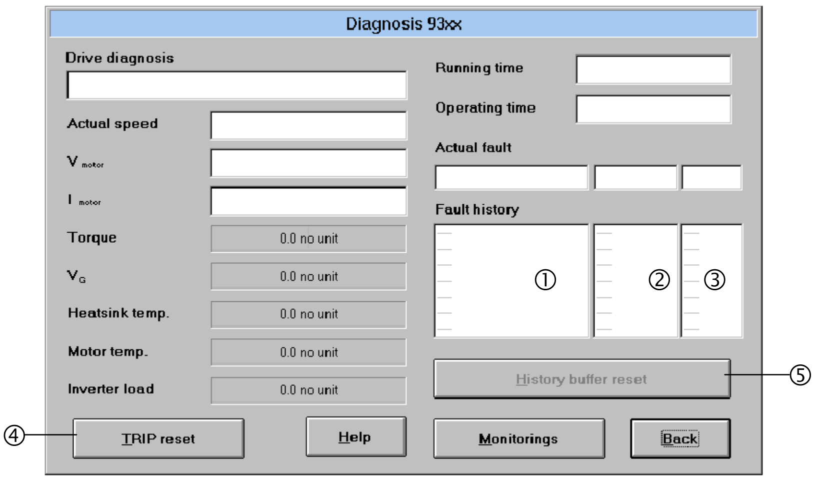


① Fault recognition and reaction
② Time of the fault
③ Frequency of the fault

The following table shows the assignment of information and codes.

Code and information to be retrieved				Memory location
C0168	C0169	C0170	Subcode	
Fault recognition and reaction	Time of the last occurrence	Frequency of the immediately following occurrence	1	Active fault
			2	Memory location 1
			3	Memory location 2
			4	Memory location 3
			5	Memory location 4
			6	Memory location 5
			7	Memory location 6
			8	Memory location 7

10.2.2 Working with the history buffer



Fault recognition and reaction ①

- Contains the fault recognition for each memory location and the reaction to the fault.
  – e. g. "OH3 TRIP"
  – For a fieldbus, the fault messages are always represented by an error number. (📖 10-6, column 2)

Note!

- For faults occurring at the same time with different reactions:
  – Only the fault with the highest-priority reaction is entered into the history buffer (priority = TRIP → Message → FAIL-QSP → Warning).
- For faults occurring at the same time with the same reaction (e. g. 2 messages):
  – Only the fault which occurred first is entered into the history buffer.

Time ②

- Contains the times for how long the faults have occurred.
  – e. g. "1234567 s"
  – Reference time is the mains switch-on time (see dialog box *Diagnosis 93xx*, field top right)

Note!

If the fault occurs several times in a row, only the time of the last occurrence is stored.

Frequency ③

- Contains the number which indicates how often the same error has occurred in a row. The time of the last occurrence is entered into the memory.

Reset fault ④

- Click the **TRIP reset** button to reset the fault.

Clear history buffer ⑤

- This function is only possible when no fault is active.
- Click the **History buffer reset** button to clear the history buffer.

10.3 Fault messages

Tip!
If the fault message is requested by a fieldbus (C0168/x), the fault message is represented by a fault number in column 2 of the table.

Error code	Fault number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
---	---	No error	-	-
CCr	x071	System error	Strong interference on control cables For 9300 cam profiler: Selection of too many points	Shield control cables For 9300 cam profiler: Reduce number of points to max. 2 points per ms)
			Ground or earth loops in the wiring	Check PE wiring
CDA	x220	Data error	Attempt to accept faulty data	New data transfer
	x221	Data error warning	The checksum of the data transferred is not correct.	New data transfer and check.
CE0	x061	Communication error	Interference 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_IN_1	CAN_IN_1 object receives faulty data, or communication is interrupted	• Check cable at X4 • Check transmitter • Increase monitoring time under C0357/1, if necessary
CE2	x063	Communication error at the process data input object CAN_IN_2	CAN_IN_2 object receives faulty data, or communication is interrupted	• Check cable at X4 • Check transmitter • Increase monitoring time under C0357/2, if necessary
CE3	x064	Communication error at the process data input object CAN_IN_3	CAN_IN_3 object receives faulty data, or communication is interrupted	• Check cable at X4 • Check transmitter • 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 to the TRIP-Set function has been activated.	Check external encoder
H05	x105	Internal error		Contact Lenze
H07	x107	Incorrect power stage	During initialisation of the controller, an incorrect power stage was detected	Contact Lenze
H10	x110	Sensor fault heatsink temperature	Sensor for heatsink temperature detection indicates indefinite values	Contact Lenze
H11	x111	Sensor fault indoor temperature	Sensor for indoor temperature detection indicates indefinite values	Contact Lenze
LP1	x032	Motor phase failure	A current-carrying motor phase has failed	• Check motor • Check supply module
			The current limit is set too high	Set a lower current limit value under C0599
			This monitoring is not suitable for: • Synchronous servo motors • at field frequencies > 480 Hz	Deactivate monitoring with C0597 = 3
LU	x030	Undervoltage	DC bus voltage is smaller than the value fixed under C0173	• Check mains voltage • Check supply cable
r_{MAX}	x200	Max. speed exceeded (C0596)	Active load (e.g. for hoists) too high Drive is not speed-controlled, torque excessively limited.	Check drive dimensioning. Increase torque limit if necessary.

Error code	Fault number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
OC1	x011	Short circuit	Short circuit.	Search for cause of short circuit; check cable.
			Excessive capacitive charging current of the motor cable.	Use motor cable which is shorter or of lower capacitance.
OC2	x012	Earth fault	One of the motor phases has earth contact.	• Check motor • Check supply module
			Excessive capacitive charging current of the motor cable.	Use motor cable which is shorter or of lower capacitance.
OC5	x015	I x t overload	Frequent and overlong acceleration with overcurrent Permanent overload with $I_{motor} > 1.05 \times I_{Nx.}$	Check drive dimensioning.
OH	x050	Heatsink temperature is higher than the value set in the controller	Ambient temperature T_{amb} > 40 °C or 50 °C.	• Allow controller to cool and ensure better ventilation. • Check ambient temperature in the control cabinet.
			Heatsink very dirty.	Clean heatsink
			Incorrect mounting position.	Change mounting position.
OH3 1)	x053	Heatsink temperature is higher than the value set in the controller	Motor too hot because of excessive current or frequent and overlong acceleration	Check drive dimensioning.
			No PTC connected.	Connect PTC or switch-off monitoring (C0583 = 3).
OH4	x054	Heatsink temperature is higher than the value set under C0122.	Ambient temperature T_{amb} > 40 °C or 50 °C.	• Allow controller to cool and ensure better ventilation. • Check ambient temperature in the control cabinet.
			Heatsink very dirty.	Clean heatsink
			Incorrect mounting position.	Change mounting position.
			Value set under C0122 was too low.	Enter higher value.
OH7 1)	x057	Motor temperature is higher than the value set under C0121.	Motor too hot because of excessive current or frequent and overlong acceleration	Check drive dimensioning.
			No PTC connected.	Connect PTC or switch-off monitoring (C0584 = 3).
			Value set under C0121 was too low.	Enter higher value.
OH8	x058	PTC at terminals T1, T2 indicates motor overheat.	Motor too hot because of excessive current or frequent and overlong acceleration	Check drive dimensioning.
			Terminals T1, T2 are not assigned.	Connect PTC or thermostat or switch off monitoring (C0585=3).
OU	x020	Overvoltage	Excessive brake energy (DC bus voltage higher than set under C0173).	Use brake module or energy recovery module.
P01	x151	Limit switch negative	Negative limit switch was reached.	• Control drive in positive direction • Check terminal connection X5/E2.
P02	x152	Positive limit switch	Positive limit switch was reached.	• Control drive in negative direction • Check terminal connection X5/E1.
P03	x153	Following error	Phase difference between set and actual position is larger than the following error limit set under C0255.	• Extend following error limit under C0255 • Switch off the monitoring if necessary (C0589 = 3).
			Drive cannot follow the digital frequency (I_{max} limit).	Check drive dimensioning.
P04	x154	Negative position limit	Negative position limit (C1224) was not reached.	Before starting again, find out why the limit was not reached (e.g. ”incorrect” position targets, setting of position value function) and adapt the negative position limit (C1224).
P05	x155	Positive position limit	Positive position limit (C1223) was exceeded.	Find out why the value was exceeded (e.g. ”incorrect” position targets, set function position value) and adjust the positive position limit (C1223) if necessary.
P06	x156	No reference	The reference point is not known. In case of the absolute positioning, no homing was carried out before the first positioning.	Perform one of the following functions and restart: • Manual homing. • Start homing in the program. • Set reference.
P07	x157	PS Absolute mode instead of relative mode.	An absolute PS (C1311) was performed during relative positioning (position mode C1210).	Perform one of the following functions and restart: • Change from absolute PS to relative PS. • Change position mode.
P08	x158	Actual offset out of range	Actual reference dimension offset (C1226) outside the position limits. Error of the program function ”set position value”.	If necessary, adapt the position limit values or check whether the program function ”set position value” is to be applied.

Error code	Fault number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
P09	x159	Impermissible programming	Impermissible programming	Check position program: • A PS with final speed must be followed by a PS with positioning; it is not permissible to wait for input.
P12	x162	Encoder range	The range of the absolute encoder was exceeded.	• Return drive by manual positioning. • Check position limits and adjustment of the encoder. • The absolute encoder has to be dimensioned and mounted such that its range is not exceeded over the complete positioning range.
P13	x163	Phase overflow	• Phase controller limit reached • Drive cannot follow the digital frequency (I_{max} limit).	• Enable drive • Check drive dimensioning
P14	x164	1st following error	The drive cannot follow the setpoint. The following error is greater than the limit value in C1218/1.	• Increase current limit C0022 (observe max. motor current). • Reduce acceleration. • Check drive dimensioning. • Increase limit value under C1218.
P15	x165	2nd following error	The drive cannot follow the setpoint. The following error is greater than the limit value in C1218/2.	• Increase current limit C0022 (observe max. motor current). • Reduce acceleration. • Check drive dimensioning. • Increase limit value under C1218.
P16	x166	Transmission error of a sync telegram on the system bus.	Sync telegram from master (PLC) is out of time pattern.	Set C1121 (Sync cycle) to the transmission cycle of the master (PLC).
			Sync telegram of master (PLC) is not received.	• Check communication channel. • Check baud rate, controller address.
			Controller enable (RFR) too soon.	Enable the controller with a delay. The required time delay depends on the intervals between the sync telegrams.
			* C0362 displays the interval between two 2 sync telegrams (C0362 = 0, communication interrupted).	
P17	x167	TP control error	Different function blocks use the TP input at the same time (e. g. FB DFSET and POS). A conflict arises.	Configure another TP input for FB POS (not possible for DFSET) or switch off monitoring under C0580.
P18	x168	Internal limitation	The data generated by calculations of the 9300 servo position controller cannot be varied arbitrarily. If the values exceed or fall below the internal limit values, the warning ”P18” is displayed and the set value is limited to the minimum or maximum respectively.	
			C1298 = 1: The negative position limit in C1223 is outside the possible display range of $1 \leq (C1223 \times C1205) \leq 1.07E9$ inc	Check entries in C1202-4, C1207/1, C1207/2. If necessary, read out the value reduced with C1220/10 at malfunction and use it to overwrite the value entered in C1223.
			C1298 = 2: The positive position limit in C1224 is outside the possible display range of $1 \leq (C1224 \times C1205) \leq 1.07E9$ inc	Check entries in C1202-4, C1207/1, C1207/2. If necessary, read out the value reduced with C1224 at malfunction and use it to overwrite the value entered in C1124.
			C1298 = 3: The maximum speed v_{max} under C1240 exceeds the possible display range of $1 \leq (C1240 \times C1205 \times 16.384) \leq 2.14E9$ inc or v_{max} not $C1240 / C1204 \times 60 \leq 1.5 \times n_{max}$	Check entries in C0011, C1202-4, C1207/1, C1207/2. If necessary, read out the value reduced with C1220/12 at malfunction and use it to overwrite the value entered in C1240 or adapt the value in C1240 to C0011.
			C1298 = 4: The maximum acceleration a_{max} in C1250 exceeds the possible display range of $1 \leq (C1250 \times C1205 \times 16.384 / 1000)$ $\leq 2.8634E7$ inc	Check entries in C1202-4, C1207/1, C1207/2. If necessary, read out the value reduced with C1220/13 at malfunction and use it to overwrite the value entered in C1250.
			C1298 = 5: An internal value range has been exceeded for a speed standardisation. Valid range: $1 \leq (C0011 \times C1207/1 / C1207/2 \times 65536 / 60000)$ ≤ 32767	Check entries in C0011, C1207/1, C1207/2.

Error code	Fault number x = 0: TRIP x = 1: Message x = 2: Warning	Error	Cause	Remedy
P21	x171	Following error RC	Phase difference between set and actual position is larger than the following error limit set under C1328.	Expand following error limit with C1328. If necessary, switch off the monitoring (C1329 = 3).
			Drive cannot follow the digital frequency (I_{max} limit).	Check drive dimensioning.
PEr	x074	Program fault	A fault in the program was detected.	Send controller with data (on diskette) to Lenze.
PI	x079	Initialising error	• A fault was detected during transfer of parameter set between the controllers • Parameter set does not match controller.	Correct parameter set.
PR0 PR1	x075 x072	Parameter set error	Fault when loading a parameter set. CAUTION: The factory setting loaded automatically.	• Set the required parameters and store them under C0003. • For PRO the supply voltage must be switched off additionally.
Sd2	x082	Resolver fault	Resolver cable interrupted.	• Check the resolver cable for open circuit • Check resolver. • or switch off monitoring (C0586 = 3).
Sd3	x083	Encoder fault at X9/8	Cable interrupted.	Check cable for open circuit.
			Input X9 PIN 8 not assigned.	Assign input X9 PIN 8 with 5V or switch off monitoring (C0587 = 3).
Sd5	x085	Master current source defective	Master current at X6/1, X6/2 < 2mA.	• Check cable for open circuit. • Check master current source.
Sd6	x086	Sensor fault	Encoder of the motor temperature detection at X7 or X8 indicates indefinite values.	Check supply cable for firm connection. Switch off monitoring with C0594 = 3 if necessary.
Sd7	x087	Encoder fault	Absolute encoder with RS485 interface does not transmit data.	Check supply cable. Check encoder. Check voltage supply C0421. No Stegmann encoder connected.

1) Temperature detection via resolver or incremental encoder

10.4 Resetting fault indications

Reaction on operating errors	Measures for re-commissioning	Danger notes
TRIP	• After the error has been eliminated, the drive can be restarted when an acknowledgement has been sent. • Acknowledge TRIP by: – Global-Drive-Control: Click ”Trip reset” in dialog box ”Diagnostics 9300”. (📖 10-4, (“Working with the history buffer”)) – XT keypad: Press STOP. Then press RUN to enable the controller. – Fieldbus module: Set C0043 = 0 – Control word C0135 – Terminal X5/E5 (default setting) or “DCTRL-TRIP-RESET” – Control word AIF – Control word system bus (CAN)	If a TRIP source is still active, TRIP cannot be reset.
Message	• After eliminating the fault, the message is reset automatically.	The drive restarts automatically if the message is removed.
Warning	• After eliminating the fault, the warning is reset automatically.	

EDSVS9332S-K
13181650

Lenze

System Manual
Part K

Selection help

Application examples

Global Drive

9300 servo inverter

This documentation is valid for the 9300 servo inverters of the versions:

	①				②	③
EVS	**9326**	**-**	**E**	**E**	**2x**	**2x**

Type

Power

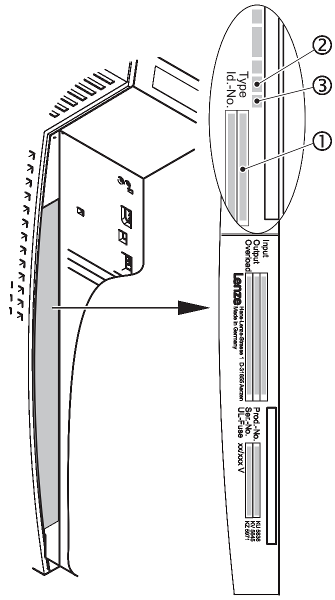
	400 V	480 V
9321 =	0.37 kW	0.37 kW
9322 =	0.75 kW	0.75 kW
9323 =	1.5 kW	1.5 kW
9324 =	3.0 kW	3.0 kW
9325 =	5.5 kW	5.5 kW
9326 =	11 kW	7.1 kW
9327 =	15 kW	18.5 kW
9328 =	22 kW	30 kW
9329 =	30 kW	37 kW
9330 =	45 kW	45 kW
9331 =	55 kW	55 kW
9332 =	75 kW	90 kW

Design
E = Built-in unit
C = Cold Plate

S = 9300 servo inverter

Hardware version

Software version



3.0 11/2006

11 Selection help

11.1 See folder “Planning”

12 Application examples

Signal processing in the controller is saved in basic configurations for common applications.

- You can select and activate the basic configurations via C0005 and adapt them with only a few settings to your application (short setup). (8-2)
- The setting of the motor data and the adaptation of the motor control is generally independent of the configuration and is described in chapter "Commissioning". (5-1)

Configuration	Basic function	
1xxx	Speed control	12-2
4xxx	Torque control with speed limitation	12-5
5xxx	Master for digital frequency coupling	12-7
6xxx	Slave to digital frequency bus	12-10
7xxx	Slave to digital frequency cascade	12-12

Tip!

GDC and the operating module include the most important codes for the basic configurations in the "Short setup" menus.

12.1 Speed control (C0005 = 1000)

Tip!
The most important settings can be found in the menu: "Short Setup / Speed mode" of the XT keypad or in the menu "Short setup / Speed mode" in Global Drive Control.

Enter motor type (contains all nameplate data of the motor)

C0173	xxx	Enter UG limit (mains voltage)
C0086	000	Enter motor data manually

Enter maximum motor current

C0022	xxxA	Determine Imax

Enter controller configuration

C0005	1000	Select speed control
C0025	xxx	Enter feedback system

Speed setpoint settings

C0011	xxx rpm	Determine max. speed
C0012	xxx s	Set acceleration time
C0013	xxx s	Set deceleration time
C0105	xxx s	Set QSP deceleration time

Application parameters

C0070	xxx	Vp n-controller
C0071	xxx	Tn n-controller

Save parameters

C0003	xxx	Save all parameters

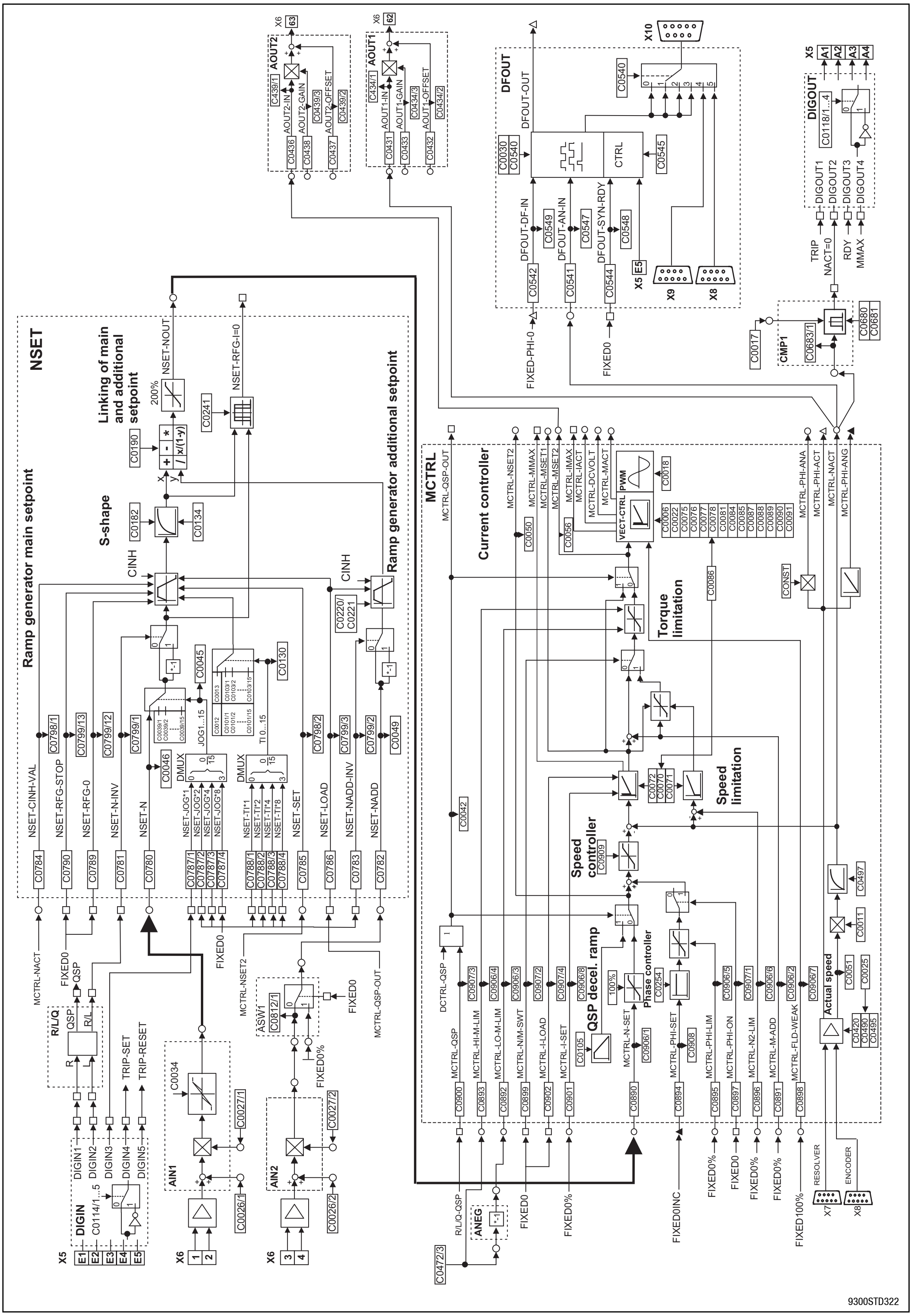


Fig. 12-1 Signal flow diagram for configuration 1000

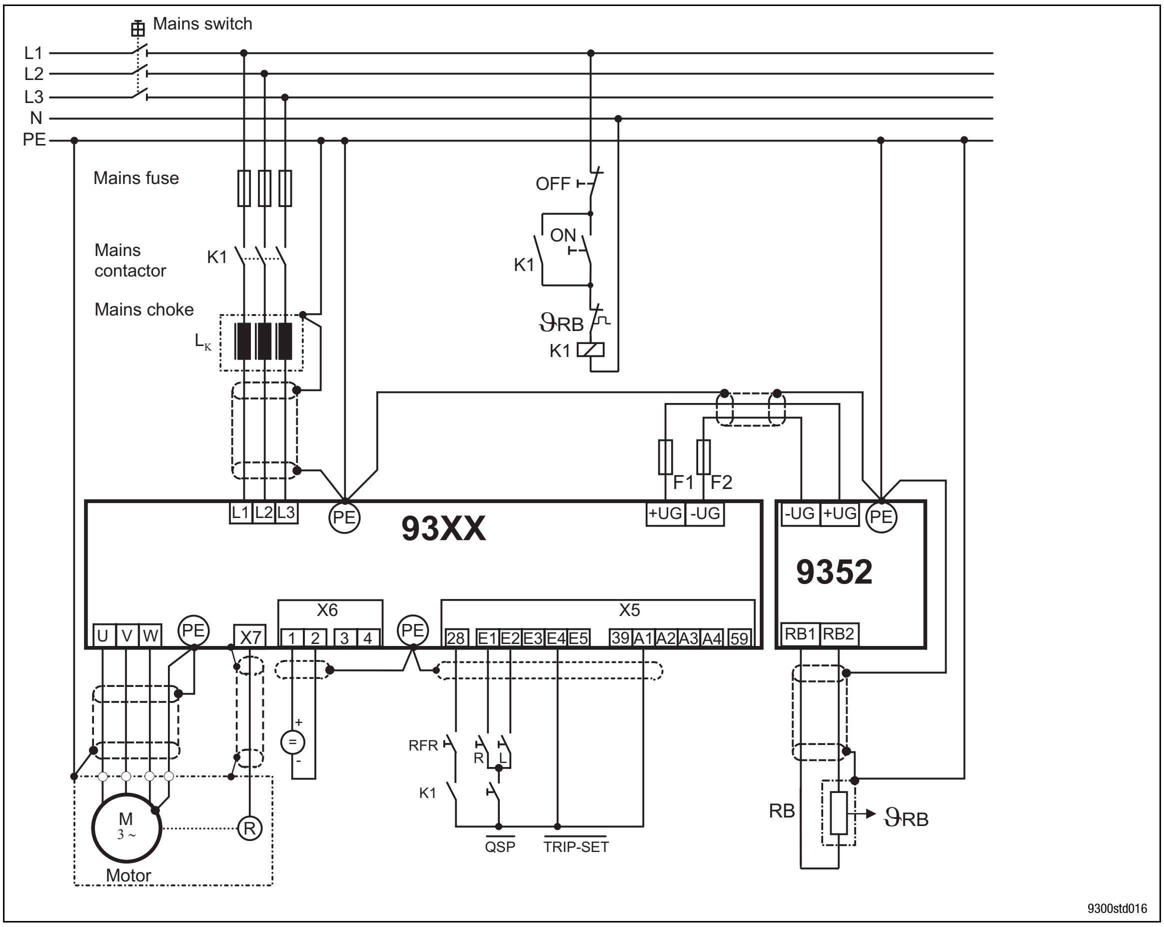


Fig. 12-2 Connection diagram of configuration 1000

Tip!

A braking unit is only required if the DC-bus voltage in the 93XX servo inverter exceeds the upper switch-off threshold set in C0173 when operating in generator mode (activation of the monitoring function "OU"). The braking unit prevents "OU" from being activated by converting the kinetic energy of the machine into heat which prevents the DC-bus voltage from exceeding the upper switch-off threshold.

12.2 Torque control with speed limitation (C0005 = 4000)

Tip!
The most important settings can be found in the menu: "Short Setup / Speed mode" of the operating module or in the menu "Short setup / Speed mode" in Global Drive Control.

Enter motor type (contains all nameplate data of the motor)

C0173	xxx	Enter UG limit (mains voltage)
C0086	000	Enter motor data manually

Enter maximum motor current

C0022	xxxA	Determine Imax

Enter controller configuration

C0005	4000	Select torque control
C0025	xxx	Enter feedback system

Speed setpoint settings

C0011	xxx rpm	Determine max. speed
C0105	xxx s	Set QSP deceleration time

Speed limitation

C0472/4	xxx % nmax	Determine lower speed limit

Application parameters

C0070	xxx	Vp n-controller
C0071	xxx	Tn n-controller

Save parameters

C0003	xxx	Save all parameters

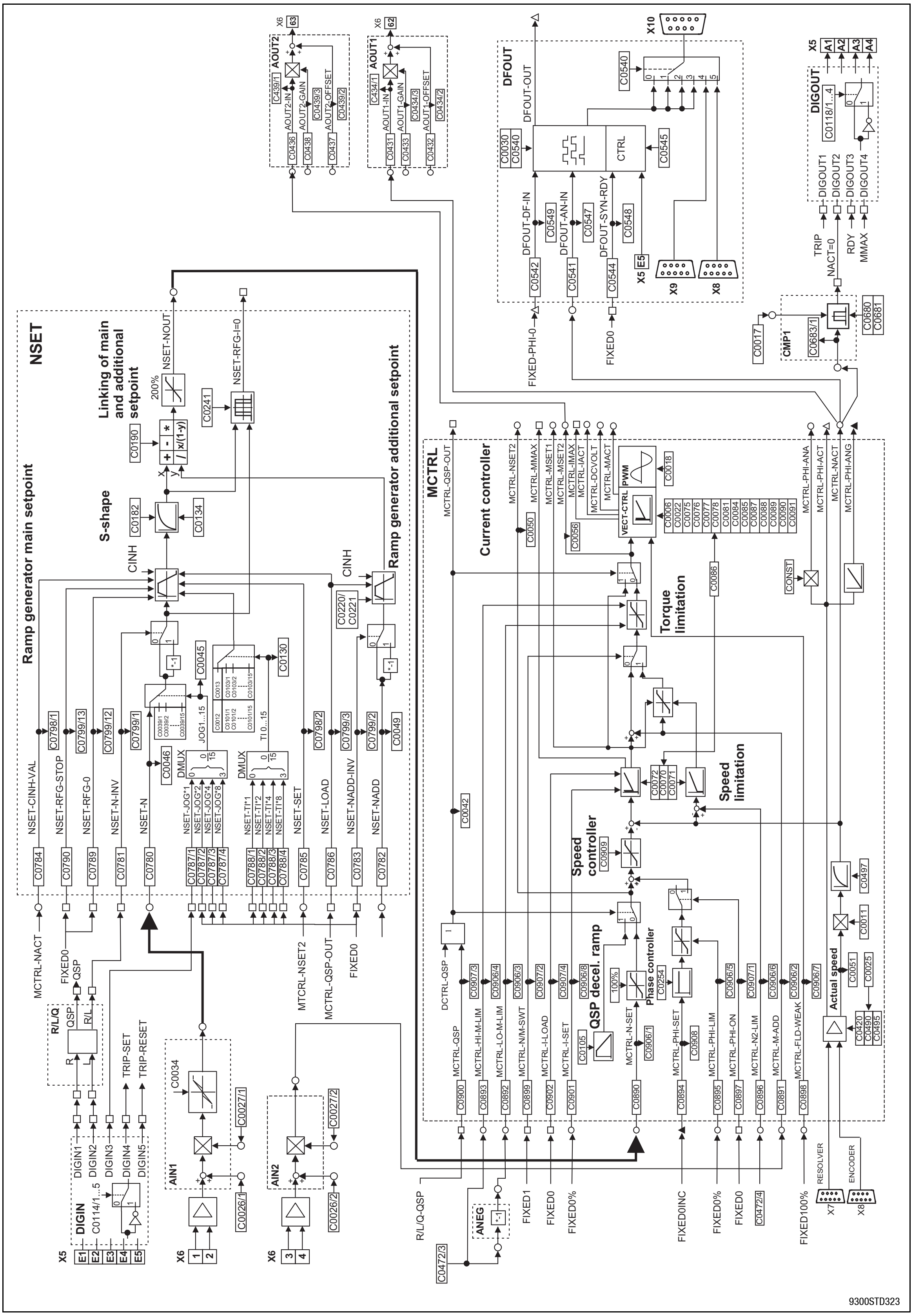


Fig. 12-3 Signal flow diagram of configuration 4000

12.3 Master frequency - Master - Drive (C0005 = 5000)

Tip!
The most important settings can be found in the menu: "Short Setup / Speed mode" of the operating module or in the menu "Short setup / Speed mode" in Global Drive Control.

Enter motor type (contains all nameplate data of the motor)

C0173	xxx	Enter UG limit (mains voltage)
C0086	000	Enter motor data manually

Enter maximum motor current

C0022	xxxA	Determine Imax

Enter controller configuration

C0005	5000	Master frequency - master - general drive
	5900	with emergency stop for the drive system with QSP
C0025	xxx	Enter feedback system

Speed setpoint settings

C0011	xxx rpm	Determine max. speed
C0012	xxx s	Set acceleration time
C0013	xxx s	Set deceleration time
C0105	xxx s	Set QSP deceleration time under C0005 = 5000
C0672	xxx s	Set QSP deceleration time under C0005 = 59xx
C0032	xxx	Numerator of gearbox factor
C0033	xxx	Denominator of gearbox factor
C0473/1	xxx	Numerator of stretching factor
C0533	xxx	Denominator of stretching factor

Application parameters

C0070	xxx	Vp n-controller
C0071	xxx	Tn n-controller
C0254	xxx	Gain of the angle controller

Save parameters

C0003	xxx	Save all parameters

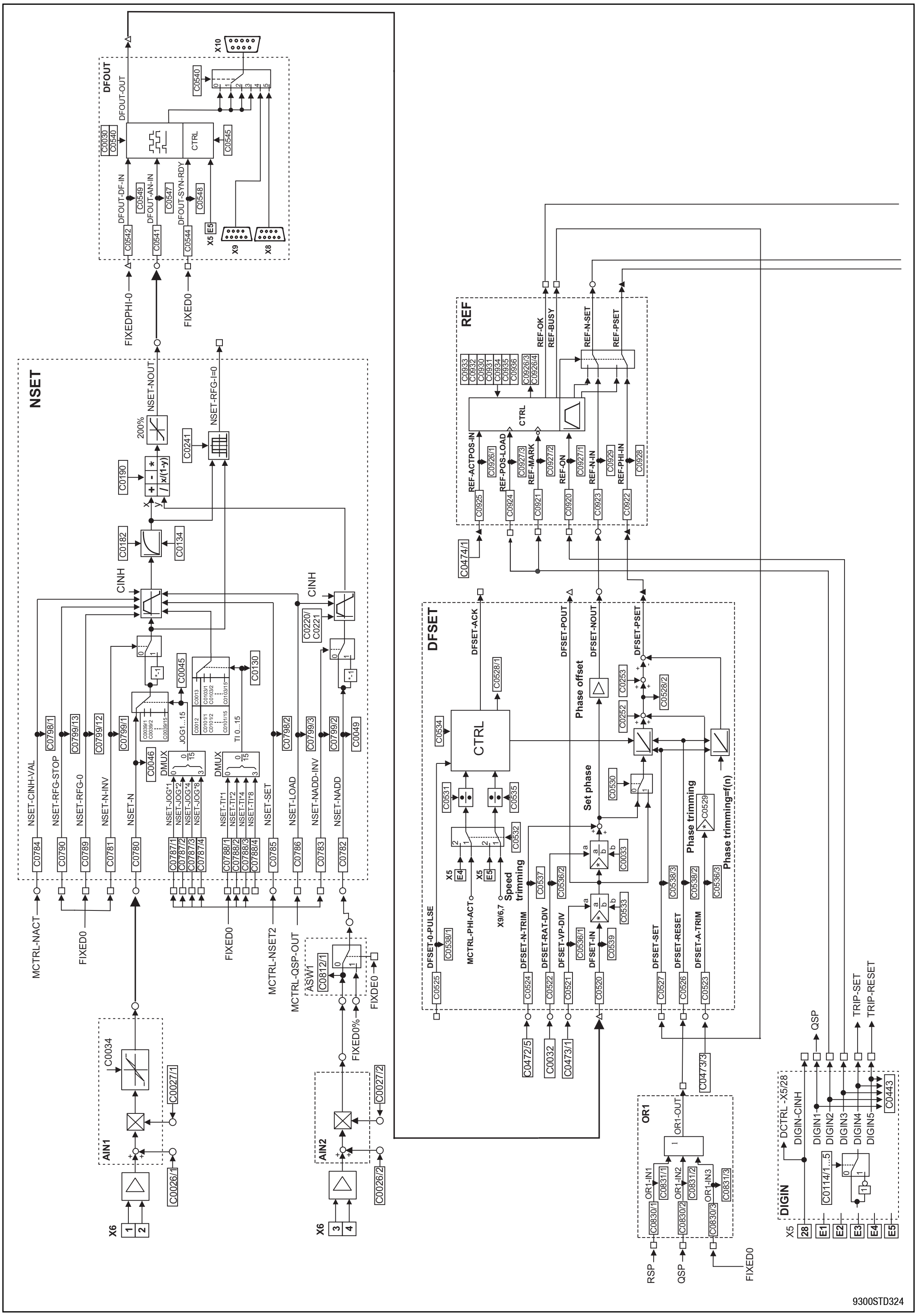


Fig. 12-4 Signal flow diagram for configuration 5000 (sheet 1)

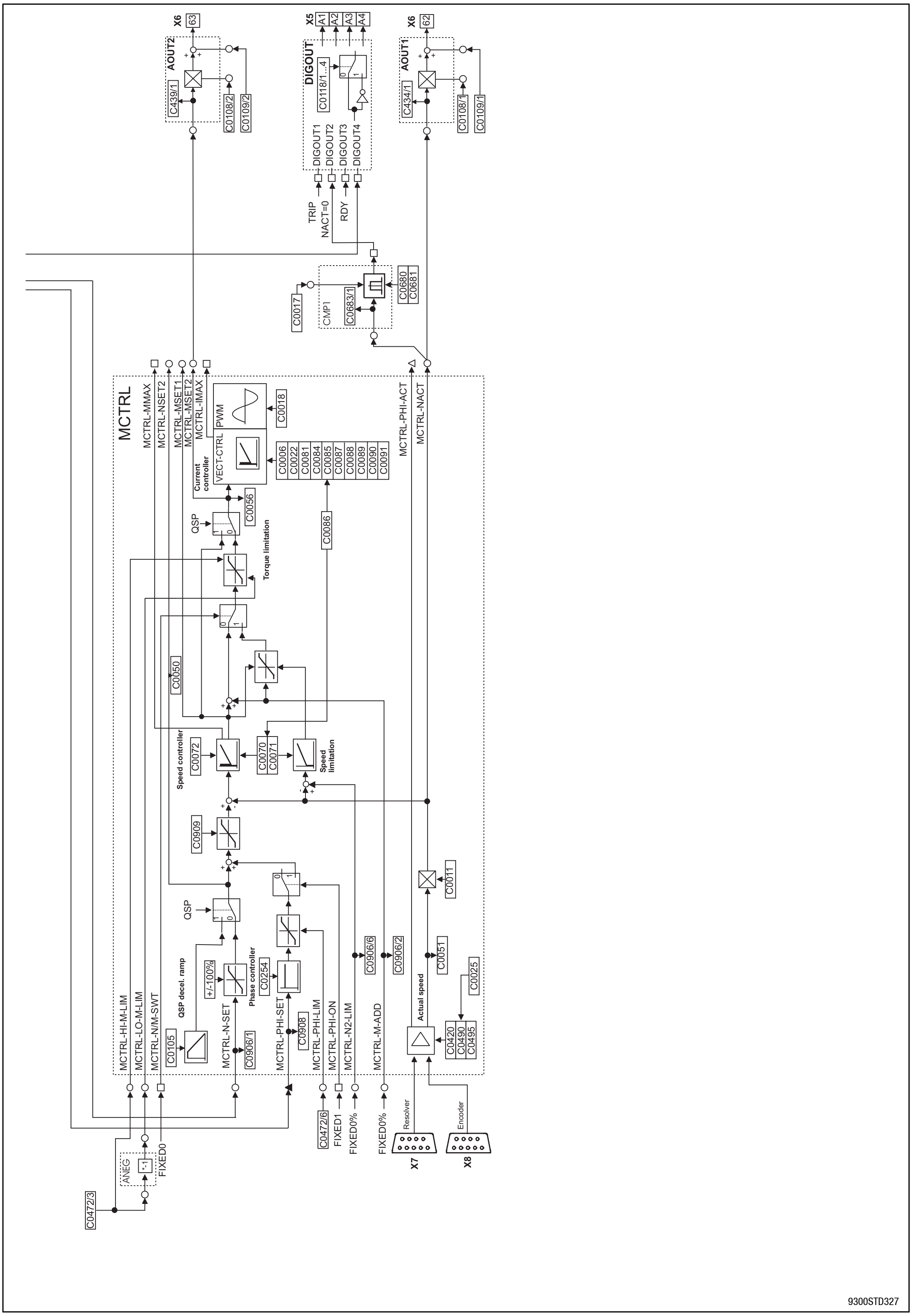


Fig. 12-5 Signal flow diagram for configuration 5000 (sheet 2)

12.4 Master frequency bus - slave - drive (C0005 = 6000)

Tip!
The most important settings can be found in the menu: "Short Setup / Speed mode" of the operating module or in the menu "Short setup / Speed mode" in Global Drive Control.

Enter motor type (contains all nameplate data of the motor)

C0173	xxx	Enter UG limit (mains voltage)
C0086	000	Enter motor data manually

Enter maximum motor current

C0022	xxxA	Determine Imax

Enter controller configuration

C0005	6000	Select digital frequency cascade - slave
C0025	xxx	Enter feedback system

Speed setpoint settings

C0011	xxx rpm	Determine max. speed
C0032	xxx	Numerator of gearbox factor
C0033	xxx	Denominator of gearbox factor
C0425	xxx	Adjust encoder constant to the master

Application parameters

C0070	xxx	Vp n-controller
C0071	xxx	Tn n-controller
C0254	xxx	Gain of the angle controller

Save parameters

C0003	xxx	Save all parameters

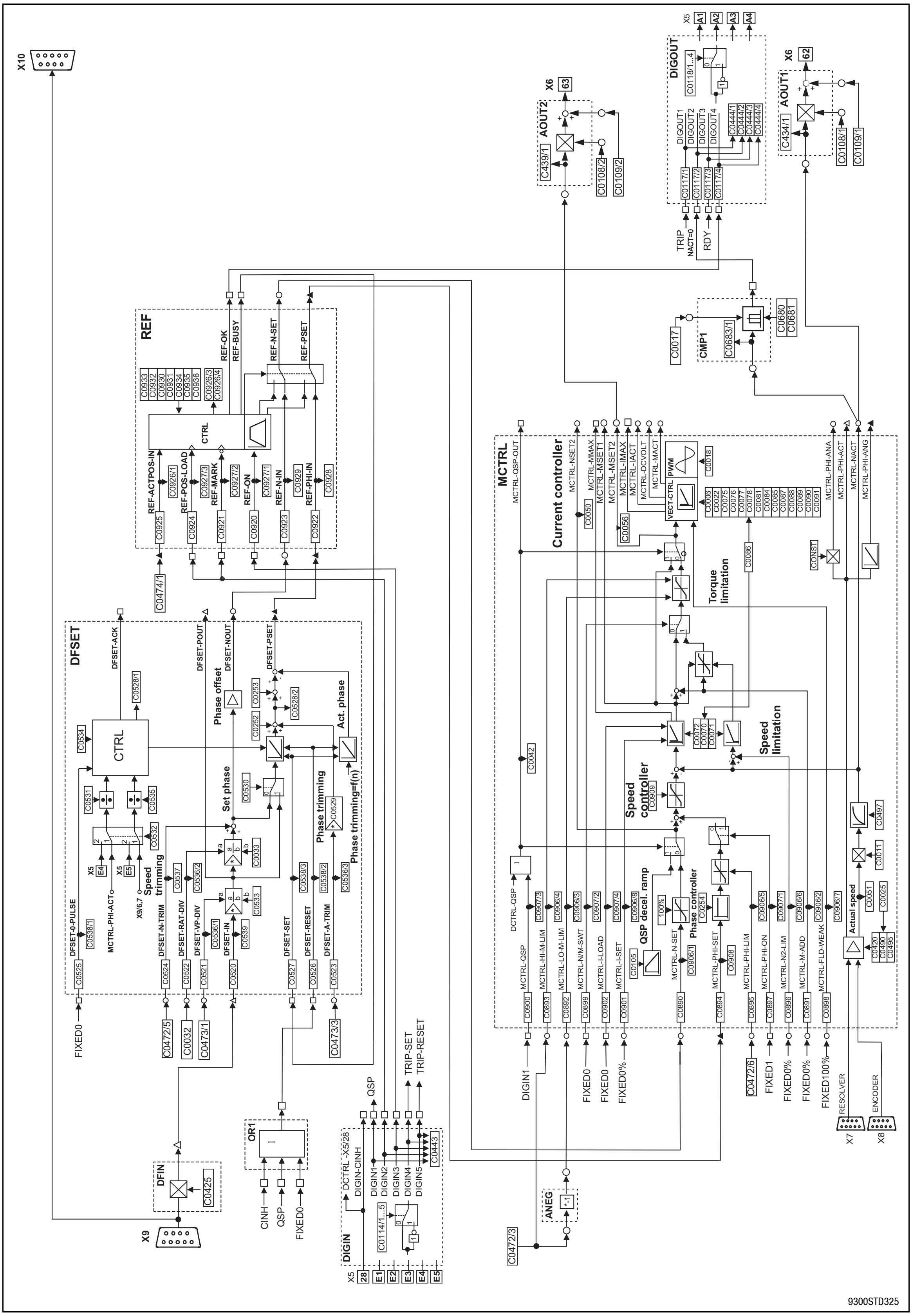


Fig. 12-6 Signal flow diagram for configuration 6000

12.5 Master frequency cascade - slave - drive (C0005 = 7000)

Tip!
The most important settings can be found in the menu: "Short Setup / Speed mode" of the operating module or in the menu "Short setup / Speed mode" in Global Drive Control.

Enter motor type (contains all nameplate data of the motor)

C0173	xxx	Enter UG limit (mains voltage)
C0086	000	Enter motor data manually

Enter maximum motor current

C0022	xxxA	Determine Imax

Enter controller configuration

C0005	7000	Select digital frequency cascade - slave

Speed setpoint settings

C0011	xxx rpm	Determine max. speed
C0032	xxx	Numerator of gearbox factor
C0033	xxx	Denominator of gearbox factor
C0425	xxx	Adjust encoder constant to the master
C0473/1	xxx	Numerator of stretching factor
C0533	xxx	Denominator of stretching factor

Application parameters

C0070	xxx	Vp n-controller
C0071	xxx	Tn n-controller
C0254	xxx	Gain of the angle controller

Save parameters

C0003	xxx	Save all parameters

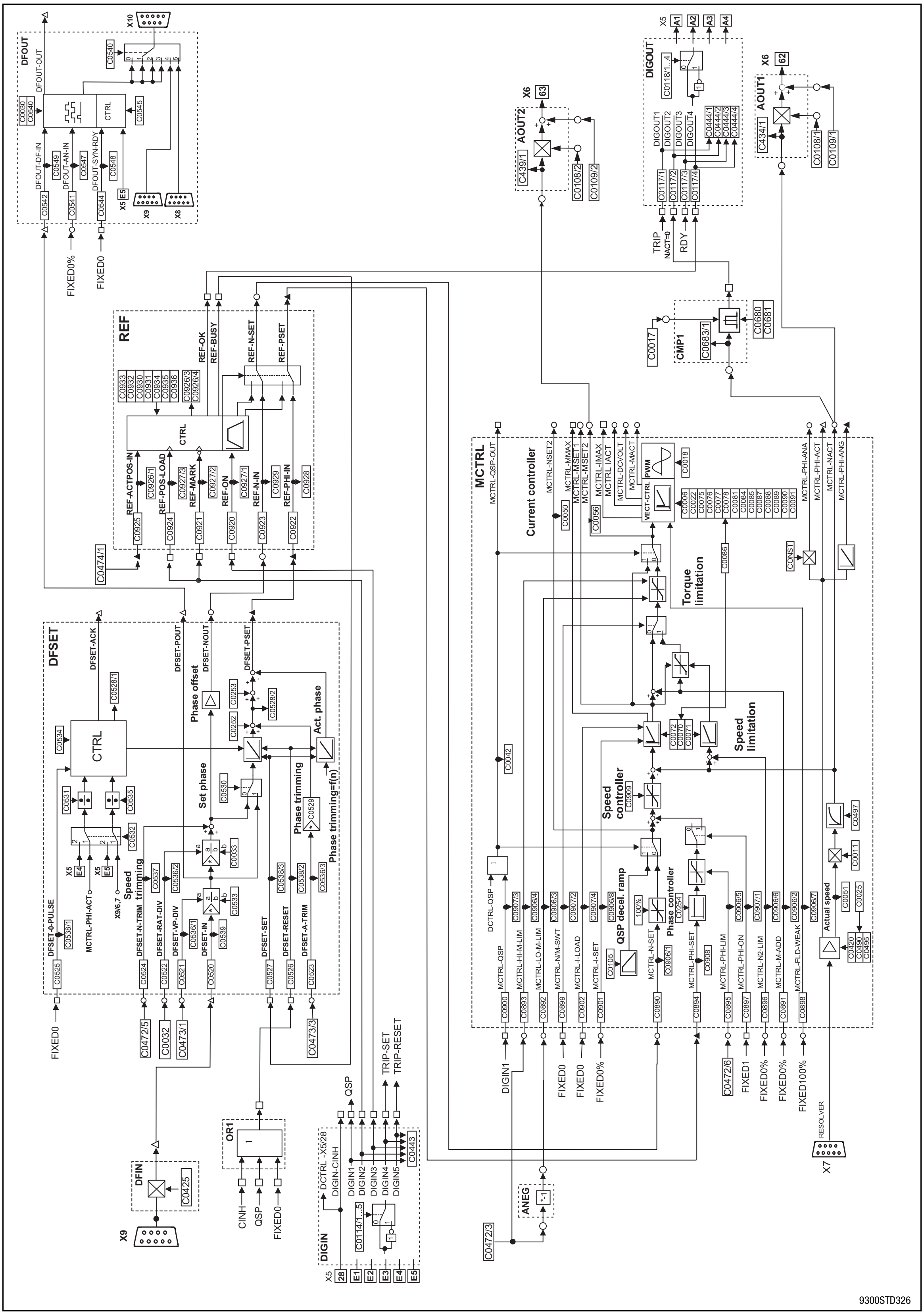


Fig. 12-7 Signal flow diagram for configuration 7000

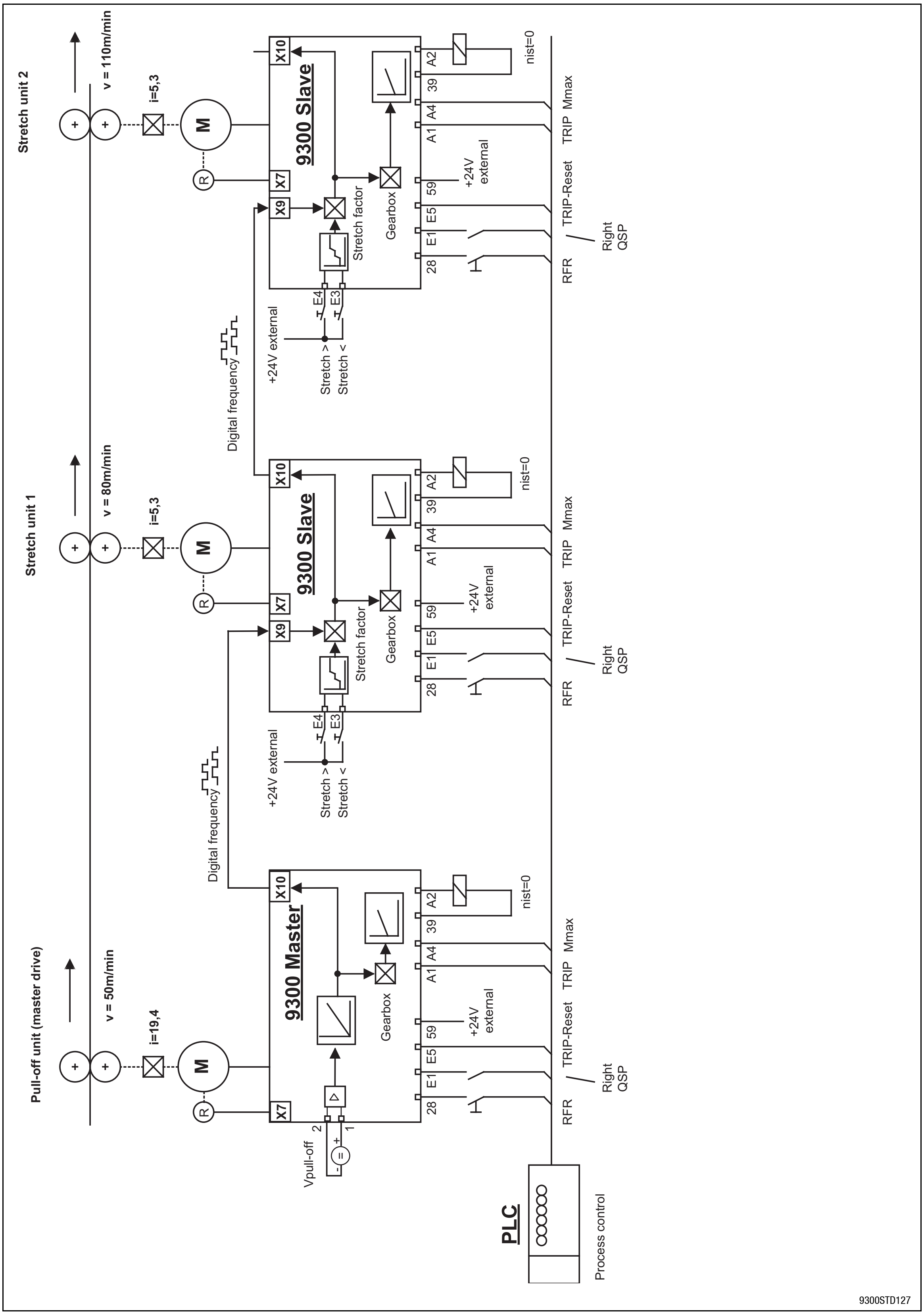


Fig. 12-8 Connection diagram of digital frequency configuration

EDSVS9332S-L
13181650

Lenze

System Manual
Part L

Signal flow diagrams

Global Drive
9300 servo inverter

This documentation is valid for the 9300 servo inverters of the versions:

	①			②	③
EVS	**9326**	**-**	**E**	**E**	**2x**	**2x**

Type

Power

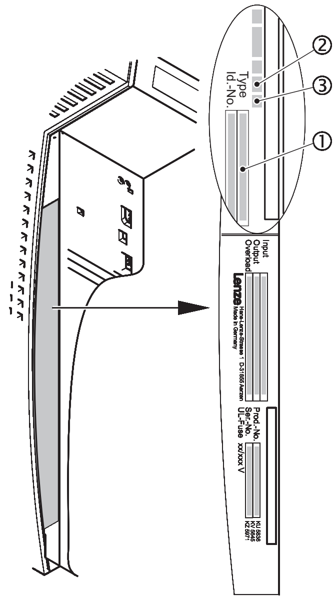
	400 V	480 V
9321 =	0.37 kW	0.37 kW
9322 =	0.75 kW	0.75 kW
9323 =	1.5 kW	1.5 kW
9324 =	3.0 kW	3.0 kW
9325 =	5.5 kW	5.5 kW
9326 =	11 kW	7.1 kW
9327 =	15 kW	18.5 kW
9328 =	22 kW	30 kW
9329 =	30 kW	37 kW
9330 =	45 kW	45 kW
9331 =	55 kW	55 kW
9332 =	75 kW	90 kW

Design
E = Built-in unit
C = Cold Plate

S = 9300 servo inverter

Hardware version

Software version



3.0 11/2006

Contents

13 Signal flow diagrams

Dear user,

the signal flow diagrams of the basic configurations and function blocks can be obtained from your Lenze representative.

EDSVS9332S-M
13181650

Lenze

System Manual
Part M

Glossary

Table of keywords

Global Drive

9300 servo inverter

This documentation is valid for the 9300 servo inverters of the versions:

	①				②	③
EVS	**9326**	**-**	**E**	**E**	**2x**	**2x**

Type

Power

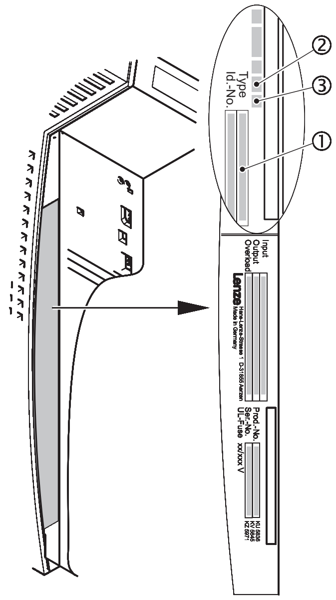
	400 V	480 V
9321 =	0.37 kW	0.37 kW
9322 =	0.75 kW	0.75 kW
9323 =	1.5 kW	1.5 kW
9324 =	3.0 kW	3.0 kW
9325 =	5.5 kW	5.5 kW
9326 =	11 kW	7.1 kW
9327 =	15 kW	18.5 kW
9328 =	22 kW	30 kW
9329 =	30 kW	37 kW
9330 =	45 kW	45 kW
9331 =	55 kW	55 kW
9332 =	75 kW	90 kW

Design
E = Built-in unit
C = Cold Plate

S = 9300 servo inverter

Hardware version

Software version



3.0 11/2006

14 Glossary

Term	Meaning
AIF	Automation interface (X1)
CAN	Controller Area Network
CE	Communauté Européenne (English: European Community)
Code	For entry and display (access) of parameter values. Variable addressing according to the format "code/subcode" (Cxxxx/xx). All variables can be addressed via the code digits.
Contouring error	Deviation between momentary position setpoint and actual position. Display for a momentary contouring error under C0908.
Contouring error monitoring	Monitors the momentary contouring error if the contouring error tolerance is exceeded and releases a fault indication, if necessary.
Contouring error tolerance	If the contouring error reaches a defined contouring error tolerance, a fault indication is released.
Ctrl. enable	Controller enable
Ctrl. inhibit	Controller inhibit (= $\overline{\text{Controller enable}}$)
FB	Function block
Fieldbus	For data exchange between master control and controller (e.g. INTERBUS or PROFIBUS).
FPDA	Freely programmable digital output
FPDE	Freely programmable digital input
GDC	Global Drive Control (PC program for Lenze controllers - Windows)
INTERBUS	Industrial communication standard to DIN E19258
JOG	JOG speed or input for JOG speed
KTY	"Linear" temperature sensor in the motor winding
LECOM	Lenze Communication
LEMOC2	PC program for Lenze controllers - DOS
LU	Undervoltage
Master	A master is for instance a PLC or PC.
OU	Overvoltage
PC	Personal Computer
PLC	Programmable logic controller
PM	Permanent magnet
Process data	For instance, setpoints and actual value which are to be exchanged as quickly as possible. Usually, this applies to smaller data amounts which are transmitted cyclically. With PORFIBUS these data are transmitted via the logic process data channel.
PROFIBUS	Communication standard DIN 19245, consisting of three parts
PTC	PTC thermistor with defined tripping temperature
QSP	Quick stop
RFG	Ramp function generator
Slave	Bus participant that must wait for the master's request to send data. Controllers are slaves.
SSC	Sensorless speed control
SSI	Synchronous serial interface
Target position	The target which is to be approached by means of a defined traversing profile.
TKO	Thermal contact / normally closed contact

14.1 Index

D

E

abc

F

Q

R

S