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Lenze

System Manual

Global Drive

9300 servo position controller

Content of the 9300 System Manuals

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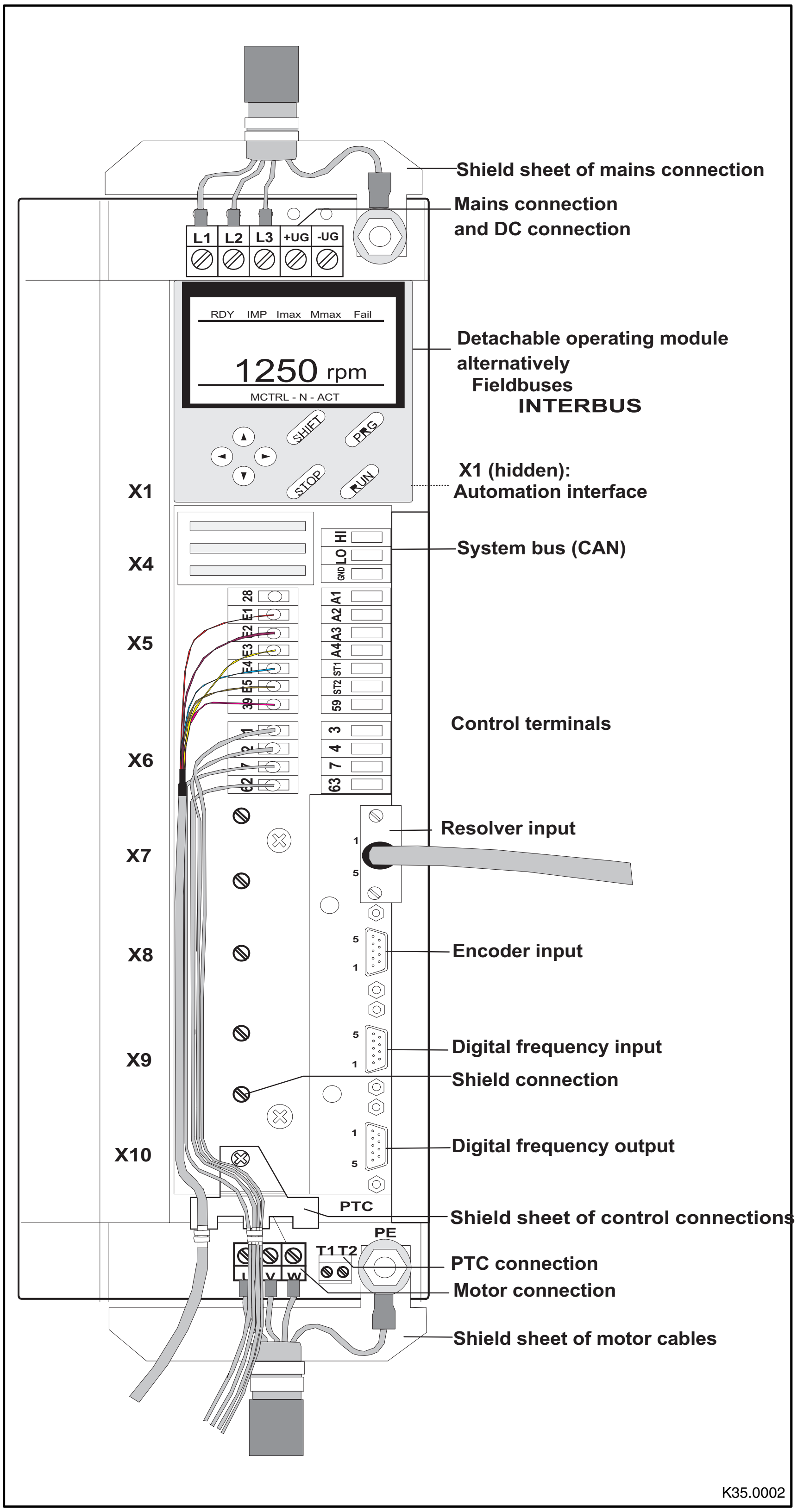
• part of the corresponding System Manual

All documentation listed here contains a type designation and an identification code at the top left edge.
The features and data of the controller specified in your System Manual correspond to the controller version at the time of printing (date of printing: see inner cover page of the parts).
Lenze strives to keep all information to the state of the latest controller version. If you should still find deviations from your System Manual, we kindly ask you to refer to the Operating Instructions included in the scope of supply or to contact your Lenze representative directly.



Shield sheet of mains connection
Mains connection
and DC connection
L1
L2
L3
+UG
-UG
RDY IMP Imax Mmax Fail
1250 rpm
MCTRL - N - ACT
SHIFT
PRG
STOP
RUN
Detachable operating module
alternatively
Fieldbuses
INTERBUS
X1 (hidden):
Automation interface
X1
X4
System bus (CAN)
X5
X6
Control terminals
X7
Resolver input
X8
Encoder input
X9
Digital frequency input
Shield connection
X10
Digital frequency output
PTC
Shield sheet of control connections
PE
T1 T2
PTC connection
Motor connection
U V W
Shield sheet of motor cables
K35.0002

EDSVS9332P-A

Lenze

System Manual
Part A

Contents

Preface and general information

Global Drive
9300 servo position controller

This documentation is valid for 9300 position controllers as of version:

Type	Design	Hardware version and index	Software version and index	Variant	Explanation
33.932X	EP	2x	2x		(9321 - 9329)
33.933X	EP	2x	2x		(9330 - 9332)
33.932X	CP	2x	2x	- V003	Cold Plate (9321 - 9328)

Type

Design:
EP = Built-in unit IP20
CP = Cold Plate

Hardware version and index

Software version and index

Variant

Explanation

3.0 11/2004

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1 Preface and general information

1.1 How to use this Manual

- This Manual supplements the Operating Instructions of the servo position controller 93XX.
- It contains the Operating Instructions which were valid at the time of printing of the System Manual and additional information on systems engineering, functionality and accessories.
  – In case of doubt, the Operating Instructions attached to the 93XX servo position controller is valid.
- The System Manual helps to select and dimension the 93XX servo position controller 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 position controller (types 9321 ... 9332)
Controller	93XX servo position controller
Drive system	Drive systems with servo position controllers 93XX and other Lenze drive components

1.1.2 What is new?

Version			Id. No.	Modifications
1.0	05/97		00397653	First edition
2.0	02/99		00406175	Types 9321 to 9324 with 200% overcurrent, new function “Automatic control parameter identification”
3.0	03/2003	TD23	00463261	Fault correction and editorial revision

1.2 Legal regulations

Labelling	**Nameplate**	**CE-identification**	**Manufacturer**
	Lenze controllers are unambiguously designated by the contents of the nameplate.	Conforms to the EC Low-Voltage Directive	Lenze Drive Systems GmbH Postfach 101352 D-31763 Hameln
Application as directed	**93XX servo position controller** • 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 position controllers** • 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!**		
Liability	• 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		
Warranty	• Terms of warranty: see terms of sales and delivery 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.		
Disposal	**Material**	**recycle**	**dispose**
	Metal	●	-
	Plastic	●	-
	Assembled PCBs	-	●

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 Nieder-spannung (73/23/EWG)** geändert durch: CE-Kenn-zeichnungsrichtlinie (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)

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1.3.4 EC Directive Electromagnetic Compatibility

(89/336/EWG)

amended by: 1st Amendment Directive (92/31/EWG)
CE-marking 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, FFI filter and mains choke are located on a common mounting plate.
- The system components have been wired according to chapter 4 "Electrical installation".

Preface and general information

EC Declaration of Conformity for the purpose of the EC Directive	EG-Konformitätserklärung im Sinne der EG-Richtlinie	Déclaration de conformité CE au sens de la directive CE
Electromagnetic Compatibility (89/336/EEC) Amended by: First Amendment (92/31/EEC) CE Mark Directive (93/ 68/ EEC)	**Elektromagnetische Verträglichkeit (89/336/EWG)** Geändert durch: 1. Änderungsrichtlinie (92/31/EWG CE-Kennzeichnungsrichtlinie (93/68/EWG)	**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)
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.	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.	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
LENZE Drive Systems GmbH, Postfach 10 13 52, D-31763 Hameln		
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:	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:	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 :
EN61800-3; EN61800-3/A11		
Adjustable speed electrical power drive systems, part 3: EMC-product standard including specific test methods	Drehzahlveränderbare elektrische Antriebe Teil 3: EMV-Produktnorm einschließlich spezieller Prüfverfahren	Entraînements électriques de puissance à vitesse variable partie 3. Norme de produit relative à la CEM incluant des méthodes d'essais spécifiques

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

Preface and general information

2 Safety instructions

2.1 General safety and application notes for Lenze controllers

(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!

Safety instructions

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 switch-off, the power terminals U, V, W and $+U_{DC}$, $-U_{DC}$ remain live for at least three minutes. • Before working on the controller, check that no voltage is applied to the power terminals. The discharge current to PE is > 3.5 mA. EN 50178 • requires a fixed installation. • requires double PE connection or a minimum cable cross-section of 10 mm^2.
Protection of devices	Cyclic connection and disconnection of the controller supply voltage at L1, L2, L3 or $+U_{DC}$, $+U_{DC}$ can overload the current input limitation: • Allow at least 3 minutes between disconnection and reconnection.
Overspeeds	Drive systems can reach dangerous overspeeds (e.g. setting high field frequencies for motors and machines which are not suitable): • The controllers do not offer any protection against these operating conditions. Use additional components for this.
Parameter set transfer	During parameter set transfer, the control terminals of the 9300 controller can have undefined states! Therefore the plugs X5 and X6 must be removed before transfer. Thus it is ensured that the controller is inhibited and all control terminals have the defined state ”LOW”.

2.3 Layout of the safety instructions

All safety information given in these Instructions have got the same structure:

Signal word (indicates the severity of danger)
Note (describes the danger and informs the reader how to avoid danger)

	Icons used		**Signal words**	
Warning of danger 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**. Consequences if disregarded: Death or severe injuries.
			Caution!	Warns of **potential, hazardous situations**. Consequences if disregarded: Light or minor injuries.
Warning of damage to materials	STOP		**Stop!**	Warns of **possible damage to material**. Consequences if disregarded: Damage of the controller/drive system or its environment.
Other notes	i		**Tip!**	It designates general, useful notes. If you follow the tip, handling of the controller/drive system will be easier.

Safety instructions

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EDSVS9332P-B

Lenze

System Manual
Part B

Technical data

Installation

Global Drive

9300 servo position controller

This documentation is valid for 9300 position controllers as of version:

Type	Design	Hardware version and index	Software version and index	Variant	Explanation
33.932X	EP	2x	2x		(9321 - 9329)
33.933X	EP	2x	2x		(9330 - 9332)
33.932X	CP	2x	2x	- V003	Cold Plate (9321 - 9328)

Type

Design:
EP = Built-in unit IP20
CP = Cold Plate

Hardware version and index

Software version and index

Variant

Explanation

3.0 11/2004

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Part B

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 or encoder feedback
  – simple connection via prefabricated system cables (accessories)
  – connecting cables can be plugged
- Point-to-point positioning
  – with or without velocity changeover
- Touch probe positioning
- Absolute or relative positioning
- S-ramps.
- Homing according to different modes
- Manual homing.
- Manual positioning.
- Manual positioning with intermediate stop
- Simple programming via PC
- 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 the connection of servo inverters and for the extension of 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

Field	Values
Vibration resistance	Germanischer Lloyd, general conditions
Climatic conditions	Class 3K3 to EN50179 (without condensation, average relative humidity 85 %)
Permissible temperature ranges	during transport: -25 °C ... +70 °C during storage of the controller: -25 °C ... +55 °C during operation of the controller: 0 °C ... +40 °C without derating +40 °C ... +55 °C with power derating (controllers 9321-9326) +40 °C ... +50 °C with power derating (controllers 9327-9332)
Permissible installation height h	h ≤1000 m a.m.s.l. without derating 1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l. with derating
Degree of pollution	VDE 0110 part 2 pollution degree 2
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 acc. 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** **Severity** Running time EN61000-4-2 3, i.e. 8 kV at air discharge and 6 kV at contact discharge RF interference (enclosure) EN61000-4-3 3, i.e. 10 V/m; 27 to 1000 MHz Burst EN61000-4-4 3/4, i.e. 2 kV/5 kHz Surge IEC 1000-4-5 3, i.e. 1.2/50 µs, 1 kV phase-phase, 2 kV phase-PE
Insulation strength	Overvoltage category III to VDE 0110
Packing	to DIN 4180 9321 to 9332: Delivery packing
Type of protection	IP20 IP41 on the heatsink side for thermal separation (push-trough technique) NEMA 1: Protection against contact
Approvals	CE: Low-Voltage Directive UL508: Industrial Control Equipment UL508C: Power Conversion Equipment

3.3 Rated data

3.3.1 Types 9321 to 9325

	Type	EVS9321-EP	EVS9322-EP	EVS9323-EP	EVS9324-EP	EVS9325-EP
	Order No.	EVS9321-EP	EVS9322-EP	EVS9323-EP	EVS9324-EP	EVS9325-EP
	Type	**EVS9321-CP**	**EVS9322-CP**	**EVS9323-CP**	**EVS9324-CP**	**EVS9325-CP**
	Order No.	EVS9321-CP	EVS9322-CP	EVS9323-CP	EVS9324-CP	EVS9325-CP
Mains voltage	V_r [V]	320 V - 0 % $\leq V_r \leq$ 528 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %				
Alternative DC supply	V_{DC} [V]	460 V - 0 % $\leq V_{DC} \leq$ 740 V + 0 %				
Mains current with mains filter Mains current without mains filter	I_r [A]	1.5 2.1	2.5 3.5	3.9 5.5	7.0 -	12.0 16.8
Rated data for operation at a mains: 3 AC / 400V / 50Hz/60Hz						
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 (8kHz*)	S_{r8} [kVA]	1.0	1.7	2.7	4.8	9.0
Output power $+U_{DC}$, $-U_{DC}$ 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
Rated data for operation at a mains: 3 AC / 480V / 50Hz/60Hz						
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 (8kHz*)	S_{r8} [kVA]	1.2	2.1	3.2	5.8	10.8
Output power $+U_{DC}$, $-U_{DC}$ 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	V_M [V]	0 - 3 × V_{Mains}				
Power loss (operation with I_{ratedx})	P_{loss} [W]	100	110	140	200	260
Power derating	[%/K] [%/m]	40 °C < T_{amb} < 55 °C: 2%/K (not UL approved) 1000 m amsl < h ≤ 4000 m amsl: 5%/1000m				
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_{ratedx}

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-EP	EVS9322-EP	EVS9323-EP	EVS9324-EP
Rated data for operation at a mains: 3 AC / 400V / 50Hz/60Hz					
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
Rated data for operation at a mains: 3 AC / 480V / 50Hz/60Hz					
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 code 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 for 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 reduces automatically to 70% of the original value.

Overcurrent diagram: 🕮 7-293

All other data: 🕮 3-3

Tip!

Switching to I_{max} > 150 % I_{rX} only if the controller is inhibited.

3.3.3 Types 9326 to 9332

	Type	**EVS9326-EP**	**EVS9327-EP**	**EVS9328-EP**	**EVS9329-EP**	**EVS9330-EP**	**EVS9331-EP**	**EVS9332-EP**
	Order No.	EVS9326-EP	EVS9327-EP	EVS9328-EP	EVS9329-EP	EVS9330-EP	EVS9331-EP	EVS9332-EP
	Type	**EVS9326-CP**	**EVS9327-CP**	**EVS9328-CP**				
	Order No.	EVS9326-CP	EVS9327-CP	EVS9328-CP				
Mains voltage	V_r [V]	320 V - 0 % ≤ V_r ≤ 528 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %						
Alternative DC supply	V_{DC} [V]	460 V - 0 % ≤ V_{DC} ≤ 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 -
Rated data for operation at a mains: 3 AC / 400V / 50Hz/60Hz								
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_{DC}, -U_{DC} 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
Rated data for operation at a mains: 3 AC / 480V / 50Hz/60Hz								
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_{DC}, -U_{DC} 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	a_M [V]	0 - 3 × V_{Mains}						
Power loss	P_{loss} [W]	360	430	640	810	1100	1470	1960
Power derating	[%/K] [%/K] [%/m]	9326: at 40 °C < T_{amb} < 55 °C: 2%/K (not UL approved) 9327 - 9332: at 40 °C < T_{amb} < 50 °C: 2.5%/K (not UL approved) 1000 m amsl < h ≤ 4000 m amsl: 5%/1000m						
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_{ratedx}

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

* Switching frequency of the inverter (C0018)

3.3.4 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	mm^2	AWG	VDE	UL	VDE	mm^2	AWG		mm^2	AWG
9321	M 6A	5A	B 6A	1	17	M 6A	5A	B 6A	1	17	6A	1	18
9322	M 6A	5A	B 6A	1	17	M 6A	5A	B 6A	1	17	6A	1	18
9323	M 10A	10A	B 10A	1.5	15	M 10A	10A	B 10A	1.5	15	12A	1.5	14
9324	-	-	-	-	-	M 10A	10A	B 10A	1.5	15	12A	1.5	14
9325	M 32A	25A	B 32A	j6	9	M 20A	20A	B 20A	4	11	20A	4	12
9326	-	-	-	-	-	M 32A	25A	B 32A	j6	9	40A	10	8
9327	M 63A	63A	-	16	j6	35A	35A	-	10	7	80A	25	3
9328	-	-	-	-	-	50A	50A	-	16	5	80A	25	3
9329	-	-	-	-	-	80A	80A	-	25	3	100A	50	1
9330	-	-	-	-	-	100A	100A	-	50	0	2 * 80A 1)	2 * 25	2 * 3
9331	-	-	-	-	-	125A	125 A	-	70	2/0	2 * 100A 1)	2 * 50	2 * 1
9332	-	-	-	-	-	160A	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

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 (DC).
  – Tripping characteristic "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.
- The data in the table "Operation with mains filters" are applicable.

3.3.5 Mains filter

Type	Rated data (uk ≈ 6%)		Lenze order number	
	Rated current	Inductance	for RFI degree A	for RFI degree 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 degree B contain additional RFI suppression components.

3.4 Dimensions

The dimensions of the controllers depend on the mechanical installation. (📖 4-1)

Show/Hide Bookmarks

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. (🕮 4-2)
- Thermally separated with external heatsink
  – ”Push-through technique” (🕮 4-3)
  – ”Cold Plate technology” (🕮 4-6)

4.1.2 Standard assembly with fixing rails or fixing brackets

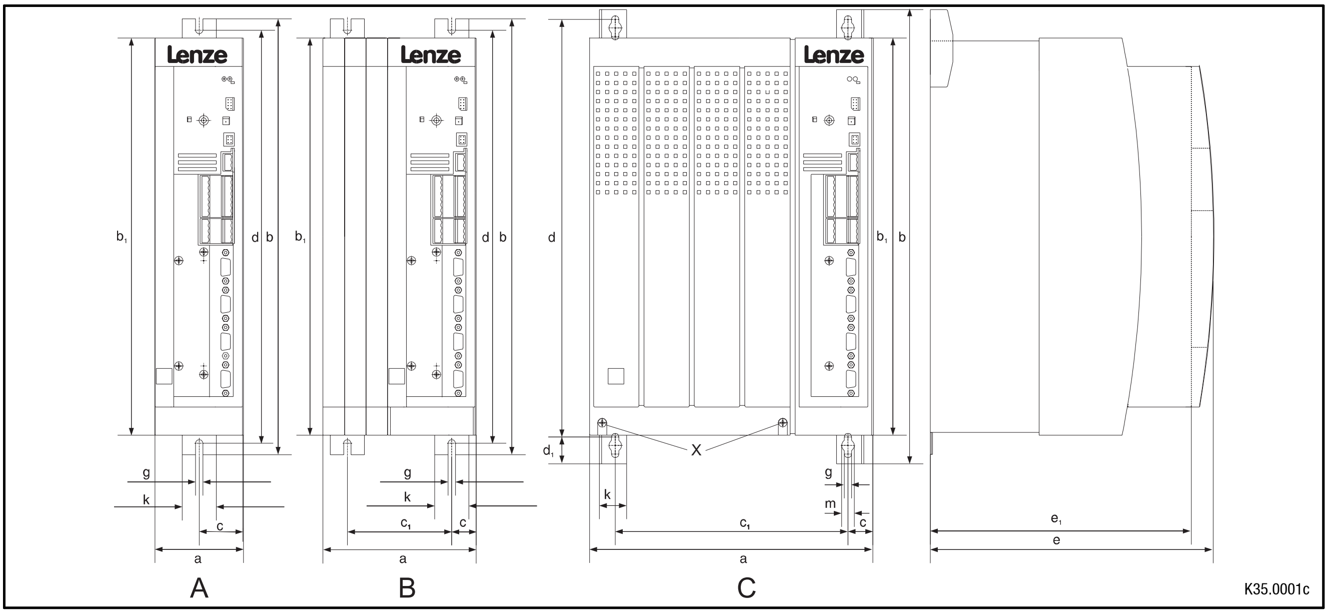


Fig. 4-1 Dimensions for assembly with fixing rails/fixing brackets

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 an attachable fieldbus module:
Observe the free space required for the connection cables

All dimensions in mm

Controllers 9321 to 9326

- Assembly preparation:
  – Take out fixing rail(s) (accessory kit in the box) and mount them on the controller housing

Controllers 9327 to 9332

- Remove cover:
  – Loosen screws (X)
  – Swing cover upwards, and detach.
  – Take accessory kit out of the interior of the controller
- Assembly preparation:
  – Take out fixing bracket and screws (accessory kit) and mount them on the controller housing

4.1.3 Assembly with thermally separated power stage ("Push-through technique")

The heatsink of the controllers 9321 ... 9329 can be mounted outside the control cabinet to reduce the heat generated in the control cabinet. For this, you need an assembly frame with seal (can be ordered from Lenze).

- Distribution of the power loss:
  – approx. 65% via the separated heatsink (heatsink + blower)
  – approx. 35 % inside the controller
- The enclosure of the separated heatsink (heatsink + blower) is IP41.
- The rated data of the controller is still valid.

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 catch.
3. Slip the seal over the heatsink and lay into the slot provided.

Installation

Dimensions of the types 9321 to 9326

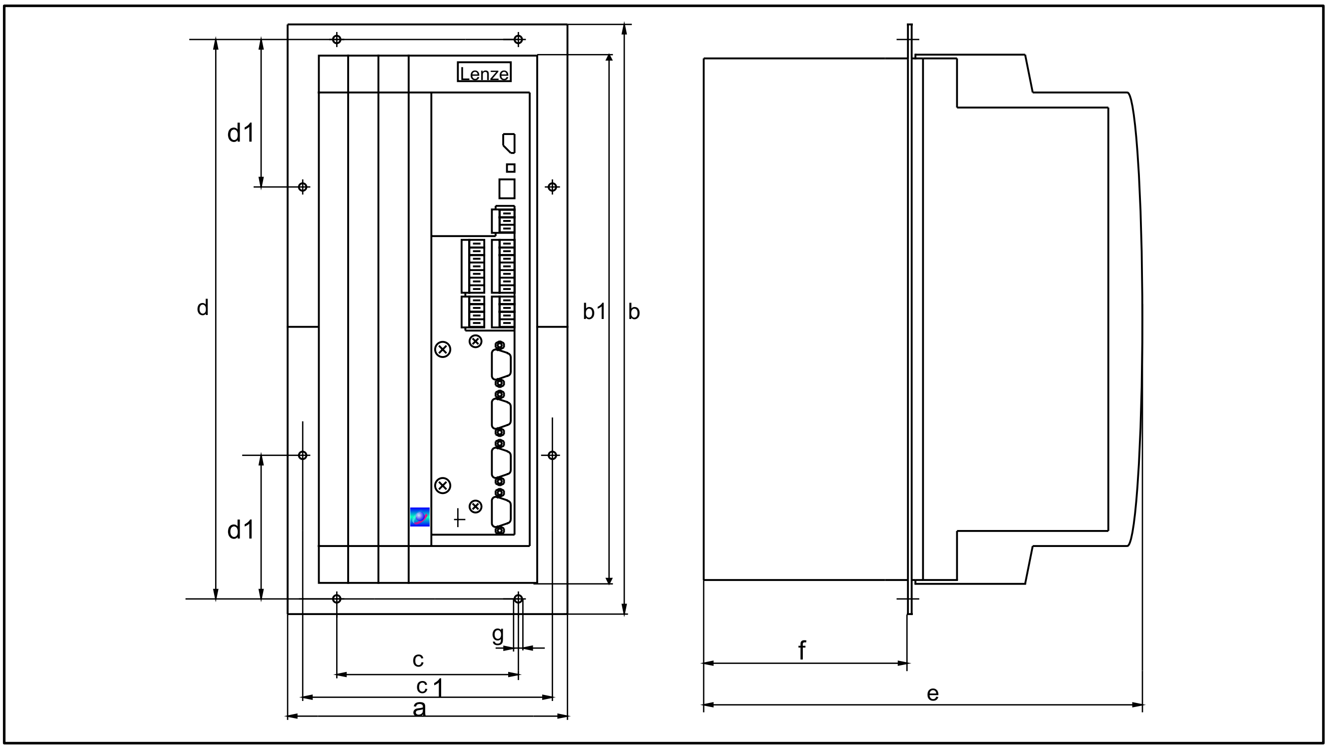


Fig. 4-2 Dimensions for assembly with thermally separated power stage

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

Assembly cutout

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

* When using an attachable fieldbus module:
Observe the free space required for the connection cables

All dimensions in mm

Dimensions of the types 9327 to 9329

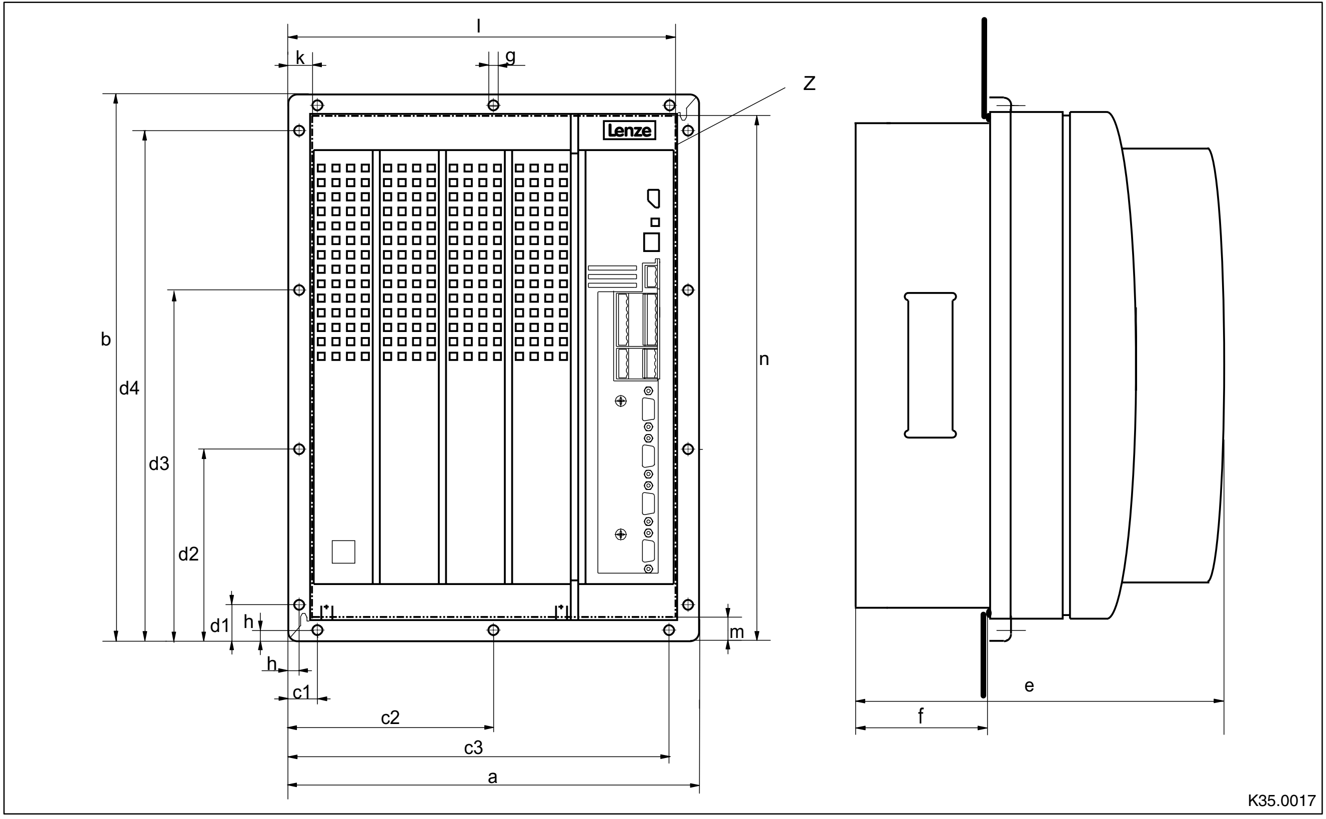


Fig. 4-3 Dimensions for assembly with thermally separated power stage

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

Cutout Z

Type	Height	Width	k	l	m	r
9327, 9328, 9329	338 ±1	238 ±1	20 ±2	259 ±2	20 ±2	359 ±2

* When using an attachable fieldbus module:
Observe the free space required for the connection cables

All dimensions in mm

4.1.4 Assembly of variants

Variant EVS932X-Cx (”Cold plate”)

For installation in a control cabinet with other heatsinks in ”cold plate technique” (x = order designation; more information on the inner cover page).

Dimensions for types 9321-Cx to 9326-Cx

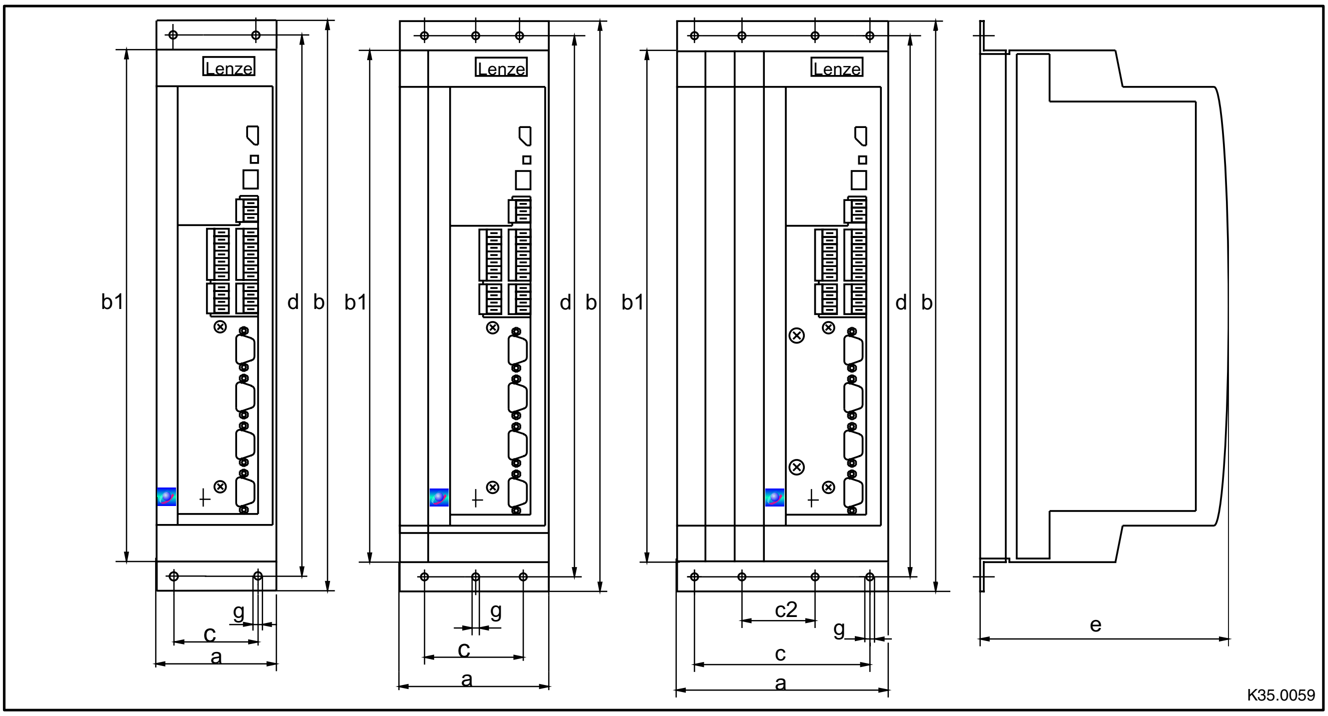


Fig. 4-4 Dimensions for ”Cold plate” assembly

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 an attachable fieldbus module:
Observe the free space required for the connection cables

All dimensions in mm

Dimensions for types 9327-Cx and 9328-Cx

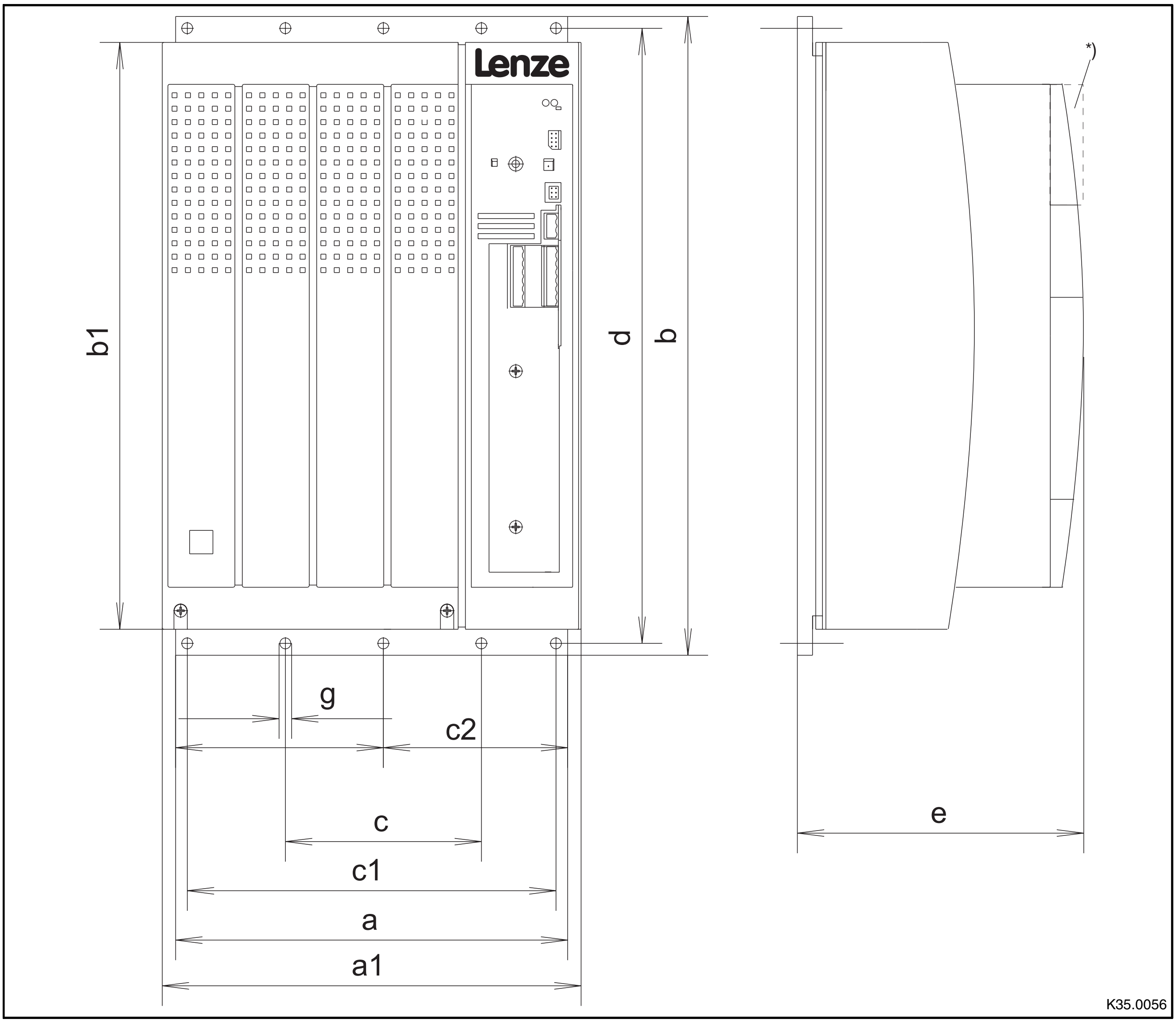


Fig. 4-5 Dimensions for "Cold plate" assembly

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 an attachable fieldbus module:
Observe the free space required for the connection cables

All dimensions in mm

Installation

- 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:

Controllers	Cooling path	
Type	Power to be dissipated P_{loss} [W]	$CW_{thmax\ heatsink}$ [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 cold plate temperature must not exceed +85 °C.
- For the bore pattern and surface quality of the heatsink please consult the factory.
- Apply the heat conducting paste (accessory kit) onto the cold plate of the controller.

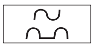
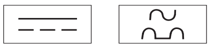
4.2 Electrical installation

Information on installation acc. to EMC requirements are included in chapter 4.3.

4.2.1 Protection of persons

Danger!
All power terminals carry voltage 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 equipped with a mains rectifier. If a short-circuit to frame occurs, a smooth DC residual current can block the activation of the DC sensitive or pulse-current sensitive RCCBs and thus destroy the protective function for all units connected. We therefore recommend:
  - "pulse-current sensitive RCCB" or "all-current RCCB" in systems equipped with controllers with single-phase mains connection (L1/N).
  - "all-current sensitive RCCB" 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 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 sentitive RCCB)

All-current sensitive RCCBs are described in the European Standard EN EN 50178 and in the IEC 755.
The EN 50178 has been harmonized 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.

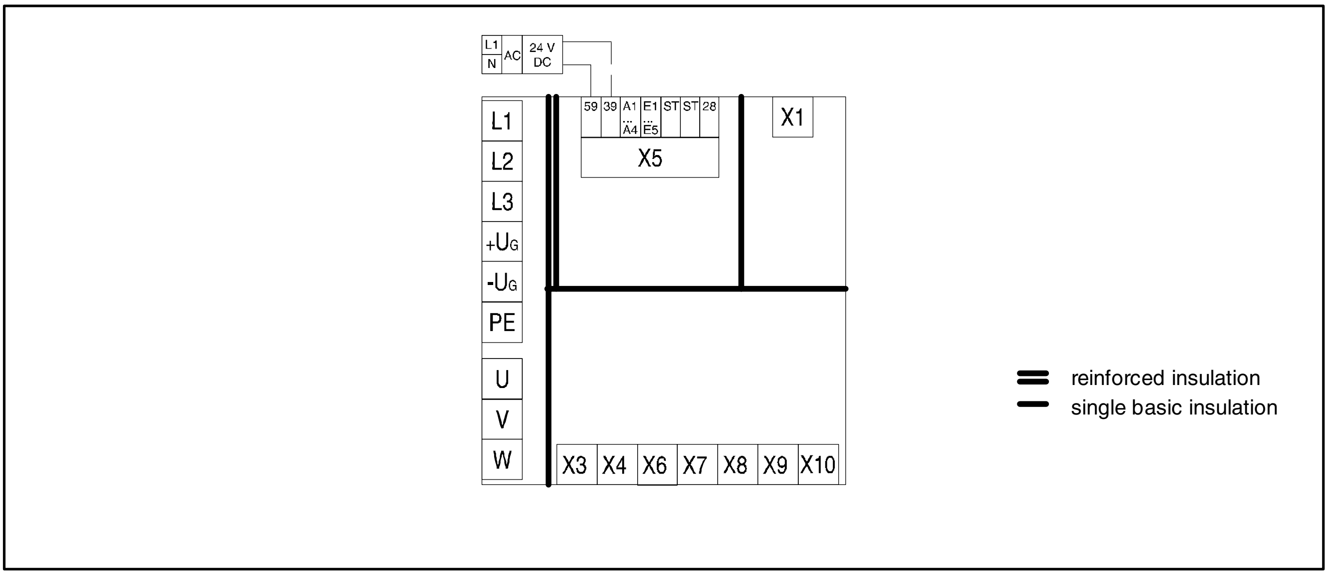


Fig. 4-6 Basic insulation in the controller

4.2.1.3 Replacement of defective fuses

Replace defective fuses with the prescribed type only when no voltage is applied. (📖 3-6)

- For single drives, the controller carries a hazardous voltage 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 Protection of the controller

Stop!

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 grounded metal part in the control cabinet.

- Length of the screws for the connection to the shield cable/shield sheet for the types 9327 to 9332: < 12 mm
- Controller protection by means of external fuses. (📖 3-6)
- Protect unused control inputs and outputs with plugs or covers (included in the contents of delivery) for the Sub-D inputs.
- Frequent mains switching can overload the internal switch-on current limitation. For cyclic mains switching, 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. (📖 3-7)
- 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 means of overcurrent relay 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 provided with thermal contacts as standard).
  – PTC thermistors or thermal contacts (NC contact) can be connected to the controller.
- Only use motors with an insulation suitable for 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 not suitable for inverter operation, please contact your motor supplier.

4.2.4 Mains types/mains conditions

Please observe the restrictions of each mains type!

Mains	Operation of the controllers	Notes
With earthed neutral (TT/TN systems)	No restrictions	Comply with controller ratings • Effective mains current: 📖 3-3
With insulated neutral (IT systems)	Possible if the controller is protected in the event of an earth fault in the mains supply • by means of suitable equipment for detecting an earth fault and • the controller is disconnected directly from the mains	In the event of an earth fault at the inverter output, safe operation 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 symmetrical to PE	Controller will be destroyed when earthing $+U_G$ conductor or $-U_G$ conductor

4.2.5 Interaction with compensation equipment

- The controllers take up a very low fundamental reactive power from the supplying AC mains. Therefore compensation is not necessary.
- If the controllers are operated on mains with compensation, this equipment must be used with chokes.
  – For this, contact the supplier of the compensation equipment.

4.2.6 Specification of the cables used

- The cables used must comply with the approvals required for the application.
- Use low-capacitance cables. Capacitance per unit length:
  – Core/core ≤ 75 pF/m
  – Core/shield ≤ 150 pF/m
- Maximum permissible motor cable length without external measures:
  – Shielded: 100 m
  – Unshielded: 200 m
- 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 overlap rate of the braid:
  Min. 70 % to 80 % with an overlap 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 upwards and detach. – Take accessory 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.

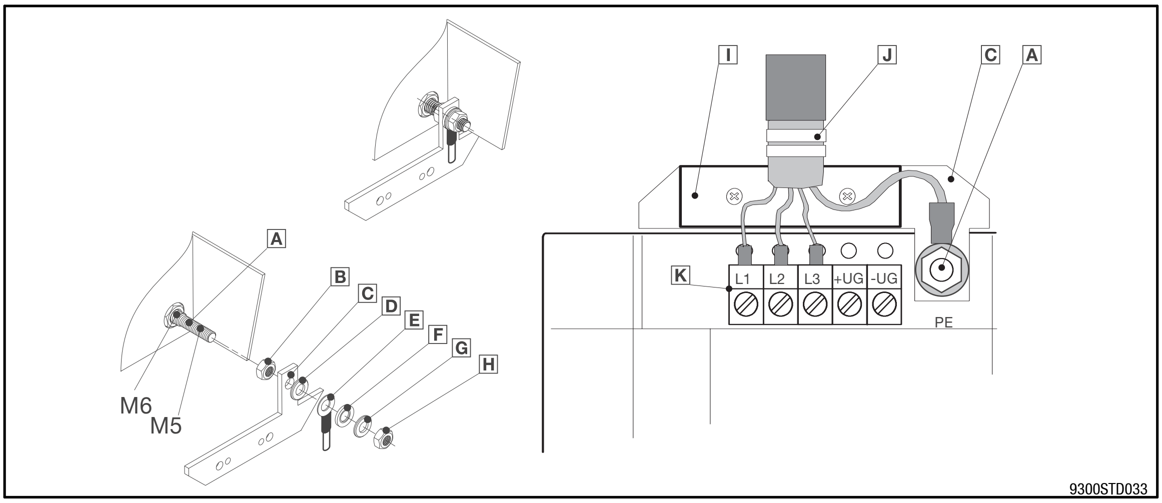


Fig. 4-7 Recommendation for a mains connection

- 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 log 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 devices at the DC bus to screw terminals +UG, -UG.

Tip!

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

Types 9327 ... 9332

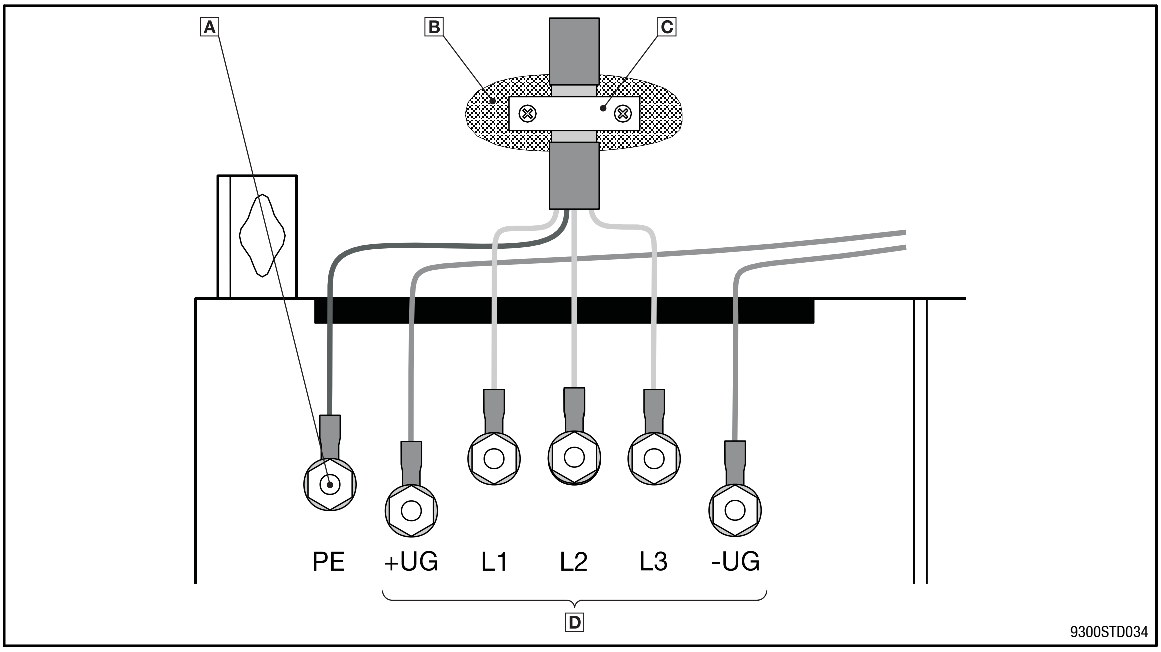


Fig. 4-8 Recommendation for a mains connection

- 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 devices of the DC bus 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 3.3.4 are recommendations and refer to • the use in control cabinets and machines • installation in cable ducts, • max. ambient temperature of +40 °C.
Selection of the cable cross-section	Please consider the voltage drop under load (according to DIN 18015, part 1: ≤ 3 %).
Cable and controller protection on the AC side (L1, L2, L3)	• By means of standard commercial fuses. • By means of fuses in UL-conform plants must have UL approval. • The rated voltages of the fuses must be dimensioned according to the mains voltage at the site. The activation characteristic is defined 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:	Please observe the notes in part F of the systems manual.
Connection of a brake unit	When connecting the brake unit to terminals +UG / -UG, please note that the fuses and cross sections indicated in chapter 3.3.4 do not apply to the brake unit. These unit-specific data can be obtained from the technical documentation for the brake unit.
Further information	For the protection of cables and the controller please see the chapter "Accessories" in the "Planning" folder.
Other 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.

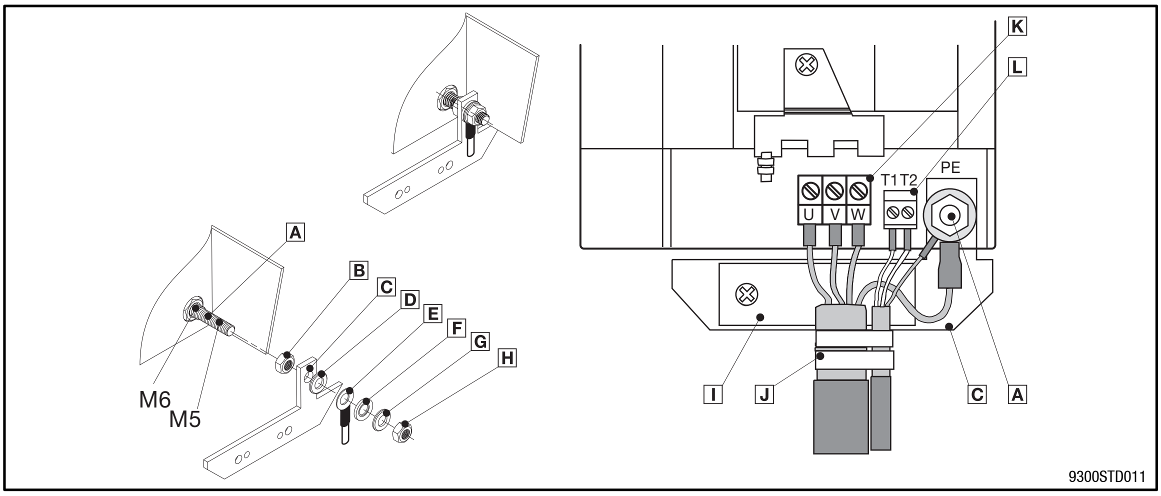


Fig. 4-9 Proposal for motor connection

- 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.

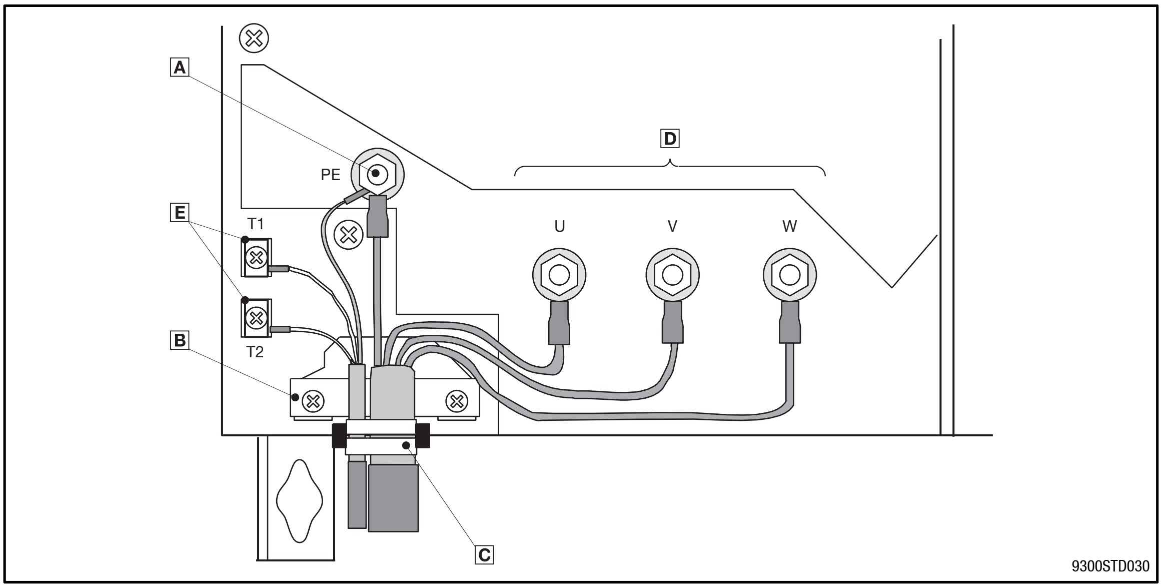


Fig. 4-10 Proposal for motor connection

- 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

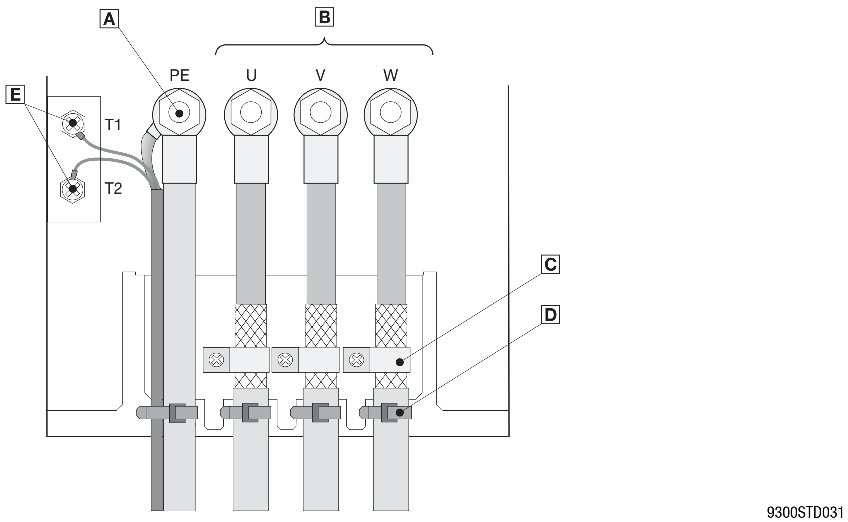


Fig. 4-11 Proposal for motor connection

- 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

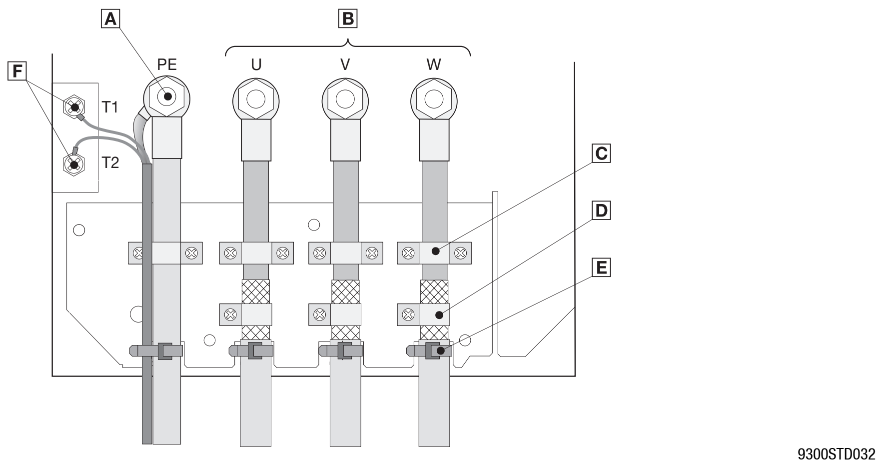


Fig. 4-12 Proposal for motor connection

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.

Installation

Max. permissible 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
9321 ... 9326	4 mm²	1.5 mm²	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)
9327 ... 9329	25 mm²		5 Nm (44 lb-in)			
9330 ... 9331	95 mm²		15 Nm (132 lb-in)			
9332	120 mm²		30 Nm (264 lb-in)			

Cable cross-sections	Connection with	Note
Up to 4 mm²	Wire end ferrules	
Up to 6 mm²	Pin-end connectors	
>25 mm²	Ring cable lugs	The cable cross-section is only limited by the cable bushing in the housing.

Max. permissible motor cable length:

Type	a_r = 400 V (+10%)		a_r = 480 V (+10%)	
	f_{chop} = 8 kHz	f_{chop} = 16 kHz	f_{chop} = 8 kHz	f_{chop} = 16 kHz
	max. permissible motor cable length		max. permissible motor cable length	
9321, 9322	up to 50 m	up to 45 m	up to 50 m	up to 25 m
9323 ... 9332	up to 50 m	up to 50 m	up to 50 m	up to 50 m

Tip!

- Switching on the motor side of the controller is only permitted for safety switch-off (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.
  – Two parallel single cores: l_{max} = 17 m
  – Three parallel single cores: l_{max} = 9 m

4.2.7.3 Connection of a brake unit

- When connecting a brake 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, if the temperature monitoring of the brake unit is activated,
  – the controllers are inhibited (X5/28 = LOW).
  – the mains is disconnected.
- Examples:
  – Chapter 4.3, "Installation of a CE-typical drive system". (🕮 4-41)
  – Fig. 4-13, "Decentralized supply for DC-bus connection of several drives". (🕮 4-22)

4.2.7.4 DC bus connection of several drives

Decentralized supply with brake module

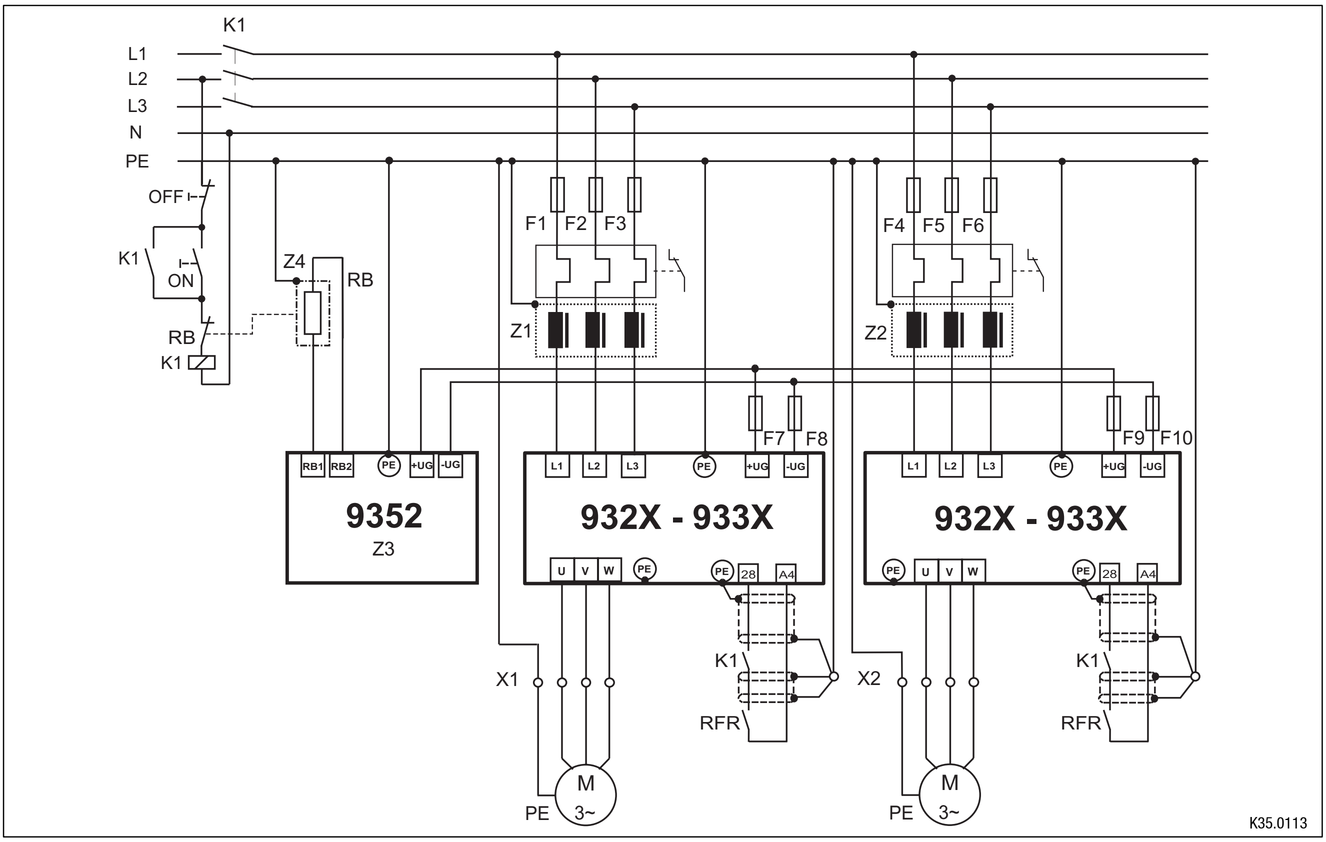


Fig. 4-13 Decentralized supply for DC-bus connection of several drives

Z1, Z2	Mains filter
Z3	Brake chopper
Z4	Brake resistor
F1...F6	Protection, see “Cable protection” (🕮 3-6) / “Mains connection” (🕮 4-13)
F7...F10	DC bus fuse; fuse holder with / without alarm contact, see “Cable protection” (🕮 3-6) / “Mains connection” (🕮 4-13)
K1	Main contactor

STOP

Stop!

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

Tip!

Please observe the specifications in part F of the Manual and the application report “DC bus connection” for the dimensioning and rating of the components.

Central supply with supply module

- When connecting the supply module, the corresponding Operating Instructions must be observed.

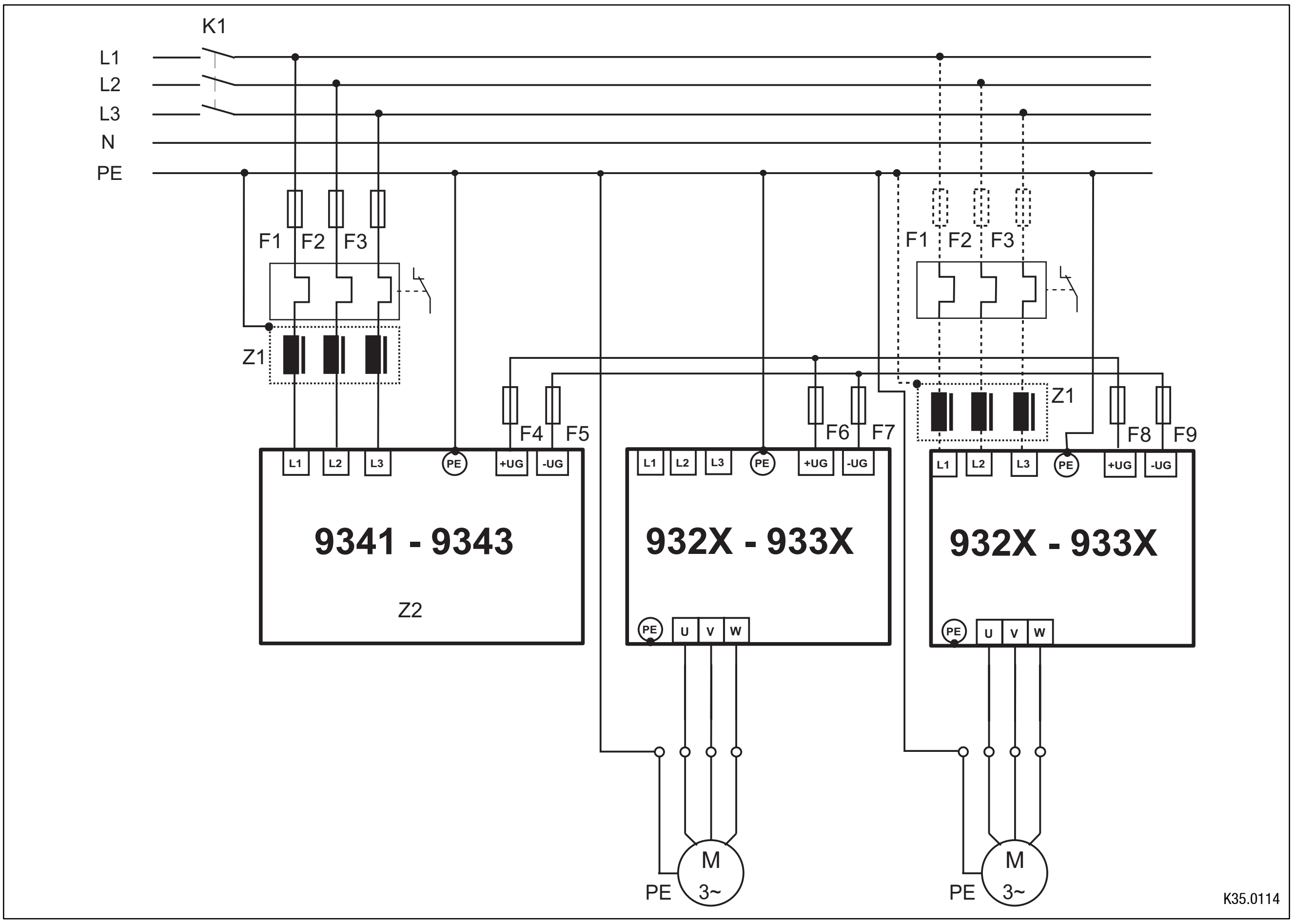


Fig. 4-14 Central supply for DC-bus connection of several drives

Z1	Mains supply filter
Z2	Supply module
F1...F6	Protection, see “Cable protection” (🕮 3-6) / “Mains connection” (🕮 4-13)
F4...F9	DC bus fuse; fuse holder with / without alarm contact, see “Cable protection” (🕮 3-6) / “Mains connection” (🕮 4-13)
K1	Main contactor

Tip!

If the power supply of the supply module is not sufficient, a parallel supply can be installed via the mains supply input of a controller (see Manual, Part F). In this case, the controllers can only be operated with the assigned mains filters.

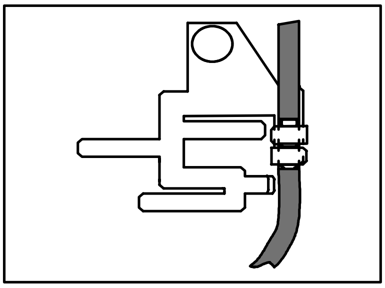
4.2.8 Control connections

4.2.8.1 Control cables

- Connect control cables to the screw terminals:

Max. permissible cable cross-section	Screw-tightening torques
1.5 mm^2	0.5 ... 0.6 Nm (4.4 ... 5.3 lbin)

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



4.2.8.2 Assignment of the control terminals

Protection against inverse polarity

- This protection prevents the wrong connection of the internal control inputs. It is however possible to overcome the protection against polarity reversal by applying great force. The controller cannot be enabled in this case.

Overview

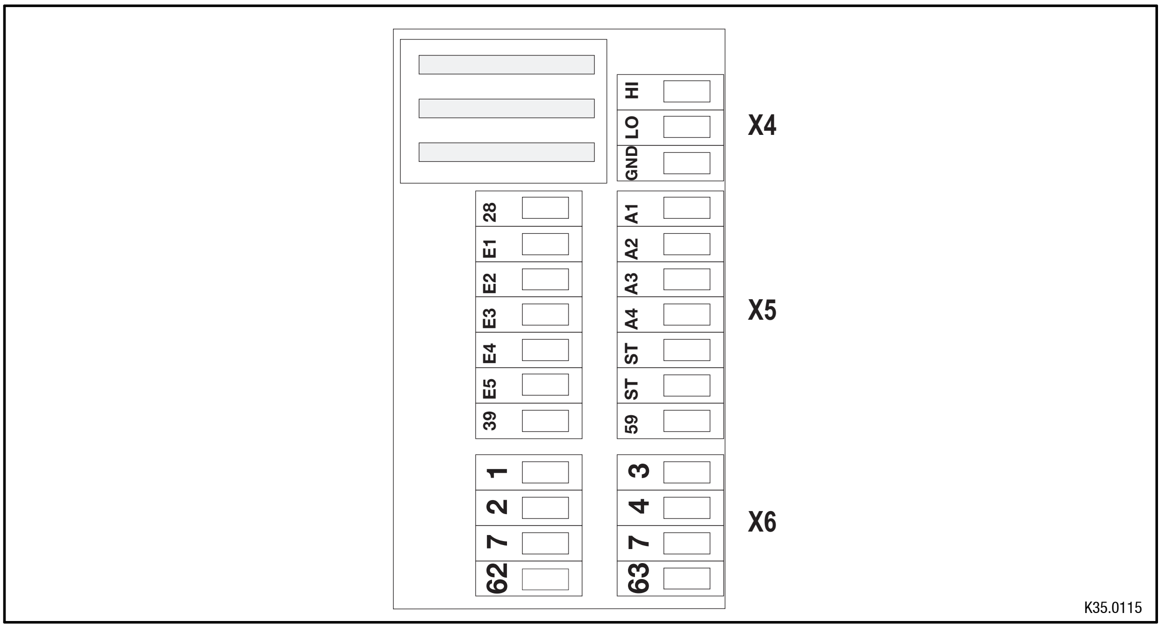


Fig. 4-15 Layout of the control connections on the front of the controller

4.2.8.3 Connection of digital signals (X5)

Stop!

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

Supply via internal voltage source

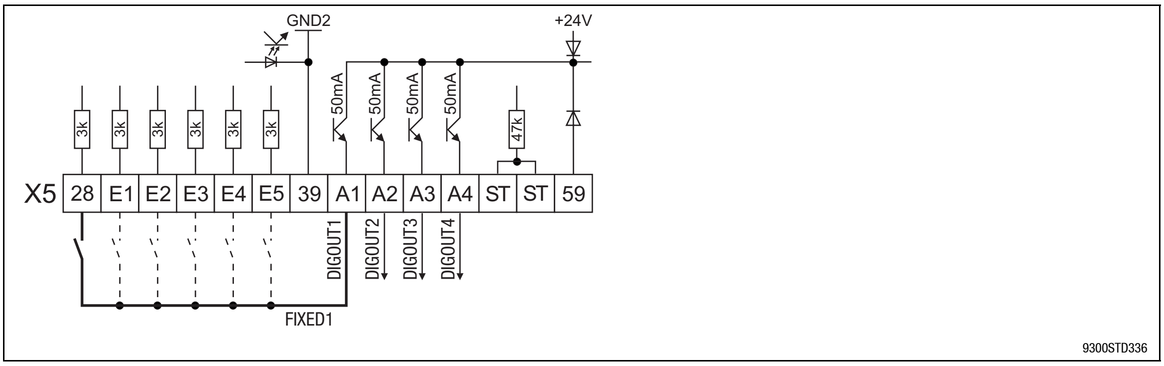


Fig. 4-16 Connection of the digital input signals for internal voltage supply

—— 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 set to HIGH level.
- Assign C0117/1 with FIXED1 and set C0118/1 = 0 (HIGH active). Apply 24 V DC to X5/A1.

Tip!

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

Installation

Supply via external voltage source

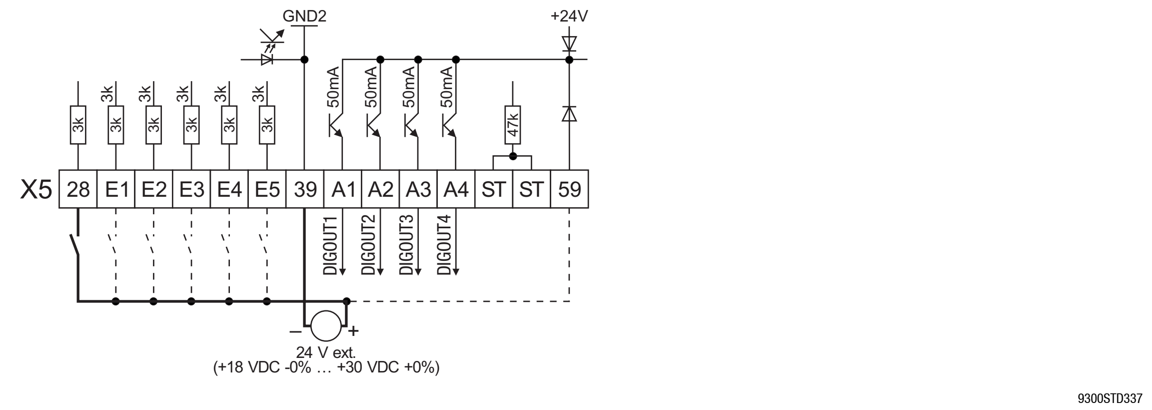


Fig. 4-17 Connection of the digital input signals for external voltage supply

—— Minimum wiring required for operation

Tip!

The supply of the digital input signals via an external voltage source allows a **backup operation in the event of mains failure**. After switching off the mains voltage all actual values are still detected and processed.

- Connect the positive pole of the external voltage source with X5/59 to create the backup operation in the event of mains failure.
- The external voltage must be able to supply a current ≥ 1 A .
- The starting current of the external voltage source is not limited by the controller. Thus, Lenze recommends using voltage sources with current limitation or with an internal impedance of Z > 1 Ω.

Terminal assignment

	Signal type	Function Bold print = **Lenze setting** (C0005 = 20000)	Level	Technical data
X5/28	Digital inputs	Controller inhibit (CINH)	HIGH = start	LOW: 0 … +3 V HIGH: +12 … +30 V Input current at +24 V: 8 mA per input Reading and writing of the inputs: Once per ms (average value)
X5/E1		Freely assignable **Limit switch – traversing in negative direction**	LOW	
X5/E2		Freely assignable **Limit switch – traversing in positive direction**	LOW	
X5/E3		Freely assignable **Start positioning program** (condition: X5/E5 = LOW)	LOW-HIGH edge	
X5/E4		Freely assignable **Reference switch and touch probe input**	HIGH	
X5/E5		Freely assignable **Program active** **Reset error message TRIP** **Reset positioning operation** **Activate manual operation**	 LOW LOW-HIGH edge HIGH HIGH	
X5/A1	Digital outputs	Freely assignable **Reference known**	HIGH	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 **Target position reached**	HIGH	
X5/A3		Freely assignable **Ready for operation**	HIGH	
X5/A4		Freely assignable **PF01**	HIGH	
X5/39	–	GND2, reference potential for digital signals	–	Electrically isolated to GND1
X5/59	–	DC supply for backup operation of the controller in the event of mains failure	+24 V external	Current demand: At least 1 A

4.2.8.4 Connection of analog signals (X6)

Stop!

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

Supply via internal voltage source

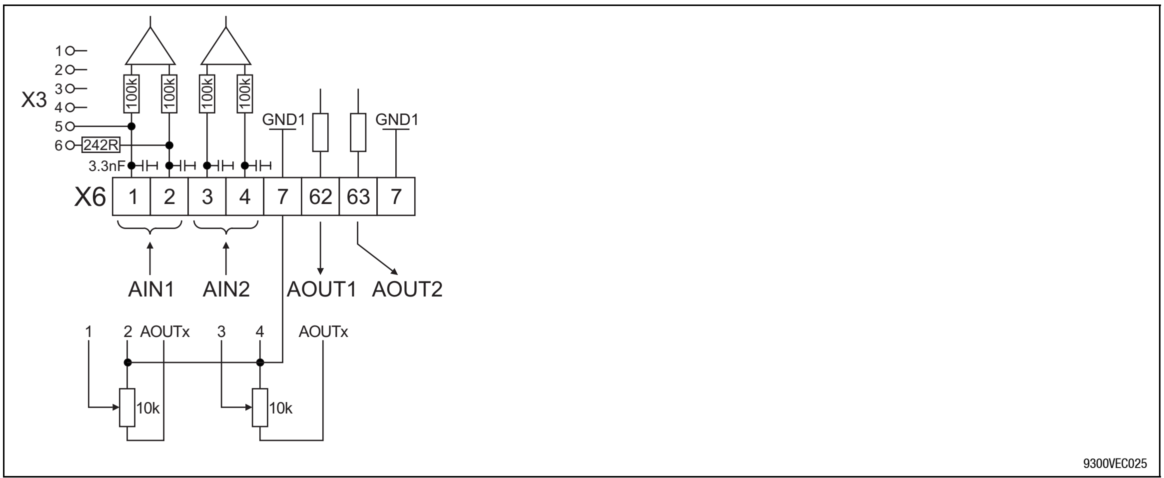


Fig. 4-18 Connection of the analog input signals for internal voltage supply

Configuration of the internal voltage supply:

- Set a freely assignable analog output (AOUTx) to HIGH level.
  – E. g. terminal X6/63: Assign C0436 with FIXED100%. Thus, 10 V are applied to terminal X6/63.

Tip!

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

Supply via external voltage source

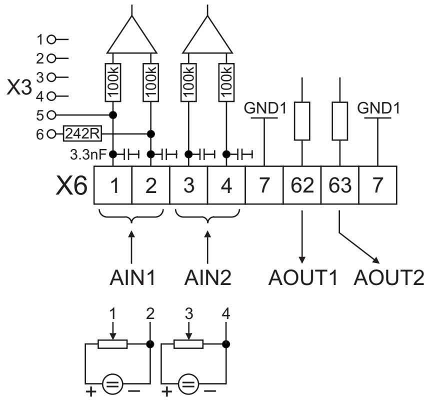
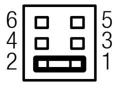
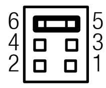


Fig. 4-19 Connection of the analog input signals for external voltage supply

Terminal assignment

	Signal type	Function Bold print = **Lenze setting** (C0005 = 20000)		Level	Technical data
X6/1 X6/2	Analog input 1	Differential input of master voltage **not assigned**	 Jumper X3 *	-10 V to +10 V	Resolution: 5 mV (11 bits + sign)
		Differential input of master current	 Jumper X3 *	-20 mA to +20 mA	Resolution: 20 µA (10 bits + sign)
X6/3 X6/4	Analog input 2	Difference input of master voltage **not assigned**	Jumper X3 has no effect	-10 V to +10 V	Resolution: 5 mV (11 bits + sign)
X6/62	Analog output 1	Monitor 1 **Actual speed value**		-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		–	–

* If necessary, remove the AIF module from X1 to reach the jumpers of X3.

Installation

Digital frequency input (X9) / Digital frequency output (X10)

Tip!

For the connection to the digital frequency input (X9) or digital frequency output (X10), use prefabricated Lenze cables. Otherwise, only use cables with twisted pairs and shielded cores (A, $\overline{A}$ / B, $\overline{B}$ / Z, $\overline{Z}$) (see connection diagram).

Features of digital frequency output X10	Features of digital frequency input X9
• 9-pole sub-D socket • Output frequency: 0 - 500 kHz • Current consumption 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) – Factory setting: Encoder simulation of the resolver signal • Load capacity of the parallel connection: Up to three slave drives • Load capacity of the series connection – 250 kHz digital master frequency: Up to 22 slave drives – 500 kHz digital master frequency: Up to 10 slave drives • LOW-level at X10/8 (enable) indicates the initialisation of the master drive (e. g. if the mains was disconnected). The slave can thus monitor the master.	• 9-pole sub-D plug • Input frequency: 0 - 500 kHz • Current consumption per channel: Max 6mA. • Two-track with inverse 5 V signals and zero track • Possible input signals: – Incremental encoder with two 5 V complementary signals shifted by 90 ° (TTL encoder) – Encoder simulation of the master • X9/8 is used to monitor the cable or the connected controller. For this, monitoring SD3 must be activated. – LOW-level at X9/8 activates TRIP or warning (SD3) – If the monitoring is not required, this input can be connected to +5V.

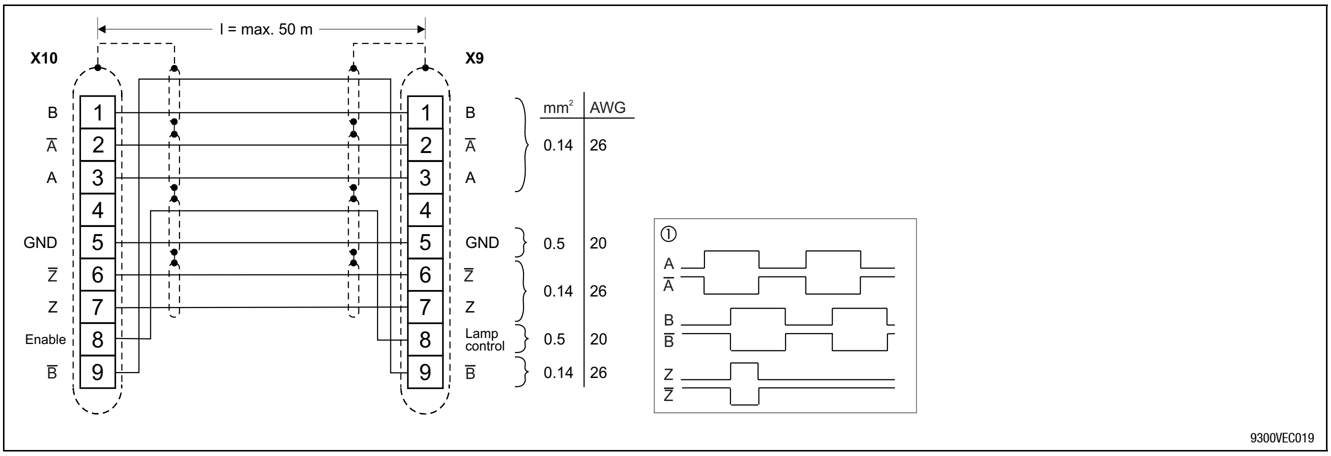


Fig. 4-20 Connection of digital frequency input (X9) / digital frequency output (X10)

X10 Master X9 Slave ① Signal sequence for cw rotation

Assignment of 9-pole sub-D socket (X10)										Assignment of 9-pole sub-D plug (X9)								
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	$\overline{B}$

Possible combinations for digital frequency channels X8, X9 and X10

	Combination	A	B	C
X8	Encoder input	▲	○	▲
X9	Digital frequency input	▲	▲	○
X10	Digital frequency output	○	▲	▲

▲ Assignment activated
○ Assignment deactivated

Assignment deactivated means
X8: C0025 = 10 (feedback with resolver)
X9: Remove function block DFIN from processing table and delete link
X10: C0540 = 4 (X10 = X9) or C0540 = 5 (X10 = X8).

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 STATE-BUS < 5m).
- Connection of STATE-BUS cables to terminals X5/ST.

STOP

Stop!

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

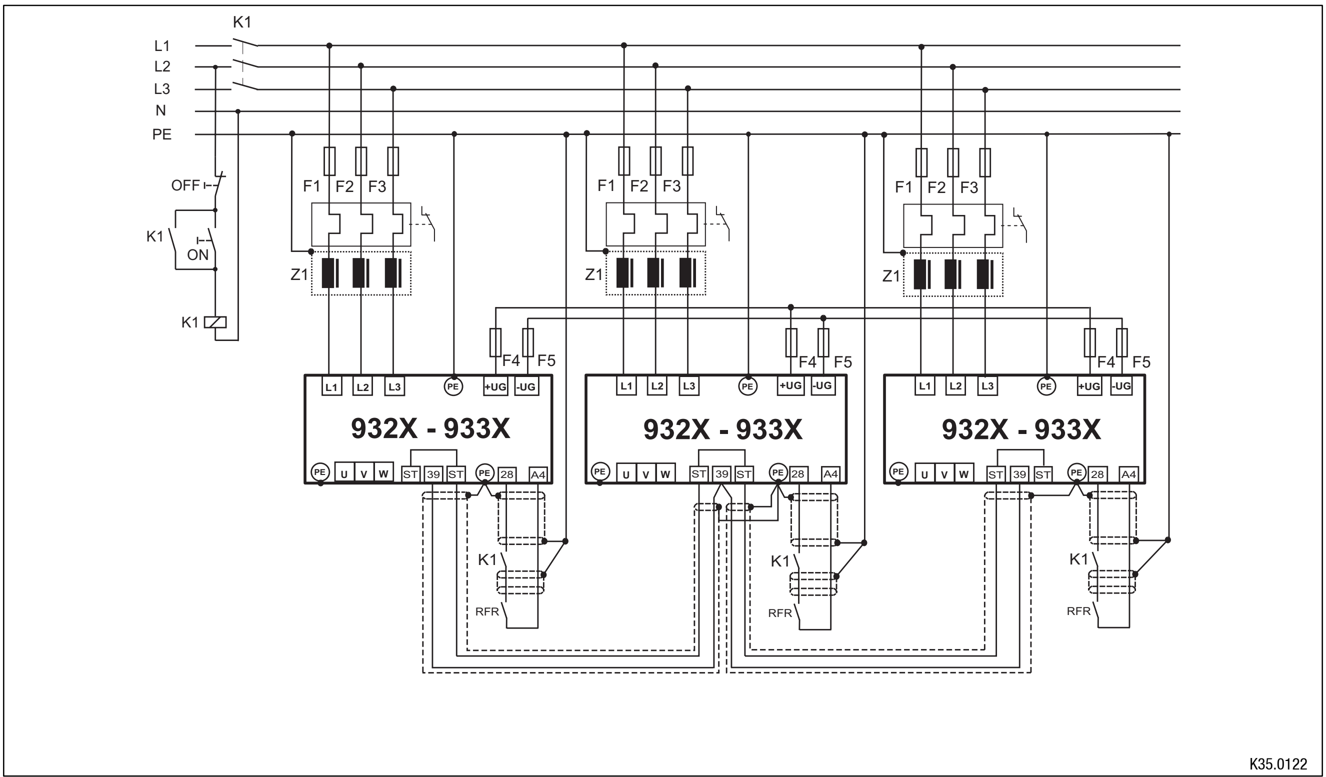


Fig. 4-21 Monitoring of a network of drives with the STATE-BUS

Z1	Mains filter
F1...F5	Protection, see “Cable protection” (📖 3-6) / “Mains connection” (📖 4-13)
K1	Main contactor

Installation

System bus connection (X4)

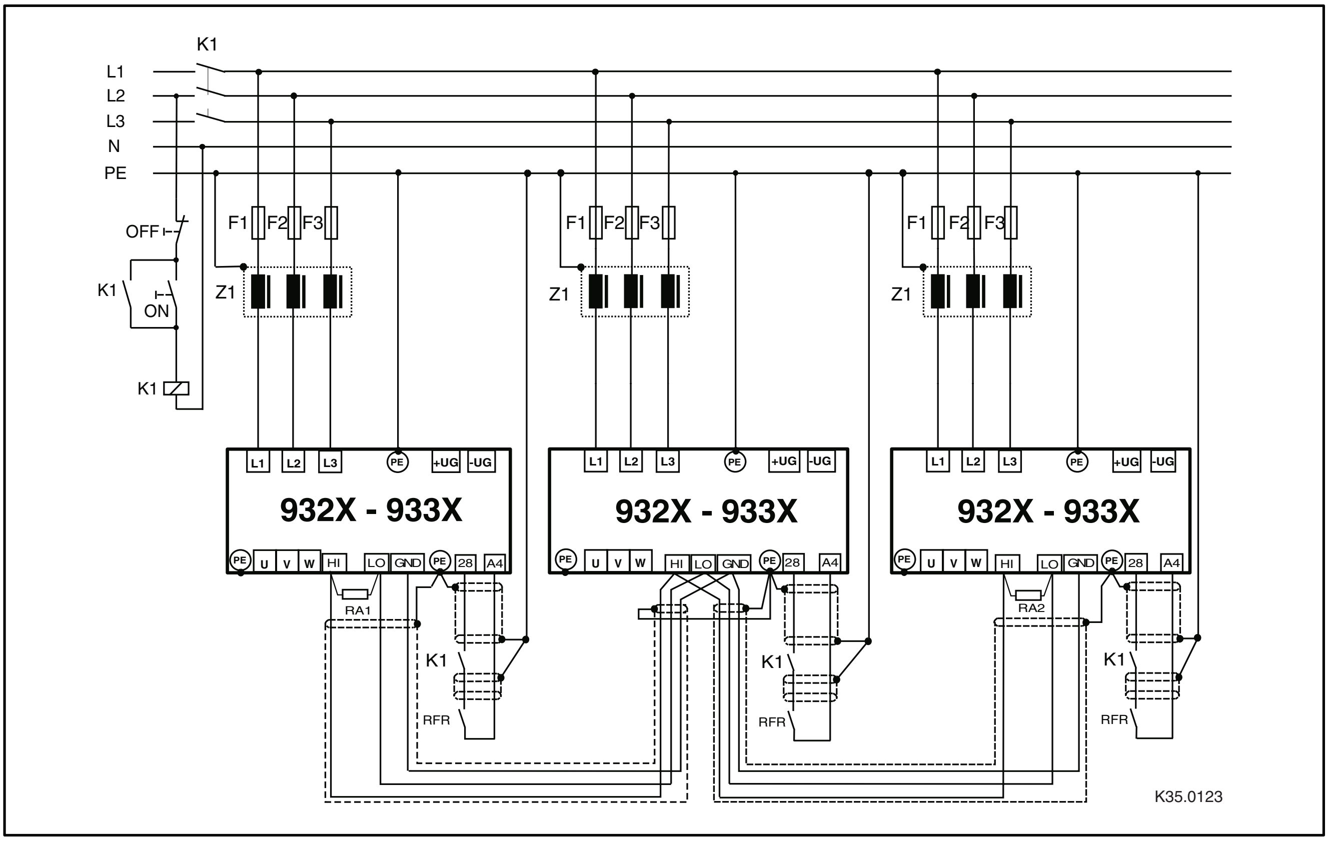


Fig. 4-22 Wiring system bus

RA1, RA2 Bus terminating resistors 120 Ω (included in the accessory kit)

- Connection via pluggable screw terminals (double terminals can be used).
- Only connect terminals of the same designation.
- Features of the system cable:

Total cable length	up to 300 m	300 m to 1000 m
Cable type	LIYCY 2 x 2 x 0.5 mm^2 twisted-pair with shielding Pair 1: CAN-LOW (LO) and CAN-HIGH (HI) Pair 2: 2*GND	CYPIMF 2 x 2 x 0.5 mm^2 twisted-pair with shielding Pair 1: CAN-LOW (LO) and CAN-HIGH (HI) Pair 2: 2*GND
Cable resistance	$\chi \leq$ 40 Ω/km	≤40 Ω/km
Capacitance per unit length	≤ 130 nF/km	≤60 nF/km

- Connection of the bus terminating resistors:
  – One resistor 120 Ω each on the first and last bus device.
  – On the 93XX controller the resistor can be screwed directly under the terminals X4/HI and X4/LO.

Features:

- CAN-based with bus protocol according to CANopen (CAL-based Communication Profile DS301)
- Bus extension:
  – 25 m for max. 1 Mbit/s baud rate
  – up to 1 km with reduced baud rate
- Very reliable data transmission (Hamming distance = 6)
- Signal level according to ISO 11898
- Up to 63 bus stations are possible
- Access to all Lenze parameters
- Master functions are integrated into the controller
  – Data exchange possible between controllers without participation of a master system (current ratio control, speed synchronization, etc.)

The following connections of the system bus connection are possible:

- Connection to a decentral terminal extension for digital and analog inputs and outputs
- Connection to a superimposed control (PLC, position control, operating terminal)
- Connection between several controllers

4.2.9 Automation interface (X1)

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

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

Tip!
A documentation is enclosed with each module, describing how to apply and handle the module.

4.2.10 Motor temperature monitoring

Selection of the sensor type	• Continuous temperature sensor KTY – "Linear" temperature sensor in the motor winding (standard for Lenze motors MDXKX, MDXQA and MDXMA) • PTC thermistor – 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 complete protection. To improve the monitoring, Lenze recommends the use of a bimetal relay.
Alternative monitoring	Comparators (CMP1 ... CMP3) monitor and a time element (TRANS1 ... TRANS4) limits the motor current for small speeds or motor standstill. This function can be implemented by interconnecting the corresponding function blocks.
Reactions	different, depending on the temperature monitoring. 📖 7-291

Stop!

Do not connect an external voltage to the inputs.

	Lenze motors			**Motors of other manufacturers**		
	MDXKX, MDXQA and MDXMA		**with thermostat**	**with sensor for continuous temperature detection**		**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	• 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 message	(MONIT-)OH3	(MONIT-)OH7	(MONIT-)OH8	(MONIT-)OH3	(MONIT-)OH7	(MONIT-)OH8
Possible reactions	The corresponding monitoring and thus the following codes are preset under C0086					
	• Trip (C0583 = 0) • OFF (C0583 = 3)	• Warning (C0584 = 2) • OFF (C0584 = 3)	• Trip (C0585 = 0) • Warning (C0585 = 2) • OFF (C0585 = 3)	• 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/thermostat): PTC: at R ϑ > 1600 Ω	fixed at 150 °C	adjustable 45°C ... 150°C (C0121)	fixed, (depending on the PTC/thermostat): PTC: at R ϑ > 1600Ω
Notes	• Monitoring is active in the default setting. • If resolver (X7) and encoder (X8) are operated together: – Connect KTY only at one connector (X7 or X8) – Do not connect KTY connection of the other female connector • For further information on the connection of the thermal sensor, please consult the description of the feedback system		• Deactivate monitoring via X7 or X8 under C0583=3 and C0584=3 • Connection to DIN 44081 (see also Fig. 4-23).	• Input characteristic. (📖 4-36) • Deactivate monitoring via X7 or X8 under C0583=3 and C0584=3		• Deactivate monitoring via X7 or X8 under C0583=3 and C0584=3 • Connection to DIN 44081 (see also Fig. 4-23). • We recommend a Ziehl PTC (up to 150 °C) K15301075 or a thermostat.

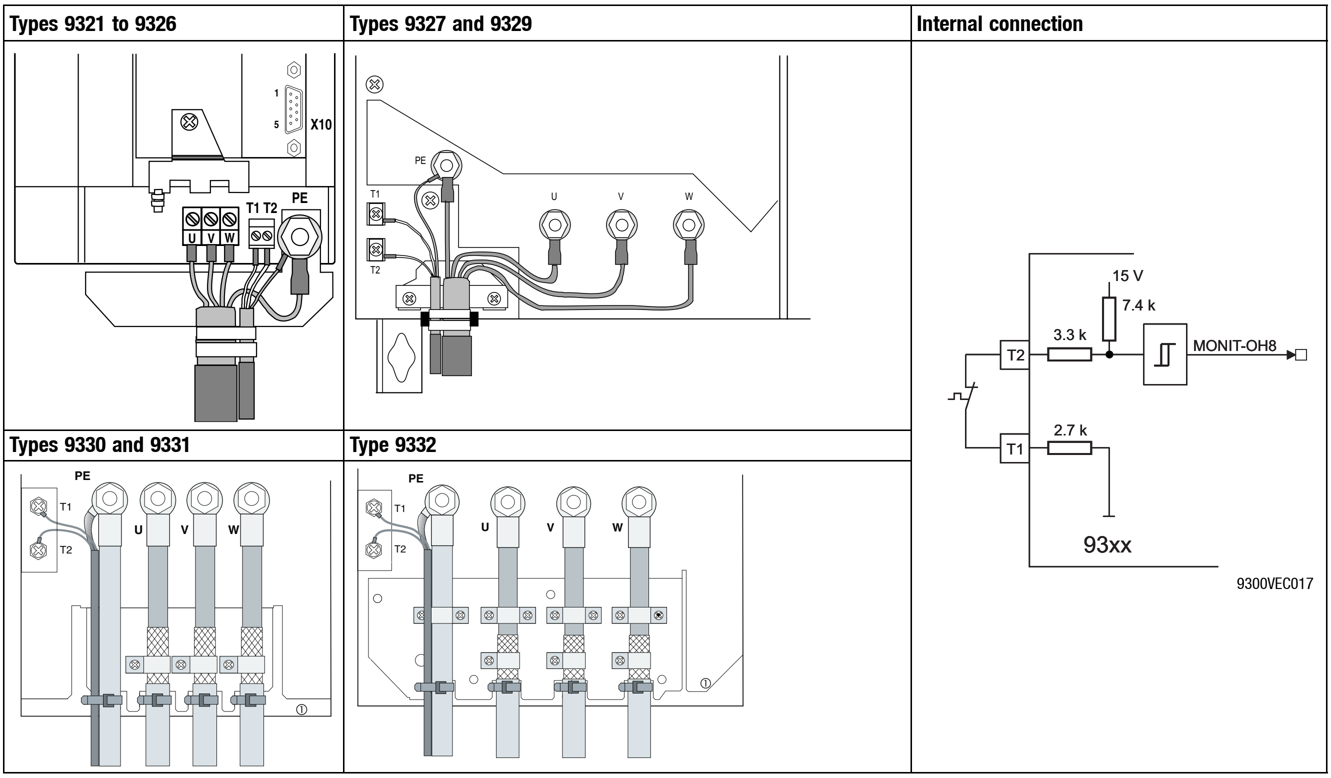
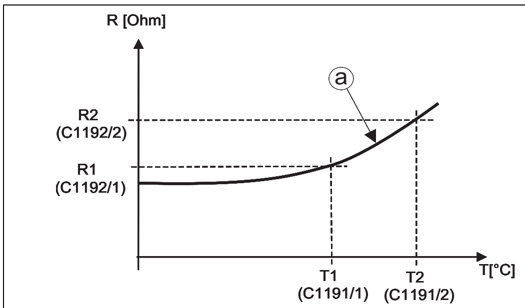


Fig. 4-23 Connection of a thermistor or PTC thermistor to terminals T1 and T2 and internal connection

Tip!

- In the prefabricated Lenze system cables for **Lenze servo motors** the cable for the temperature feedback is already included. The cables are designed for wiring according to EMC.
- If you make up your own cables:
  – Always lay cables separately from motor cables.

4.2.10.1 User-specific characteristic for a PTC thermistor



Example of a sensor characteristic for continuous temperature detection

Code	Subcode	Description
C1190	0 (operating mode 1)	Evaluation of the Lenze standard motor temperature sensor
	1 (operating mode 2)	Evaluation of a user-specific thermal sensor. The operating point is in the almost linear area (a) of the sensor characteristic. The operating point is provided by two interpolation points. Interpolation takes place between these two points.
C1191	1 (100 °C)	Definition of the temperature vertices assigned to the resistances of the sensor.
	2 (150 °C)	
C1192	1 (1670 Ω)	Definition of the sensor resistances
	2 (2225 Ω)	

4.2.11 Feedback systems

Different feedback systems can be connected to the controller:

- Resolver feedback (factory setting)
- Encoder feedback
  – Incremental encoder TTL
  – Sin/cos encoder
  – Sin/cos encoder with serial communication (single-turn)
  – Sin/cos encoder with serial communication (multi-turn)

Note!

- If homing is not possible, use a sin/cos encoder with serial communication (multi-turn). Please indicate the motor/encoder combination for your order.
- For monitoring of feedback systems please see
  – chapter “Troubleshooting and error elimination” of the Operating Instructions/Manual
  – chapter ”Configuration/Monitoring” of the Manual

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

- Connection as shown in the figures:
  – Use twisted pair cables and shielded pair cables.
  – Connect the shield at both ends.
  – Use the indicated cable cross-sections.
- The feedback system is activated under C0025.

Resolver connection (X7)

- In all configurations predefined under C0005, a resolver can be used as feedback system. An adjustment is not necessary.

Note!

Use prefabricated Lenze system cables for the resolver connection.

Please contact Lenze before you use other resolvers.

Features:

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

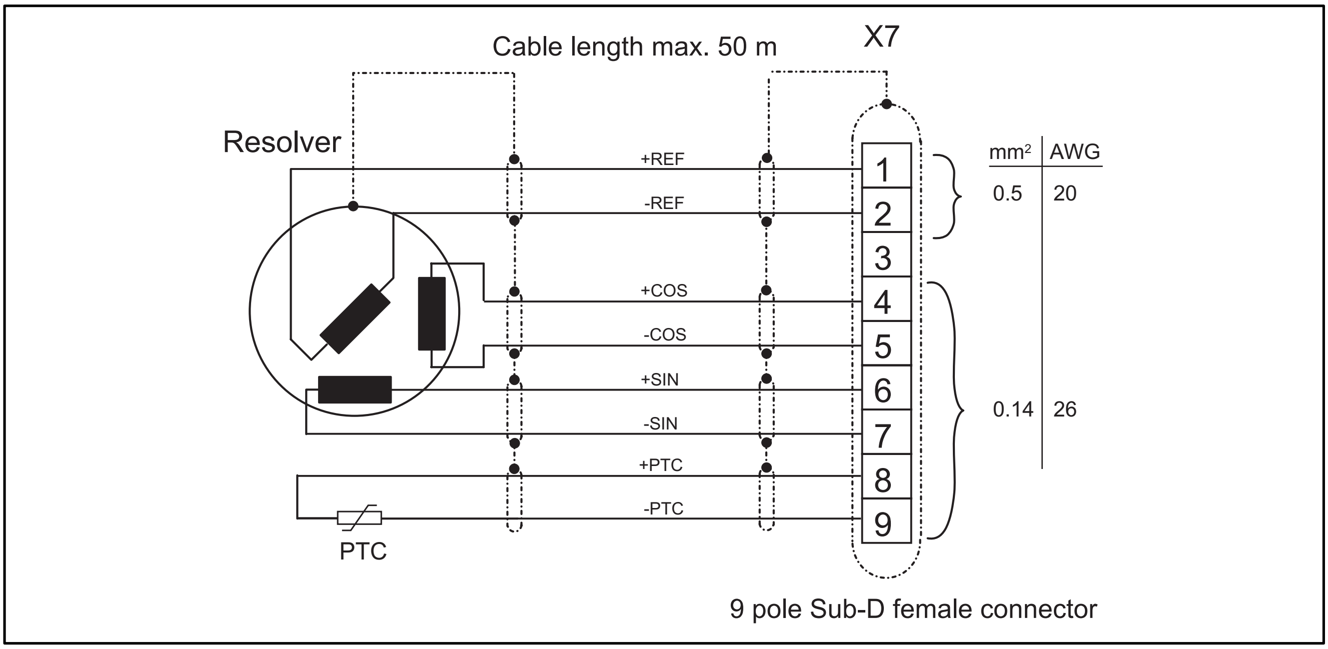


Fig. 4-24 Resolver connection

Assignment of the female connector (X7)									
Pin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Signal	+Ref	-Ref	GND	+COS	-COS	+SIN	-SIN	+PTC (4-35)	-PTC (4-35)

Encoder connection (X8)

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

Note!

Use the prefabricated Lenze system cable for the encoder connection.

- The encoder supply voltage V_{CC5_E} can be adjusted in the range from 5 V to 8 V under C0421
  – to set the encoder supply
  – to compensate the voltage drop on the encoder cable, if necessary
  $\Delta U \approx 2$ * cable length * resistance/m * $I_{encoder}$

Stop!

Observe the connection voltage of the encoder system used. An excessive setting under C0421 can destroy the encoder.

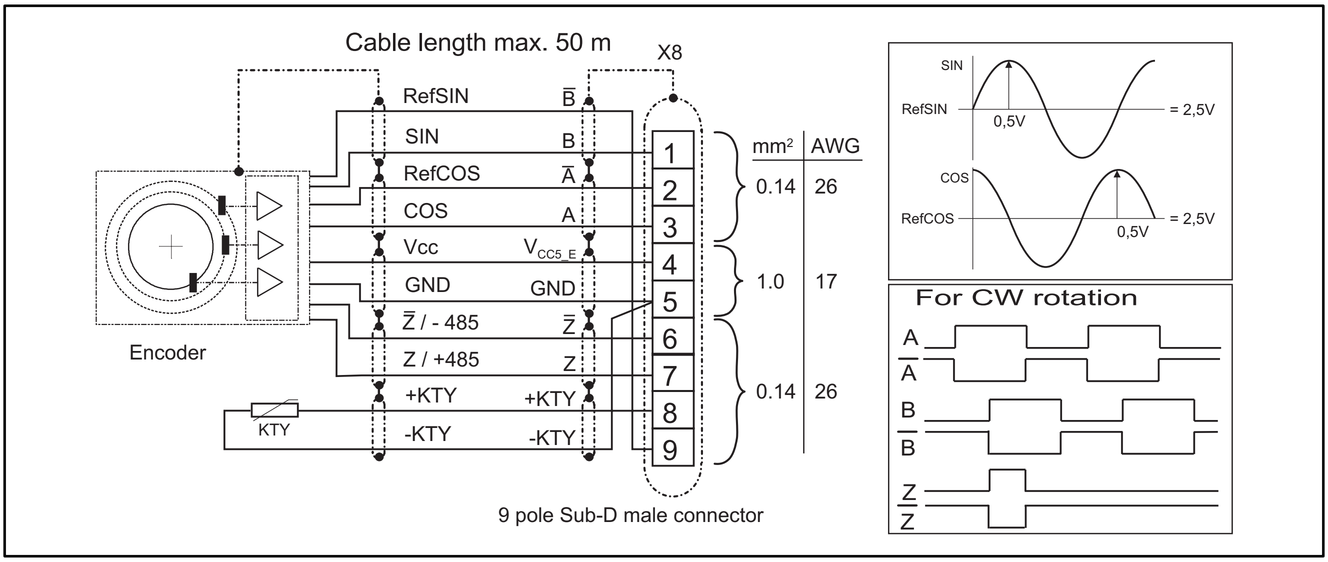


Fig. 4-25 Encoder connection

Installation

Incremental encoder

Features:

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

Assignment of the male connector (X8)									
Pin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Signal	B	$\overline{A}$	A	V_{CC5_E}	GND (-PTC)	$\overline{Z}$	Z	+PTC (4-35)	$\overline{B}$

Sin/cos encoder

Features:

- 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 initialization time of the controller is increased to approx. 2 seconds).
- 9-pole Sub-D female connector
- Internal resistance Ri = 221 Ω
- Voltage of sine and cosine track: 1 Vss ±0,2 V
- Voltage RefSIN and RefCOS: +2.5 V

Note!

For encoder with tracks: sine, $\overline{\text{sine}}$ and cosine, $\overline{\text{cosine}}$:
RefSIN with $\overline{\text{sine}}$ and RefCOS with $\overline{\text{cosine}}$

Assignment of the male connector (X8)									
Pin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Signal	SIN	RefCOS	COS	V_{CC5_E}	GND (-PTC)	$\overline{Z}$ or -RS485	Z or +RS485	+PTC (4-35)	RefSIN

4.3 Installation of a CE-typical drive system

General notes	• The electromagnetic compatibility of a machine depends on the type of installation and care taken. Please observe: – 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 valid for – 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. • Cable guides as close as possible to the reference potential. Unguided cables have the same effect as 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. – Recommendation: For the connection, 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 300mm: – 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: – To limit the radio interference, use an additional shield damping ≥ 10 dB. This is usually achieved by installation in enclosed and earthed control cabinets made of metal.
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.

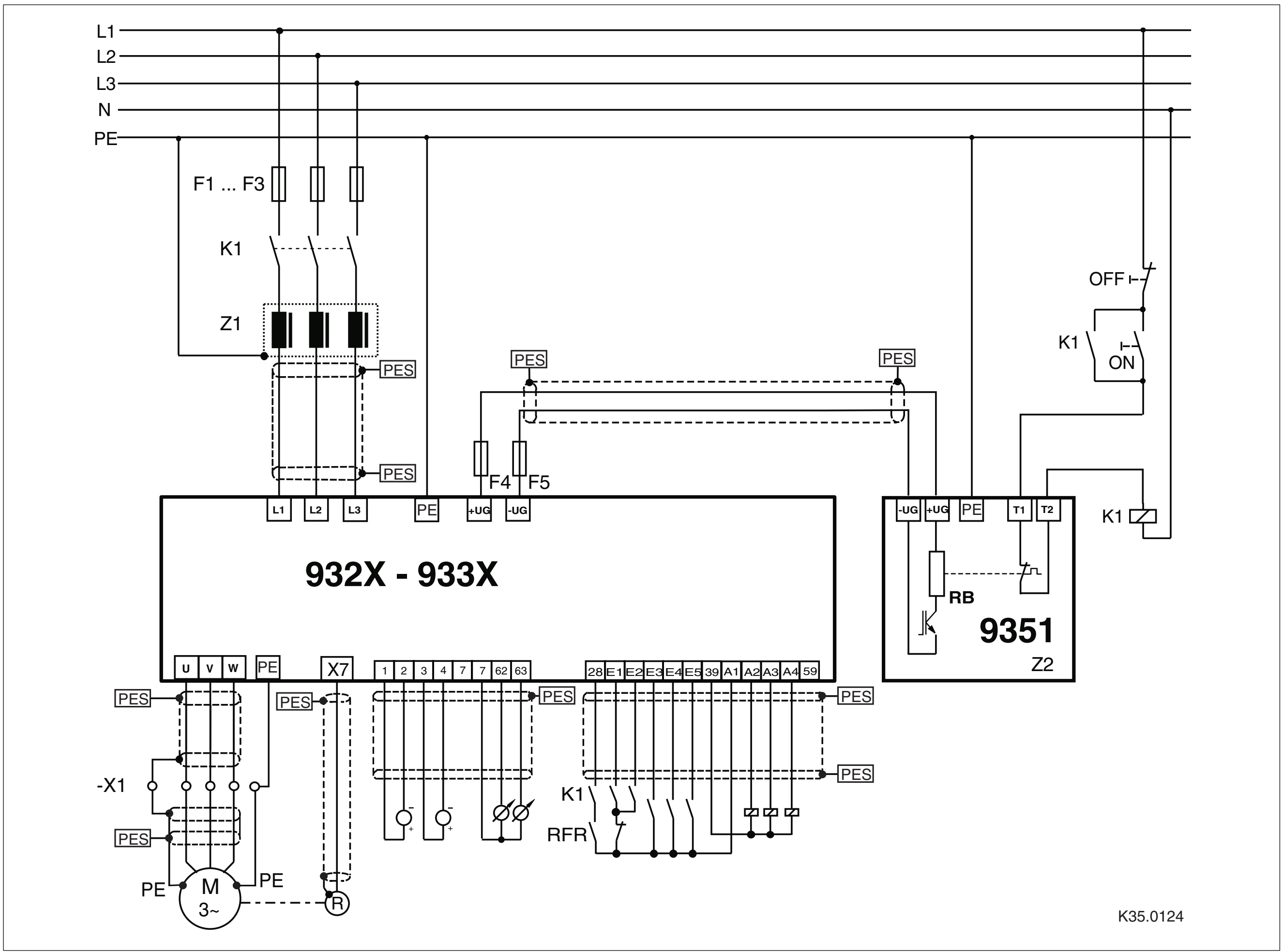


Fig. 4-26 Example for wiring in accordance with EMC regulations

F1...F5	Protection, see “Cable protection” (🕮 3-6) / “Mains connection” (🕮 4-13)
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 screening by connection to PE with a surface as large as possible (see ”Shielding”) 🕮 4-41)

Show/Hide Bookmarks

EDSVS9332P-C

Lenze

System Manual
Part C

Commissioning

During operation

Global Drive
9300 servo position controller

This documentation is valid for 9300 position controllers as of version:

33.932X	EP	2x	2x		(9321 - 9329)
33.933X	EP	2x	2x		(9330 - 9332)
33.932X	CP	2x	2x	- V003	Cold Plate (9321 - 9328)

Type

Design:
EP = Built-in unit IP20
CP = Cold Plate

Hardware version and index

Software version and index

Variant

Explanation

3.0 11/2004

Contents

Part C

5 Commissioning

5.1 Before switching on

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).
- Cover of the power terminals:
  – Put on cover(s) and fix.
- **Keep to the switch-on sequence!**
- All commissioning steps described in this chapter refer to the default setting.

5.2 Initial switch-on

Tip!

- Use a PC with the Lenze program ”Global Drive Control” (GDC) under Windows for commissioning. The convenient menu includes the codes for the most important settings.
- A fieldbus module type 2102 ”RS232, RS485, fibre optics” (Lecom A/B) is required to run the GDC.
- GDC and fieldbus module are not included in the scope of supply of the controller.

Commissioning

Commissioning using an example

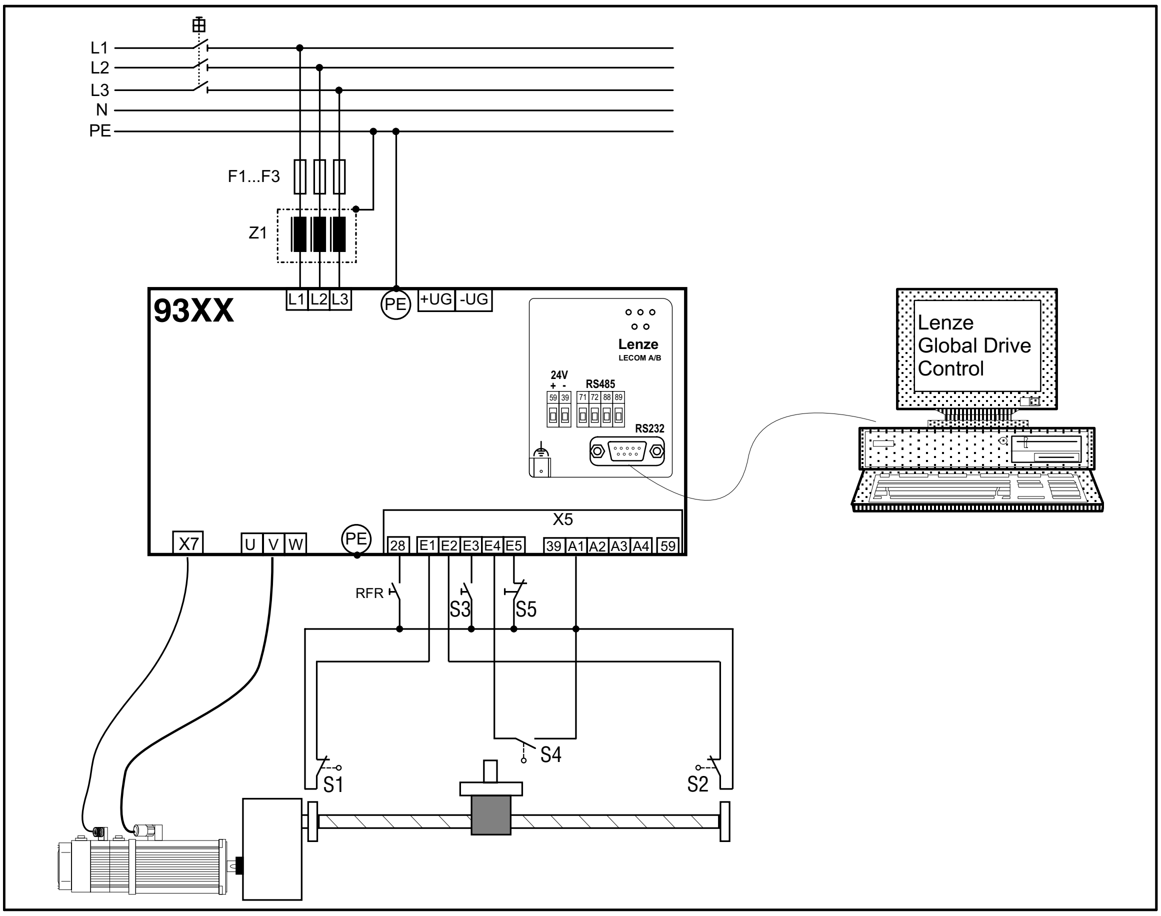
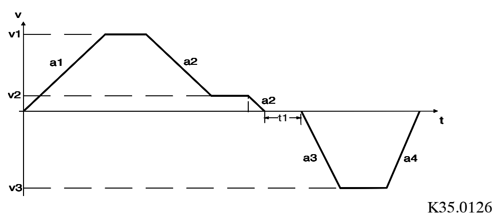


Fig. 5-1 Example of a drive control with default setting

Switch	Function
S1	Limit switch for negative direction of positioning (system protection)
S2	Limit switch for positive direction of positioning (system protection)
S3	Start positioning program
S4	Reference label for homing Tip: Set E4 to HIGH if there is no homing mark.
S5	Changeover from positioning to manual operation

Positioning profile	Name	Function
	a1	Acceleration - forwards
	v1	Traversing speed - forwards
	a2	Deceleration - forwards
	v2	Creeping for target approach
	t1	Waiting time (e.g. processing of a workpiece)
	a3	Acceleration - backwards
	v3	Traversing speed - backwards
	a4	Deceleration - backwards

The following table briefly shows how to commission a position control according to the example depicted in Fig. 5-1. A more detailed description of how to commission position controls can be obtained from the following chapters.

Section	Action	Detailed description
Switch on controller	1. Assign terminal X5/28 (controller enable) to LOW signal. 2. Assign terminals X5/E1 and X5/E2 to HIGH signal (+13...+30V). 3. Assign terminals X5/E3 to X5/E5 to LOW signal. 4. Switch on mains: – The controller is ready for operation after approx. 1s (2 s for drives with sine-cosine encoder with serial interface).	🕮 5-5
Switch on PC	Start GDC on the PC – Set the communication parameters for the online mode in the dialog box ”Momentary drive”. Confirm with ”OK”. – Select a controller in the dialog box ”Assign controller description”. Confirm with ”OK”.	🕮 5-6
Generate parameter set	1. Adapt controller to the mains 2. Adapt controller to the motor 3. Enter machine parameters	🕮 5-7 🕮 5-8 🕮 5-9
Manual control	1. Enter parameters for manual positioning or use default setting 2. Enable controller 3. Function test with manual control	🕮 5-10 🕮 5-11 🕮 5-12
Enter parameters for traversing profile	1. Enter positioning data in the ”Programming” dialog box. 2. Connect the X5 terminals in the ”Terminal monitor 93XX (digital)” menu – When the digital terminals X5 are supplied with internal voltage; Assign output X5/A1 with ”FIXED1”. Approx. 24V are output to the terminal X5/A1. **TIP!** For this application case one of the predefined configurations in C0005 can be used. C0005 = XXX1X (e. g. 20010 = absolute positioning with control via terminals) automatically assigns the output X5/A1 with FIXED1	🕮 5-14
Control drive	1. Check whether the controller is ready for operation: – When the green LED is flashing: Controller is ready for operation, go on with step 2. – When the green LED is off and the red LED is flashing: A fault has occurred. Remove the fault before proceeding with the commissioning. 2. Enable controller – Green LED is illuminated when a HIGH signal (+13...+30V) is assigned and no other source of the controller inhibit is active. 3. For operation with a fieldbus module, additional settings are necessary (see Operating Instructions of the fieldbus module). The motor now rotates with the provided setpoint and the selected direction of rotation.	🕮 5-24 🕮 8-1

5.3 Commissioning sequence

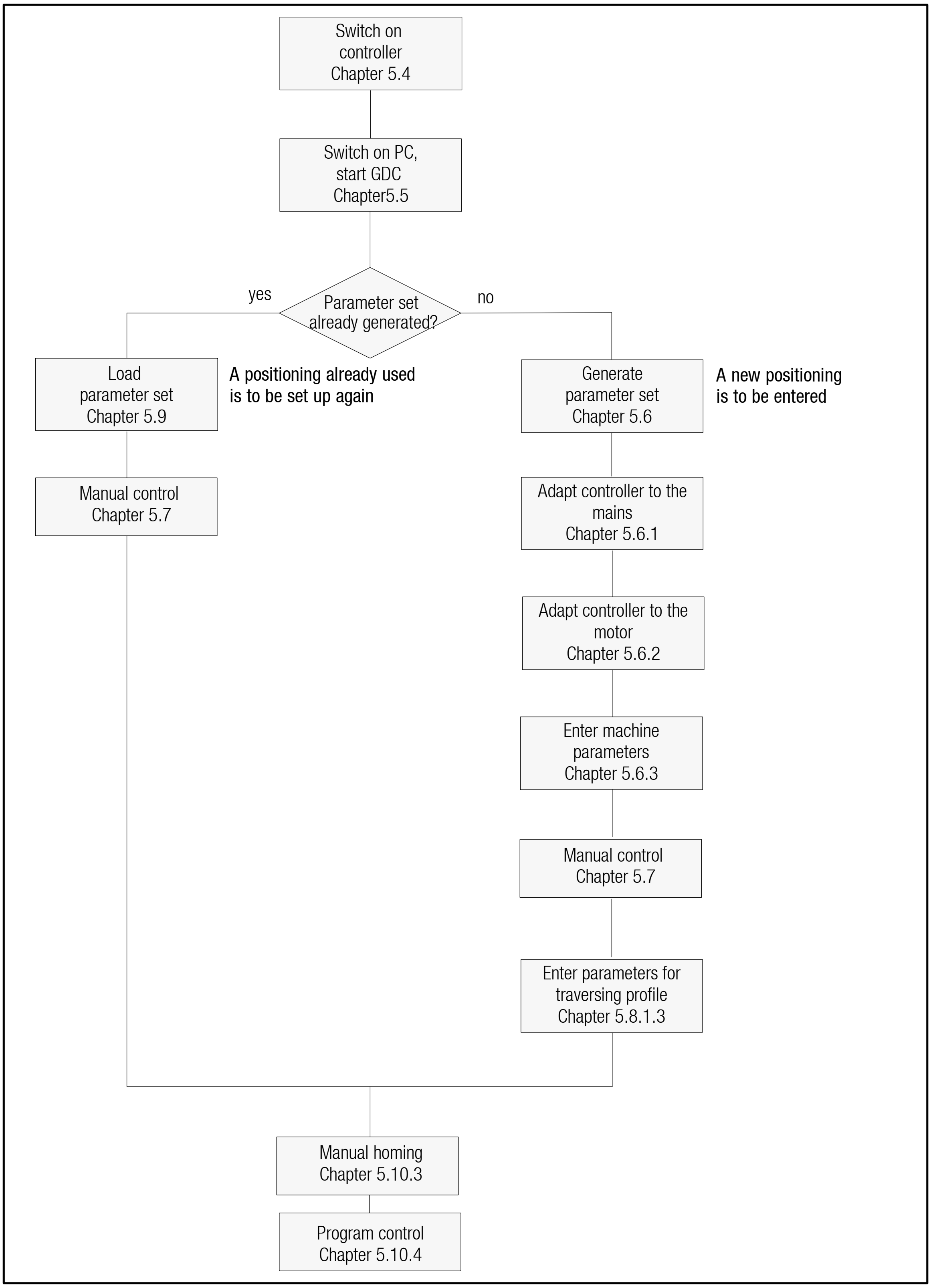


Fig. 5-2 Commissioning sequence

5.4 Switch on controller

Step	
1. Assign X5/28 to LOW level (CINH).	
2. Connect the travel range limit switch to terminals X5/E1 and X5/E2	See: 📖 4-24 Assign X5/E1 and X5/E2 with HIGH level if you do not use any travel range limit switches.
3. Assign digital input signals to (X5/E3 ... X5/E5).	
4. Switch on mains voltage.	The controller is ready for operation after approx. 2 s.
5. Adapt DC-bus voltage threshold with C0173 to the mains voltage.	
6. Check whether the drive is ready for operation.	• When the green LED is flashing: – Controller is ready for operation • When green LED is off and red LED is flashing: – A fault has occurred. Eliminate the fault before proceeding with commissioning. See chapter 8 ”Troubleshooting and fault elimination”.
7. For operation with a fieldbus module, additional settings are necessary.	See Operating Instructions for the corresponding fieldbus module.

Tip!

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

As long as the overvoltage message is applied

- pulse inhibit is set and
- the drive has no torque.

The controller inhibit is evaluated, among other things, by the ”holding brake (BRK)” (see chapter in the corresponding 9300 System Manual).

*) C0172 = ”OV reduce - Threshold for activating the brake torque reduction before OU message”

5.5 Switch on PC, start GDC

- Switch on PC.
- Start the GDC program under Windows.

When GDC is in ”online operation”

- The ”Find LECOM A/B drives” dialog box is opened.
- Click ”Find”. GDC will now search for a controller.
- GDC selects the first controller found.
- GDC tests all baud rates which can be set.
- GDC loads the parameter set description for the connected controller.
  – If GDC does not find a parameter set description, you are asked which description you want to load alternatively.
- GDC automatically reads the parameter set from the controller.

When GDC is in ”offline operation”

- You have to select the controller manually.
  – You can change to ”online operation”. GDC automatically selects a controller.
- Open the ”Controller” menu in the menu bar and click ”Select”. Make your choice for:
  – the desired parameter set description.
  – Baud rate.
  – Controller address.

5.6 Generate parameter set

Warning!

Do not change any settings of the controller that are not mentioned in this chapter. For more complex positioning tasks use the System Manual.

The instructions for the generation of a parameter set in this chapter are based on the default setting.

Proceed systematically when generating a parameter set:

1. Adapt controller to mains conditions.
2. Adapt controller to motor.
3. Enter machine parameters.
4. Enter parameters for manual control. (Afterwards, carry out a function test)
5. Enter parameters for traversing profile.

Tip!

Make a travel profile of your positioning task and determine as many positioning data as possible, using this drawing. (🕮 5-14)

5.6.1 Adapt controller to the mains

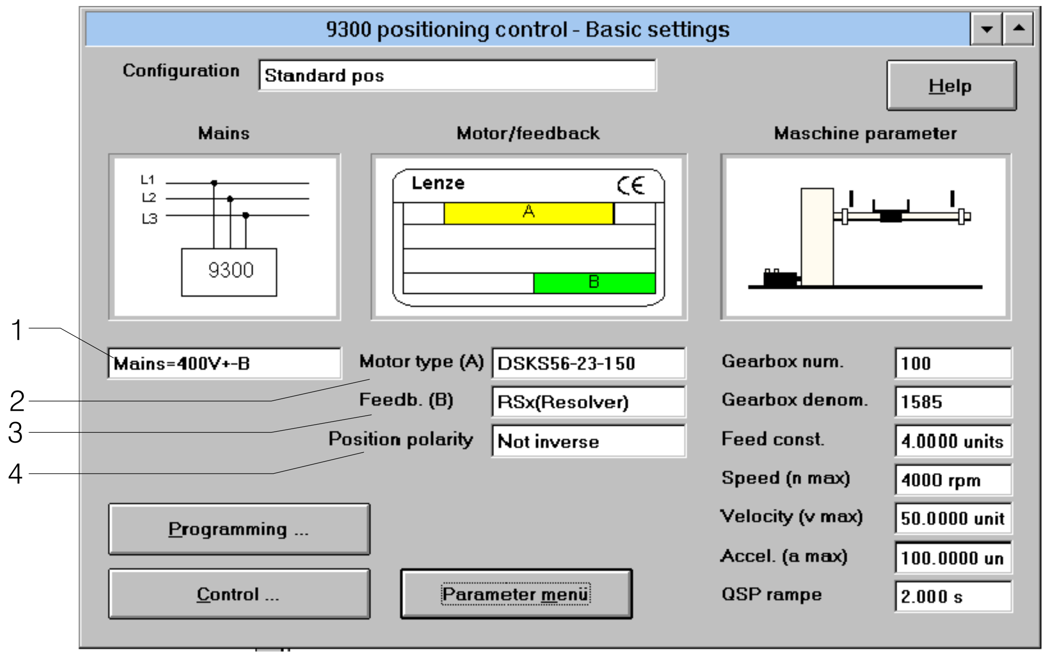


Fig. 5-3 "Basic settings" dialog box

Field	Command	Function
1	Click on field	Select values for the actual mains and operating conditions.

5.6.2 Adapt controller to the motor

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

When you use a Lenze motor:

Field	Command	Function
2	Click on field "motor type (A)".	Select connected motor.
3	Click on field "encoder (B)".	Selected feedback system used.
4	Click on field "position polarity".	Select direction of rotation.

For motors with a resolver, use the eight-digit designation of the motor nameplate "encoder" (as an option).

- For this, change to the parameter menu (see button Fig. 5-4) and select the menu "Motor/feedback system".

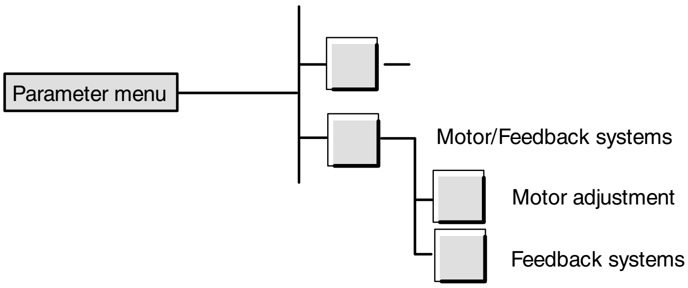


Fig. 5-4 How to find the menus "Motor setting" and "Feedback systems"

In the menu "Feedback systems":

Field	Command	Function
	Select C0416	Resolver error. Enter the value of the motor nameplate.
	Select C0003	Save data (C0003 = 1).

If you use a motor other than the Lenze motor:

Change to the menu "Motor setting" (see Fig. 5-4).

In the menu "Motor setting":

Field	Command	Function
	Select C0086	Select a motor the data of which largely correspond to the data of the motor used. List of the available motors: 📖 7-406.
	Select C0006	Operating mode of the motor control
	Select C0022	Adapt I_{max} to the maximum motor current.
	Select C0081	Rated motor power
	Select C0084	Stator resistance of the motor (only for very high demands on the control characteristics).
	Select C0085	Leakage inductance of the motor (only for very high demands on the control characteristics).
	Select C0087	Rated motor speed.
	Select C0088	Rated motor current.
	Select C0089	Rated motor frequency
	Select C0090	Rated motor voltage.
	Select C0091	Motor cos φ.
	Select C0003	Save data (C0003 = 1).

5.6.3 Enter machine parameters

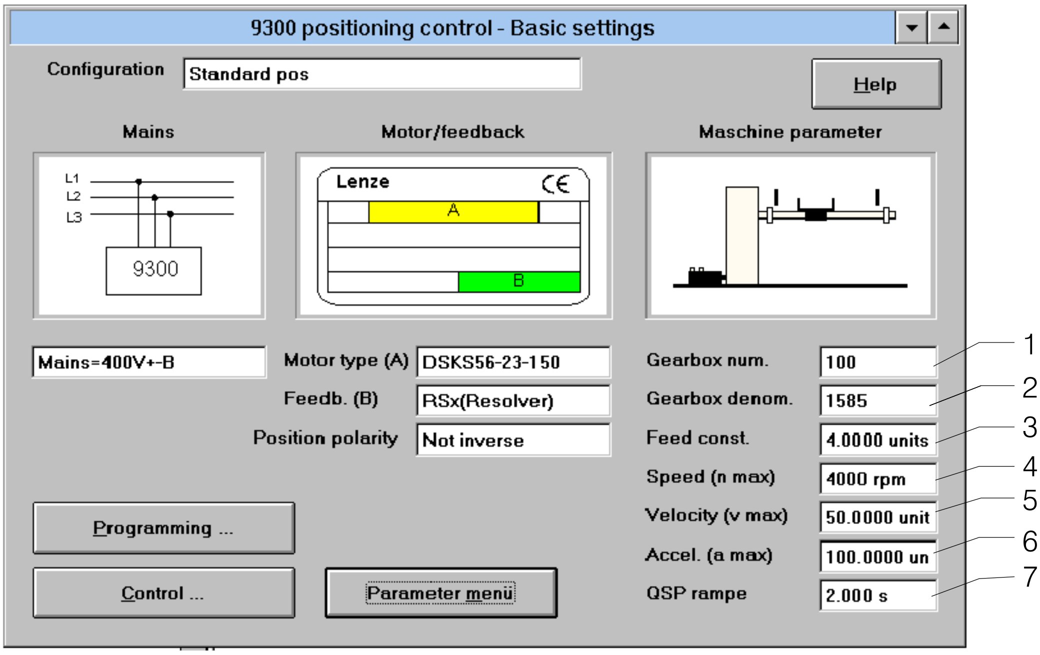


Fig. 5-5 ”Basic settings” dialog box

Field	Command	Function	
1	Click on field ”Gearbox numerator”	Enter denominator for the gearbox ratio.	$i = \frac{n_{Motor}}{n_{Gearbox\ output}}$
2	Click on field ”Gearbox denominator”	Enter numerator for the gearbox ratio.	
3	Click on field ”Feed constant”	Enter feed of the spindle.	The value results from the number of units (e. g. mm) being moved forward during one rotation at the gearbox output side.
4	Click on field ”Speed (n-max)”	Enter upper speed limit of the motor	
5	Click on field ”Velocity (v-max)”	Enter fastest traversing velocity of the machine	
6	Click on field ”Acceleration (a-max)”	Maximum permissible acceleration (with interference or during approach to travel range limit switches a-max cannot be activated.	
7	Click on field ”QSP ramp”	Time from release of fault or approach to a travel range limit switch to machine standstill.	

5.6.4 Parameters for manual control

Stop!

Check the parameters for manual control. In order to check a configuration select small values for acceleration and deceleration (e. g. default setting).

The default setting of the parameters is sufficient for most of the application cases. Enter the setting as follows:

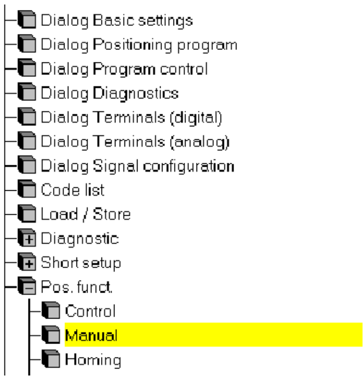


Fig. 5-6 Menu ”Manual control” in the parameter menu

Step	Command	Function
1	Select ”Basic settings” dialog box.	
2	Click on ”Parameter menu” button.	Open parameter menu
3	Click on ”Positioning functions” menu.	Open ”Positioning functions” menu.
4	Click on ”Manual control” menu.	Open ”Manual control” menu.
5	Click on C1243. Enter a new value.	Manual control speed. Default setting: 5 % of vmax
6	Click on C1252. Enter a new value.	Manual control acceleration. Default setting: 10 % of amax
7	Click on C0003.	Save settings
8	Click on ”Dialog control” menu.	Open ”Control” dialog box.

5.6.5 Controller enable

- The controller is only enabled if all sources of controller inhibit are reset.
  – When the controller is enabled, the green LED on the controller is illuminated.
- For displaying active sources of a controller inhibit see chapter "Troubleshooting" (📖 8-1).

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	-
Fault	In case of TRIP In case of message	TRIP reset	For check see 📖 8-1
System bus (CAN)	Transmission of control information INHIBIT via C0135	Transmission of control information ENABLE via C0135	📖 Manual
Fieldbus module	See Operating Instructions for the corresponding fieldbus module		-

Tip!

All sources of controller inhibit act like a series connection of switches that are independent of each other.

Stop!

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

5.7 Function test with manual control

Test the function with manual control after every new or modified configuration.

Warning!

Provide suitable emergency stops for manual operation so that you will be able to stop the drive in the event of unpredictable movements.

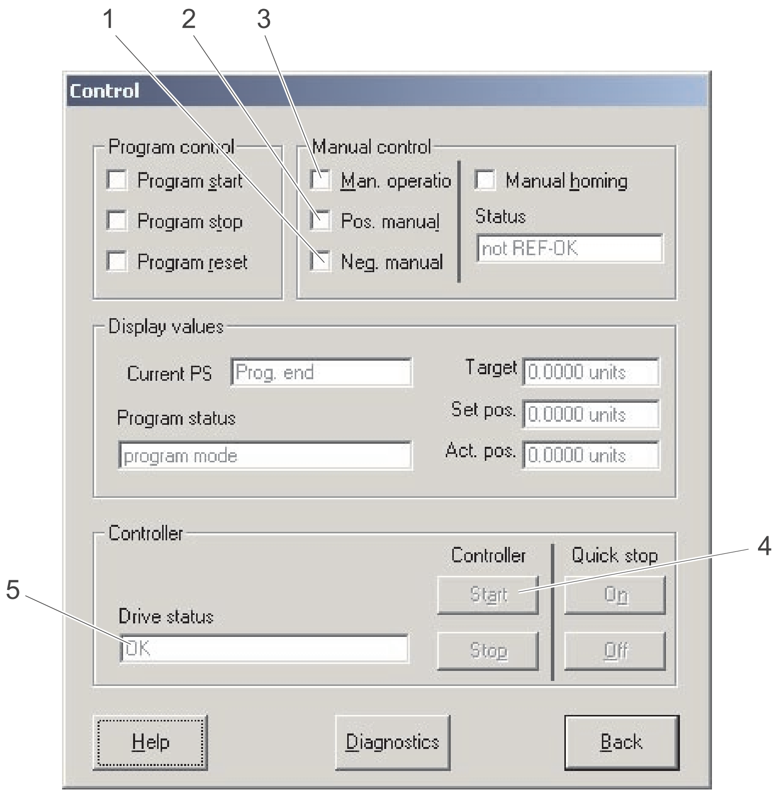
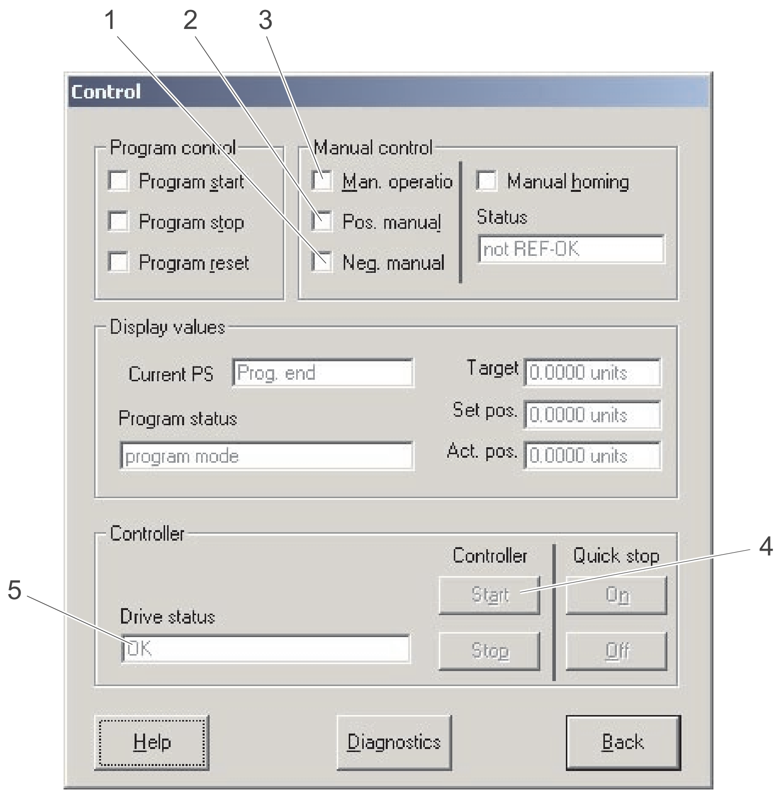


Fig. 5-7 Dialog box ”Control”

Field	Command	Function
3	Select ”Manual operation”	Manual operation active
5		With drive status ”OK”, ”Start” is possible 🕮 6-2.
4	Controller ”Start”	Starts the controller if there is no interference.
2	Select ”Positive manual”	The drive moves in the positive direction towards the limit switch. • Test positioning limits • Override travel range limit switch to test its function.
	Reset ”Positive manual”	The drive stops.



9300pos041

Fig. 5-8 Dialog box ”Control”

Field	Command	Function
1	Select ”Negative manual”	The drive positions in the negative direction towards the limit switch. • Test positioning limits • Override travel range limit switch to test its function.
	Reset ”Negative manual”	The drive stops.
1, 2	”Positive manual” and ”Negative manual” selected	The drive brakes with a-max down to standstill.

Tip!

- To assign the reverse direction to the function ”Positive manual” and ”Negative manual”, change to the dialog box ”Base settings” and set the field ”Position polarity” to ”inverted”.
- You can quit overridden limit switches only by changing the traversing direction (”Positive manual” or ”Negative manual”).

5.8 Enter travel profile parameters

5.8.1 Structure of a positioning program

- The positioning program consists of max. 32 program sets (PS).
- The sequence of processing the PS within the positioning program can be freely selected.
- The positioning sequence is determined by the PS. The functions are processed in a defined sequence (see Fig. 5-14). These functions include:
  - Type of positioning (relative or absolute positioning with or without touch probe)
  - Speed profile of the positioning
  - Access to data in the variable tables (VT).
  - Reaction on external events via digital inputs (PFI)
  - Processing of waiting times
  - Repetition of number of pieces
  - Output of control signals via digital outputs (PFO)

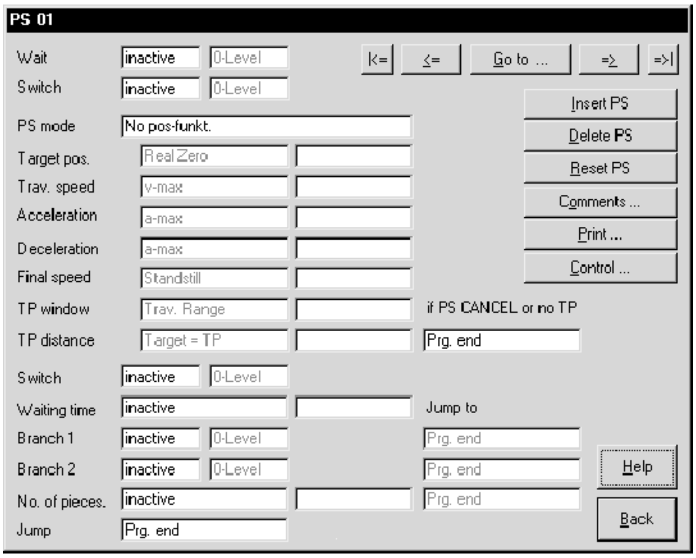


Fig. 5-9 PS input dialog

- The positioning is done with the travel profile parameters. These parameters are included in the variable table (VT). The following VTs are available:
  - VTPOS for the target position
  - VTVEL for the positioning speed and final speed
  - VTACC for the acceleration and deceleration
  - VTPCS for the number of pieces or repeat function
  - VTTIME for the waiting time

5.8.1.1 Tools for editing

For a quick and easy entry of the parameter data the GDC makes tools for editing available to the user. These are explained with the help of the PS templates that are displayed in the operating program.

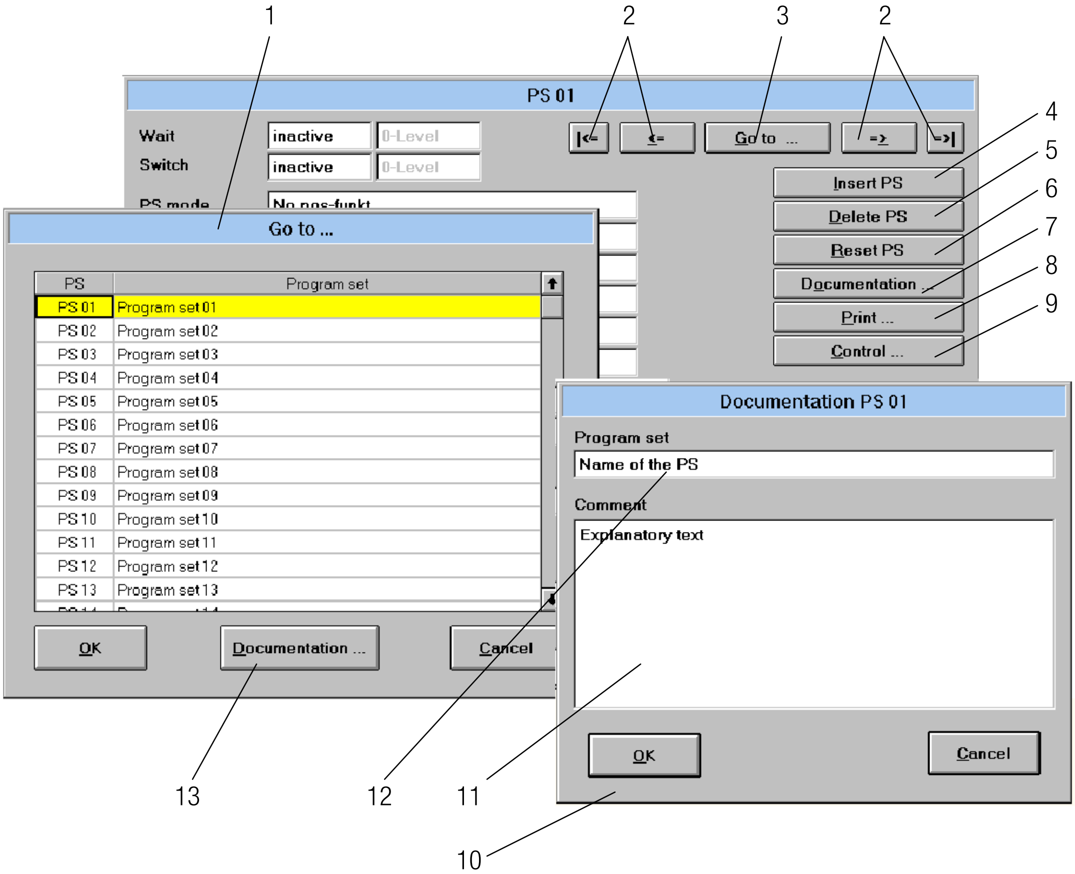


Fig. 5-10 Editing tools for the program sets

Field	Function	Description
1, 3	Selection of a PS	Click on "Go to ..." (3). The dialog box (1) opens. Select a PS that you want to process. At the same time you can write notes about the PS. For this, click on "Documentation" (13) (see also 7).
2	Browsing the PS	Select the previous or next PS or jump to the first or last PS.
4	Insert PS	Inserts a new PS at this position and shifts all following PS one position to the back. The last PS is deleted.
5	Delete PS	Deletes the current PS and displaces all following PS by one position.
6	Reset PS	Resets all parameters of the current PS to factory setting.
7, 10, 11, 12	Write comments on the PS	Documentation of the current PS. In the dialog box (10) you can enter a name for the PS (12) and add an explanatory text as comment (11).
8	Print PS	Output of the current or all PS to a printer.
9	Select dialog box "Control".	Direct change to the dialog box "Control", e.g. to test modifications in manual operation. 🕮 5-12

5.8.1.2 Structure of a travel profile

- Make a travel profile of your drive task (e. g. B. Fig. 5-11, Fig. 5-12)
- For more complex positioning profiles, generate the positioning program with several PS (e.g. for different positioning speeds).

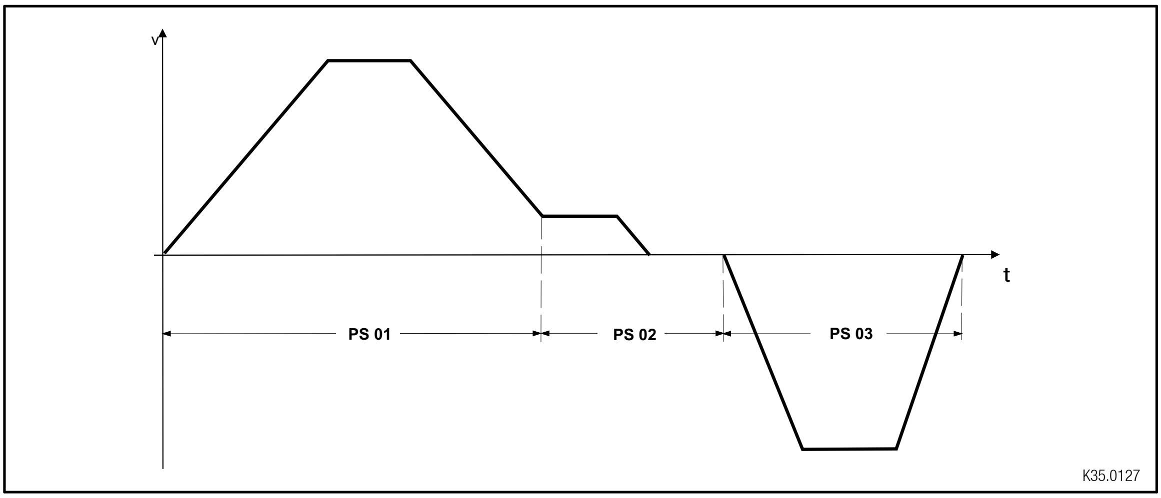


Fig. 5-11 Structure of a positioning profile (example of a point-to-point positioning)

In the example a total of three program sets are required for the complete input of all parameters. Each PS uses the same input template. The input template is described in the next chapter.

Program sets

The parameter data for the travel profile are saved in program sets.

- Due to the template of the program sets
  – the sequence of the input is determined. (📖 5-20)
  – complex positionings are divided into individual sections (sets).
- Every program set can be called up again and again without further programming.
- A total of 32 program sets are available.

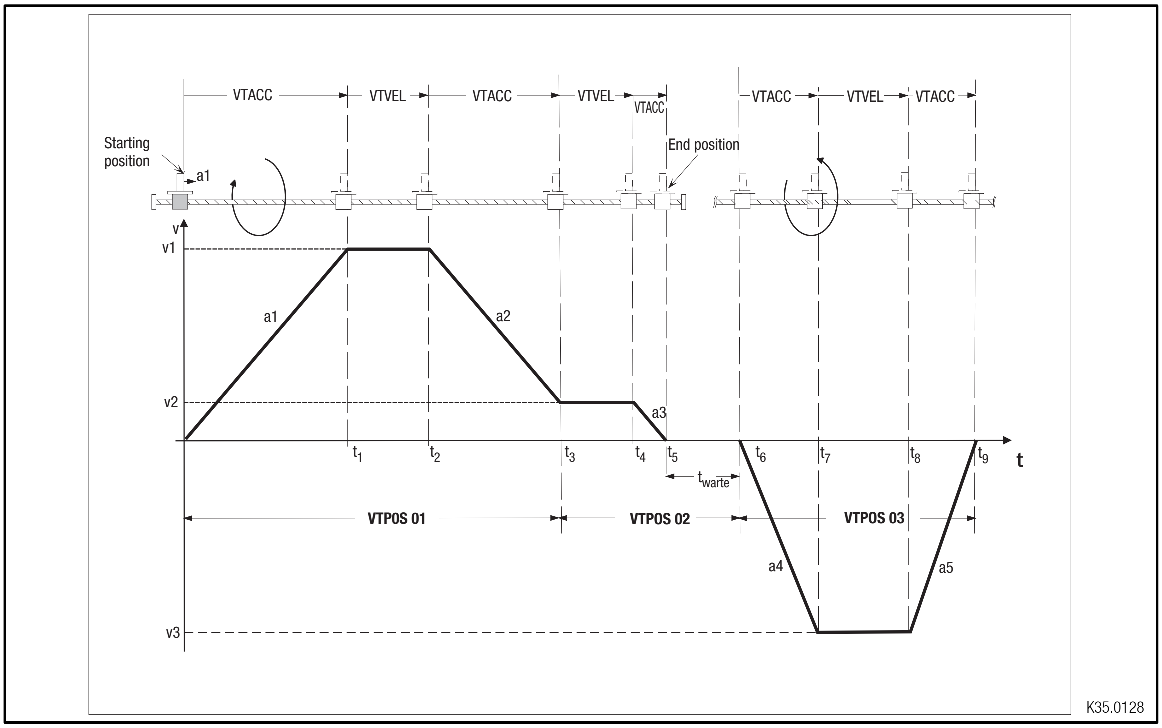


Fig. 5-12 Structure of a travel profile (example of a point-to-point positioning)

Name	Program set (PS)	Function
a1	PS01	Acceleration - forwards
t1	PS01	Time until v1 is reached
v1	PS01	Traversing speed - forwards
t2	PS01	Calculated time of braking to reach v2 in t3
a2	PS01	Deceleration 1 - forwards
t3	PS01	Start creeping with v2
v2	PS01, PS02	Final speed (PS01), positioning speed (PS02)
t4	PS02	Drive approaches position
a3	PS02	Deceleration 2 - forwards
t5	PS02	Position reached, then waiting time (e.g. processing of a workpiece)
t6	PS03	Start backward motion
a4	PS03	Acceleration - backwards
t7	PS03	Time until v3 is reached
v3	PS03	Traversing speed - backwards
t8	PS03	Time until a5 starts (calculated)
a5	PS03	Deceleration - backwards
t9	PS03	Time until the start is reached again

Description of the input template

<End Sub>Click on the ”Programming” button in the ”Basic settings” dialog box.

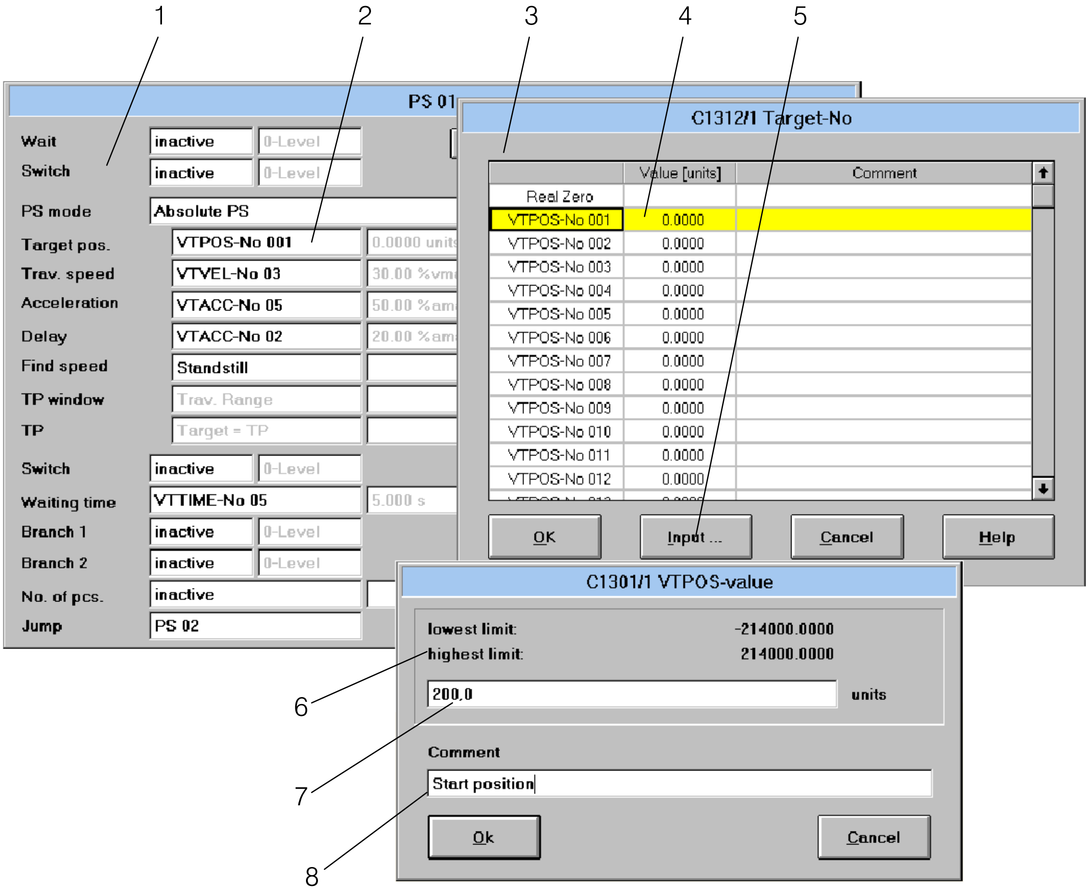


Fig. 5-13 Dialog box for entering the positioning data

Field	Function	Description
1	Dialog box for a program set (PS)	All necessary positioning profile parameters for a PS are entered as well as possible branches to further PS.
2, 3	Parameter field	Click on the field. A dialog box (3) for selecting a parameter is opened.
4, 5, 6	Selection field	Here, the parameter is selected. Click on the desired parameter. For variable tables (VT) you can describe the table positions. For this, click on ”Input” (5). A dialog box (6) opens for entering a parameter.
6	Dialog box	Dialog box for entering a parameter in the variable table.
7	Input field	Input of the desired parameter.
8	Comment on the parameter	You can write a comment on the parameter, e.g. for which function it is required.

Processing a program set

The following chart shows the processing of a program set (PS).

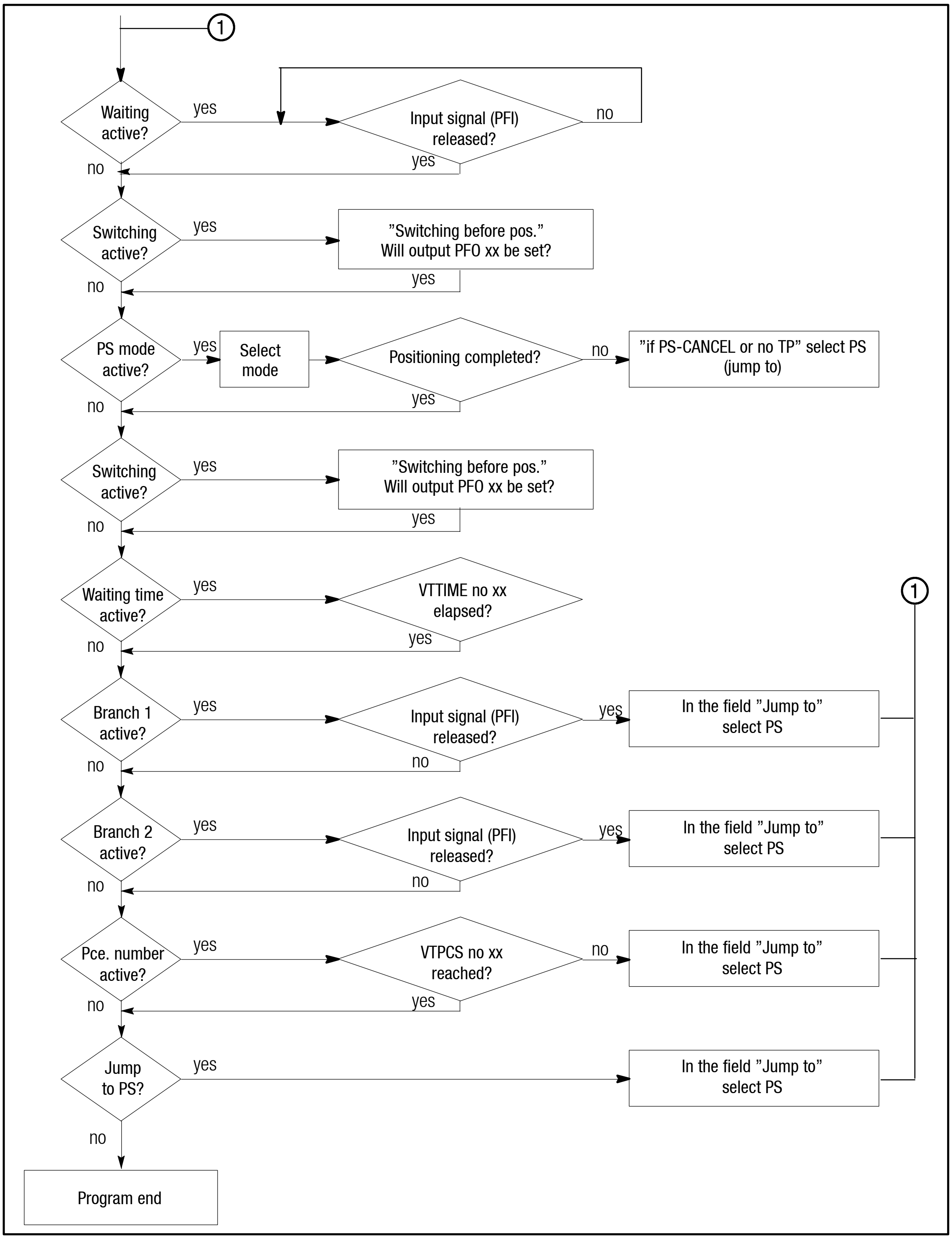


Fig. 5-14 Processing a program set

5.8.1.3 Enter parameter

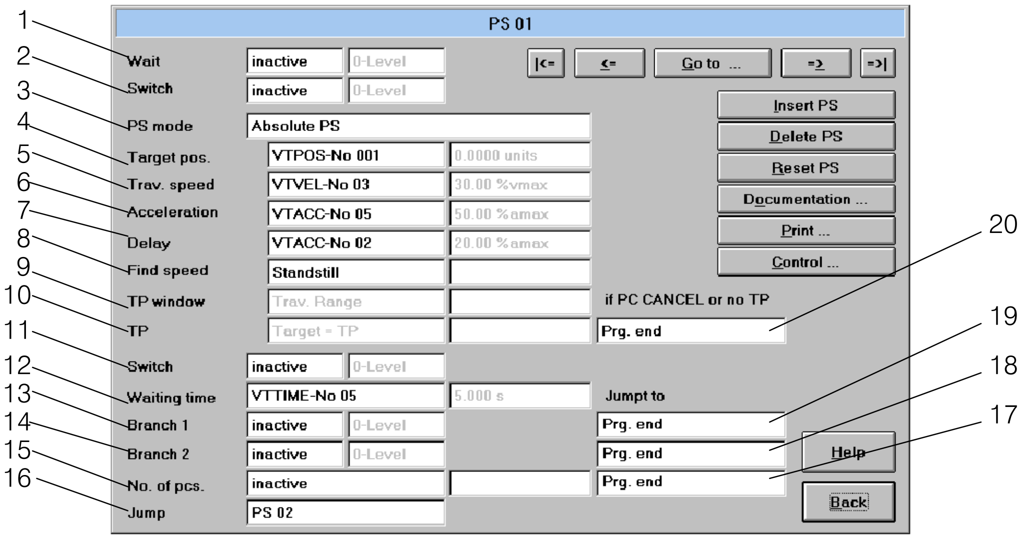


Fig. 5-15 Dialog box for entering the positioning data

Field	Function	Description
1	Inactive or no. of a PFI 0 level or 1 level	Program function input (PFI). A digital input signal via an FB or terminal starts the PS processing.
2	Inactive or no. of a PFO (0 or 1 level)	Program function output (PFO). A digital output signal indicates the state.
3	Type of positioning	e.g. absolute positioning, relative positioning or special function (set reference).
4	Target position of VTPOS	Input of a target position from the variable table VTPOS.
5	Positioning speed from VTVEL	Input of a speed from the variable table VTVEL.
6	Acceleration from VTACC	Input of an acceleration from the variable table VTACC.
7	Deceleration from VTACC	Input of a deceleration from the variable table VTACC.
8	Final speed from VTVEL	Input of a speed from the variable table VIVEL or standstill.
9	TP window from VTPOS	Input of a position value from the variable table VTPOS.
10→20	TP residual distance from VTPOS	Input of a position value from the variable table VTPOS. If there is no touch probe during a touch probe positioning, the program branches/jumps to a PS or program end (”if PS CANCEL or no TP”).
11	Inactive or no. of a PFO (0 or 1 level)	Program function output (PFO). A digital output signal indicates the state.
12	Inactive or time from VTTIME	Input of a waiting time from the variable table VTTIME until the next program function is processed.
13→19	Inactive or no. of a PFI 0 level or 1 level	Program function input (PFI).If a digital input signal is applied during a request (via a FB or a terminal), the program branches (”Jump to”) to a PS or to the program end.
14→18	Inactive or no. of a PFI 0 level or 1 level	Program function input (PFI).If a digital input signal is applied during a request (via a FB or a terminal), the program branches (”Jump to”) to a PS or to the program end.
15→17	Inactive or number from VTPCS	Input of a set quantity from the variable table VTPCS. As long as the this quantity has not been reached, the program branches (”jump to”) to a PS or to the program end.
16	Jump to the next PS or program end	Input of a PS or program end to which the program branches after the current PS has been processed.

5.8.2 Saving a parameter set

The operating menu GDC (see Fig. 5-16) allows you to save a new or modified parameter set:

- Saving on the hard disk of the PC or a diskette by ”Write all parameter sets to file”
- Saving in the controller with ”Write current parameter set to the controller (F5)”
  – You can save the data as non-volatile with C0003=1 in the ”Parameter set management” menu.

Tip!
You can enter comments for the parameter set when saving on the hard disk or diskette.

1. Click on ”Drive parameters” in the menu bar of GDC.

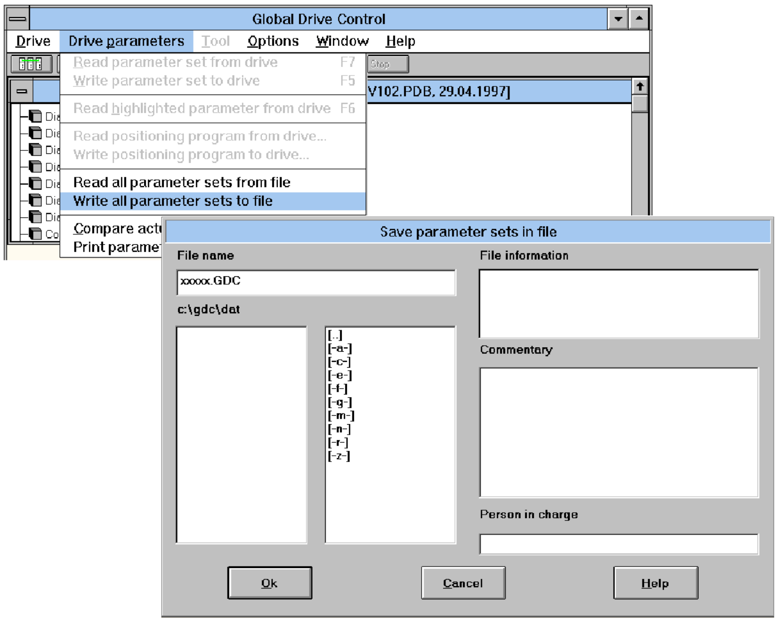


Fig. 5-16 Dialog box ”Write parameter set to file”

2. Select ”Write all parameter sets to file”.
3. Enter the file names and select the disk drive on which you want to save the parameter set.
4. Write a comment on the parameter set in the ”Commentary” field and confirm with ”OK”.

5.9 Load parameter set

5.9.1 Load parameter set from the PC

The operating menu (Fig. 5-17) enables the parameter set to be loaded

- from the hard disk of the PC or a diskette in GDC by "Read all parameter sets from file",
- from the PC to the controller with "Write current parameter set to the controller (F5)".

Warning!

- The controller is reinitialised by the parameter set transfer from the PC to the controller:
  – System configurations and terminal assignments can be changed. Make sure that your wiring and drive configuration comply with the settings of the parameter set.
- Use terminal X5/28 as source for the controller inhibit or the STOP function from GDC.
  A parameter set can only be transferred with an inhibited controller.

---

1. Insert the floppy with the parameter set into the drive of the PC. Click on "Drive parameters" in the menu bar of the GDC.

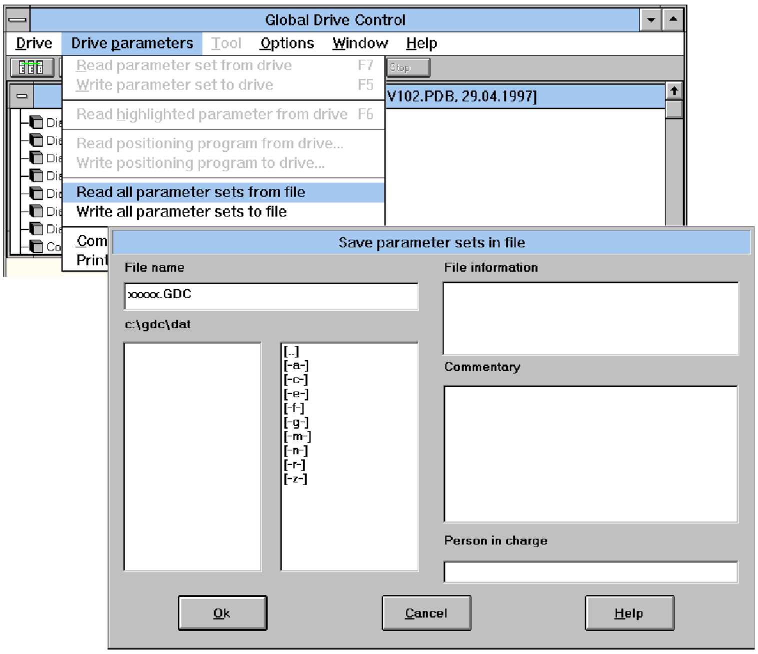


Fig. 5-17 Dialog box "Read all parameter sets from file"

2. Select "Read all parameter sets from file".
3. Select the drive and the parameter set which is to be loaded. Confirm with "OK".
4. Make sure that your wiring and drive configuration comply with the settings of the new parameter set.

5.9.2 Load parameter set from the controller

The operating menu (Fig. 5-17) enables the parameter set to be loaded

- from the controller to the PC by "Read current parameter set from the controller (F7)"
  – C0002 offers the following options in the menu "Parameter set management":

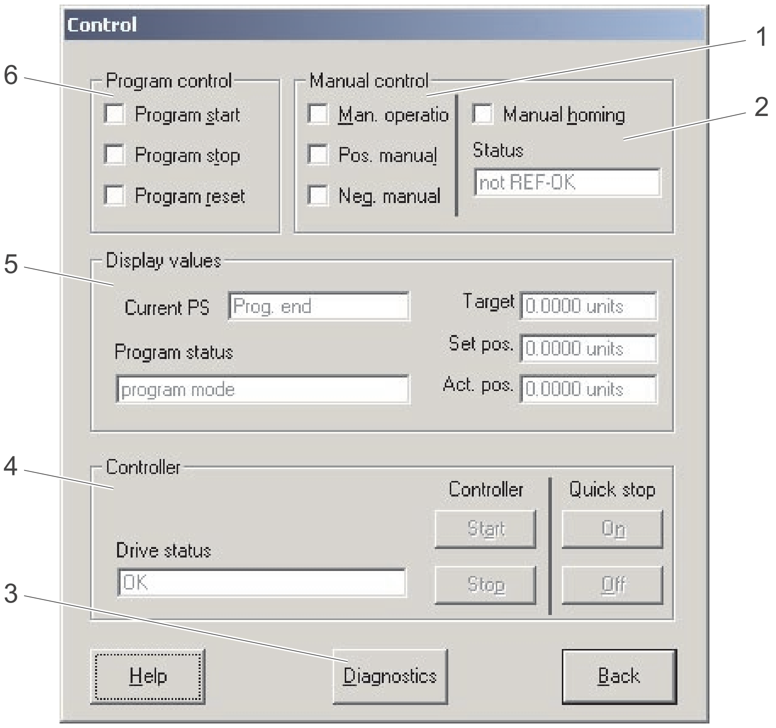
1. Loading of the default setting (C0002=0)
2. Loading of customer-specific parameter set (C0002=1)

Tip!
The RDY message is not displayed while the parameter set is loaded since the controller cannot be operated then.

5.10 Control drive

5.10.1 Description of the dialog box

- Click on the ”Control” button in the ”Basic settings” dialog box.



9300pos043

Fig. 5-18 Dialog box ”Control”

Field	Function	Description
1	Manual control	5-12
2	Manual homing	5-26
3	Menu ”Diagnostics”	6-2
4	”Start”, ”Stop” controller and drive status	5-11, “Controller enable” 5-12, “Function test with manual control” 5-26, “Manual homing” 5-27, “Program control”
5	Status display	Important values for program control 5-27
6	Program control	5-27

5.10.2 Parameters for homing

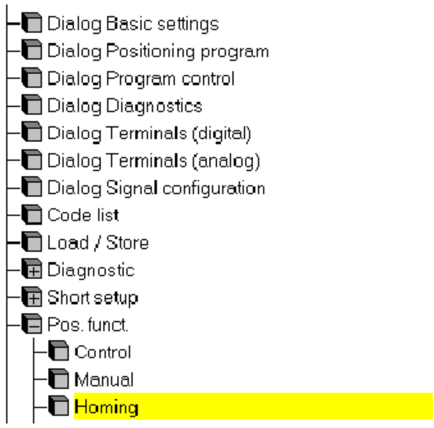


Fig. 5-19 Menu "Homing" in the parameter menu

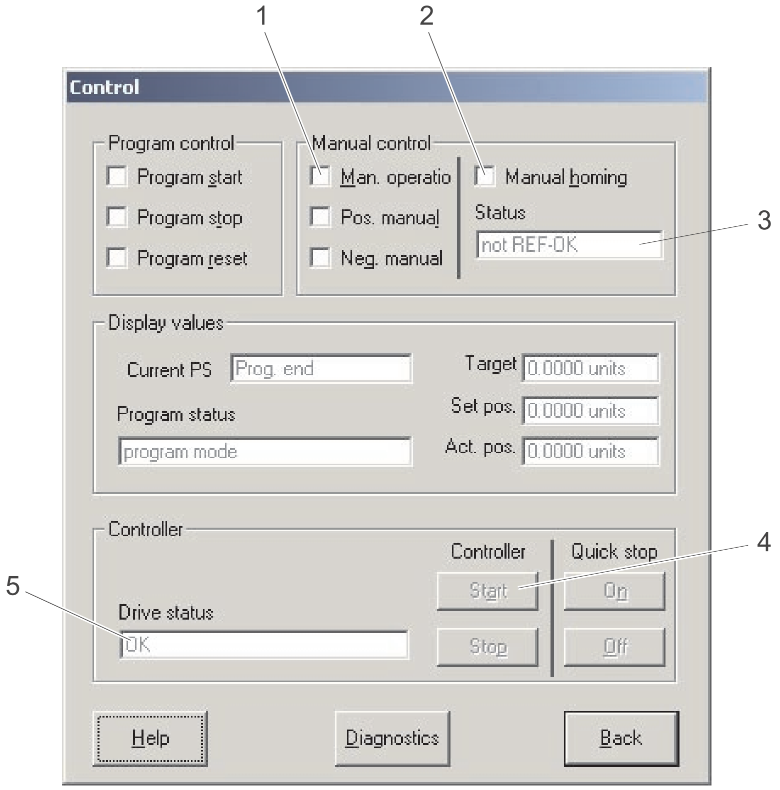
The default setting of the parameters is sufficient for most of the application cases. Enter the setting as follows:

Step	**Command**	**Function**
1	Select "Basic settings" dialog box.	
2	Click on "Parameter menu" button.	Open parameter menu
3	Click on "Positioning functions" menu.	Open "Positioning functions" menu.
4	Click on "Homing" menu.	Open "Homing" menu.
5	Click on C1242. Enter a new value.	Homing speed. Default setting: 5 % of vmax
6	Click on C1251. Enter a new value.	Homing acceleration. Default setting: 10 % of amax
7	Click on C1213. Select a traversing direction. Default setting: +home Setting: -home	Homing mode • The drive moves in the positive direction towards the limit switch. • The drive positions in the negative direction towards the limit switch.
8	Click on C0003.	Save settings
9	Click on "Dialog control" menu.	Open "Control" dialog box.

5.10.3 Manual homing

The controller can perform all positioning tasks only with a defined reference point (zero point).

- Click on the ”Control” button in the ”Basic settings” dialog box.

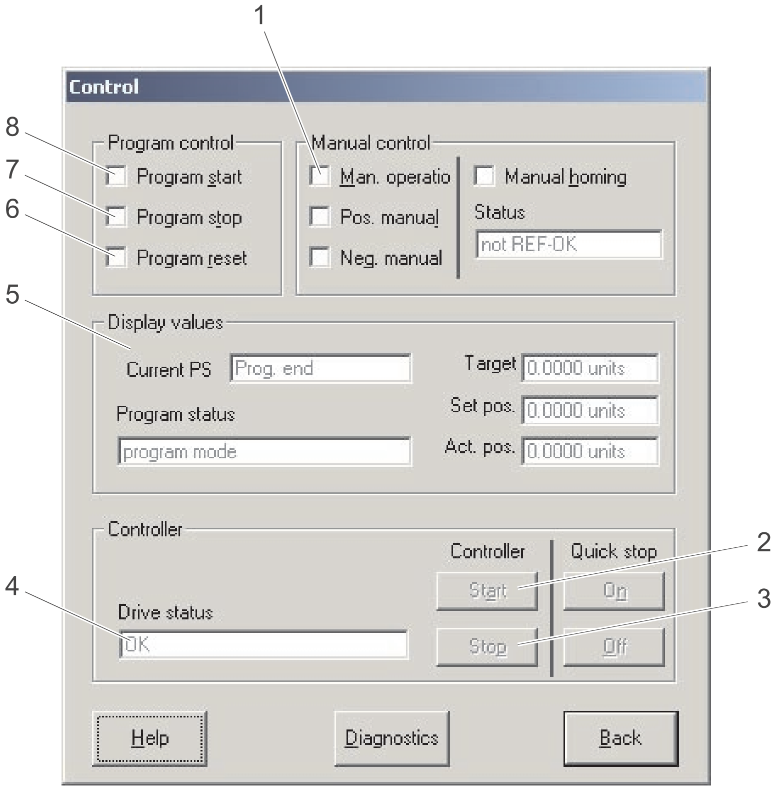


9300pos044

Fig. 5-20 Dialog box ”Control”

Field	Command	Function
1	Select ”Manual operation”	Manual operation active
5		With drive status ”OK”, ”Start” is possible. 🕮 6-2
4	Controller ”Start”	Starts the controller if there is no interference.
2	Select ”Manual homing”.	The drive uses the reference parameters for positioning. 🕮 5-25
	Reset ”Manual homing”.	The drive stops.
	Override the reference switch.	The drive traverses to the next zero position of the rotor and brakes to a standstill. This position is now considered to be the reference point for all positioning data.
3		Status display ”Reference OK” is displayed after successful reference homing.
		Terminal X5/A4 = HIGH

5.10.4 Program control



9300pos045

Fig. 5-21 Dialog box ”Control”

Field	Command	Function
	Activate program operation	For default setting • Switch terminal X5/E5 = HIGH.
1	Reset ”Manual operation”.	Manual operation switched off.
4		With drive status ”OK”, ”Start” is possible. 🕮 6-2
2	Controller ”Start”	Starts the controller if there is no interference.
3	Controller ”Stop”	Stops the controller.
8	Select ”Program start”.	The drive moves according to the loaded positioning profile.
	Reset ”Program start” and select again.	The program restarts, or is continued after an interrupt (”Program stop”).
5		Display of the current position and the current program state.
7	Select ”Program stop”.	The program is interrupted, the drive stops.
	Reset ”Program stop”.	The program can be continued with ”Program start”.
6	Select ”Program reset”.	The program interrupts, the drive stops. Resets the piece counter and all PFO. 🕮 5-14
6	Reset ”Program reset”.	Loads the first PS with which the program is to start. The program can be restarted with ”Program start”.

5.11 Automatic control parameter identification

The function “Automatic control parameter identification” serves to

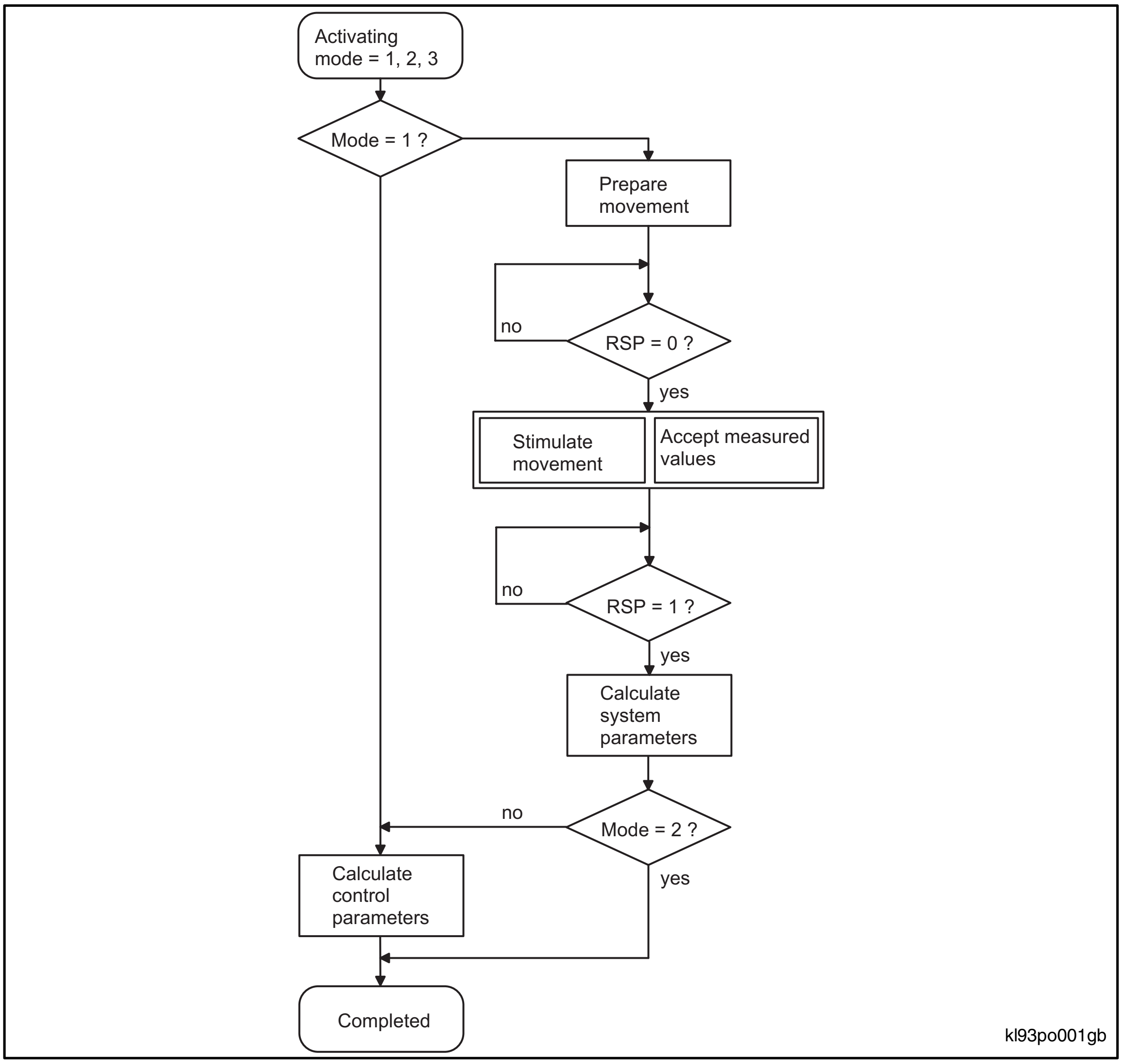
- identify mechanical distance parameters by a short motion run and
- automatically set the speed and position encoder based on the parameters identified or selected.

STOP

Stop!

- An identification can only be carried out if the drive is not exposed to external torques. In the event of overhauling loads (or similar) a motion must not be activated through the function!
- Release the brake (if mounted) before executing this function.
- Ensure the following to keep the number of revolutions:
  – Brake resistor or regenerative power supply unit
  – Constant moment of inertia.
- If the values differ too much from default setting of codes C1182 - C1185, deviations in the identification of distance parameters and thus controller setting may occur.
- The motion to be carried out by the function must be set in a way that even the slowest rotating element of the controller train is still moving significantly.

5.11.1 Procedure



The function is activated via "Mode" (C1180). For the activation the controller must be inhibited (CINH) and the drive must be at standstill. Otherwise the function will not be carried out and the status (C1181) with the corresponding error code is set. A reactivation of the function would lead to an error reset and a restart of the initialisation and the corresponding function. If zero is entered for "Mode", the function is reset to the initial state.

Calculation of control parameters (Mode = 1)

This function only calculates control parameters.

Identification/Identification and calculation of control parameters (mode = 2 / 3)

By activating the function “Identification” or ”Identification and Calculation of control parameters” a motion of the drive is released. Reset the controller inhibit (CINH) to release the motion after the function has been activated. After the motion has been completed, the controller must be inhibited again to complete the function.

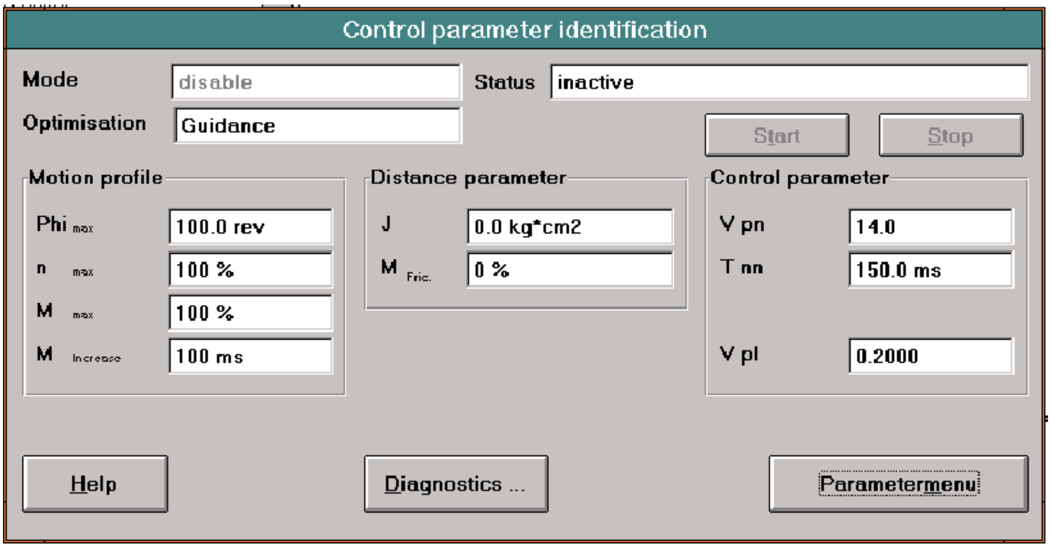


Fig. 5-22 Dialog box “Control parameter identification”

5.11.2 Troubleshooting

If an error occurs during parameter identification, the status (C1181) helps to detect the error.

Status (C1181)	Cause	Remedy
2	Control parameter calculation not possible	Check whether distance parameters are set reasonably (C1187/C1188).
3	Too few scanning points.	Change motion conditions (C1182-C1185), i. e. increase torque, increase number of revolutions, increase speed, reduce torque rise time.
4	Reference torque too low	• Increase Imax (C0022) • Check maximum torque (C0057)
5	Speed at start ≠ 0	Stop drive and reactivate function
6	Controller inhibit during motion	Repeat identification
7	Minimum brake torque not reached Torque ramp too flat or maximum torque too low	Change motion conditions (C1182-C1185), i. e. increase torque, increase number of revolutions, increase speed, reduce torque rise time.
8	Time overflow	Select higher torque or shorter torque rise time
9	Blocking	Release brake, check motor cable, eliminate blocking

5.11.2.1 Password protection

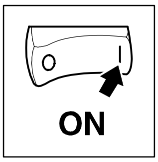
Code	LCD	Possible settings			IMPORTANT
		Lenze	Selection		
C0094	Password	0	0 {1} 9999		Password • Parameter access protection for the operating module. When the password is activated, only the codes of the user menus can be accessed. For further possible selections see C0096
[C0096] 1 2	 AIF protect. CAN protect.	 0 0	 0 1 2 3	 No password protection Read protection Write protection Read/Write protection	Extended password protection for bus systems with activated password (C0094). • All codes in the user menu can be accessed.

You can restrict the code access via the operating module using the password protection in C0094.

- Reading C0094 using the operating module:
  – C0094 = 0: password protection is not activated.
  – C0094 = 9999: password protection is activated.
- Activate password protection:
  – Enter four-digit number in C0094.
  – Confirm using SH + PRG.
- Deactivate password protection:
  – Enter four-digit number again.
  – All other inputs are refused.

Effect

- Working with the operating module:
  – The codes listed in the USER menu can still be read and changed.
  – All other codes are no longer displayed.
- Working with the fieldbus:
  – It is possible to extend the protection for codes via the fieldbus under C0096/1 (AIF) and C0096/2 (CAN).


ON

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.

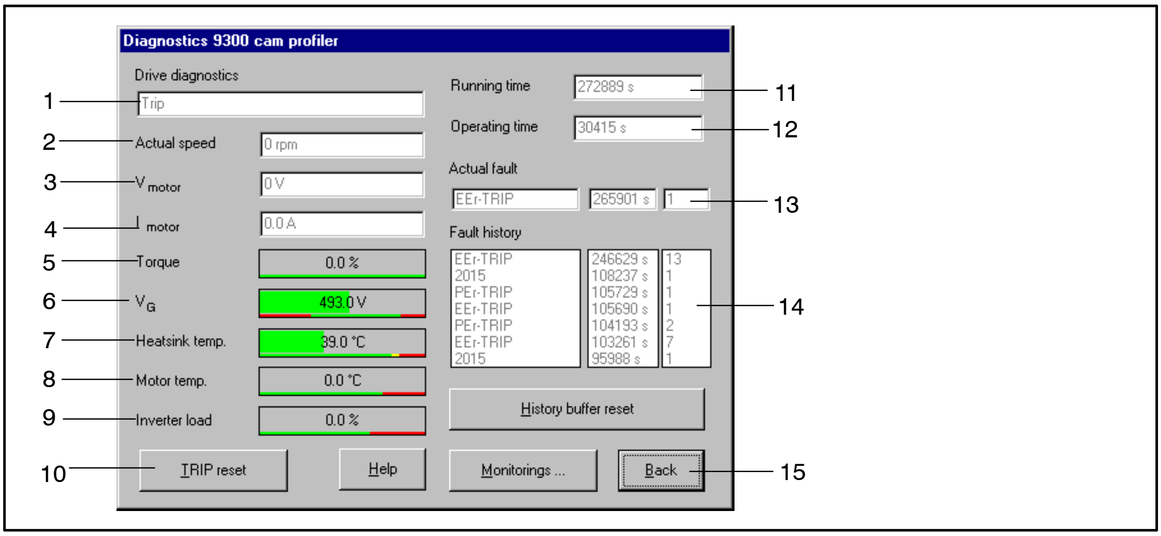


Fig. 6-1 ”Diagnostic 9300” dialog box

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 when the supply voltage was applied
12	Time when the controller was enabled
13	Actual fault with time and frequency of the fault. 📖 8-3
14	Fault history with time and frequency of the fault. 📖 8-3
15	Reset history buffer. 📖 8-4

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

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 is 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).

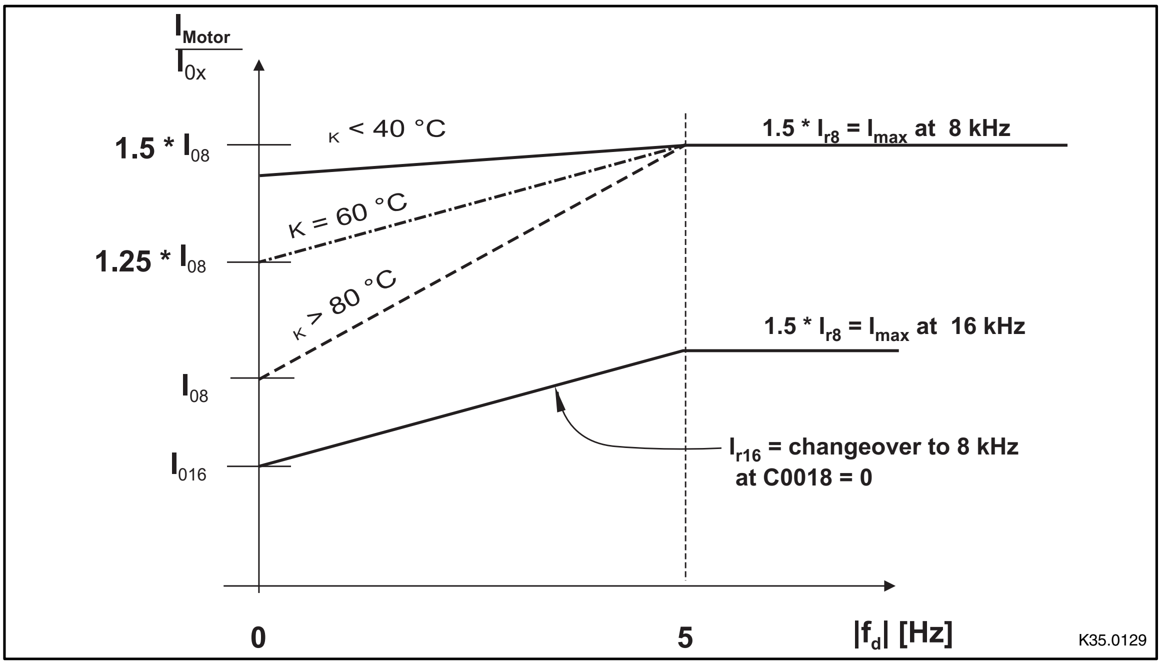


Fig. 6-2 Current derating function of the controllers 9326 to 9332.

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” (🕮 3-3).

EDSVS9332P-D21

Lenze

System Manual
Part D2.1

Configuration

Global Drive

9300 servo position controller

This documentation is valid for 9300 position controllers as of version:

33.932X	EP	2x	2x		(9321 - 9329)
33.933X	EP	2x	2x		(9330 - 9332)
33.932X	CP	2x	2x	- V003	Cold Plate (9321 - 9328)

Type

Design:
EP = Built-in unit IP20
CP = Cold Plate

Hardware version and index

Software version and index

Variant

Explanation

3.0 11/2004

Contents

Part D2.1

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Contents

7 Configuration

In practice every application requires an adjusted controller-internal configuration. For this, a great number of different function blocks are available, which must be linked in a suitable way. (📖 7-7)

7.1 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.

Tip!

Further information can be obtained from the Manual for your controller.

7.1.1 Changing the basic configuration

If the basic configuration must be changed for a special application, proceed as follows:

1. Select a basic configuration via C0005 which largely meets the requirements.
2. Add functions by:
   – Reconfigure inputs and/or outputs.
   – Set parameters for function blocks. (7-5)
   – Integrate or remove function blocks. (7-11)

Tip!

If you change the signal flow of the basic configuration, e. g. by adding function blocks, C0005 is set to 0. The display indicates ”COMMON”.

7.2 Operating modes

Determine the operating mode, the interface you want to use for parameter setting or control of the controller, by choosing an operating module.

7.2.1 Parameter setting

Parameters can be set with one of the following modules:

- Communication module
  – 2102 (LECOM A/B/LI)
  – 2111 (INTERBUS)
  – 2131 (PROFIBUS)
  – 2133 (PROFIBUS)
- PC system bus module
  – 2173

7.2.2 Control

Control via terminals (X5 and X6), via the fieldbus module at X1 or via the system bus (X4). Mixed modes are also possible.

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

7.2.3 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.

Show/Hide Bookmarks

7.2.4 Elements of a function block

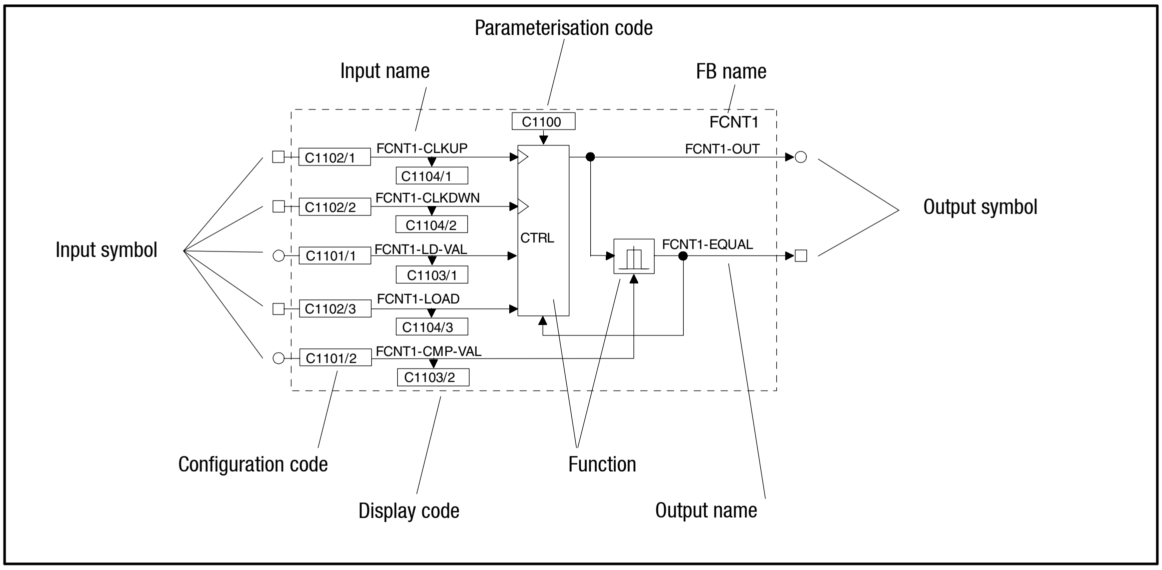


Fig. 7-1 Function block structure - considering as example FCNT1

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. (📖 7-11)

The selection numbers are listed in selection list 5. (📖7-381 ff)

Example:

(FCNT1, see Fig. 7-1)

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

Input symbol

Designates the signal type which is allowed as signal source for this input. (📖 7-4)

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

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. 7-1).

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. (🕮 7-20)

Output symbol

Designates the signal type. Connections with inputs of the same signal type are possible. (🕮 7-4)

Each output is defined by a selection number. The selection numbers are divided into selection lists (1 ... 4) according to the different signal types. (🕮7-381 ff)

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

Example:

(FCNT1, see Fig. 7-1)

- 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.

7.2.5 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.

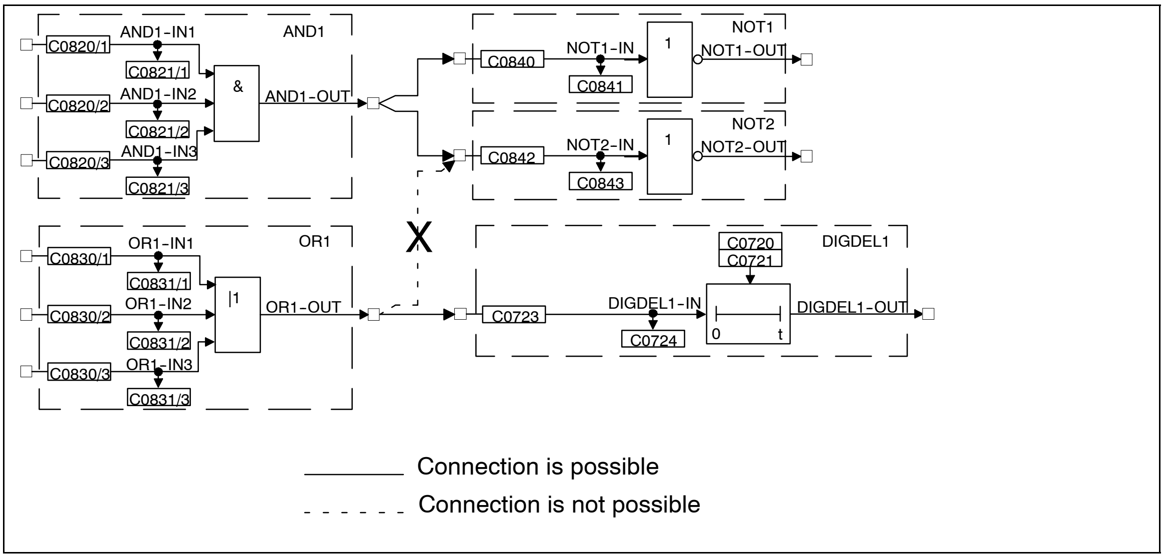


Fig. 7-2 Correct connection of function blocks

Configuration

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.

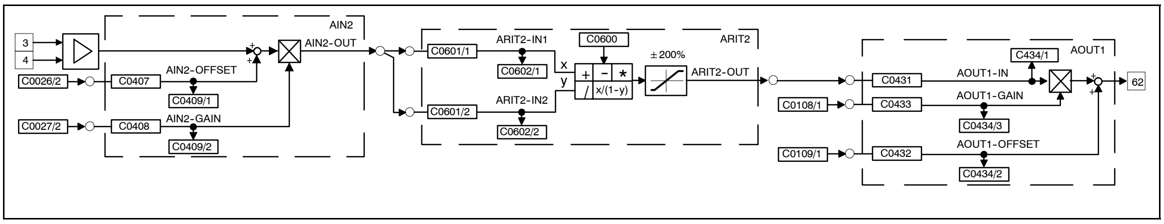


Fig. 7-3 Example of a simple configuration

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.

Configuration

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.

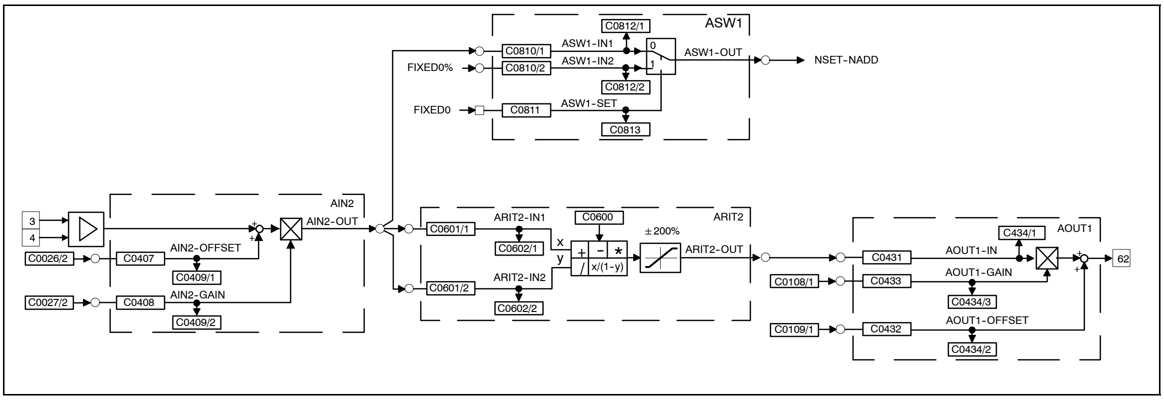


Fig. 7-4 Remove connections in a configuration

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 using 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.

7.2.6 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:

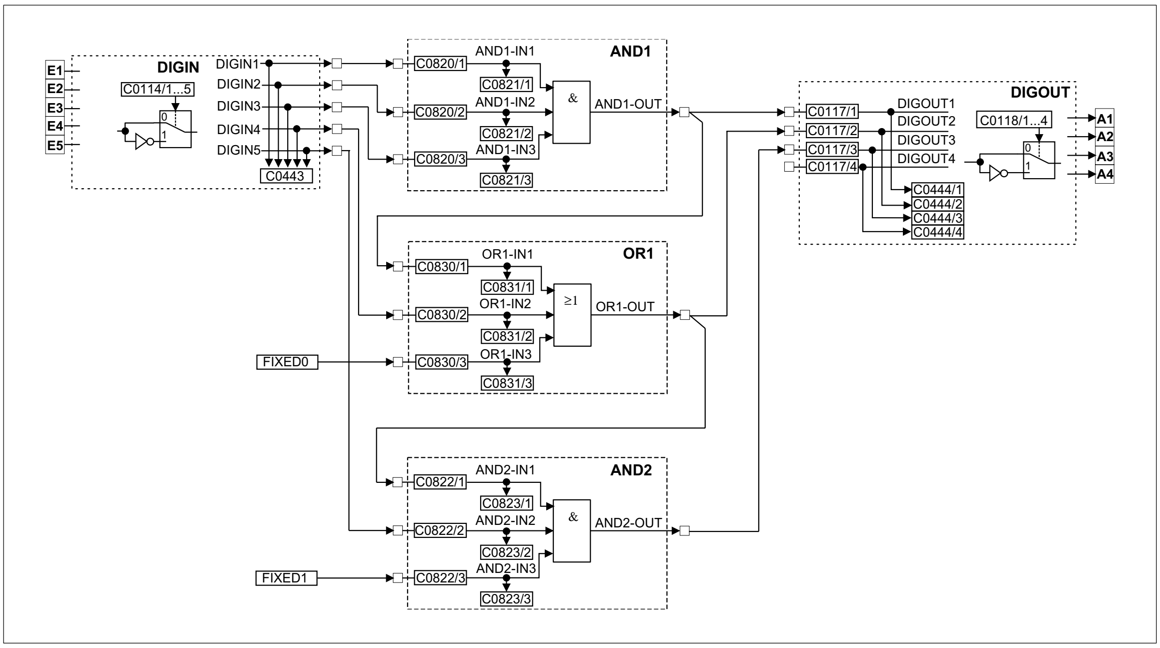


Fig. 7-5 Example of a configuration

Structure of the processing table for the configuration example Fig. 7-5:

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.)

Configuration

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

7.2.6.1 Signal configuration with Global Drive Control

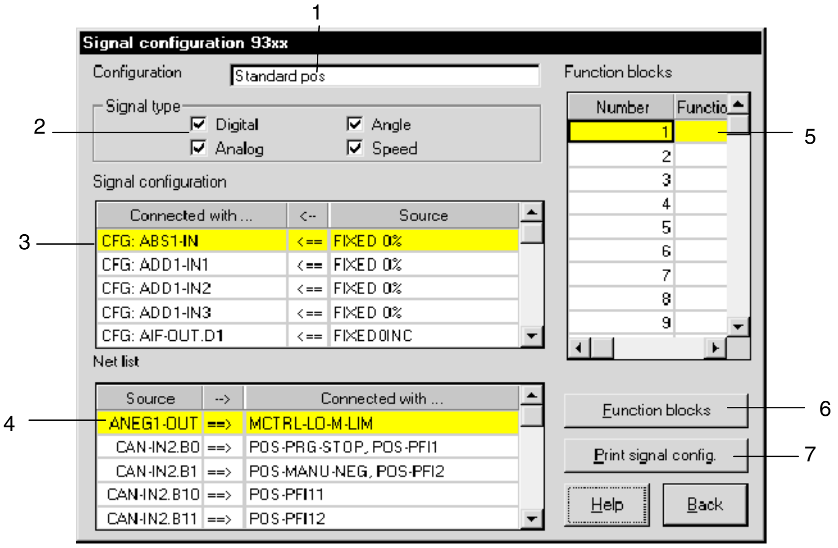


Fig. 7-6 Dialog field “Signal configuration of servo positioning controller 9300”

Field	Command	Function
	Initiate parameter menu	
	Open menu “Dialog signal configuration”.	
1	Click “Configuration”.	All signal configurations available are displayed in a window. • Select the signal configuration required and confirm with “OK”.
2	Highlight the option for “Signal type” required.	Fields 4 and 5 only list the signal types available for the corresponding option.
3	Click an entry in “Signal link”.	All signal sources available for the FB input selected are displayed in a window. • Select the signal source required and confirm with “OK”.
4	Click the entry under “Network list”.	The corresponding FB and its links are displayed in a window.
5	Click “Edit FB”.	All FBs available are displayed in a window. • Select the FB required and confirm with “Accept”.
6	Click “Function blocks”.	All FBs available are displayed in a window.
7	Click “Print signal config.”.	Output of the current signal configuration to the printer.

Entry sequence for FBs

The FBs must not be entered directly one after another into the processing table. The best order, however, corresponds to the signal flow. Non-assigned positions are permissible.

7.3 Terminal assignment

If you change the signal configuration via C0005, the assignment of all inputs and outputs will be overwritten with the corresponding basic assignment. If necessary, adapt the function assignment to your wiring.

- The digital inputs are linked via the FB DIGIN. (📖 7-192)
- The digital outputs are linked by the FB DIGOUT. (📖 7-193)
- The analog inputs are linked by the FB AIN. (📖 7-101)
- The analog outputs are linked by the FB AOUT. (📖 7-107)

STOP

Stop!

If you link an FB input with a signal source, already existing links are preserved. Remove undesired links. (📖 7-10)

7.3.1 Freely assignable digital inputs

Five freely assignable inputs are available (X5/E1 ... X5/E5). The signals are conditioned and linked with other FBs via FB DIGIN. (🕮 7-192)

Display links:

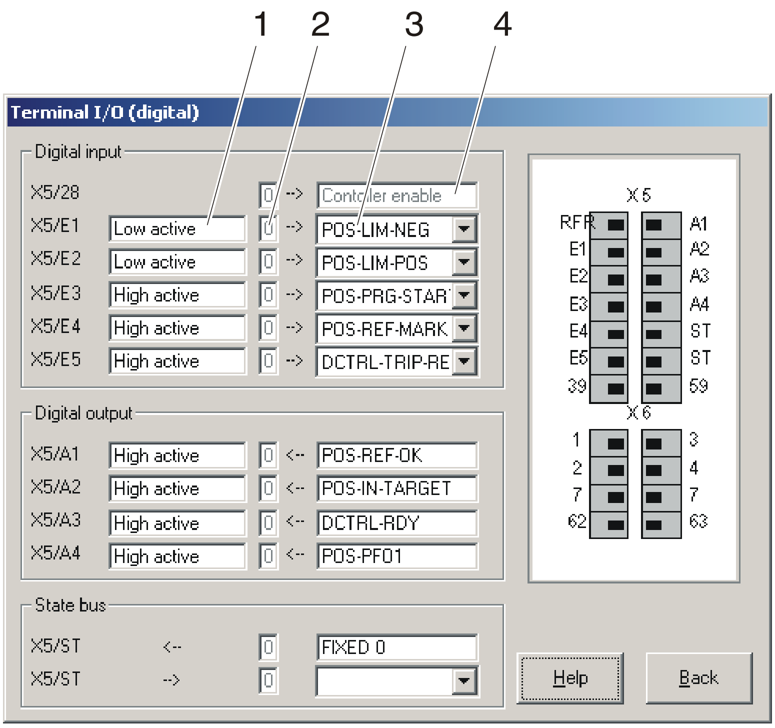


Fig. 7-7 Dialog box “Terminal I/O (digital)”

Field	Command	Function
	Initiate parameter menu	
	Click on “Dialog terminal I/O (digital)” menu.	
1	Click on field.	Select signal level on which the input X5/E1 has to react.
2		Displays whether the input is triggered with a HIGH (1) or LOW (0) edge.
3	Click on field.	A window displays the existing links for the input X5/E1.
4		Input X5/28 is assigned with controller enable. Cannot be changed.

The display of the links of the terminals X5/E2 ... X5/E5 is done in the same way.

Tip!

In the “Dialog signal configuration” menu you can carry out all links to the FB DIGIN. (🕮 7-13)
Field 3 (in Fig. 7-7 for terminal X5/E1) shows these links.

7.3.2 Freely assignable digital outputs

Four freely assignable outputs are available (X5/A1 ... X5/A5). The signals are conditioned and linked with other FBs via FB DIGOUT. (📖 7-193)

Change assignment:

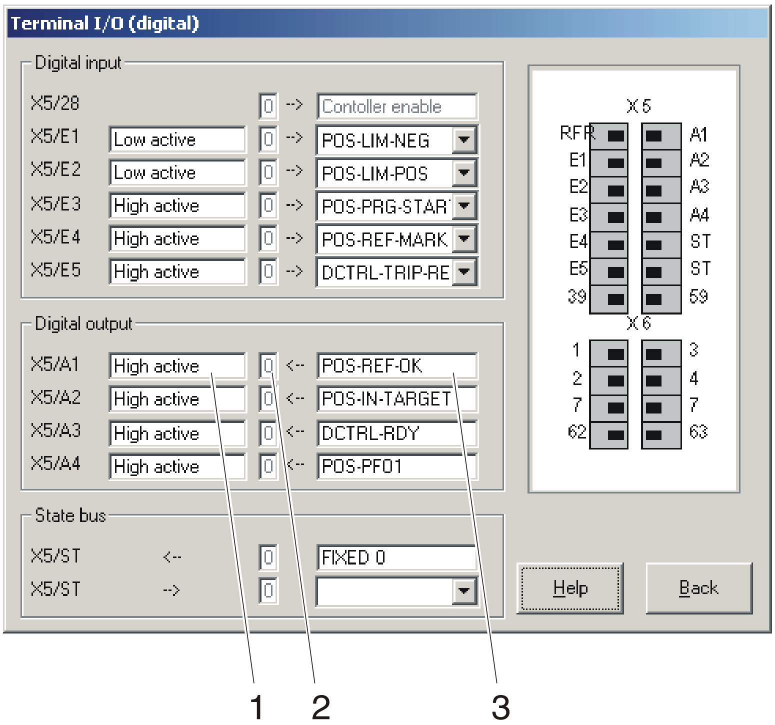


Fig. 7-8 Dialog box "Terminal I/O (digital)"

Field	Command	Function
	Initiate parameter menu	
	Click on "Dialog terminal I/O (digital)" menu.	
1	Click on field.	Select signal level on which the output X5/A1 has to switch when it is triggered.
2		Displays whether the output is triggered with a HIGH (1) or LOW (0) edge.
3	Click on field.	A window displays all available links of the output X5/A1. • Select link.

The assignment of the terminals X5/A2 ... X5/A4 is changed in the same way.

7.3.3 Input and outputof the STATE-BUS

Configure input and output of the FB STATE-BUS. (📖 7-267)

Change assignment:

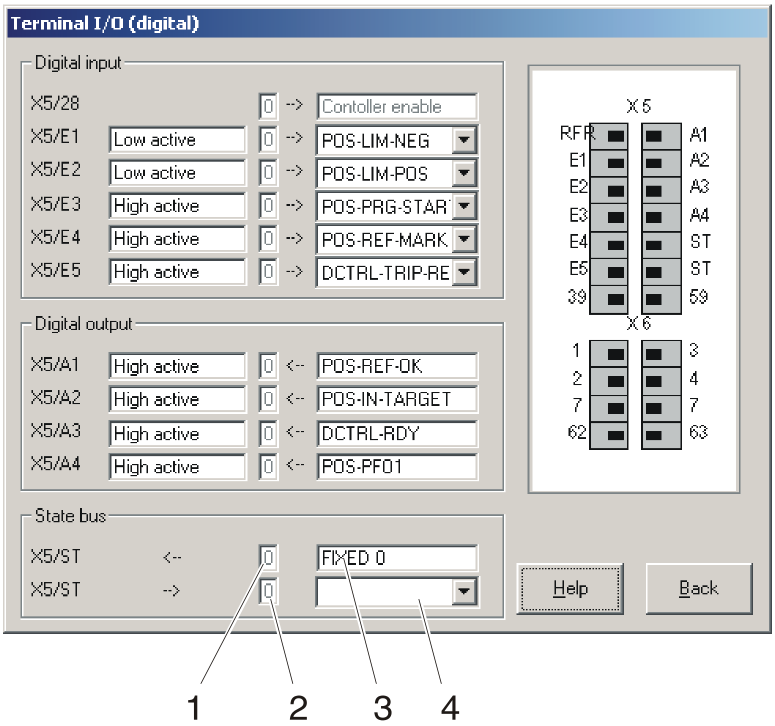


Fig. 7-9 Dialog box "Terminal I/O (digital)"

Field	Command	Function
	Initiate parameter menu	
	Click on "Dialog terminal I/O (digital)" menu.	
1		Displays whether the output X5/ST is triggered with HIGH (1) or LOW (0) edge.
2		Displays whether the input X5/ST is triggered with a HIGH (1) or LOW (0) edge.
3	Click on field.	A window displays the available links by means of which the outgoing bus signal is to be output at terminal X5/ST. • Select link.
4	Click on field.	A window displays the existing links by means of which the incoming bus signal is to be processed. • Select link.

Tip!

In the "Dialog signal configuration" menu you can carry out all links to the FB STATE-BUS. (📖 7-13)
Field 4 displays these links.

7.3.4 Freely assignable analog inputs

Two freely assignable analog inputs are available (X6/1,2 and X6/3,4). The signals are conditioned and linked with other FBs via FB AIN. (🕮 7-101)

Display links:

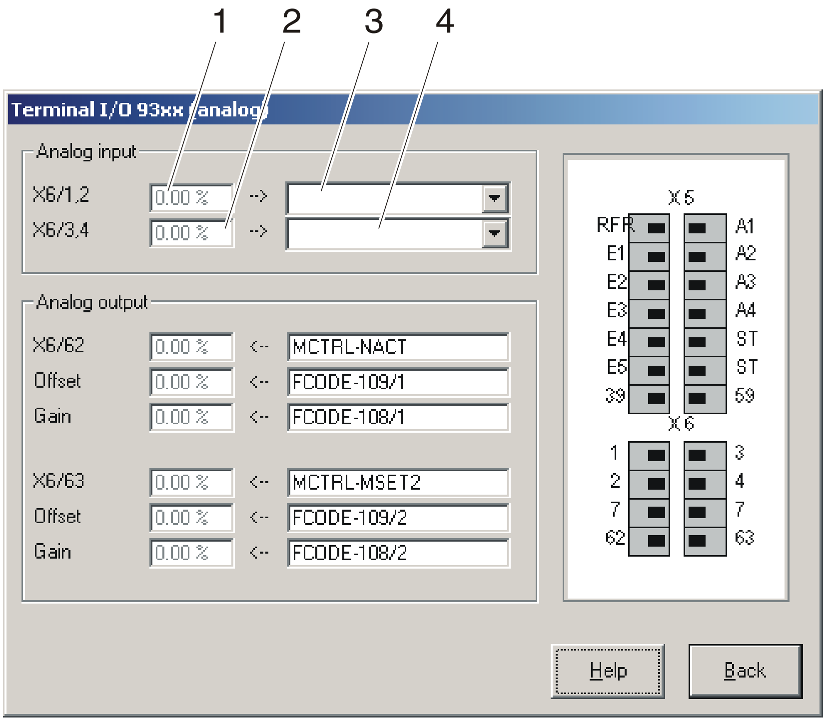


Fig. 7-10 Dialog box “Terminal I/O 93xx (analog)”

Field	Command	Function
	Initiate parameter menu	
	Click on “Dialog terminal I/O 93xx (analog)” menu.	
1		Displays the input value at terminal X6/1,2.
2		Displays the input value at terminal X6/3,4.
3	Click on field.	A window displays the existing links for the input X6/1,2.
4	Click on field.	A window displays the existing links for the input X6/3,4.

Tip!

In the “Dialog signal configuration” menu you can carry out all links to the FB AIN. (🕮 7-13)
Field 1 or field 2 diplays these links.

7.3.5 Freely assignable analog outputs

Two freely assignable analog outputs are available (X6/62 and X6/63). The signals are conditioned and linked with other FBs via FB AOUT. (📖 7-107)

Change assignment:

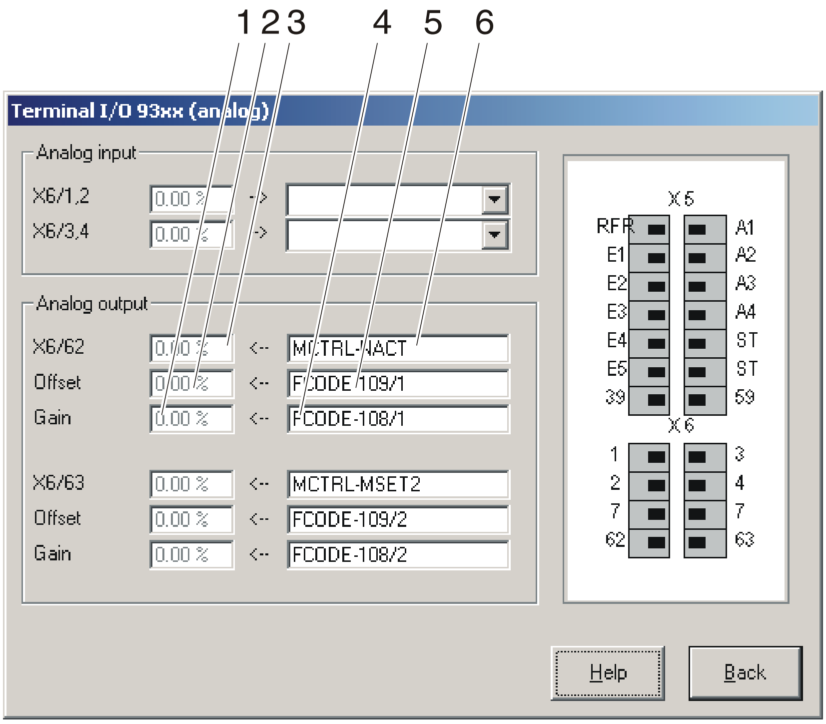


Fig. 7-11 Dialog box “Terminal I/O 93xx (analog)”

Field	Command	Function
	Initiate parameter menu	
	Click on “Dialog terminal I/O 93xx (analog)” menu.	
1		Displays the value of the gain signal.
2		Displays the value of the offset signal.
3		Displays the output value at terminal X6/62.
4	Click on field.	A window displays the available links for the evaluation of the signal with a gain. • Select link.
5	Click on field.	A window displays the available links for the evaluation of the signal with an offset. • Select link.
6	Click on field.	A window displays all available links of the output X6/62. • Select link.

The assignment of terminal X6/63 is changed in the same way.

7.4 Description of the function blocks

Function blocks

Function block	Description		CPU time [µs]	used in base configuration C0005						
				1000	20000	22000	26000			
ABS1	Absolute value generator	7-94	4							
ADD1	Adding block	7-95	8							
AIF-IN	Fieldbus	7-96	60							
AIF-OUT	Fieldbus	7-99	56	•						
AIN1	Analog input X6/1, X6/2	7-101	10	•						
AIN2	Analog input X6/3, X6/4		28	•						
AND1	Logic AND, block1	7-103	6							
AND2	Logic AND, block2									
AND3	Logic AND, block3									
AND4	Logic AND, block4									
AND5	Logic AND, block5									
ANEG1	Analog inverter 1	7-106	3	•	•	•	•			
ANEG2	Analog inverter 2									
AOUT1	Analog output X6/62	7-107	12	•	•	•	•			
AOUT2	Analog output X6/63			•	•	•	•			
ARIT1	Arithmetic block 1	7-109	11							
ARIT2	Arithmetic block 2									
ARITPH1	32-bit arithmetic block	7-110	15							
ARITPH2	32-bit arithmetic block 2									
ARITPH3	32-bit arithmetic block3									
ARITPH4	32-bit arithmetic block4									
ARITPH5	32-bit arithmetic block5									
ARITPH6	32-bit arithmetic block6									
ASW1	Analog changeover 1	7-113	4	•						
ASW2	Analog changeover 2									
ASW3	Analog changeover 3									
ASW4	Analog changeover 4									
BCD1	BCD decade switch 1	7-115	30							
BCD2	BCD decade switch 2									
BCD3	BCD decade switch 3									
BRK	Trigger holding brake	7-126	15							
CAN-IN1	System bus	7-131	-							
CAN-IN2	System bus									
CAN-IN3	System bus									
CAN-OUT1	System bus	7-138	56	•	•	•				
CAN-OUT2	System bus			•	•	•				
CAN-OUT3	System bus			•	•	•				
CMP1	Comparator 1	7-143	15	•						
CMP2	Comparator 2									
CMP3	Comparator 3		15							
CMPPH1	Comparator 1	7-147	20							
CMPPH2	Comparator 2									
CMPPH3	Comparator 3									
CONV1	Conversion analog signals	7-152	8							
CONV2	Conversion analog signals									
CONV3	Conversion speed signals to analog signals									
CONV4	Conversion speed signals to analog signals									
CONV5	Conversion analog signals to speed signals									
CONVAD1	Analog digital converter 1	7-155	4							
CONVAD2	Analog digital converter 2									

Function block	Description		CPU time [µs]	used in base configuration C0005						
				1000	20000	22000	26000			
CONVAPH1	Analog phase converter 1	7-157	31							
CONVAPH2	Analog phase converter 2									
CONVAPH3	Analog phase converter 3									
CONVDA1	Digital analog converter 1	7-159	38							
CONVDA2	Digital analog converter 2									
CONVDA3	Digital analog converter 3									
CONVPHA1	Phase analog converter 1	7-162	6							
CONVPHA2	Phase analog converter 2									
CONVPHA3	Phase analog converter 3									
CONVPHPH2	Phase converter 2	7-164	80				•			
CURVE1	Characteristic function	7-165	15			•				
DB1	Dead band	7-168	7							
DCTRL	Device control	7-169	-							
DFIN	Digital frequency input	7-172	5	•						
DFOUT	Digital frequency output	7-175	35	•	•	•	•			
DFRFG1	Digital frequency ramp function generator	7-179	40							
DFSET	Digital frequency processing	7-185	85							
DIGDEL1	Binary delay element 1	7-189	9							
DIGDEL2	Binary delay element 2									
DIGIN	Input terminals X5/E1…X5/E5	7-192	-							
DIGOUT	Output terminals X5/A1…X5/A4	7-193	-							
DISA	Free analog display code	7-194	1							
DISPH	Free phase display code	7-196	1							
DT1	Differential element	7-197	12							
FCNT1	Free piece counter, block 1	7-198	11							
FCNT2	Free piece counter, block 2									
FCNT3	Free piece counter, block 3									
FDO	Free digital outputs	7-202	-							
FEVAN1	Free analog input variable	7-204	4							
FEVAN2	Free analog input variable									
FEVAN3	Free analog input variable									
FEVAN4	Free analog input variable									
FEVAN5	Free analog input variable									
FEVAN6	Free analog input variable									
FIXSET1	Fixed setpoints	7-211	9							
FLIP1	D-flipflop 1	7-213	6							
FLIP2	D-flipflop 2									
LIM1	Limiter	7-216	5							
MCTRL	Servo control	7-217	-							
MPOT1	Motor potentiometer	7-228	20							
NOT1	Logic NOT, block1	7-231	4		•	•	•			
NOT2	Logic NOT, block2						•			
NOT3	Logic NOT, block3						•			
NOT4	Logic NOT, block4									
NOT5	Logic NOT, block5									
NSET	Speed setpoint conditioning	7-233	70	•						
OR1	Logic OR, block1	7-239	6				•			
OR2	Logic OR, block2						•			
OR3	Logic OR, block3									
OR4	Logic OR, block4									
OR5	Logic OR, block5									
OSZ	Oscilloscope function	7-242	70							
PCTRL1	Process controller	7-246	58							

Function library

Function block	Description		CPU time [µs]	used in base configuration C0005						
				1000	20000	22000	26000			
PHDIV1	Conversion	🕮 7-249	8							
PHINT1	Phase integrator	🕮 7-250	7							
POS	Position control	🕮 7-24	330		•	•	•			
PT1-1	1st order delay element	🕮 7-253	8							
R/L/Q	QSP / setpoint inversion	🕮 7-254	8	•						
RFG1	Ramp function generator	🕮 7-255	16							
S&H1	Sample and Hold	🕮 7-257	4							
SELPH1	Phase value selection, block 1	🕮 7-258	6							
SELPH2	Phase value selection, block 2									
SP1	Switching points, block 1	🕮 7-260	80			•				
SP2	Position switch points, block 2		130							
STAT	Output of digital status signals	🕮 7-266	-							
STATE-BUS	Control of a drive network	🕮 7-267	-							
SYNC1	Multi-axis positioning	🕮 7-268	37				•			
TEACH1	Teach in programming	🕮 7-276	10			•				
TRANS1	Binary flank evaluation	🕮 7-278	7				•			
TRANS2	Binary flank evaluation									
VTACC	Variable table Acceleration	🕮 7-281	20							
VTPCS	Variable table - piece number	🕮 7-283	12							
VTPOS	Variable table - target position (position value)	🕮 7-285	45							
VTTIME	Variable table - waiting time	🕮 7-287	12							
VTVEL	Variable table - speed	🕮 7-289	18							

Table of free codes

Code	Description	CPU time [µs]							
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 141									
FCODE 250									
FCODE 470/1									
FCODE 470/2									
FCODE 470/3									
FCODE 470/4									
FCODE 471									
FCODE 472/1									
FCODE 472/2									
FCODE 472/3									
FCODE 472/4									
FCODE 472/5									
FCODE 472/6									
FCODE 472/7									

Code	Description	CPU time [µs]							
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 475/1									
FCODE 475/2									
FCODE 1211									

7.5 Positioning control (POS)

Purpose

The function block "positioning control (POS)" is the core of the 9300 servo position controller. It controls positioning in the controller.

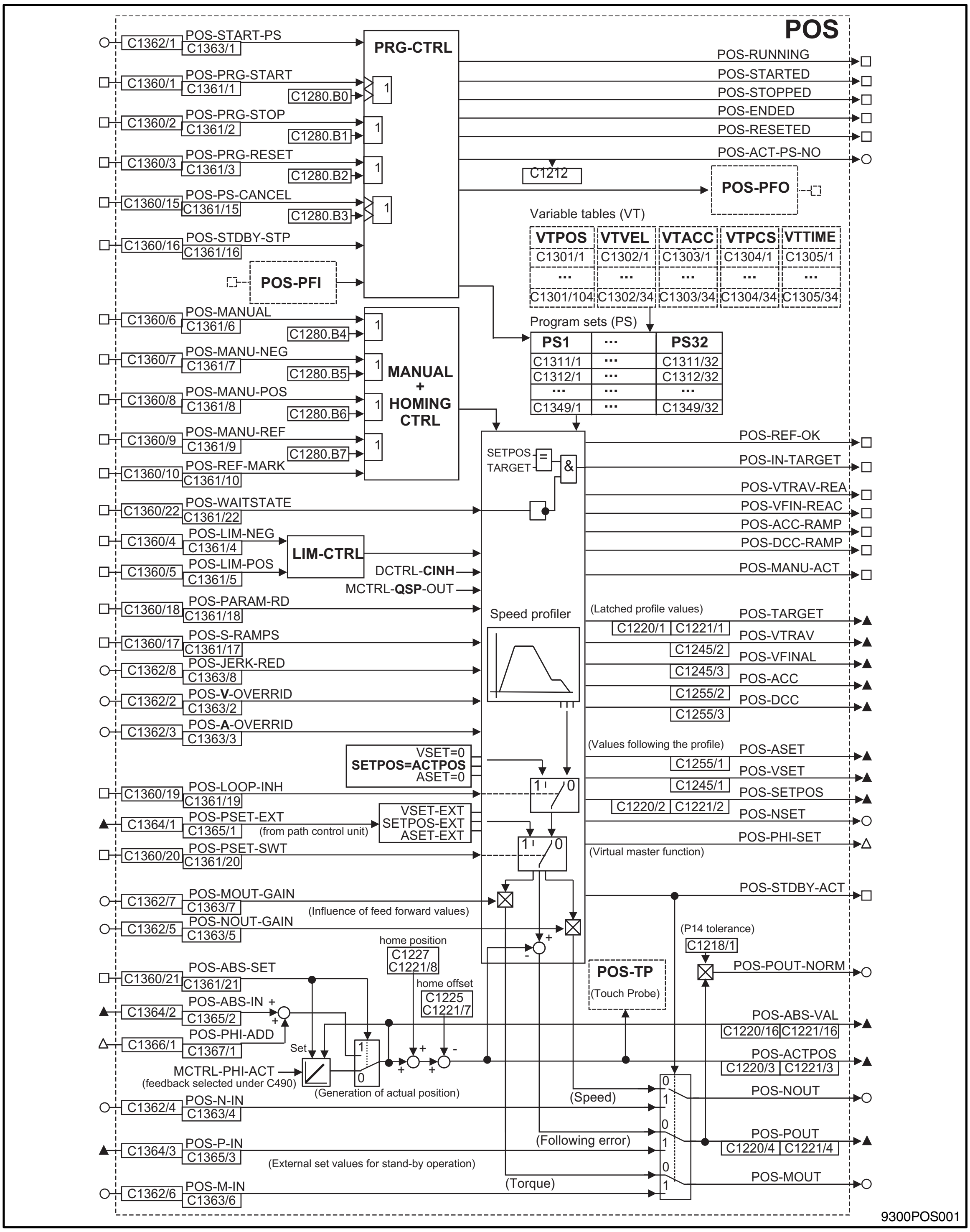


Fig. 7-12 Function block POS

Signal				Source		Note
Designation	Type	DIS	DIS format	CFG	List	
POS-A-OVERRID	a	C1363/3	dec [%]	C1362/3	1	Reduces the acceleration and deceleration as well as the manual traversing acceleration and homing acceleration. Note: Only positive override values are effective, negative values will be evaluated as zero. (See "Override" 🕮 7-63)
POS-ABS-IN	ph	C1365/2	dec [inc]	C1364/2	3	Input for external actual position value, e. g. when using an absolute value encoder with a CAN interface. (see "Absolute encoder via system bus" 🕮 7-44)
POS-ABS-SET	d	C1361/21	bin	C1360/21	2	HIGH = Phase value at POS-ABS-IN is read for generating the actual position value (POS-ACTPOS). The following values are considered for the POS-ACTPOS: position setpoint polarity (C1206), actual position polarity (C1208), actual home position (display C1220/8), actual dimension offset (display C1220/7).
POS-ABS-VAL	ph	C1220/16 C1221/16	dec [units] dec [inc]			Display as actual position POS-ACTPOS, but without considering setpoint position polarity (C1206), actual position (C1206), actual home position (display C1220/8) and actual reference dimension offset (display C1220/7).
POS-ACC	ph	C1255/2	dec [inc]	-	-	Deceleration, absolute value for current PS; for scaling see formula 3.
POS-ACC-RAMP	d	-	-	-	-	HIGH = Drive accelerates
POS-ACT-PS-NO	a	C1212	dec [inc]	-	-	Current program block
POS-ACTPOS	ph	C1220/3 C1221/3	dec [units] dec [inc]	-	-	Actual position; for scaling see formula 1
POS-ASET	ph	C1255/1	dec [inc]	-	-	Current acceleration/deceleration setpoint, for scaling see formula 3.
POS-DCC	ph	C1255/3	dec [inc]	-	-	Deceleration in current program block (positive display); for scaling see formula 3
POS-DCC-RAMP	d	-	-	-	-	HIGH = drive brakes
POS-ENDED	d	-	-	-	-	Position status display HIGH = program end reached. Current program block no.=0 (POS-ACT-PS-NO). (see "program control" 🕮 7-71)
POS-IN-TARGET	d	-	bin	-	-	HIGH = Position setpoint has reached target position, positioning is completed, the following function of the PS will be processed. LOW = Positioning is running or was cancelled by POS-PS-CANCEL. POS-IN-TARGET remains LOW, as long as POS-WAITESTATE = HIGH. 🕮 7-65
POS-JERK-RED	a	1363/8	dec [%]	C1362/8	1	Reduces the jerk of an S profile, or prolongs the jerk time (Tr) (see "S ramps" 🕮 7-61). Note: will be evaluated as value.
POS-LIM-NEG	d	C1361/4	bin	C1360/4	2	HIGH = negative end of travel range limit switch approached. (see "Travel limits" 🕮 7-47)
POS-LIM-POS	d	C1361/5	bin	C1360/5	2	HIGH = positive travel range limit switch approached. (see "Travel range limits" 🕮 7-47)
POS-LOOP-INH	d	C1361/19	bin	C1360/19	2	HIGH = position control loop is switched off. (POS-SETPOS = POS-ACTPOS, POS-VSET = 0, POS-ASET = 0).
POS-M-IN	a	C1363/6	dec [%]	C1362/6	1	External torque precontrol, effective in stand-by operation (🕮 7-81)
POS-MANU-ACT	d	-	-	-	-	HIGH = manual operation active, no program operation Note: Signal will not be updated when the controller is inhibited (DCTRL-CINH = HIGH) or quick stop (MCTRL-QSP-OUT = HIGH) is set
POS-MANU-NEG	d	C1361/7	bin	C1360/7	2	HIGH = drive travels with v_manual (C1243) in negative direction. Acceleration with a-manual (C1252). The override inputs POS-V-OVERRID and POS-A-OVERRID have influence. LOW = drive is stopped with a-manual (C1252). The override inputs POS-V-OVERRID and POS-A-OVERRID have influence. Note: POS-MANU-REF has priority. When -NEG and -POS are controlled simultaneously the drive stops. (see "Manual operation" 🕮 7-68)
POS-MANU-POS	d	C1361/8	bin	C1360/8	2	like POS-MANU-NEG, but in positive direction. (see "Manual operation" 🕮 7-68)
POS-MANU-REF	d	C1361/9	bin	C1360/9	2	LOW-HIGH signal = Start manual homing HIGH level required for the time of homing (see "manual homing" 🕮 7-70)
POS-MANUAL	d	C1361/6	bin	C1360/6	2	Changeover Manual/program operation HIGH = manual operation; if necessary, running program is interrupted. If necessary, drive is decelerated to standstill with a-manual (C1252) and the influence of POS-A-OVERRID. LOW = Program mode (see "manual mode" 🕮 7-68)

Function library

Signal				Source		Note
Designation	Type	DIS	DIS format	CFG	List	
POS-MOUT	a	-	-	-	-	Current torque precontrol value after influence of POS-MOUT-GAIN. Scaling: 100% acc. to a-max (C1250).
POS-MOUT-GAIN	a	C1363/7	dec [%]	C1362/7	1	Reduces torque precontrol. The polarity of the input signal is considered.
POS-N-IN	a	C1363/4	dec [%]	C1362/4	1	External speed setpoint, effective in stand-by operation (🕮 7-81)
POS-NOUT	a	-	-	-	-	Current speed setpoint for n controller after influence of POS-NOUT-GAIN. Scaling: 100% acc. to. nmax (C0011).
POS-NOUT-GAIN	a	C1363/5	dec [%]	C1362/5	1	Reduces speed precontrol. The polarity of the input signal is considered.
POS-NSET	a	-	-	-	-	Current speed setpoint (profile generator output), scaling: 100% acc. to nmax (C0011).
POS-P-IN	ph	C1365/3	dec [inc]	C1364/3	3	Externally calculated following error, effective in stand-by operation (🕮 7-81)
POS-PARAM-RD	d	C1361/18	bin	C1360/18	2	LOW-HIGH signal = new profile parameters will be accepted immediately, even during positioning HIGH level accepts new parameters every 10 ms Profile parameters: target position, traversing speed, acceleration, deceleration, final speed, V-OVERRID, A-OVERRID, POS-S-RAMPS. Note: Not effective in stand-by operation (”Stand-By operation” see 🕮 7-81)
POS-PHI-ADD	phd	C1367/1		C1366/1		Phase difference signal is added to POS-ABS-IN. Function: With POS-ABS-SET= HIGH the actual position is set to the value POS-ABS-IN. Encoder increments that have arrived in the setting cycle are not considered in the default. If required, the encoder change can be connected in the setting cycle; the signal MCTRL-PHI-ACT must be linked with the input POS-PHI-ADD.
POS-PHI-SET	phd	-	-	-	-	“Virtual Master” application: 🕮 7-66)
POS-POUT	ph	-	-	-	-	Following error for phase controller
POS-POUT-NORM	d	-	dec [%]			Scaled analog following error output. The current following error POS-POUT is additionally output as follows: 100% equals first following error tolerance (C1218/1). Tip: for monitoring the dynamic drive response.
POS-PRG-RESET	d	C1361/3	bin	C1360/3	2	HIGH= interrupts the program processing and sets ”program end”. Parts counters and PFOs are reset. The Touch Probe inputs used by the program are disabled and, if required, the stand-by operation is interrupted. The drive is stopped with a-max (C1250) (no influence of POS-A-OVERRID). (see “program control” 🕮 7-71)
POS-PRG-START	d	C1361/1	bin	C1360/1	2	Start of the program. LOW-HIGH edge = Start, from the beginning (POS-START-PS) or continued at the same position after program interruption. The program is executed to the ”program end”, even if POS-PRG-START is reset again. If POS-PRG-START = HIGH at the program end, the program will be processed again from its beginning. (see “program control” 🕮 7-71)
POS-PRG-STOP	d	C1361/2	bin	C1360/2	2	HIGH = program processing and the running positioning are interrupted. The drive is stopped with the current delay of the program block (no influence of POS-A-OVERRID). LOW = Program processing is continued. Positioning is continued with the current profile parameters of the program block, if required. (see “program control” 🕮 7-71)
POS-PS-CANCEL	d	C1361/15	bin	C1360/15	2	Cancel PS and continue program from another point. LOW-HIGH edge = aborts current program block. Drive is braked to standstill with the separately adjustable delay “a-cancel” (C1253). Afterwards the program is continued in the selected program block (C1333; JMP-TP-PS). (see “program control” 🕮 7-71)
POS-PSET-EXT	ph	C1365/1	dec [inc]	C1364/1	3	External position setpoint.
POS-PSET-SWT	d	C1361/20	bin	C1360/20	2	HIGH = Phase value at POS-PSET-EXT will be accepted as position setpoint (POS-SETPOS) LOW = Position setpoint will be generated by the profile generator.
POS-REF-MARK	d	C1361/10	bin	C1360/10	2	Home position switch
POS-REF-OK	d	C1284/1	-	-	-	HIGH = Homing completed/reference known

Signal				Source		Note
Designation	Type	DIS	DIS format	CFG	List	
POS-RESETED	d	-	-	-	-	Position status display HIGH = Position program in status “Prg-Reset” (see “program control” 🕮 7-71)
POS-RUNNING	d	-	-	-	-	Position status display POS-RUNNING = HIGH: Program run is started and is not interrupted by controller inhibit, faults or manual control. POS-RUNNING = LOW and POS-STARTED = HIGH: Program run interrupted; for continuing the program run a new edge to POS-PRG-START is required.
POS-S-RAMPS	d	C1361/17	bin	C1361/17	2	HIGH level = S profile is active (see S-shaped ramps” 🕮 7-61)
POS-SETPOS	ph	C1220/2 C1221/2	dec [units] dec [inc]	-	-	Current position setpoint; for scaling see formula 1
POS-START-PS	a	C1363/1	dec [inc]	C1362/1	1	Start program set Number of the program set with which the program run is to be started. In the standard configurations (see C0005) it is connected with C1211,
POS-STARTED	d	-	-	-	-	Position status display HIGH = Program started If the program has been interrupted by controller inhibit, fault or manual homing, POS-STARTED remains HIGH. The program can only continue if a new signal is applied to POS-PRG-START. (see “program control” 🕮 7-71)
POS-STDBY-ACT	d	-	-	-	-	HIGH = stand-by operation is active (see “Stand-by operation” 🕮 7-81)
POS-STDBY-STP	d	C1361/16	bin	C1360/16	2	HIGH = terminates the stand-by operation, if ”STDBY” is selected in the POS mode (C1311 = 30). No other function. (see “Stand-by operation” 🕮 7-81)
POS-STOPPED	d	-	-	-	-	Position status display HIGH = Program and drive have been stopped or drive is being stopped (see “program control” 🕮 7-71)
POS-TARGET	ph	C1220/1 C1221/1	dec [units] dec [inc]	-	-	current target position in real measuring system; for scaling see formula 1
POS-V-OVERRID	a	C1363/2	dec [%]	C1362/2	1	Reduces the traversing and final speed as well as the manual traversing speed and the homing speed. Note: Only positive override values are effective, negative values will be evaluated as zero. (See ”Override” 🕮 7-63)
POS-VFIN-REAC	d	-	-	-	-	HIGH = current final speed reached
POS-VFINAL	ph	C1245/3	dec [inc]	-	-	Acceleration, absolute value for current PS, for scaling see formula 3.
POS-VSET	ph	C1245/1	dec [inc]	-	-	Current speed setpoint; for scaling see formula 2
POS-VTRAV	ph	C1245/2	dec [inc]	-	-	Final speed, absolute value for current PS, for scaling see formula 2.
POS-VTRAV-REA	d	-		-	-	HIGH = current traversing speed reached
POS-WAITSTATE	d	C1360/22	bin	C1361/22	2002	Completion of positioning in the actual program block is delayed to wait until the possibly occurring following error has been eliminated when reaching the target. HIGH = POS-IN-TARGET is not set, the actual positioning is not completed. (see chapter “Target window” 🕮 7-65)

Formulae for scaling the signals (see preceding table, column ”Note”):

Formula 1: Position

$$\text{Position [inc]} = \text{Position [units]} \cdot \frac{65536\ \text{[inc/Umdr]} \cdot \text{gear nominator}}{\text{Feed const. [units/Umdr]} \cdot \text{gear denominator}} = \text{Position} \cdot \frac{65536 \cdot \text{C1202}}{\text{C1204} \cdot \text{C1203}}$$

Formula 2: Speed (VEL)

$$\text{VEL } [\text{inc}_\text{v}/\text{ ms}] = \text{VEL [units/s]} \cdot \frac{65536\ \text{[inc/Umdr]} \cdot \text{gear nominator} \cdot 16384\ [\text{inc}_\text{v}/\text{inc}]}{\text{Feed const. [units/Umdr]} \cdot \text{gear denominator} \cdot 1000\ [1/\text{s}]} = \text{VEL} \cdot \frac{65536 \cdot \text{C1202} \cdot 16384}{\text{C1204} \cdot \text{C1203} \cdot 1000}$$

Formula 3: Acceleration/deceleration (ACC/DCC)

$$\text{ACC}[\text{inc}_\text{v}/\text{ms}^2] = \text{ACC}[\text{units/s}^2] \cdot \frac{65536\text{[inc/Umdr]} \cdot \text{gear nominator} \cdot 16384\ [\text{inc}_\text{v}/\text{inc}]}{\text{Feed const.[units/Umdr]} \cdot \text{gear denominator} \cdot 1000000[1/\text{s}^2]} = \text{ACC} \cdot \frac{65536 \cdot \text{C1202} \cdot 16384}{\text{C1204} \cdot \text{C1203} \cdot 1000000}$$

$$1\ \text{inc}_\text{v} = \frac{1\ \text{inc}}{2^{14}}$$

Function

7.5.1 Dimensions

Absolute dimensions

An absolute target position is a defined position on the traversing path with reference to a zero point. The target position is approached irrespective of the current position.

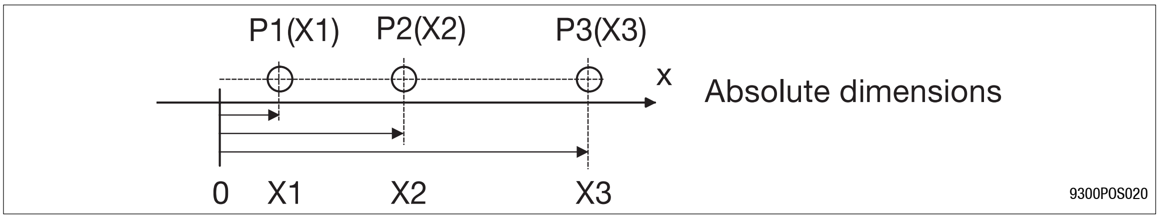


Fig. 7-13 Absolute dimensions

Relative dimensions

Relative dimensioning corresponds to incremental dimensioning. Each new target refers to the preceding target.

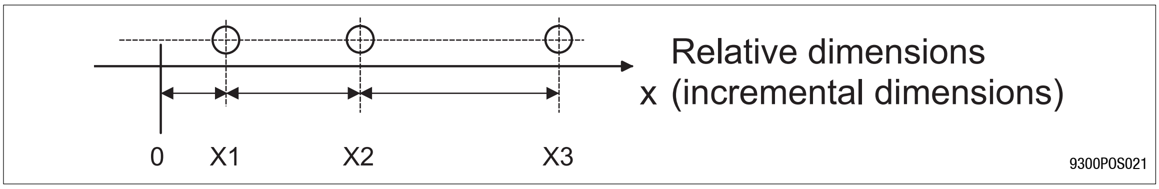


Fig. 7-14 Relative dimensions

Mixed dimensions

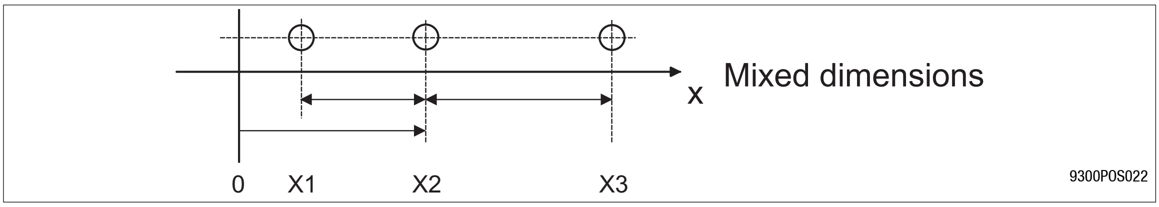


Fig. 7-15 Mixed dimensions

7.5.2 Machine parameters

Example

Purpose

- The physical unit (e.g.: mm, m, degree) is defined by entering the machine parameters (see Part C, chapter 5.6.1).

Function

- Input of the gear ratio under C1202 and C1203, according to the nameplate data of the gearbox.

$$\frac{C1202}{C1203} \equiv \frac{\textit{Motor speed}}{\textit{Gearbox output speed}}$$

- Entry of the feed constant under C1204. Enter the number of units (e.g.: mm), to be fed during one revolution at the gearbox output side.
- Entry of the maximum motor speed (n_{max}) under C0011. The limitation mainly applies to the motor.
- Entry of the maximum speed (v_{max}) under C1240. Limitation mainly applies to the entire machine. It should be set lower than the maximum motor speed. The maximum speed v_{max} is considered as reference for all speed data in the variable table VTVEL.

$$v_{max} \leq n_{max} \cdot \frac{v_k}{60 \cdot i}$$

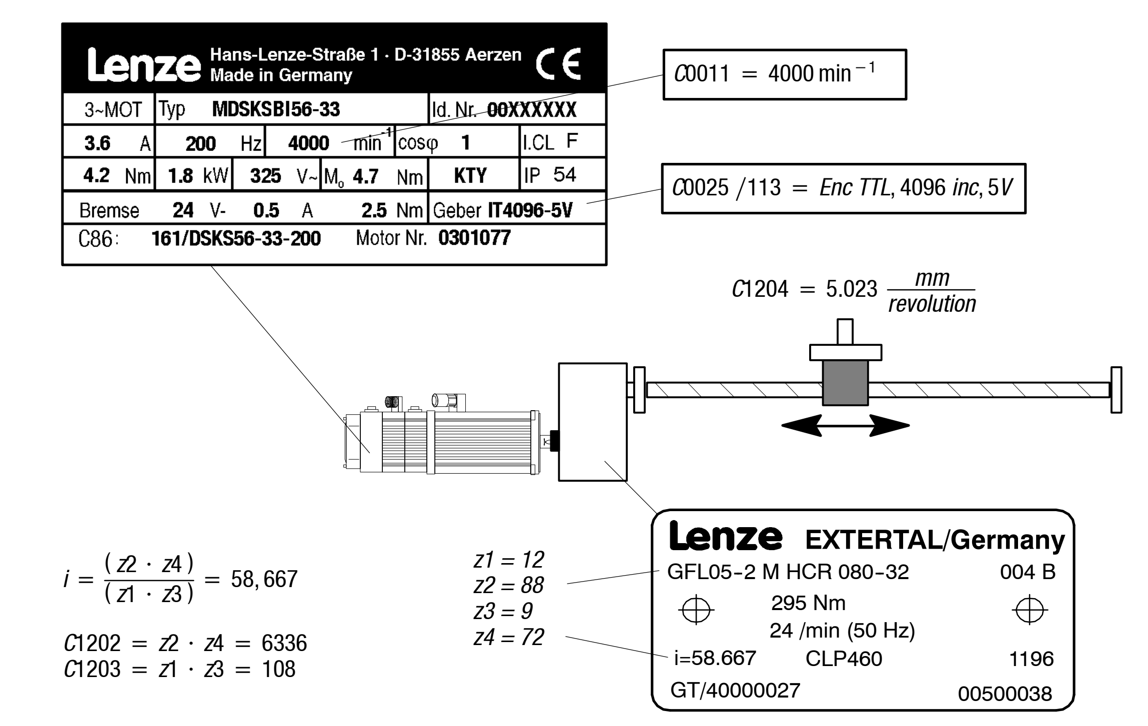
$$C1240 \leq C0011 \cdot \frac{C1204 \cdot C1203}{60 \cdot C1202}$$

- Entry of the maximum acceleration (a_{max}) under C1250.
  The maximum acceleration is considered as reference for all acceleration data given in per cent in the variable table VTACC.

Function library

Application example

For positioning a spindle feeding unit is driven via a gearbox. An incremental encoder is used instead of the standard resolver as feedback system. The incremental encoder is mounted to the motor and has a number of increments of 4096 pulses / rev. The gearbox has a ratio of i = 32 ($n_{motor}/n_{spindle}$). The spindle has a lead of h = 10 mm. The entries are to be made in mm (1 mm = 1 unit).



Settings:

Code	Name	Input	Notes
C0025	Encoder system selection	-113-	Incremental encoder, IT-4096-5V
C0420	Encoder constant X8	4096 incr	(automatically through C0025)
C0490	Position feedback system	-1-	(Encoder TTL) (automatically through C0025)
C0495	Speed feedback system	-1-	(Encoder TTL) (automatically through C0025)
C1202	Gearbox numerator	6336	Numerator according to motor speed
C1203	Gearbox denominator	108	Denominator corresponds to gearbox output speed
C1204	Feed constant	5.023 units/rev	mm per rev. at gearbox output
C1207/1	Position encoder gearbox factor, numerator	1	(1/1 = no gearbox between encoder and motor) Numerator corresponds to motor speed
C1207/2	Position encoder gearbox factor, denominator	1	(1/1 = no gearbox between encoder and motor) Denominator corresponds to encoder speed

7.5.2.1 Position encoder at material path

Purpose

The gearbox backlash and the slip between drive, machine, and material should be eliminated to increase the accuracy of the calculation of an act. position value.

Function

- The feedback is ensured by a separate position encoder (C0490) at the material web.
- The speed is fed back through an encoder mounted to the motor shaft (C0495).

Tip!

For defining the dimension of a unit (e.g. mm, cm), machine parameters are entered as if the position encoder was mounted to the motor shaft.

- There is a ratio between the position encoder and the motor. This ratio is adjusted via the "encoder/gearbox factor" (C1207/1, C1207/2). Counter and denominator are entered according to the speed ratio between motor and position encoder.

$$\frac{C1207/1}{C1207/2} = \frac{n_{Motor}}{n_{Encoder}}$$

- The counting direction of the actual position value (GDC monitor, C1220/3) must increase with CC rotation of the motor.

If this is not the case, the counting direction of the position encoder can be inverted as follows:

1. Changing the encoder track
2. Changing the polarity of the actual position value (C1208)

Stop!

An opposing setting of the counting directions of the position setpoint and the actual position value leads to a positive feedback in the control loop with the consequence that the drive may race.

- For software version ≤ V2.1:
  - Inverting the counting direction via the actual value polarity (C1208) is not considered while executing the QSP function.This could lead to a positive feedback in the position control loop when the QSP or FAIL-QSP function is activated. The drive could accelerate to its speed limit n_{max} in an uncontrolled way ("race")!
  - Therefore the positioning controller must be switched off during the update of the QSP function (MCTRL-QSP-OUT = HIGH). In the case of QSP it is not enough to only switch the input MCTRL-PHI-ON = LOW. The analog input MCTRL-P-ADAPT = 0% must be switched e.g. by means of the function block ASW via MCTRL-QSP-OUT.
- For software version > V2.1:
  With QSP only the motor encoder is automatically evaluated to stop the motor.

Stop!

Increasing the ratio between the position encoder and the motor shaft reduces the resolution of the position information. This can have a negative effect on the stability of the control loop!

Example (refers to the preceding safety information):
With a quadruple evaluation of a position encoder with 1024 increments 4096 increments are available. The angle of rotation of the motor shaft per encoder increment:

$$\frac{360°}{4096\ incr} = 0.0879\,° = 0°\,5.3' \qquad (5.3\ \textit{angular minutes})$$

Ratio of the position encoder e.g. i = 128:

$$0.0879° \times 128 = 11.25° = 11°\,15' \qquad (11\,°\ \text{and}\ 15\ \textit{angular minutes})$$

The motor should rotate by 11° to compensate an offset of one increment. A further increase of the ratio would raise the ”compensating path” of the motor.

Permanent slipping of a friction wheel running on the material web (= drive of the position encoder) results in a faulty actual position value. A web break could accelerate the drive to high speeds due to the missing actual position value.

Example:
The spindle drive mentioned in the previous example is driven with a separate position encoder connected to the spindle (gearbox output side).

Settings as described under machine parameter but:

C1206	Polarity of position setpoint	-0-: Not inverse -1-: Inverse	Reversal of traversing direction
C1207/1	Position encoder gearbox factor, numerator	32	Numerator according to motor speed
C1207/2	Position encoder gearbox factor, denominator	1	Denominator according to encoder speed
C1208	Polarity actual position	-0-: Not inverse -1-: Inverse	If “inverse” is selected, observe the QSP function notes.

7.5.3 Positioning modes (C1210)

You can select the following positioning modes under C1210:

- Relative positioning (🕮 7-35)
- Absolute positioning (🕮 7-37)
- Absolute positioning with saving (🕮 7-38)

7.5.3.1 Relative positioning

Purpose

- Use with infinite applications, e.g. a cutter.

Function

- Set positioning mode (C1210) = 1.
- Absolute target positions cannot be approached. A fault is indicated (P07).
- The setpoint positions and actual positions are reset prior to a new positioning.
  – The current following error is maintained (POS-SETPOS = 0, POS-ACTPOS = current following error).
- The position limit values (C1223, C1224) determine the maximum feed length in the corresponding direction.

Tip!

If you do not need the travel range limit switch remove the connection to the digital input terminals (DIGIN) or switch to +24 V.

- Homing is not necessary, but can be used to set the machine to a defined position.

Rounding error

Without special measures for the mechanical design the path covered of a defined target position may amount to a fractional number of increments (e. g. 1554.4 inc.). The internal calculation merely considers the integer part of this value (= 1554 inc.).

For a relative positioning, the momentary target position of which always refers to the previous target position, rounding errors are propagated with each distance traversed.

This effect can lead to a drifting of the holding position of a conveyor. Therefore it must be observed that all required target positions can be displayed without decimal position of an increment (see position resolution).

Position resolution

- Display via code C1205.
  Display of the number of increments with which the units defined by the user are resolved (incr/unit).
- The position resolution can be used to check for rounding errors.

Calculation example:

C1301/1 = 100.2550 units (position value in VTPOS)

C1205 = 80.0000 inc/unit (position resolution)

Formula:

$$\text{Feed} = \text{C1301[units]} \cdot \text{C1205[inc/unit]}$$

$8020,4\ \text{inc} = 100,2550\ \text{units} * 80,0000\ \text{inc/unit}$

A difference of 0.4 inc results from every feed.

Tip!

If it is not possible to have increments without decimal positions, drifting of the holding position can be avoided by touch-probe positioning.

7.5.3.2 Absolute positioning

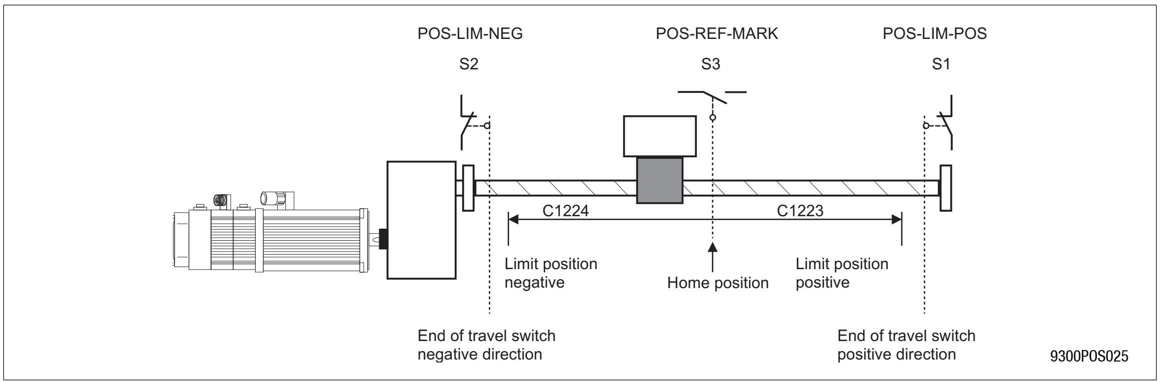


Fig. 7-16 Example of a machine with finite traversing range

Purpose

- Use in applications with finite traversing range, e. g. in warehousing or handling machines.

Function

- Set positioning mode (C1210) = 0 (default setting)
- Before starting a positioning drive homing must be carried out (output POS-REF-OK = 1, homing status C1284 = “REF-OK”). By homing the reference point of the measuring system to the machine is determined (📖 7-49)
- In the absolute positioning mode absolute and relative target positions can be approached. There are two measuring systems (📖 7-39):
  – the machine measuring system and
  – the real measuring system
- The travel range limit switches are located in front of the mechanical stops. They prevent the drive from touching the stops.
- Adjustable position limiting values (C1223, C1224) prevent the travel range limit switches from being approached under normal operating conditions. A target position located outside the position limiting value is not approached. In this case a fault is indicated (P04, P05).

7.5.3.3 Absolute positioning with saving

Purpose

Homing is not necessary after mains switching.

Function

- Resolver or absolute value encoder (single-turn) to X8 is required as position feedback system.
- Set positioning mode (C1210) = 2 (absolute positioning with saving).
- The actual position value (POS-ACTPOS) is automatically stored when the mains is switched off and reinitialised when the mains is switched on. In the OFF state the motor may rotate with a deviation of max. ±0,5 revolutions so that the actual position value is correctly initialised after switching on the mains.

All other function are identical with absolute positioning in chapter 7.5.3.2.

Homing status ”Homing known”

For absolute positioning the correct machine reference is required (”Homing known”)! Output POS-REF-OK = 1 and homing status C1284 = “REF-OK” .

During commissioning or after homing loss (📖 7-49) the drive must be referenced once. According to the requirements of the application homing can be carried out by “homing function”, “home setting” or the function “POS-ABS-SET”.

- With firmware version ≥V2.5:
  – The current homing status is stored at mains switch-off and is initialised correspondingly when the mains is switched on again.
  At the first commissioning the homing status is not set.
- With firmware version < V2.5:
  – Homing status “Homing known” is automatically set when the mains is switched on.

Tip!

Although POS-REF-OK = 1 is displayed the drive must be set once during commissioning or after a homing loss. This serves to re-establish the correct reference to the machine.

7.5.4 Measuring systems

Purpose

- Limitation of the traversing and determination of reference points for positioning.

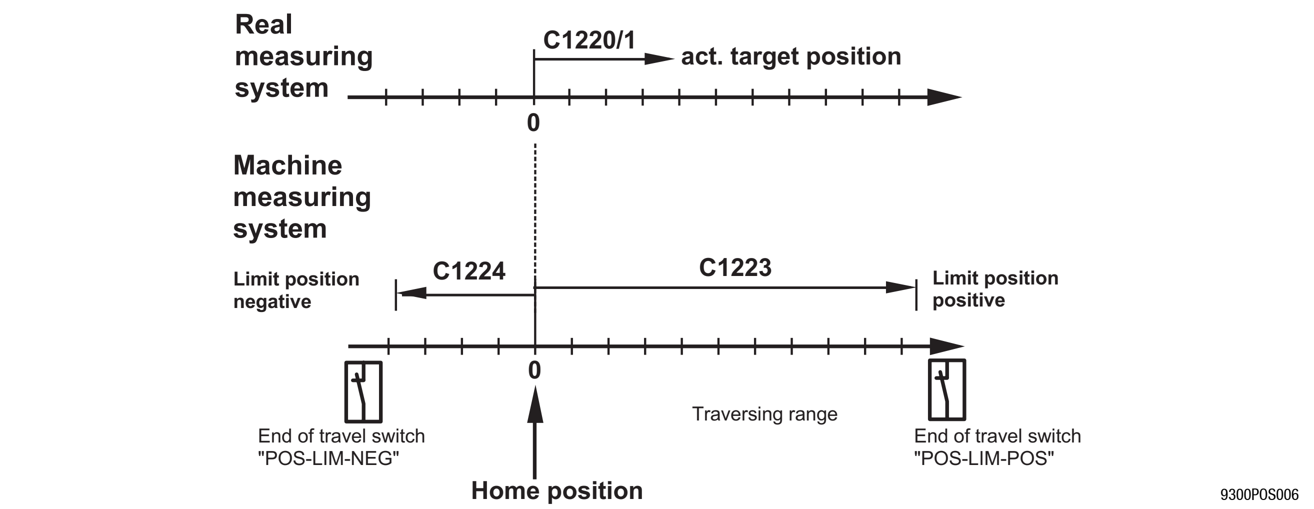


Fig. 7-17 Measuring systems for absolute positioning in default setting (C1225=0, C1227=0)

In default setting the reference point = machine zero = real zero (🕮 7-39).

Reference point

- The reference point is the reference for the "connection" of the measuring systems with the machine.
- Is detected through "referencing".

Machine measuring system

- The permissible travelling range for the machine measuring system is determined through the position limit values (C1223 and C1224).
- The machine measuring system has a fixed reference to the machine because of the reference point.
- The reference point is detected by a "reference run" or "setting reference" and, usually, not shifted later. (🕮 7-49).

Real measuring system

- All indications (e.g.: target positions, position setpoint, and actual position) refer to the real zero of the real measuring system.
- The real measuring system can be shifted by entering a reference measuring offset.

7.5.4.1 Measuring systems and zero shifts

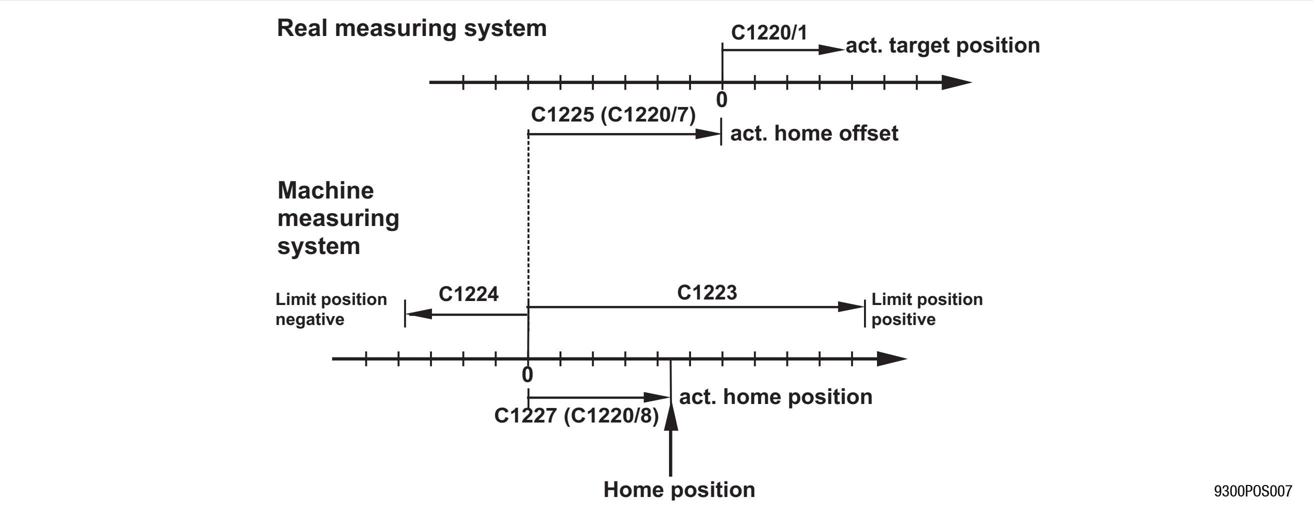


Fig. 7-18 Measuring systems for absolute positioning and zero point shifting

Shifting of machine zero

Purpose

- The reference run is to be carried out on one side of the traversing range when it is too time consuming to approach the machine zero.

Function

- Via the home position (C1227) the machine zero point is shifted with regard to the reference point. The home position is set at the reference point so that with a positive home position the machine zero point is situated in negative direction.
- The home position (C1227) will only be accepted as “actual home position” when being in “reference run” or “set reference point” mode.
- The effective “actual home position” is indicated under C1220/8 and C1221/8.

Shifting of real zero

Purpose

- The target positions must always refer e.g. to the front edge of the workpiece. This means the real measuring system must be shifted accordingly.

Function

- By means of the reference offset (C1225) the real zero point can be shifted with regard to the machine zero point. The input of a positive value results in a shift of the real zero point in positive direction.
- The reference measure offset takes directly effect with the input. The position setpoint (POS-SETPOS) and the actual position value (POS-ACTPOS) change in accordance with the change of the reference offset because of the change of its reference point (real zero point).
- The effective “actual reference offset” is indicated under C1220/7 and C1221/7.

Tip!

The input value C1225 and the actual reference offset can only be different when using the program function ”set position value”.

7.5.4.2 Measuring systems for absolute value encoders

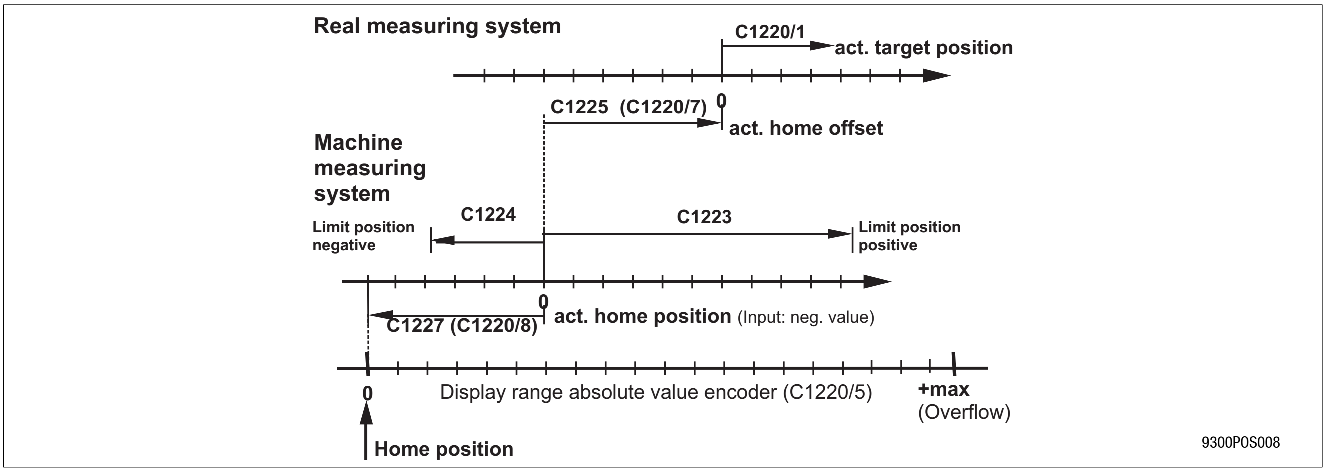


Fig. 7-19 Measuring systems with absolute value encoders

For absolute value encoders the same conditions than for positioning apply (see above) concerning the measuring systems and their references.The only difference is the definition of the reference point.

Encoder zero is defined as reference point.

- Actual home position
  - Use “actual home position” to move the machine zero further into the traversing range (negative value moves the machine zero in positive direction).
  - The “actual home position” is indicated under C1220/8 in “units” and C1221/8 in “incr”.
- Initialisation
  - After switch-on the ”actual home position” is initialised with the ”home position”.
  - “Actual home offset” (C1220/7, C1221/7) is set equal to the input value “home offset” (C1225).
- During operation
  - After changing, C1227 is not directly transferred to the ”actual home position”. During program operation, the transfer can be initialised via the function ”Acceptance home position (C1227)” (setting under PS mode (C1311) = 16).
- Set homing value
  - The program function ”set reference” enables the machine zero point to be set at the current position. Therefore the ”actual home position” is set to the negative value of the actual position value (POS-ACTPOS).
  - Transfer the value manually under C1220/8 to C1227 and save it under C0003 to ensure that the setting is available after mains switching.
  - The “actual reference offset” (C1220/7) is set equal to the input value “reference offset” (C1225) when setting the home position.

7.5.5 Absolute value encoder

Purpose

The absolute actual position value should be known immediately after mains switching so that homing is not necessary (for instance if homing is not possible because of machining or processing circumstances).

- The following functions **cannot** be executed for positioning with absolute value encoder:
  - – Homing in program operation,
  - – manual homing
  - – Program function "set position value" (PS mode C1311 = 5).

Tip!

Homing (to determine the machine zero) can be simulated when using touch probe positioning and the home position setting function.

7.5.5.1 Absolute value encoder via encoder connection X8

Function

- Connection of sine/cosine absolute value encoders with hyperface communication interfaces to encoder input X8. Absolute value encoders with a number of increments of 512 periods/rev and the corresponding data format of the initialisation value of 2^{14} inc/rev can be used (e. g. Stegmann SCS70, SCS60).
- The following absolute value encoders can be used as of the device version 33.93xx.EP.2x.**62**:

Number of increments [Periods/rev]	**Data format** [inc/rev]	**Tenderer**	**Type designation**
2048	2^{16}	–	–
1024	2^{15}	Stegmann company	SRM50, SRS50
512	2^{14}	Stegmann company	SCM70, SCM60
256	2^{13}	–	–
128	2^{12}	Stegmann company	SKS36
64	2^{11}	–	–

Installation

The absolute value encoder must be mechanically mounted so that the encoder zero point is outside the travel range. Otherwise a value overflow would occur in the encoder within the travel range. This would result in a wrong actual position value after mains switching.

Commissioning

Observe the commissioning sequence to avoid a reset of C0420 to default setting.

1. Select the connected absolute value encoder under C0025 or C0495.
   – After the selection the fault SD7 is indicated since the encoder has not yet been initialised. The initialisation only takes place by mains switching. (see step 5.).
2. Enter the number of increments of the absolute value encoder under C0420.
   – By entering the number of increments the data format is automatically considered during initialisation. The data format determines the resolution to be reached of the initialised absolute value.
3. Carry out a fine adjustment under C1227 (home position).
   – By entering a negative value (see Fig. 7-19) the machine zero point is shifted into the traversing range by means of the home position to enable the input of reasonable position limit values and monitoring of the traversing range. (🕮 7-41)
4. Save the settings under C0003.
5. Switch of the mains voltage off and on again.
   – The absolute value encoder is initialised. The fault indication SD7 is reset.

Tip!

- Absolute value encoders have a finite area, e. g. 4096 revolutions. Within this area they can also be moved in a switch-off state; nevertheless they are able to deliver the correct absolute actual position value after switching on the mains.
- The overflow point of the encoder amounts to 65536 inc/rev × 4096 rev = 268.435.456 inc. (display: C1221/5)
  – When the area to be described is exceeded the fault P12 is indicated.

7.5.5.2 Absolute value encoder via system bus (CAN)

Purpose

- Using absolute value encoders with CAN interface (e. g. laser measuring system).

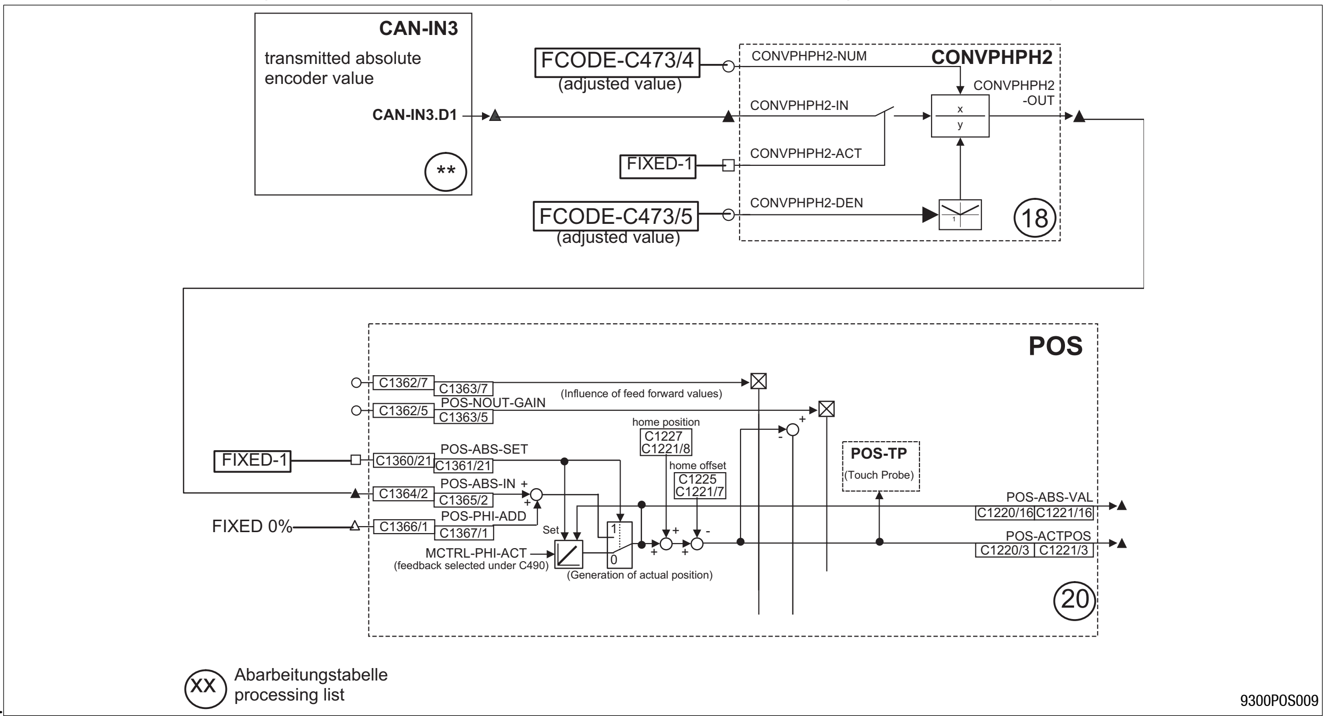


Fig. 7-20 Absolute value encoder via system bus (CAN)

Function

- All absolute value encoders with a CAN interface to specification “CAL DS-301” (CAN open) can be used.
- The CAN parameters, especially CAN baud rate, CAN identifier, and cycle time are to be set accordingly. The set CAN parameters must be storable in the encoder!
- The absolute value read via, for instance, CAN-IN3.D1 is sent to the input “POS-ABS-IN”.
- Input “POS-ABS-SET” is assigned to 1 signal (e.g.: FIXED1) and thus the acceptance of the absolute value at input POS-ABS-IN is activated.
- POS-ABS-SET = HIGH sets the homing status “REF-OK” automatically, homing is therefore not necessary.
- The encoder resolution is adapted to the internal position resolution of 65536 inc/rev via the function block CONVPHPH2. The adaptation factor is entered via the free codes C473/4 and C473/5.

Tip!

The input POS-PHI-ADD and the output POS-ABS-VAL are available as of firmware version ≥ 2.5

Example for the adaptation of the encoder resolution:

Gearbox between encoder and drive	i = 30
Effective wheel diameter	d = 50 mm
Position resolution of the measuring system	A_{meas} = 8 inc/mm
Internal position resolution (fix)	$A_{internal}$ = 65536 inc/rev

Position resolution of the measuring system (with regard to motor side):

$$Ax_{mess} = \frac{(A_{mess} \cdot d \cdot \pi)}{i} = \frac{(8\ inc/mm \cdot 50\ mm \cdot 3,14)}{30}$$

$$Ax_{mess} = 41,87\ inc/rev$$

Adaptation factor for CONVPHPH2:

$$\frac{C0473/4}{C0473/5} = \frac{A_{intern}}{Ax_{mess}} = \frac{65536 inc/rev}{41,87 inc/rev}$$

$$\frac{C0473/4}{C0473/5} = \frac{1565}{1}$$

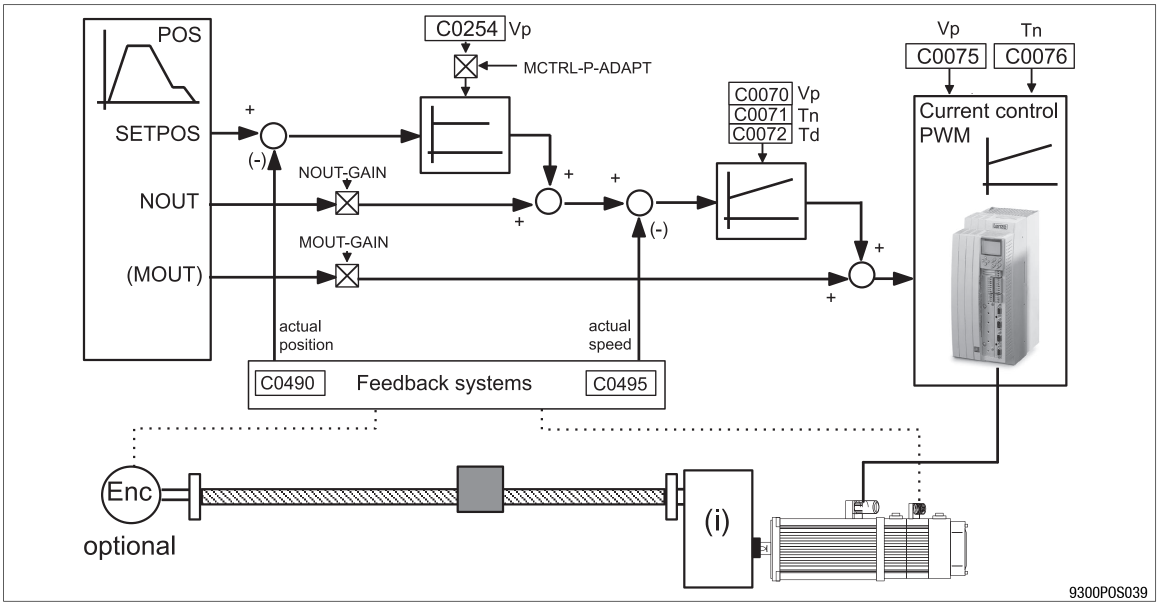
- Read the absolute value at POS-ABS-IN under consideration of the setpoint polarity (C1206) and the actual value polarity (C1208).
- The “actual home position” (C1220/8) is then added and the “actual home offset” (C1220/7) is subtracted.
- The “actual home position” is set equal to C1227 if POS-ABS-SET = HIGH during initialisation (switch on).

Tip!

The display values under C1220/5 and C1221/5 only correspond to the absolute value of the encoder read when using the absolute value encoder through X8!

7.5.6 Control structure

The following graph provides an overview of the control structure realised in the 9300 servo position controller. It shows the parameters and codes that are decisive for the adjustment of the control loops.



Adjustment points of the control loops

- Speed controller (PID controller)
  - C0070: Gain Vp_n
  - C0071: Integral-action time Tn_n
  - C0072: Rate time Td_n (default setting Td_n = 0 is usually not changed)
  - POS-NOUT-GAIN: Master speed control (default setting: 100%)
- Position controller (P controller)
  - C0254: Gain Vp position controller
  - MCTRL-P-ADAPT for adapting the gain depending on e.g. the speed
- Current controller (PI controller)
  - C0075: Vp (default setting is usually not changed)
  - C0076: Tn (default setting is usually not changed)

Important signals for adjusting the control loops

The following signals are especially suitable for evaluating the positioning behaviour and control features:

- POS-NOUT: Speed setpoint, 100 % $\equiv n_{max}$ (C0011)
- MCTRL-NACT: Actual speed value, 100 % $\equiv n_{max}$ (C0011)
- MCTRL-MSET2: Actual torque, 100 % $\equiv M_{max}$ (C0057)
- POS-POUT-NORM: Actual following error, 100 % ≡ Following error tolerance (C1218/1)

Tip!

The codes can be found in the following function library and additionally in table form in part D2.2 of this Manual.

7.5.7 Travel range limits

You can prevent the mechanical stops of the limited travel range from being touched by

- the travel range limit switches (hardware),
- the position limiting values (software).

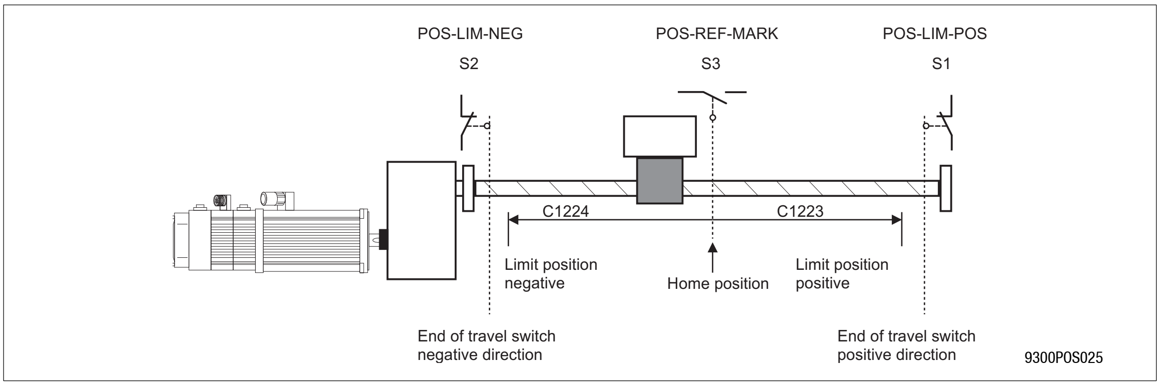


Fig. 7-21 Example of travel range limits

7.5.7.1 End of travel range limit switch

- The travel range limit switches are connected via the digital input terminals X5/E1 and X5/E2.
- In the default setting, X5/E1 and X5/E2 are configured for the function block inputs POS-LIM-POS and POS-LIM-NEG and are LOW active (protected against open circuit).
- A travel range limit switch indicates the fault P01 or P02 under the following circumstances:
  – In program operation if the speed setpoint (POS-NOUT) is unequal 0.
  – In manual operation if the drive moves outside the traversing range.
  – During homing, if the drive does not reverse when reaching the limit switch.
- In the event of a failure the drive brakes to standstill using the function “FAIL-QSP” (default setting); the ramp time “QSP-Tif” can be adjusted under C0105.

Tip!

The travel range limit switches should be mounted in positions that provide enough braking distance for the drive in the event of a failure.

7.5.7.2 Position limit values (C1223, C1224)

- Position limit values (C1223, C1224) define the permissible traversing range of the drive.
- The reference point for the position limiting values always is the machine zero point. Shifting the real zero point does not result in a shift of the position limiting value with the regard to the mechanical travel range limits. (🕮 7-39).
- Exceeding the limit positions causes a fault (P04, P05).
- In the event of a failure the drive brakes to standstill using the function “FAIL-QSP” (default setting); the ramp time “QSP-Tif” can be adjusted under C0105.

Code	Name	Limits	Note
C1223	Pos.limit+	0.0000 ... 214000.0000 [units]	Positive position limiting value
C1224	Pos.limit-	-214000.0000 ... 0.0000 [units]	Negative positive limiting value

Tip!

- The settings should not allow that the end of travel limit switches are reached during operation.
- The max. traversing range amounts to ±16000 revolutions of position encoder.
- If the position limiting values exceed the internal area, the warning P18 (internal limitation) is triggered. The limiting values are internally automatically limited to the possible area. Positioning can only take place within these limits.
- The input values under C1223 and C1224 remain the same and need to be modified by the user (if necessary).
- Display of internally limited position limiting values under C1220/10 and C1220/11 [units] and under C1221/10 and C1221/11 [incr.].

7.5.8 Homing

Determination of the mechanical reference point for measuring systems.

After homing, the drive is in a defined position.

Functions

- Homing (📖 7-49)
- Homing end (📖 7-50)
- Homing status (📖 7-51)
- Homing modes (📖 7-52)ff.
- Second homing speed (📖 7-58)
- Set homing value (📖 7-58)

7.5.8.1 Homing

Purpose

Defining the reference point in the absolute or relative positioning mode.

Function

- Selection of a sequence suitable for homing (📖 7-52).
- Setting of the homing speed under C1242
  – Setting of a second homing speed under C1241 (if necessary) (📖 7-58)
- Setting of the homing acceleration under C1251
- Defining the homing end point under C1209.
- Execution of homing in
  – Manual operation via ”manual homing” (📖 7-68).
  – Program operation (GDC dialog ”Programming” under “PS mode” or selection under C1311/x = 3, program set mode)

Homing procedure

- The homing status POS-REF-OK is reset (see (📖 7-51)) and the current reference offset initialised using the value entered under C1225.
- Homing is started and carried out according to the mode selected under C1213.
- If the reference point is found, the home position (C1227) is started and the reference offset (C1225) is added. The position data now refer to the real zero point (see Fig. 7-18).
- The homing status POS-REF-OK is set.

7.5.8.2 Homing end

Purpose

- Determination of the point where the drive is going to stop after homing.
- Avoid reversing while homing

Selection of the homing limit (C1209)

- C1209 = 0 (default setting):
  Drive stops at **reference point** (index pulse / zero position / touch probe) or returns to that point.
- C1209 = 1:
  Drive does not stop until it has reached the **real zero point**. The distance covered additionally is determined by the reference offset, and the home position.
- C1209 = 61:
  Drive does not stop until it has reached the target position **VTPOS-NO-60** (parameter C1301/60). The distance covered additionally is determined by the reference offset, the home position, and the target position.
- C1209 = 71:
  Drive stops at target position **VTPOS-NO-70** (function block input). The distance covered additionally is determined by the reference offset, the home position and the target position.
- C1209 = 101:
  Drive stops at target position **VTPOS-NO-100** (teach-in value). The distance covered additionally is determined by the reference offset, the home position, and the target position.

Tip!

When the drive must not reverse during homing:

- Select real zero as homing limit (C1209) and
- enter reference offset.

Thus, the braking distance after homing is always long enough.

7.5.8.3 Referencing status (POS-REF-OK)

The referencing status is indicated via the function block output “POS-REF-OK” and displayed under C1284.

The referencing status is displayed as ”Reference known” when the measuring systems have a defined reference to the machine. Absolute positioning (📖 7-37) or (📖 7-38) is only possible after a defined reference has been created.

The output POS-REF-OK is set by

- homing is completed,
- the program function “Set reference” is set,
- the absolute value encoder is selected as position feedback (C0490 = 4).
- Set Fb input POS-ABS-SET = 1.
- C1210 = 2 (absolute positioning with saving)

The output POS-REF-OK is reset by

- Start of homing
- Description of the following codes:
  - C0011 (Nmax)
  - C0490 (feedback system for the position controller)
  - C1202 (Gearbox factor, numerator)
  - C1203 (Gearbox factor, denominator)
  - C1204 (Feed constant)
  - C1207/1(Position encoder gearbox factor, numerator)
  - C1207/2 (Position encoder gearbox factor, denominator)
  - C1210 (Positioning mode)
- The following errors occur:
  - NMAX (limit speed of C0596)
  - P12 (encoder limit exceeded)
  - SD2 (resolver error) if resolver has been selected as position feedback system (C0490=0), SD7 (absolute value encoder).
- In relative positioning mode (C1210=1) if Prg-reset is carried out during a running positioning process.

7.5.8.4 Homing mode 0 and 1

Purpose

- Simple homing in all positioning modes (C1210 = 0, 1, 2).
- The homing switch (POS-REF-MARK) must be in direction of the movement.

Move to reference point via homing switch

Mode 0: Traversing direction to positive end of travel range limit switch

Set C1213 = 0.

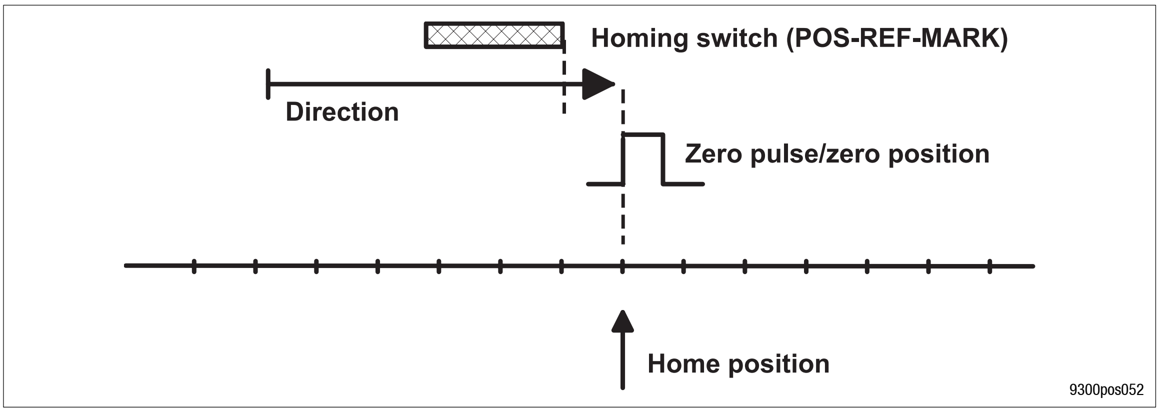


Fig. 7-22 Move to reference point via homing switch

Function procedure

- Move to the reference point with homing speed (C1242) towards positive end of travel range limit switch overriding the homing switch.
- The reference point is at the first zero pulse / zero position of the position encoder after leaving the homing switch.

The drive can be on the homing switch before homing.

Mode 1: Traversing direction to negative end of travel range limit switch

Set C1213 = 1.

Function procedure

- Like mode 0, but the drive traverses in negative direction to travel range limit switch.

7.5.8.5 Homing mode 2 and 3

Purpose

- Homing in absolute positioning mode (C1210 = 0, 2), with finite traversing range and existing travel range limit switches (POS-LIM-xxx).
- The homing switch (POS-REF-MARK) is always found. In worst case the entire traversing range will be searched.

Approach end of travel range limit switch, reverse and move to reference point via homing switch

Mode 2: Traversing direction to positive end of travel range limit switch

Set C1213 = 2.

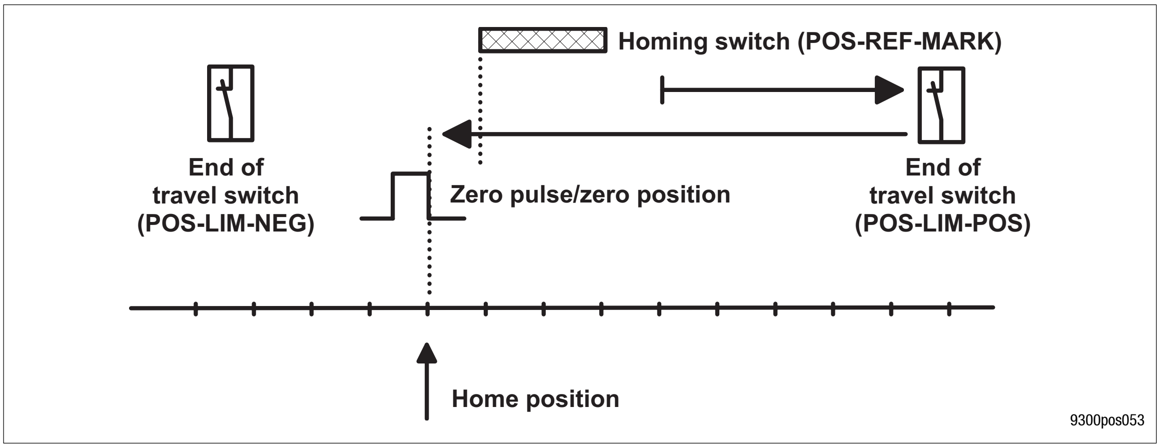


Fig. 7-23 Move to POS-LIM-POS, reverse, move to reference point via POS-REF-MARK

Function procedure

- Move to positive travel range limit switch with homing speed C1242.
- Reverse there and move beyond the reference switch to the reference point with homing speed C1242. In this case, no fault (PO2) is indicated!
- The reference point is at the first zero pulse / zero position of the position encoder after leaving the homing switch.
- If the drive is already on the positive end of travel range limit switch before homing, it is reversed immediately.
- If the drive is positioned at the reference switch when homing is started, the switch will be overridden. The drive then goes on to the limit switch and reverses there.

Modus 3: Traversing direction to negative end of travel range limit switch

Set C1213 = 3.

Function procedure

- As "Traversing direction to positive end of travel range limit switch", but the drive moves towards the negative end of travel range limit switch.
- No fault indication (PO2)

Tip!

The limit switch (POS-LIM-xxx) can be used as homing switch (POS-REF-MARK) at the same time to save initiators.

7.5.8.6 Homing mode 4 and 5

Purpose

- Simple homing in all positioning modes (C1210 = 0, 1, 2).
- The homing switch (POS-REF-MARK) will not be overridden. Positions to the right of the homing switch cannot occur due to the mechanical design.
- The homing switch must be in direction of the movement.

Move to homing switch, reverse and move to reference point

Mode 4: Traversing direction to the positive end of the travel range limit switch

Set C1213 = 4.

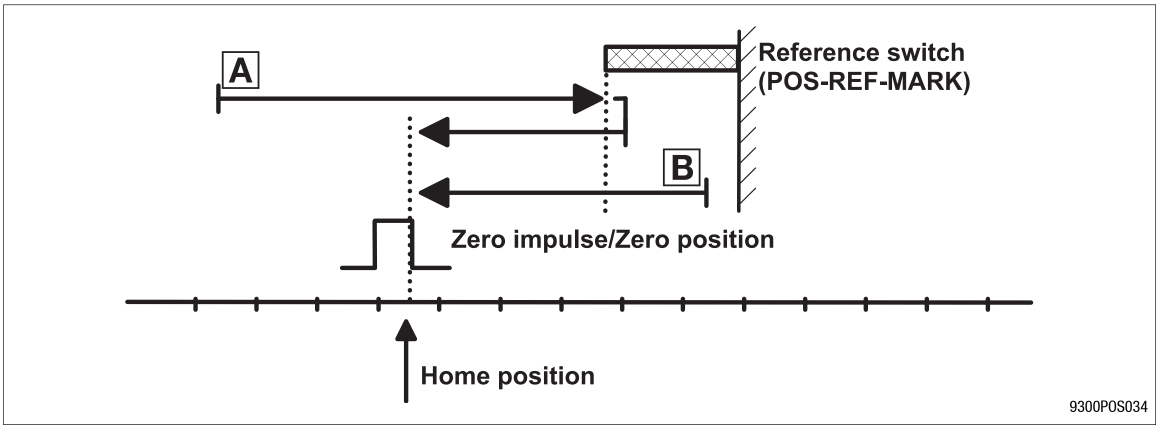


Fig. 7-24 Move to POS-REF-MARK, reverse and move to reference point

Function procedure

- Move towards travel range limit switch with homing speed C1242 up to homing switch (case A).
- Reverse there and move to the reference point. The homing switch must be assigned during the entire homing process!
- The reference point is at the first zero pulse / zero position of the position encoder after leaving the homing switch.
- If the drive is already positioned on the homing switch before homing it is reversed immediately
(case B).

Mode 5: Traversing direction to negative end of travel range limit switch

Set C1213 = 5.

Function procedure

- Like mode 4, but the drive traverses in negative direction of travel range limit switch.

7.5.8.7 Homing mode 6 and 7

Purpose

- Homing in all positioning modes (C1210 = 0, 1, 2).
- Use of touch probe if the index pulse does not appear at the same place in a reproducible form due to the mechanical constellation. The index signal can also be mechanically shifted after a motor exchange.
- The homing switch (POS-REF-MARK) must be in direction of the movement.

Travel to TP signal via homing switch

Mode 6: Traversing direction to positive end of travel range limit switch

Set C1213 = 6.

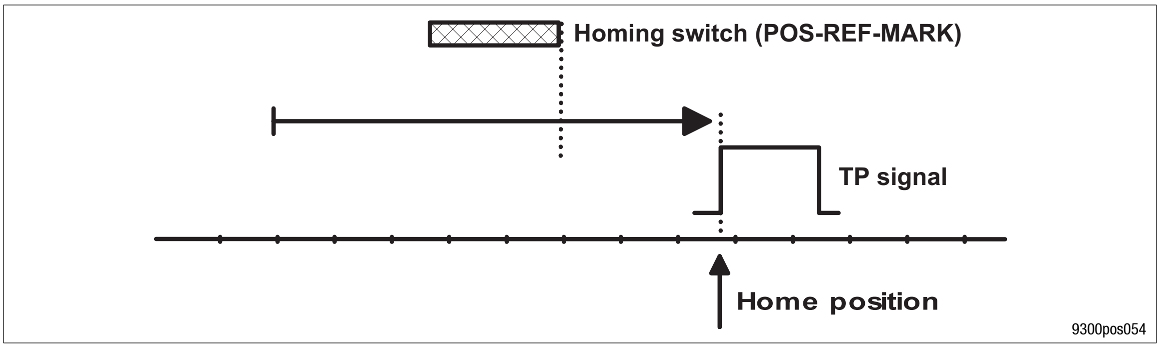


Fig. 7-25 Move to TP signal via POS-REF-MARK

The following settings are necessary:

- Select terminal for TP initiator via C1214.
  - C1214 = 1 ≙ Terminal X5/E1.
  - C1214 = 2 ≙ Terminal X5/E2.
  - C1214 = 3 ≙ Terminal X5/E3.
  - C1214 = 4 ≙ Terminal X5/E4 (this setting is recommended by LENZE).
- Select edge of the TP input via C1215.
  - C1215 = 0 ≙ LOW-HIGH edge.
  - C1215 = 1 ≙ HIGH-LOW edge.

Function procedure

- Move to the home position with homing speed (C1242) towards positive end of travel range limit switch overriding the homing switch.
- After leaving the homing switch the reference point is determined by the TP signal. TP signals that occurred before are ignored.
- The drive may be positioned on the homing switch before homing.

Modus 7: Traversing direction to negative end of travel range limit switch

Set C1213 = 7.

Function procedure

- As "Traversing direction to positive end of travel range limit switch", but the drive moves towards the negative end of travel range limit switch.

7.5.8.8 Homing mode 8 and 9

Purpose

- Homing in all positioning modes (C1210 = 0, 1, 2).
- Use of touch probe if the index pulse does not appear at the same place in a reproducible form due to the mechanical constellation. The index signal can also be mechanically shifted after a motor exchange.
- The touch probe must be situated in direction of movement. The TP must not be assigned before starting homing.

Directly travel to TP signal

Mode 8: Traversing direction to the positive end of the travel range limit switch

Set C1213 = 8.

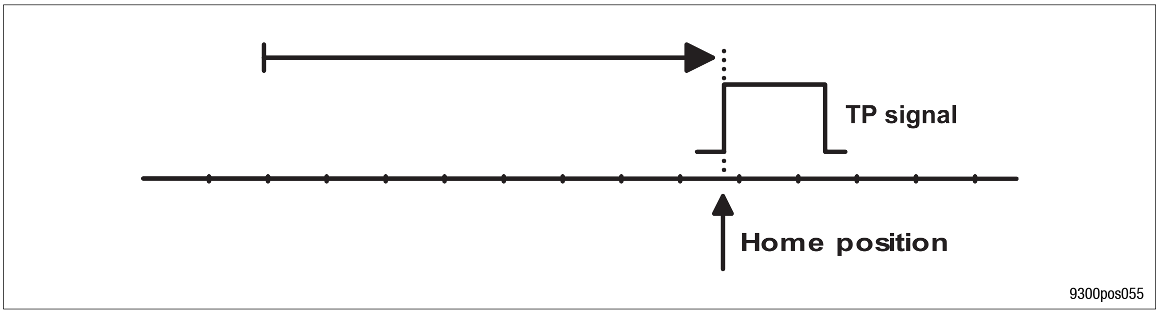


Fig. 7-26 Move to TP signal

The following settings are necessary:

- Select terminal for TP initiator via C1214.
  – C1214 = 1 ≙ Terminal X5/E1.
  – C1214 = 2 ≙ Terminal X5/E2.
  – C1214 = 3 ≙ Terminal X5/E3.
  – C1214 = 4 ≙ Terminal X5/E4 (this setting is recommended by LENZE).
- Select signal of the TP input via C1215/x.
  – C1215/x = 0 ≙ LOW-HIGH edge.
  – C1215/x = 1 ≙ HIGH-LOW edge

Function procedure

- Move to the TP signal with homing speed (C1242) towards positive end of travel range limit switch.
- The first TP signal determines the reference point.

Modus 9: Traversing direction to negative end of travel range limit switch

Set C1213 = 9.

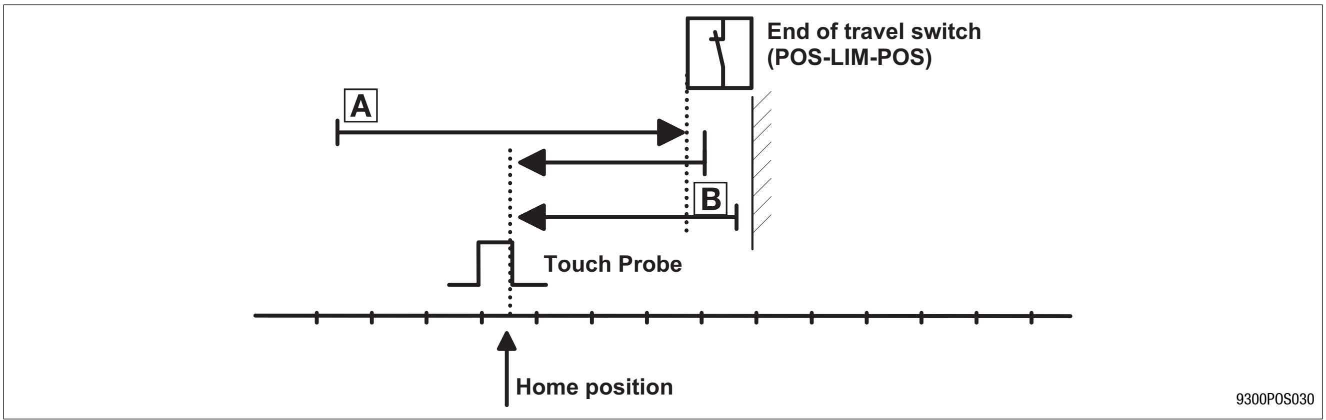
Function procedure

- As ”Traversing direction to positive end of travel range limit switch”, but the drive moves towards the negative end of travel range limit switch.

7.5.8.9 Homing mode 10 and 11

Purpose

- Homing in absolute positioning mode (C1210 = 0, 2).
- Use of touch probe if the index pulse does not appear at the same place in a reproducible form due to the mechanical constellation. The index signal can also be mechanically shifted after a motor exchange.



Mode 10: Traversing direction to positive POS-LIM-POS

Traverse in positive direction up to POS-LIM-POS, reverse there and reference to TP (case A). During reversing the limit switch must always be assigned!

- Move to positive end of travel range limit switch in positive direction with homing speed C1242.
- Reverse and move in negative direction to the reference point via touch probe with homing speed C1242 or C1241 (depending on the setting in C1216, see second homing speed).
- If the drive is positioned on the positive end of the travel range limit switch before homing, it travels in negative direction (case B).
- The reference point is at touch probe + home position C1227.

The fault P02 is not displayed!

Mode 11: Traversing direction to negative POS-LIM-NEG

Travel in negative direction up to POS-LIM-NEG, reverse there and reference to TP. TP can also be the negative edge of POS-LIM-NEG.

Otherwise identical with mode 10

Tip!

In order to save initiators the limit switch (POS-LIM-xxx) can be simultaneously used as touch probe. The TP input is selected under C1214.

Since the limit switches are factory-set to LOW active, select the rising edge for TP (C1215/x = 0). After homing, the drive must not directly stop on the reference point, since this may result in a response of the travel range limit switches. The reference limit point must be set accordingly.

7.5.8.10 Second homing speed

Second homing speed

A second homing speed (C1241) can be activated by C1216.

Homing procedure with activated second homing speed:

Mode 0, 1:

To POS-REF-MARK at first speed, then at second speed.

Mode 2, 3:

At first speed to limit switch POS-LIM-POS (mode 2) or POS-LIM-NEG (mode 3), second speed after reversing.

Mode 4, 5:

To limit switch POS-REF-MARK at first speed, second speed after reversing.

Mode 6, 7:

To POS-REF-MARK at first speed, then at second speed.

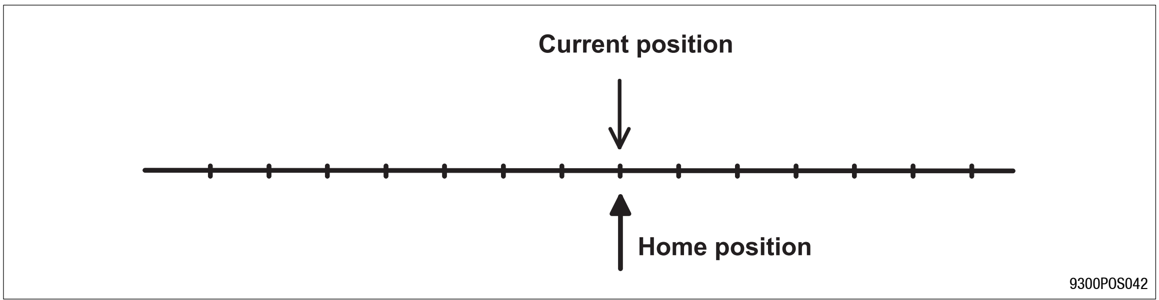
Mode 8, 9:

Only at first speed to reference point via TP.

Mode 10, 11:

To limit switch POS-LIM-POS or POS-LIM-NEG at first speed, second speed after reversing.

7.5.8.11 Set homing value



Purpose

If the reference point is known (e.g. by a higher-level master system), homing is not necessary.

Function

- Select ”Set homing value” under ”PS mode” in the PS (C1311 = 4).
- In this case, the current position is the reference point.
- The zero points of the measuring systems are set accordingly (7-39).

7.5.9 Travel profile generator and setpoints

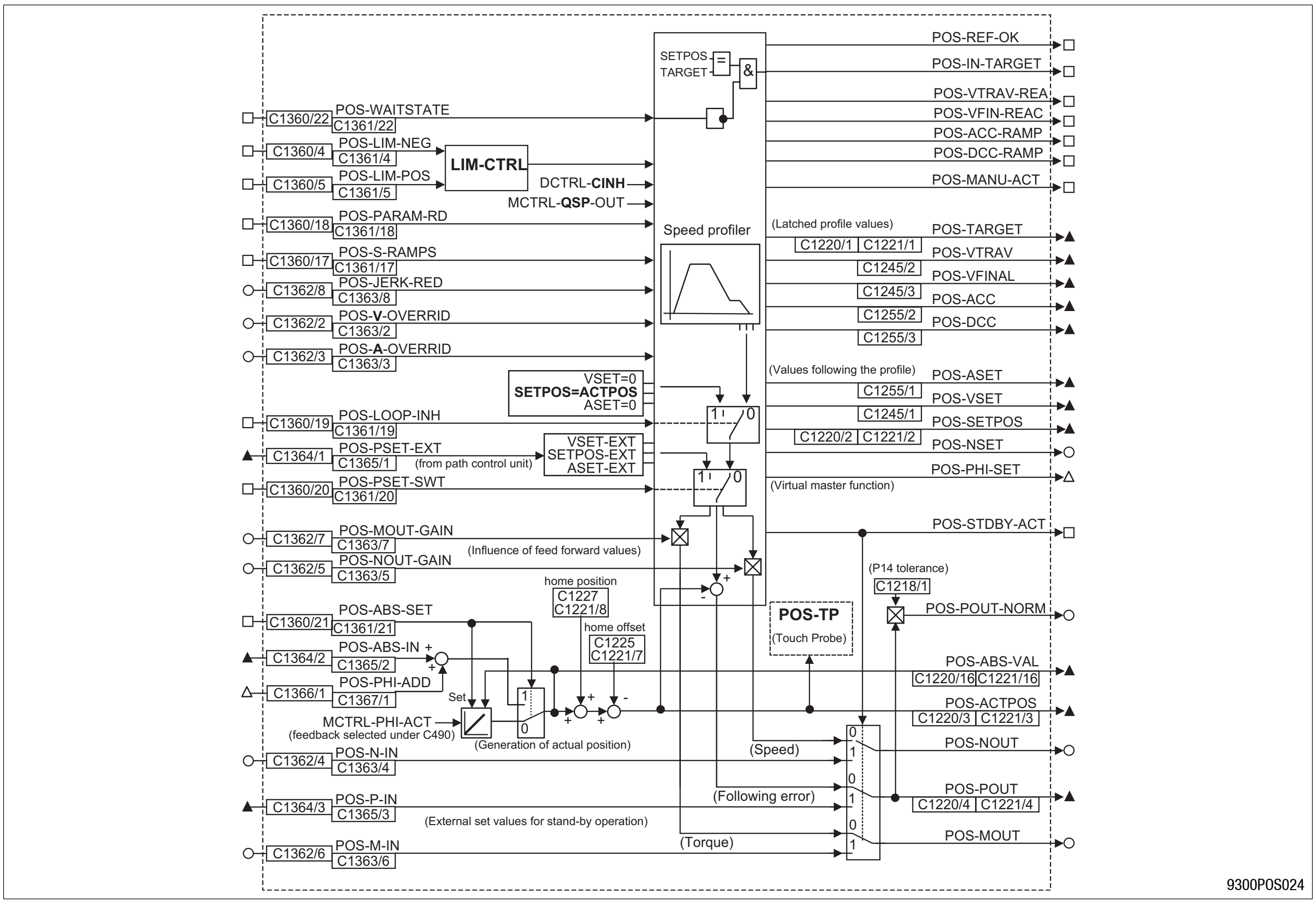


Fig. 7-27 Part of the function block POS

Purpose

- The travel profile generator of the POS function block generates a speed travel profile with the corresponding setpoints for:
  - position setpoint (POS-SETPOS),
  - speed precontrol value and (POS-NOUT) and
  - torque precontrol value (POS-MOUT).
- The travel profile is generated with regard to the defined travel profile parameters:
  - target position (VTPOS),
  - traversing speed (VTVEL)
  - acceleration (VTACC)
  - deceleration (VTACC)
  - final speed (VTVEL).
- The travel profile parameters are always read by the profile generator at the beginning of a positioning process and remain unchanged for entire positioning time. The override inputs (POS-V-OVERRID, POS-A-OVERRID) are considered during this process.
  The values given in the variable tables VTxxx can already be changed for the next positioning while the current positioning is still running.
- Traversing profile parameters can be changed via input POS-PARAM-RD even during a positioning process.

Function

- Linear ramps (L profile) (🕮 7-60)
- S ramps (S profile) (🕮 7-61)
- Override (POS-V-OVERRID, POS-A-OVERRID) (🕮 7-63)
- New traversing profile parameters during positioning (POS-PARAM-RD) (🕮 7-59)
- Influence of precontrol values (POS-NOUT-GAIN, POS-MOUT-GAIN) (🕮 7-63)
- Target window (POS-WAITSTATE) (🕮 7-65)
- Virtual master (POS-PHI-SET) (🕮 7-66)

7.5.9.1 Linear ramps (L profile)

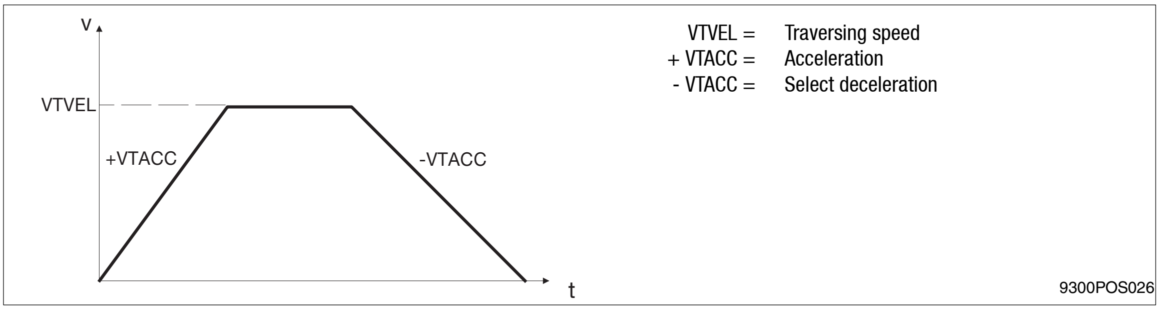


Fig. 7-28 Linear ramps (L profile)

- The profile generator works on an optimum time base using the L profile, i.e. the target position can be reached as quick as possible with the acceleration and speed selected.
- The acceleration selected is immediately effective when changing the velocity.
- Default setting: L profile.

7.5.9.2 S ramps (S profile)

Purpose

Protection from damage of the drive components by reducing the jerk during acceleration and deceleration.

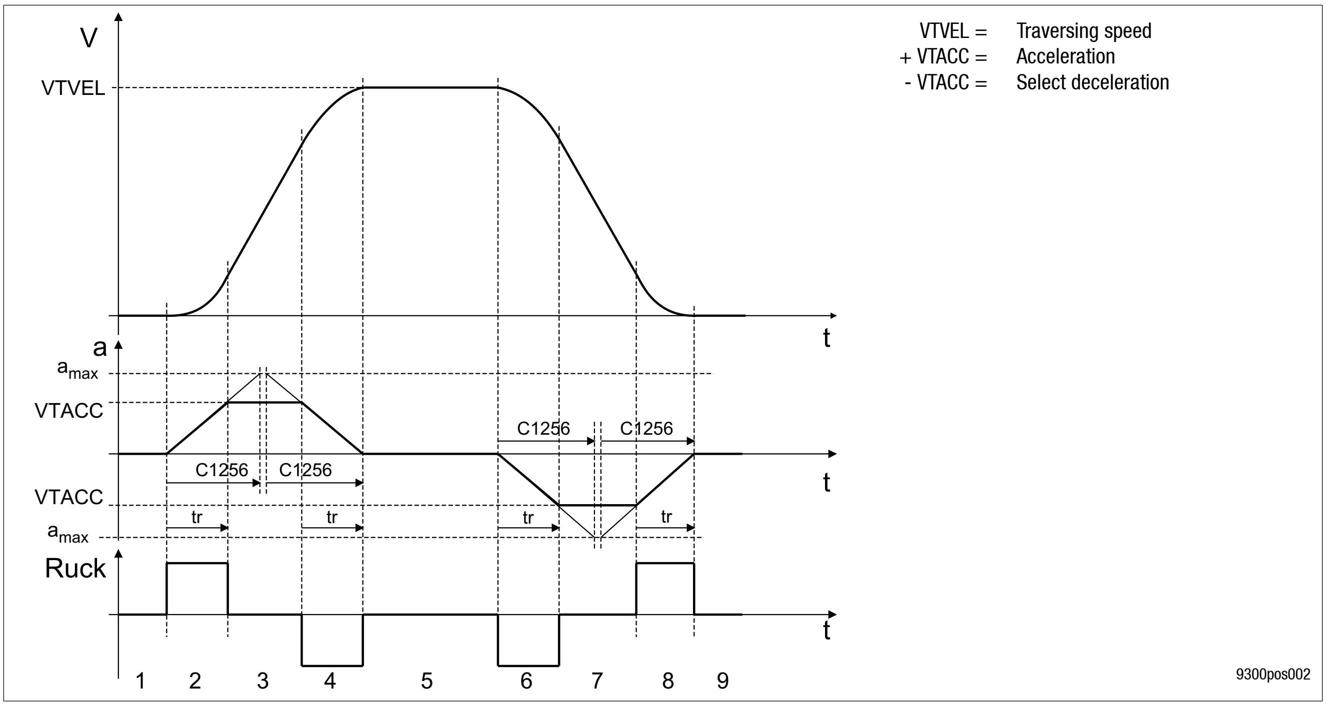


Fig. 7-29 S ramps (S profile)

1. Standstill
2. Deceleration with adjusted jerk
3. Acceleration with VTACC
4. Reduce acceleration with adjusted jerk
5. Traversing with VTVEL
6. Deceleration with adjusted jerk
7. Deceleration with VTACC
8. Reduce deceleration with adjusted jerk
9. Drive in targetposition

- With the S profile acceleration and deceleration processes are started smoothly. The defined acceleration is only reached at the end of the jerk time.
  - A slower acceleration always leads to a longer positioning time - compared to the time-optimised L profile.
  - Set jerk time (T_r) via C1256.

$$t_r = T_r \times \frac{a}{a_{max}} \rightarrow t_r = C1256 \times \frac{VTACC\,[\%]}{100\,\%}$$

  - Reducing the jerk or increasing the jerk time ($t_{r(RED)}$) can be set via the input “POS-JERK-RED” (default setting 100%).

$$t_{r(RED)} = t_r \times \frac{100\%}{POS\text{-}JERK\text{-}RED}$$

- The S profile must be activated before starting positioning.
- S profile is activated as follows:
  Connect input "POS-S-RAMPS" with 1-Signal, e. g. assign FIXED1 directly or set FCODE-471.B1 = 1 (default setting).
- With "POS-PARAM-RD" you can switch between both profiles even during the positioning process.
  When changing from the L profile to the S profile during acceleration/deceleration, the S profile starts with acceleration 0 all the same. The process is prolonged accordingly.

Tip!

- The jerk remains unchanged when the acceleration is changed.
  - If a target position cannot be reached with these parameters (e. g. with TP positioning or velocity changeover) the target position is overtravelled. Afterwards the drives changes its direction of rotation and travels to the target position.
  - If a positioning process with or without final speed (changeover of velocity) is followed by a positioning process in opposite direction, the acceleration will be reduced to 0 before it is built up in opposite direction.
- For the S-profile, the deceleration is automatically equated with the acceleration in the PS. Inputs for the deceleration are not considered.
- Special feature when stopping in manual operation, homing, PS-CANCEL, program stop:
  → Stops are always realised with linear ramps! Firmware version ≥ 2.5:
  Under C1259/1.../3 it is possible to change to S ramps for stopping.

Stopping with S ramp

The corresponding setting parameters for the S ramp can be found in the GDC under the following menu: "POS functions / S ramps". This function can be set with code C1258.

With the S ramp function activated the drive is stopped in case of the following functions with linear ramp due to the default setting:

- manual control,
- Prg-stop,
- PS-CANCEL and
- Homing

With firmware version ≥ V2.5 the controller can be switched to stopping with S ramp for the following functions when the S ramp function is activated:

- Manual control (C1258/1),
- Prg-Stop (C1258/2),
- PS-CANCEL (C1258/3)

7.5.9.3 Override

Purpose

- Dynamic change of the profile parameters (speed and acceleration).
  Example: Setting the traversing speed depending on the master speed.

Function

- Dynamic adaptation of traversing and final speed (POS-**V**-OVERRID).
- Dynamic adaptation of acceleration and deceleration (POS-**A**-OVERRID).
- The override inputs are considered before each positioning process. With the input POS-PARAM-RD this is also possible during the process (see chapter 7.5.9.4)
  – The parameter values are reduced according to the % values at the override inputs.
- In manual operation the override inputs are always effective.
  – Note: Only positive override values are effective, negative values will be evaluated as zero.

7.5.9.4 New travel profile parameters during positioning

Purpose

- Change of the target position, speed or acceleration during positioning.

Function

- LOW-HIGH edge at POS-PARAM-RD immediately accepts - also while positioning is running - new profile parameters from the variable tables VT.
  Profile : Target position, traversing speed, acceleration, deceleration, final speed, V override, A override, POS-S-RAMPS (limited).
  – With constant HIGH level: new profile parameters are accepted every 10 ms.

Tip!

Firmware version < 2.5: Not effective in stand-by operation.

Firmware version ≥ 2.5: Also effective in stand-by operation.

7.5.9.5 Influence of precontrol values (POS-NOUT-GAIN, POS-MOUT-GAIN)

Purpose

- Reduction of the influence of precontrol on speed and torque controller.

Function

- Adaptation of the speed precontrol (POS-NOUT) to the speed controller (MCTRL-N-SET) (POS-**N**OUT-GAIN, default setting: 100 %)
- Adaptation of the torque precontrol (POS-MOUT) to the torque controller (POS-**M**OUT-GAIN, default setting: switched off)
- The precontrol values are reduced according to the % values at the inputs.

Tip!

With dynamic positioning processes, a reduction of the speed precontrol (e.g. to 95%) can be advantageous for the travelling performance towards the target position.

7.5.9.6 "Target-reached" message (POS-IN-TARGET)

Purpose

Messaging the termination of positioning.

Function

- A positioning process is terminated when the position setpoint POS-SETPOS of the profile generator has reached the target position POS-TARGET ("setpoint-based").
- POS-IN-TARGET = HIGH messages that the position setpoint POS-SETPOS has reached the target position POS-TARGET.
- The other program functions are only processed further when → POS-IN-TARGET = HIGH.

Tip!

Because of mains failure, the drive may not be in the indicated position, although the message POS-IN-TARGET was indicated.

7.5.9.7 Target window (POS-WAITSTATE)

Purpose

Particularly high demands on the accuracy of TARGET-REACHED MESSAGE.

Function

With the input POS-WAITSTATE the target-reached message can be (📖 7-64) decelerated until the drive has exactly reached the target.

The program will not be processed until

- the position setpoint POS-SETPOS has reached the target and
- the input POS-WAITSTATE = LOW.

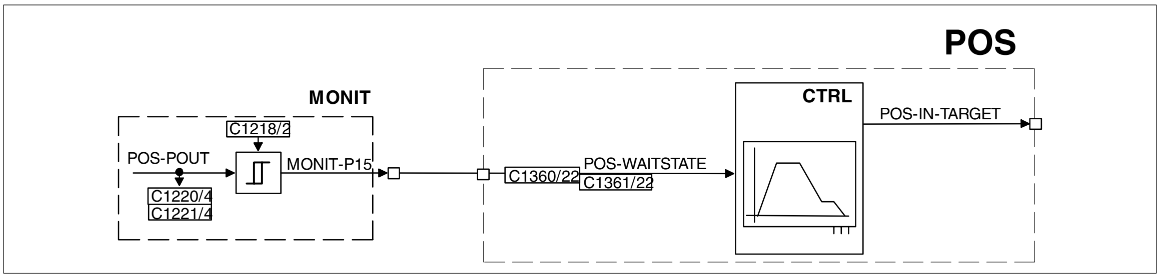


Fig. 7-30 Connect output MONIT-P15 with input POS-WAITSTATE

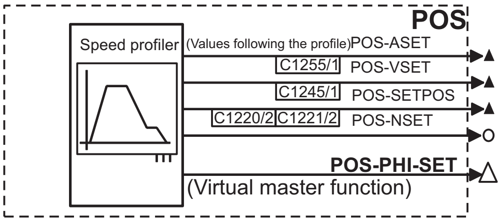
Output	Level	Description
POS-WAITSTATE	HIGH	POS-IN-TARGET is not set yet since the current positioning is still running. The functions of the next PS are not carried out yet.
	LOW	Continuation of the program: The program is continued only once the difference between actual value and setpoint is compensated such that the difference is within the permissible following error tolerance. Under code C1218/2 you can enter a following error with less tolerance.
MONIT-P15	HIGH	Display when the momentary following error is higher than the target window.
		The output MONIT-P15 will be switched even if the second following error monitoring is switched off.

Tip!

Due to highly dynamic acceleration processes the system may deviate to such an extent that the setpoint reaches the target position before the actual value. Continuing the program processing immediately would be faulty and have a negative effect on the following processes.

These drive tasks can be solved by decelerating the program continuation within a small target window (POS-WAITSTATE = HIGH) until the actual position value is really situated in the target window. The target window is defined as very narrow by the code C1218/2 (second following error tolerance). In order to continue the program processing later on, the system deviation called following error must be lower than the target window defined before.

7.5.9.8 Virtual master (output POS-PHI-SET)



9300POS038

Purpose

- Phase and speed synchronous traversing of two or several drives.

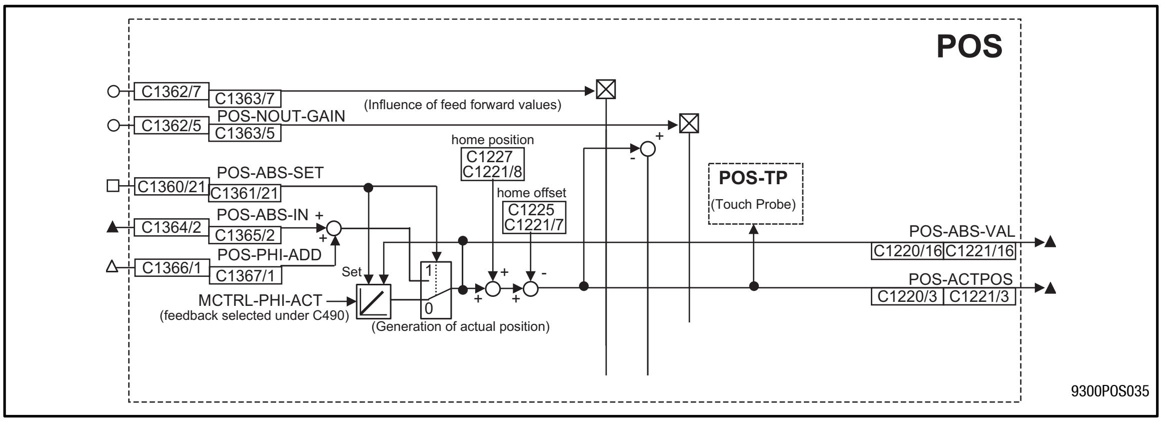
Function

- Definition of “virtual master”:
  Via the required phase difference output (POS-PHI-SET) of the master drive the master drive itself and the ”slave” drives are positioned in parallel.
  This does not lead to any reactions between the drives and no offset in positioning occurs in contrast to connecting the slave drives via the actual phase difference output (MCTRL-PHI-ACT).
- POS-PHI-SET is transmitted to the slave drives through digital frequency connection (DFOUT, DFIN, DFSET).
- A connection via system bus (CAN) is possible.
  – Advantage of clocked drives:
  For improving the dynamic features a speed precontrol can be transmitted in addition.

Tip!

With system bus coupling (CAN) the controllers must be synchronised, otherwise position information may get lost. The synchronisation is realised in the slave drives via the SYNC function block. In the master drive the ”CAN-Sync telegram” must be generated.

7.5.9.9 Setting the actual position value (POS-ABS-SET)



POS-ABS-IN	C1365/2	C1364/2	Input for external actual position value, e. g. when using an absolute value encoder with a CAN interface. (see "Absolute encoder via system bus" 🕮 7-44)
POS-ABS-SET			Changeover (position encoder C490) / (ABS-IN)
POS-ABS-VAL	C1220/16 C1221/16		Display as actual position POS-ACTPOS, but without considering setpoint position polarity (C1206), actual position (C1206), actual home position (display C1220/8) and actual reference dimension offset (display C1220/7).
POS-ACTPOS	C1220/3 C1221/3	-	Actual position; position referring to real zero For rating see formula 1
POS-PHI-ADD	C1367/1	C1366/1	Phase difference signal is added to POS-ABS-IN. Function: With POS-ABS-SET= HIGH the actual position is set to the value POS-ABS-IN. Encoder increments that have arrived in the setting cycle are not considered in the default. If required, the encoder change can be connected in the setting cycle; the signal MCTRL-PHI-ACT must be linked with the input POS-PHI-ADD.

Home position

HIGH = Phase value at POS-ABS-IN is read in for actual position value generation (POS-ACTPOS).

The following values are considered when POS-ACTPOS is generated:

– Position setpoint polarity (C1206)
– Actual position value polarity (C1208)
– Actual home position (display C1220/8)
– Actual reference dimension offset (display C1220/7).

7.5.10 Manual operation

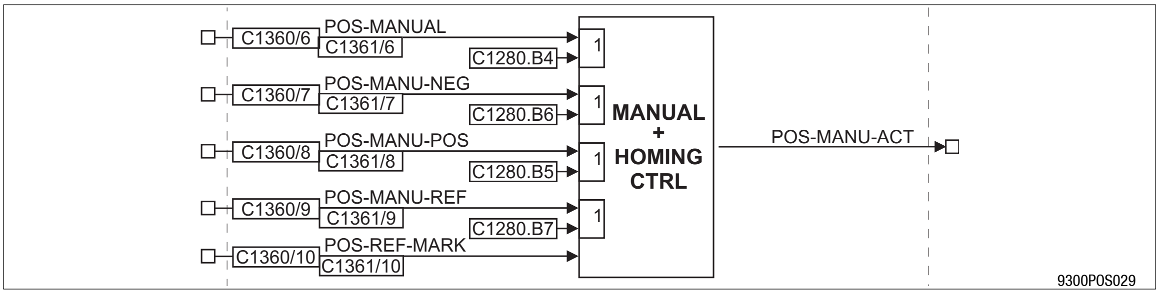


Fig. 7-31 Manual control (part of the function block POS)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
POS-MANUAL	d	C1361/6	bin	C1360/6	2	Changeover Manual/program operation HIGH = manual operation; if necessary, running program is interrupted. If necessary, drive is decelerated to standstill with a-manual (C1252) and the influence of POS-A-OVERRID. LOW = Program operation
POS-MANU-NEG	d	C1361/7	bin	C1360/7	2	HIGH = drive travels with v_manual (C1243) in negative direction. Acceleration with a-manual (C1252). The override inputs POS-V-OVERRID and POS-A-OVERRID have influence. LOW = drive is stopped with a-manual (C1252). The override inputs POS-V-OVERRID and POS-A-OVERRID have influence. Note: POS-MANU-REF has priority. When -NEG and -POS are controlled simultaneously the drive stops.
POS-MANU-POS	d	C1361/8	bin	C1360/8	2	Like POS-MANU-NEG, but in positive direction
POS-MANU-REF	d	C1361/9	bin	C1360/9	2	LOW-HIGH signal = Start manual homing HIGH level required for the time of homing (see 7.5.10.3 "Manual homing")
POS-REF-MARK	d	C1361/10	bin	C1360/10	2	Home position switch
POS-MANU-ACT	d	-	-	-	-	HIGH = manual operation active, no program operation Note: Signal will not be updated when the controller is inhibited (DCTRL-CINH = HIGH) or quick stop (MCTRL-QSP-OUT = HIGH) is set

Function

- Manual positioning without intermediate stop (🕮 7-69)
- Manual positioning with intermediate stop (🕮 7-70)
- Manual homing (🕮 7-70)

7.5.10.1 Manual positioning

- Set manual positioning mode to “Manual positioning without intermediate stop” (C1260 = 0)
- Activating manual operation: Activating manual operation:
  POS-MANUAL = HIGH and/or
  C1280/B4 = 1 (“manual control” in the GDC dialog ”Control”)
- Manual control in positive direction:
  POS-MANU-POS = HIGH and/or
  C1280/B5 = 1 (“manual positive” in the GDC dialog “Control”).
- Manual control in negative direction:
  POS-MANU-NEG = HIGH and/or
  C1280/B6 = 1 (“manual negative” in the GDC dialog ”Control”).
- The drive brakes to standstill if none of the manual functions is activated or both of them.
- Manual positioning speed adjustable under C1243.
- Manual acceleration/deceleration adjustable under C1252.
- The override inputs POS-V-OVERRIDE and POS-A-OVERRIDE are always effective
- The drive stops when a travel range limit switch is reached. The fault indications P01 or P02 are activated.

Tip!

- Assigned travel range limit switches can be left again in manual operation in travel range direction. The fault must be reset before.
- In manual operation the drive stops with linear ramps (L-profile). As of software version 2.5 the ramps can be set with C1256. (📖 7-61)

The following conditions must be met to ensure that the drive can be traversed manually:

1. The drive must be enabled (DCTRL-INH =0),
2. The QSP function must not be activated (MCTRL-QSP-OUT=0),
3. Manual homing must be inactive:
   POS-MANU-REF = LOW and
   C1280/B7 = 0 (“Manual homing” in the GDC dialog “Control”),
4. Only one direction is to be selected.
   If the positive and negative direction are activated at the same time, the drive is braked to standstill.

7.5.10.2 Manual positioning with intermediate stop

Purpose

- During manual positioning, the drive is to stop at defined target positions (intermediate stops).

Activating this function

- Set manual positioning mode to "Manual positioning with intermediate stop" (C1260 = 1)
- The mode is activated as explained under "Manual positioning" (see above),
- The breakpoint positions are defined by selecting the target positions from the variable table VTPOS. Up to 16 target positions can be selected via C2161/1 to C1261/16. (GDC menu: "Positioning functions/manual control")
- The drive travels to the next target position and stops there. In order to continue, the control signal for manual positive or manual negative must be reset and then set again. The drive immediately brakes to standstill, if the control signal is reset before reaching the next target position.

7.5.10.3 Manual homing

Purpose

Example: Homing during commissioning (Part C, (🕮 5-1))

Activating this function

- The homing parameters set apply to manual homing (🕮 7-49)
- Activate manual operation
  - POS-MANUAL = HIGH
    and/or
    C1280/B4 = 1 ("Manual control" in the GDC dialog "Control"), if none of the manual functions is activated, the drive will brake to standstill.
- Start manual homing
  - POS-MANU-REF = LOW / HIGH edge
    or
    C1280/B7 = 0 / 1 edge ("manual homing" in the GDC dialog "Control").
    The signal for manual homing is required to the end of the homing process, otherwise the process will be interrupted.
    A new start of manual homing requires an edge again.

Tip!

The following conditions must be fulfilled for manual homing:

1. The drive must be enabled (DCTRL-INH =0).
2. The QSP function must not be activated (MCTRL-QSP-OUT=0).

Manual homing has priority over manual positioning, that means the signals for manual positioning have no effect when manual homing is signalled by one of the control signals.

7.5.11 Program operation

Purpose

Positioning programs for automatic operation of the application can run during program operation.

Function

- Program control (7-71)
- Variable tables (VT) (7-75)
- Program sets (PS) (7-76)

7.5.11.1 Program control

Purpose

Program control offers the possibility to influence program processing by a higher-level control (e.g. PLC) or directly from the operator's panel.

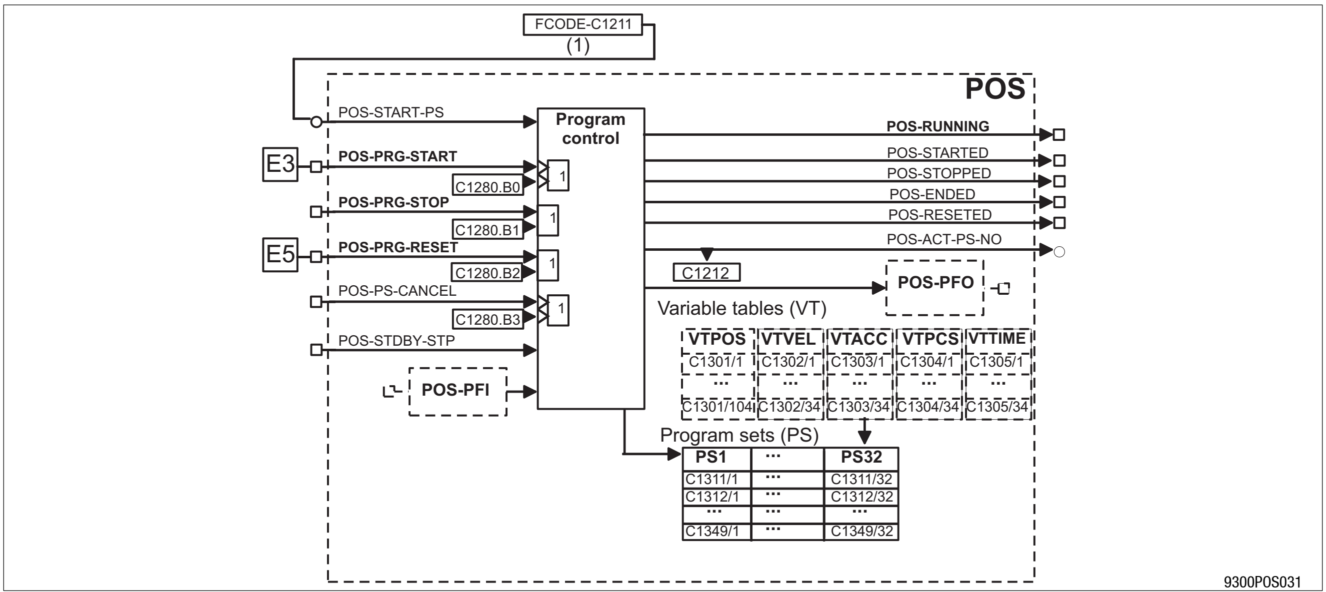


Fig. 7-32 Section from the function block POS: Functionality of PS, VT, PFI and PFO

Starting the program (PRG-START)

- The beginning of the program to be started is determined by the FB input "POS-START-PS". In the standard configurations this input is connected with FCODE C1211. In the default setting the program starts with PS01.
- Starting the positioning program with
  - LOW-HIGH edge at POS-PRG-START or
  - C1280.B0 = 0 / 1 edge ("Program start" in the GDC dialog "Control").

Tip!

- The program processing is also continued to the "Program end" when the start signal is immediately reset.
- If the start signal is still applied at "program end" the program will be restarted automatically every time.
- A new edge at POS-PRG-START is required after interrupting the program processing (e.g. by controller inhibit) or by a fault indication.
  Afterwards the program is continued at the same place (status display: C1283=15).

The start signal will only be accepted in program operation and when the controller is enabled.

The controller is enabled when

1. the power stage is supplied (DCTRL-RDY=1),
2. no fault applies (DCTRL-TRIP=0, DCTRL-FAIL-QSP=0),
3. the control enable signal is applied (DCTRL-CINH=0)
4. quick stop (QSP) is not activated (MCTRL-QSP-OUT=0)
5. manual operation is not activated (POS-MANUAL=0, C1280.B4=0)
6. program reset is not activated (POS-PRG-RESET=0, C1280.B2=0)

Stopping the program (PRG_STOP)

- POS-PRG-STOP = HIGH or C1280.B1 = 1 (“Program stop” in the GDC dialog ”Control”).
  - The signal ”program stop” interrupts the program processing and the running positioning. The drive is stopped with the current delay of the program set (no influence of POS-A-OVERRID).
- POS-PRG-STOP = LOW **and** C1280.B1 = 0 (“Program stop” in the GDC dialog ”Control”).
  - The program is continued at the same position when “Program stop” = LOW. The positioning process is finished with the current profile parameters of the PS.

Resetting the program (PRG-RESET)

- POS-PRG-RESET = HIGH or C1280.B2 = 0 (“Program reset” in the GDC dialog ”Control”).
- When a program is reset
  - the drive will be stopped with a-max (C1250) (no influence of POS-A-OVERRID)
  - the program will be interrupted
  - “Program end” will be set
  - the piece counter will be set to zero
  - the program function outputs (PFO) will be reset
  - the touch probe inputs used by the program will be “disabled”
  - and if necessary, stand-by operation will be cancelled.

Tip!

The signal for resetting the program is also accepted and saved in the inhibited state. The program reset will only be executed in the released state (see notes under ”starting the program”).

Cancel actual PS (PS-CANCEL)

- LOW-HIGH signal at POS-PS-CANCEL or C1280.B3 = 0 / 1 signal.
  - The drive will be decelerated to standstill with the separately adjustable delay “a-cancel” (C1253).
  - The program will be continued in the PS selected (C1333; JMP-TP-PS).

7.5.11.2 Status of the program control

The actual state of the program control is displayed via the status outputs of the function block POS and the positioning status (C1283).

Status outputs

Update conditions of the status outputs ”RUNNING”, “POS-STARTED”, “POS-STOPPED”, “POS-ENDED”, “POS-RESETED” and the positioning status in code C1283:

– The power stage is supplied (DCTRL-RDY=1)
– The drive is enabled (DCTRL-CINH=0)
– No fault applies (DCTRL-TRIP=0, DCTRL-FAIL-QSP=0)
– Quick stop (QSP) is not activated (MCTRL-QSP-OUT=0)
– Manual operation is not activated (POS-MANUAL=0, C1280.B4=0)

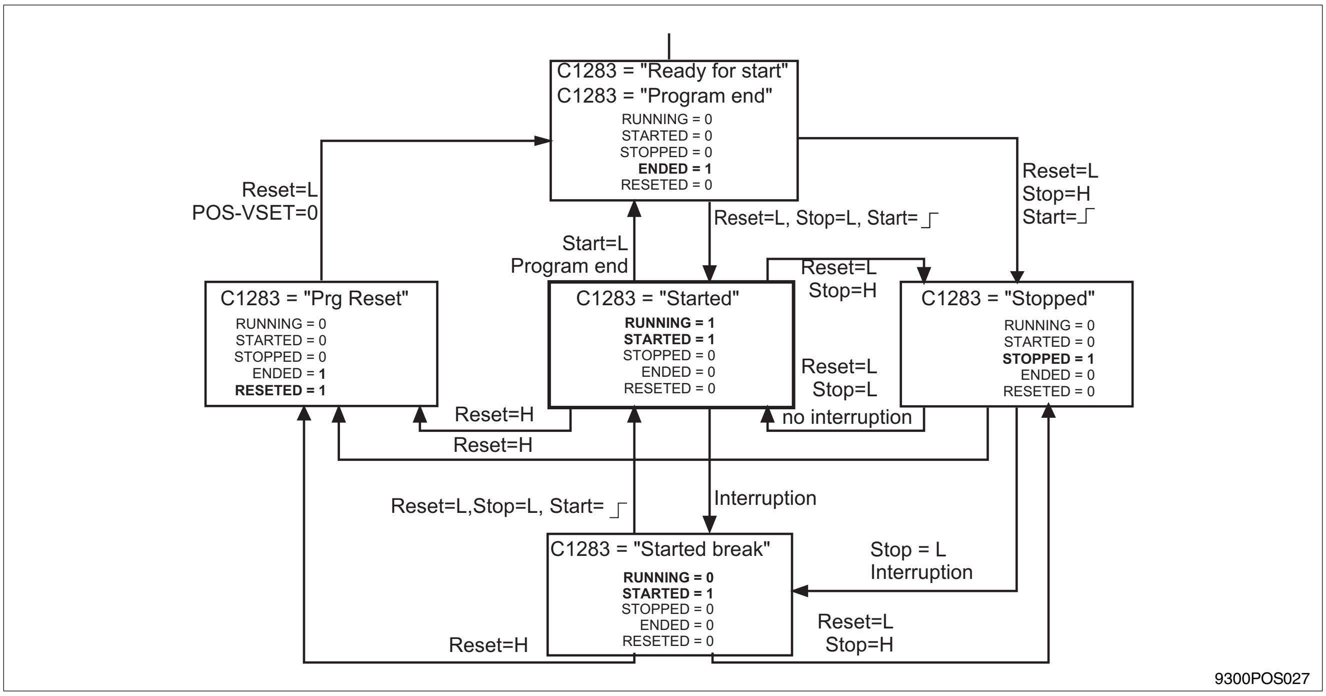


Fig. 7-33 Status machine of program control

Status ”Ready to start”

- Program control is ready to start but not started yet.
- Status output POS-ENDED = HIGH,
- Positioning status (C1283) = “Ready to start”,
- Current PS No. (POS-ACT-PS-NO) = 0 (program end)

Status “Started”

- Program has been started, the positioning program is running.
- Status output POS-STARTED = HIGH and
- Status output POS-RUNNING = HIGH (for firmware version ≥ 2.5)
- Positioning status (C1283) = “Started”,
  or “Started-rem”, if C1280.B0 = 1 (GDC control),
  or “Started-dig”, if input POS-PRG-START = HIGH.

Status "Started-break"

- Program processing is started but is interrupted by controller inhibit, QSP, TRIP, mains failure, Fail-QSP or manual control (interruption). In order to continue the program processing a new start edge is required.
- Status output POS-STARTED = HIGH and
- POS-RUNNING = LOW (for firmware version ≥ 2.5)
- positioning status (C1283) = "Started break".

Tip!

- Firmware version ≥ 2.5:
  The states "Started" and "Started-break" can be distinguished by the new status output "POS-RUNNING".
- Firmware version < 2.5:
  When the stand-by operation is activated "Started-break" cannot be identified!
  The states "Started" and "Started-break" can only be distinguished via the positioning status (C1283).

Status "Stopped"

- Program and drive stopped, or drive will be stopped.
- Status output POS-STOPPED = HIGH,
- Positioning status (C1283) = "Stopped",
  or "Stopped-rem", if C1280.B1 = 1 (GDC control),
  or "Stopped-dig", if input POS-PRG-STOP = HIGH,

Status "Prg reset"

- Program processing is aborted and the drive is stopped. Actual PS No. (POS-ACT-PS-NO) is set to "program end".
- Output POS-RESETED = HIGH,
- output POS-ENDED = HIGH,
- positioning status (C1283) = "Prg-Reset-rem", if C1280.B2 = 1 (GDC control),
  or "Prg-Reset-dig", if input POS-PRG-RESET = HIGH,
- current PS No. (POS-ACT-PS-NO) = 0 (program end)

7.5.12 Variable tables (VT)

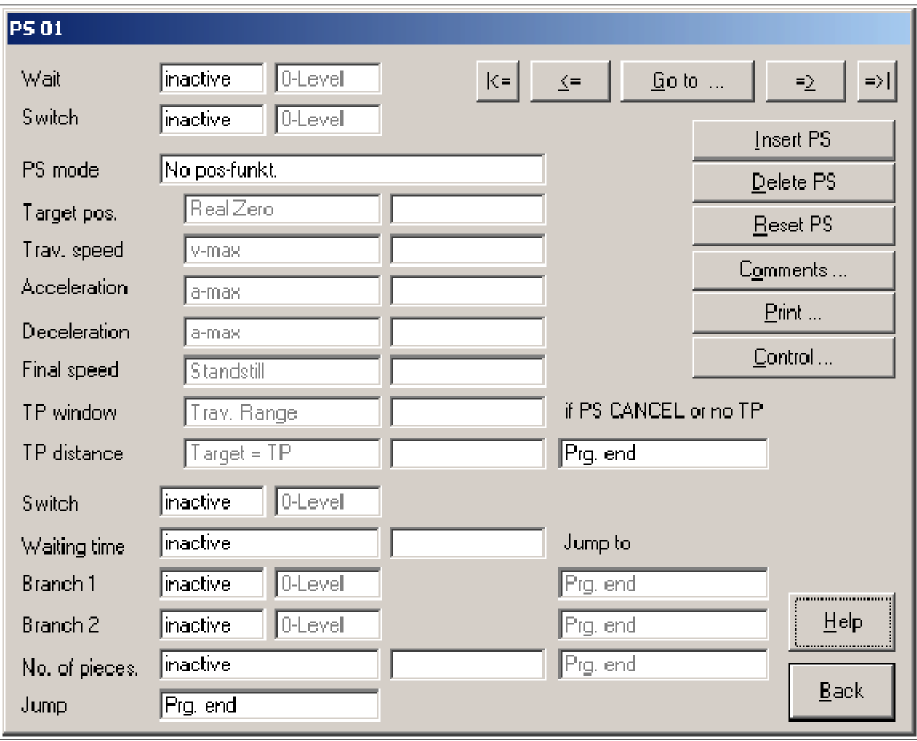
Five variable tables comprise the profile parameters determining the positioning.

- Function block: VTPOS (📖 7-285)
  – 104 variables for position values
- Function block: VTVEL (📖 7-289)
  – 34 variables for speeds
- Function block: VTACC (📖 7-281)
  – 34 variables for acceleration / deceleration
- Function block: VTTIME (📖 7-287)
  – 34 variables for waiting time
- Function block: VTPCS (📖 7-283)
  – 34 variables for piece numbers

7.5.13 Program sets (PS)

Function

- PS mode
- Point-to-point positioning
- Point-to-point positioning with changeover of velocity
- Touch probe positioning
- Stand-by mode
- Position value setting
- Prg. fct. “Wait for input”
- Prg. fct. “Switch output **before** positioning”
- Prg. fct. “Positioning or special function”
- Prg. fct. “Switch output **after** positioning”
- Prg. fct. “Waiting time”
- Prg. fct. “Branch 1”
- Prg. fct. “Branch 2”
- Prg. fct. “Repetition function - No. of pieces”
- Prg fct. “Jump to next PS”



9300POS028

Fig. 7-34 Screenshot: GDC input: Dialog “Programming”

7.5.13.1 PS mode

Purpose

- Selection which positioning or special function is to be carried out in the PS.

Function

- GDC input: Dialog "Programming"
- Factory setting: No positioning or special function
- Input under PS mode (C1311):

Value	Program functions
0	No positioning or special function
1	Absolute PS
2	Relative PS
3	Homing
4	Set homing value
5	Set position value to target position (C1312)
6	Absolute PS; TP positioning with E01
7	Absolute PS, TP positioning with E02
8	Absolute PS, TP positioning with E03
9	Absolute PS, TP positioning with E04
11	Relative PS, TP positioning with E01
12	Absolute PS, TP positioning with E02
13	Relative PS, TP positioning with E03
14	Relative PS, TP positioning with E04
16	Acceptance of home position (C1227)
30	Stand-by mode, cancel with STDBY-STP
31	Stand-by mode, cancel with TP E01 and traversing of the residual distance
32	Stand-by mode, cancel with TP E02 and traversing of the residual distance
33	Stand-by mode, cancel with TP E03 and traversing of the residual distance
34	Stand-by mode, cancel with TP E04 and traversing of the residual distance

7.5.13.2 Point-to-point positioning

Purpose

Point-to-point positioning of a defined target position A.

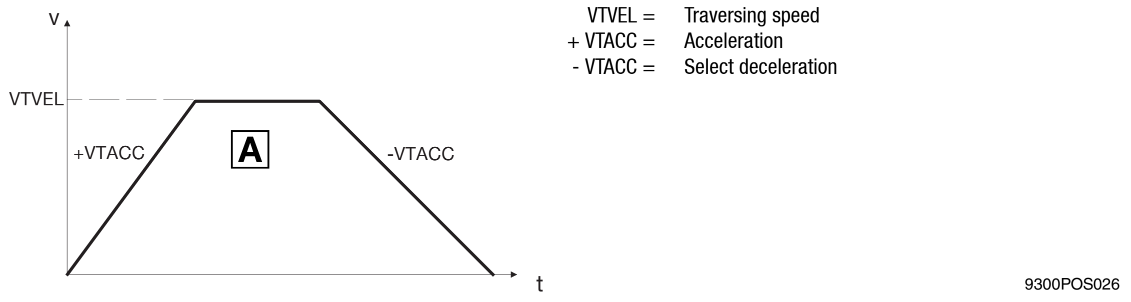


Fig. 7-35 Point-to-point positioning

Function

- PS mode (C1311): Select "Absolute PS" or "Relative PS".
- The traversing profile is generated according to the parameters selected (see also traversing profile generator).
- The traversing profile parameters can be adjusted individually for any PS. They are selected from the variable tables VTxxx:
  Select **target position** from "VTPOS" (selection under C1312/x)
  Select **traversing speed** from "VTVEL" (selection under C1313/x)
  Select **acceleration** from "VTACC" (selection under C1314/x)
  Select **deceleration** from "VTACC" (selection under C1315/x)
  Final speed = 0 (standstill) (selection under C1316/x)
- Point-to-point positioning is possible with the positioning modes (C1210) "absolute" and "relative positioning".
- The travel profile parameters can be changed during positioning (see chapter 7.5.9.4)
- The travel profile parameters can be adjusted during operation with the override inputs (see chapter 7.5.9.3).
- The status output POS-IN-TARGET displays the end of a positioning process (see also 7.5.9.7)

7.5.13.3 Point-to-point positioning with changeover of velocity

Purpose

- Changeover of velocity between two positionings without stopping.

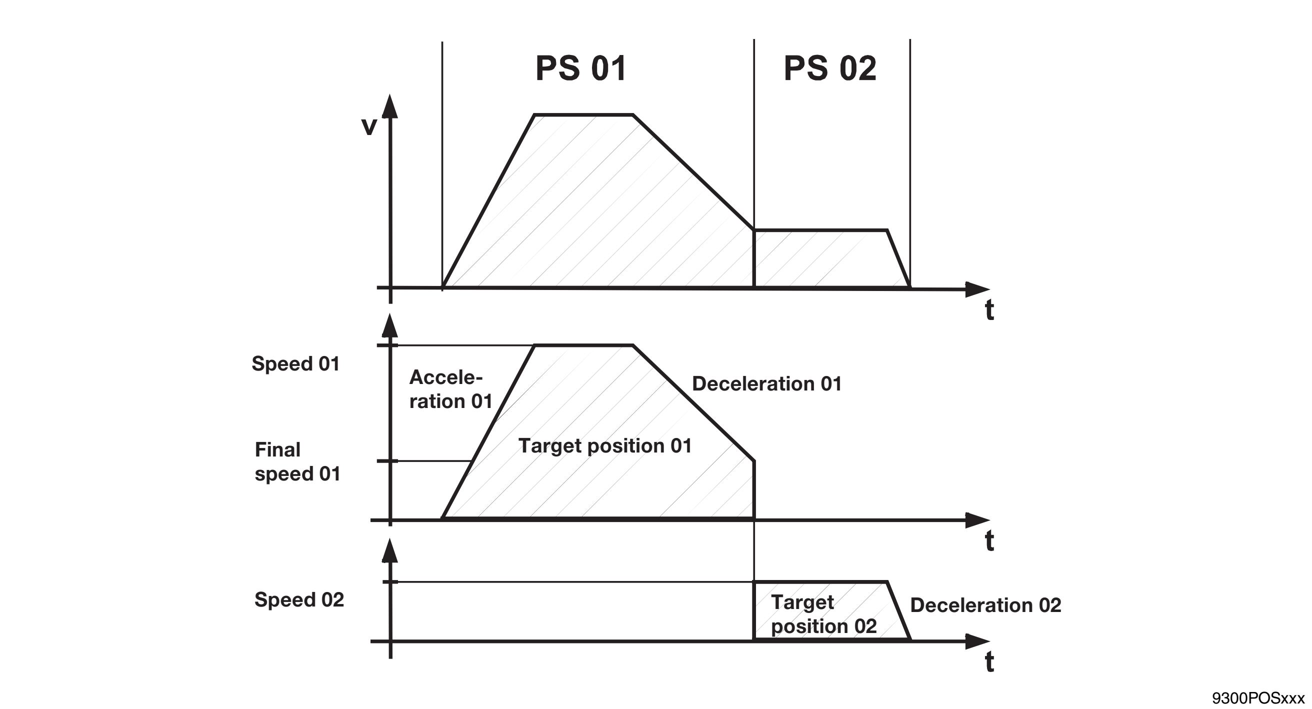


Fig. 7-36 Point-to-point positioning with changeover of velocity

Function

- PS mode (C1311): Select “Absolute PS” or “Relative PS”.
- The travel profiles of two subsequent positioning processes are set as in point-to-point positioning except that one final speed is unequal 0. The final speed is reached when the target position is reached. Positioning will start at this speed. Positioning will start at this speed.
  Select **target position** from “VTPOS” (selection under C1312/x)
  Select **traversing speed** from “VTVEL” (selection under C1313/x)
  Select **acceleration** from “VTACC” (selection under C1314/x)
  Select **deceleration** from “VTACC” (selection under C1315/x)
  Select **final speed from “VTVEL”** (selection under C1316/x)
- Point-to-point positioning is possible with the positioning modes (C1210) “absolute” and “relative positioning”.

Tip!

If a PS with final speed unequal 0 is not followed by a positioning, for instance because of a jump to “Program end” or the function “Wait for input”, the fault message P09 (impermissible programming) will be activated. The drive brakes to standstill.

7.5.13.4 Touch probe positioning

Purpose

- Positioning depending on an external digital terminal signal (TP positioning).
- E. g.: The front edge of workpieces of different lengths is always to be positioned at the same place.

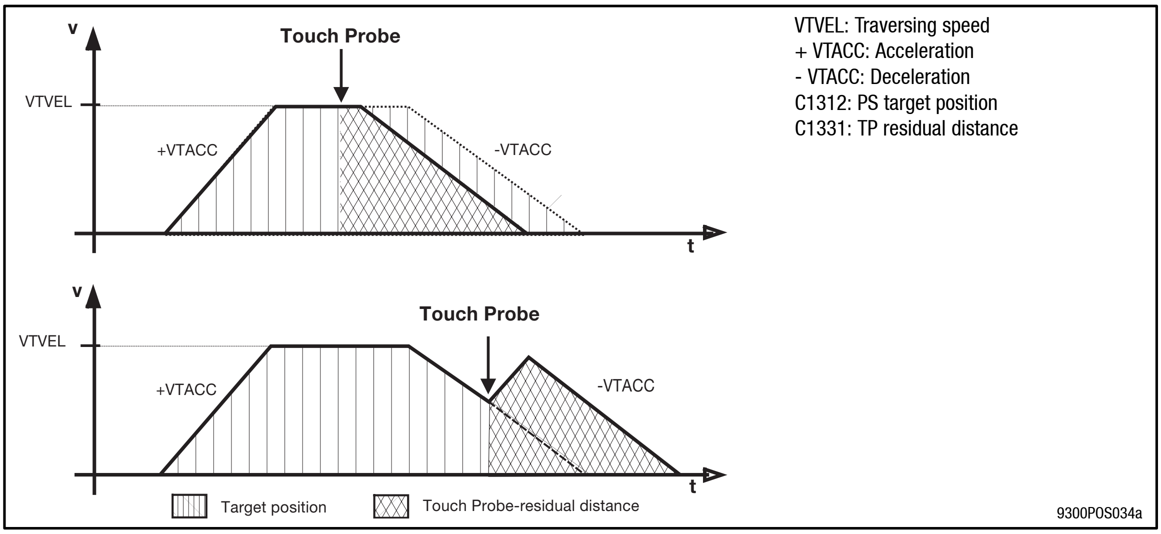


Fig. 7-37 Speed profile of a TP positioning

Function

- PS mode (C1311): Select 6...14 ("Absolute PS", "Relative PS", TP).
- TP positioning corresponds to a point-to-point positioning with / without velocity changeover. One of the four possible touch probe inputs (terminals X5/E1 ... X5/E4) is enabled during positioning.
- If TP occurs, the actual position value is saved as TP position and the target position of the current positioning is changed.

  Calculation of the new target position when TP occurs

  $$\textbf{TP position} + |\textbf{TP residual distance}|$$

  – The value of the TP residual distance is always added to the value of the TP position.
  – The direction of the TP residual distance always corresponds to the traversing direction when TP occurs.
- The actual position value saving via TP is interrupt-controlled and has a very short reaction time:
  – rising edge at terminal: <0.010 ms
  – falling edge at terminal: <0.100 ms
- The TP input can be enabled for the entire TP positioning process or for parts of it. Target position, TP residual distance and TP window determine the restricted area (fig. 7-37).

Tip!

- The TP position values saved are available in VTPOS-OUT-101 to -104 for further function block interconnections.
- The function "Touch-probe saving of the actual position value" via the function block inputs "POS-TPx-ENABL" is a separate function (see POS-TP). TP positioning has priority over "Touch-probe saving".

7.5.13.5 Stand-by mode

Purpose

- Implementation of a “Flying saw”, with additional function block interconnection (on request).
- Enables the changeover between positioning and another setpoint source, e.g. master frequency of a main drive.

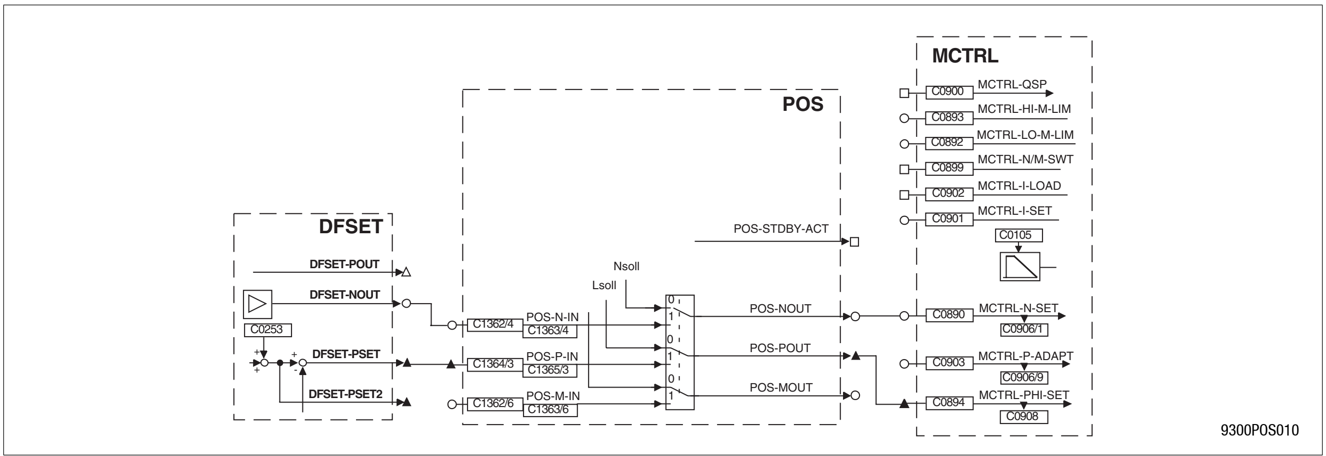


Fig. 7-38 Stand-by operation with selection through master frequency

Function

- Stand-by operation is only possible in manual operation.
- PS mode (C1311): Select 30...34 (stand-by operation and signal source for abort).
- In PS, stand-by operation is executed instead of positioning. As long as stand-by operation is active, ”positioning or special function” in the PS is not completed. The following PS functions are only processed when the stand-by operation is terminated (see diagrams).
- After having started the stand-by operation, the drive is accelerated or decelerated to the external speed setpoint at POS-N-N due to positioning. The profile parameters of the PS apply.
  When reaching the speed the external setpoint inputs (POS-N-IN, POS-P-IN) are used. From now on, the position setpoint (POS-SETPOS) equals the actual position value (POS-ACTPOS):
  ➞ POS-STDBY-ACT = HIGH

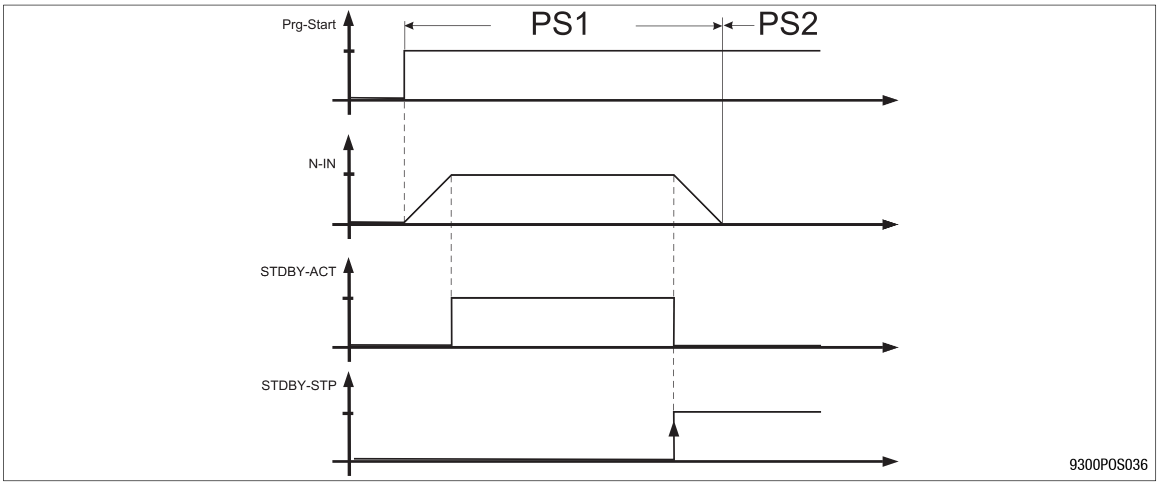
Cancel stand-by operation

The stand-by operation can be aborted via two ways:

1. Abortion via FB input “POS-STDBY-STP”
2. Abortion via touch-probe signal at terminal X5/E1 ... X5/E4

Abortion via FB input “POS-STDBY-STP”

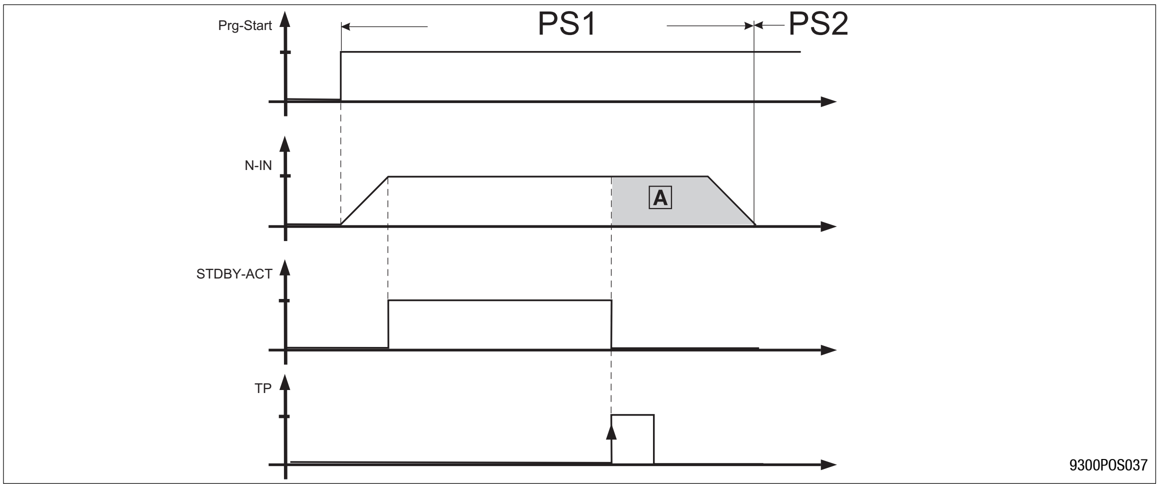
E.g.: Linkage with a digital control signal via a fieldbus or a function block interconnection.



The stand-by operation is aborted and the drive will be reset to positioning when POS-STDBY-STP = HIGH. Positioning accelerates /decelerates the drive with the profile parameters of the PS to the preset final speed of the PS. Further PS functions will only be processed when the final speed has been reached.

Abortion via touch-probe signal at terminal X5/E1 ... X5/E4

E. g.: For accurate positioning over a mark signal after operation with a master frequency.



A TP input has been enabled during stand-by operation. When the TP signal occurs, the stand-by operation is aborted and the drive is reset to positioning. A positioning action follows comprising the TP residual distance and starting from the TP position. The positioning traverses the drive using the profile parameters of the PS. Only after positioning has been completed, the following PS functions will be processed.

Monitoring in stand-by operation

- Monitoring of the travel range limit switch is active (fault P01, P02).
- Monitoring of the position limit value is active (fault P04, P05).
- Endless operation is possible with relative positioning (1210 = 1). The position values (POS-SETPOS and POS-ACTPOS) are reset to 0 when reaching half the position limiting value; the current following error remains the same (no jerking).
- The following error monitoring of the positioning (P14, P15) is not active in stand-by operation.

Tip!

The stand-by operation is terminated when the program is reset (see program control) or manual operation is activated (see manual operation).

- Firmware version ≥2.5:
  - If the program is interrupted by CINH or QSP the stand-by operation is interrupted. After a renewed program start the stand-by operation will be continued.
  - New profile parameters can be accepted in the stand-by operation using PARAM-RD.
- Firmware version < 2.5:
  - If the program is interrupted by CINH (controller inhibit) or QSP (see program control) the stand-by operation will be continued. The stand-by operation cannot be aborted. The program must be restarted.
  - The profile parameters and override inputs are **not** read in anew.

7.5.13.6 Set position value

Purpose

- Shifting of the real measuring system during program processing

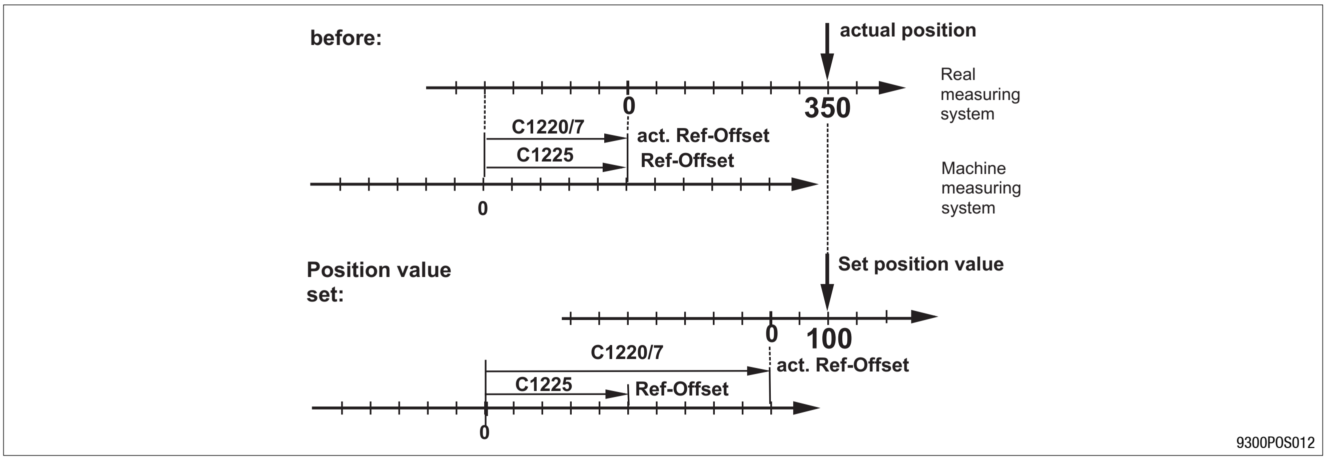


Fig. 7-39 Set position value

Function

- Selection of the function “Set position value” in PS under PS mode (C1311=5).
- The position setpoint (POS-SETPOS) is set to the target position selected in the PS.
- The actual position value (POS-ACTPOS) is set in order to keep the actual following error (no jerk).
- Setting the position value shifts the real zero; the actual reference offset (C1220/7) is changed. The actual reference offset does not correspond to the input value under C1225 anymore.
- The real zero can be shifted within the position limiting values (C1223, C1224). When exceeding these limits the error message “P08” (actual offset out of range) is set.

7.5.13.7 Prg. fct. “Wait for input”

Purpose

PS processing will not be continued before the selected digital input (POS-PFI) shows the level required.

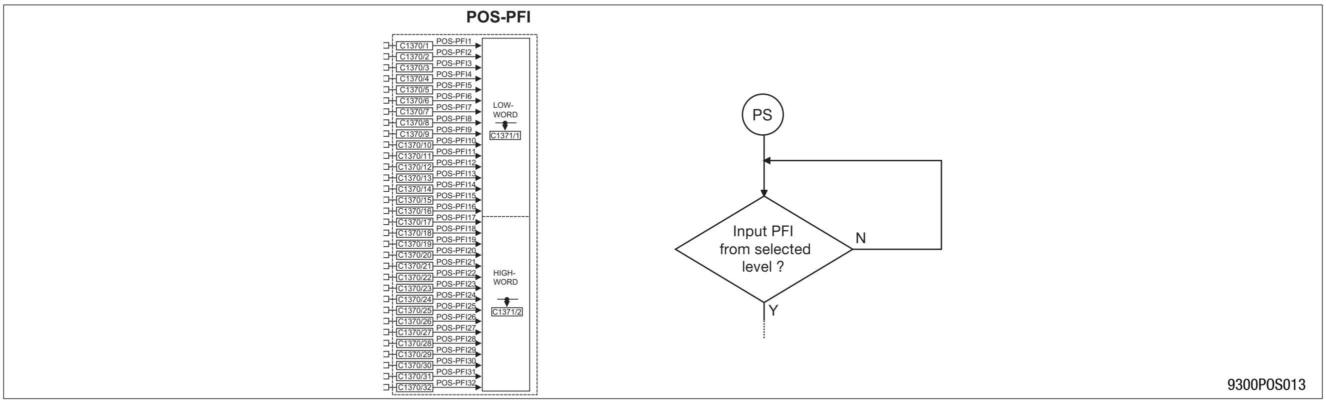


Fig. 7-40 Scheme - Wait for input

Function

- Selection of any PFI under C1318/x
- Selection of the required level under C1319/x.
- GDC input: Dialog “Programming”
- Default setting: not active

7.5.13.8 Prg. fct. “Switch output before positioning”

Purpose

Setting or resetting a digital output signal (POS-PFO), for instance, to control a machine function before positioning starts.

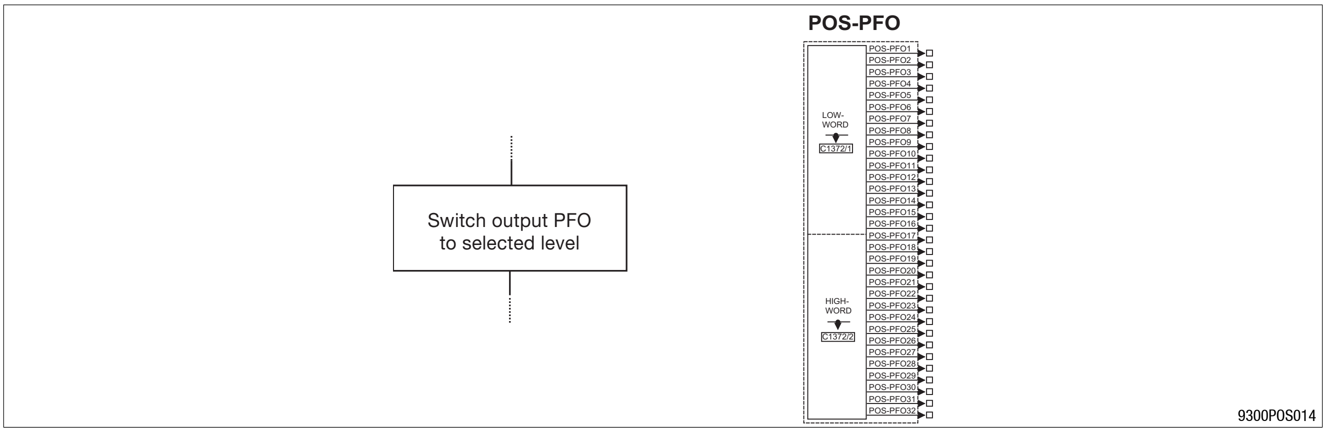


Fig. 7-41 Scheme - Switch output

Function

- Selection of any PFO under C1320/x. It is also possible to switch all PFO at the same time or in groups of 8.
- Selection of the signal level (setting or resetting) under C1321/x.
- 32 PFO are available (see POS-PFO).
- GDC input: Dialog “Programming”
- Default setting: not active

7.5.13.9 Prg. fct. “Switch output after positioning”

Purpose

Like “Switch output before positioning”.

Function

- Selection of any PFO under C1322/x. It is also possible to switch all PFO at the same time or in groups of 8.
- Selection of the signal level (setting or resetting) under C1323/x.
- 32 PFO are available (see POS-PFO).
- GDC input: Dialog “Programming”
- Default setting: not active

Tip!

If an output is to be set and reset before a positioning process, the output will not be switched , if no positioning has taken place or the target position has been reached in the same cycle. For remedy reset the output in one of the following PS’s. The output will then be switched for at least one cycle.

7.5.13.10 Prg. fct. “Waiting time”

Purpose

Continue program only after waiting time is over.

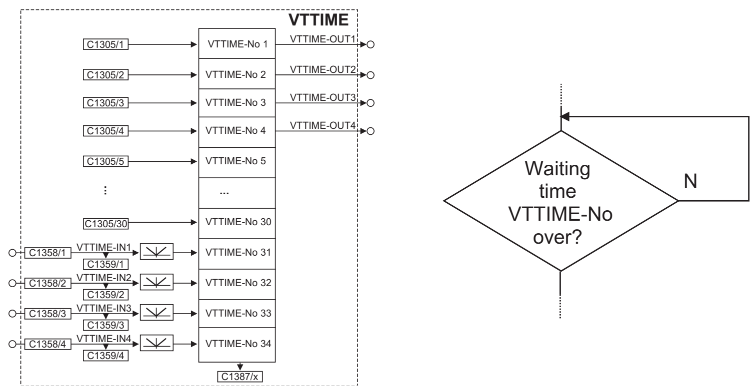


Fig. 7-42 Scheme - Waiting time

Function

- Waiting time selection from VTTIME under C1324/x.
- GDC input: Dialog “Programming”
- Default setting: not active

7.5.13.11 Prg. fct. "Branch 1"

Purpose

Branching during program processing depending on the digital input signals (PFI).

Branching because of conditional query of two variables (<, >, = <=, >=):

1. Comparison of two variables with function block "CMPPH" (7-109)
2. Connect the CMPPH output to the POS-PFI wanted.

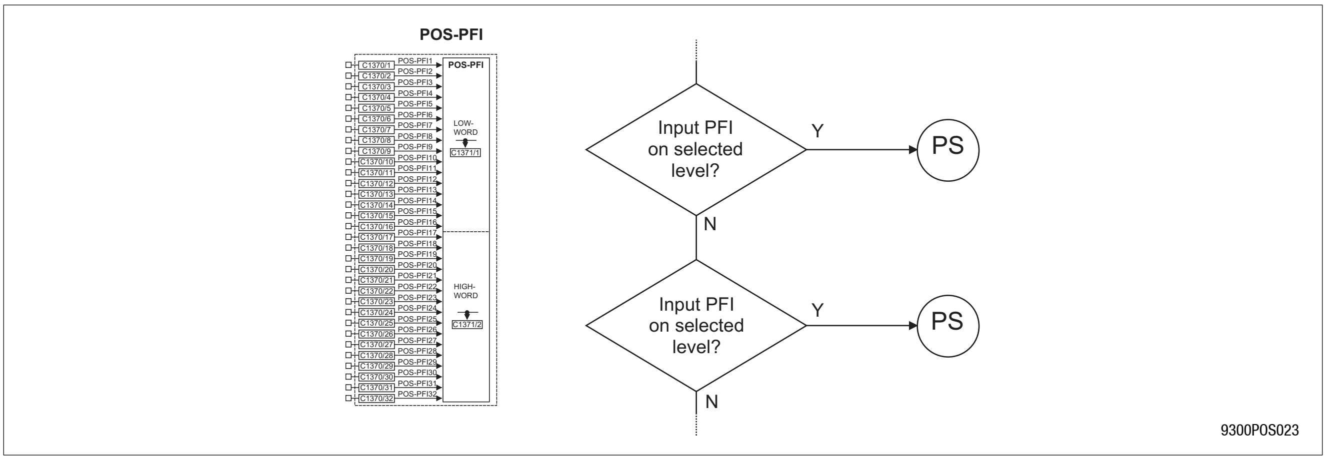


Fig. 7-43 Scheme - Branch 1 and 2

Function

- Selection of any PFI under C1325/x.
- Selection of the signal level under C1326/x.
- Selection of the PS to be branched to PS under C1327/x (if the PFI has the level selected).
- 32 PFO are available (see POS-PFO).
- GDC input: Dialog "Programming"
- Default setting: Not active

7.5.13.12 Prg. fct. "Branch 2"

Purpose

See branch 1

Function

- Selection of any PFI under C1334/x.
- Selection of the signal level under C1335/x.
- Selection of the PS to be branched to PS under C1336/x (if the PFI has the level selected).
- 32 PFO are available (see POS-PFO).
- GDC input: Dialog "Programming"
- Default setting: not active

7.5.13.13 Prg. fct. “Repetition function - No. of pieces”

Purpose

- Repeated repetition of the same PS or PS sequence.

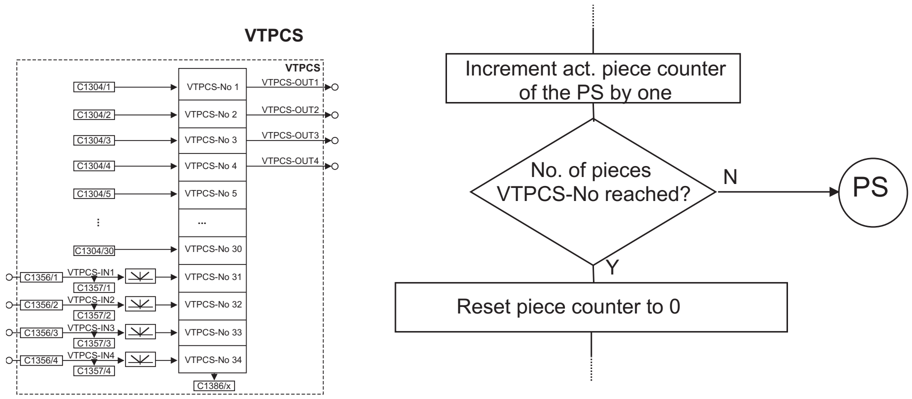


Fig. 7-44 Scheme - No. of pieces - Repetition function

Function

- Selection of a no. of pieces from VTPCS under C1328/x.
- Selection of the PS to be branched to as long as the no. of pieces is not reached under C1229/x.
- Each PS has its own piece counter. C1299/x indicates the current count.
- With every PS cycle the corresponding piece counter is increased by 1, starting from 0. Afterwards the setpoint and actual values are compared and branched accordingly, if the required no. of pieces has still not been reached. When the no. of pieces is reached, the piece counter is reset for the cycle and the piece number repetition function is terminated.
- “Program reset” resets all piece counters.
- GDC input: Dialog “Programming”
- Default setting: not active

7.5.13.14 Prg. fct. “Jump to next PS”

Purpose

- Link several PS in one program.

Fig. 7-45 Scheme - Jump to next PS

Function

- Selection of the next PS under C1349/x.
- GDC input: Dialog “Programming”
- Default setting: Program end

7.5.14 POS-TP (Touch-probe saving of the actual position value)

Purpose

- Saving of the actual position value (POS-ACTPOS) is interrupt-controlled, the reaction times are very short.
- The values saved are available as position-targets for positioning or, for instance, for length calculation with arithmetic function blocks.

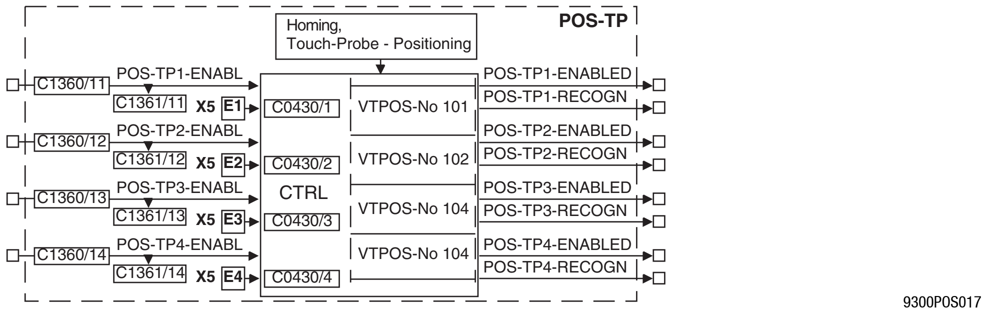


Fig. 7-46 Table inputs, outputs

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
POS-TP1-ENABL	d	C1361/11	bin	C1360/11	2	HIGH = activate TP saving
POS-TP2-ENABL	d	C1361/12	bin	C1360/12	2	HIGH = activate TP saving
POS-TP3-ENABL	d	C1361/13	bin	C1360/13	2	HIGH = activate TP saving
POS-TP4-ENABL	d	C1361/14	bin	C1360/14	2	HIGH = activate TP saving
POS-TP1-ENABLED	d	-	-	-	-	Indicates the enabling of the TP input
POS-TP1-RECOGN	d	-	-	-	-	TP signal detected at terminal X5/E1
POS-TP2-ENABLED	d	-	-	-	-	Indicates the enabling of the TP input
POS-TP2-RECOGN	d	-	-	-	-	TP signal detected at terminal X5/E2
POS-TP3-ENABLED	d	-	-	-	-	Indicates the enabling of the TP input
POS-TP3-RECOGN	d	-	-	-	-	TP signal detected at terminal X5/E3
POS-TP4-ENABLED	d	-	-	-	-	Indicates the enabling of the TP input
POS-TP4-RECOGN	d	-	-	-	-	TP signal detected at terminal X5/E4

Function

The following table positions are assigned to the TP inputs:

- TP1 $\triangleq$ X5/E1 and saves in table position VTPOS-No 101.
- TP2 $\triangleq$ X5/E2 and saves in table position VTPOS-No 102.
- TP3 $\triangleq$ X5/E3 and saves in table position VTPOS-No 103.
- TP4 $\triangleq$ X5/E4 and saves in table position VTPOS-No 104.

The following settings are required:

Code	Subcode	Function
C1215	1 ... 4	Determine signal edge for the initiator at the TP input. • 0 = LOW-HIGH edge • 1 = HIGH-LOW edge • Subcode 1 ... 4 for terminal X5/E1 ... X5/E4
C1360	11 ... 14	Configuration of a signal source to activate the TP input.

Procedure:

1. A LOW-HIGH edge at POS-ENABLE-TPx
   – switches POS-TPx-RECOGN = LOW.
   – switches POS-TPx-ENABLED = HIGH.
2. A signal edge at TP input terminal X5/Ex
   – switches POS-TPx-RECOGN = HIGH,
   – switches POS-TPx-ENABLED = LOW.
3. The actual position at POS-ACTPOS valid at this time is saved in VTPOS at the corresponding table position.
4. Another LOW-HIGH edge at POS-ENABLE-TPx
   – switches POS-TPx-RECOGN = LOW.
   – switches POS-TPx-ENABLED = HIGH.

Tip!

The function block POS-TP is part of POS. Therefore it is not necessary to explicitly transfer it to the processing.

TP positioning has priority over the POS-TP function. When the same TP input is used simultaneously, TP positioning takes precedence with regard to the TP enable (also see chapter 7.5.13.4).

7.5.15 POS-PFI (Program Function Inputs)

Purpose

- Input for digital signals for controlling user programs, e. g. initiators at the machine or switches in the keyboard.

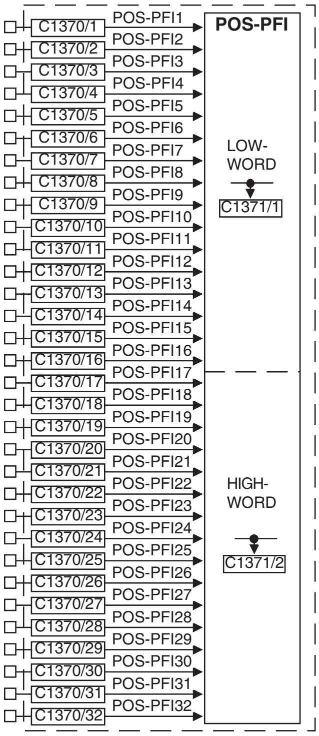


Fig. 7-47 POS-PFI, Program Function Inputs

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
POS-PFI1	d	-	-	C1370/1	2	-
...	d	-	-	...	2	-
POS-PFI32	d	-	-	C1370/32	2	-
LOW-WORD	-	C1371/1	hex	-	-	-
HIGH-WORD	-	C1371/2	hex	-	-	-

Function

- The PFI are evaluated during PS processing through the following program functions:
  “Wait for input”,
  “Branch 1” and
  “Branch 2”.
- 32 PFI available.
- The PFI can be linked to any number of digital signal sources (e.g. the digital input terminals (DIGIN), fieldbus control signals (AIF-IN) or system bus control signals (CAN-IN) (function block interconnection).

Tip!

The function block POS-PFI is part of POS. Therefore it is not necessary to explicitly transfer it to the processing.

7.5.16 POS-PFO (Program Function Outputs)

Purpose

- Output of digital signals for controlling machine functions and operating status displays, e. g. start slave drive or activate spray jet.

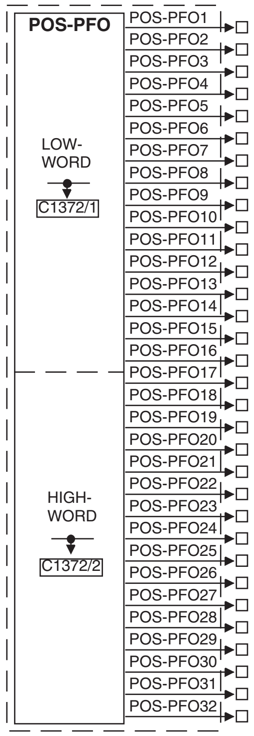


Fig. 7-48 POS-PFO, Program Function Outputs

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
POS-PF01	d	-	-	-	-	-
...	d	-	-	-	-	-
POS-PF032	d	-	-	-	-	-
LOW-WORD	-	C1372/1	hex	-	-	-
HIGH-WORD	-	C1372/2	hex	-	-	-

Function

- The PFO are switched during PS processing through the following program functions:
  “Switch output **before** positioning”,
  “Switch output **after** positioning”.
- PFO can be used as single PFOs, altogether or in groups of 8 PFOs.
- PFOs are available as digital signal sources. They can be output via digital output terminals (DIGOUT) (function block interconnection).

Tip!

The function block POS-PFO is part of POS. Therefore it is not necessary to explicitly transfer it to the processing.

7.5.17 Absolute value generator (ABS)

Purpose

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

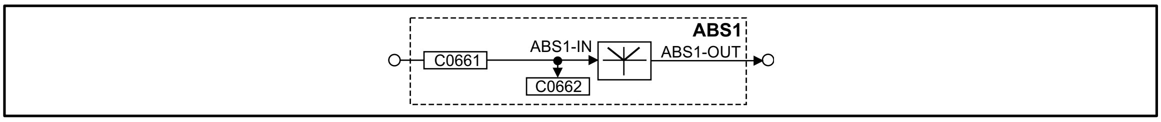


Fig. 7-49 Absolute value generator (ABS1)

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.

7.5.18 Addition block (ADD)

Purpose

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

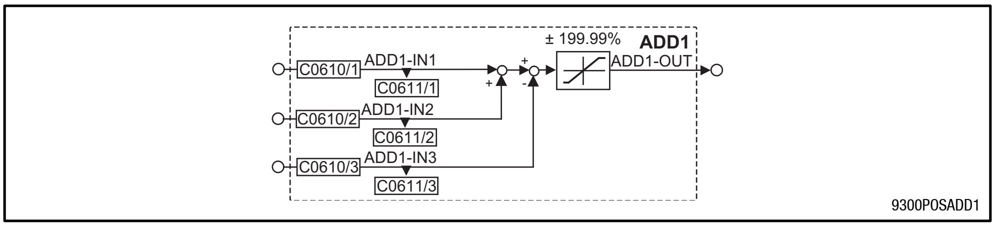


Fig. 7-50 Addition block (ADD1)

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 %.

7.5.19 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.

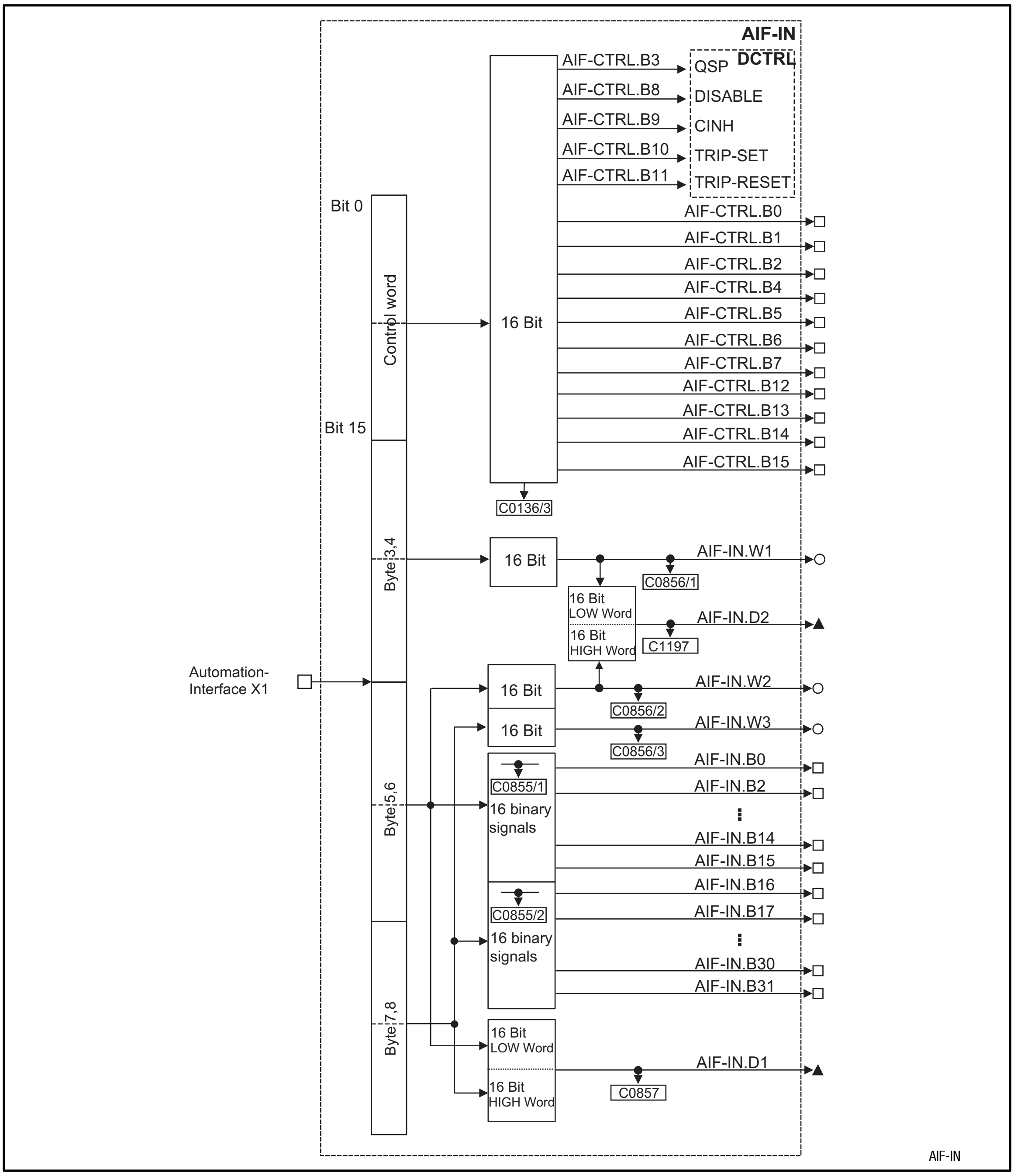


Fig. 7-51 Automation interface (AIF-IN)

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.

7.5.20 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.

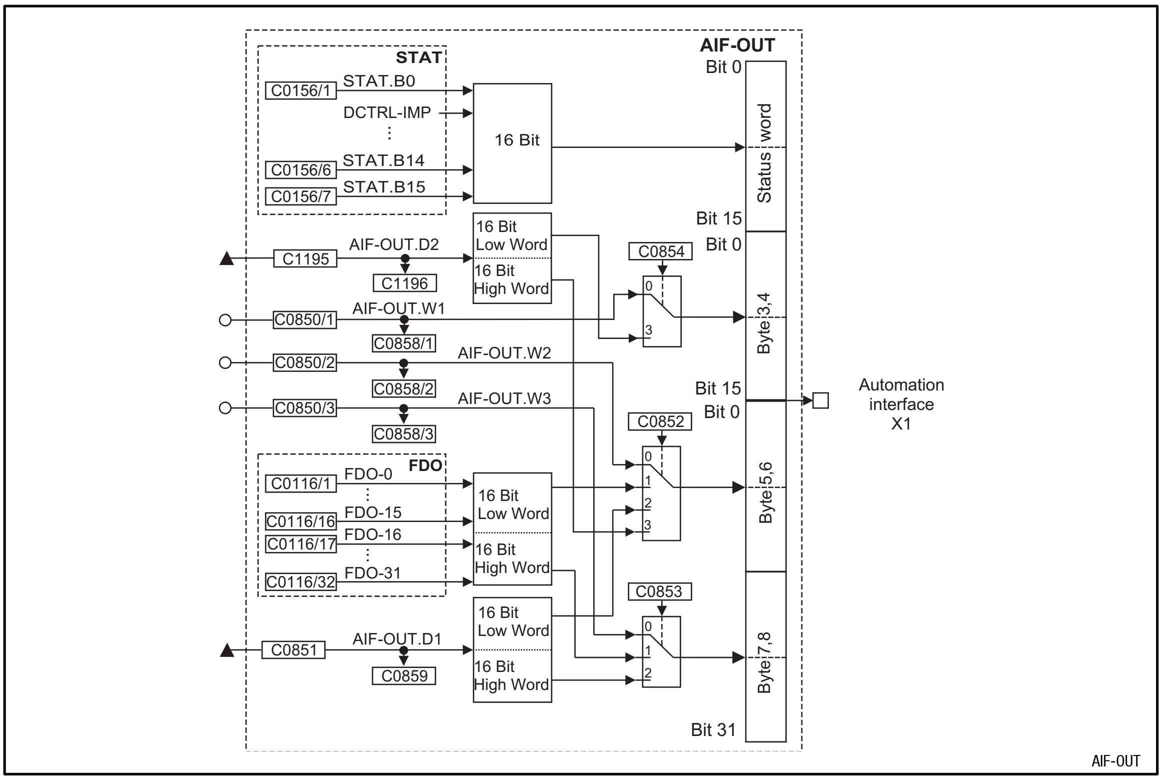


Fig. 7-52 Automation interface (AIF-OUT)

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 7.5.77)

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.

7.5.21 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.

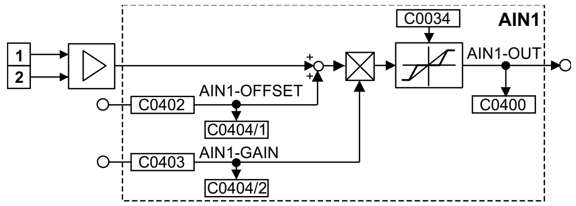


Fig. 7-53 Analog input via terminal 1,2 (AIN1)

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

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).

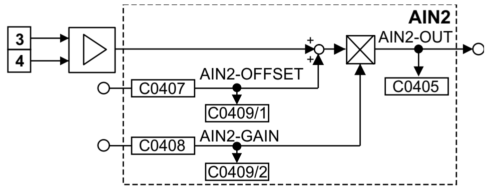


Fig. 7-54 Analog input via terminal 3, 4 (AIN2)

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	a	C0409/1	dec [%]	C0407	1	19503	-
AIN2-GAIN	a	C0409/2	dec [%]	C0408	1	19505	-
AIN2-OUT	a	-	-	-	-	-	-

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.

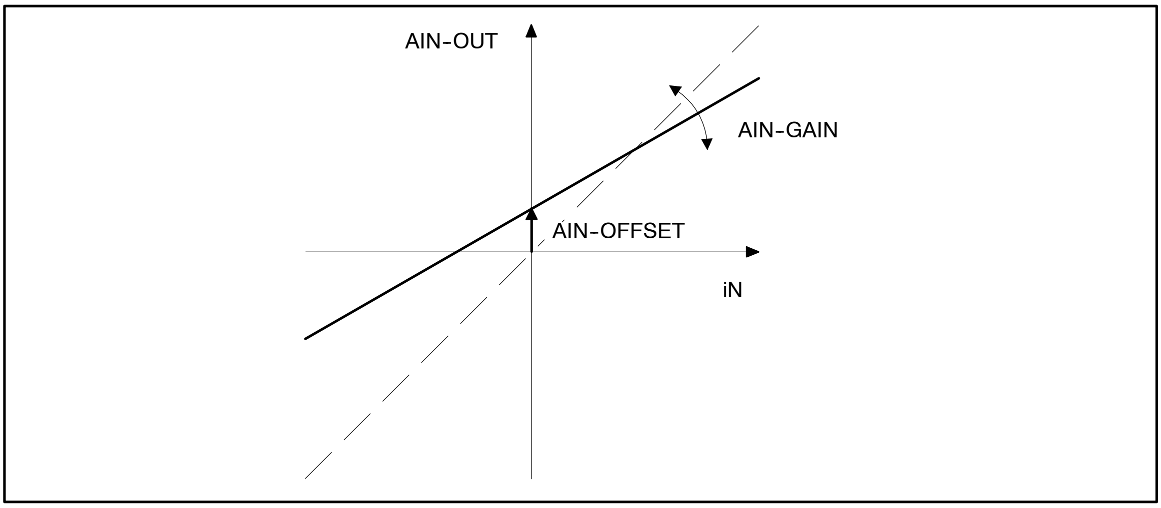


Fig. 7-55 Offset and gain of the analog input

7.5.22 AND operation (AND)

Purpose

With this function digital signals can be linked as an AND function. These links can be used to control functions or create status information.

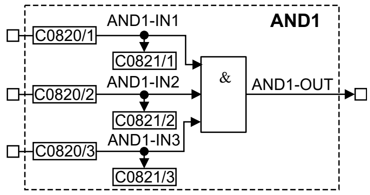


Fig. 7-56 AND function (AND1)

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	-	-	-	-	-	-

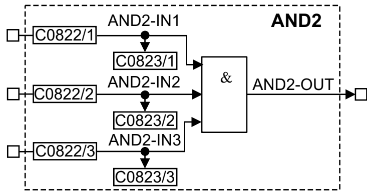


Fig. 7-57 AND function (AND2)

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	-	-	-	-	-	-

Function library

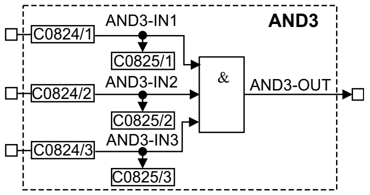


Fig. 7-58 AND function (AND3)

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	-	-	-	-	-	-

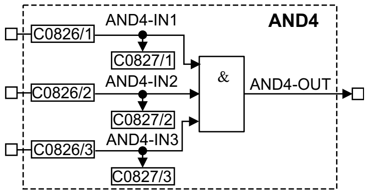


Fig. 7-59 AND function (AND4)

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	-	-	-	-	-	-

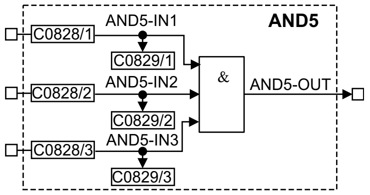


Fig. 7-60 AND function (AND5)

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	-	-	-	-	-	-

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.

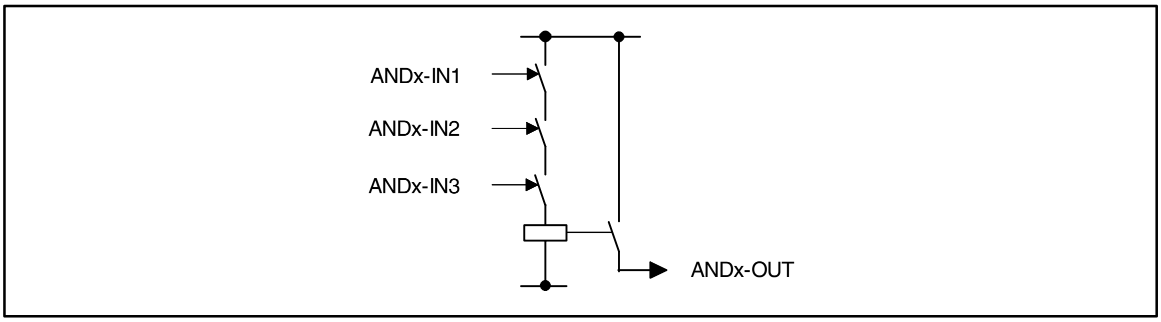


Fig. 7-61 AND function as a series connection of normally-open contacts

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.

7.5.23 Inverter (ANEG)

Purpose

This FB inverts the sign of an analog signal.

Two inverters are available:

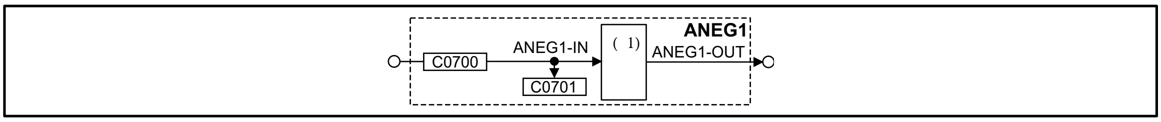


Fig. 7-62 Inverter (ANEG1)

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

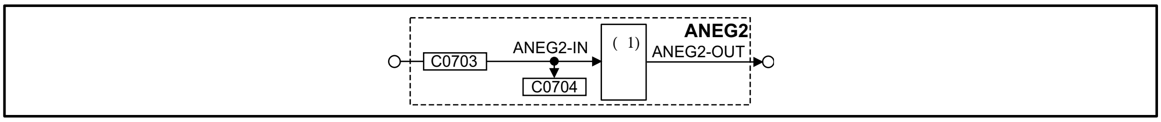


Fig. 7-63 Inverter (ANEG2)

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.

7.5.24 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.

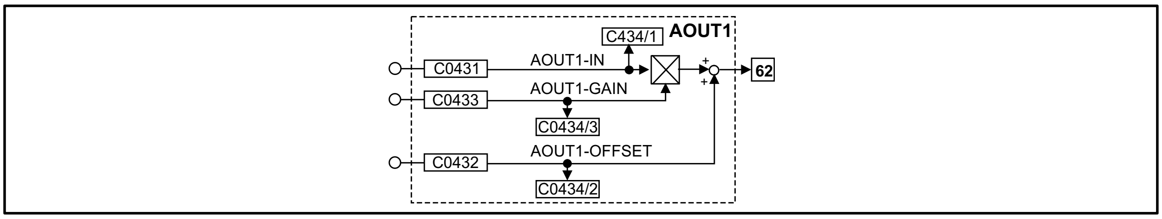


Fig. 7-64 Analog output via terminal X6/62 (AOUT1)

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	-

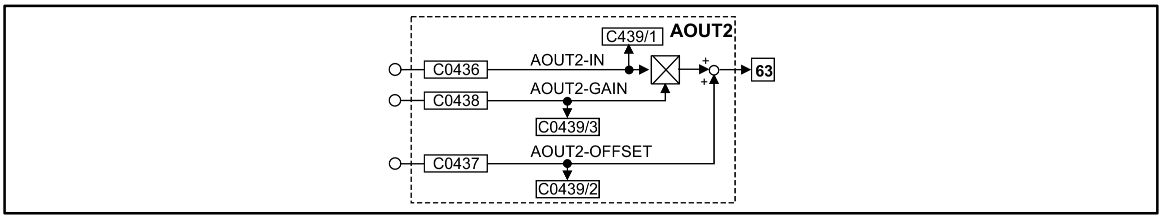


Fig. 7-65 Analog output via terminal X6/63 (AOUT2)

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 with 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

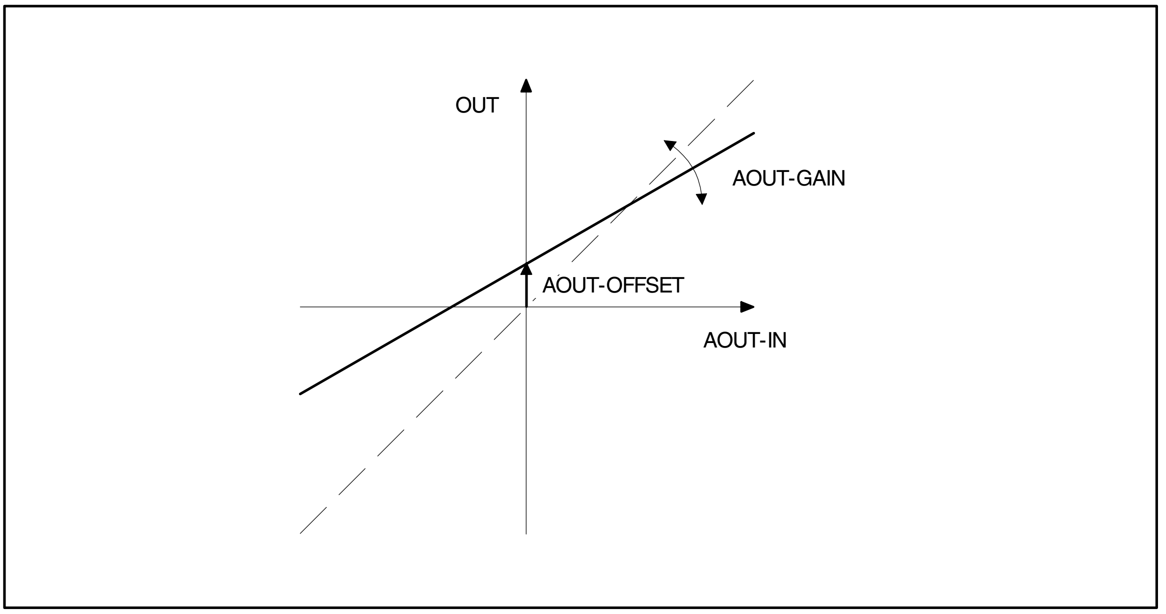


Fig. 7-66 Offset and gain of the analog output

7.5.25 Arithmetic block (ARIT)

Purpose

Logic operation of two "analog" signals.

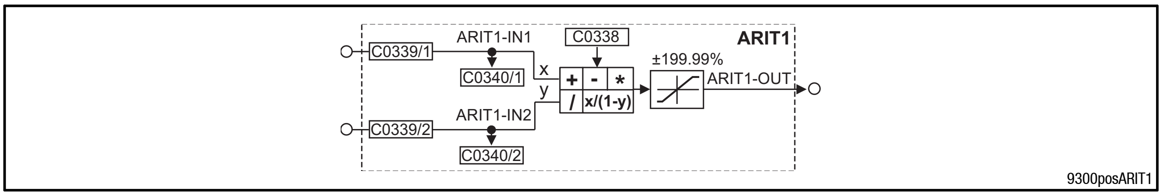


Fig. 7-67 Arithmetic block (ARIT1)

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 %

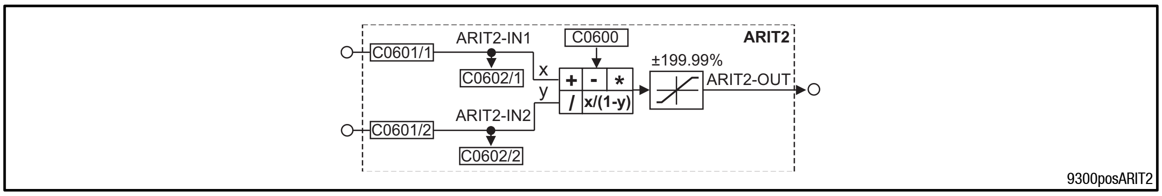


Fig. 7-68 Arithmetic block (ARIT2)

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

7.5.26 Arithmetic block (ARITPH)

Purpose

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

ARITPH1

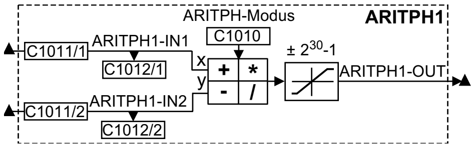


Fig. 7-69 Function block ARITPH1

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	-	-	-	-	

ARITPH2

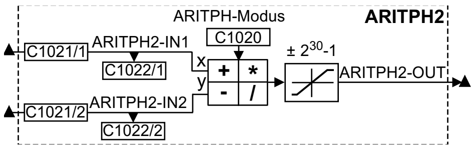


Fig. 7-70 Function block ARITPH2

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
ARITPH2-IN1	ph	C1022/1	dec [inc]	C1021/1	3	-
ARITPH2-IN2	ph	C1022/2	dec [inc]	C1021/2	3	-
ARITPH2-OUT	ph	-	-	-	-	

ARITPH3

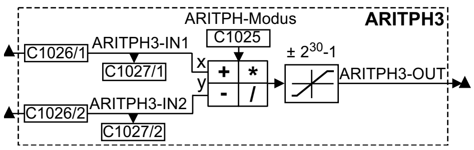


Fig. 7-71 Function block ARITPH3

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
ARITPH3-IN1	ph	C1027/1	dec [inc]	C1026/1	3	-
ARITPH3-IN2	ph	C1027/2	dec [inc]	C1026/2	3	-
ARITPH3-OUT	ph	-	-	-	-	

ARITPH4

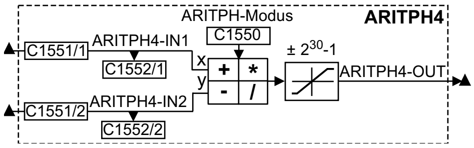


Fig. 7-72 Function block ARITPH4

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
ARITPH4-IN1	ph	C1552/1	dec [inc]	C1551/1	3	-
ARITPH4-IN2	ph	C1552/2	dec [inc]	C1551/2	3	-
ARITPH4-OUT	ph	-	-	-	-	

ARITPH5

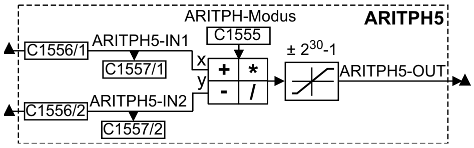


Fig. 7-73 Function block ARITPH5

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
ARITPH5-IN1	ph	C1557/1	dec [inc]	C1556/1	3	-
ARITPH5-IN2	ph	C1557/2	dec [inc]	C1556/2	3	-
ARITPH5-OUT	ph	-	-	-	-	

ARITPH6

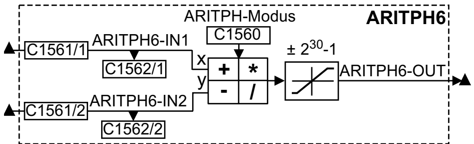


Fig. 7-74 Function block ARITPH6

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
ARITPH6-IN1	ph	C1562/1	dec [inc]	C1561/1	3	-
ARITPH6-IN2	ph	C1562/2	dec [inc]	C1561/2	3	-
ARITPH6-OUT	ph	-	-	-	-	

Function library

Function

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

Code	Selection number	Arithmetic function	Limitation	
ARITPH1: C1010 ARITPH2: C1020 ARITPH3: C1025 ARITPH4: C1550 ARITPH5: C1555 ARITPH6: C1560	0	OUT = IN1		Without limit
	1	OUT = IN1 + IN2	2^{30} -1	
	2	OUT = IN1 - IN2	2^{30} -1	
	3	OUT = (IN1 × IN2) ÷ 2^{30}	2^{30} -1	(Remainder not considered)
	13	OUT = IN1 × IN2	2^{31}	
	14	OUT = IN1 ÷ IN2	2^{30} -1	(Remainder not considered)
	15	OUT = IN1 % IN2		Remainder output (Modulo)
	21	OUT = IN1 + IN2	no limit	Without limit
	22	OUT = IN1 - IN2	no limit	Without limit

- The calculation is performed cyclically in the control program.

7.5.27 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.

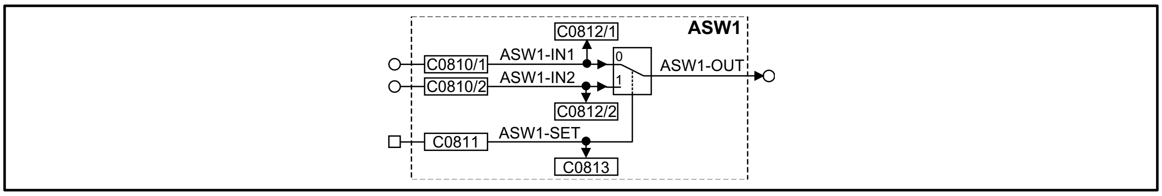


Fig. 7-75 Changeover switch for analog signals (ASW1)

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	-	-	-	-	-	-

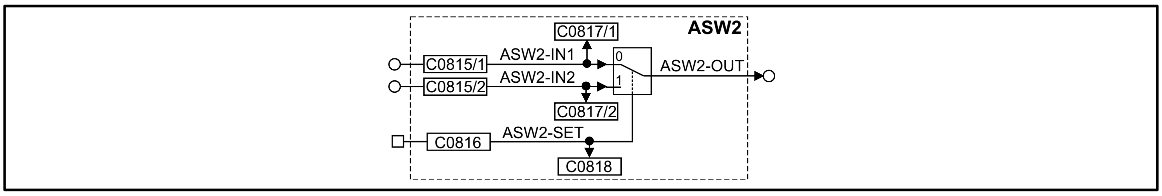


Fig. 7-76 Changeover switch for analog signals (ASW2)

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	-	-	-	-	-	-

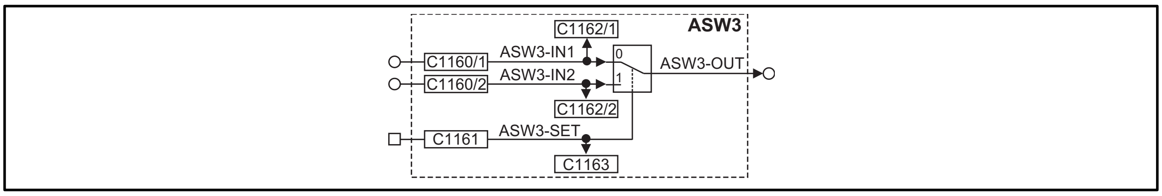


Fig. 7-77 Changeover switch for analog signals (ASW3)

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	-	-	-	-	-	-

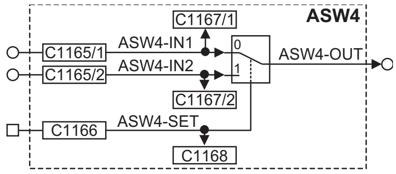


Fig. 7-78 Changeover switch for analog signals (ASW4)

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.

7.5.28 BCD decade switch (BCD)

Three FBs are available FB (BCD1 ... BCD3).

Purpose

Reads eight absolute value digits and a sign in binary coding and transmits it to a code.

Function library

BCD1

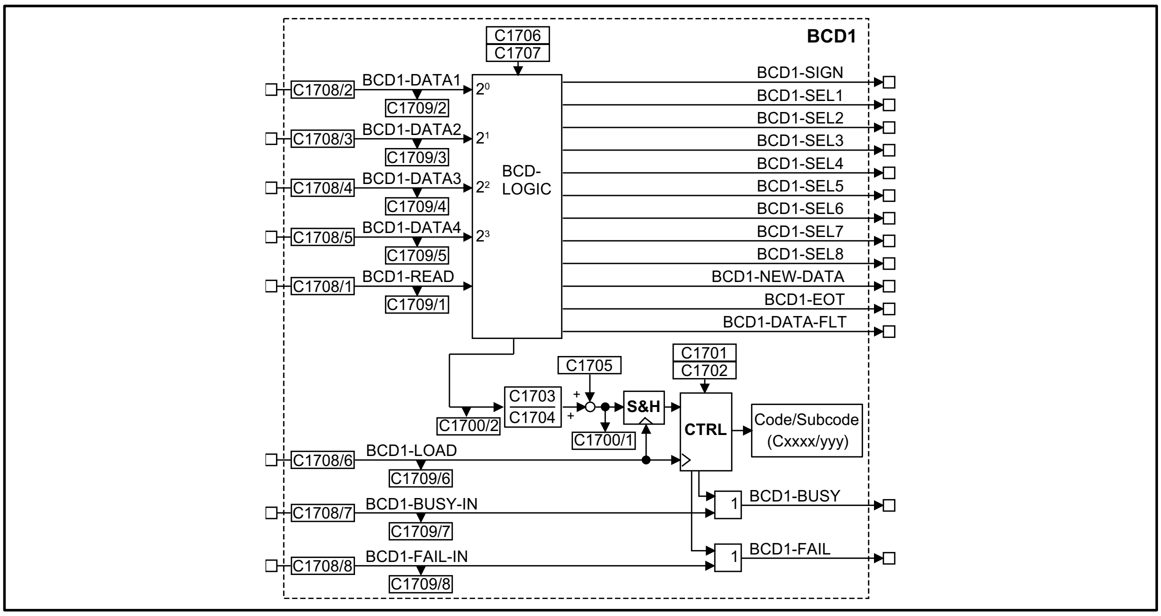


Fig. 7-79 Function block BCD1

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
BCD1-DATA1	d	C1709/2	bin	C1708/2	2	Data input (LSB)
BCD1-DATA2	d	C1709/3	bin	C1708/3	2	Data input
BCD1-DATA3	d	C1709/4	bin	C1708/4	2	Data input
BCD1-DATA4	d	C1709/5	bin	C1708/5	2	Data input (MSB).
BCD1-READ	d	C1709/1	bin	C1708/1	2	Only required for handshake mode: • Signal must be applied at the controller for at least 2 ms. • LOW-HIGH edge starts the data transmission for a BCD.
BCD1-LOAD	d	C1709/6	bin	C1708/6	2	LOW-HIGH edge = Write data to the code.
BCD1-BUSY-IN	d	C1709/7	bin	C1708/7	2	Generating a collective busy signal
BCD1-FAIL-IN	d	C1709/8	bin	C1708/8	2	Generating a collective fail signal
BCD1-SIGN	d	-	-	-	-	HIGH = Read sign.
BCD1-SEL1	d	-	-	-	-	HIGH = Read 1st BCD.
BCD1-SEL2	d	-	-	-	-	HIGH = Read 2nd BCD.
BCD1-SEL3	d	-	-	-	-	HIGH = Read 3rd BCD.
BCD1-SEL4	d	-	-	-	-	HIGH = Read 4th BCD.
BCD1-SEL5	d	-	-	-	-	HIGH = Read 5th BCD.
BCD1-SEL6	d	-	-	-	-	HIGH = Read 6th BCD.
BCD1-SEL7	d	-	-	-	-	HIGH = Read 7th BCD.
BCD1-SEL8	d	-	-	-	-	HIGH = Read 8th BCD.
BCD1-NEW-DATA	d	-	-	-	-	HIGH = BCD accepted, transmit next BCD.
BCD1-EOT	d	-	-	-	-	HIGH = all BCDs read or ”CANCEL” recognised.
BCD1-DATA-FLT	d	-	-	-	-	HIGH = BCD code (see chapter 7.5.28.1).
BCD1-BUSY	d	-	-	-	-	HIGH = Data are being transmitted to code.
BCD1-FAIL	d	-	-	-	-	HIGH = Data transmission to code is faulty.

Show/Hide Bookmarks

BCD2

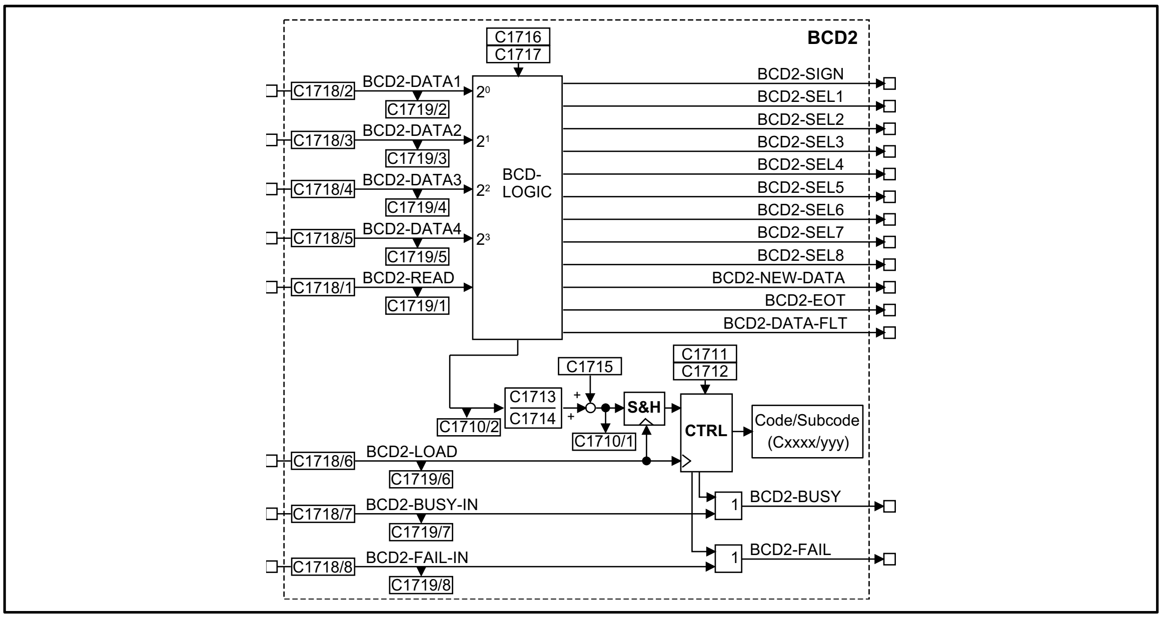


Fig. 7-80 Function block BCD2

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
BCD2-DATA1	d	C1719/2	bin	C1718/2	2	Data input (LSB)
BCD2-DATA2	d	C1719/3	bin	C1718/3	2	Data input
BCD2-DATA3	d	C1719/4	bin	C1718/4	2	Data input
BCD2-DATA4	d	C1719/5	bin	C1718/5	2	Data input (MSB)
BCD2-READ	d	C1719/1	bin	C1718/1	2	Only required for handshake mode: • Signal must be applied at the controller for at least 2 ms. • LOW-HIGH edge starts the data transmission for a BCD.
BCD2-LOAD	d	C1719/6	bin	C1718/6	2	LOW-HIGH edge = Write data to the code.
BCD2-BUSY-IN	d	C1719/7	bin	C1718/7	2	Generating a collective busy signal
BCD2-FAIL-IN	d	C1719/8	bin	C1718/8	2	Generating a collective fail signal
BCD2-SIGN	d	-	-	-	-	HIGH = Read sign.
BCD2-SEL1	d	-	-	-	-	HIGH = Read 1st BCD.
BCD2-SEL2	d	-	-	-	-	HIGH = Read 2nd BCD.
BCD2-SEL3	d	-	-	-	-	HIGH = Read 3rd BCD.
BCD2-SEL4	d	-	-	-	-	HIGH = Read 4th BCD.
BCD2-SEL5	d	-	-	-	-	HIGH = Read 5th BCD.
BCD2-SEL6	d	-	-	-	-	HIGH = Read 6th BCD.
BCD2-SEL7	d	-	-	-	-	HIGH = Read 7th BCD.
BCD2-SEL8	d	-	-	-	-	HIGH = Read 8th BCD.
BCD2-NEW-DATA	d	-	-	-	-	HIGH = BCD accepted, transmit next BCD.
BCD2-EOT	d	-	-	-	-	HIGH = all BCDs read or "CANCEL" recognised.
BCD2-DATA-FLT	d	-	-	-	-	HIGH = BCD code (see chapter 7.5.28.1).
BCD2-BUSY	d	-	-	-	-	HIGH = Data are being transmitted to code.
BCD2-FAIL	d	-	-	-	-	HIGH = Data transmission to code is faulty.

BCD3

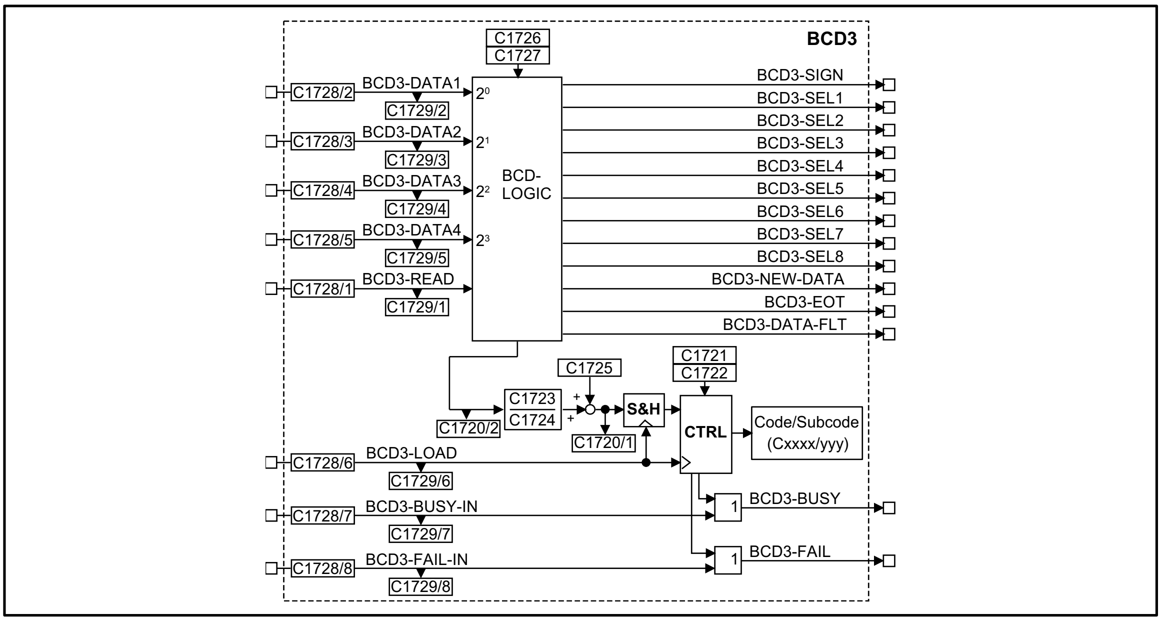


Fig. 7-81 Function block BCD3

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
BCD3-DATA1	d	C1729/2	bin	C1728/2	2	Data input (LSB)
BCD3-DATA2	d	C1729/3	bin	C1728/3	2	Data input
BCD3-DATA3	d	C1729/4	bin	C1728/4	2	Data input
BCD4-DATA4	d	C1729/5	bin	C1728/5	2	Data input (MSB)
BCD3-READ	d	C1729/1	bin	C1728/1	2	Only required for handshake mode: • Signal must be applied at the controller for at least 2 ms. • LOW-HIGH edge starts the data transmission for a BCD.
BCD3-LOAD	d	C1729/6	bin	C1728/6	2	LOW-HIGH edge = Write data to the code.
BCD3-BUSY-IN	d	C1729/7	bin	C1728/7	2	Generating a collective busy signal
BCD3-FAIL-IN	d	C1729/8	bin	C1728/8	2	Generating a collective fail signal
BCD3-SIGN	d	-	-	-	-	HIGH = Read sign.
BCD3-SEL1	d	-	-	-	-	HIGH = Read 1st BCD.
BCD3-SEL2	d	-	-	-	-	HIGH = Read 2nd BCD.
BCD3-SEL3	d	-	-	-	-	HIGH = Read 3rd BCD.
BCD3-SEL4	d	-	-	-	-	HIGH = Read 4th BCD.
BCD3-SEL5	d	-	-	-	-	HIGH = Read 5th BCD.
BCD3-SEL6	d	-	-	-	-	HIGH = Read 6th BCD.
BCD3-SEL7	d	-	-	-	-	HIGH = Read 7th BCD.
BCD3-SEL8	d	-	-	-	-	HIGH = Read 8th BCD.
BCD3-NEW-DATA	d	-	-	-	-	HIGH = BCD accepted, transmit next BCD.
BCD3-EOT	d	-	-	-	-	HIGH = all BCDs read or "CANCEL" recognised.
BCD3-DATA-FLT	d	-	-	-	-	HIGH = BCD code (see chapter 7.5.28.1).
BCD3-BUSY	d	-	-	-	-	HIGH = Data are being transmitted to code.
BCD3-FAIL	d	-	-	-	-	HIGH = Data transmission to code is faulty.

Overview of the codes for the evaluation of the read data and for the selection of the target code.

Function	BCD1	BCD2	BCD3
Output signal (DIS)	C1700/1	C1710/1	C1720/1
BCD result of the read data (DIS)	C1700/2	C1710/2	C1720/2
Target code	C1701	C1711	C1721
Subcode of the target code	C1702	C1712	C1722
Numerator (evaluation of the result)	C1703	C1713	C1723
Denominator (evaluation of the result)	C1704	C1714	C1724
Offset (evaluation of the result)	C1705	C1715	C1725

Function

- BCD decade switch
- Data inputs
- Signal processing
- ”CANCEL” function
- ”RESET” function
- BCD decade switch
- Complete BCD reading
- BCD mode

7.5.28.1 Data inputs

Evaluation of the read data:

<table>
<tr><th>BCDx-Datax
MSB ... LSB</th><th>BCD ABSOLUTE VALUE</th><th>BCD-SIGN</th></tr>
<tr><td>0000</td><td>0</td><td rowspan="8">(+)</td></tr>
<tr><td>0001</td><td>1</td></tr>
<tr><td>0010</td><td>2</td></tr>
<tr><td>0011</td><td>3</td></tr>
<tr><td>0100</td><td>4</td></tr>
<tr><td>0101</td><td>5</td></tr>
<tr><td>0110</td><td>6</td></tr>
<tr><td>0111</td><td>7</td></tr>
<tr><td>1000</td><td>8</td><td rowspan="2">(-)</td></tr>
<tr><td>1001</td><td>9</td></tr>
<tr><td>1010</td><td>CANCEL</td><td>CANCEL</td></tr>
<tr><td>1011</td><td>RESET</td><td>RESET</td></tr>
<tr><td>1100</td><td rowspan="4">BCD error</td><td rowspan="4">BCD error</td></tr>
<tr><td>1101</td></tr>
<tr><td>1110</td></tr>
<tr><td>1111</td></tr>
</table>

7.5.28.2 Signal processing

Reading the BCDs:

Output	Signal	Function
BCDx-EOT	LOW	Beginning of the BCD reading.
	HIGH	If • all 8 absolute value digits and the sign are transmitted or • ”CANCEL” has been identified.
BCDx-NEW-DATA	LOW	After a LOW-HIGH edge at BCD-READ.
	HIGH	After the transmission of a BCD is completed.
BCDx-DATA-FLT	HIGH	If ”BCD error” has been identified (see table in chapter 7.5.28.1).
BCDx-FAIL	HIGH	If • the permissible value range for the target code is exceeded or • BCDx-DATA-FLT = HIGH has occurred before.

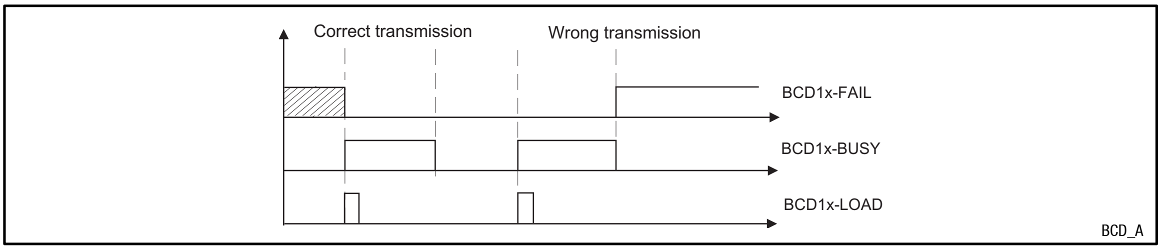


Fig. 7-82 Signal shape for FB BCD1 for the transmission to the target code

Transmission sequence of data to the target code:

Output	Signal	Function
BCDx-LOAD	LOW-HIGH edge	Transmits the signal to the target code.
BCDx-BUSY	HIGH	For the time of transmission
BCDx-FAIL	HIGH	If a transmission error occurs. Only another LOW-HIGH edge at BCDx-LOAD switches BCDx-FAIL = LOW. Transmission error: • No target code • No target subcode. • transmitted data are out of the target code limits. • ”BCD error” has been identified (BCDx-DATA-FLT = HIGH). • The target code is inhibited. Code can only be written when the controller is inhibited.

For the data conditioning for the target code see FB FEVAN. (🕮 7-204)

7.5.28.3 ”CANCEL” function

The identification for ”CANCEL” at the inputs BCDx-DATAx results in the following state:

Input/output	Signal	Function
BCDx-EOT	HIGH	Switches
BCDx-NEW-DATA	HIGH	Switches
-	-	Sets BCDs which are not yet read to zero and stops reading.
-	-	The inputs BCDx-DATAx expect the sign as the next BCD.

7.5.28.4 ”RESET” function

The identification for ”RESET” at the inputs BCDx-DATAx results in the following state:

Function	Input/output	Signal
Switches	BCDx-EOT	LOW
Switches	BCDx-DATA-FLT	LOW
Switches for a millisecond	BCDx-NEW-DATA	LOW
Switches if BCDx-FAIL-IN = LOW is switched at the same time (internal OR link).	BCDx-FAIL	LOW
Switches if BCDx-BUSY-IN = LOW is switched at the same time (internal OR link).	BCDx-BUSY	LOW
The inputs BCDx-DATAx expect the sign as the next BCD.	-	-
The BCD read last remains and can be transmitted to the target code.	-	-

7.5.28.5 BCD decade switch

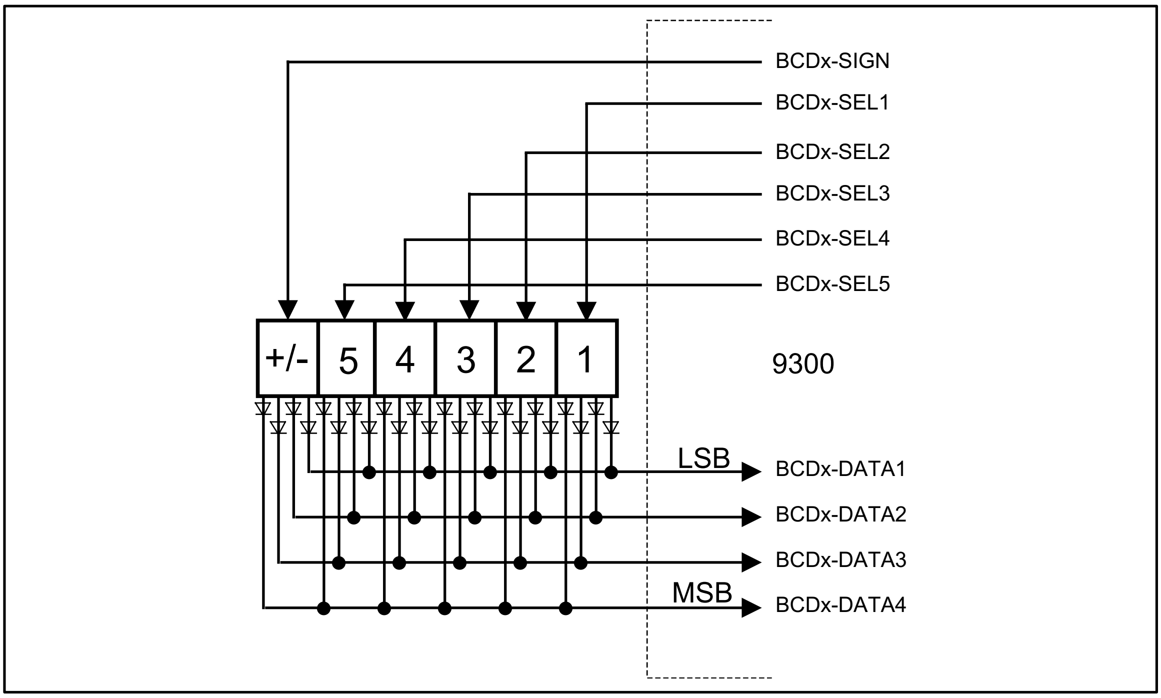


Fig. 7-83 Connection of a BCD decade switch

- The data outputs of the BCD decade switch must be decoupled via diodes. If necessary, use a terminal extension (via system bus CAN).
  – LENZE offers this terminal extension.

Function

A BCD is transmitted to the target code as follows:

Input/output	Signal	Function
BCDx-SELx or BCDx-SIGN	HIGH	Triggers the corresponding BCD decade switch. Reading and temporary storing of the BCD data to BCDx-DATA1 ... BCDx-DATA4.
BCDx-LOAD	LOW-HIGH edge	Writes BCD data to the target code.

7.5.28.6 Complete BCD reading

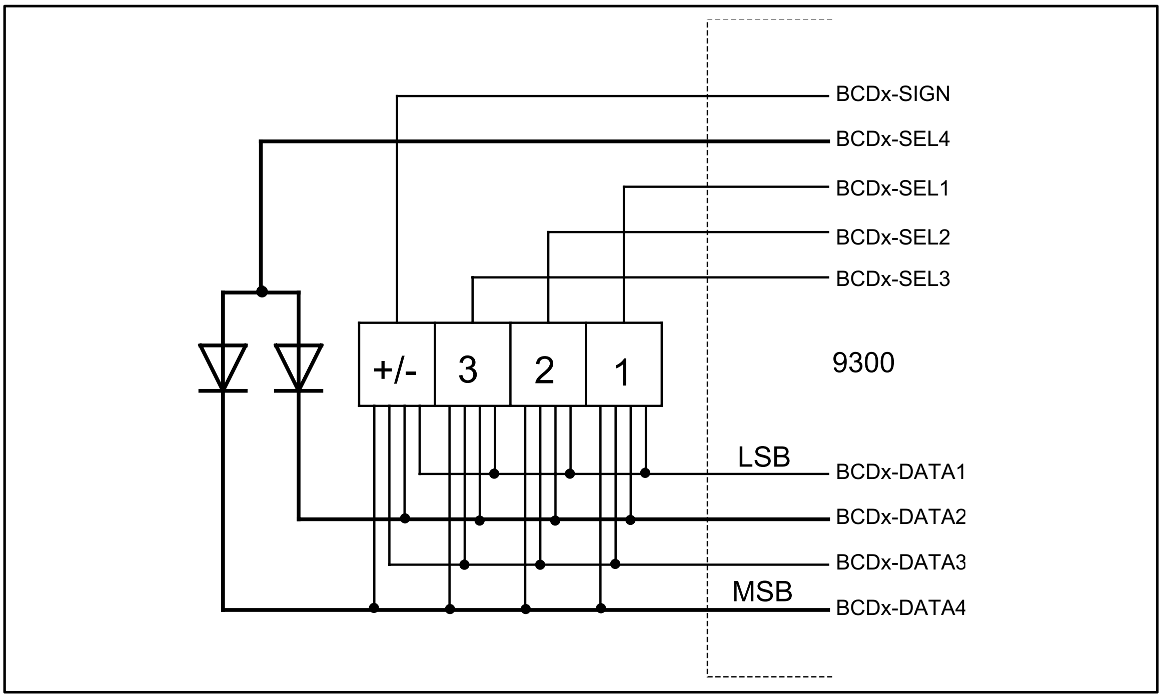


Fig. 7-84 Cancel after the 3rd absolute value digit (diode circuit)

Function

Reading can be shortened if BCDs are not required.

- The FB does not read the following BCDs if the value A_{hex} (1010_{bin}) for ”ABORT” is transmitted after a BCD has been read. The reading stops with the identification of ”ABORT”.
- In the case of the abort via a value digit, the least significant bit (LSB) is to be assigned with ”ABORT”, because the reading sequence stops at the least significant bit.
- In the handshake mode, ”CANCEL” should be identified at the beginning of the data transmission (see also the following chapter).

7.5.28.7 BCD mode

The BCD mode defines the type of BCD transmission (not the transmission to the target code).

Overview of the settings in the BCD mode:

Function	BCD1	BCD2	BCD3
BCD mode • 0 = no handshaking • 1 = handshaking	C1706	C1716	C1726
BCD delay in ms (only for data transmission without handshaking)	C1707	C1717	C1727

No handshaking, minimum wiring

Set BCD mode = 0.

Function

- Cyclic reading of BCDs
  - No acceptance signal (BCDx-READ), e.g. for reading a BCD decade switch required.
- Set BCD delay (see table)
  - Defines the period between reading the individual BCDs. The setting may be necessary if a bus system provides the data transfer between the BCD decade switch and the FB BCDx (e.g. terminal extension via system bus).
  - The bus system used, the baud rate, and the bus load determine the time to be set.

The BCDs are read in the following sequence:

1. Sign
2. BCD 1
3. BCD 2
4. etc.

With handshaking, minimum wiring

Set BCD mode = 1.

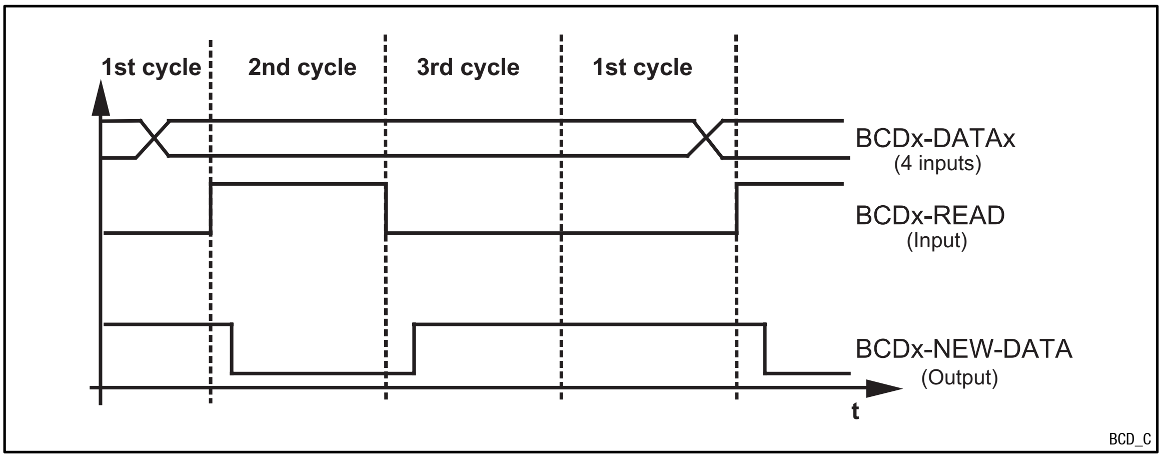


Fig. 7-85 Sequence of handshaking

Function

- The superimposed control (e.g. PLC) determines the time of data transmission.
- After the acceptance signal has been sent from the control to BCDx-READ the BCD is read.
  – The signal must be sent for every BCD.
  – The reading routine of the FB BCD remains in waiting position until the data transmission is started.

The BCDs are read in the following sequence:

1. Sign
2. BCD 1
3. BCD 2
4. etc.

Transmission sequence of a BCD:

Input/output	Signal	Function
BCDx-DATA1 ... BCDx-DATA4		Generating data for the first or next BCD via PLC.
BCDx-NEW-DATA	HIGH	Enables the transmission for the next BCD.
BCDx-READ	LOW-HIGH edge	Reading of the BCD data to the FB BCD.
BCDx-NEW-DATA	LOW	Inhibits the transmission for the next BCD.
BCDx-READ	LOW	Set via PLC.

7.5.29 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:

5. Set C0172 = 0 V
6. 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

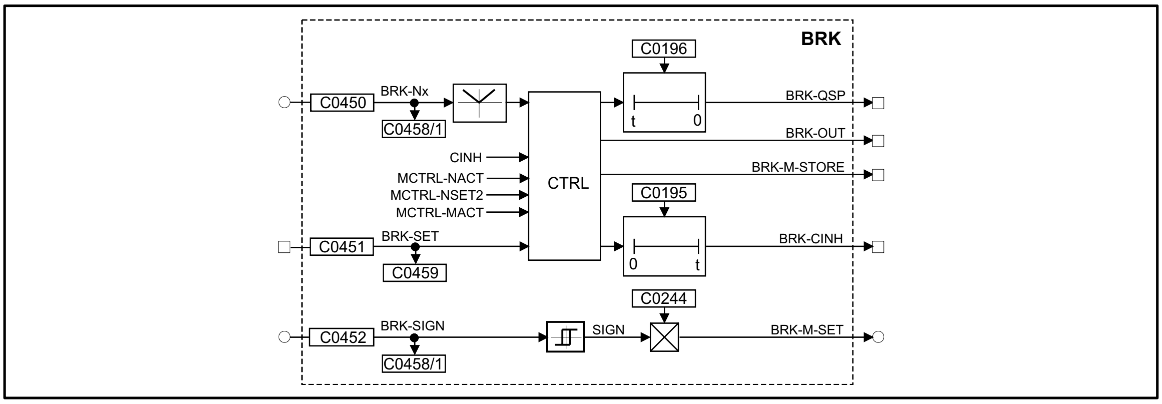


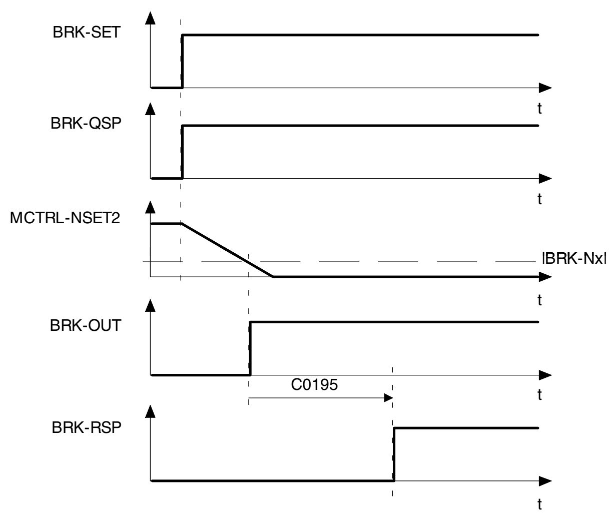
Fig. 7-86 Holding brake (BRK)

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 engaging time
BRK-T-RELEASE	a	-	dec	C0196	-	0.0	Brake application time

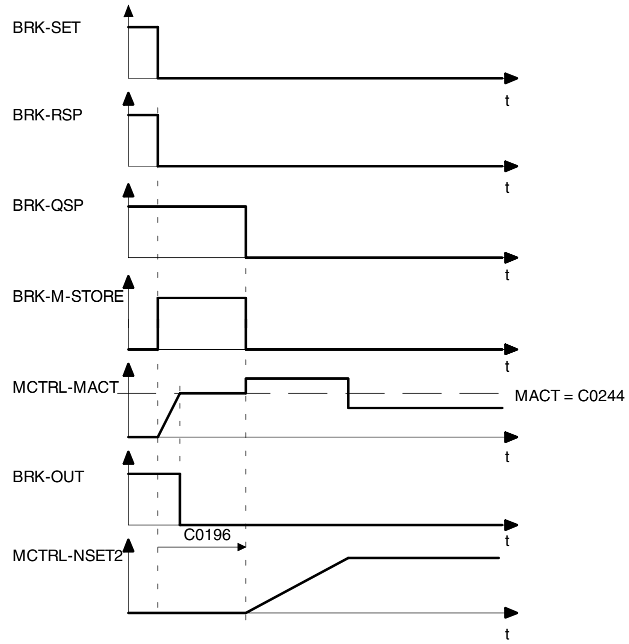
Function

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

7.5.29.1 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).	

7.5.29.2 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.	

7.5.29.3 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".

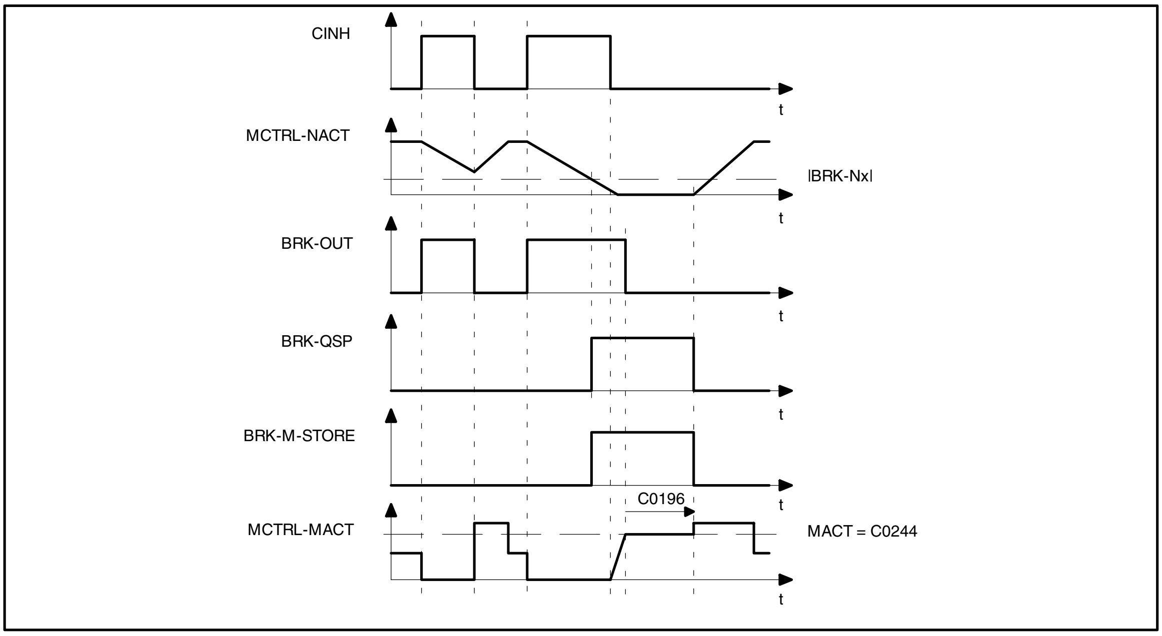


Fig. 7-87 Control brake by CINH

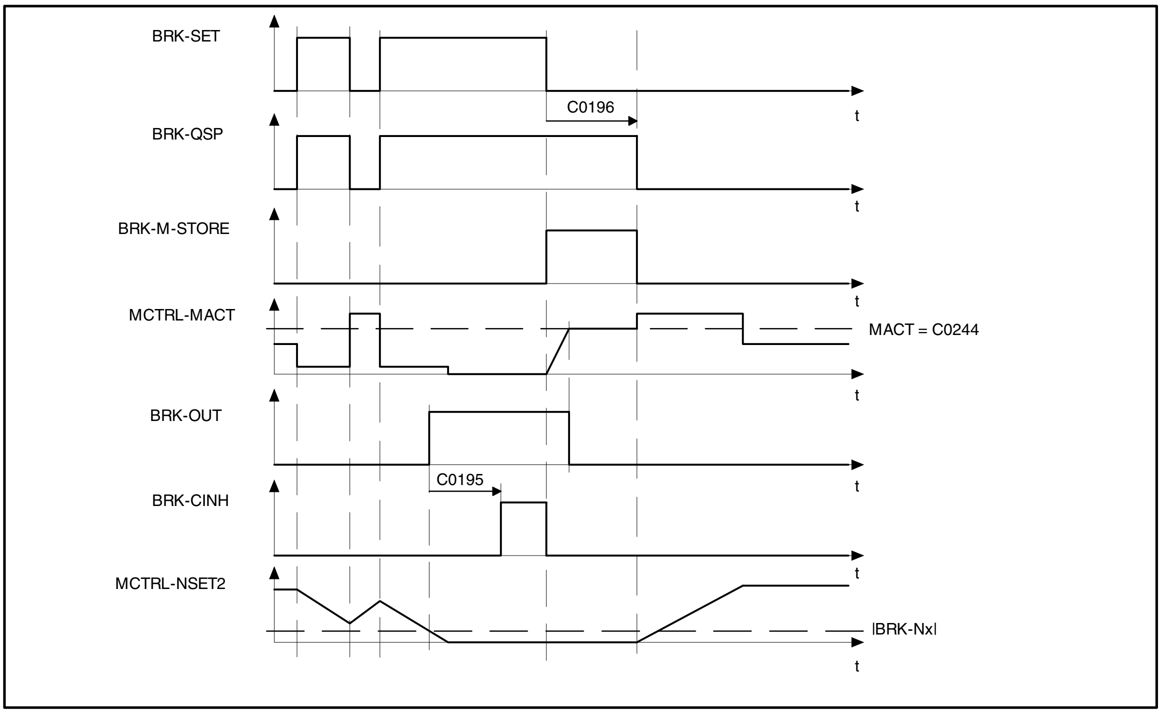


Fig. 7-88 Switching cycle when braking

7.5.30 System bus (CAN-IN)

Purpose

Interface for input signals from the system bus for setpoints and actual values as binary, analog, or phase information.

CAN-IN1

The process data object CAN-IN1 is intended for the transfer of process data and provides the communication with a higher-level host system.

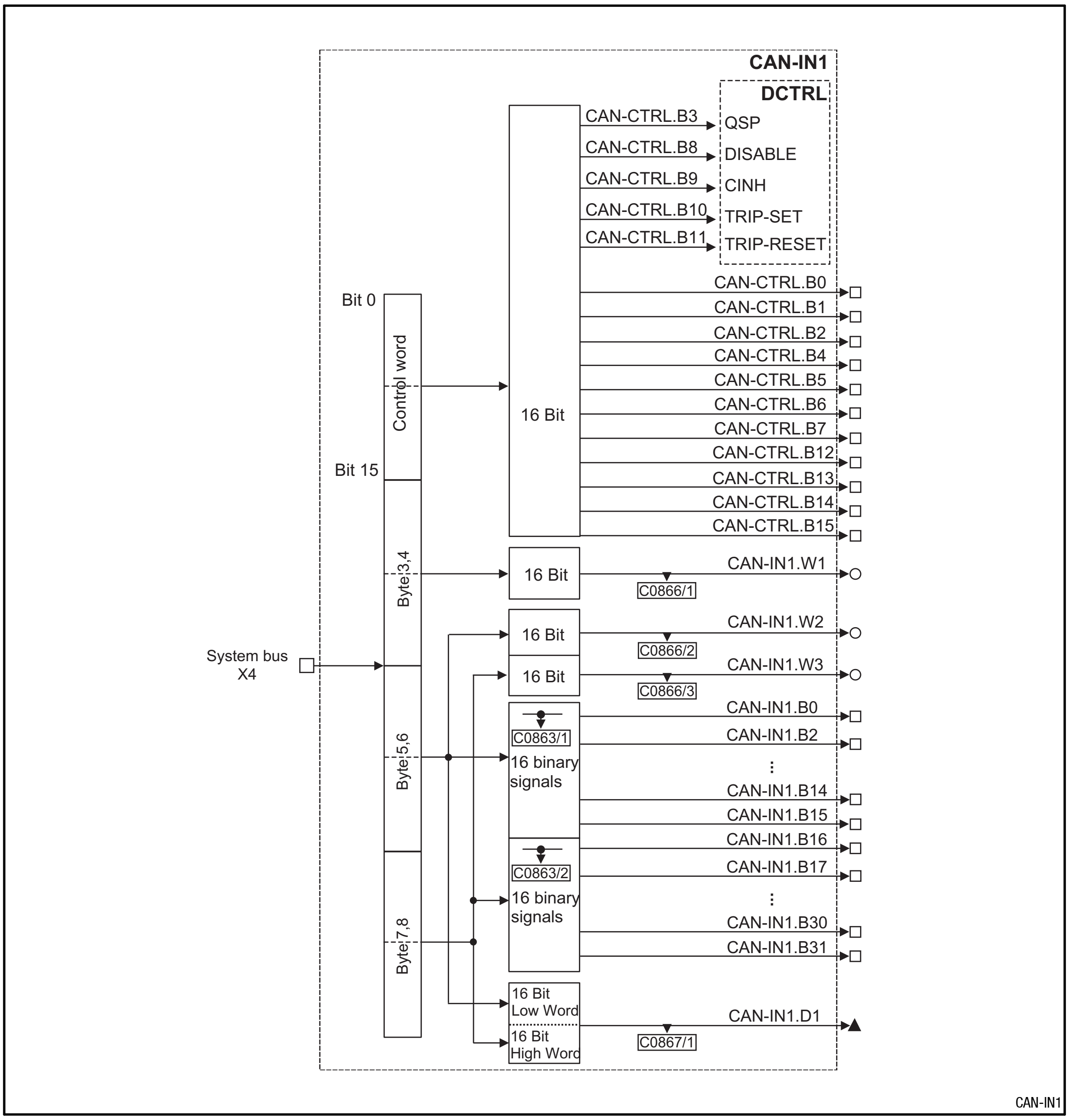


Fig. 7-89 System bus (CAN-IN1)

Function library

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CAN-CTRL.B0	d	C0136/2	bin	-	-	-	
CAN-CTRL.B1	d	C0136/2	bin	-	-	-	
CAN-CTRL.B2	d	C0136/2	bin	-	-	-	
CAN-CTRL.B4	d	C0136/2	bin	-	-	-	
CAN-CTRL.B5	d	C0136/2	bin	-	-	-	
CAN-CTRL.B6	d	C0136/2	bin	-	-	-	
CAN-CTRL.B7	d	C0136/2	bin	-	-	-	
CAN-CTRL.B12	d	C0136/2	bin	-	-	-	
CAN-CTRL.B13	d	C0136/2	bin	-	-	-	
CAN-CTRL.B14	d	C0136/2	bin	-	-	-	
CAN-CTRL.B15	d	C0136/2	bin	-	-	-	
CAN-IN1.W1	a	C0866/1	dec [%]	-	-	-	+16384 = +100 %
CAN-IN1.W2	a	C0866/2	dec [%]	-	-	-	+16384 = +100 %
CAN-IN1.W3	a	C0866/3	dec [%]	-	-	-	+16384 = +100 %
CAN-IN1.D1	ph	C0867/1	dec [inc]	-	-	-	65536 = 1 rev.
CAN-IN1.B0	d	C0863/1	hex	-	-	-	
CAN-IN1.B1	d	C0863/1	hex	-	-	-	
CAN-IN1.B2	d	C0863/1	hex	-	-	-	
CAN-IN1.B3	d	C0863/1	hex	-	-	-	
CAN-IN1.B4	d	C0863/1	hex	-	-	-	
CAN-IN1.B5	d	C0863/1	hex	-	-	-	
CAN-IN1.B6	d	C0863/1	hex	-	-	-	
CAN-IN1.B7	d	C0863/1	hex	-	-	-	
CAN-IN1.B8	d	C0863/1	hex	-	-	-	
CAN-IN1.B9	d	C0863/1	hex	-	-	-	
CAN-IN1.B10	d	C0863/1	hex	-	-	-	
CAN-IN1.B11	d	C0863/1	hex	-	-	-	
CAN-IN1.B12	d	C0863/1	hex	-	-	-	
CAN-IN1.B13	d	C0863/1	hex	-	-	-	
CAN-IN1.B14	d	C0863/1	hex	-	-	-	
CAN-IN1.B15	d	C0863/1	hex	-	-	-	
CAN-IN1.B16	d	C0863/2	hex	-	-	-	
CAN-IN1.B17	d	C0863/2	hex	-	-	-	
CAN-IN1.B18	d	C0863/2	hex	-	-	-	
CAN-IN1.B19	d	C0863/2	hex	-	-	-	
CAN-IN1.B20	d	C0863/2	hex	-	-	-	
CAN-IN1.B21	d	C0863/2	hex	-	-	-	
CAN-IN1.B22	d	C0863/2	hex	-	-	-	
CAN-IN1.B23	d	C0863/2	hex	-	-	-	
CAN-IN1.B24	d	C0863/2	hex	-	-	-	
CAN-IN1.B25	d	C0863/2	hex	-	-	-	
CAN-IN1.B26	d	C0863/2	hex	-	-	-	
CAN-IN1.B27	d	C0863/2	hex	-	-	-	
CAN-IN1.B28	d	C0863/2	hex	-	-	-	
CAN-IN1.B29	d	C0863/2	hex	-	-	-	
CAN-IN1.B30	d	C0863/2	hex	-	-	-	
CAN-IN1.B31	d	C0863/2	hex	-	-	-	

Function

The input signals of the 8-byte user data of this 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 CAN-IN1.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.

CAN-IN2

The process data object CAN-IN2 provides the event-controlled transfer of process data and the communication among the controllers. However, decentralised inputs can also be evaluated.

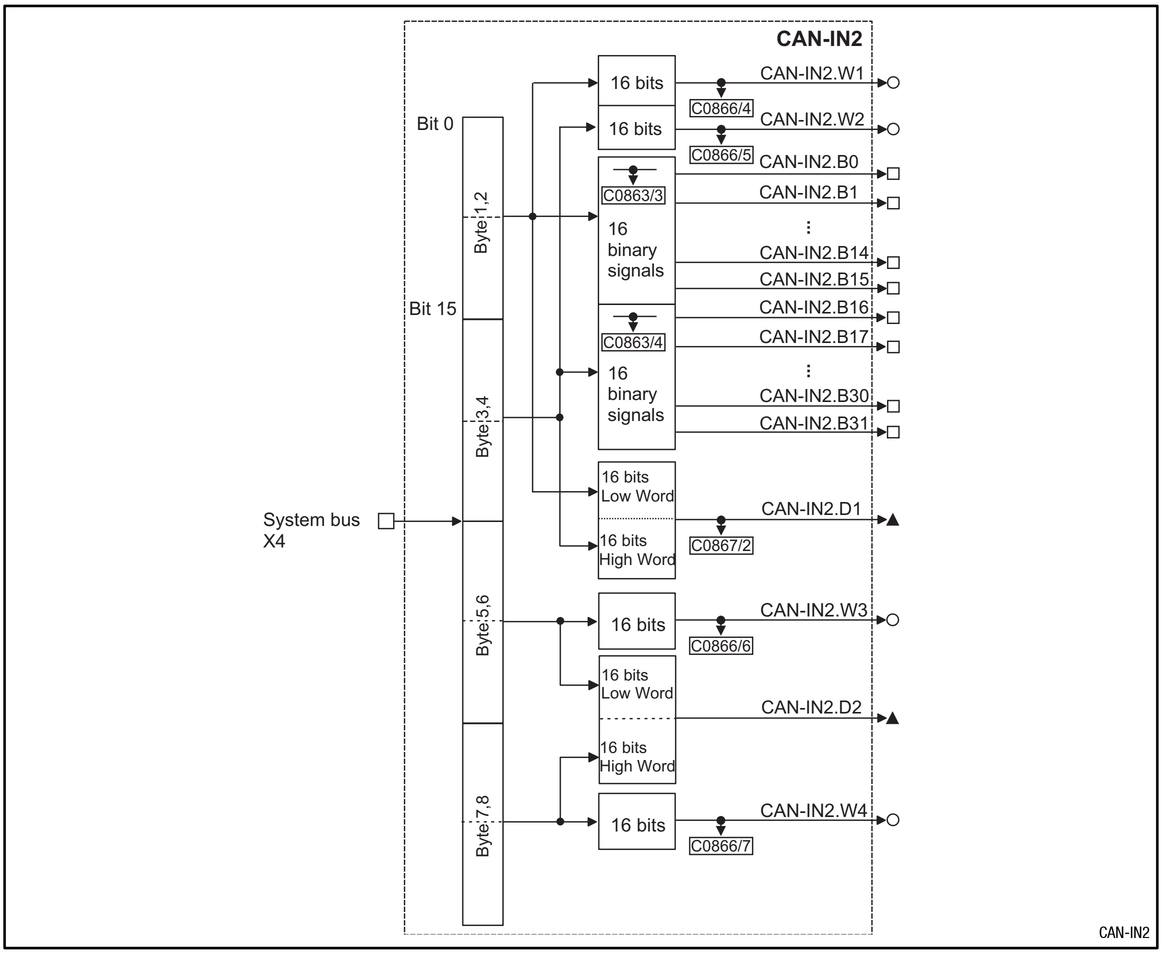


Fig. 7-90 System bus (CAN-IN2)

Function library

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CAN-IN2.W1	a	C0866/4	dec [%]	-	-	-	+16384 = +100 %
CAN-IN2.W2	a	C0866/5	dec [%]	-	-	-	+16384 = +100 %
CAN-IN2.W3	a	C0866/6	dec [%]	-	-	-	+16384 = +100 %
CAN-IN2.W4	a	C0866/7	dec [%]	-	-	-	+16384 = +100 %
CAN-IN2.D1	ph	C0867/2	dec [inc]	-	-	-	65536 = 1 rev.
CAN-IN2.B0	d	C0863/3	hex	-	-	-	
CAN-IN2.B1	d	C0863/3	hex	-	-	-	
CAN-IN2.B2	d	C0863/3	hex	-	-	-	
CAN-IN2.B3	d	C0863/3	hex	-	-	-	
CAN-IN2.B4	d	C0863/3	hex	-	-	-	
CAN-IN2.B5	d	C0863/3	hex	-	-	-	
CAN-IN2.B6	d	C0863/3	hex	-	-	-	
CAN-IN2.B7	d	C0863/3	hex	-	-	-	
CAN-IN2.B8	d	C0863/3	hex	-	-	-	
CAN-IN2.B9	d	C0863/3	hex	-	-	-	
CAN-IN2.B10	d	C0863/3	hex	-	-	-	
CAN-IN2.B11	d	C0863/3	hex	-	-	-	
CAN-IN2.B12	d	C0863/3	hex	-	-	-	
CAN-IN2.B13	d	C0863/3	hex	-	-	-	
CAN-IN2.B14	d	C0863/3	hex	-	-	-	
CAN-IN2.B15	d	C0863/3	hex	-	-	-	
CAN-IN2.B16	d	C0863/4	hex	-	-	-	
CAN-IN2.B17	d	C0863/4	hex	-	-	-	
CAN-IN2.B18	d	C0863/4	hex	-	-	-	
CAN-IN2.B19	d	C0863/4	hex	-	-	-	
CAN-IN2.B20	d	C0863/4	hex	-	-	-	
CAN-IN2.B21	d	C0863/4	hex	-	-	-	
CAN-IN2.B22	d	C0863/4	hex	-	-	-	
CAN-IN2.B23	d	C0863/4	hex	-	-	-	
CAN-IN2.B24	d	C0863/4	hex	-	-	-	
CAN-IN2.B25	d	C0863/4	hex	-	-	-	
CAN-IN2.B26	d	C0863/4	hex	-	-	-	
CAN-IN2.B27	d	C0863/4	hex	-	-	-	
CAN-IN2.B28	d	C0863/4	hex	-	-	-	
CAN-IN2.B29	d	C0863/4	hex	-	-	-	
CAN-IN2.B30	d	C0863/4	hex	-	-	-	
CAN-IN2.B31	d	C0863/4	hex	-	-	-	

Function

The input signals of the 8-byte user data of this AIF object are converted into corresponding signal types. The signals can be used via further function blocks.

Byte 1, 2, 3, and 4

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.

Byte 5 and 6

form the signal to CAN-IN2.W3.

Byte 7 and 8

form the signal to CAN-IN2.W4.

CAN-IN3

The process data object CAN-IN3 provides the event-controlled transfer of process data and the communication among the controllers. However, decentralised inputs can also be evaluated.

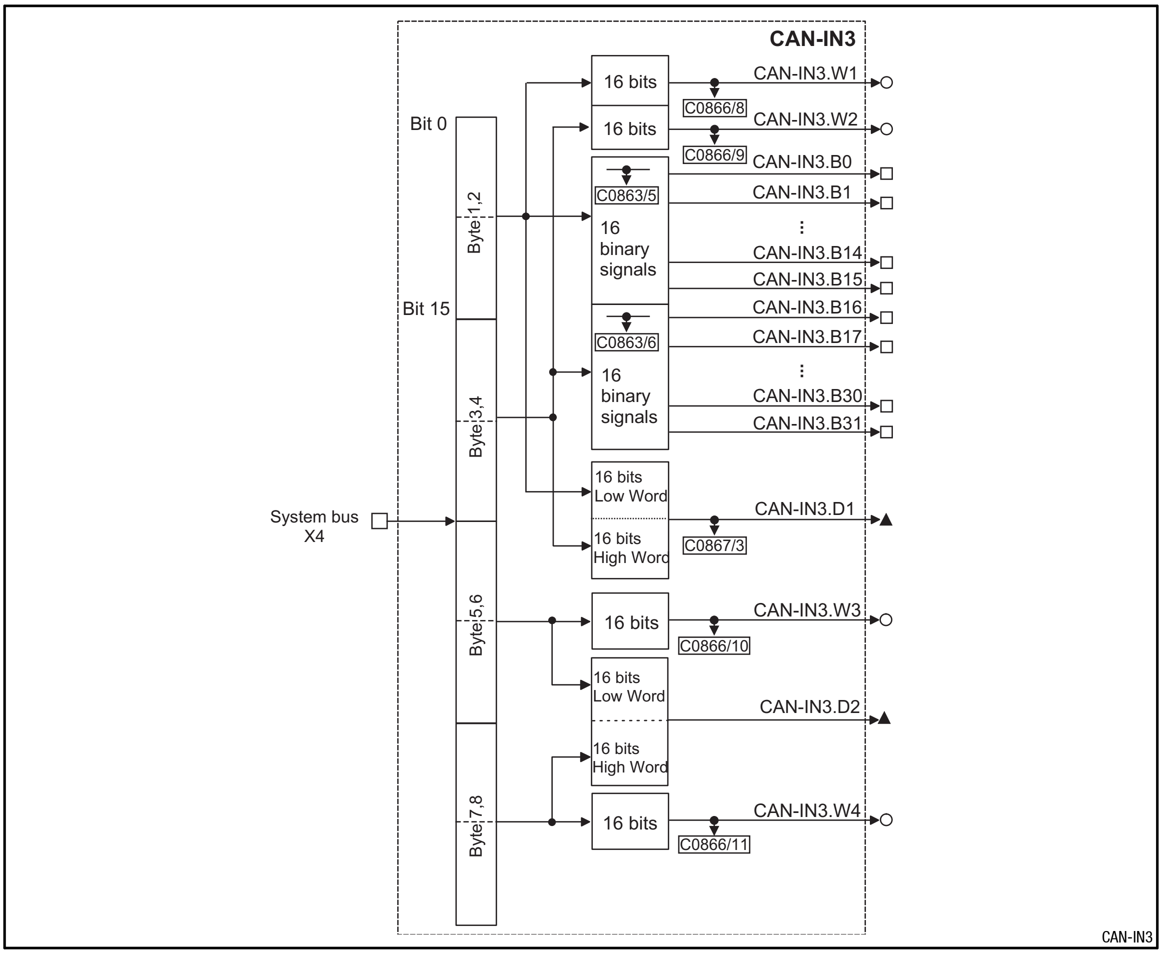


Fig. 7-91 System bus (CAN-IN3)

Function library

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CAN-IN3.W1	a	C0866/8	dec [%]	-	-	-	+16384 = +100 %
CAN-IN3.W2	a	C0866/9	dec [%]	-	-	-	+16384 = +100 %
CAN-IN3.W3	a	C0866/10	dec [%]	-	-	-	+16384 = +100 %
CAN-IN3.W4	a	C0866/11	dec [%]	-	-	-	+16384 = +100 %
CAN-IN3.D1	ph	C0867/3	dec [inc]	-	-	-	65536 = 1 rev.
CAN-IN3.B0	d	C0863/5	hex	-	-	-	
CAN-IN3.B1	d	C0863/5	hex	-	-	-	
CAN-IN3.B2	d	C0863/5	hex	-	-	-	
CAN-IN3.B3	d	C0863/5	hex	-	-	-	
CAN-IN3.B4	d	C0863/5	hex	-	-	-	
CAN-IN3.B5	d	C0863/5	hex	-	-	-	
CAN-IN3.B6	d	C0863/5	hex	-	-	-	
CAN-IN3.B7	d	C0863/5	hex	-	-	-	
CAN-IN3.B8	d	C0863/5	hex	-	-	-	
CAN-IN3.B9	d	C0863/5	hex	-	-	-	
CAN-IN3.B10	d	C0863/5	hex	-	-	-	
CAN-IN3.B11	d	C0863/5	hex	-	-	-	
CAN-IN3.B12	d	C0863/5	hex	-	-	-	
CAN-IN3.B13	d	C0863/5	hex	-	-	-	
CAN-IN3.B14	d	C0863/5	hex	-	-	-	
CAN-IN3.B15	d	C0863/5	hex	-	-	-	
CAN-IN3.B16	d	C0863/6	hex	-	-	-	
CAN-IN3.B17	d	C0863/6	hex	-	-	-	
CAN-IN3.B18	d	C0863/6	hex	-	-	-	
CAN-IN3.B19	d	C0863/6	hex	-	-	-	
CAN-IN3.B20	d	C0863/6	hex	-	-	-	
CAN-IN3.B21	d	C0863/6	hex	-	-	-	
CAN-IN3.B22	d	C0863/6	hex	-	-	-	
CAN-IN3.B23	d	C0863/6	hex	-	-	-	
CAN-IN3.B24	d	C0863/6	hex	-	-	-	
CAN-IN3.B25	d	C0863/6	hex	-	-	-	
CAN-IN3.B26	d	C0863/6	hex	-	-	-	
CAN-IN3.B27	d	C0863/6	hex	-	-	-	
CAN-IN3.B28	d	C0863/6	hex	-	-	-	
CAN-IN3.B29	d	C0863/6	hex	-	-	-	
CAN-IN3.B30	d	C0863/6	hex	-	-	-	
CAN-IN3.B31	d	C0863/6	hex	-	-	-	

Function

The input signals of the 8-byte user data of this AIF object are converted into corresponding signal types. The signals can be used via further function blocks.

Byte 1, 2, 3, and 4

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.

Byte 5 and 6

form the signal to CAN-IN3.W3.

Byte 7 and 8

form the signal to CAN-IN3.W4.

7.5.31 System bus (CAN-OUT)

Purpose

Interface for output signals to the system bus for setpoints and actual values as binary, analog, or phase information. (📖 7-131)

CAN-OUT1

The process data object CAN-OUT1 is intended for the transfer of process data and provides the communication with a higher-level host system.

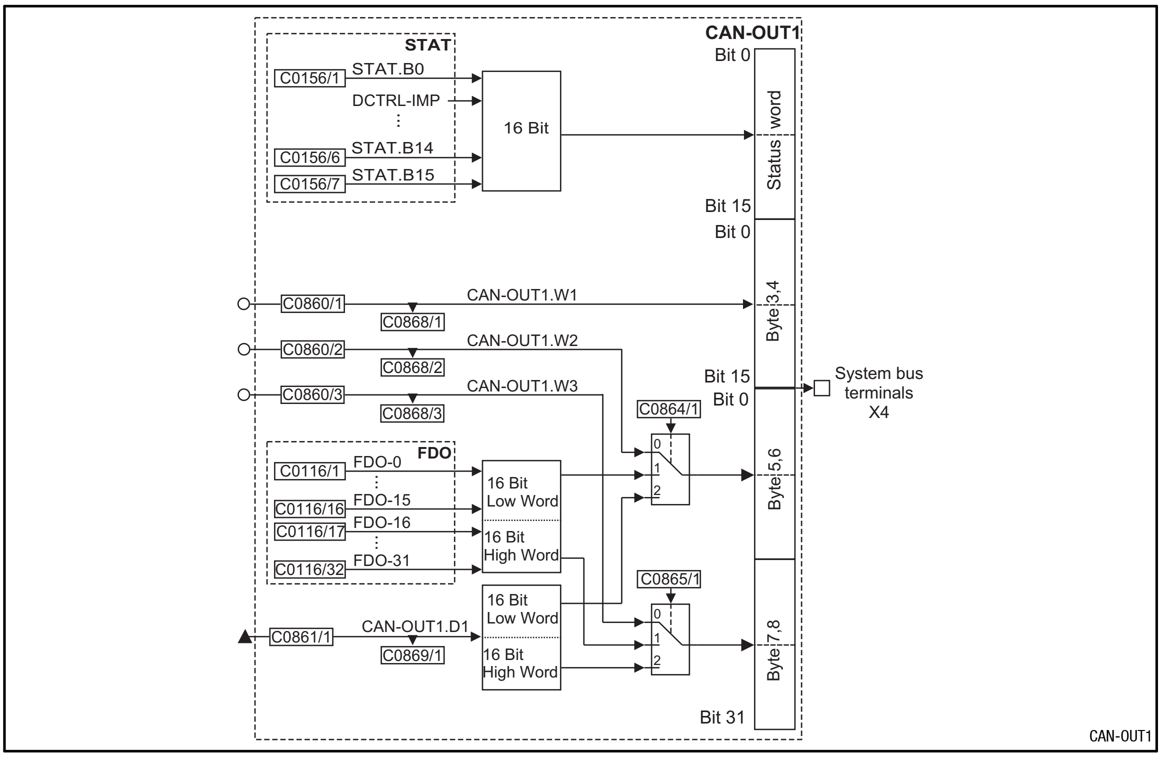


Fig. 7-92 System bus (CAN-OUT1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CAN-OUT1.W1	a	C0868/1	dec [%]	C0860/1	1	1000	+100 % = +16384
CAN-OUT1.W2	a	C0868/2	dec [%]	C0860/2	1	1000	+100 % = +16384
CAN-OUT1.W3	a	C0868/3	dec [%]	C0860/3	1	1000	+100 % = +16384
CAN-OUT1.D1	ph	C0869/1	dec [inc]	C0861/1	4	1000	1 rev. = 65536

Function

The input signals of this function block are copied to the 8-byte user data of the CAN object 1 and assigned to the system bus. The meaning of the user data can be determined very easily with C0864/1 and C0865/1 and the corresponding configuration code (CFG).

Byte 1 and 2

Here, the status word from the function block STAT is mapped. (📖 7-266)
Some of the bits are freely assignable.

Byte 3 and 4

Here, the analog signal configured at the CAN-OUT1.W1 input is mapped.

Byte 5, 6, 7, and 8

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

Example:

16 digital signals and one analog signal are to be output.

The digital signals are output via the FDO function block. Here, the bits 16 to 31 are to be output. For this purpose set C0865/1 = 1. The bits are output on byte 7 and 8.

It follows that the analog signal is led via CAN-OUT1.W2. For this purpose set C0864/1 = 0. It is output on byte 5 and 6. The input is assigned to an analog signal source via configuration code C0860/2.

CAN-OUT2

The process data object CAN-OUT2 provides the event-controlled transfer of process data and the communication among the controllers. Decentralised outputs can also be accessed.

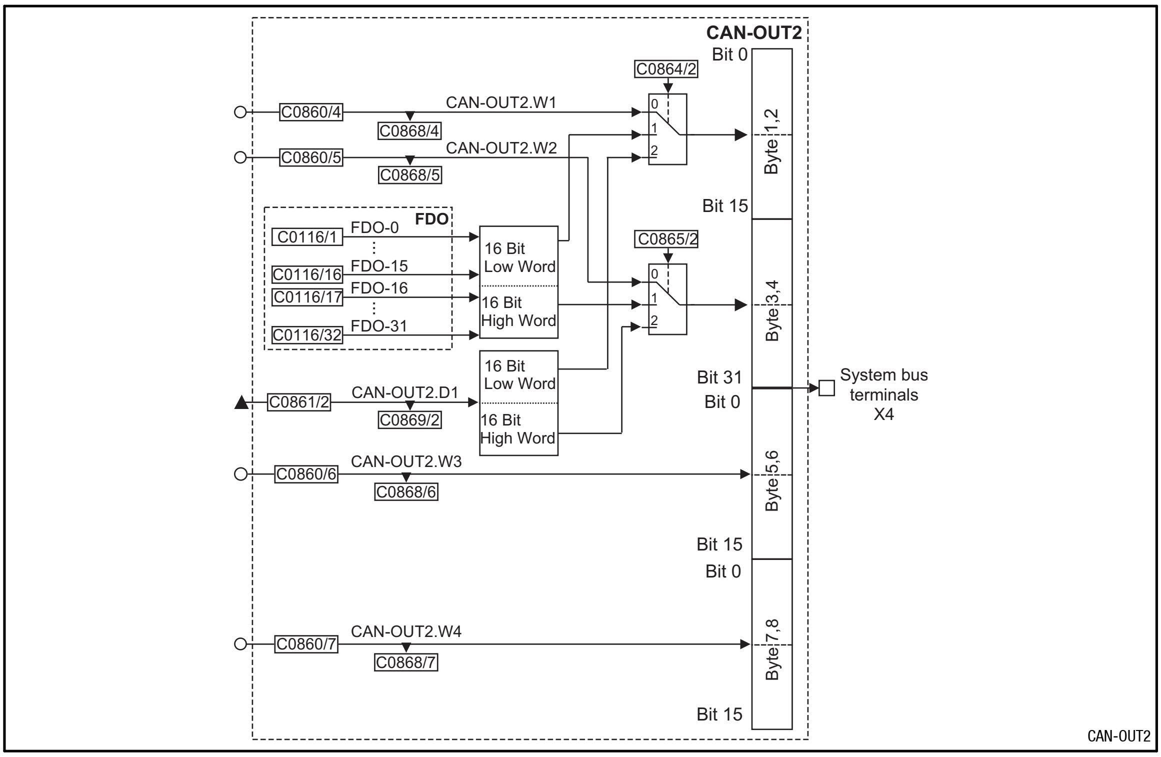


Fig. 7-93 System bus (CAN-OUT2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CAN-OUT2.W1	a	C0868/4	dec [%]	C0860/4	1	1000	+100 % = +16384
CAN-OUT2.W2	a	C0868/5	dec [%]	C0860/5	1	1000	+100 % = +16384
CAN-OUT2.W3	a	C0868/6	dec [%]	C0860/6	1	1000	+100 % = +16384
CAN-OUT2.W4	a	C0868/7	dec [%]	C0860/7	1	1000	+100 % = +16384
CAN-OUT2.D1	ph	C0869/2	dec [inc]	C0861/2	4	1000	1 rev. = 65536

Function

The input signals of this function block are copied to the 8-byte user data of the CAN object 2 and assigned to the system bus. The meaning of the user data can be determined very easily with C0864/2 and C0865/2 and the corresponding configuration code (CFG).

Byte 1, 2, 3, and 4

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

Byte 5 and 6

Here, the analog signal configured at the CAN-OUT2.W3 input is mapped.

Byte 7 and 8

Here, the analog signal configured at the CAN-OUT2.W4 input is mapped.

CAN-OUT3

The process data object CAN-OUT3 provides the event-controlled transfer of process data and the communication among the controllers. Decentralised outputs can also be accessed.

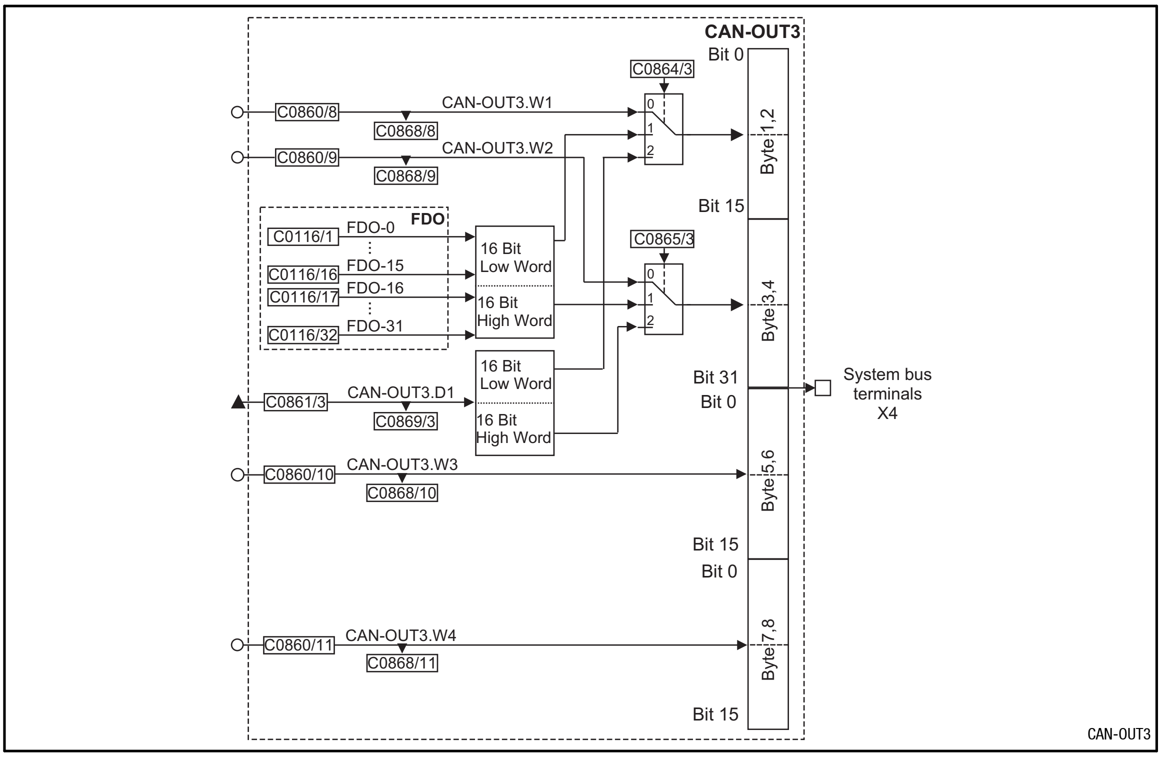


Fig. 7-94 System bus (CAN-OUT3)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CAN-OUT3.W1	a	C0868/8	dec [%]	C0860/8	1	1000	+100 % = +16384
CAN-OUT3.W2	a	C0868/9	dec [%]	C0860/9	1	1000	+100 % = +16384
CAN-OUT3.W3	a	C0868/10	dec [%]	C0860/10	1	1000	+100 % = +16384
CAN-OUT3.W4	a	C0868/11	dec [%]	C0860/11	1	1000	+100 % = +16384
CAN-OUT3.D1	ph	C0869/3	dec [inc]	C0861/3	4	1000	1 rev. = 65536

Function

The input signals of this function block are copied to the 8-byte user data of the CAN object 3 and assigned to the system bus. The meaning of the user data can be determined very easily with C0864/3 and C0865/3 and the corresponding configuration code (CFG).

Byte 1, 2, 3, and 4

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

Byte 5 and 6

Here, the analog signal configured at the CAN-OUT3.W3 input is mapped.

Byte 7 and 8

Here, the analog signal configured at the CAN-OUT3.W4 input is mapped.

7.5.32 Comparator (CMP)

Purpose

These FBs serve to compare two analog signals.

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

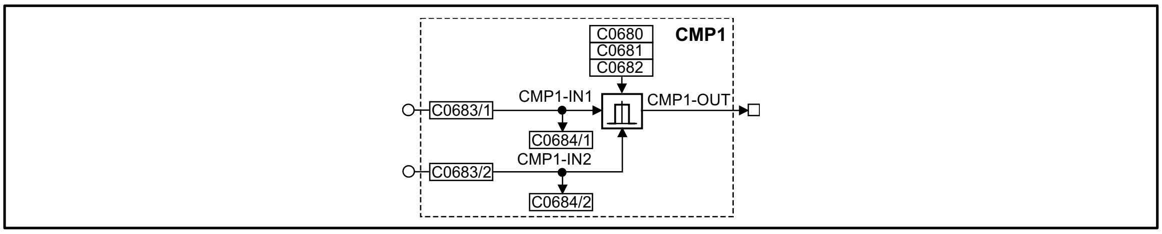


Fig. 7-95 Comparator (CMP1)

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	-	-	-	-	-	-

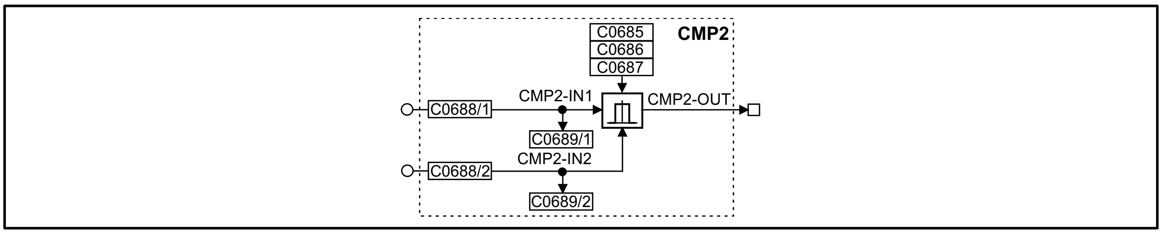


Fig. 7-96 Comparator (CMP2)

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	-	-	-	-	-	-

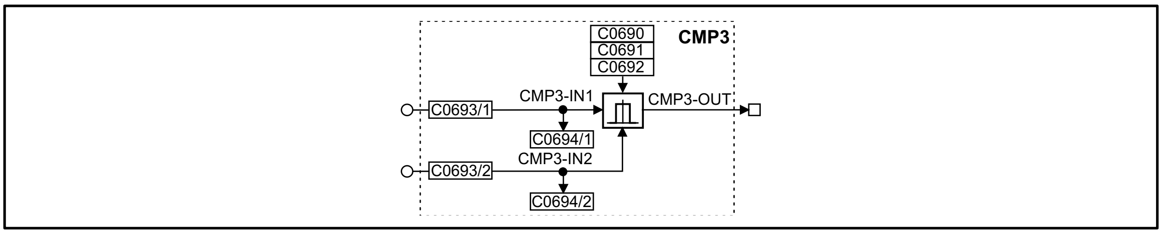


Fig. 7-97 Comparator (CMP3)

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|

7.5.32.1 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.

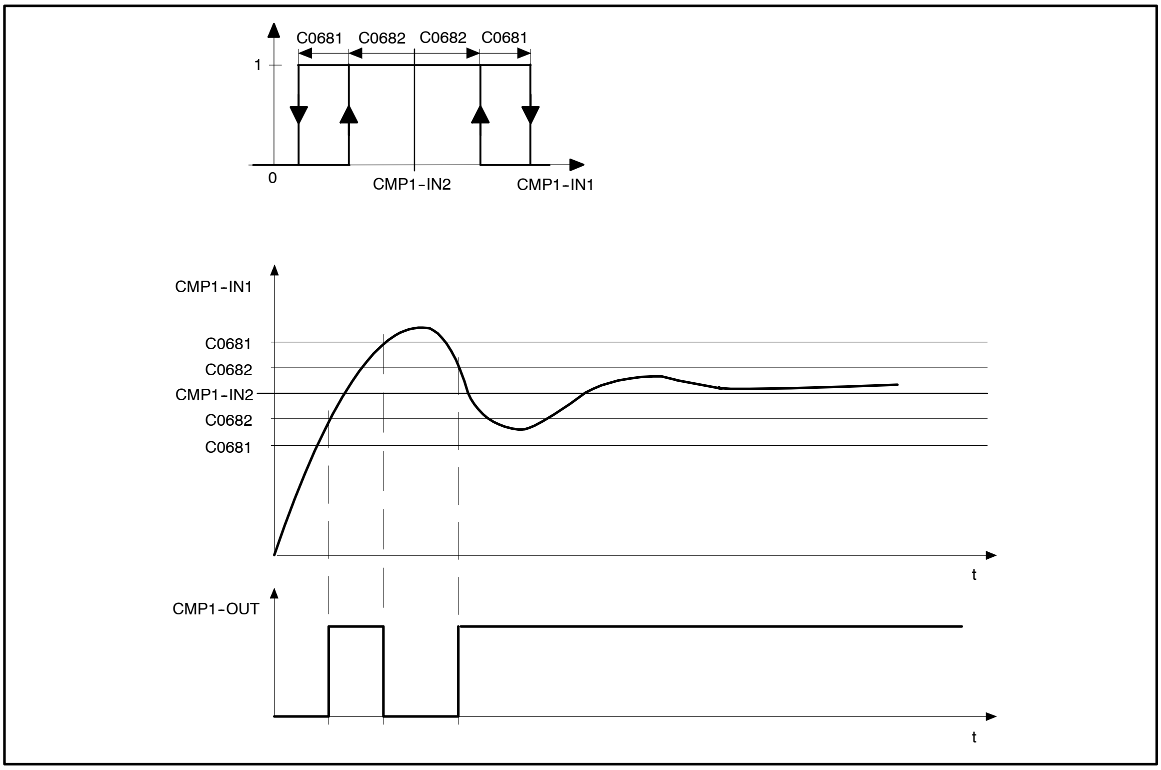


Fig. 7-98 Equality of signals (CMP1-IN1 = CMP1-IN2)

Example:

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

7.5.32.2 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.

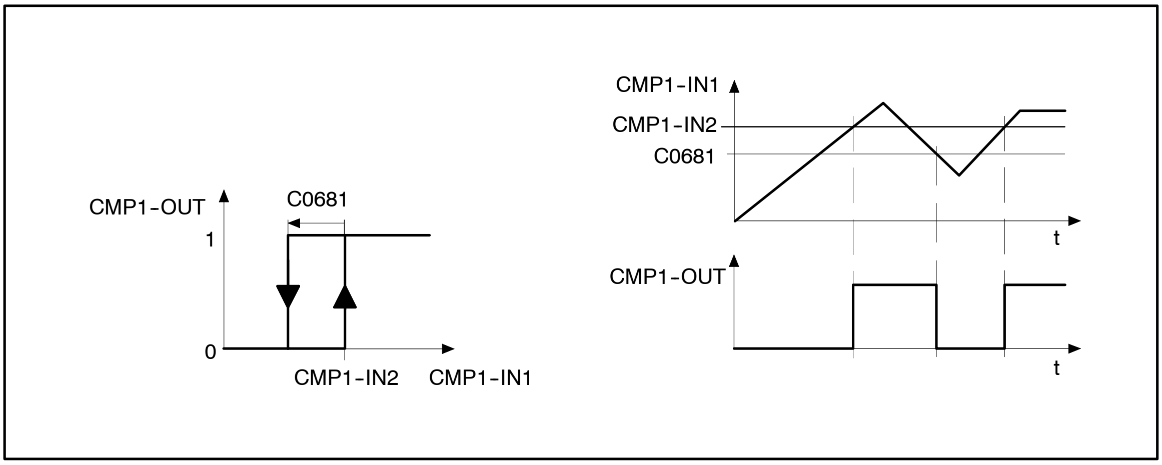


Fig. 7-99 Exceeding signal values (CMP1-IN1 > CMP1-IN2)

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.

7.5.32.3 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.

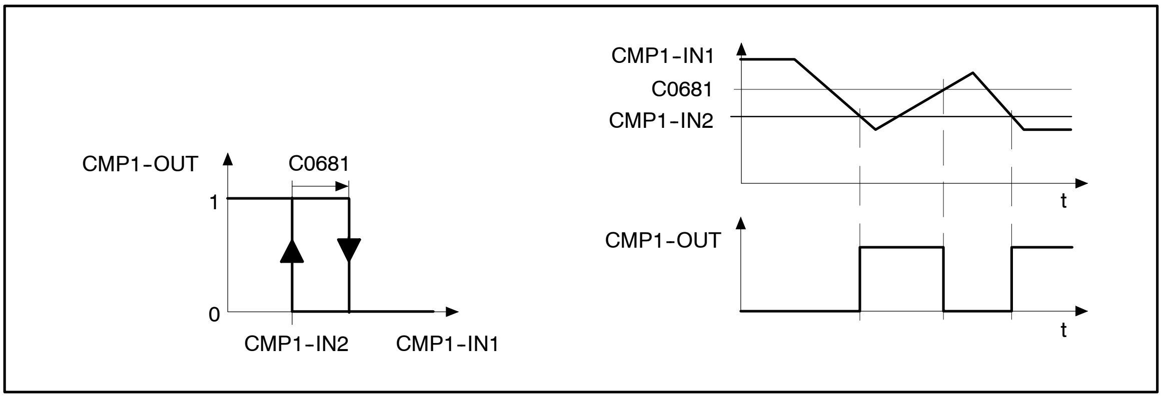


Fig. 7-100 Values falling below signal values (CMP1-IN1 CMP1-IN2)

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.

7.5.32.4 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".

7.5.32.5 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.

7.5.32.6 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.

7.5.33 Long comparator (CMPPH)

Three FBs are available (CMPPH1 ... CMPPH3).

Purpose

Comparison of two phase signals or their absolute values to achieve triggers.

CMPPH1

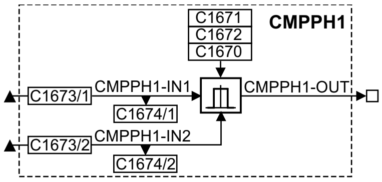


Fig. 7-101 Function block CMPPH1

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CMPPH1-IN1	ph	C1674/1	dec [inc]	C1673/1	3	-
CMPPH1-IN2	ph	C1674/2	dec [inc]	C1673/2	3	-
CMPPH1-OUT	d	-	-	-	-	-

CMPPH2

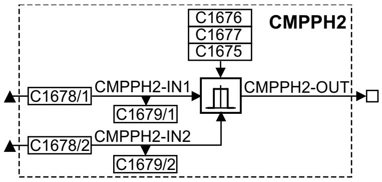


Fig. 7-102 Function block CMPPH2

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CMPPH2-IN1	ph	C1679/1	dec [inc]	C1678/1	1	-
CMPPH2-IN2	ph	C1679/2	dec [inc]	C1678/2	1	-
CMPPH2-OUT	d	-	-	-	-	-

CMPPH3

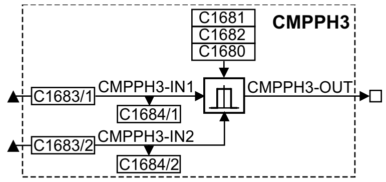


Fig. 7-103 Function block CMPPH3

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CMPPH3-IN1	ph	C1684/1	dec [inc]	C1683/1	1	-
CMPPH3-IN2	ph	C1684/2	dec [inc]	C1683/2	1	-
CMPPH3-OUT	d	-	-	-	-	-

Function

FB CMPPH1 serves as example for the functions. They are also applicable for the FB CMPPH2 and CMPPH3.

The following functions can be selected via C1670 (CMPPH1):

- Function 1: CMPPH1-IN1 = CMPPH1-IN2
- Function 2: CMPPH1-IN1 > CMPPH1-IN2
- Function 3: CMPPH1-IN1 < CMPPH1-IN2
- Function 4: |CMPPH1-IN1| = |CMPPH1-IN2|
- Function 5: |CMPPH1-IN1| > |CMPPH1-IN2|
- Function 6: |CMPPH1-IN1| < |CMPPH1-IN2|

7.5.33.1 Function 1: CMPPH1-IN1 = CMPPH1-IN2

Comparison of two phase signals.

- Set the window under C1672, where the equality is to be effective.
- Set a hysteresis under C1671 if the input signals are not stable and the output oscillates.

The exact function can be obtained from the line diagram.

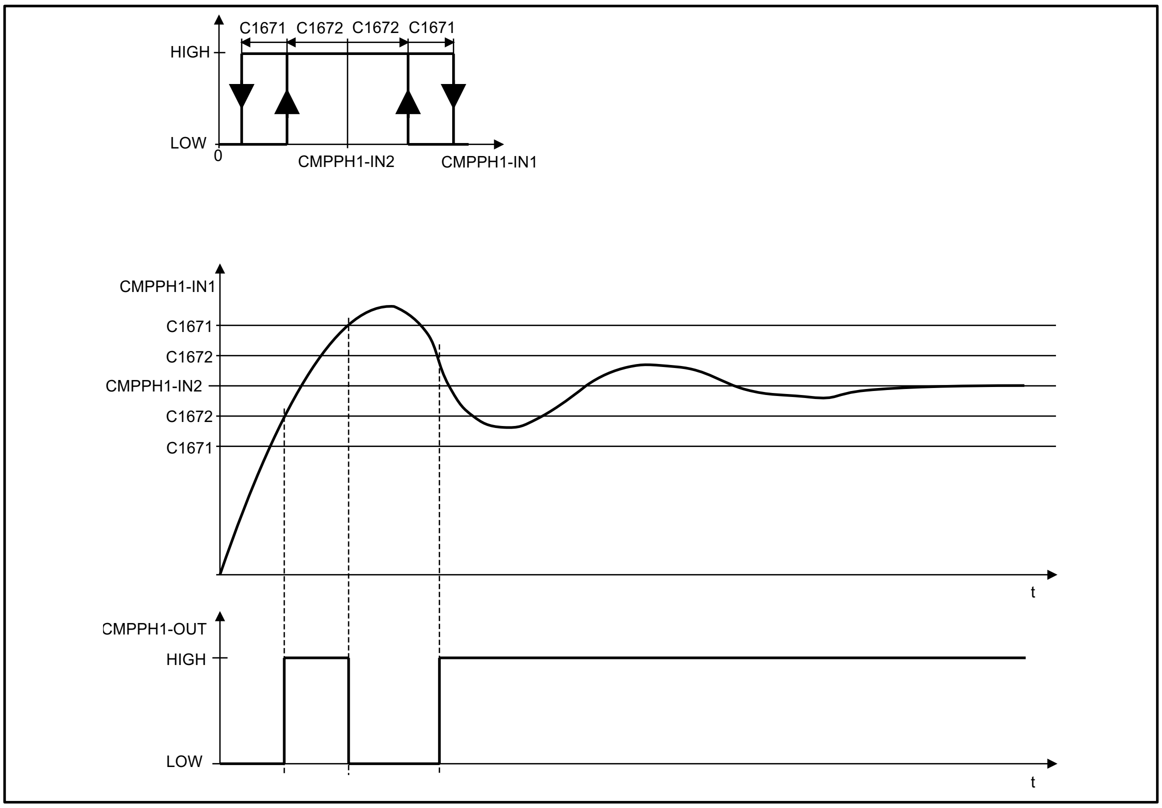


Fig. 7-104 Equality of signals (CMPPH1-IN1 = CMPPH1-IN2)

Example:
This function is for the comparison "Actual phase equal to setpoint phase ($ph_{act.}= ph_{set}$)".

7.5.33.2 Function 2: CMPPH1-IN1 > CMPPH1-IN2

- CMPPH1-IN1 > CMPPH1-IN2
  – CMPPH1-OUT = HIGH
- CMPPH1-IN1 < CMPPH1-IN2
  – CMPPH1-OUT = LOW

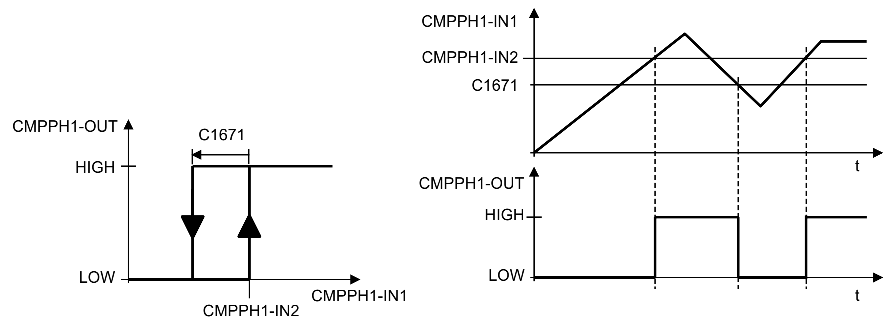


Fig. 7-105 Exceeding signal values (CMPPH1-IN1 > CMPPH1-IN2)

Example:
This function is for the comparison ”Actual phase equal to limit value ($ph_{act.} > ph_x$)”.

7.5.33.3 Function 3: CMPPH1-IN1 < CMPPH1-IN2

- CMPPH1-IN1 < CMPPH1-IN2
  – CMPPH1-OUT = HIGH
- CMPPH1-IN1 > CMPPH1-IN2
  – CMPPH1-OUT = LOW

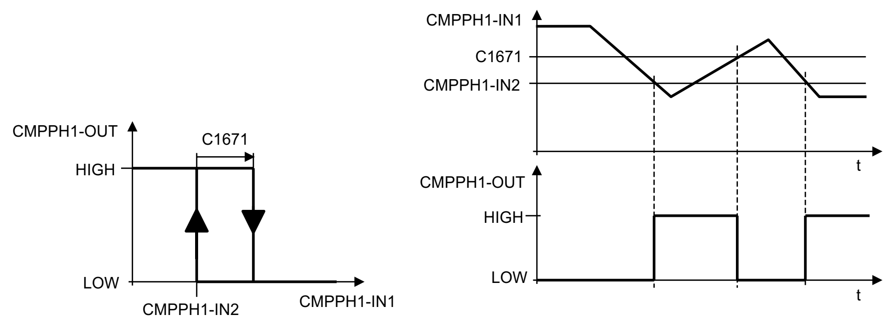


Fig. 7-106 Falling below signal values (CMPPH1-IN1 < CMPPH1-IN2)

Example:
This function is for the comparison ”Actual phase smaller than a limit value ($ph_{act.} < ph_x$)”.

7.5.33.4 Function 4: |CMPPH1-IN1| = |CMPPH1-IN2|

This function is the same as function 1.

- The absolute value of the input signals (without sign) is generated prior to the signal processing.

Example:
This function is for the comparison "$ph_{act.} = 0$".

7.5.33.5 Function 5: |CMPPH1-IN1| > |CMPPH1-IN2|

This function is the same as function 3.

- The absolute value of the input signals (without sign) is generated prior to the signal processing.

Example:
This function is for the comparison "$|ph_{act.}| > |ph_x|$".

7.5.33.6 Function 6: |CMPPH1-IN1| < |CMPPH1-IN2|

This function is the same as function 2.

- The absolute value of the input signals (without sign) is generated prior to the signal processing.

Example:
This function is for the comparison "$|ph_{act.}| < |ph_x|$".

7.5.34 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

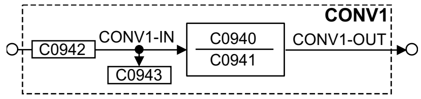


Fig. 7-107 Function block CONV1

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:

$$\mathrm{CONV1{-}OUT} = \mathrm{CONV1{-}IN} \cdot \frac{\mathrm{C0940}}{\mathrm{C0941}}$$

Example:

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

CONV2

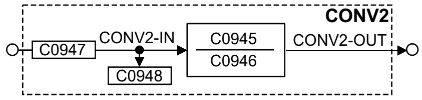


Fig. 7-108 Function block CONV2

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:

$$\mathrm{CONV2{-}OUT} = \mathrm{CONV2{-}IN} \cdot \frac{\mathrm{C0945}}{\mathrm{C0946}}$$

CONV3

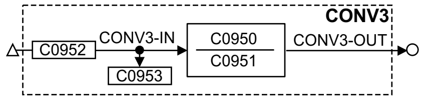


Fig. 7-109 Function block CONV3

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

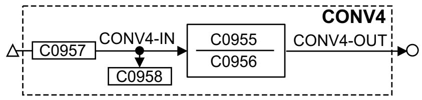


Fig. 7-110 Function block CONV4

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

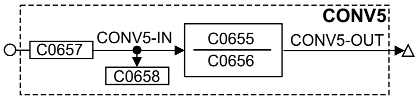


Fig. 7-111 Function block CONV5

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:

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

7.5.35 Analog-digital converter (CONVAD)

Conversion of an analog value into individual digital signals.

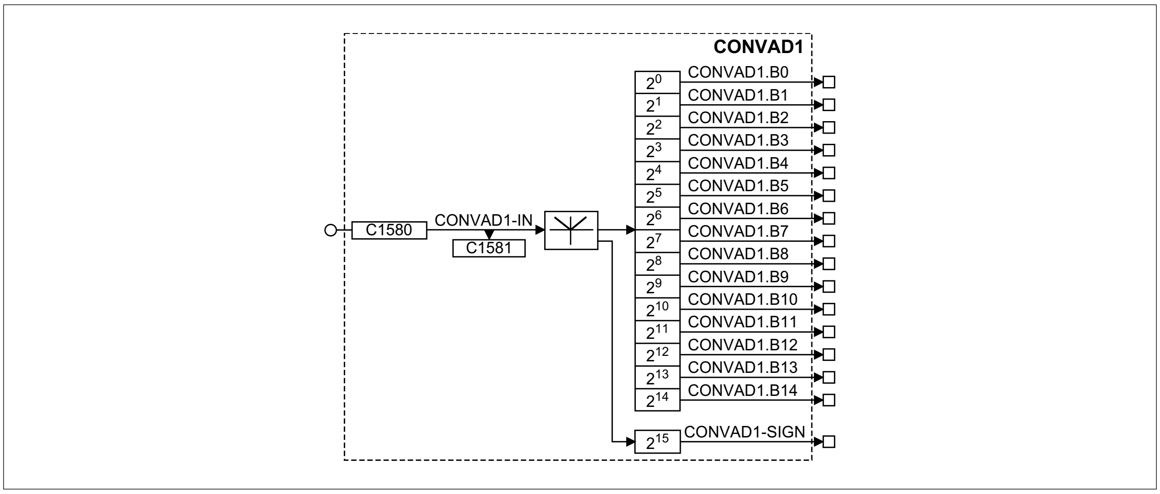


Fig. 7-112 Analog digital converter (CONVAD1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVAD1-IN	a	C1581	dec	C1580	1	-
CONVAD1.B0 ... B14	d	-	-	-	-	-
CONVAD1-SIGN	d	-	-	-	-	Sign digit

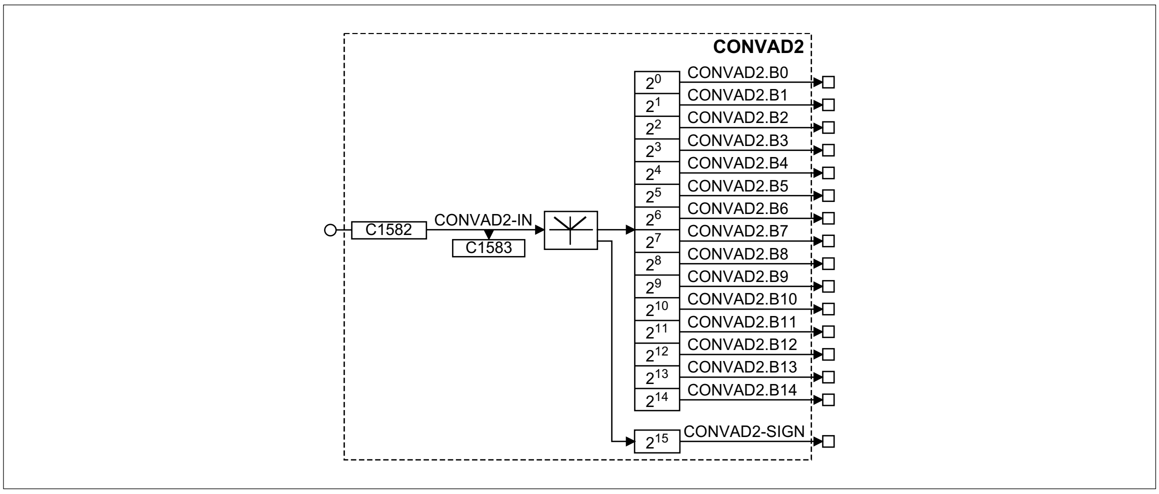


Fig. 7-113 Analog digital converter (CONVAD2)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVAD2IN	a	C1583	dec	C1582	1	-
CONVAD2.B0 ... B14	d	-	-	-	-	-
CONVAD2-SIGN	d	-	-	-	-	Sign digit

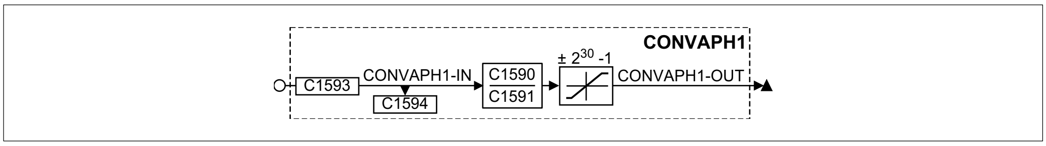
Function

- Represents the analog value as 16-bit binary word.
- Every binary digit is assigned to a digital output.
- The 16th bit (2^{15}) is a sign to show whether it is a positive or negative analog value.

7.5.36 Analog-phase converter (CONVAPH)

Conversion of an analog value into a phase signal.

CONVAPH1



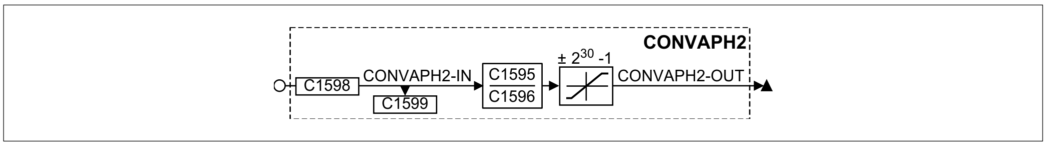
Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVAPH1-IN	a	C1594	dec	C1593	1	-
CONVAPH1-OUT	ph	-	-	-	-	Limited to $\pm 2^{30}$-1

Function

- Conversion with adaptation through multiplier and divisor.
- Conversion according to the formula:

$$\text{CONVAPH1–OUT} = \text{CONVAPH1–IN} \cdot \frac{\text{C1590}}{\text{C1591}} \cdot \frac{16384}{100\%}$$

CONVAPH2

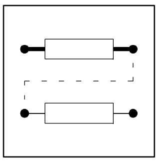


Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVAPH2-IN	a	C1599	dec	C1598	1	-
CONVAPH2-OUT	ph	-	-	-	-	Limits to $\pm 2^{30}$-1

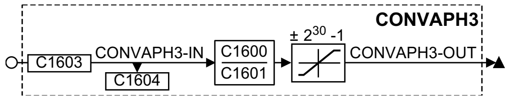
Function

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

$$\text{CONVAPH1} - \text{OUT} = \text{CONVAPH1} - \text{IN} \cdot \frac{\text{C1595}}{\text{C1596}} \cdot \frac{16384}{100\%}$$



CONVAPH3



Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVAPH3-IN	a	C1604	dec	C1603	1	-
CONVAPH3-OUT	ph	-	-	-	-	Limits to $\pm 2^{30}$-1

Function

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

$$\text{CONVAPH1} - \text{OUT} = \text{CONVAPH1} - \text{IN} \cdot \frac{\text{C1600}}{\text{C1601}} \cdot \frac{16384}{100\%}$$

7.5.37 Digital-analog converter (CONVDA)

Three function blocks (CONVDA1 ... CONVDA3) are available.

Purpose

Conversion of individual digital signals to an analog value.

CONVDA1

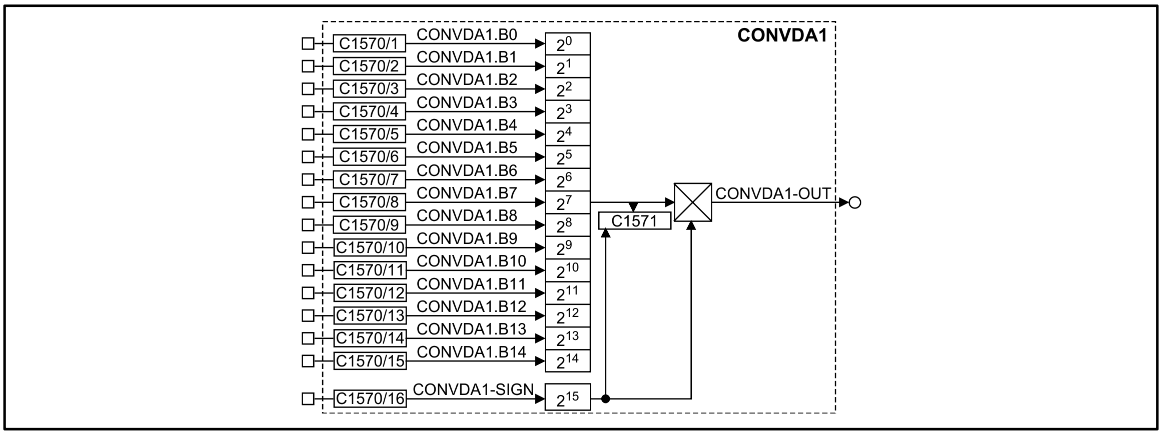


Fig. 7-114 Function block CONVDA1

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVDA1.B0	d	-	-	C1570/1	2	-
CONVDA1.B1	d	-	-	C1570/2	2	-
CONVDA1.B2	d	-	-	C1570/3	2	-
CONVDA1.B3	d	-	-	C1570/4	2	-
CONVDA1.B4	d	-	-	C1570/5	2	-
CONVDA1.B5	d	-	-	C1570/6	2	-
CONVDA1.B6	d	-	-	C1570/7	2	-
CONVDA1.B7	d	-	-	C1570/8	2	-
CONVDA1.B8	d	-	-	C1570/9	2	-
CONVDA1.B9	d	-	-	C1570/10	2	-
CONVDA1.B10	d	-	-	C1570/11	2	-
CONVDA1.B11	d	-	-	C1570/12	2	-
CONVDA1.B12	d	-	-	C1570/13	2	-
CONVDA1.B13	d	-	-	C1570/14	2	-
CONVDA1.B14	d	-	-	C1570/15	2	-
CONVDA1-SIGN	d	-	-	C1570/16	2	Sign HIGH $\triangleq$ negative sign LOW $\triangleq$ positive sign
CONVDA1-OUT	a	-	-	-	-	-
-	-	C1571	hex	-	-	Indicates the result

CONVDA2

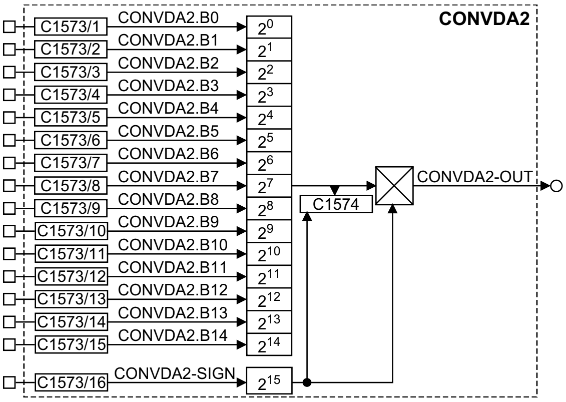


Fig. 7-115 Function block CONVDA2

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVDA2.B0	d	-	-	C1573/1	2	-
CONVDA2.B1	d	-	-	C1573/2	2	-
CONVDA2.B2	d	-	-	C1573/3	2	-
CONVDA2.B3	d	-	-	C1573/4	2	-
CONVDA2.B4	d	-	-	C1573/5	2	-
CONVDA2.B5	d	-	-	C1573/6	2	-
CONVDA2.B6	d	-	-	C1573/7	2	-
CONVDA2.B7	d	-	-	C1573/8	2	-
CONVDA2.B8	d	-	-	C1573/9	2	-
CONVDA2.B9	d	-	-	C1573/10	2	-
CONVDA2.B10	d	-	-	C1573/11	2	-
CONVDA2.B11	d	-	-	C1573/12	2	-
CONVDA2.B12	d	-	-	C1573/13	2	-
CONVDA2.B13	d	-	-	C1573/14	2	-
CONVDA2.B14	d	-	-	C1573/15	2	-
CONVDA2-SIGN	d	-	-	C1573/16	2	Sign HIGH $\triangleq$ negative sign LOW $\triangleq$ positive sign
CONVDA2-OUT	a	-	-	-	-	-
-	-	C1574	hex	-	-	Indicates the result

CONVDA3

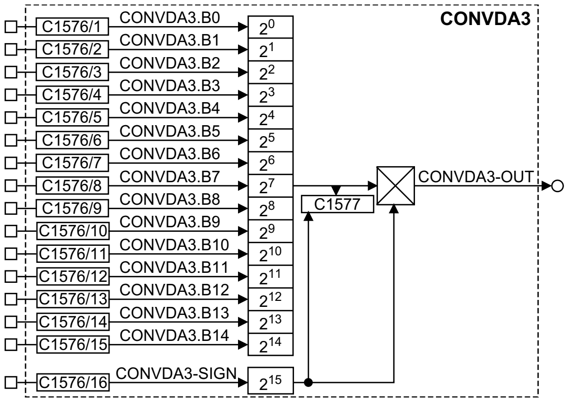


Fig. 7-116 Function block CONVDA3

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVDA3.B0	d	-	-	C1576/1	2	-
CONVDA3.B1	d	-	-	C1576/2	2	-
CONVDA3.B2	d	-	-	C1576/3	2	-
CONVDA3.B3	d	-	-	C1576/4	2	-
CONVDA3.B4	d	-	-	C1576/5	2	-
CONVDA3.B5	d	-	-	C1576/6	2	-
CONVDA3.B6	d	-	-	C1576/7	2	-
CONVDA3.B7	d	-	-	C1576/8	2	-
CONVDA3.B8	d	-	-	C1576/9	2	-
CONVDA3.B9	d	-	-	C1576/10	2	-
CONVDA3.B10	d	-	-	C1576/11	2	-
CONVDA3.B11	d	-	-	C1576/12	2	-
CONVDA3.B12	d	-	-	C1576/13	2	-
CONVDA3.B13	d	-	-	C1576/14	2	-
CONVDA3.B14	d	-	-	C1576/15	2	-
CONVDA3-SIGN	d	-	-	C1576/16	2	Sign HIGH $\triangleq$ negative sign LOW $\triangleq$ positive sign
CONVDA3-OUT	a	-	-	-	-	-
-	-	C1577	hex	-	-	Indicates the result

Function

- Input of 15 absolute values (2^0 ... 2^{14})
- The 16th bit (2^{15}) is the sign to indicate whether the analog value is positive or negative.
- Display of the analog value via a code in the hex format
  – C1571 for CONVDA1
  – C1574 for CONVDA2
  – C1577 for CONVDA3

7.5.38 Phase-analog converter (CONVPHA)

Three function blocks (CONVPHA1 ... CONVPHA3) are available.

Purpose

Conversion of a phase signal into an analog value.

CONVPHA1

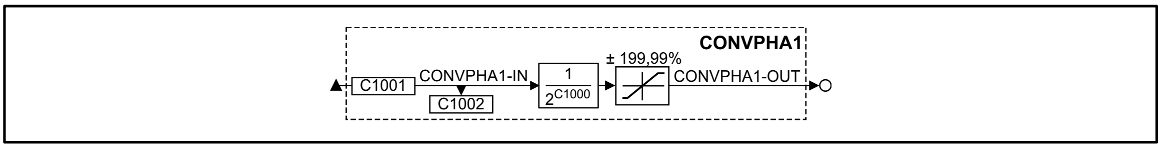


Fig. 7-117 Function block CONVPHA1

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVPHA1-IN	ph	C1002	dec [inc]	C1001	3	-
CONVPHA1-OUT	a	-	-	-	-	Limited to ±199.99 %

Function

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

$$\text{CONVPHA1–OUT} = \text{CONVPHA1–IN} \cdot \frac{1}{2^{C1000}} \cdot \frac{100\%}{16384}$$

CONVPHA2

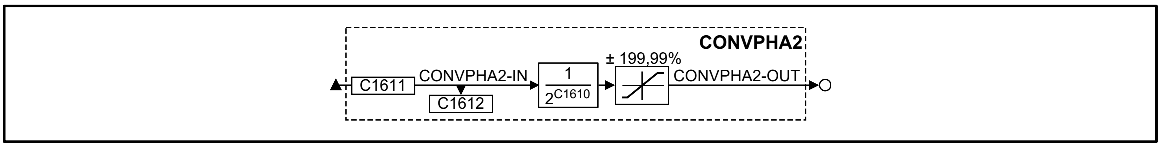


Fig. 7-118 Function block CONVPHA2

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVPHA2-IN	ph	C1612	dec [inc]	C1611	3	-
CONVPHA2-OUT	a	-	-	-	-	Limited to ±199.99 %

Function

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

$$\text{CONVPHA2–OUT} = \text{CONVPHA2–IN} \cdot \frac{1}{2^{C1610}} \cdot \frac{100\%}{16384}$$

CONVPHA3

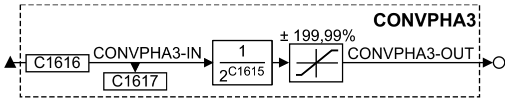


Fig. 7-119 Function block CONVPHA3

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVPHA3-IN	ph	C1617	dec [inc]	C1616	3	-
CONVPHA3-OUT	a	-	-	-	-	Limited to ±199.99 %

Function

- Conversion with adaptation using divisor and exact residual value treatment.
- The conversion is performed according to the formula:

$$\text{CONVPHA3–OUT} = \text{CONVPHA3–IN} \cdot \frac{1}{2^{C1615}} \cdot \frac{100\%}{16384}$$

7.5.39 Phase conversion (CONVPHPH2)

Purpose

Conversion of a phase signal with dynamic fracture.

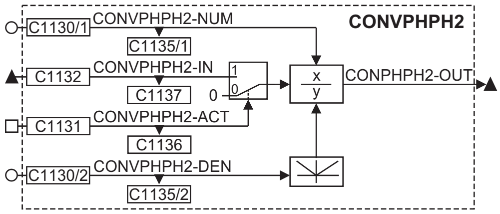


Fig. 7-120 Phase conversion (CONVPHPH2)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
CONVPHPH2-IN	ph	C1137	dec [inc]	C1132	3	-
CONVPHPH2-NUM	a	C1135/1	dec	C1130/1	1	Numerator
CONVPHPH2-DEN	a	C1135/2	dec	C1130/2	1	Denominator (with absolute-value generation)
CONVPHPH2-ACT	d	C1136	bin	C1131	2	-
CONVPHPH2-OUT	ph	-	-	-	-	Without limitation, residual value considered

Function

Caution!

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

- C1131 = HIGH
  – The phase signal at CONVPHPH2-IN is evaluated with the factor from C1135/1 / C1135/2.
- C1131 = LOW
  – The value 0 is evaluated with the factor from C1135/1 / C1135/2.

7.5.40 Characteristic function (CURVE)

Purpose

Conversion of an analog signal into a characteristic.

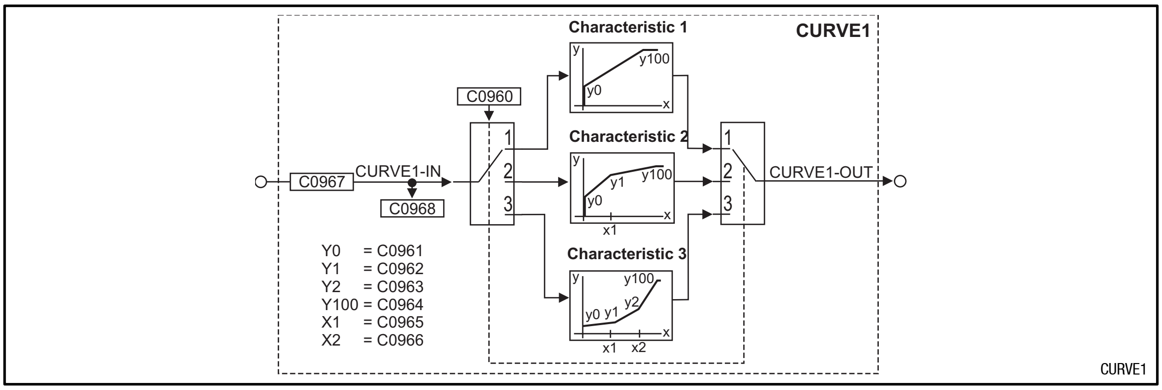


Fig. 7-121 Characteristic function (CURVE1)

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

7.5.40.1 Characteristic with two co-ordinates

Set C0960 = 1.

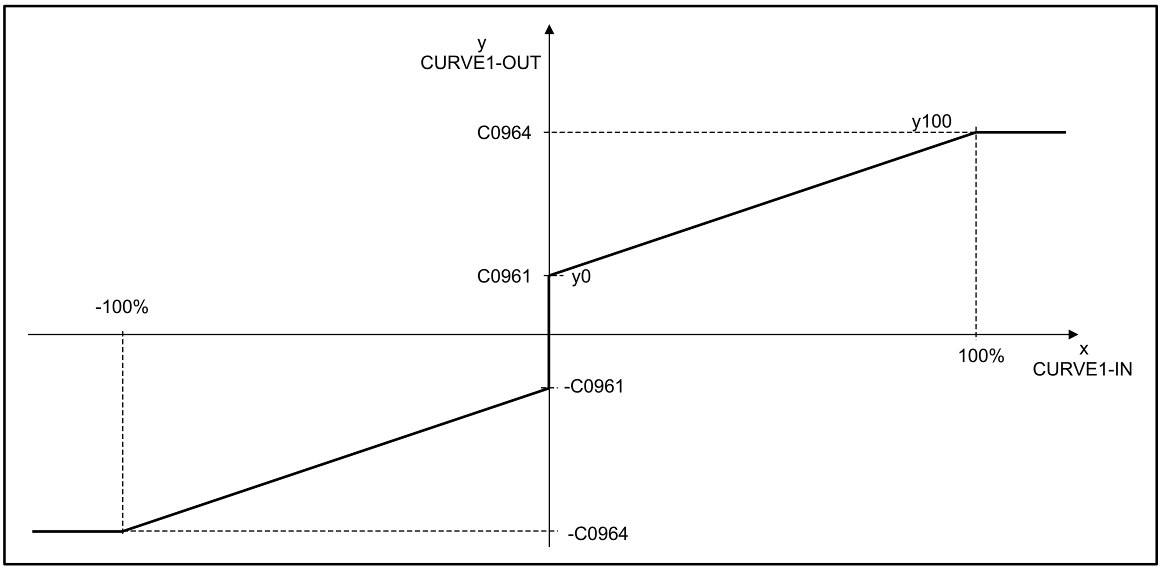


Fig. 7-122 Line diagram with 2 co-ordinates

7.5.40.2 Characteristic with three co-ordinates

Set C0960 = 2.

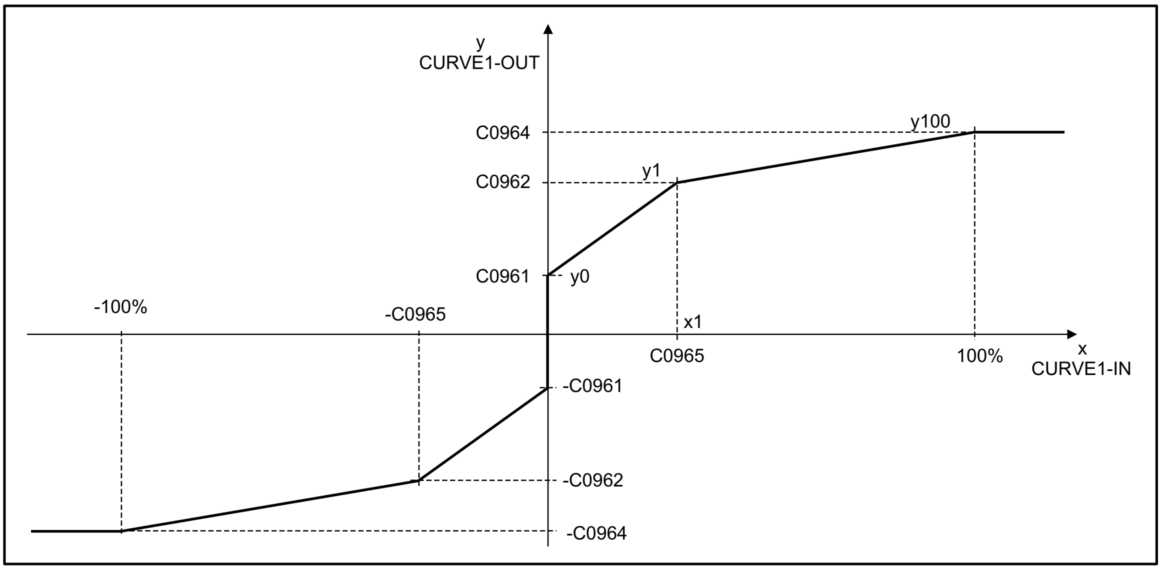


Fig. 7-123 Characteristic with 3 co-ordinates

7.5.40.3 Characteristic with four co-ordinates

Set C0960 = 3.

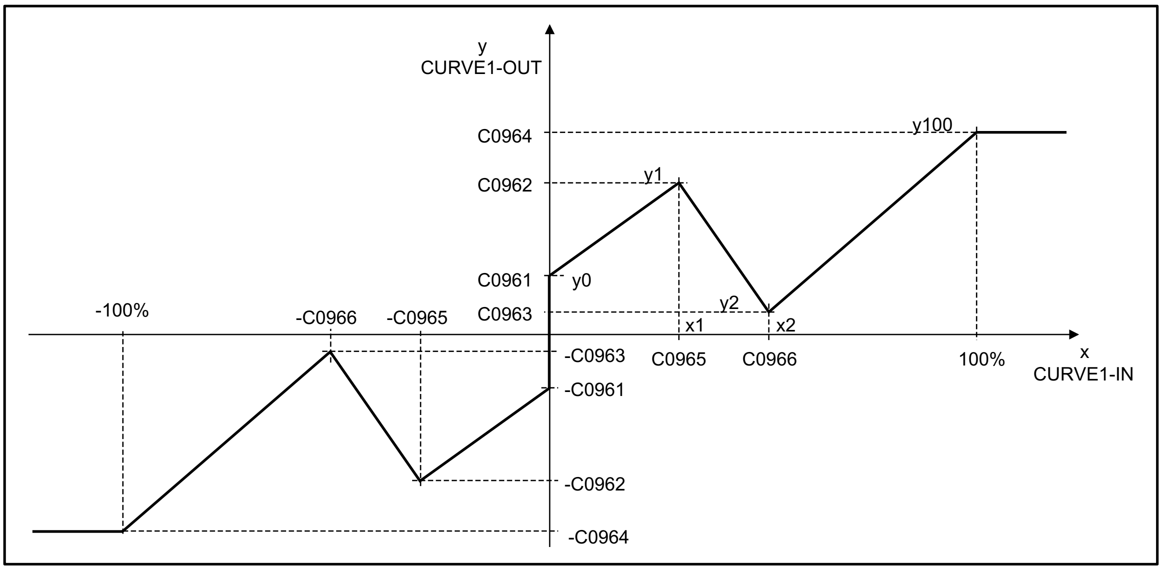


Fig. 7-124 Line diagram characteristic with four co-ordinates

7.5.41 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.

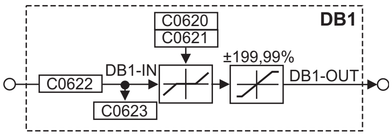


Fig. 7-125 Dead band element (DB1)

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 parameterized under C0621.
- The gain is set under C0620.

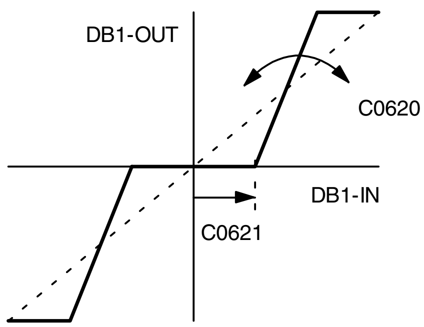


Fig. 7-126 Dead band and gain

7.5.42 Controller control (DCTRL)

Purpose

Set certain controller states (e. g. trip, trip reset, quick stop or controller inhibit).

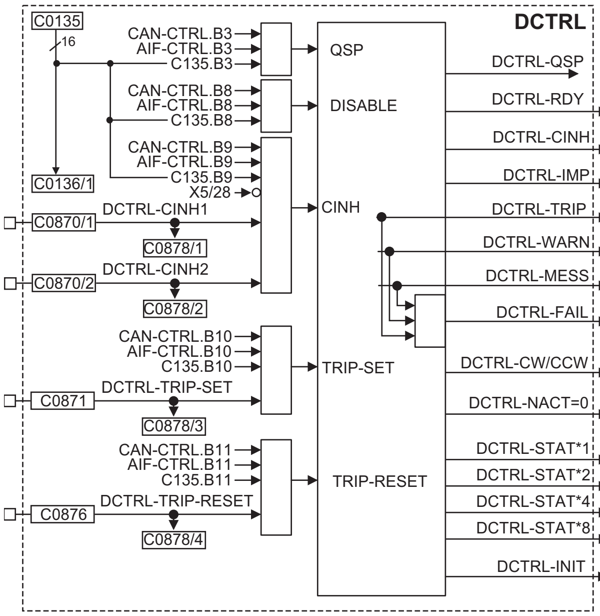


Fig. 7-127 Control of the controller (DCTRL)

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 = Error message EEr
DCTRL-TRIPRESET	d	C0878/4	bin	C0876	2	55	LOW-HIGH transition = Trip reset
DCTRL-RDY	d	-	-	-	-	-	HIGH = Ready for operation
DCTRL-CINH	d	-	-	-	-	-	HIGH = Controller reset
DCTRL-IMP	d	-	-	-	-	-	HIGH = High-ohmic power end stages
DCTRL-TRIP	d	-	-	-	-	-	HIGH = Error active
DCTRL-WARN	d	-	-	-	-	-	HIGH = Warning active
DCTRL-MESS	d	-	-	-	-	-	HIGH = Message active
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	-	-	-	-	-	-

Function

- Quick stop (QSP)
- Operation inhibited (DISABLE)
- Controller inhibit (CINH)
- TRIP SET
- TRIP RESET
- Parameter-set changeover (PAR)
- Controller status

7.5.42.1 Quick stop (QSP)

The controller is braked to standstill following the deceleration ramp C0105. It generates a holding torque.

- This function can be controlled via 3 inputs.
  – Control word CAN-CTRL bit 3 from CAN-IN1
  – Control word AIF-CTRL bit 3 from AIF-IN
  – Control word C0135 bit 3
- All inputs are OR linked.
- C0136/1 indicates the control word C0135

7.5.42.2 Operation inhibited (DISABLE)

When being in this status, the drive cannot be started with the command: controller enable. The power end stages are inhibited. All controllers are reset.

- This function can be controlled via 3 inputs.
  – Control word CAN-CTRL bit 8 from CAN-IN1
  – Control word AIF-CTRL bit 8 from AIF-IN
  – Control word C0135 bit 8
- All inputs are OR linked.
- C0136/1 indicates the control word C0135

7.5.42.3 Controller inhibit (CINH)

The power end stages are inhibited. All controllers are reset.

- This function can be controlled via 6 inputs.
  – Terminal X5/28 (LOW = controller inhibit)
  – Control word CAN-CTRL bit 9 from CAN-IN1
  – Control word AIF-CTRL bit 9 from AIF-IN
  – Control word C0135 bit 9
  – Free inputs DCTRL-CINH1 and DCTRL-CINH2
- All inputs are OR linked.
- C0136/1 indicates the control word C0135

7.5.42.4 TRIP-SET

The drive is controlled to the status set under code C0581 and indicates EEr (external error).

- This function can be controlled via 4 inputs.
  – Control word CAN-CTRL bit 10 from CAN-IN1
  – Control word AIF-CTRL bit 10 from AIF-IN
  – Control word C0135 bit 10
  – Free input DCTRL-TRIP-SET
- All inputs are OR linked.
- C0136/1 indicates the control word C0135

7.5.42.5 TRIP-RESET

Resets an active trip after the cause has been eliminated. If the cause is still active, it does not respond.

- This function can be controlled via 4 inputs.
  – Control word CAN-CTRL bit 11 from CAN-IN1
  – Control word AIF-CTRL bit 11 from AIF-IN
  – Control word C0135 bit 11
  – Free input DCTRL-TRIP-RESET
- All inputs are OR linked.
- This function is only carried out by a LOW-HIGH transition of the signal resulting from the OR linkage.
- C0136/1 indicates the control word C0135

Note!

If one of the inputs is set to HIGH, it is not possible that a LOW-HIGH transition occurs at the resulting signal.

7.5.42.6 Controller status

The status is binary coded in the output DCTRL-STAT*x.

STAT*8	STAT*4	STAT*2	STAT*1	Controller action
0	0	0	0	Initialization after connection of the supply voltage
0	0	0	1	LOCK-MODE, restart protection active C0142
0	0	1	1	Drive is inhibited
0	1	1	0	Controller enabled
0	1	1	1	The activation of a monitoring leads to a ’message’.
1	0	0	0	The release of a monitoring function resulted in a ”trip”
1	0	1	0	A monitoring function was activated and set ”FAIL-QSP”

7.5.43 Digital 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).

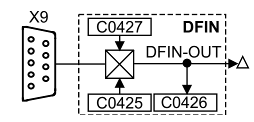


Fig. 7-128 Digital frequency input (DFIN)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
DFIN-OUT	phd	C0426	dec [rpm]	-	-	

Function

- The input X9 is designed for signals with TTL level (see chapter 4.2.8 "Digital frequency input X9").
- 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

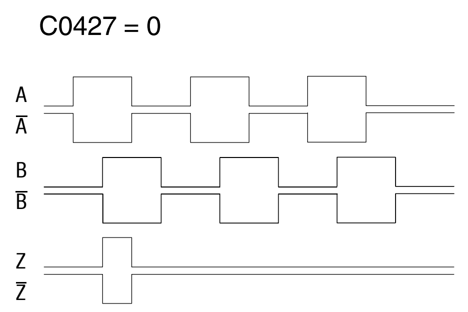


Fig. 7-129 Phase-delayed signal sequence (CW rotation)

- 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

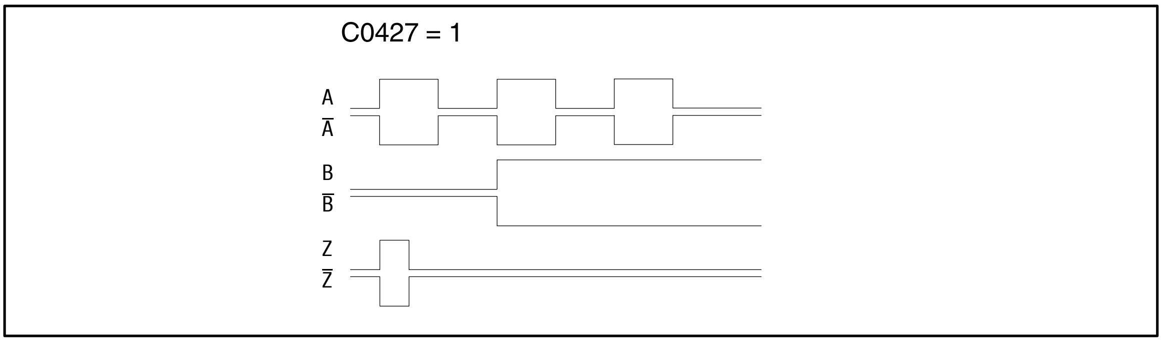


Fig. 7-130 Control of direction of rotation via track B

- 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

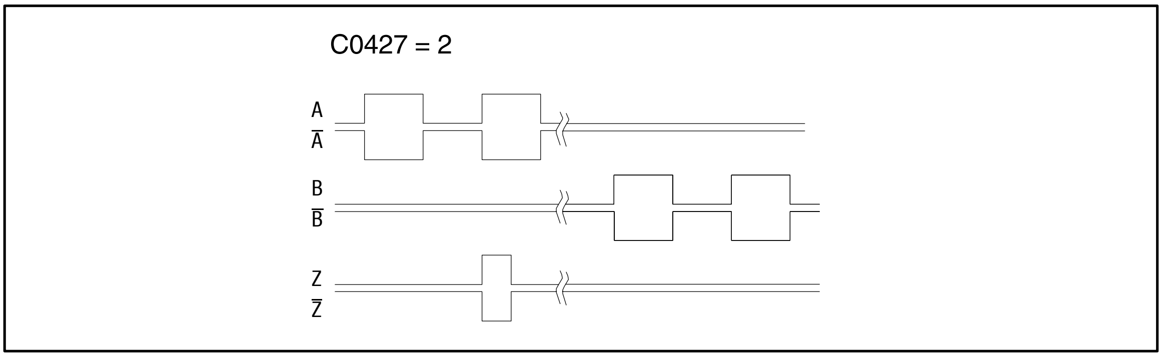


Fig. 7-131 Control of speed and direction of rotation via track A or track B

- CW rotation
  – Track A transfers the speed and direction of rotation (positive value at DFIN-OUT).
  – Track B = LOW
- CCW rotation
  – Track B transfers the speed and direction of rotation (negative value at DFIN-OUT).
  – Track A = LOW

Transfer function

$$\text{DFIN-OUT [rpm]} = f\,[\text{Hz}] \cdot \frac{60}{\text{Increments from C0425}}$$

Example:

Input frequency = 200 kHz

C0425 = 3 ($\triangleq$ a number of increments of 2048 Inc/rev.)

$$\text{DFIN-OUT [rpm]} = 200000\ \text{Hz} \cdot \frac{60}{2048} = 5859\ \text{rpm}$$

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 performed according to the formula:

$$\text{CONV3} - \text{OUT}\,[\%] = f\,[\text{Hz}] \cdot \frac{0,4}{\text{Increments from C0425}} \cdot \frac{\text{C0950}}{\text{C0951}}$$

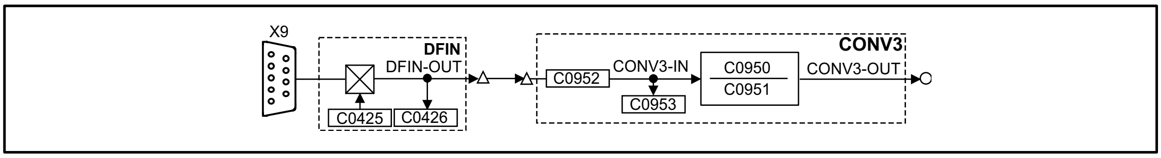


Fig. 7-132 Digital frequency input (DFIN) with connected converter

Stop!

If C0540 = 0, 1, 2, 3 and a feedback system C0025 > 10, you must not use the digital frequency input X9.

7.5.44 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).

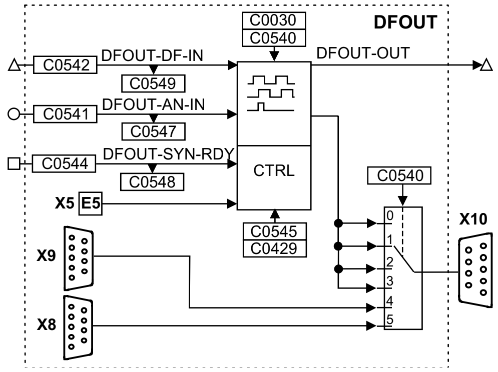


Fig. 7-133 Digital frequency output (DFOUT)

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

7.5.44.1 Output signals to X10

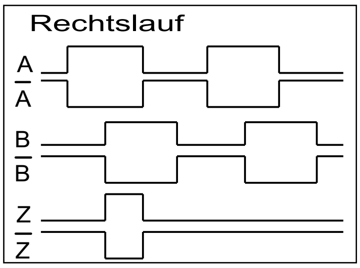


Fig. 7-134 Signal sequence for CW rotation (definition)

- 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)

7.5.44.2 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

$$f\,[Hz] = 50\,\% \cdot \frac{2048}{100} \cdot \frac{3000}{60} = 51200\text{ Hz}$$

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.

7.5.44.3 Output of a speed signal

- Set C0540 = 1.
  – This setting only converts the value at input DFOUT-DF-IN into a frequency.

Transfer function

$$f\,\textit{[Hz]} = \text{DFOUT-DF-IN}\,\textit{[rpm]} \cdot \frac{\text{Increments from C0030}}{60}$$

Example:

DFOUT-DF-IN = 3000 rpm

C0030 = 3, this corresponds to a number of increments of 2048 inc/rev.

$$f\,\textit{[Hz]} = 3000\,\textit{[rpm]} \cdot \frac{2048}{60} = 102400\,\textit{[Hz]}$$

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 genrerated according to C0030.
3. The index pulse can be shifted by +360° via C0545 (65536 inc = 360°).

7.5.44.4 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°).

7.5.44.5 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.

7.5.44.6 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.

7.5.45 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.

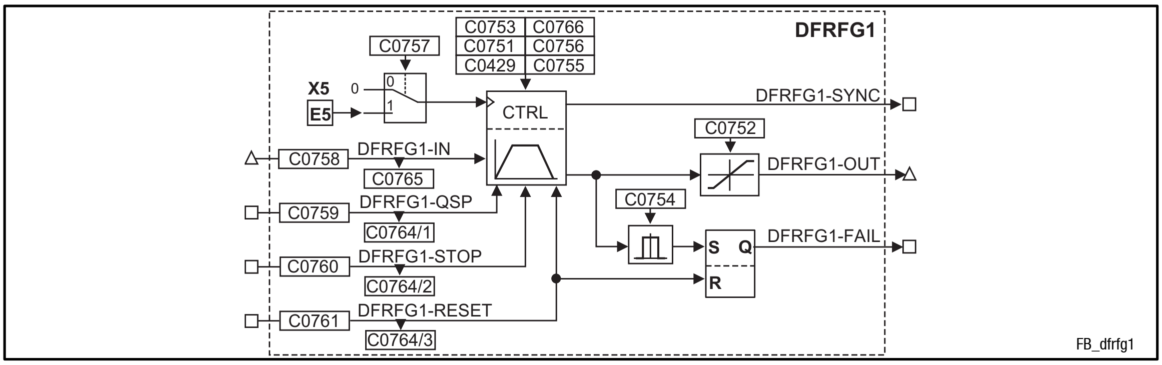


Fig. 7-135 Digital frequency ramp function generator (DFRFG1)

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)

7.5.45.1 Profile generator

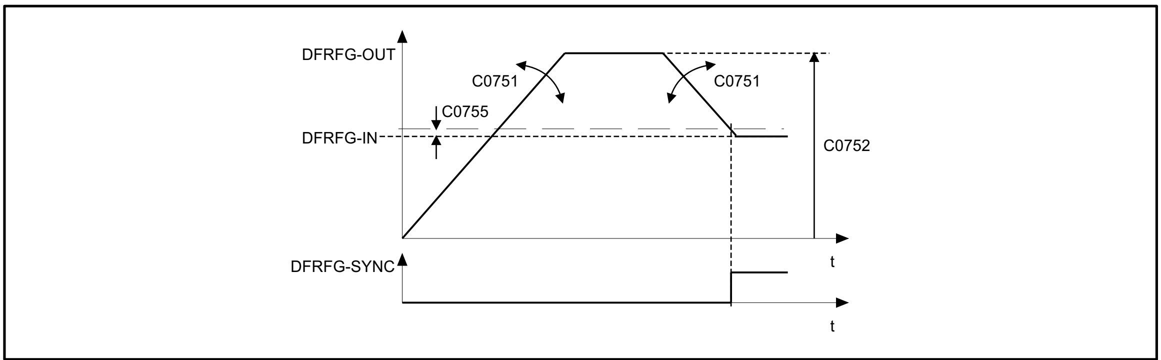


Fig. 7-136 Synchronisation on DFRFG

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!

Do not operate the drive with this function at the torque limitation M_{max}, I_{max}.

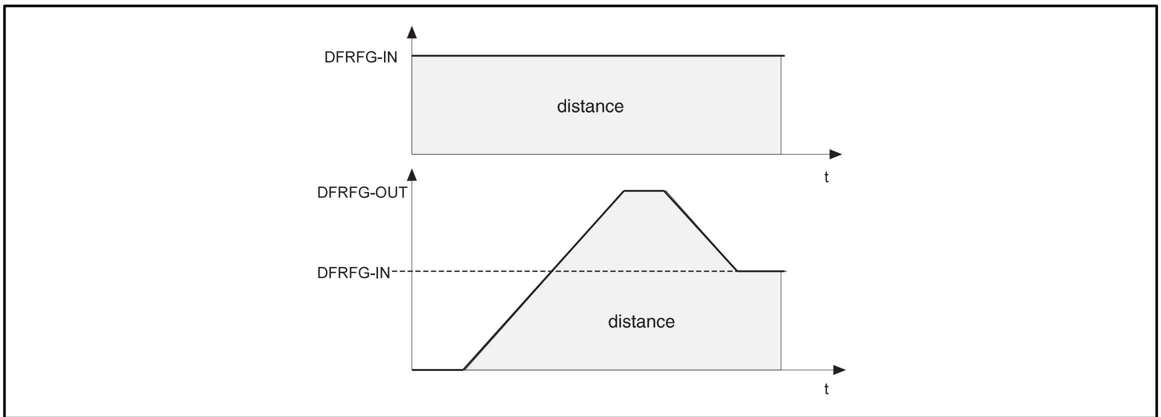


Fig. 7-137 Speed-time diagram DFRFG

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).

7.5.45.2 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.

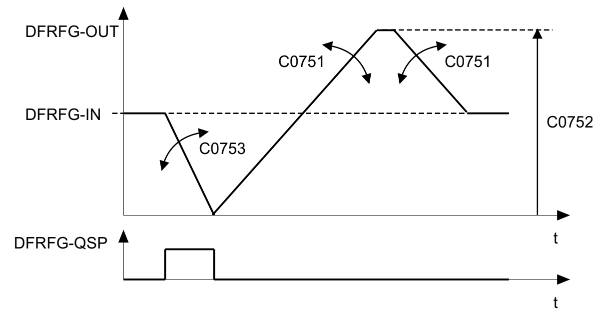


Fig. 7-138 Quick stop DFRFG

7.5.45.3 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.

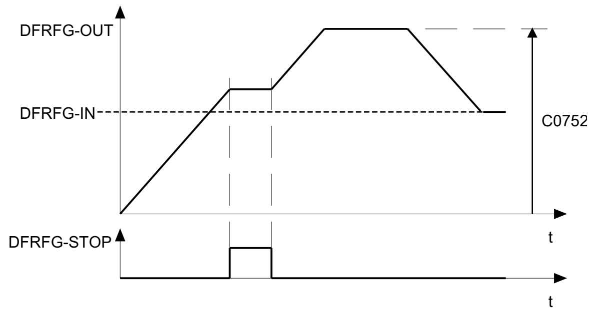


Fig. 7-139 Ramp function generator stop

7.5.45.4 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.

7.5.45.5 Detect phase difference

Monitoring the phase difference between input DFRFG-IN and output DFRFG-OUT.

- Set limit value of monitoring via C0754.
- Activates the monitoring: DFRFG-FAIL = HIGH
- Storing the signal until DFRFG-RESET = HIGH.
- The profile generator can accept a phase difference of up to ±2140000000 inc (= 32000 revolutions).

7.5.45.6 Start via touch probe initiator (terminal X5/E5)

STOP

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:

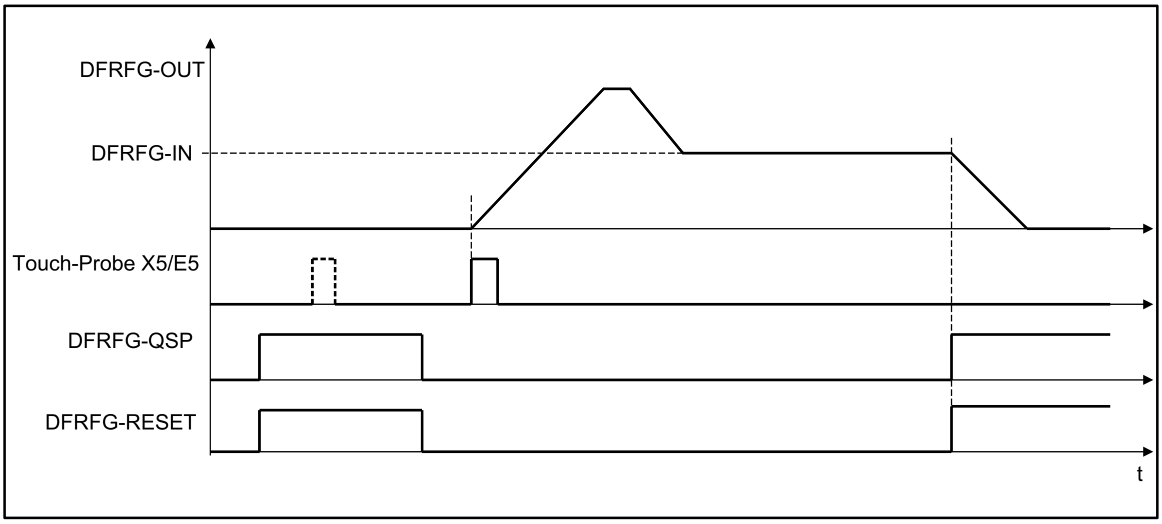


Fig. 7-140 Start via touch probe initiator (terminal X5/E5)

7.5.45.7 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.

7.5.45.8 Offset setting

The offset can be set with the code C0756 (see chapter 7.8; 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.

7.5.46 Digital frequency processing (DFSET)

Purpose

Conditions the digital frequency for the controller. Input of the stretching factor, gearbox factor, and speed or phase trimming.

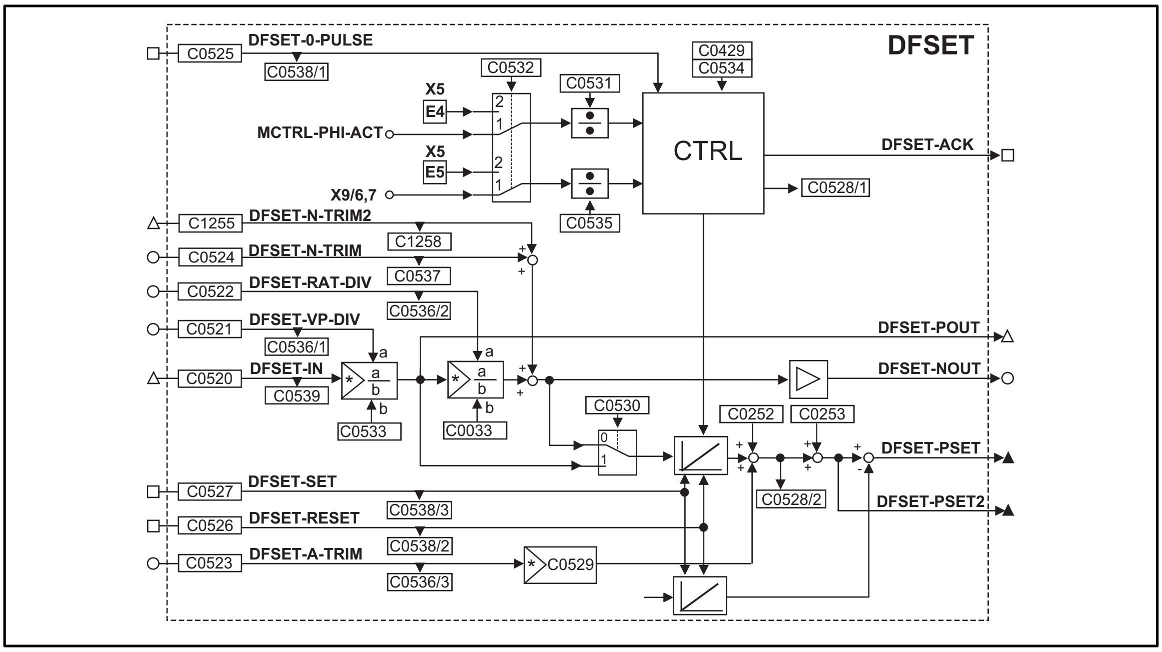


Fig. 7-141 Digital frequency processing (DFSET)

Signal				Source		Note
Name	**Type**	**DIS**	**DIS format**	**CFG**	**List**	
DFSET-IN	phd	C0539	dec [rpm]	C0520	4	Speed/Phase setpoint
DFSET-N-TRIM	a	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	a	C0536/3	dec [inc]	C0523	1	Phase trimming 100% = 16384 inc
DFSET-VP-DIV	a	C0536/1	dec	C0521	1	Numerator of stretching factor 100 % = 16384 inc
DFSET-RAT-DIV	a	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	a	-	-	-	-	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)

7.5.46.1 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:

$$\text{DFSET} - \text{NOUT} = \text{Stretching factor} \cdot \frac{\text{DFSET} - \text{RAT} - \text{DIV}}{\text{C0033}}$$

$$\text{DFSET–NOUT} = \text{DFSET–IN} \cdot \frac{\text{DFSET–VP–DIV}}{\text{C0533}} \cdot \frac{\text{DFSET–RAT–DIV}}{\text{C0033}}$$

7.5.46.2 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 ($\triangleq$ ±1/2 rev.). Every analog signal can be used as a source.

- The input is done in increments (one revolution $\triangleq$ 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).

7.5.46.3 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:

$$\text{Correction value at C0429} = 16384 \cdot \text{Korrekturwert}$$

- 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 signal to DFSET-0-pulse, the zero track is synchronised once
10	One synchronisation, a phase deviation is corrected in the shortest possible way	After a LOW-HIGH signal to DFSET-0-pulse, the zero track is synchronised once
11	One synchronisation, a phase deviation is corrected in CW direction	After a LOW-HIGH signal to DFSET-0-pulse, the zero track is synchronised once
12	One synchronisation, a phase deviation is corrected in CCW direction	After a LOW-HIGH signal to DFSET-0-pulse, the zero track is synchronised once
13	Single synchronisation, a phase difference is determined between setpoint pulse and actual pulse and is corrected to the corresponding direction of rotation according to the sign	After a LOW-HIGH signal to DFSET-0-pulse, the zero track is synchronised once

7.5.47 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.

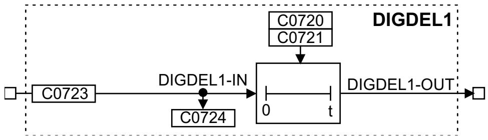


Fig. 7-142 Delay element (DIGDEL1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DIGDEL1-IN	d	C0724	bin	C0723	2	1000	-
DIGDEL1-OUT	d	-	-	-	-	-	-

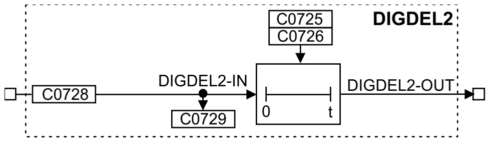


Fig. 7-143 Delay element (DIGDEL2)

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

7.5.47.1 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.

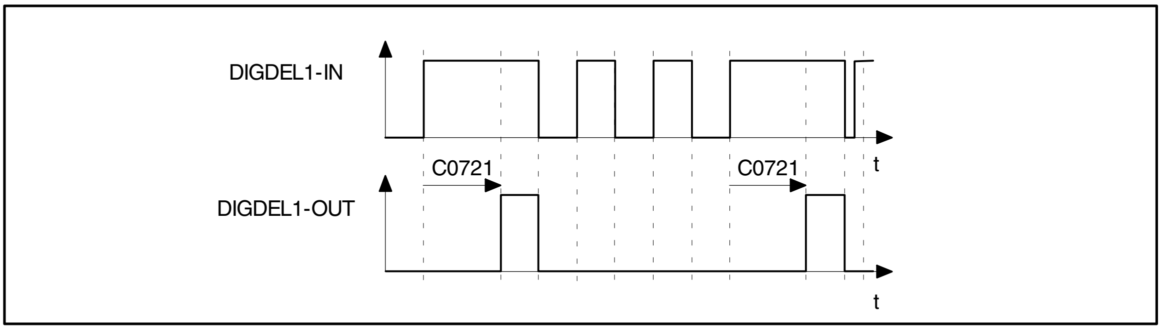


Fig. 7-144 On-delay (DIGDEL1)

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.

7.5.47.2 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.

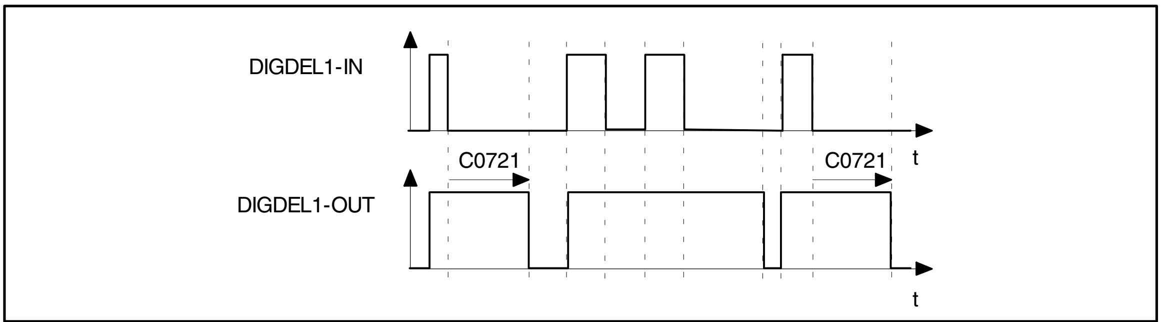


Fig. 7-145 Dropout delay (DIGDEL1)

- 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.

7.5.47.3 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.

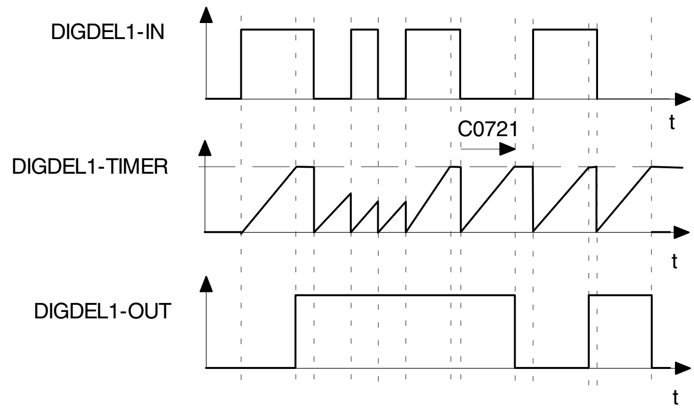


Fig. 7-146 General delay

- 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.

7.5.48 Freely assignable digital inputs (DIGIN)

Purpose

Reading and conditioning of the signals at the terminals X5/E1 to X5/E5.

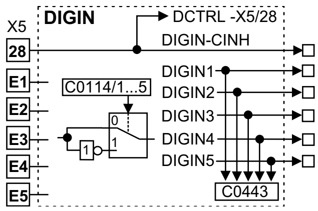


Fig. 7-147 Freely assignable digital inputs (DIGIN)

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)

7.5.49 Freely assignable digital outputs (DIGOUT)

Purpose

Conditioning of the digital signals and output to the terminals X5/A1 to X5/A4.

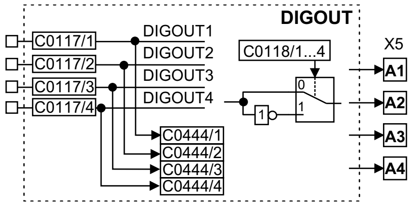


Fig. 7-148 Freely assignable digital outputs (DIGOUT)

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)

7.5.50 Free analog display code (DISA)

One function block (DISA) is available.

Purpose

Display analog values in the following formats:

- Analog (%)
- Decimal (dec)
- Hexadecimal (hex)

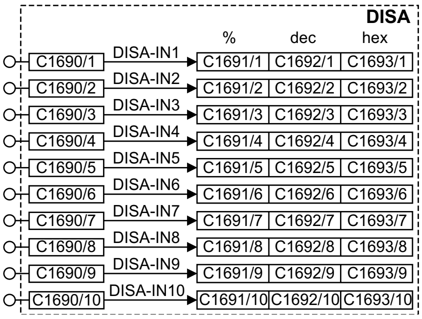


Fig. 7-149 Function block DISA

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
DISA-IN1	a	C1691/1	dec [%]	C1690/1	1	-
		C1692/1	dec			
		C1693/1	hex			
DISA-IN2	a	C1691/2	dec [%]	C1690/2	1	-
		C1692/2	dec			
		C1693/2	hex			
DISA-IN3	a	C1691/3	dec [%]	C1690/3	1	-
		C1692/3	dec			
		C1693/3	hex			
DISA-IN4	a	C1691/4	dec [%]	C1690/4	1	-
		C1692/4	dec			
		C1693/4	hex			
DISA-IN5	a	C1691/5	dec [%]	C1690/5	1	-
		C1692/5	dec			
		C1693/5	hex			

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
DISA-IN6	a	C1691/6	dec [%]	C1690/6	1	-
		C1692/6	dec			
		C1693/6	hex			
DISA-IN7	a	C1691/7	dec [%]	C1690/7	1	-
		C1692/7	dec			
		C1693/7	hex			
DISA-IN8	a	C1691/8	dec [%]	C1690/8	1	-
		C1692/8	dec			
		C1693/8	hex			
DISA-IN9	a	C1691/9	dec [%]	C1690/9	1	-
		C1692/9	dec			
		C1693/9	hex			
DISA-IN10	a	C1691/10	dec [%]	C1690/10	1	-
		C1692/10	dec			
		C1693/10	hex			

7.5.51 Free phase display code (DISPH)

One function block (DISPH) is available.

Purpose

Display phase values.

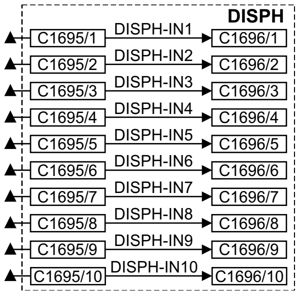


Fig. 7-150 Function block DISPH

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
DISPH-IN1	ph	C1696/1	dec [inc]	C1695/1	3	-
DISPH-IN2	ph	C1696/2	dec [inc]	C1695/2	3	-
DISPH-IN3	ph	C1696/3	dec [inc]	C1695/3	3	-
DISPH-IN4	ph	C1696/4	dec [inc]	C1695/4	3	-
DISPH-IN5	ph	C1696/5	dec [inc]	C1695/5	3	-
DISPH-IN6	ph	C1696/6	dec [inc]	C1695/6	3	-
DISPH-IN7	ph	C1696/7	dec [inc]	C1695/7	3	-
DISPH-IN8	ph	C1696/8	dec [inc]	C1695/8	3	-
DISPH-IN9	ph	C1696/9	dec [inc]	C1695/9	3	-
DISPH-IN10	ph	C1696/10	dec [inc]	C1695/10	3	-

7.5.52 First order derivative-action element (DT1)

Purpose

Derivative action of signals.

For instance, used for the speed injection (dv/dt).

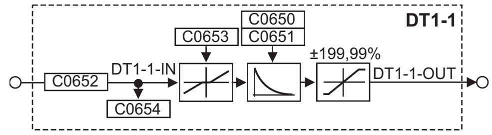


Fig. 7-151 First order derivative-action element (DT1-1)

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.

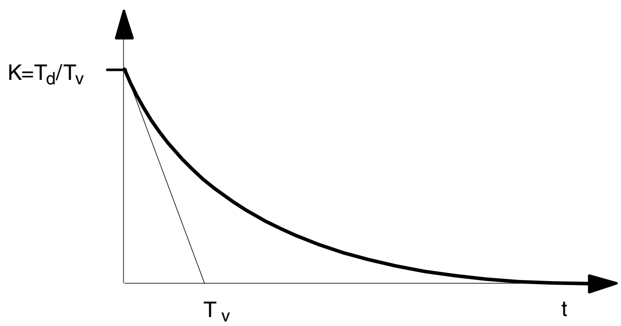


Fig. 7-152 Delay time T_v of the first order derivative-action element

7.5.53 Free piece counter (FCNT)

Purpose

Digital up/down counter

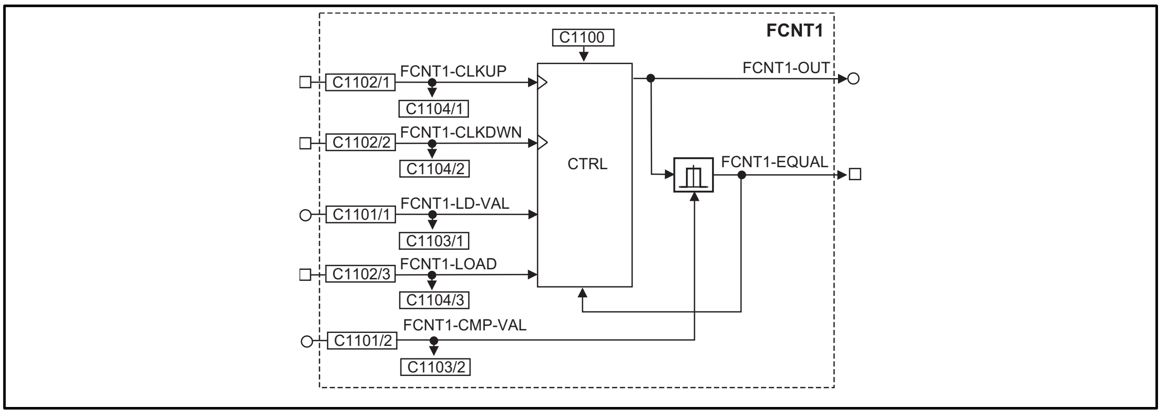


Fig. 7-153 Free piece counter (FCNT1)

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	Start value
FCNT1-LOAD	d	C1104/3	bin	C1102/3	2	• HIGH = Accept start value • The input has the highest priority
FCNT1-CMP-VAL	a	C1103/2	dec	C1101/2	1	Comparison value
FCNT1-OUT	a	-	-	-	-	Counter limited to ±199.99 % (≙ ±32767)
FCNT1-EQUAL	d	-	-	-	-	HIGH = comparison value reached

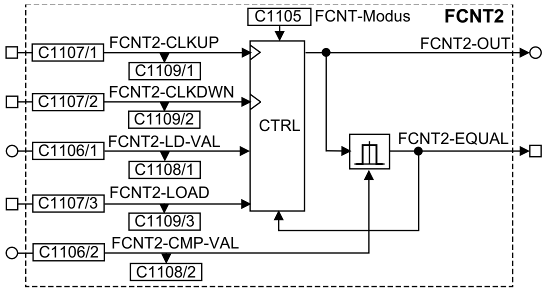


Fig. 7-154 Free piece counter (FCNT2)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
FCNT2-CLKUP	d	C1109/1	bin	C1107/1	2	LOW-HIGH edge = Increment counter by 1
FCNT2-CLKDWN	d	C1109/2	bin	C1107/2	2	LOW-HIGH edge = Decrement counter by 1
FCNT2-LD-VAL	a	C1108/1	dec	C1106/1	1	Start value
FCNT2-LOAD	d	C1109/3	bin	C1107/3	2	HIGH = Accept start value
FCNT2-CMP-VAL	a	C1108/2	dec	C1106/2	1	Comparison value
FCNT2-OUT	a	-	-	-	-	Count limited to ±199.99% corresponds to ±32767
FCNT2-EQUAL	d	-	-	-	-	HIGH = comparison value reached

Function library

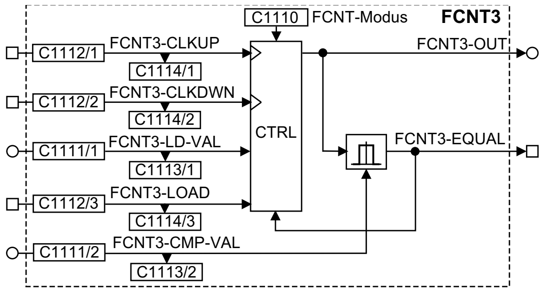


Fig. 7-155 Free piece counter (FCNT3)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
FCNT3-CLKUP	d	C1114/1	bin	C1112/1	2	LOW-HIGH edge = Increment counter by 1
FCNT3-CLKDWN	d	C1114/2	bin	C1112/2	2	LOW-HIGH edge = Decrement counter by 1
FCNT3-LD-VAL	a	C1113/1	dec	C1111/1	1	Start value
FCNT3-LOAD	d	C1114/3	bin	C1112/3	2	HIGH = Accept start value
FCNT3-CMP-VAL	a	C1113/2	dec	C1111/2	1	Comparison value
FCNT3-OUT	a	-	-	-	-	Count limited to ±199.99% corresponds to ±32767
FCNT3-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)

7.5.54 Free codes (FCODE)

2 x 16 free codes are available:
FCODE1476/1-16 and FCODE1477/1-16

Purpose

Input of length-related setpoints in physical units

Function

FCODE1476/1 -16

Input in [m_units]. (Measuring system of the master value)

FCODE1477/1 -16

Input in [s_units]. (Measuring system of the drive)

Stop!

The codes for the determination of the scaling factors (gearbox factors, feeding factors) affect the conversion of the units in incremental values.

Master-units:	C1303/1; C1303/2; C1304
Slave units:	C1305/1; C1305/2; C1306

7.5.55 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.

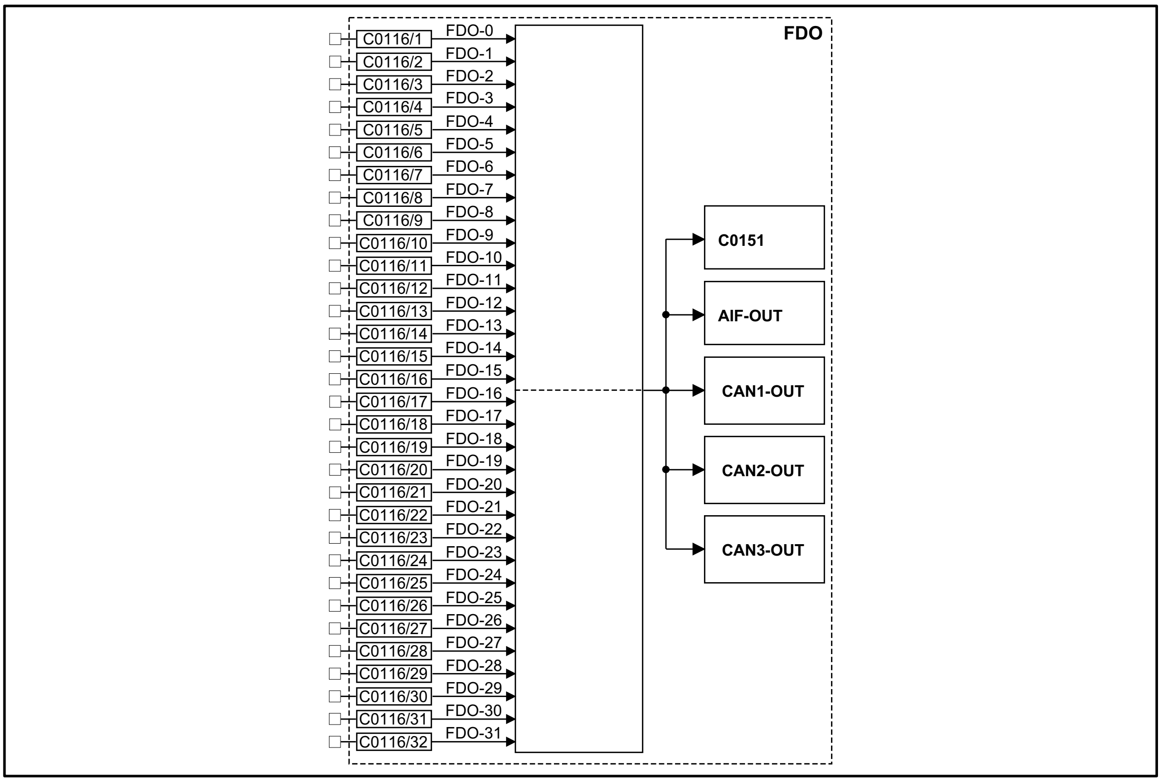


Fig. 7-156 Free digital outputs (FDO)

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.

7.5.56 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.

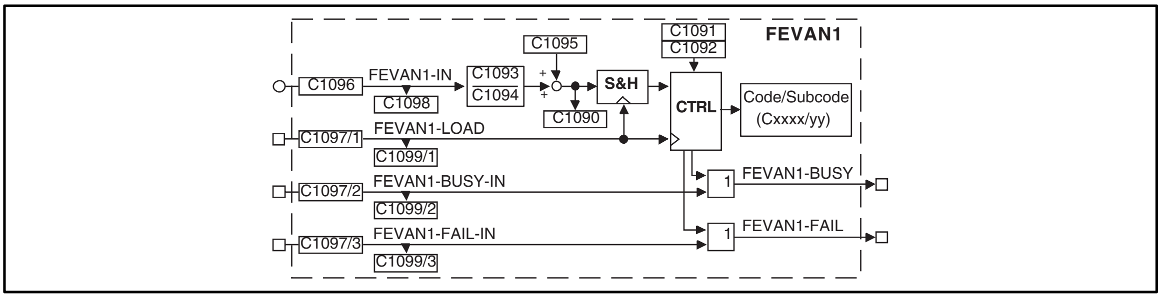


Fig. 7-157 Freely assignable input variables (FEVAN1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
FEVAN1-IN	a	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-IN	d	C1099/2	bin	C1097/2	2	HIGH = transmitting
FEVAN1-FAIL-IN	d	C1099/3	bin	C1097/3	2	High = transmission failed
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

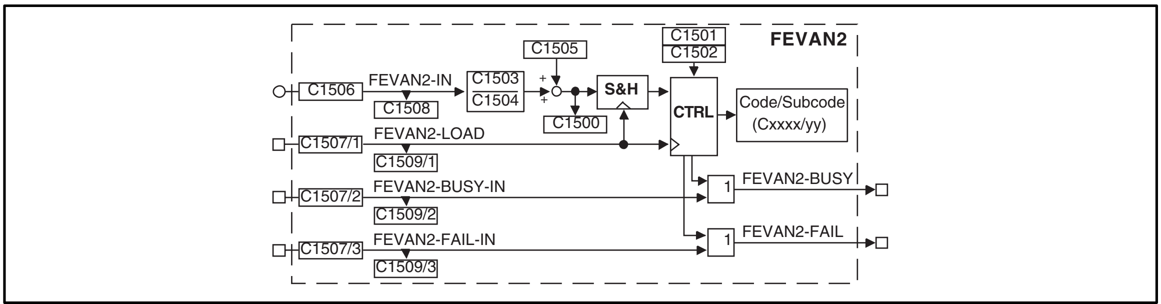


Fig. 7-158 Freely assignable input variables (FEVAN2)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
FEVAN2-IN	a	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-IN	d	C1509/2	bin	C1507/2	2	HIGH = transmitting
FEVAN2-FAIL-IN	d	C1509/3	bin	C1507/3	2	HIGH = transmission failed
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

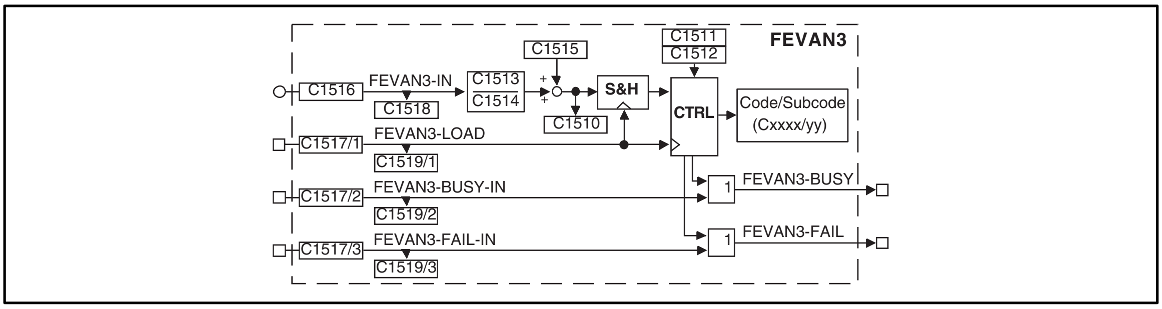


Fig. 7-159 Freely assignable input variables (FEVAN3)

Signal				Source		Note
Name	**Type**	**DIS**	**DIS format**	**CFG**	**List**	
FEVAN3-IN	a	C1518	dec	C1516	1	Input value
FEVAN3-LOAD	d	C1519/1	bin	C1517/1	2	A LOW-HIGH edge transmits the converted signal to the target code.
FEVAN3-BUSY-IN	d	C1519/2	bin	C1517/2	2	HIGH = transmitting
FEVAN3-FAIL-IN	d	C1519/3	bin	C1517/3	2	High = transmission failed
FEVAN3-BUSY	d	-	-	-	-	HIGH = transmitting
FEVAN3-FAIL	d	-	-	-	-	HIGH = transmission failed A LOW-HIGH edge at FEFAN3-LOAD sets FEFAN3-FAIL = LOW.
-	-	C1510	-	-	-	Display of the converted signal

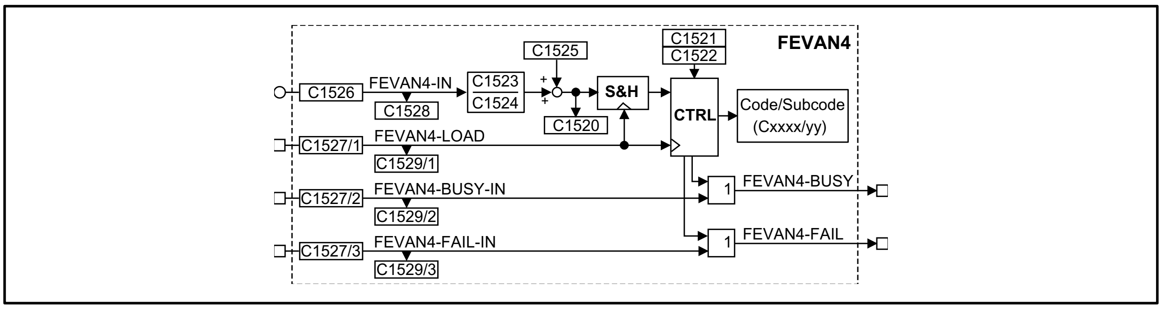


Fig. 7-160 Freely assignable input variables (FEVAN4)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
FEVAN4-IN	a	C1528	dec	C1526	1	Input value
FEVAN4-LOAD	d	C1529/1	bin	C1527/1	2	A LOW-HIGH edge transmits the converted signal to the target code.
FEVAN4-BUSY-IN	d	C1529/2	bin	C1527/2	2	HIGH = transmitting
FEVAN4-FAIL-IN	d	C1529/3	bin	C1527/3	2	HIGH = transmission failed
FEVAN4-BUSY	d	-	-	-	-	HIGH = transmitting
FEVAN4-FAIL	d	-	-	-	-	HIGH = transmission failed A LOW-HIGH edge at FEFAN4-LOAD sets FEFAN4-FAIL = LOW.
-	-	C1520	-	-	-	Display of the converted signal

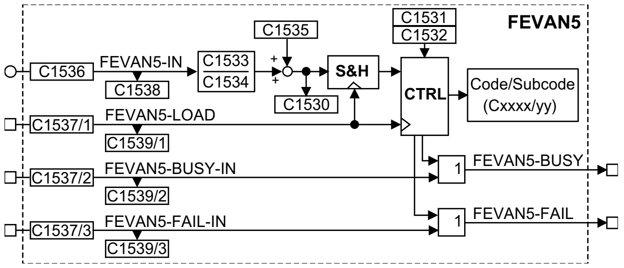


Fig. 7-161 Freely assignable input variables (FEVAN5)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
FEVAN5-IN	a	C1538	dec	C1536	1	Input value
FEVAN5-LOAD	d	C1539/1	bin	C1537/1	2	A LOW-HIGH edge transmits the converted signal to the target code.
FEVAN5-BUSY-IN	d	C1539/2	bin	C1537/2	2	HIGH = transmitting
FEVAN5-FAIL-IN	d	C1539/3	bin	C1537/3	2	HIGH = transmission failed
FEVAN5-BUSY	d	-	-	-	-	HIGH = transmitting
FEVAN5-FAIL	d	-	-	-	-	HIGH = transmission failed A LOW-HIGH edge at FEFAN5-LOAD sets FEFAN5-FAIL = LOW.
-	-	C1530	-	-	-	Display of the converted signal

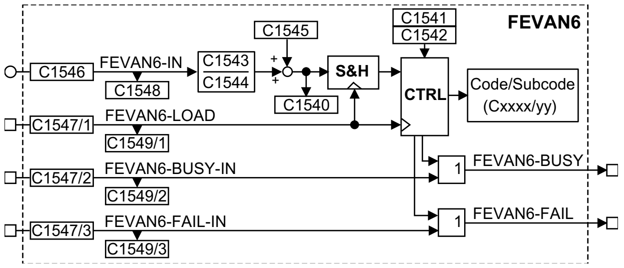


Fig. 7-162 Freely assignable input variables (FEVAN6)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
FEVAN6-IN	a	C1548	dec	C1546	1	Input value
FEVAN6-LOAD	d	C1549/1	bin	C1547/1	2	A LOW-HIGH edge transmits the converted signal to the target code.
FEVAN6-BUSY-IN	d	C1549/2	bin	C1547/2	2	HIGH = transmitting
FEVAN6-FAIL-IN	d	C1549/3	bin	C1547/3	2	High = transmission failed
FEVAN6-BUSY	d	-	-	-	-	HIGH = transmitting
FEVAN6-FAIL	d	-	-	-	-	HIGH = transmission failed A LOW-HIGH edge at FEFAN6-LOAD sets FEFAN6-FAIL = LOW.
-	-	C1540	-	-	-	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	
FEVAN3	C1513	C1514	C1515	C1511	C1512	
FEVAN4	C1523	C1524	C1525	C1521	C1522	
FEVAN5	C1533	C1534	C1535	C1531	C1532	
FEVAN6	C1543	C1544	C1545	C1541	C1542	

Data transmission

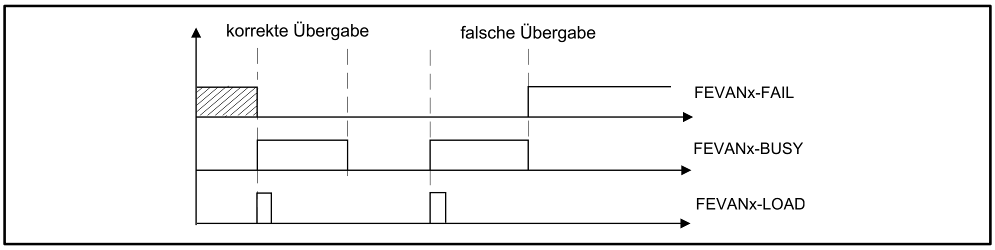


Fig. 7-163 Signal flow

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

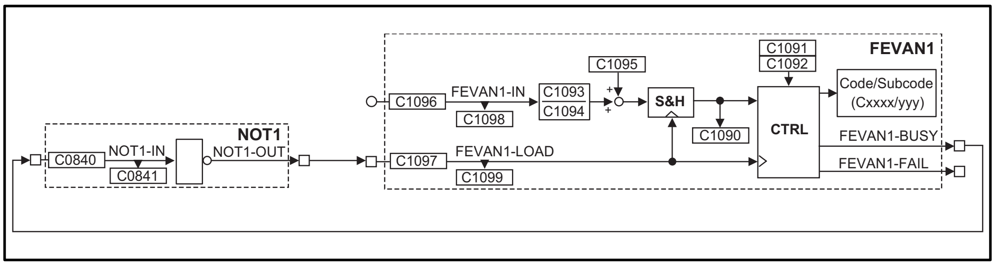


Fig. 7-164 Example for a cyclic data transmission to a target code

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 7.9.2).
- 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 scaling factor (see example 1).

Example 1 (only for FIX32 format with % scaling):

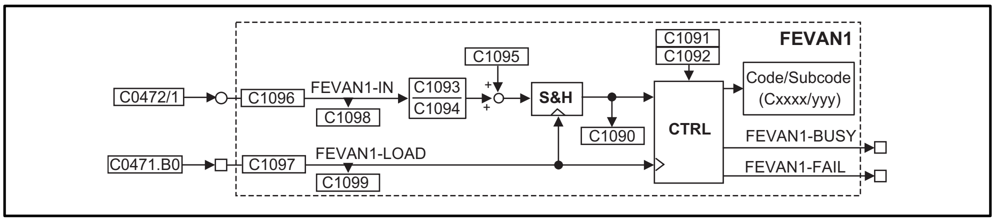


Fig. 7-165 Example of a circuit for FIX32 format with % scaling

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:

$$\text{FEVAN1–IN [\%]} \cdot \underbrace{\frac{1}{10000}}_{\text{Scaling factor}} \cdot \underbrace{\frac{16384}{100}}_{\text{Scaling factor}} \cdot \frac{\text{C1093}}{\text{C1094}} + \text{C1095} = \text{C0141 [\%]}$$

Control:

- Set C0471.B0 = 1 (≙ 00000001h) so that the data are transmitted to the target code.

Example for converting to C1093:

$$\underbrace{1.05\,\%}_{\text{Setpoint in C0141}} \cdot 10000 \cdot \frac{100}{16384} \cdot \text{C1094} \cdot \underbrace{\frac{1}{1.05\,\%}}_{\text{FEVAN1-IN}} = \text{C1093} = 0.6103$$

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:

$$\text{FEVAN1–IN} \cdot \frac{1}{10000} \cdot \underbrace{\frac{\text{C1093}}{\text{C1094}}}_{\text{Scaling factor}} + \text{C1095} = \text{C0011 [rpm]}$$

$$1000 \cdot \frac{1}{10000} \cdot \frac{1,0}{0.0001} + 0 = 1000\ \text{rpm}$$

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:

$$\text{FEVAN1–IN} \cdot \frac{\text{C1093}}{\text{C1094}} + \text{C1095} = x$$

7.5.57 Fixed setpoints (FIXSET)

Purpose

This function block is used to program a maximum of 15 fixed setpoints and to call them via digital terminals or control codes.

The fixed setpoints can be used e.g. for:

- Different dancer set positions when a dancer position control is used or
- Different stretching ratios (gearbox factor) when a speed ratio control with digital frequency coupling is used

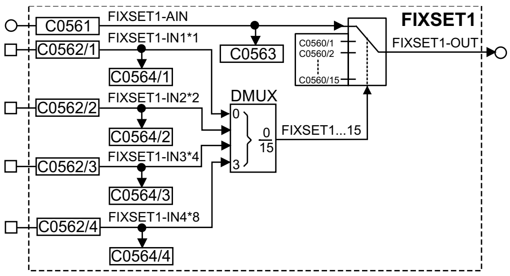


Fig. 7-166 Fixed setpoint (FIXSET1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
FIXSET1-AIN	a	C0563	dec [%]	C0561	1	1000	The input is switched to the output, if a LOW level is applied at all selection inputs FIXSET-INx.
FIXSET1-IN1*1	d	C0564/1	bin	C0562/1	2	1000	The number of inputs to be assigned depends on the number of required FIXSET setpoints.
FIXSET1-IN2*2	d	C0564/2	bin	C0562/2	2	1000	
FIXSET1-IN3*4	d	C0564/3	bin	C0562/3	2	1000	
FIXSET1-IN4*8	d	C0564/4	bin	C0562/4	2	1000	
FIXSET1-OUT	a	-	-	-	-	-	

Function

The output of the FB can be used as a setpoint source (signal source) for another FB (e.g. process controller, arithmetic block, etc.). The parameter setting and handling is the same as for JOG, but it is independent of JOG (see function block NSET).

- Parameter setting of the fixed setpoints
  – The individual fixed setpoints are parameterised by the subcodes of C0560.
- Output of the selected fixed setpoint:
  – If the binary inputs are triggered with a HIGH signal, a fixed setpoint from the table is switched to the output.
- Range:
  – The values for the fixed setpoints range from -200% to +200%.

7.5.57.1 Enabling of the FIXSET1 setpoints

Number of required fixed setpoints	Number of the inputs to be assigned
1	at least 1
1 ... 3	at least 2
4 ... 7	at least 3
8 ... 15	4

Decoding table of the binary input signals:

Output signal FIXSET1-OUT =	1st input FIXSET1-IN1	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

7.5.58 Flipflop element (FLIP)

Purpose

This FB is a D flipflop. This function is used to evaluate and save digital signal transitions.

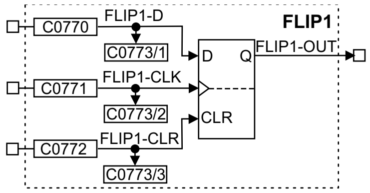


Fig. 7-167 Flipflop element (FLIP1)

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	-	-	-	-	-	-

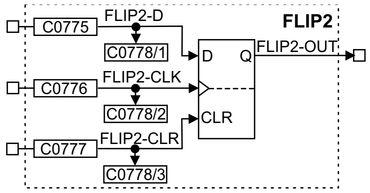


Fig. 7-168 Flipflop element (FLIP2)

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	-	-	-	-	-	-

Function library

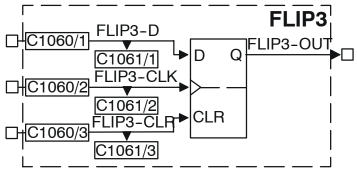


Fig. 7-169 Flipflop element (FLIP3)

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	-	-	-	-	-	-

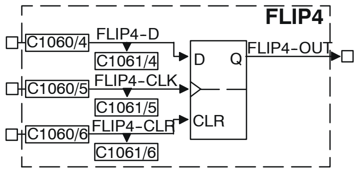


Fig. 7-170 Flipflop element (FLIP4)

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

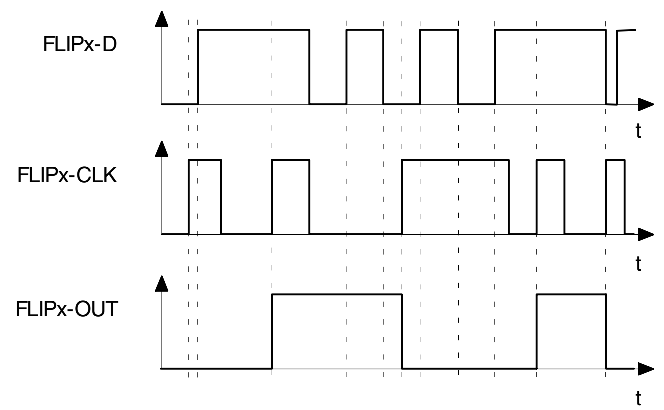
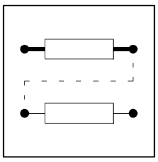


Fig. 7-171 Sequence of a flipflop

- 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.



7.5.59 Limiter (LIM)

Purpose

This FB is used to limit signals to ranges which can be set.

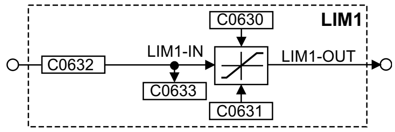


Fig. 7-172 Limiter (LIM1)

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).

7.5.60 Internal motor control (MCTRL)

Purpose

This function block controls the drive machine consisting of phase controller, speed controller, and motor control.

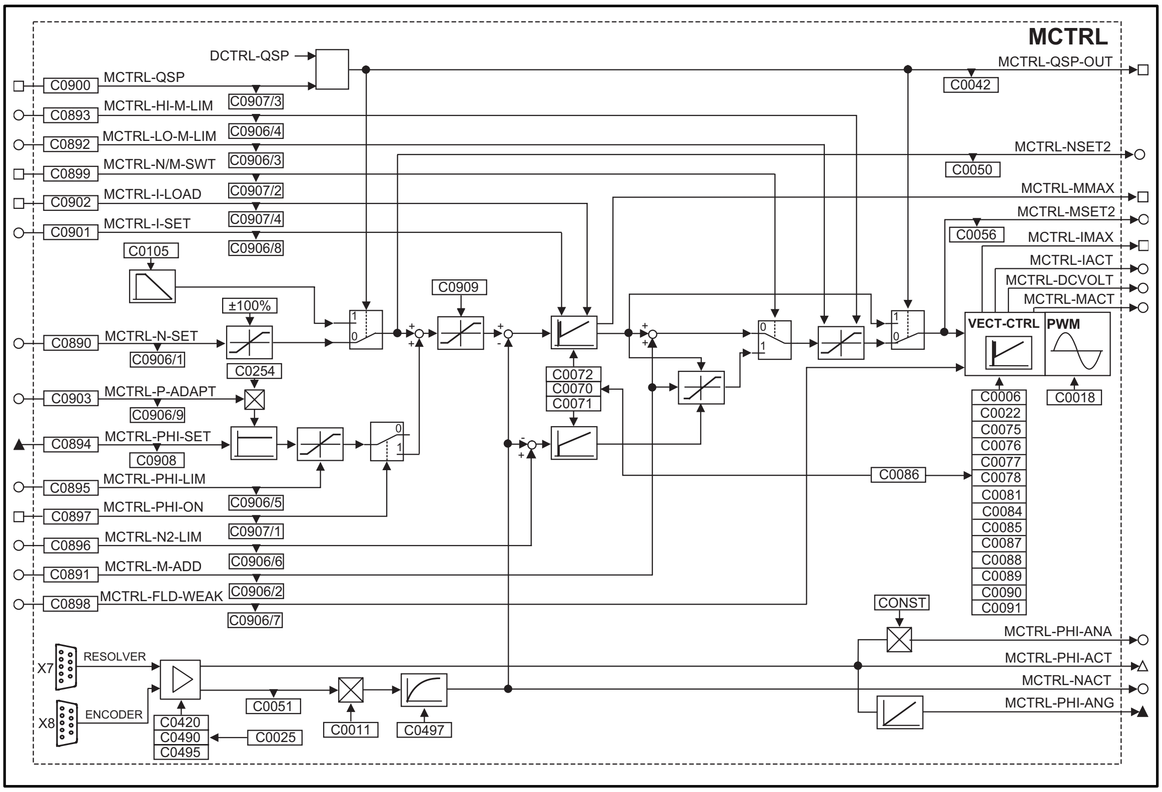


Fig. 7-173 Internal motor control (MCTRL)

Function library

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

7.5.60.1 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. (📖 7-406)
With this the parameters of the current controller are automatically set correctly.

7.5.60.2 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.

7.5.60.3 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

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.

7.5.60.4 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.

7.5.60.5 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.

7.5.60.6 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.

7.5.60.7 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 7.5.60.4)
   – 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.

7.5.60.8 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.

7.5.60.9 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!
The available torque is reduced by the field weakening.

7.5.60.10 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

7.5.61 Motor phase failure detection (MLP)

Purpose

Motor phase monitoring.

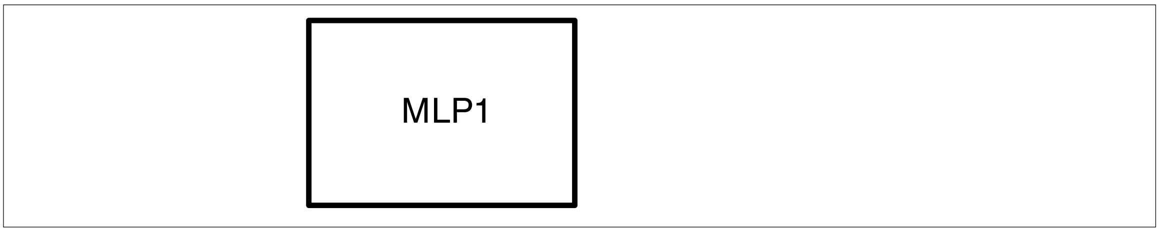


Fig. 7-174 Motor phase failure detection (MLP1)

Code	LCD	Possible settings		Important
		Lenze	Selection	
C0597	MONIT LP1	3	0 Trip 2 Warning 3 Off	**Conf. LP1** Configuration 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.

7.5.62 Monitor outputs of monitoring system (MONIT)

Purpose

The monitoring functions output digital monitor signals.

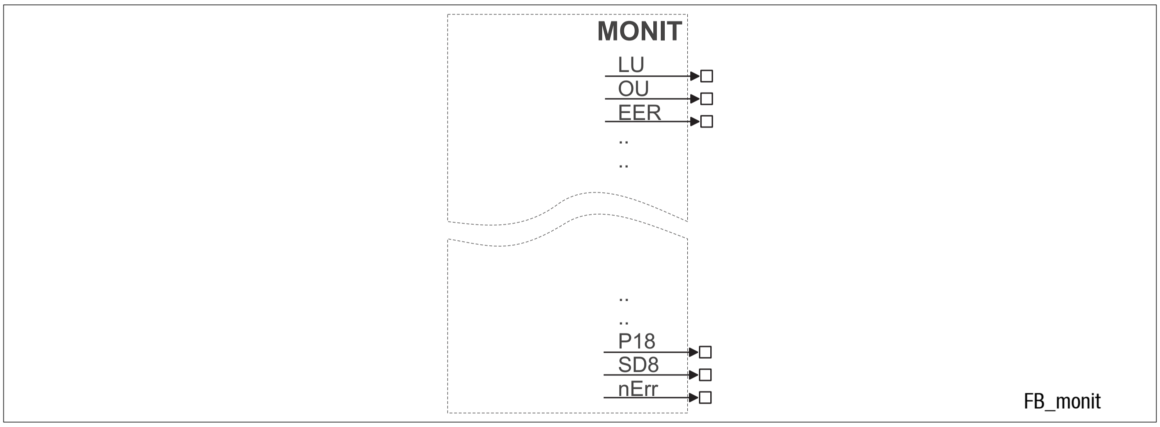


Fig. 7-175 Monitor outputs of the monitoring system (MONIT)

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".

7.5.63 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.

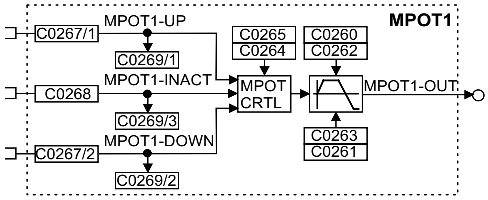


Fig. 7-176 Motor potentiometer (MPOT1)

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.

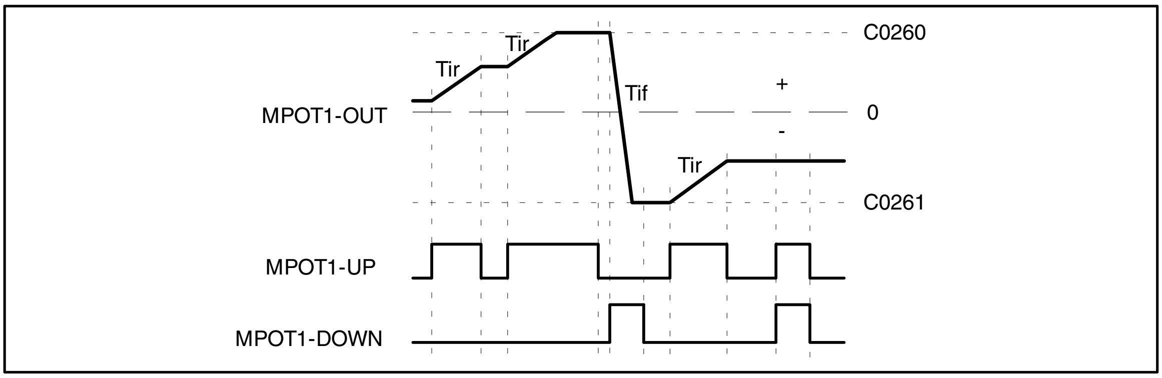


Fig. 7-177 Control signals of the motor potentiometer

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.

Function library

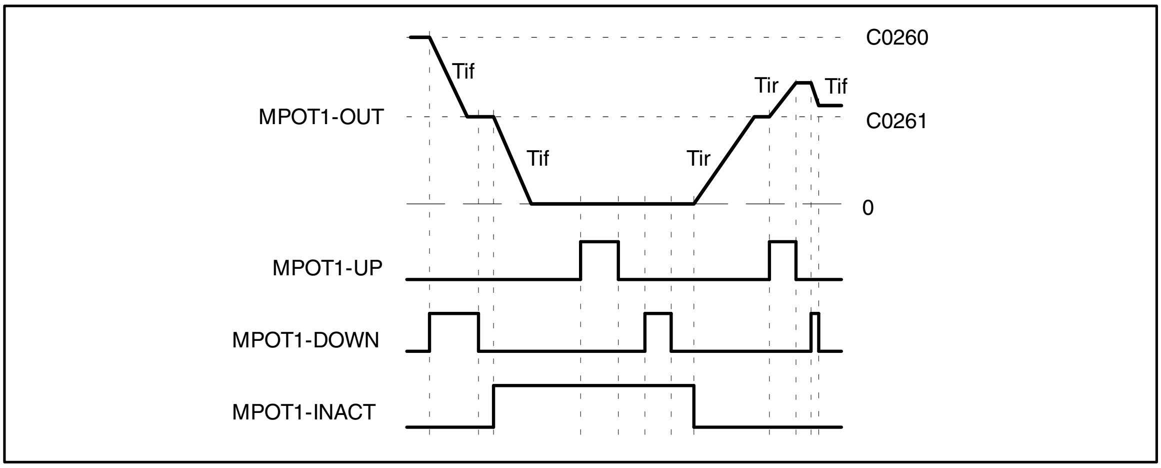


Fig. 7-178 Deactivation of the motor potentiometer via the input MPOT1-INACT

Initialisation

This function is used to save the output value of the MPOT non-volatile 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.

7.5.64 Logic NOT

Purpose

Logic inversion of digital signals. The inversion can be used to control functions or generate status information.

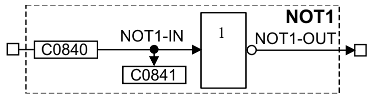


Fig. 7-179 Logic NOT (NOT1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NOT1-IN	d	C0841	bin	C0840	2	1000	-
NOT1-OUT	d	-	-	-	-	-	-

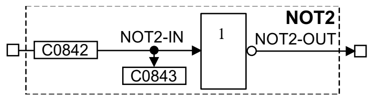


Fig. 7-180 Logic NOT (NOT2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NOT2-IN	d	C0843	bin	C0842	2	1000	-
NOT2-OUT	d	-	-	-	-	-	-

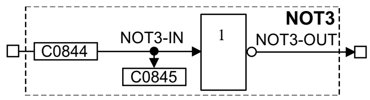


Fig. 7-181 Logic NOT (NOT3)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NOT3-IN	d	C0845	bin	C0844	2	1000	-
NOT3-OUT	d	-	-	-	-	-	-

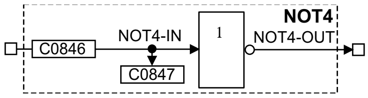


Fig. 7-182 Logic NOT (NOT4)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NOT4-IN	d	C0847	bin	C0846	2	1000	-
NOT4-OUT	d	-	-	-	-	-	-

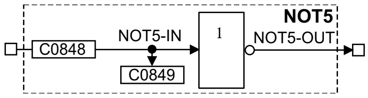


Fig. 7-183 Logic NOT (NOT5)

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.

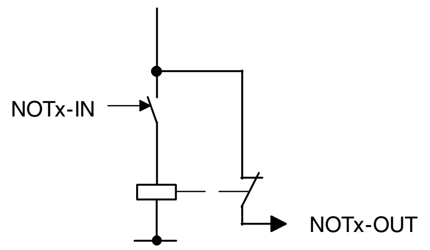


Fig. 7-184 Function of NOT when changing an NO contact to an NC contact.

7.5.65 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.

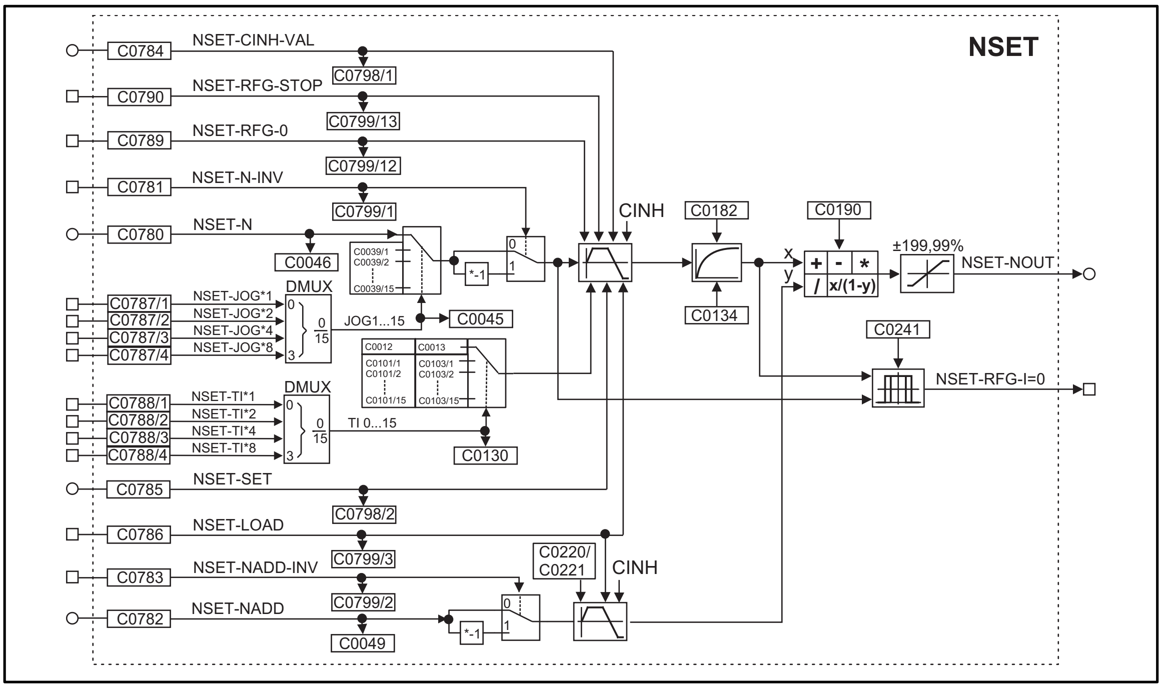


Fig. 7-185 Speed setpoint conditioning (NSET)

Function library

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NSET-N	a	C0046	dec [%]	C0780	1	50	Intended for main setpoint, other signals are permissible
NSET-NADD	a	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 "fixed setpoints" for the main setpoint
NSET-TI*2	d	C0799/9	bin	C0788/2	2	1000	
NSET-TI*4	d	C0799/10	bin	C0788/3	2	1000	
NSET-TI*8	d	C0799/11	bin	C0788/4	2	1000	
NSET-N-INV	d	C0799/1	bin	C0781	2	10251	Control of the signal inversion for the main setpoint
NSET-NADD-INV	d	C0799/2	bin	C0783	2	1000	Control of the signal inversion for the additional setpoint
NSET-RFG-0	d	C0799/12	bin	C0789	2	1000	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	a	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	a	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	a	-	-	-	-	-	-
NSET-RFG-I=0	d	-	-	-	-	-	-

Function

- Main setpoint path
- JOG setpoints
- Setpoint inversion
- S ramp

7.5.65.1 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.

7.5.65.2 JOG setpoints

- Are fixed values which are saved 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

7.5.65.3 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.

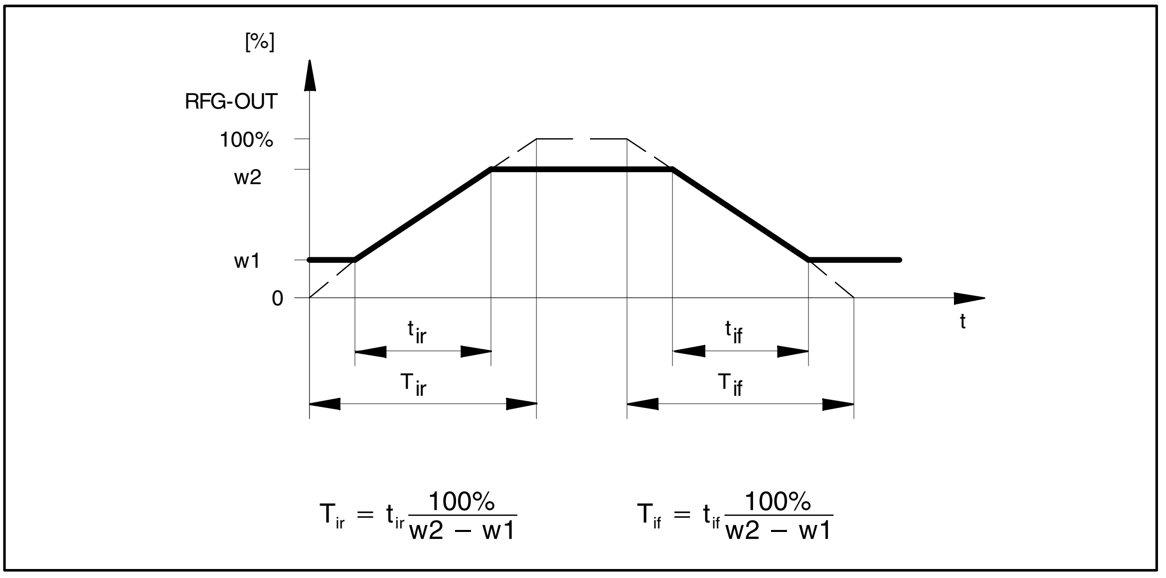


Fig. 7-186 Acceleration and deceleration times of the ramp function generator

- 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 tapped at the output.

Priorities:

CINH	NSET-LOAD	NSET-RFG-0	NSET-RFG-STOP	Function
0	0	0	0	RFG follows the input value via the set ramps
0	0	0	1	The value at the output of RFG is frozen
0	0	1	0	RFG decelerates to zero along the set deceleration time
0	0	1	1	
0	1	0	0	RFG accepts the value applied to input NSET-SET and taps 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 taps 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	

7.5.65.4 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.

7.5.65.5 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/IYI	1 % = 100 % / 100%
5	Output = X/(100% - Y)	200 % = 100 % / (100 % - 50 %)

*) Please observe the note for C0190 = 3, 4 in the following chapter

7.5.65.6 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.

Tip!

Do not link the main setpoint with negative additional setpoints when C0190 = 3 or C0190 =4! Otherwise the drive may change its direction of rotation!

The drive behaviour depends on the times for the main setpoint and additional setpoint set at the ramp function generator.

7.5.66 OR operation (OR)

Purpose

Logic OR operation of digital signals. The operations are used for controlling functions or creating status information.

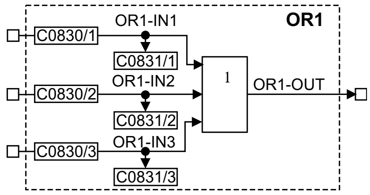


Fig. 7-187 OR operation (OR1)

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	-	-	-	-	-	-

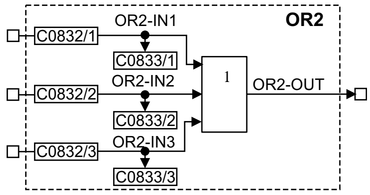


Fig. 7-188 OR operation (OR2)

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	-	-	-	-	-	-

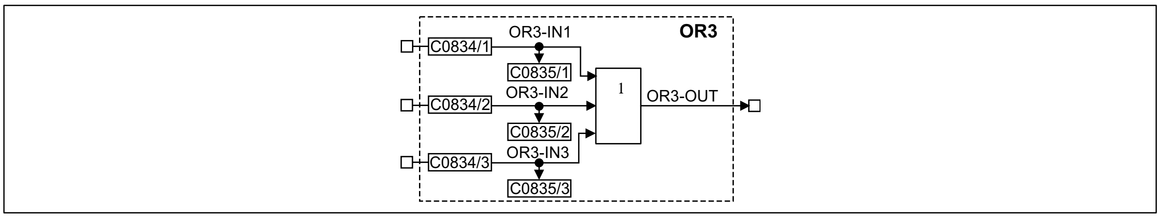


Fig. 7-189 OR operation (OR3)

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	-	-	-	-	-	-

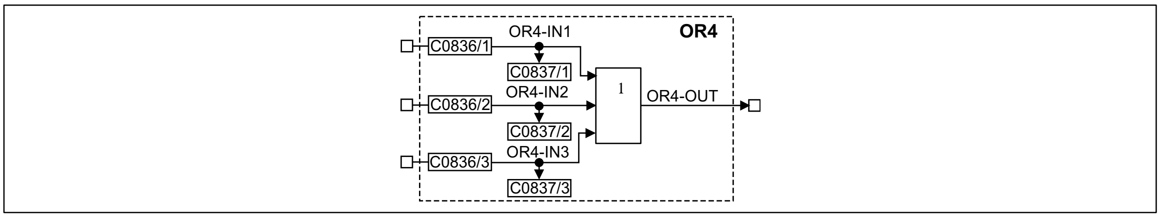


Fig. 7-190 OR operation (OR4)

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	-	-	-	-	-	-

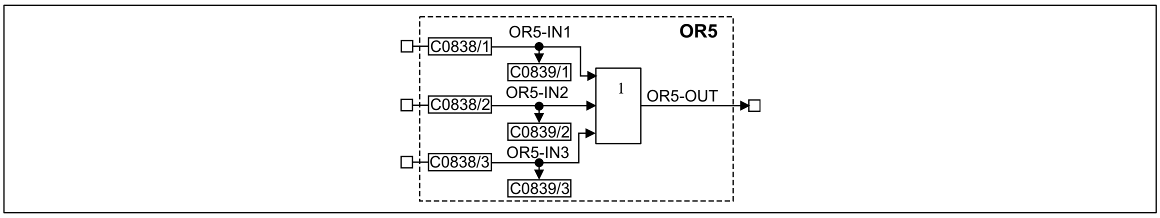


Fig. 7-191 OR operation (OR5)

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.

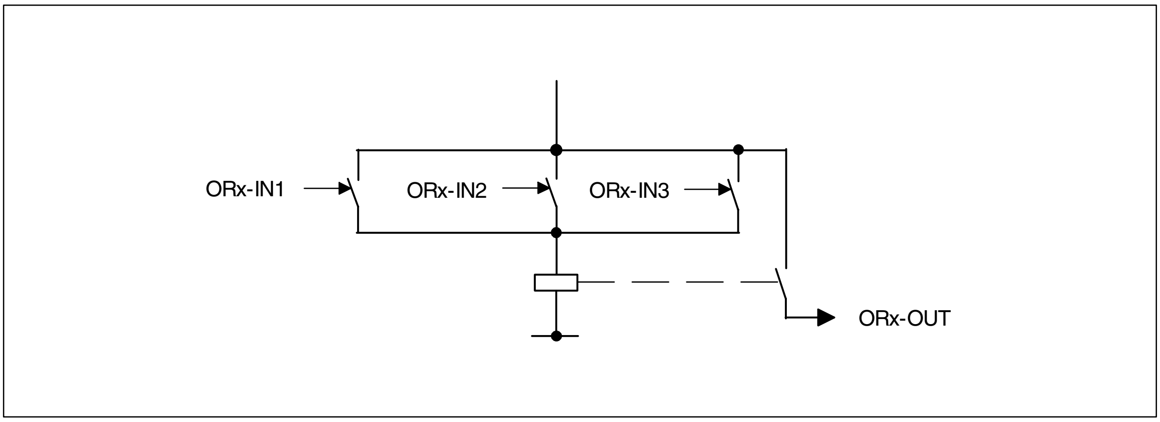


Fig. 7-192 Function of the OR operation as a parallel connection of NO contacts.

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.

7.5.67 Oscilloscope function (OSZ)

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.

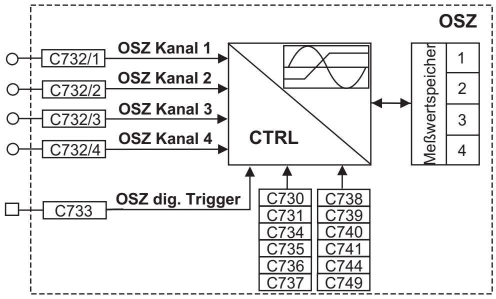


Fig. 7-193 Oscilloscope function (OSZ)

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. 7-194 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. 7-195).
		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. 7-194).
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)
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

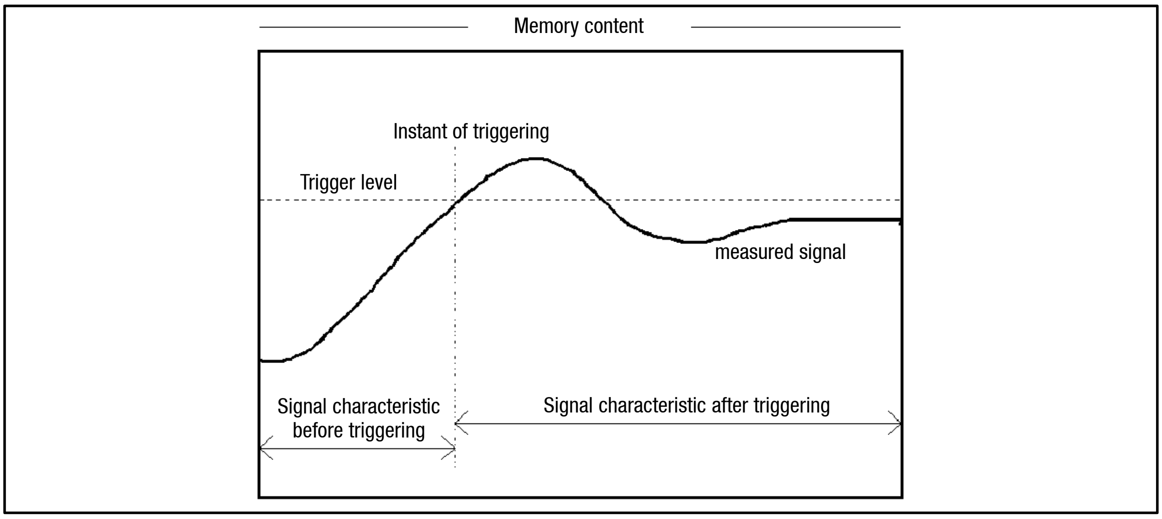


Fig. 7-194 Example: Trigger level and trigger delay with approx. -30 % of pre-triggering

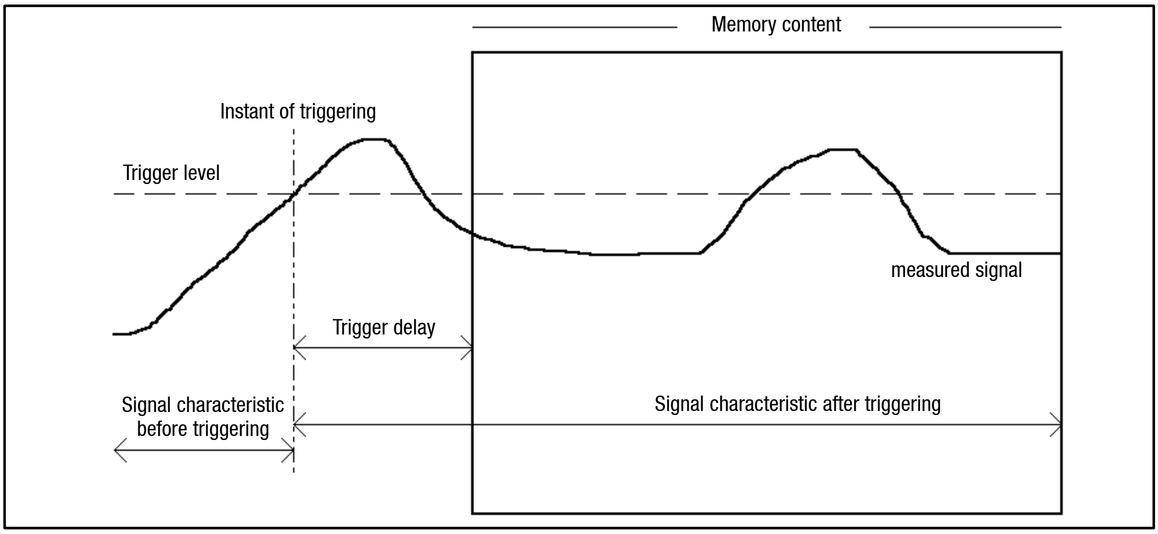


Fig. 7-195 Example: Trigger level and trigger delay with approx. -30 % of post-triggering

7.5.68 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.

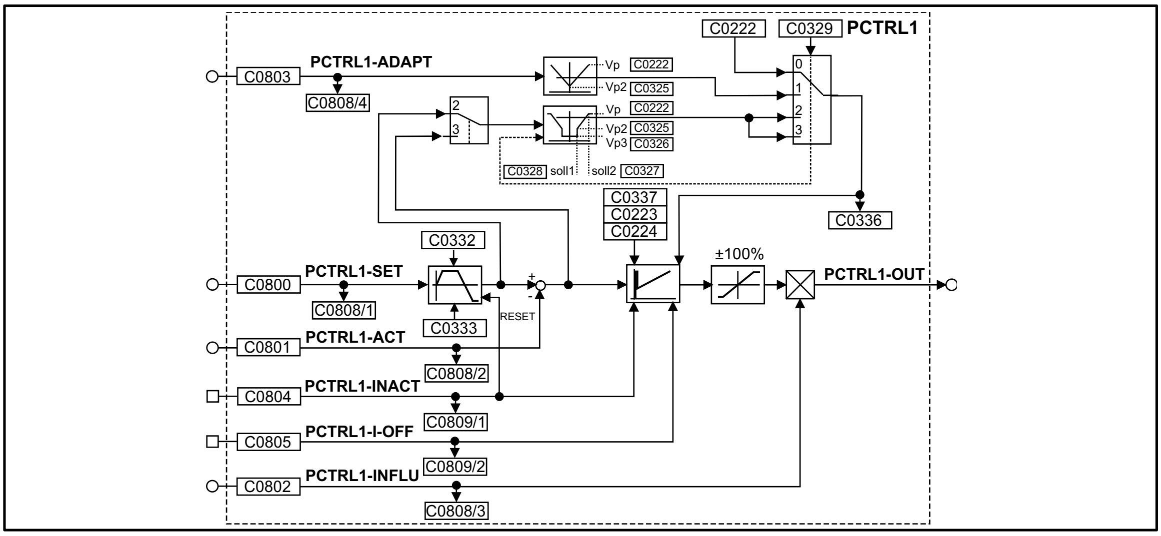


Fig. 7-196 Process controller (PCTRL1)

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).

7.5.68.1 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 switched off the I-component
  – PCTRL-I-OFF = LOW switches on the I-component
- The adjustment time is parameterized 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 %.

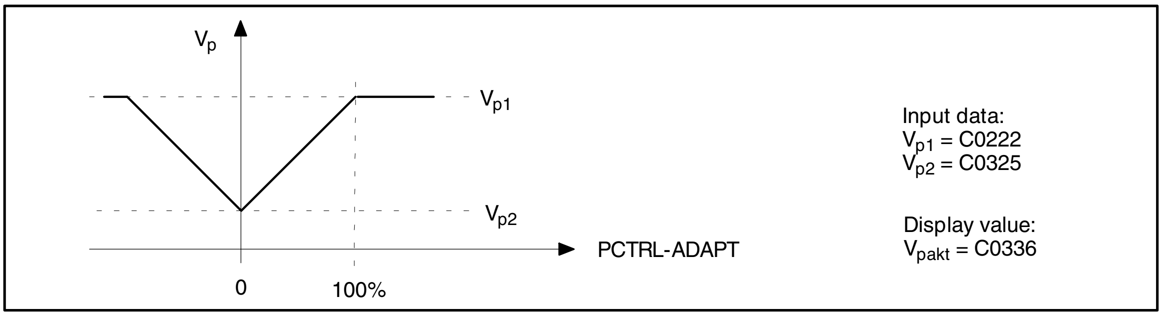


Fig. 7-197 Input of the P-gain via PCTRL-ADAPT input

  – 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.

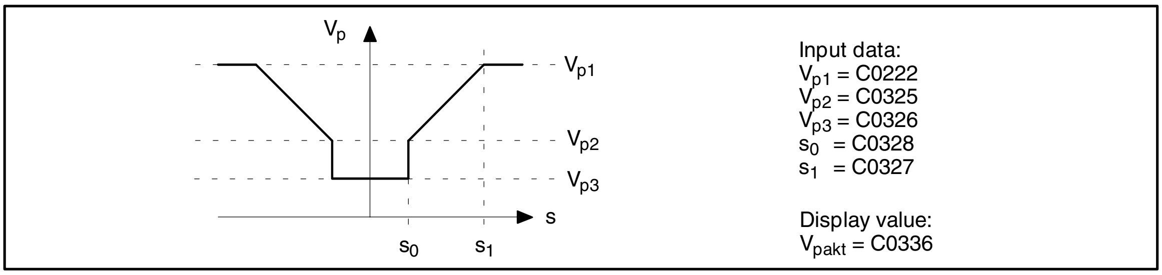
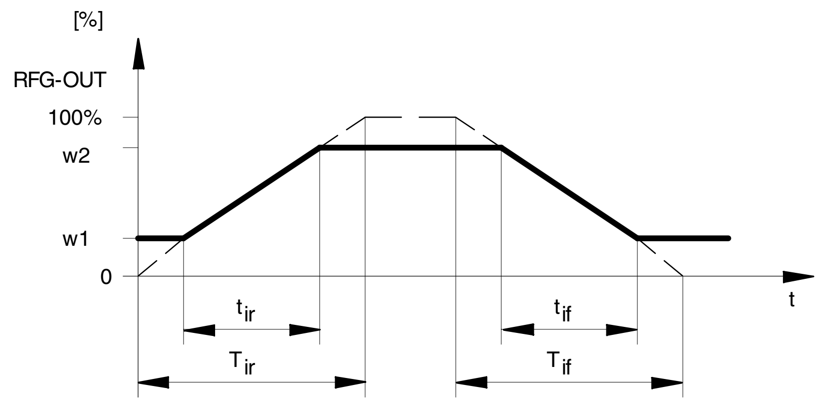


Fig. 7-198 Input of the P-gain derived from the PCTRL-SET process setpoint

  – C0329 = 3
  The input of the P-gain is derived from the control difference and led by the characteristic generation as C0329 = 2.

7.5.68.2 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. 7-199 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.

7.5.68.3 Value range of the output signal

- The process controller operates bipolar in the default setting.
  - The output value is limited to ±100 %.
- The function can be set unipolar under C0337.
  - The output value is limited to 0 ... +100 %.

7.5.68.4 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).

7.5.68.5 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.

7.5.69 Signal adaptation for phase signals (PHDIV)

Purpose

Division or multiplication of phase signals as a power of two.

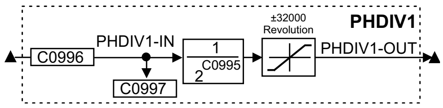


Fig. 7-200 Signal adaptation for phasae signals (PHDIV1)

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.

7.5.70 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.

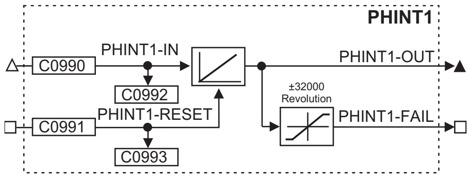


Fig. 7-201 Phase integrator (PHINT1)

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

Function

- constant input value
- Scaling of PHINTx-OUT

7.5.70.1 Constant input value

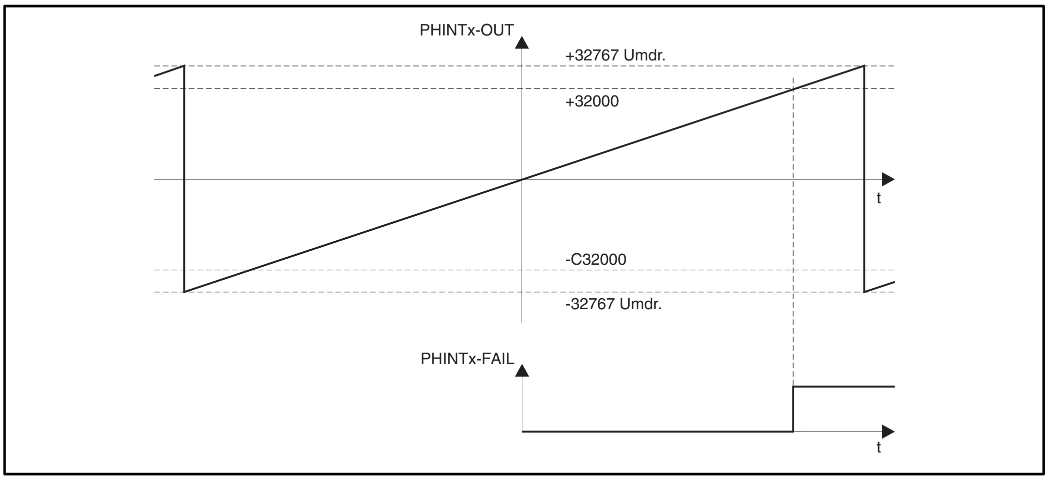


Fig. 7-202 Function of PHINTx with constant input value

- 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
- 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.

7.5.70.2 Scaling of PHINTx-OUT

Mathematic description of PHINTx-OUT:

$$\text{PHINTx–OUT[inc]} = \text{PHINTx–IN[rpm]} \cdot \text{t[s]} \cdot \text{65536[inc/Umdr.]}$$

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:

$$1000\ \text{rpm} = \frac{1000\ \text{rev.}}{60\ \text{s}}$$

  – Calculation of PHINTx-OUT:

$$\text{PHINTx} - \text{OUT} = \frac{1000\ \text{rev.}}{60\ \text{s}} \cdot 10\ \text{s} \cdot \frac{65536\ \text{inc}}{\text{rev.}} = 10922666\ \text{inc}$$

7.5.71 First order delay element (PT1)

Purpose

Filter and delay analog signals.

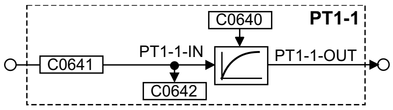


Fig. 7-203 First order delay element (PT1-1)

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.

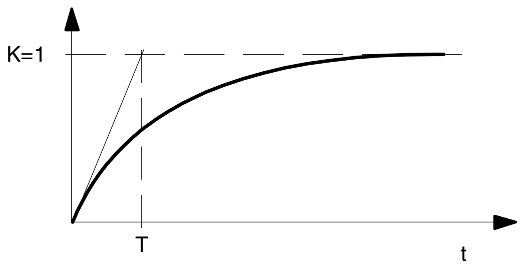


Fig. 7-204 Delay T of the first order delay element

7.5.72 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.

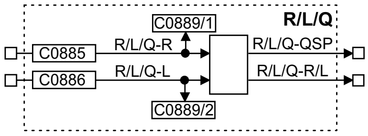


Fig. 7-205 CW-CCW-QSP link (R/L/Q)

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.

7.5.73 Ramp function generator (RFG)

Purpose

The ramp function generator limits the rise of signals.

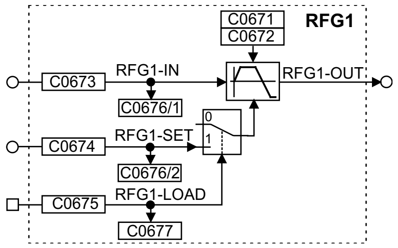


Fig. 7-206 Ramp function generator (RFG1)

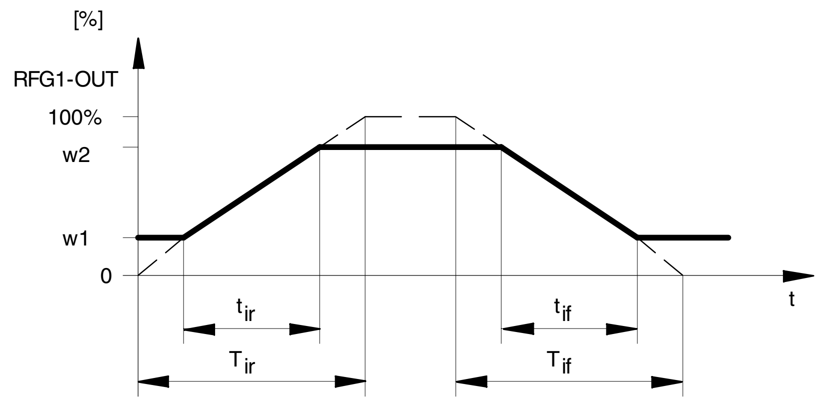
Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
RFG1-IN	a	C0676/1	dec [%]	C0673	1	1000	-
RFG1-SET	a	C0676/2	dec [%]	C0674	1	1000	-
RFG1-LOAD	d	C0677	-	C0675	2	1000	-
RFG1-OUT	a	-	-	-	-	-	-

Function

- Calculation and setting of the times T_{ir} and T_{if}
- Loading of the ramp generator

7.5.73.1 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. 7-207 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.

7.5.73.2 Loading of the ramp function generator

The ramp function generator can be initialized 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.

7.5.74 Sample and hold function (S&H)

Purpose

The FB can save analog signals. The saved value is also available after mains switching.

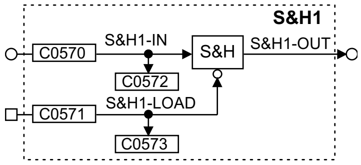


Fig. 7-208 Sample and hold function (S&H1)

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).

7.5.75 Phase value selection (SELPH)

Two FBs (SELPH1, SELPH2) are available.

Purpose

Select one phase value from nine phase values and switch to the output.

SELPH1

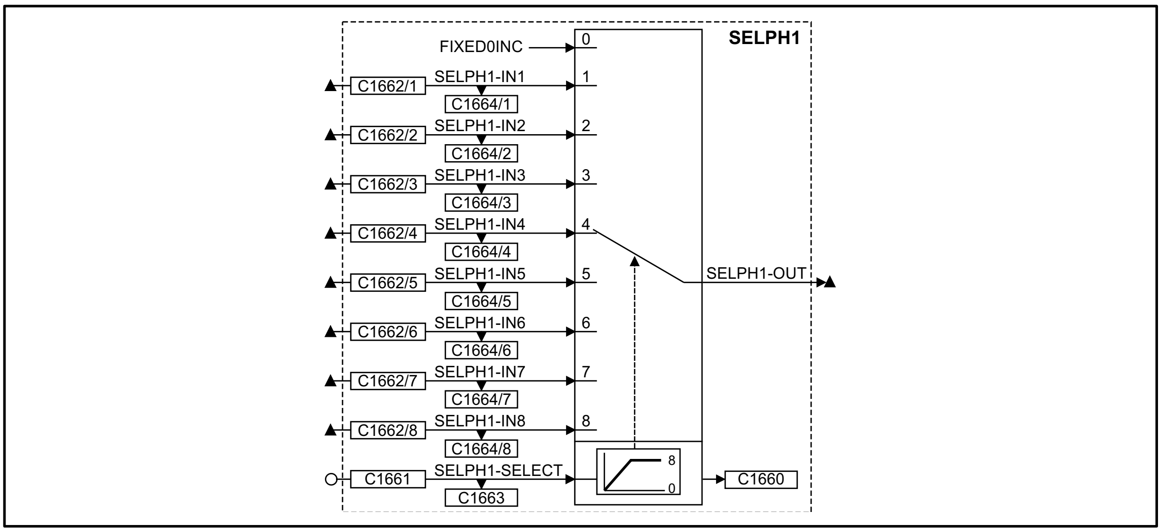


Fig. 7-209 Function block SELPH1

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
SELPH1-SELECT	a	C1663	dec	C1661	1	-
SELPH1-IN1	ph	C1664/1	dec [inc]	C1662/1	3	-
SELPH1-IN2	ph	C1664/2	dec [inc]	C1662/2	3	-
SELPH1-IN3	ph	C1664/3	dec [inc]	C1662/3	3	-
SELPH1-IN4	ph	C1664/4	dec [inc]	C1662/4	3	-
SELPH1-IN5	ph	C1664/5	dec [inc]	C1662/5	3	-
SELPH1-IN6	ph	C1664/6	dec [inc]	C1662/6	3	-
SELPH1-IN7	ph	C1664/7	dec [inc]	C1662/7	3	-
SELPH1-IN8	ph	C1664/8	dec [inc]	C1662/8	3	-
SELPH1-OUT	ph	-	-	-	-	-
-	-	C1660	dec	-	-	displays the current selection

SELPH2

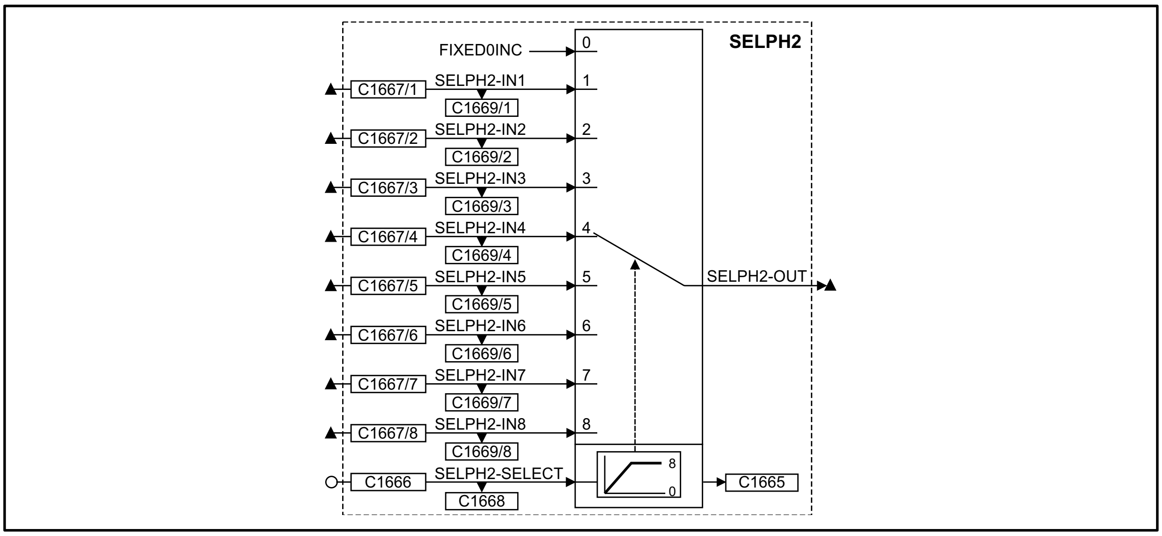


Fig. 7-210 Function block SELPH2

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
SELPH2-SELECT	a	C1668	dec	C1666	1	-
SELPH2-IN1	ph	C1669/1	dec [inc]	C1667/1	3	-
SELPH2-IN2	ph	C1669/2	dec [inc]	C1667/2	3	-
SELPH2-IN3	ph	C1669/3	dec [inc]	C1667/3	3	-
SELPH2-IN4	ph	C1669/4	dec [inc]	C1667/4	3	-
SELPH2-IN5	ph	C1669/5	dec [inc]	C1667/5	3	-
SELPH2-IN6	ph	C1669/6	dec [inc]	C1667/6	3	-
SELPH2-IN7	ph	C1669/7	dec [inc]	C1667/7	3	-
SELPH2-IN8	ph	C1669/8	dec [inc]	C1667/8	3	-
SELPH2-OUT	ph	-	-	-	-	-
-	-	C1665	dec	-	-	displays the current selection

Function

- An analog signal at SELPHx-SELECT directly selects an input and switches it to SELPHx-OUT.
  - If SELPHx-SELECT = 0, SELPHx-OUT switches to FIXED 0 INC.
  - If SELPHx-SELECT < 0, SELPHx-OUT switches to FIXED 0 INC.
  - If SELPHx-SELECT > 8, SELPHx-OUT switches to SELPHx-IN8.

Tip!

You can select an input via a digital signal by connecting the FB CONVDAx before SELPHx-SELECT.

7.5.76 Switching points (SP)

Two FBs (SP1, SP2) are available.

Purpose

Switches an output signal if the drive moves within a certain range (achieving a camgroup, triggering spray jets).

SP1

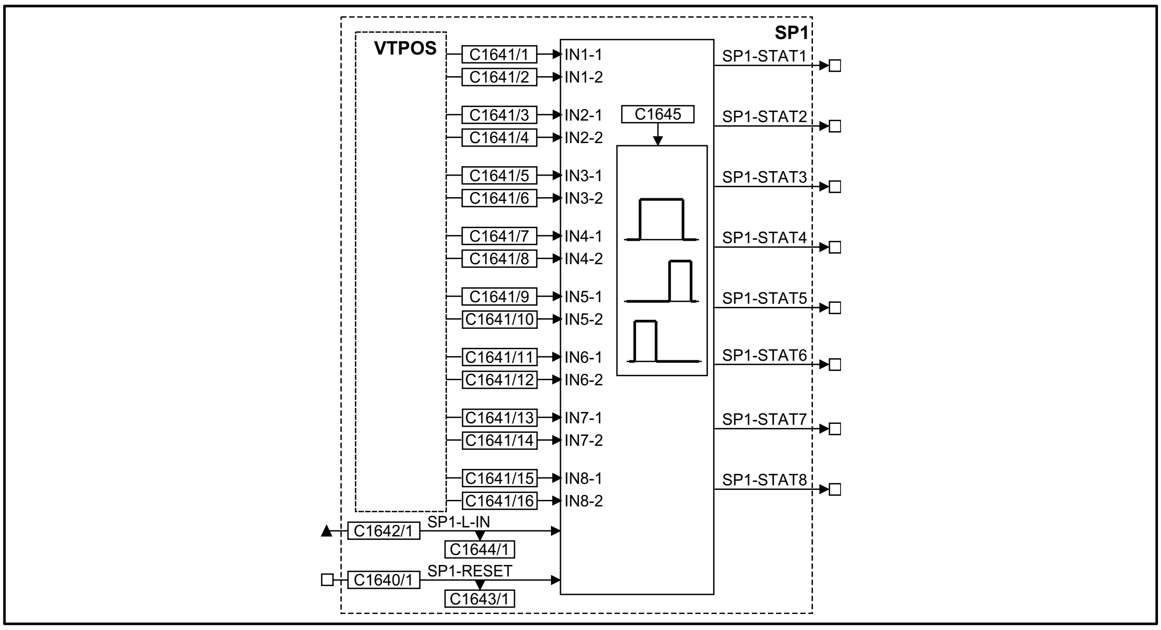


Fig. 7-211 Function block SP1

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
SP1-L-IN	ph	C1644/1	dec [inc]	C1642/1	3	65536 inc = 1 revolution
SP1-RESET	d	C1643/1	bin	C1640/1	2	-
SP1-STAT1	d	-	-	-	-	-
SP1-STAT2	d	-	-	-	-	-
SP1-STAT3	d	-	-	-	-	-
SP1-STAT4	d	-	-	-	-	-
SP1-STAT5	d	-	-	-	-	-
SP1-STAT6	d	-	-	-	-	-
SP1-STAT7	d	-	-	-	-	-
SP1-STAT8	d	-	-	-	-	-

SP2

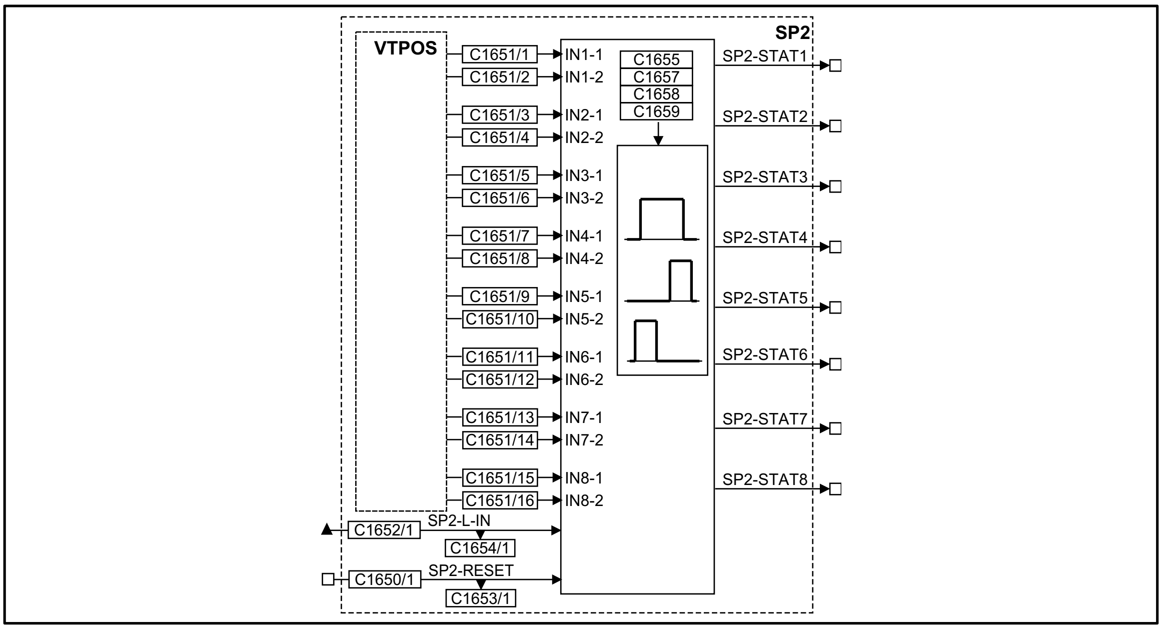


Fig. 7-212 Function block SP2

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
SP2-L-IN	ph	C1654/1	dec [inc]	C1652/1	3	65536 inc = 1 revolution
SP2-RESET	d	C1653/1	bin	C1650/1	2	-
SP2-STAT1	d	-	-	-	-	-
SP2-STAT2	d	-	-	-	-	-
SP2-STAT3	d	-	-	-	-	-
SP2-STAT4	d	-	-	-	-	-
SP2-STAT5	d	-	-	-	-	-
SP2-STAT6	d	-	-	-	-	-
SP2-STAT7	d	-	-	-	-	-
SP2-STAT8	d	-	-	-	-	-

Function

- Switching points (start/end, center/range)
- Switching hysteresis
- Switching dead time
- Switching filter time constant

7.5.76.1 Switching points

- The switching points can be set in two ways:
  – Mode 1: Start and end point
  – Mode 2: Centre point with switching range
- The switching points are entered via the variable table VTPOS.
  – Direct input of the switch-on and switch-off points or centre point and range in VTPOS.
- If the value at SPx-L-IN is within the range of the switching points set, SPx-STATx switches HIGH
- In factory setting, SPx-L-IN is connected to the actual position value (POS-ACTPOS) of the FB POS.
  – Therefore, the switching points refer to the distance traversed by the motor.

Assignment of the switch-on and switch-off points for SP1 (see also Fig. 7-211):

Code	Subcode	Switching point	Output FB
C1641	1	IN1-1	SP1-STAT1
	2	IN1-2	
...	...	...	...
C1641	15	IN8-1	SP1-STAT8
	16	IN8-2	

Assignment of the switch-on and switch-off points for SP2 (see also Fig. 7-212):

Code	Subcode	Switching point	Output FB
C1651	1	IN1-1	SP2-STAT1
	2	IN1-2	
...	...	...	...
C1651	15	IN8-1	SP2-STAT8
	16	IN8-2	

Mode 1: Start and end point

C1645 = set 0 (SP1)

C1655 = set 0 (SP2)

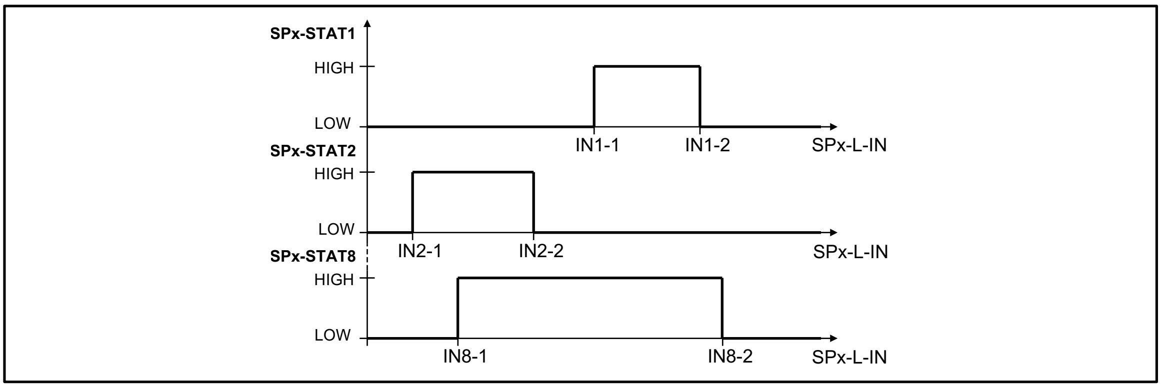


Fig. 7-213 Switch-on and switch-off points for SPx-STAT1, SPx-STAT2 and SPx-STAT8

Switch-on and switch-off positions depend on the travel direction:

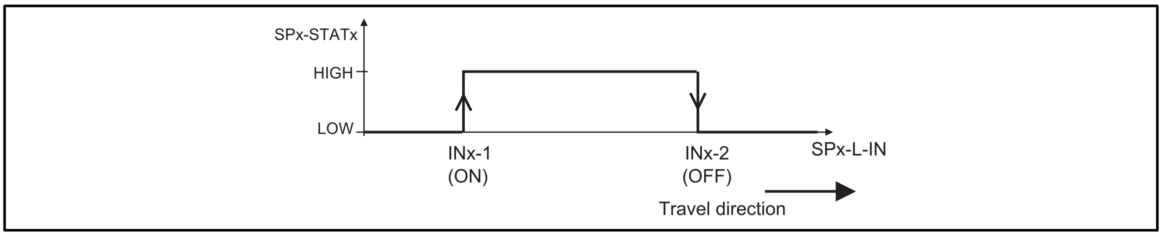


Fig. 7-214 Definition of a switch-on and switch-off position according to the travel direction

Mode 2: Centre point with switching range

C1645 = set 1 (SP1)

C1655 = set 1 (SP2)

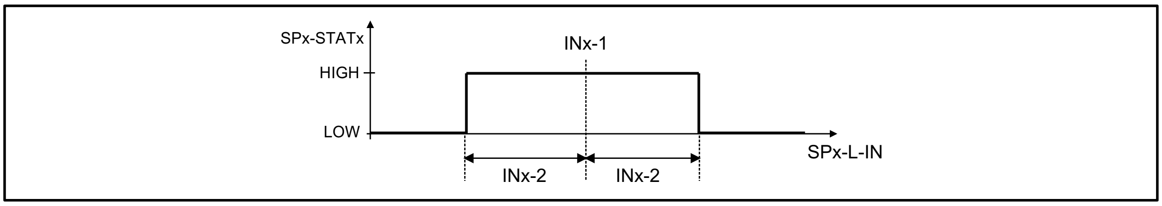


Fig. 7-215 Centre point with switching range

- INx-1 determines the centre point.
- INx-2 determines the switching range around the centre point.

7.5.76.2 Hysteresis

This function is available only for the FB SP2.

Purpose

Avoids indefined switching of the output signals (in standstill the drive is located exactly on a switching point).

Function

- The hysteresis is entered via C1658.
  – The setting is effective for SP2-STAT1 ... SP2-STAT8.

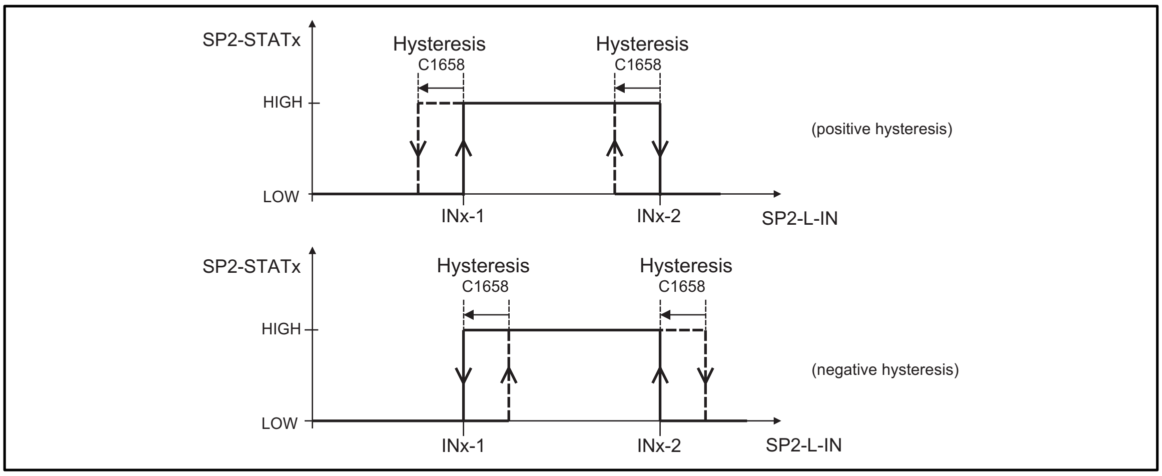


Fig. 7-216 Hysteresis for positive and negative values

7.5.76.3 Dead time

This function is available only for the FB SP2.

Purpose

Delayed triggering of subsequent machine parts (e.g. spray jets).

Function

- The dead time is entered via C1657.
  – The setting is possible for SP2-STAT1 ... SP2-STAT4 only.

Assignment of the code to the outputs:

Code	Subcode	Output FB SP2
C1657	1	SP2-STAT1
	2	SP2-STAT2
	3	SP2-STAT3
	4	SP2-STAT4

- The dead time acts on switching points and hysteresis.

Positive dead time

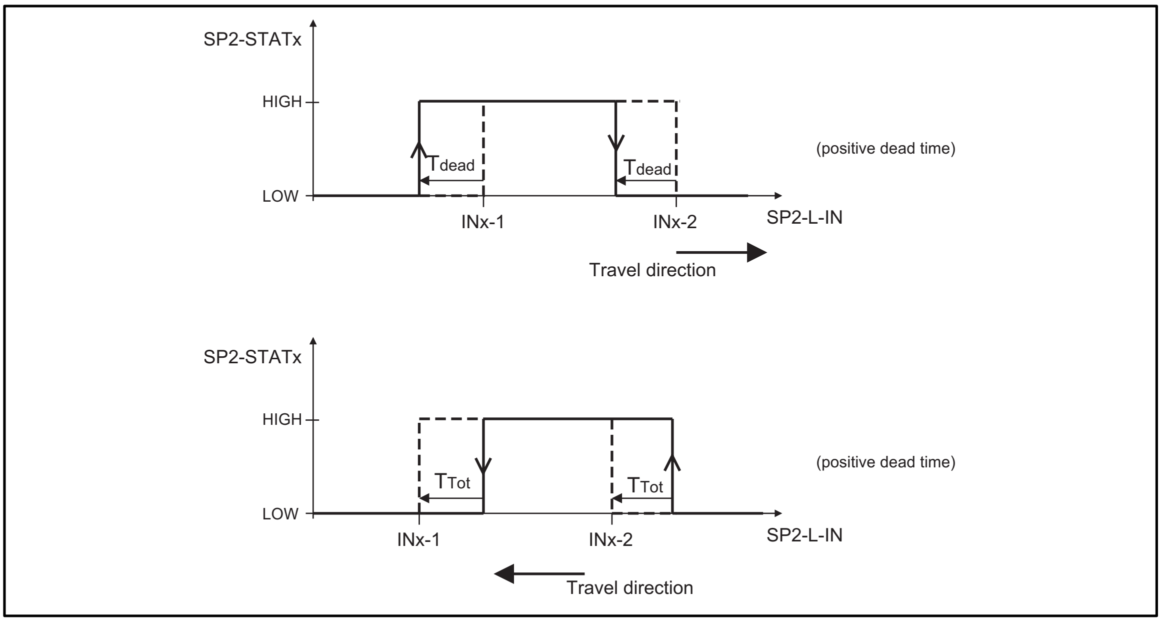


Fig. 7-217 Function of the positive dead time with different travel directions

- With a positive dead time, the drive reacts earlier by the time period set.

Negative dead time

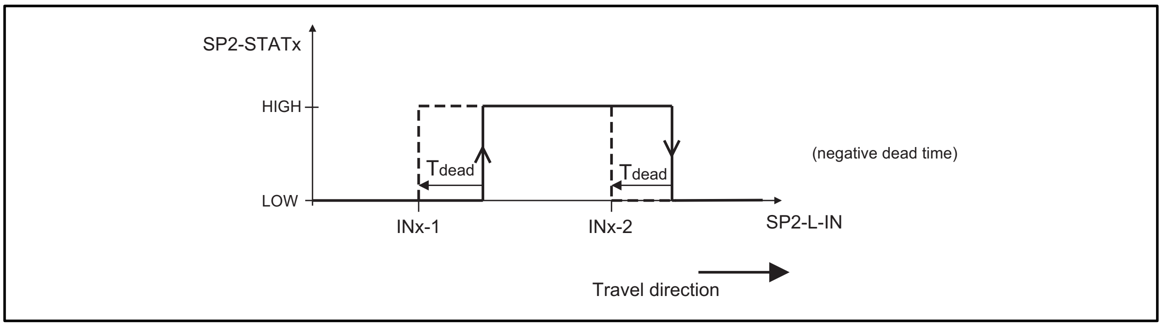


Fig. 7-218 Function of the negative dead time

- With a negative dead time, the drive reacts later by the time period set.

7.5.76.4 Filter time constant

This function is available only for the FB SP2.

Purpose

Avoids undefined switching of the output signals at SP2-STAT1 ... SP2-STAT4 when the motor is running at low speed.

Function

- The filter time constant is entered via C1659.
  – The setting is valid for SP2-STAT1 ... SP2-STAT4.

Assignment of the codes to the filter time constant:

Code	Value	Filter time constant
C1659	0	Off
	1	1 ms
	2	2 ms
	4	4 ms
	8	8 ms
	16	16 ms

Tip!

The correct setting can only be found by testing.

In general:

- The lower the resolution of the actual position encoder and the lower the travel speed, the higher the filter time constant.

7.5.77 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.

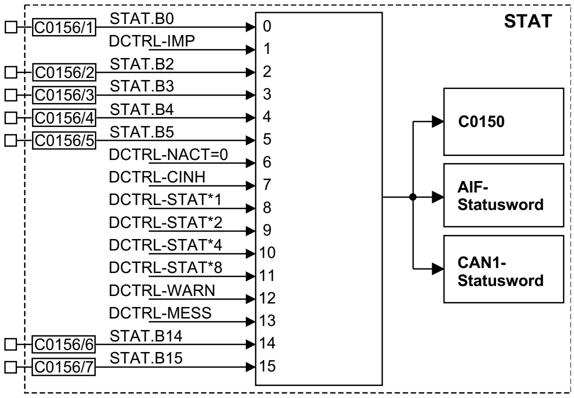


Fig. 7-219 Output of digital status signals (STAT)

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 Statuswort 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. (📖 7-169)

7.5.78 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).

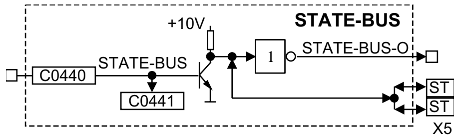


Fig. 7-220 Control of a function block STATE-BUS

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

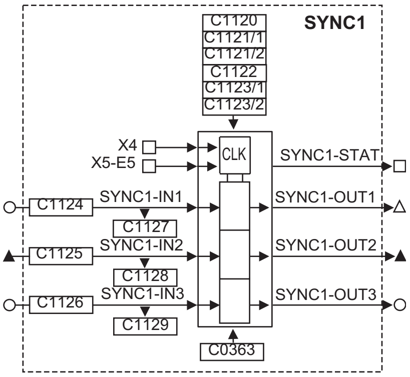
Stop!

Do not apply an external voltage at terminal X5/ST.

7.5.79 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 7.5.79.1)
- Cycle times (chapter 7.5.79.2)
- Phase displacement (chapter 7.5.79.3)
- Synchronisation window for synchronisation via terminal (SYNC WINDOW) (chapter 7.5.79.4)
- Correction value of phase controller (SYNC CORRECT) (chapter 7.5.79.5)
- Fault indications (chapter 7.5.79.6)
- Configuration examples (chapter 7.5.79.7)
- Scaling (chapter 7.5.79.8)

7.5.79.1 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.

Function library

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).

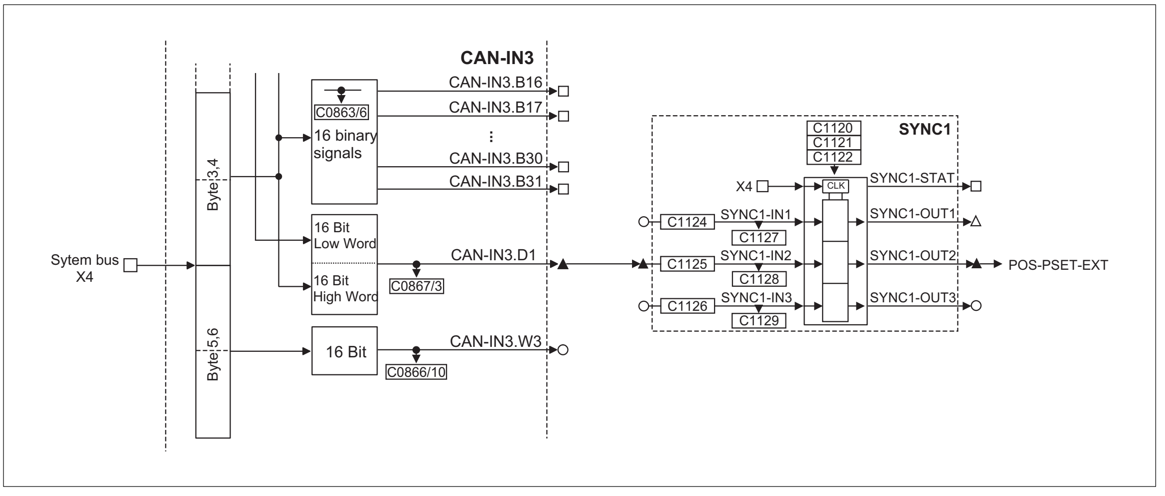


Fig. 7-221 Example for linking the FB SYNC1

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.

7.5.79.2 Cycle times

Sync cycle time (SYNC CYCLE)

The master (e. g. PLC) sends the periodic sync telegram[1)] (Sync signal[2)]).

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.

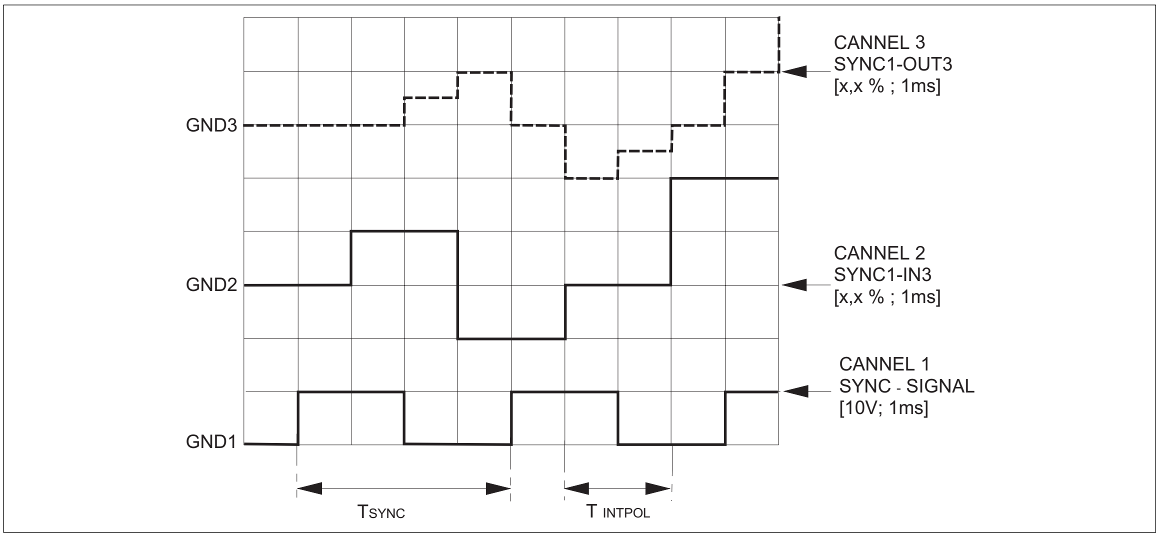


Fig. 7-222 Interpolation example

See Fig. 7-222:

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

7.5.79.3 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).

7.5.79.4 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.

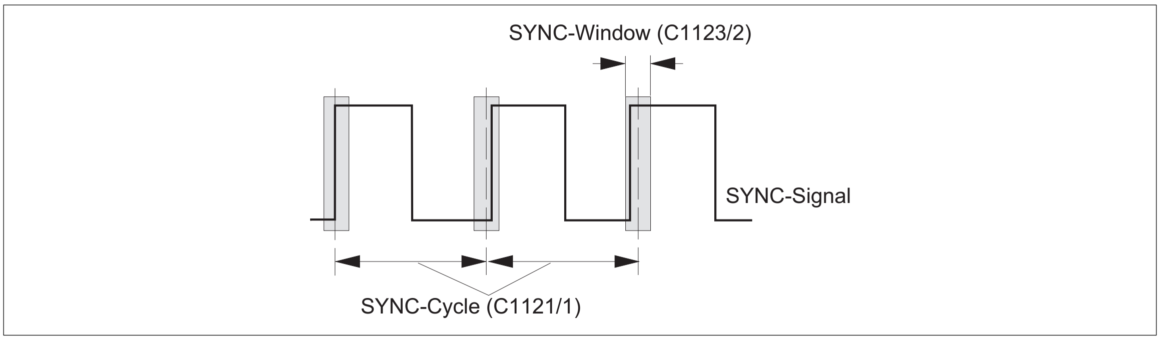


Fig. 7-223 “Time slot” for the LOW-HIGH edges of the sync signal

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”.

7.5.79.5 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.

7.5.79.6 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

7.5.79.7 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 ≥ 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

7.5.79.8 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.

7.5.80 Teach-in in programming (TEACH)

A function block (TEACH1) is available.

Purpose

Accepting actual position values and saving them in the VTPOS table. These values are then available as position setpoints.

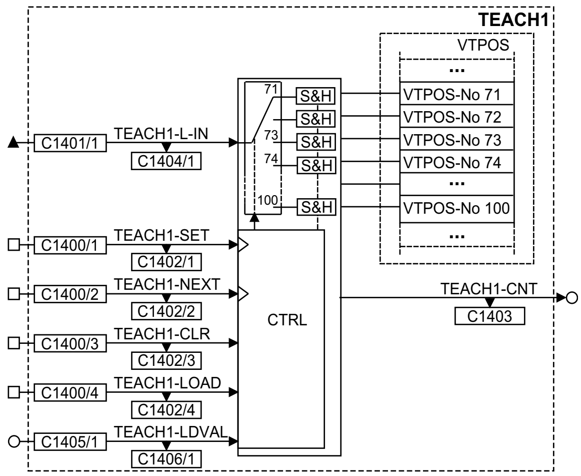


Fig. 7-224 Function block TEACH1

Signal				Source		Note
Name	**Type**	**DIS**	**DIS format**	**CFG**	**List**	
TEACH1-L-IN	ph	C1404/1	dec [inc]	C1401/1	3	Input for actual position
TEACH1-SET	d	C1402/1	bin	C1400/1	2	-
TEACH1-NEXT	d	C1402/2	bin	C1400/2	2	-
TEACH1-CLR	d	C1402/3	bin	C1400/3	2	-
TEACH1-LOAD	d	C1402/4	bin	C1400/4	2	-
TEACH1-LDVAL	a	C1406/1	dec [inc]	C1405/1	1	-
TEACH1-CNT	a	C1403	dec [inc]	-	-	Display of the table position which is selected as memory unit (table position = C1403 + 70)

Function

- The FB accepts a value (e.g. actual position) at TEACH1-L-IN.
- A LOW HIGH edge at TEACH1-SET transmits the value TEACH1-L-IN to the selected table position in VTPOS.
- A LOW-HIGH edge at TEACH-NEXT selects the next table position.
  – 30 table positions (VTPOS-No 71 ... VTPOS-No 100) are available.
  – The number of the selected table position can be displayed via C1403.
  – TEACH1-CNT transmits the number of the table position as analog signal.
- TEACH1-CLR = HIGH resets all values in the table positions to zero and selects simultaneously the table position VTPOS-No 71.
- An analog signal at TEACH1-LDVAL selects directly a table position (VTPOS-No).
  – Signal values < 71 = interpreted as VTPOS-No 71.
  – Signal values > 100 = interpreted as VTPOS-No 100.
  – TEACH1-LOAD = HIGH selects the position.
- If the levels are applied at the same time to the digital inputs, the following priority is valid:
  – TEACH1-CLR (1)
  – TEACH1-LOAD (2)
  – TEACH1-NEXT (3)
  – TEACH1-SET (4)

Tip!
Save the target positions permanently using C0003.

7.5.81 Edge evaluation (TRANS)

Purpose

This function is used to evaluate digital signal edges and convert them into pulses with a defined time.

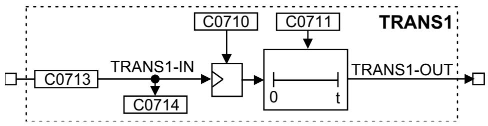


Fig. 7-225 Edge evaluation (TRANS1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TRANS1-IN	d	C0714	bin	C0713	2	1000	-
TRANS1-OUT	d	-	-	-	-	-	-

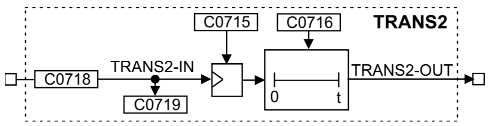


Fig. 7-226 Edge evaluation (TRANS2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TRANS2-IN	d	C0719	bin	C0718	2	1000	-
TRANS2-OUT	d	-	-	-	-	-	-

Function

This FB is an edge evaluator which can be retriggered. This FB can react on different events. The following functions can be selected under code C0710 or C0716:

- Positive edge
- Negative edge
- Positive or negative edge

7.5.81.1 Evaluate positive edge

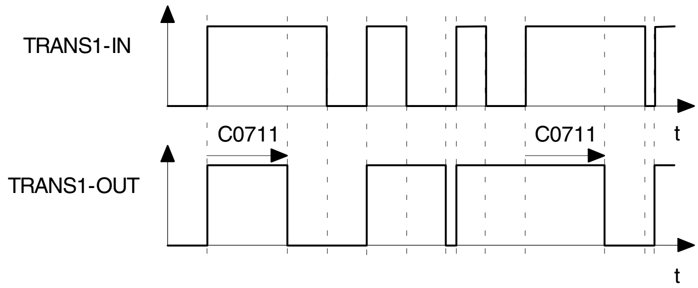


Fig. 7-227 Evaluation of positive edges (TRANS1)

- 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.

7.5.81.2 Evalute negative edge

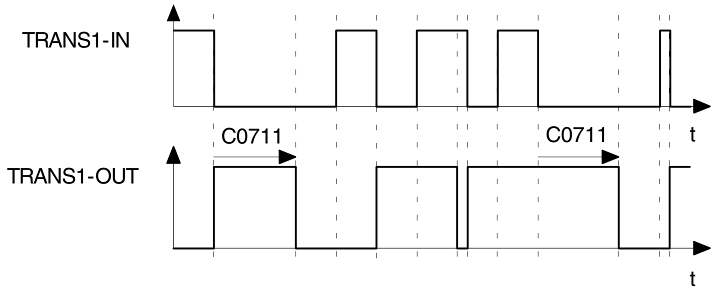


Fig. 7-228 Evaluation of negative edges (TRANS1)

- 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.

7.5.81.3 Evaluate positive or negative edge

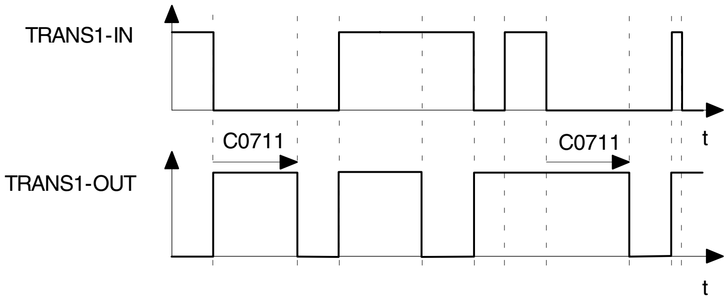


Fig. 7-229 Evaluation of positive and negative edges (TRANS1)

- 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.

7.5.82 Variable table - acceleration (VTACC)

One function block (VTACC) is available.

Purpose

Stores the values for acceleration and deceleration. They serve as acceleration and deceleration ramps in the positioning program.

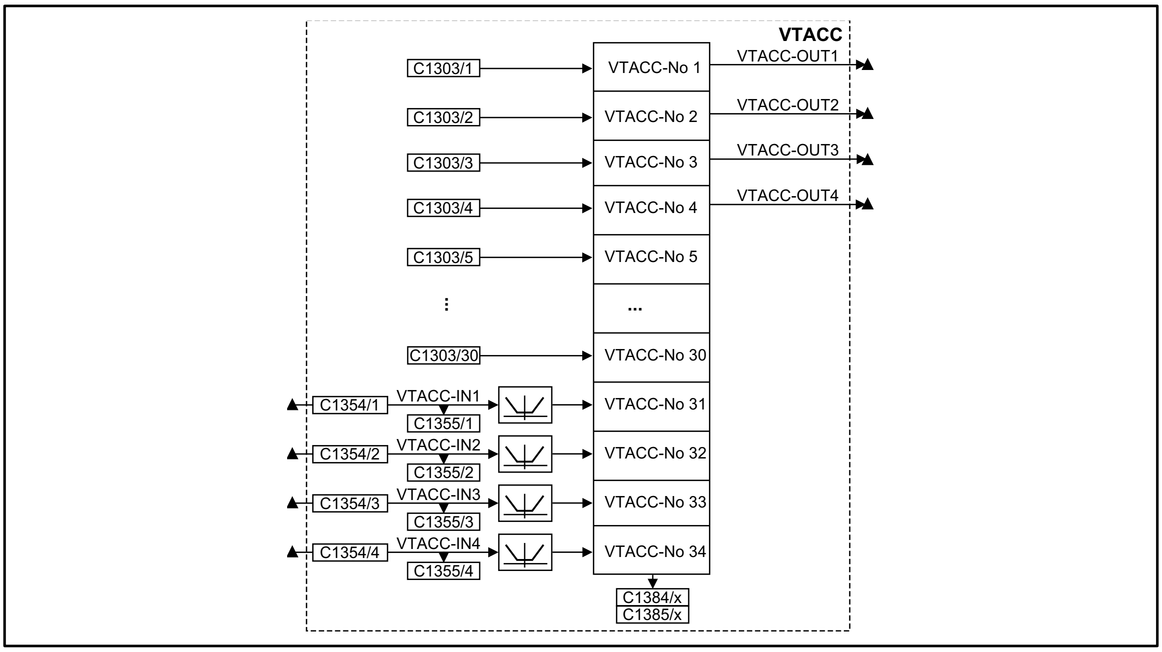


Fig. 7-230 Function block VTACC

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
VTACC-IN1	ph	C1355/1	dec [inc]	C1354/1	3	• Generates the absolute value for negative values. • When the values are > amax (C1250) the drive moves with amax.
VTACC-IN2	ph	C1355/2	dec [inc]	C1354/2	3	
VTACC-IN3	ph	C1355/3	dec [inc]	C1354/3	3	
VTACC-IN4	ph	C1355/4	dec [inc]	C1354/4	3	
VTACC-OUT1	ph	-	-	-	-	-
VTACC-OUT2	ph	-	-	-	-	-
VTACC-OUT3	ph	-	-	-	-	-
VTACC-OUT4	ph	-	-	-	-	-

Function

A total of 34 table positions is available.

- Enter fixed values under C1303.
  – 30 table positions (VTACC-No1 ... VTACC-No30) are available.
  – Subcodes (C1303/1 ... C1303/30) define the table position number.
- Enter variable values in VTACC-INx.
  – 4 table positions (VTACC-No31 ... VTACC-No34) are available.
  – Signal input via function blocks.
  – The values must be transmitted to the table positions before the corresponding program set starts and accesses these values.
- C1384 indicates the values (in % of amax) on the table positions.
  – Select table position (C1384/1 ... C1384/34) with subcode.
- C1385 displays the values (in inc) on the table positions.
  – Select table position (C1385/1 ... C1385/34) with subcode.
- The conversion from a [units/s^2] to a [inc] is performed according to the formula:

$$a\,[\text{inc}] = a\,[\text{units/s}^2] \cdot \frac{65536\,[\text{inc/r}] \cdot \text{gear nominator} \cdot 16384}{\text{Feed const. [units/r]} \cdot \text{gear denominator} \cdot 1000000\,[1/\text{s}^2]}$$

Tip!

Entries into the processing table are only required if FB inputs and outputs are used.

7.5.83 Variable table Piece number (VTPCS)

One function block FB (VTPCS) is available.

Purpose

Stores setpoint piece numbers. They are used as comparison values for the piece number function in the program processing.

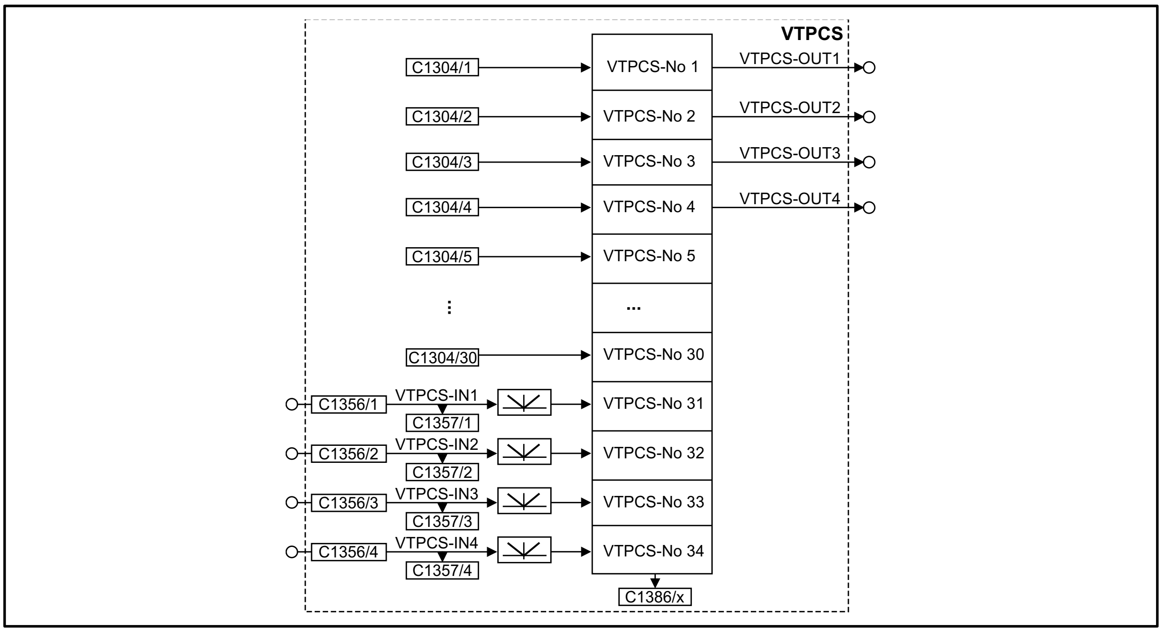


Fig. 7-231 Function block VTPCS

Stop!

If piece numbers >32767 are entered under C1304/1 to C1304/4, the outputs VTPCS-OUT1 ... VTPCS-OUT4 must no longer be used.

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
VTPCS-IN1	a	C1357/1	dec [inc]	C1356/1	1	• Generates the absolute value for negative values. • Limits the value to 32767.
VTPCS-IN2	a	C1357/2	dec [inc]	C1356/2	1	
VTPCS-IN3	a	C1357/3	dec [inc]	C1356/3	1	
VTPCS-IN4	a	C1357/4	dec [inc]	C1356/4	1	
VTPCS-OUT1	a	-	-	-	-	-
VTPCS-OUT2	a	-	-	-	-	-
VTPCS-OUT3	a	-	-	-	-	-
VTPCS-OUT4	a	-	-	-	-	-

Function

A total of 34 table positions are available.

- Enter fixed values under C1304.
  - 30 table positions (VTPCS-No1 ... VTPCS-No30) are available.
  - Subcodes (C1304/1 ... C1304/30) define the table position number.
- Enter variable values in VTPCS-INx.
  - 4 table positions (VTPCS-No31 ... VTPCS-No34) are available.
  - Signal input via function blocks.
  - The values must be transmitted to the table positions before the corresponding program set starts and accesses these values.
- C1386 displays the values on the table positions.
  - Select table position (C1386/1 ... C1386/34) with subcode.
- For signals with percentage standardization at VTPCS-INx the conversion is performed according the the formula:

$$\text{VTPCS–INx [inc]} = \text{VTPCS–INx [\%]} \cdot \frac{16384\ \text{[inc]}}{100\ \%}$$

Tip!

Entries into the processing table are necessary only if the FB inputs and outputs are used.

7.5.84 Variable table - target position/position values (VTPOS)

One function block (VTPOS) is available.

Purpose

Stores values for target positions (position values): They serve as target positions in the positioning program or comparison values for SP1 and SP2.

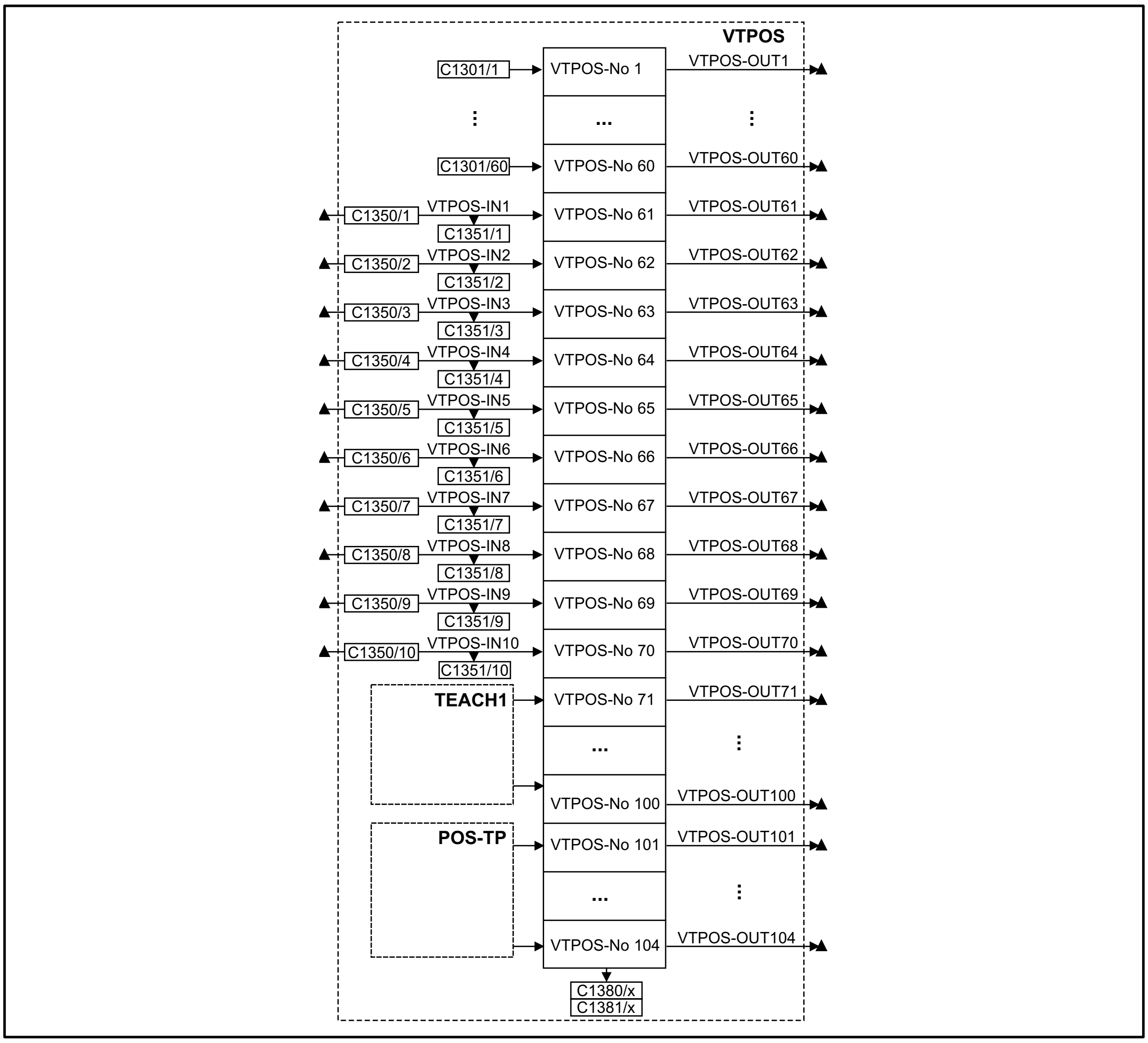


Fig. 7-232 Function block VTPOS

Function library

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
VTPOS-IN1	ph	C1351/1	dec [inc]	C1350/1	3	-
VTPOS-IN2	ph	C1351/2	dec [inc]	C1350/2	3	-
VTPOS-IN3	ph	C1351/3	dec [inc]	C1350/3	3	-
VTPOS-IN4	ph	C1351/4	dec [inc]	C1350/4	3	-
VTPOS-IN5	ph	C1351/5	dec [inc]	C1350/5	3	-
VTPOS-IN6	ph	C1351/6	dec [inc]	C1350/6	3	-
VTPOS-IN7	ph	C1351/7	dec [inc]	C1350/7	3	-
VTPOS-IN8	ph	C1351/8	dec [inc]	C1350/8	3	-
VTPOS-IN9	ph	C1351/8	dec [inc]	C1350/9	3	-
VTPOS-IN10	ph	C1351/10	dec [inc]	C1350/10	3	-
VTPOS-OUT1	ph	-	-	-	-	-
...	...					
VTPOS-OUT104	ph	-	-	-	-	-

Function

A total of 104 table positions are available.

- Enter fixed target position values via C1301/x.
  – 60 table positions (VTPOS-No1 ... VTPOS-No60) are available.
  – Subcodes (C1301/1 ... C1301/60) define the table position number.
- Enter variable target position values via VTPOS-INx.
  – 10 table positions (VTVEL-No61 ... VTVEL-No70) are available.
  – Signal input via function blocks.
  – The target position value must be transmitted to the table positions before the corresponding program set starts and accesses these values.
- Enter target position values of FB TEACH1.
  – 30 table positions (VTPOS-No71 ... VTPOS-No100) are available.
- Enter target position values via touch probe.
  – 4 table positions (VTPOS-No101 ... VTPOS-No104) are available.
- C1380 displays the target position values (in units) on the table positions.
  – Select table position (C1380/1 ... C1380/104) with subcode.
- C1381 displays the target position values (in inc) on the table positions.
  – Select table position (C1381/1 ... C1381/104) with subcode.
- The conversion from target position [units] to target position [inc] is performed according to the formula:

$$\text{Target position [inc]} = \text{Target position [units]} \cdot \frac{65536\ [\text{inc/r}] \cdot \text{gear nominator}}{\text{Feed const. [units/r]} \cdot \text{gear denominator}}$$

Tip!

Entries into the processing table are only required if FB inputs are used.

7.5.85 Variable table Waiting time (VTTIME)

One function block (VTTIME) is available.

Purpose

Store values for waiting times. They are used as delays for the function ”Waiting time” in the positioning program.

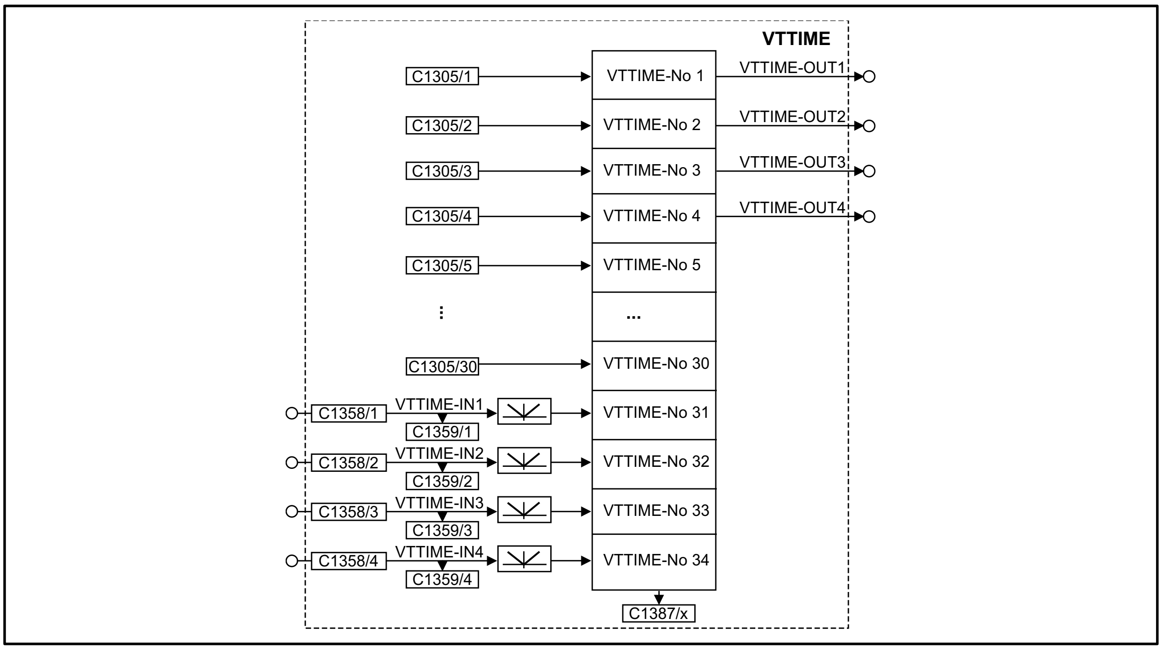


Fig. 7-233 Function block VTTIME

Stop!

If times >32767 ms are entered under C1305/1 to C1305/4 the outputs VTTIME-OUT1 ... VTTIME-OUT4 must no longer be used.

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
VTTIME-IN1	a	C1359/1	dec [inc]	C1358/1	3	• Generates the absolute value for negative values. • Value = 100 % = 16384 ms • Limits the value to 32767 ms • Display: 1 inc = 1 ms
VTTIME-IN2	a	C1359/2	dec [inc]	C1358/2	3	
VTTIME-IN3	a	C1359/3	dec [inc]	C1358/3	3	
VTTIME-IN4	a	C1359/4	dec [inc]	C1358/4	3	
VTTIME-OUT1	a	-	-	-	-	1 inc = 1 ms
VTTIME-OUT2	a	-	-	-	-	1 inc = 1 ms
VTTIME-OUT3	a	-	-	-	-	1 inc = 1 ms
VTTIME-OUT4	a	-	-	-	-	1 inc = 1 ms

Function

A total of 34 table positions are available.

- Enter fixed time value under C1305.
  - 30 table positions (VTTIME-No1 ... VTTIME-No30) are available.
  - Subcodes (C1305/1 ... C1305/30) define the table position number.
- Enter variable time values under VTTIME-INx.
  - 4 table positions (VTTIME-No31 ... VTTIME-No34) are available.
  - Signal input via function blocks.
  - The time values must be transmitted to the table positions before the program set starts and has access to it.
- C1387 displays the time values on the table positions.
  - Select table position (C1387/1 ... C1387/34) with subcode.

Note!

Entries into the processing table are necessary only if the FB inputs and outputs are used.

7.5.86 Variable table - speed (VTVEL)

One function block (VTVEL) is available.

Purpose

Stores values for traversing and final speeds. They serve as setpoint speeds in the positioning program.

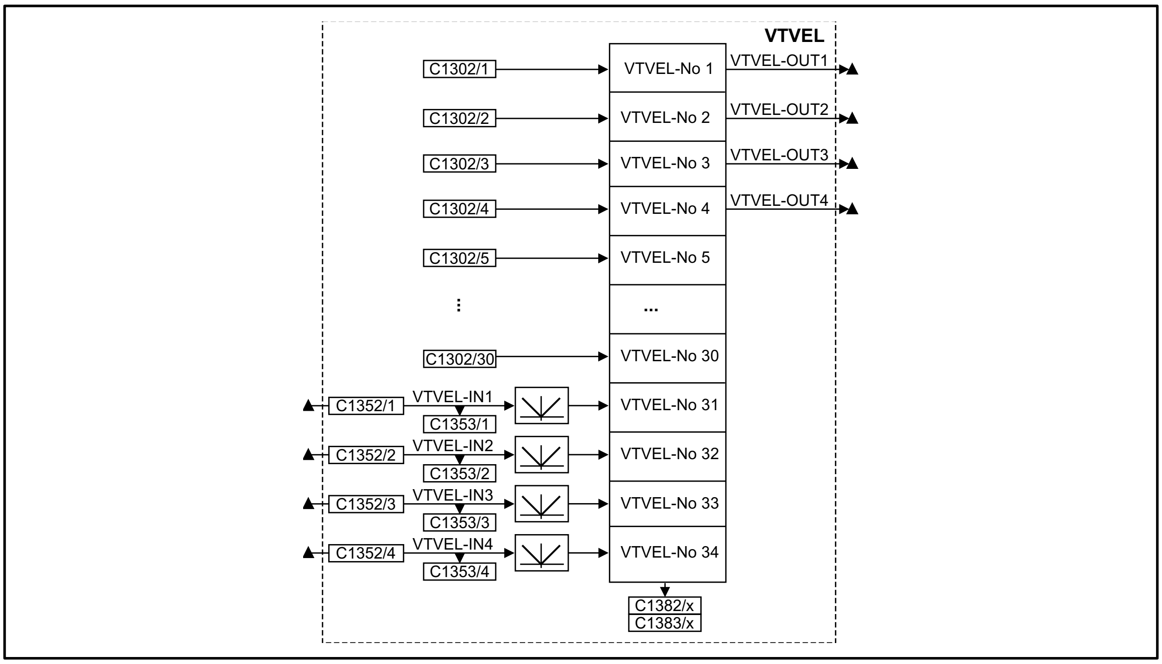


Fig. 7-234 Function block VTVEL

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
VTVEL-IN1	ph	C1353/1	dec [inc]	C1352/1	3	• Generates the absolute value for negative values. • When the values exceed vmax (C1240) the drive moves with vmax.
VTVEL-IN2	ph	C1353/2	dec [inc]	C1352/2	3	
VTVEL-IN3	ph	C1353/3	dec [inc]	C1352/3	3	
VTVEL-IN4	ph	C1353/4	dec [inc]	C1352/4	3	
VTVEL-OUT1	ph	-	-	-	-	-
VTVEL-OUT2	ph	-	-	-	-	-
VTVEL-OUT3	ph	-	-	-	-	-
VTVEL-OUT4	ph	-	-	-	-	-

Function library

Function

A total of 34 table positions is available.

- Enter fixed setpoints under C1302.
  - 30 table positions (VTVEL-No1 ... VTVEL-No30) are available.
  - Subcodes (C1302/1 ... C1302/30) define the table position number.
- Enter variable setpoints under VTVEL-INx.
  - Four table positions (VTVEL-No31 ... VTVEL-No34) are available.
  - Signal input via function blocks.
  - The setpoints must be transmitted to the table positions before the program set starts and has access to it.
- C1382 indicates the setpoints (in % of vmax) on the table positions.
  - Select table position (C1382/1 ... C1382/34) with subcode.
- C1383 displays the setpoints (in inc) on the table positions.
  - Select table position (C1383/1 ... C1383/34) with subcode.
- The conversion from v [units/s] to v [inc] is performed according to the formula:

$$v\,[\text{inc}] = v\,[\text{units/s}] \cdot \frac{65536\,[\text{inc/r}] \cdot \text{gear nominator} \cdot 16384}{\text{Feed const. [units/r]} \cdot \text{gear denominator} \cdot 1000\,[1/\text{s}]}$$

Tip!

Entries into the processing table are only required if FB inputs and outputs are used.

7.6 Monitoring

Various monitoring functions protect the drive from impermissible operating conditions (📖 7-293).

If a monitoring function is activated,

- a reaction to protect the drive will be activated (configuration (📖 7-292)).
- a digital output is set, if it is assigned to the corresponding reaction.
- the fault indication is entered at the first position in the history buffer. (📖 8-3)

7.6.1 Reactions

According to the interferences one or several of the following reactions are possible via the monitoring function:

<table>
<tr><th>Reaction</th><th colspan="2">Effects on drive or controller</th><th>Danger notes</th></tr>
<tr><td>TRIP
(highest priority)</td><td colspan="2">• 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. (📖 8-10)</td><td></td></tr>
<tr><td rowspan="3">Message</td><td colspan="2">• Switches the power outputs U, V, W to a high resistance as long as the message is active.</td><td rowspan="3">The drive restarts automatically if the message is removed.</td></tr>
<tr><td>• Short-term message ≤ 0.5 s</td><td>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.</td></tr>
<tr><td>• Long-term message > 0.5 s</td><td>The drive is idling (because of internal controller inhibit!) as long as the message is active
If necessary, restart positioning program.</td></tr>
<tr><td>FAIL-QSP</td><td colspan="2">• The drive brakes along the QSP ramp (C0105) to standstill.
• The time for the QSP ramp is set in the ”Basic settings” dialog box.</td><td></td></tr>
<tr><td>Warning</td><td colspan="2">• Only display of the operating fault.
• The drive operates under control.</td><td rowspan="2">STOP
Since these reactions have no effect on the drive behaviour, the drive may be destroyed.</td></tr>
<tr><td>Off</td><td colspan="2">• No reaction to operating faults! Monitoring is deactivated.</td></tr>
</table>

7.6.2 Set reactions

1. Click on the ”Parameter menu” button in the ”Basic settings” dialog box.
2. Open the ”Dialog Diagnostics” menu by a double-click.

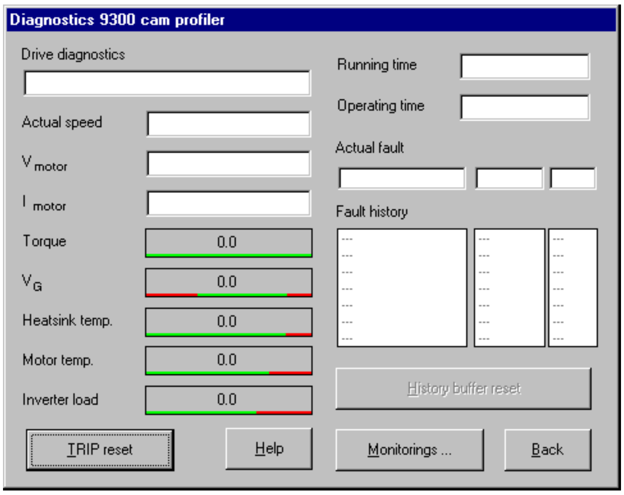


Fig. 7-235 Dialog box ”Diagnostics 9300”

3. Click the button ”Monitorings...”.

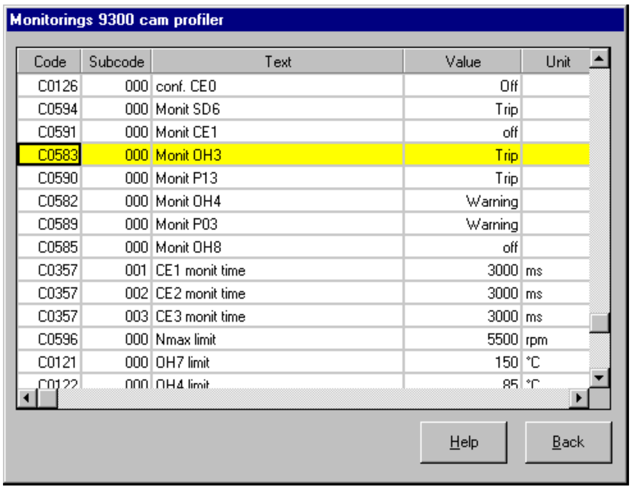


Fig. 7-236 ”Monitoring configuration 93xx” dialog box

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.

7.6.3 Monitoring functions

Overview of the fault sources detected by the controller, and the corresponding reactions.

Display	Meaning	TRIP	Message	Warning	FAIL-QSP	off	Code	Notes
CCr	System fault	•	-	-	-	-	-	
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	Part E, 📖 8-5
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 occurred)	✓	-	✓	-	•	C0595	
EEr	External monitoring	•	✓	✓	✓	✓	C0581	📖 7-297
H05, H07	Internal error	•	-	-	-	-	-	
H10	Sensor fault: heat sink temperature	•	-	-	-	✓	C0588	Part E, 📖 8-5
H11	Sensor fault: internal temperature	•	-	-	-	✓		
LP1	Motor phase failure detection (function block must be entered in C0465)	✓	-	✓	-	•	C0597	📖 7-299
LU	Undervoltage	-	•	-	-	-	-	📖 7-300
NMAX	Maximum speed exceeded (C0596)	•	-	-	-	-	-	📖 7-301
nErr	Speed monitoring	✓	✓	✓	✓	•	C0576	📖 8-5
OC1	Short-circuit	•	-	-	-	-	-	📖 7-302
OC2	Earth fault	•	-	-	-	-	-	📖 7-303
OC5	I x t overload	•	-	-	-	-	-	📖 7-304
OH	Heatsink temperature 1 (max. permissible, fixed)	•	-	-	-	-	-	📖 7-305
OH3	Motor temperature 1 (max. permissible, fixed)	•	-	-	-	✓	C0583	📖 7-306
OH4	Heatsink temperature 2 (adjustable; C0122)	-	-	•	-	✓	C0582	📖 7-307
OH7	Motor temperature 2 (can be set; code: C0121)	-	-	•	-	✓	C0584	📖 7-308
OH8	Motor temperature (fixed) via inputs T1/T2	✓	-	✓*	-	•	C0585	📖 7-309
OU	Overvoltage in the DC bus	-	•	-	-	-	-	📖 7-310
P01	Limit switch negative = LOW	✓	-	-	•	-	C1285/1	Part E, 📖 8-5
P02	Limit switch positive = LOW	✓	-	-	•	-	C1285/2	
P03	Following error - digital frequency > C0255	✓	-	•	-	✓	C0589	📖 7-312
P04	Position limit negative exceeded	✓	-	-	•	-	C1285/3	
P05	Position limit positive exceeded	✓	-	-	•	-	C1285/4	
P06	No reference	✓	-	-	•	-	C1287/1	
P07	Parameter set mode absolute	✓	-	-	•	-	C1291/1	Part E, 📖 8-5
P08	Actual offset out of range	✓	-	-	•	-	C1291/2	
P09	Impermissible programming	✓	-	-	•	-	C1291/3	
P12	Encoder range exceeded	✓	-	-	•	-	C1288/1	
P13	Phase overflow	•	-	✓	-	✓	C0590	📖 7-313
P14	1. following error POS > C1218/1	✓	-	✓	•	✓	C1286/1	
P15	2. following error POS > C1218/2	✓	-	✓	•	✓	C1286/2	
P16	Sync error	✓	-	✓	•	✓	C1290/1	
P17	TP control error	✓	-	✓	•	✓	C1289/1	Part E, 📖 8-5
P18	Internal limitation	✓	-	•	✓	✓	C1289/2	
PEr	Program error	•	-	-	-	-	-	
PI	Fault during initialization	•	-	-	-	-	-	
PR0	General fault in parameter sets	•	-	-	-	-	-	📖 7-314
PR1	Fault in parameter set 1	•	-	-	-	-	-	📖 7-315
Sd2	Resolver error	•	-	✓*	-	✓	C0586	📖 7-316
Sd3	Encoder fault at X9 PIN 8	✓	-	✓*	-	•	C0587	📖 7-317

Configuration

Display	Meaning	TRIP	Message	Warning	FAIL-QSP	off	Code	Notes
Sd5	Encoder fault at X6/1 X6/2 (C0034 = 1)	✓	-	✓	-	•	C0598	
Sd6	Sensor fault: motor temperature (X7 or X8)	•	-	✓	-	✓	C0594	Part E, 📖 8-5
Sd7	Error of the absolute value encoder at X8	✓	-	-	-	•	C0025	
Sd8	Error of the SinCos encoder	✓	-	-	-	•	C0580	Part E, 📖 8-5

• Factory setting ✓ possible - not possible ✓* possible, but the drive can be destroyed if the fault is not removed immediately.

Show/Hide Bookmarks

7.6.3.1 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)

7.6.3.2 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)

7.6.3.3 External error EEr

Purpose

Process monitoring

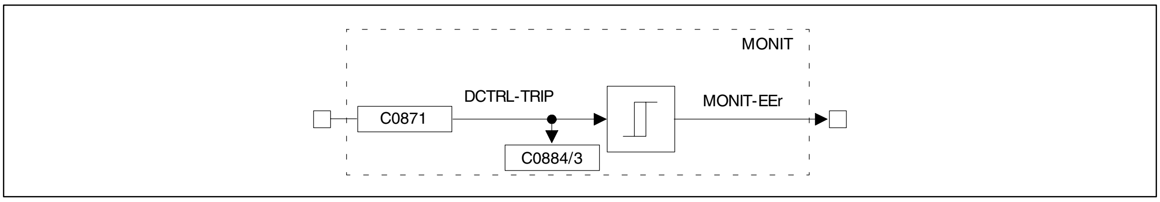


Fig. 7-237 External error EEr

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

7.6.3.4 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)

7.6.3.5 Monitoring for failure of a motor phase LP1

Purpose

Motor protection

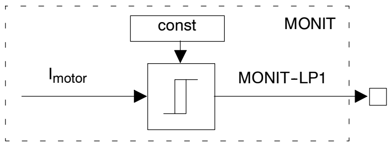


Fig. 7-238 Monitoring for failure of a motor phase LP1

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)

7.6.3.6 Low voltage LU

Purpose

DC bus monitoring, controller protection.

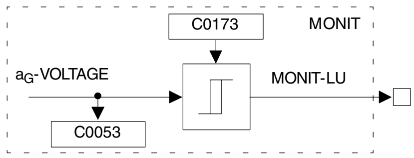


Fig. 7-239 Low voltage LU

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)

7.6.3.7 System speed monitoring N_{Max}

Purpose

Process monitoring

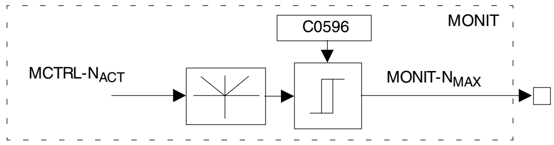


Fig. 7-240 System speed monitoring N_{Max}

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)

7.6.3.8 Monitoring for short-circuit OC1

Purpose

Controller protection

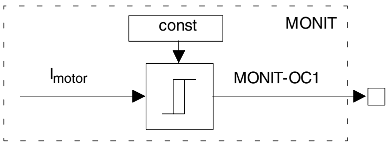


Fig. 7-241 Monitoring for short-circuit OC1

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)

7.6.3.9 Monitoring for earth fault OC2

Purpose

Controller protection

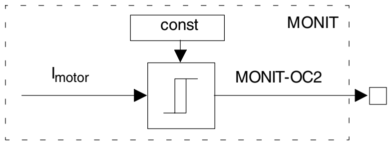


Fig. 7-242 Monitoring for earth fault OC2

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

7.6.3.10 Fault message (OC5)

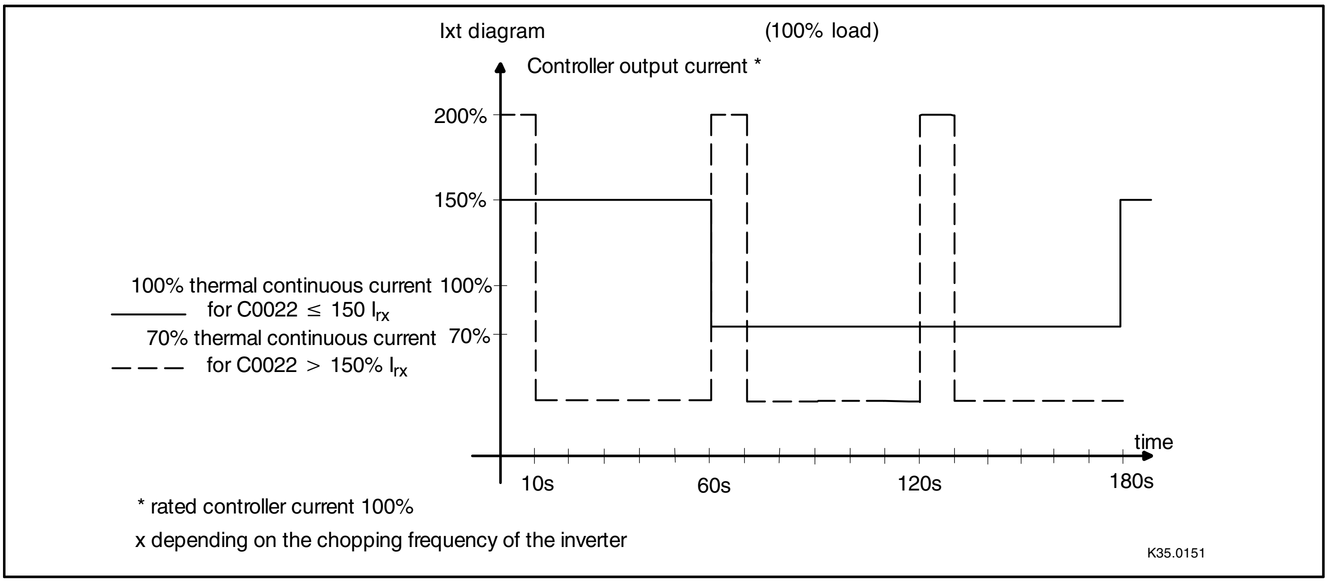


Fig. 7-243 Max. permitted overcurrent depending on the time

7.6.3.11 Heatsink monitoring OH (fixed)

Purpose

Controller protection

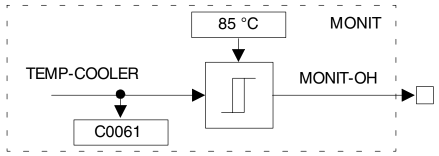


Fig. 7-244 Heatsink monitoring OH

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 switch 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

7.6.3.12 Motor temperature monitoring OH3 (fixed)

Purpose

Protects the motor from overheating

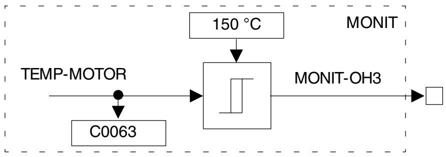


Fig. 7-245 Motor temperature monitoring OH3 with fixed threshold

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

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

7.6.3.13 Heatsink monitoring OH4 (adjustable)

Purpose

Controller protection

This monitoring is designed as a warning before the disconnection of the controller via the OH-TRIP.

Thus, the process can be influenced to avoid a switch-off of the controller at an inconvenient time.

For example, fans which would cause an inacceptable noise in continuous operation, can also be triggered.

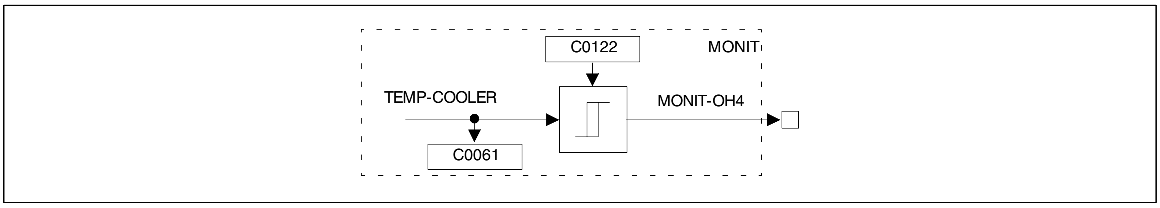


Fig. 7-246 Heatsink monitoring OH4 with adjustable threshold

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

7.6.3.14 Motor temperature monitoring OH7 (adjustable)

Purpose

Process monitoring

This monitoring is designed as a warning before the disconnection via the OH3-TRIP.

Thus, the process can be influenced to avoid a switch-off of the motor at an inconvenient time.

For example, blowers which would cause an inacceptable noise in continuous operation, can also be triggered.

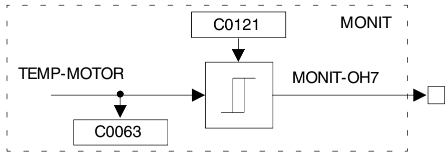


Fig. 7-247 Motor temperature monitoring OH7 with adjustable threshold

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

7.6.3.15 Motor temperature monitoring OH8

Purpose

Motor protection

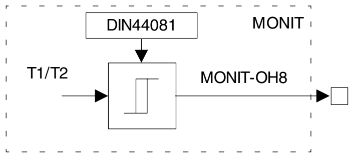


Fig. 7-248 Motor temperature monitoring OH8

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 4.2.10).

STOP

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

7.6.3.16 Overvoltage OU

Purpose

DC bus monitoring. Controller protection.

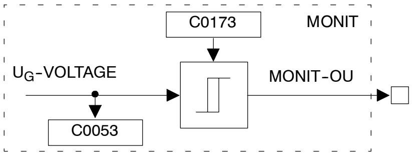


Fig. 7-249 Overvoltage OU

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.

7.6.3.17 Following error P03

Purpose

Process monitoring

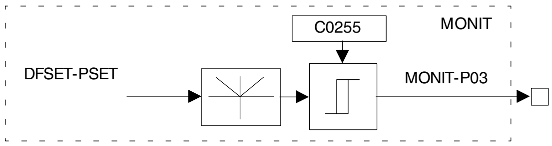


Fig. 7-250 Following error P03

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

7.6.3.18 Phase controller overflow P13

Purpose

Process monitoring

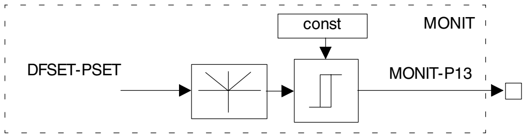


Fig. 7-251 Phase controller overflow P13

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

7.6.3.19 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)

7.6.3.20 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)

7.6.3.21 Resolver monitoring for wire breakage Sd2

Purpose

Motor protection

Monitors the cable and the resolver for wire breakage.

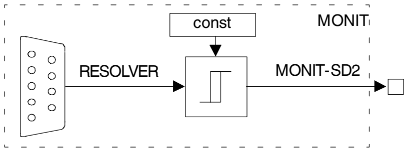


Fig. 7-252 Resolver monitoring for wire breakage Sd2

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

7.6.3.22 Dig-Set monitoring Sd3

Purpose

Process monitoring

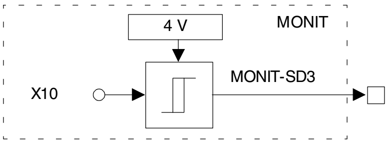


Fig. 7-253 Dig-Set monitoring Sd3

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
X10	-	-	-	-	-	-	-
MONIT-SD3	d	-	-	-	-	-	-

Function

The monitoringSd3 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

7.6.4 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).

7.7 Parameter setting

- The parameter setting of the controller is used to adapt the drive to your applications.
- The complete parameter set is organised in codes which are consecutively numbered and begin with ”C” (see “Code table”).
- Save the parameter set for your application.
  – The parameters are factory-set when delivered.

7.7.1 Possible parameter settings

Parameter setting with Global Drive Control

With Global Drive Control (GDC), LENZE offers an easy-to-understand tool for parameter setting.

Detailed information about parameter setting can be found in the GDC Manuals.

Tip!

Lenze recommends you to use Global Drive Control for the parameter setting of your controller.

Parameter setting with 9371BB keypad

The keypad can be used for minor changes in the parameter set.

You can also use the keypad to

- display operating data,
- transfer parameter sets to other controllers,
- control the controller (e. g. controller inhibit and controller enable).

Detailed information can be found in the Operating Instructions for the keypad.

Parameter setting via bus system

Detailed information can be found in the Operating Instructions for the corresponding fieldbus module.

7.7.2 Structure of a parameter set

For easy operation, menu levels for the 9371BB keypad and the PC programs Global Drive Control and LEMOC2 lead you quickly to the codes required:

- Main menu
  – contains submenus
  – contains the complete code list
- Submenus
  – contain the codes which are assigned to them

Codes consist of:

- Code level
  – codes without subcodes contain one parameter
  – codes with subcodes contain several parameters
- Parameter level/operating level
  There are four different parameter types:
  – Absolute values of a physical variable
  (e. g. 400 V, 10 s)
  – Relative values of instrument variables
  (e.g. 50 % setpoint)
  – Numbers for certain states
  (e.g. 0 = controller inhibited, 1 = controller enabled)
  – Display values
  These values can only be displayed but not changed.
  (e.g. actual motor current under C0054)

You can change absolute and relative values in discrete steps.

Show/Hide Bookmarks

EDSVS9332P-D22

Lenze

System Manual
Part D2.2

Code table

Global Drive

9300 servo position controller

This documentation is valid for 9300 position controllers as of version:

Type	Design	Hardware version and index	Software version and index	Variant	Explanation
33.932X	EP	2x	2x		(9321 - 9329)
33.933X	EP	2x	2x		(9330 - 9332)
33.932X	CP	2x	2x	- V003	Cold Plate (9321 - 9328)

Type

Design:
EP = Built-in unit IP20
CP = Cold Plate

Hardware version and index

Software version and index

Variant

Explanation

3.0 11/2004

Contents

Part D2.2

Contents

7.8 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		Factory 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
	📖 7-323	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 factory setting into RAM
			1	Load pset 1		Load parameter set 1 into the RAM and activate it Parameter set is loaded automatically after every mains connection.
			11	Load parameter set externally		Load the parameter set 1 from the keypad into the RAM and activate it
			20	ext. → EEPROM		Load all parameter sets from the keypad into the RAM and activate them
C0003	PAR SAVE	0				**Save parameter set**
			0	Saving completed		Saving completed
			1	Save parameter set1		Save parameter set non-volatile
			11	Save externally		Transfer parameter set into the keypad
C0004	OP DISPLAY	56	1	{1}	1999	**Operating display** Keypad shows selected code in the operating level if no other status messages of C0183 are active.

Configuration

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 2xxx: Absolute positioning via home position The **second** digit indicates additional functions x0xx: No additional function x2xx: With position switch points and Teach function x6xx: ??? 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 xxx3: AIF
			0	COMMON	Modified basic configuration
			100	Empty	All internal connections are deleted
			1000	Speed mode	Speed control
			20000 20003 20010 20013 20200 20203 20210 20213	Standard pos abs AIF abs/supply abs/supply AIF relative relative AIF relative/supply relative/supply AIF	Absolute positioning via home position
			22000 22003 22010 22013 22200 22203 22210 22213	abs/sp abs/sp AIF abs/sp/supply abs/sp/supply AIF relative/sp relative/sp AIF relative/sp/supply relative/sp/supply AIF	Absolute positioning with home positions and Teach function
			26000 26010	set pos.sel set pos. sel/supply	External path control in preparation for a multi-axis positioning
[C0006]	OP MODE	→	2 3 22	Servo control asynchronous motors in star connection Servo control synchronous motors in star connection Servo control asynchronous motors in delta connection	**Motor control mode** → 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, fibre optics.
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. For parameter setting via interface: Major 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 (referring to speed variation 0 ... n_{max})

Code		Possible settings				Important
No.	**LCD**	**Lenze**	**Selection**			
C0013	TIF (DEC)	0.000	0.000	{0.001 s}	999.900	**NSET deceleration time Tif** for the main setpoint of NSET (referring to speed variation 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
C0018		1				**Switching frequency switch**
			0	16/8 kHz sine		Optimum noise reduction with automatic changeover to 8 kHz
			1	8 kHz sine		Performance-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** active only in 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.
			110 111 112 113	IT-512-5V IT-1024-5V IT-2048-5V IT-4096-5V		Incremental encoder with TTL level
			210 211 212 213	IS-512-5V IS-2024-5V IS-2048-5V IS-4096-5V		Sin/cos encoder
			310	AS-512-8V		Single-turn sin/cos encoder with RS485 interface by Stegmann company (the 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
1	FCODE (OFFSET)	0.00				Offset for terminal X6/1,2
2	FCODE (OFFSET)	0.00				Offset for terminal X6/3,4
C0027			-199.99	{0.01 %}	199.99	**FCODE (AIN)** Freely assignable code for relative analog signals
1	FCODE (GAIN)	100.00				Gain X6/1,2
2	FCODE (GAIN)	100.00				Gain X6/3,4
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

Configuration

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0032	FCODE GEARBOX	1	-32767 {1} 32767	**FCODE (gearbox factor numerator)** Freely assignable code
C0033	GEARBOX DENOM	1	1 {1} 32767	**Gearbox factor denominator**
C0034	MST CURRENT	0	0 -10 V ... + 10 V 1 +4 mA ... +20 mA 2 -20 mA ... +20 mA	**Master voltage/master 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 “write”, controls the code 1 “read”, reads controller status	**Controller enable RFR**
C0042	QSP	Disp	1 QSP inactive 2 QSP active	**Quick stop**
C0043	TRIP RESET	0	0 Trip reset 1 Active error	**Trip 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} 300.0	**Imot (Motor current)**
C0056	MCTRL-MSET2	Disp	-100.00 {0.01 %} 100.00	**MCTRL** Torque setpoint (speed controller output) with M precontrol (MCTRL-M-ADD)
C0057	MAX TORQUE	Disp	0 {1 Nm} 400	**Maximum torque (C0086/C0022)** Maximum possible torque of the drive configuration depending on C0022, C0086
C0058	ROTOR DIFF	0.0	-180.0 {0.1 °} 179.9	**Rotor 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} 2047	**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 utilisation Ixt** Utilisation of the last 180 s C0064 > 100 % releases Trip OC5 Trip reset is possible only if C0064 < 95 %

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0067	ACT TRIP	Disp	All fault indications		→ Selection list 10	**Error message TRIP** Momentary fault indication
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}	1999.0	**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}	7999.0	**T_{nF} field controller** 8000 ms: Switched off
[C0081]	MOT POWER	→	0.01	{0.01 kW}	500.00	**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}	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 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
			Controller	Lenze setting	Assigned motor type	Lenze motor type
			9321	110	MDSKS56-23-150	MDSKSXX056-23, f_N: 150Hz
			9322	111	MDSKS56-33-150	MDSKSXX056-33, f_N: 150Hz
			9323	112	MDSKS71-13-150	MDSKSXX071-13, f_N: 150Hz
			9324	116	MDSKS71-33-150	MDSKSXX071-33, f_N: 150Hz
			9325	15	MDFKA80-120	MDFKAXX080-22, f_N: 120Hz
			9326	19	MDFKA90-120	MDFKAXX090-22, f_N: 120Hz
			9327	23	MDFKA100-120	MDFKAXX100-22, f_N: 120Hz
			9328	27	MDFKA112-120	MDFKAXX112-22, f_N: 120Hz
			9329	225	30kW-ASM-50	–
			9330	227	45kW-ASM-50	–
			9331	228	55kW-ASM-50	–
			9332	229	75kW-ASM-50	–
[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}	500.0	**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**

Configuration

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[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 invalid 1 none 93xx 93xx	**Controller identification** 93xx: Lenze position controller
C0094	PASSWORD	0	0 {1} 9999	**Password** Parameter access protection for the keypad. When the password is activated only the codes of the user menu can be accessed. For further possible selections see C0096
[C0095]	ROTOR POS ADJ	0	0 inactive 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) (referring to speed variation of 0 ... $n_{max.}$)
C0108		100.00	-199.99 {0.01 %} 199.99	**FCODE (gainAOUT)** Freely assignable code for relative analog signals
1	FCODE (GAIN)			
2	FCODE (GAIN)			
C0109			-199.99 {0.01 %} 199.99	**FCODE (offs.AOUT)** Freely assignable code for relative analog signals
	FCODE (OFFSET)	0.00		
	FCODE (OFFSET)	0.00		
C0114			0 HIGH active 1 LOW active	**DIGIN polarity** Terminal polarity
1	DIGIN1 POL	1		X5/E1
2	DIGIN2 POL	1		X5/E2
3	DIGIN3 POL	0		X5/E3
4	DIGIN4 POL	0		X5/E4
5	DIGIN5 POL	0		X5/E5
[C0116]			→ Selection list 2	Signal configuration **FDO-xx** Free digital outputs can only be evaluated when being linked with automation interfaces.
1	FDO-00	1000	FIXED0	
...	...	...	...	
32	FDO-31	1000	FIXED0	

Code		Possible settings		Important
No.	**LCD**	**Lenze**	**Selection**	
[C0117]		→	→ Selection list 2	**DIGOUT** Signal configuration → depending on C0005
1	DIGOUT1	30012	pos-ref-ok	X5/A1
2	DIGOUT2	30013	POS-IN-TARGET	X5/A2
3	DIGOUT3	500	DCTRL-RDY	X5/A3
4	DIGOUT4	30101	pos-pfo1	X5/A4
C0118			0 HIGH active 1 LOW active	**DIGOUT** Terminal polarity
1	DIGOUT1 POL	0		X5/A1
2	DIGOUT2 POL	0		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** Warning threshold - motor temperature
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 communication error monitoring with automation interface CE0
C0130	ACT TI	Disp	0 C0012/C0013 active 1 $T_{ir}1/T_{if}1$ active 2 $T_{ir}2/T_{if}2$ active ... ... 14 $T_{ir}14/T_{if}14$ active 15 $T_{ir}15/T_{if}15$ active	**NSET** Active T_i times of NSET
C0134	RFG CHARAC	0	0 linear 1 S-shaped	**NSET RFG characteristic** Characteristic of ramp function generator 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 in DCTRL
2	CTRLWORD CAN			Control word in CAN-IN
3	CTRLWORD AIF			Control word in AIF-IN
C0141	FCODE (SETVAL)	0.0	-199.9 {0.1} 199.9	**Main setpoint** Freely assignable code for relative analog signals • used as main setpoint in the configurations C0005 = xxx1
C0142	START OPTIONS	1	0 Start lock 1 Autostart	**Start option** Start condition is executed: • after mains connection • after message (t > 0.5s) • after TRIP
C0150	STATUS WORD	Disp	0 {1} 65535	**Status word** when linked 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

Configuration

Code		Possible settings		Important
No.	**LCD**	**Lenze**	**Selection**	
C0155	STATUS WORD 2	Disp	Bit00 Fail Bit08 CW/CCW Bit01 Mmax Bit09 – Bit02 Imax Bit10 – Bit03 IMP Bit11 – Bit04 RDY Bit12 – Bit05 RSP 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	1000	FIXED0	
2	STAT.B2	30012	pos-ref-ok	
3	STAT.B3	1000	FIXED0	
4	STAT.B4	10600	NOT1-OUT	
5	STAT.B5	30013	POS-IN-TARGET	
6	STAT.B14	15004	DCTRL-FAIL-QSP	
7	STAT.B15	500	DCTRL-RDY	
C0157	(C0156)	Disp	0 1	
C0161	ACT TRIP	Disp	All fault indications	**Error message TRIP** current fault indications (as under C0168/1)
C0167	RESET FAILMEM	0	0 No reset 1 Reset	**History buffer reset** Clears the history buffer
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 of how often the faults 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 for activating the brake torque reduction before OU message
[C0173]	UG LIMIT	1		**Adaptation of UG thresholds** (UG = DC-bus voltage) Check during commissioning and adapt, if necessary! All drive components in DC bus connections must have the same thresholds!
			0 Mains < 400V, ±B	Operation on mains <400 V with or without brake unit
			1 Mains = 400V, ±B	Operation on 400 V mains with or without brake unit
			2 Mains = 460V, ±B	Operation on 460 V mains with or without brake unit
			3 Mains = 480V, -B	Operation on 480 V mains without brake unit
			4 Mains = 480V, +B	Operation on 480 V mains with brake unit

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0178	OP TIMER	Disp	0	{1 s}	4294967295	**Elapsed operating time meter** Time when the controller was enabled
C0179	MAINS TIMER	Disp	0	{1 s}	4294967295	**Mains switch-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
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
			10	Init		Initialisation phase
			91 92 93	Trip-Set C135 Trip-Set AIF Trip-Set CAN		
			102	Trip		TRIP active
			103	RFG-P-OFF		Emergency stop was released
			104	IMP Message		Message active
			105	Power off		Function is not supported
			111	BSP C135		Operation inhibited
			112	BSP AIF		
			113	BSP CAN		
			121	CINH term 28		Controller inhibited via X5/28
			122	CINH int 1		DCTRL-CINH1
			123	CINH int 2		DCTRL-CINH2
			124	CINH C135/STP		STOP key at the keypad
			125	CINH AIF		Controller inhibited via AIF
			126	CINH CAN		Controller inhibited via system bus
			131	FAIL-QSP		Fault reaction
			141	Lock mode		Restart protection active
			142	IMP		Power outputs with high resistance
			151	QSP ext term		QSP via MCTRL-QSP
			152	QSP C135/STP		QSP via STOP key at the keypad
			153	QSP AIF		QSP via AIF
			154	QSP CAN		QSP via system bus
			250	Warning		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 the function block NSET Connects main setpoint C0046 and additional setpoint C0040
C0195	BRK1 T ACT	99.9	0.0	{0.1 s}	99.9	**BRK1** Brake engagement 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 disengagement 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

Configuration

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0200	S/W ID	Disp				**Software identification** Software identification
C0201	S/W DATE	Disp				**Date of software release** Creation date
C0202	INTERNAL IO	Disp	0.000	{0.001}	100.000	Internal identification
C0203	COMM. NO.	Disp	x / xxxx / xxxxx			**Commission number**
C0204	SERIAL-NO.	Disp	0	{1}	65535	**Serial number**
C0206	PRODUCT DATE	Disp				**Date of production**
C0207	DL INFO 1	Disp				**Download info 1**
C0208	DL INFO 2	Disp				**Download info 2**
C0209	DL INFO 3	Disp				**Download info 3**
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}	99998	**PCTRL** Tn integral component 99999 ms: Switched off
C0224	PCTRL KD	0.0	0.0	{0.1}	5.0	**PCTRL** Kd differential component
C0241	NSET RFG-I = 0	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 lower limit 1 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	-100.00	-199.99	{0.01 %}	199.99	**MPOT1** Lower limit (condition: C0261 < C0260)

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
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 No change 1 Deceleration with T_{if} to 0% 2 Deceleration with T_{if} to C0261 3 Jump with T_{if} = 0 to 0% 4 Jump with T_{if} = 0 to C0261 5 Acceleration with T_{ir} to C0260	**MPOT1** Deactivation function of motor pot Function which is executed when motor pot is deactivated via the input MPOT1-INACTIVE.
C0265	MPOT1 INIT	0	0 Value during mains failure 1 lower limit of C0261 2 0 %	**MPOT1** Initialisation.Value which is accepted during mains switching and activated motor potentiometer.
[C0267]			→ Selection list 2	Digital inputs of motor potentiometers
1	UP	1000	FIXED0	Mpot-UP
2	DOWN	1000	FIXED0	MPOT-Down
[C0268]	MPOT1-INACT	1000	FIXED0 → Selection list 2	**MPOT1** Input signal configuration
C0269		Disp		
1	(C0267/1)			
2	(C0267/2)			
3	(C0268)			
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 No process controller adaptation 1 External via input 2 Adaptation via setpoint 3 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 Bipolar 1 Unipolar	**PCTRL** Bipolar/unipolar range of action
C0338	ARIT1 FUNCT	1	0 OUT = IN1 1 IN1 + IN2 2 IN1 - IN2 3 IN1 * IN2 4 IN1 / IN2 5 IN1/(100% - IN2)	**ARIT1** Function selection

Configuration

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 BAUDRATE	0	0 500 kbits/s 1 250 kbits/s 2 125 kbits/s 3 50 kbits/s 4 1000 kbits/s	**CAN** Baud rate
[C0352]	CAN MST	0	0 Slave 1 Master	**CAN** Establishing a master operation
C0353			0 C0350 1 C0354	**CAN** Source for IN/OUT addresses
1	CAN ADDR SEL1	0	0	CAN-IN1/OUT1 address
2	CAN ADDR SEL2	0		CAN-IN2/OUT2 address
3	CAN ADDR SEL3	0		CAN-IN3/OUT3 address
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_{Nx}
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 No function 1 CAN reset	**CAN** Install CAN bus reset node
C0359	CAN STATE	Disp	0 Operational 1 Pre-Operational 2 Warning 3 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 telegrams sent
2	MESSAGE IN			All telegrams 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 channel1
7	MESSAGE POUT2			Sent to parameter channel1
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 channel1
12	MESSAGE PIN2			Received from parameter channel2
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 telegrams sent
2	LOAD IN			All telegrams 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 channel1
7	LOAD POUT2			Sent to parameter channel1
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 channel1
12	LOAD PIN2			Received from parameter channel2
C0362	SYNC CYCLE	Disp	0 {1 ms} 30	**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 the offset of AIN1
[C0403]	GAIN	19504	FCODE-27/1 → Selection list 1	**AIN1** Configuring the gain of AIN1

Configuration

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0404		Disp	-199.99		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** Configuring the offset
[C0408]	GAIN	19505	FCODE-27/2		→ Selection list 1	**AIN2** Configuring the gain
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 fault** For Lenze motors: Read resolver error from the nameplate
[C0420]	ENCODER CONST	512	1	{1 inc/rev}	8192	**Encoder input X8** 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 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		**DFIN** Increment of the digital frequency input
C0426	DFIN-OUT	Disp	-32767	{1 rpm}	32767	Output signal of DFIN
C0427	DFIN FUNCTION	0				**DFIN** Selection of master frequency signal
			0	2-phases		Quadrature
			1	A pulse / B dir		Pulse / direction
			2	Pulse A or B		Pulse A / Pulse B
C0429	TP5 DELAY	0	-32767	{1 inc}	32767	Dead time compensation for the TP function of DFSET and DFRFG
C0430			0.000	{0.001 ms}	2.000	TP1 delay
1	TP1 DELAY	0.218				
2	TP2 DELAY	0.218				
3	TP3 DELAY	0.218				
4	TP4 DELAY	0.218				
[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

Code		Possible settings		Important
No.	**LCD**	**Lenze**	**Selection**	
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		
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 of analog input signal
[C0451]	ON	1000	FIXED0 → Selection list 2	**BRK1** Configuration of digital input signal
[C0452]	SIGN	1000	FIXED0% → Selection list 1	**BRK1** Configuration of 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 of 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 in 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 STP KEY	2	0 switched off 1 Set CINH (controller inhibit) 2 SetQSP (Quick stop)	**Keypad** STOP key function. Function is executed while pressing the key.
C0470			0 {1} 255	Freely assignable code for digital signals The data words C0470 and C0471 are in parallel and are identical
0	FCODE 8BIT 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 32 bits 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			-199.99 {0.01 %} 199.99	Freely assignable code for relative analog signals
1	FCODE ANALOG	0.00		
2	FCODE ANALOG	0.00		
3	FCODE ANALOG	100.00		
6	FCODE ANALOG	100.00		
...	...	...		
19	FCODE ANALOG	0.00		
20	FCODE ANALOG	0.00		
C0473			-32767 {1} 32767	**FCODE** Freely assignable code for absolute analog signals
1	FCODE ABS	1		
2	FCODE ABS	1		
3	FCODE ABS	0		
...	...	...		
9	FCODE ABS	0		
10	FCODE ABS	0		
C0474			-2147483648 {1} 2147483648	**FCODE** Freely assignable code for phase signals 1 rev. = 65536 inc
1	FCODE PH	0		
...	...	...		
5	FCODE PH	0		
C0475			-16000 {1 rpm} 16000	**FCODE** Freely assignable code for phase difference signals 1 rev. = 65536 inc
1	FCODE DF	0		
2	FCODE DF	0		
[C0490]	FEEDBACK POS	0		**Position feedback system** Feedback system for position controller
			0 Resolver at X7 1 Encoder TTL at X8 2 Encoder sin an X8	Feedback system can be merged with C0495 = 0, 1, 2
			3 Single-turn absolute value encoder at X8 4 Multi-turn absolute value encoder 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 Resolver at X7 1 Encoder TTL at X8 2 Encoder sin an X8	Feedback system can be merged with C0495 = 0, 1, 2
			3 Single-turn absolute value encoder at X8 4 Multi-turn absolute value encoder 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

Configuration

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	C005/0 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
C0529	MULTIP OFFSET	1	-20000 {1} 20000	**DFSET** Offset multiplier
C0530	DF EVALUATION	0	0 with g factor 1 without g factor	**DFSET** Master frequency evaluation Evaluation of the setpoint integrator (with/without gearbox factor)
C0531	ACT 0 DIV	1	1 {1} 16384	**DFSET** Actual zero pulse divider
C0532	0-PULSE/TP	1	1 Index pulse 2 Touch probe 3 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

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0534	0 PULSE FCT	0	0 Inactive 1 Continuous 2 Cont. switchable 10 Once, fast way 11 Once, cw 12 Once, ccw 13 Once, 2*index 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 Analog input 1 Phase difference input 2 Resolver simulation + zero pulse 3 Resolver simulation without zero pulse 4 X10 = X9 5 X10 = X8	**DFOUT** Function of the encoder outputs • X9 is inhibited if 0, 1, 2 or 3 has been selected • The input signals are buffered
[C0541]	AN-IN	1000	FIXED0% → Selection list 1	**DFOUT** Configuration of analog input signal
[C0542]	DF-IN	5000	MCTRL-phi-act → Selection list 4	**DFOUT** Configuration - master frequency input
[C0544]	SYN-RDY	1000	FIXED0 → Selection list 2	**DFOUT** Synchronisation signals for the index pulse
C0545	PH OFFSET	0	0 {1 inc} 65535	**DFOUT** Phase offset
C0546	MIN INC/REV	1000	-245760000 {1 inc} 245760000	**Min. incr. per rev.**
C0547	(C0541)	Disp	-199.99 {0.01 %} 199.99	
C0548	(C0544)	Disp	0 1	
C0549	(C0542)	Disp	-32767 {1 rpm} 32767	
C0560			-199.99 {0.01 %} 199.99	**FIXSET1** Fixed setpoints
1	FIX SET-VALUE	100		
2	FIX SET-VALUE	75		
3	FIX SET-VALUE	50		
4	FIX SET-VALUE	25		
5	FIX SET-VALUE	0		
...	...	...		
15	FIX SET-VALUE	0		
[C0561]	AIN	1000	FIXED0% → Selection list 1	**FIXSET1** Configuration of 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		

Configuration

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[C0570]	IN	1000	FIXED0% → Selection list 1	**S&H1** Configuration - analog input signal
[C0571]	LOAD	1000	FIXED0 → Selection list 2	**S&H1** Configuration of digital input signal
C0572	(C0570)	Disp	-199.99 {0.01 %} 199.99	
C0573	(C0571)	Disp		
C0577	VP FLD WEAK	3.00	0.00 {0.01 ms] 15.99	**Field weakening controller** V_{pgain}
C0578	TN FLD WEAK	10	2.0 {0.5 ms} 8192.0	**Field weakening controller** Adjustment time Tn C0578 = 8000 ms: Switched off
C0581	MONIT EER	0	0 Trip 1 Message 2 Warning 3 Off 4 Fail-QSP	**Monitoring EEr** Configuration - monitoring of external faults
C0582	MONIT OH4	2	2 Warning 3 Off	**Monitoring OH4** Configuration - monitoring of heatsink temperature
C0583	MONIT OH3	→	0 Trip 3 Off	**Monitoring OH3** Configuration - monitoring of "fixed motor temperature" → depending on C0086
C0584	MONIT OH7	→	2 Warning 3 Off	**Monitoring OH7** Configuration - monitoring of "adjustable motor temperature" → depending on C0086 Temperature monitoring via resolver input
C0585	MONIT OH8	3	0 Trip 2 Warning 3 Off	**Monitoring OH8** Configuration - monitoring of "adjustable motor temperature" Temperature monitoring via PTC input
C0586	MONIT SD2	0	0 Trip 2 Warning 3 Off	**Monitoring SD2** Configuration - resolver monitoring
C0587	MONIT SD3	3	0 Trip 2 Warning 3 Off	**Monitoring SD3** Configuration - "Encoder at X9"
C0588	MONIT H10/H11	3	0 Trip 2 Warning 3 3	**Monitoring H10 / H11** Configuration - monitoring of "temperature sensors in the controller"
C0589	MONIT P03	2	0 Trip 2 Warning 3 Off	**Monitoring P03** Configuration - monitoring of following errors
C0590	MONIT P13	0	0 Trip 2 Warning 3 Off	**Monitoring P13** Configuration - monitoring of phase-angle error
C0591	MONIT CE1	3	0 Trip 2 Warning 3 Off	**Monitoring CE1** Configuration - monitoring of "CAN-IN1 fault"
C0592	MONIT CE2	3	0 Trip 2 Warning 3 Off	**Monitoring CE2** Configuration - monitoring of "CAN-IN2 fault"
C0593	MONIT CE3	3	0 Trip 2 Warning 3 Off	**Monitoring CE3** Configuration - monitoring of "CAN-IN3 fault"
C0594	MONIT SD6	→	0 Trip 2 Warning 3 Off	**Monitoring SD6** Configuration - monitoring of "motor temperature sensor" → depending on C0086

Code No.	LCD	Possible settings Lenze	Selection			Important
C0595	MONIT CE4	3	0 2 3	Trip Warning Off		**Monitoring CE4** Configuration - monitoring of "CAN-Bus Off"
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		**Monitoring LP1** Configuration - monitoring of motor phase failure
C0598	MONIT SD5	3	0 2 3	Trip Warning Off		**Monitoring SD5** 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%			
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 of the upper limit
C0631	MIN LIMIT	-100.0	-199.99	{0.01 %}	199.99	**LIM1** Setting of the lower limit
[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 of 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

Configuration

Code		Possible settings		Important
No.	**LCD**	**Lenze**	**Selection**	
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 of the acceleration time T_{ir}
C0672	RFG1 TIF	0.000	0.000 {0.01 s} 999.900	**RFG1** Setting of 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 of digital input signal
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

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[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)			
[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 (edge 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 of digital input signal
C0714	(C0713)	Disp		
C0715	FUNCTION	0	0 Rising edge 1 Falling edge 2 Both edges	**TRANS2** Function selection (edge 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 of 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 of 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

Configuration

Code		Possible settings		Important
No.	**LCD**	**Lenze**	**Selection**	
[C0728]	IN	1000	FIXED0 → Selection list 2	**DIGDEL2** Configuration of digital input signal
C0729	(C0728)	Disp		
C0730	MODE	0	0 Start measurement 1 Stop measurement	**OSZ** Start / Stop of the measured-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 of digital input signal
1	DIG. TRIGGER	1000	FIXED0	
C0734	TRIG SOURCE	0	0 dig. trigger input 1 Channel 1 2 Channel 2 3 Channel 3 4 Channel 4	**OSZ** Selection of trigger source
C0735	TRIGGER LEVEL	0	-32767 {1} 32767	**OSZ** Setting trigger level for channel 1 ... 4
C0736	TRIGGER EDGE	0	0 LOW-HIGH edge 1 HIGH-LOW edge	**OSZ** Selection of the trigger edge
C0737	TRIGGER DELAY	0.0	-100.0 {0.1 %} 999.99	**OSZ** Setting of pre- and post-triggering
C0738	SAMPLING PERIOD	3	3 1 ms 4 2 ms 5 5 ms 6 10 ms 7 20 ms 8 50 ms 9 100 ms 10 200 ms 11 500 ms 12 1 s 13 2 s 14 5 s 15 10 s 16 20 s 17 50 s 18 1 min 19 2 min 20 5 min 21 10 min	**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	ENABLE/INHIBIT	0	0 Inhibit ”read data” 1 Enable ”read data”	Enable/inhibit The data memory must be enabled for reading

Code		Possible settings		Important
No.	**LCD**	**Lenze**	**Selection**	
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	2048	0 512 1 1024 2 1536 3 2048 4 3072 5 4096 6 8192	**OSZ** Adapt memory depth to the measuring task
C0749		Disp		**OSZ** Information on saving the measured values
1	INDEX ABORT			
2	NDEX TRIGGER			
3	INDEX END			
C0750	VP DENOM	16	1 Vp = 1 2 Vp = 1/2 4 Vp = 1/4 8 Vp = 1/8 16 Vp = 1/16 34 Vp = 1/32 64 Vp = 1/64 128 Vp = 1/128 256 Vp = 1/256 512 Vp = 1/512 1024 Vp = 1/1024 2048 Vp = 1/2048 4096 Vp = 1/4096 8192 Vp = 1/8192 16384 Vp = 1/16384	**DFRFG1** Denominator - position controller gain
C0751	DFRFG1 TIR	1.000	0.000 {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 deceleration ramp is activated
C0754	PH ERROR	$2 \cdot 10^9$	10 {1} $2 \cdot 10^9$	**DFRFG1** Following error • 1 revolution = 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 No TP start 1 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

Configuration

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[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 Direction of rotation cw/ccw (R/L) 2 Direction of rotation cw (to the right) 3 Direction of rotation ccw (to the left)	**DFRFG1** Selecting direction of rotation
[C0770]	D	1000	FIXED0 → Selection list 2	**FLIP1** Configuration of digital input signal
[C0771]	CLK	1000	FIXED0 → Selection list 2	**FLIP1** Configuration of digital input signal
[C0772]	CLR	1000	FIXED0 → Selection list 2	**FLIP1** Configuration of digital input signal
C0773		Disp		
1	(C0770)			
2	(C0771)			
3	(C0772)			
[C0775]	D	1000	FIXED0 → Selection list 2	**FLIP2** Configuration - digital input signal
[C0776]	CLK	1000	FIXED0 → Selection list 2	**FLIP2** Configuration of digital input signal
[C0777]	CLR	1000	FIXED0 → Selection list 2	**FLIP2** Configuration of digital input signal
C0778		Disp		
1	(C0775)			
2	(C0776)			
3	(C0777)			
[C0780]	N	1000	FIXED0% → Selection list 1	**NSET** Configuration - main setpoint input
[C0781]	N-INV	1000	FIXED0 → Selection list 2	**NSET** Configuration - main setpoint inversion
[C0782]	NADD	1000	FIXED0% → Selection list 1	**NSET** Configuration - additional setpoint input
[C0783]	NADD-INV	1000	FIXED0 → Selection list 2	**NSET** Configuration - additional setpoint inversion
[C0784]	CINH-VAL	1000	FIXED0% → Selection list 1	**NSET** Configuration - output signal with controller inhibited
[C0785]	SET	1000	FIXED0% → Selection list 1	**NSET** Configuration - ramp function generator
[C0786]	LOAD	1000	FIXED0 → 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	1000	FIXED0	
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	

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[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			
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	1000	FIXED0%	
2	IN	1000	FIXED0%	
[C0811]	SET	1000	FIXED0 → Selection list 2	**ASW1** Configuration of 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%	

Configuration

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[C0816]	SET	1000	FIXED0 → Selection list 2	**ASW2** Configuration of 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	
C0821		Disp		
1	(C0820/1)			
2	(C0820/2)			
3	(C0820/3)			
[C0822]		1000	→ Selection list 2	**AND2** Configuration - digital inputs
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 inputs
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)			

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[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)			
[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

Configuration

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
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)
C0855		Disp		**AIF-IN** Process input words hexadecimal for automation interface X1
1	IN (0-15)		Bit 00 {1} Bit 15	AIF-IN
2	IN (16-31)		Bit 16 {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 Analog signal 1 digital 0-15 2 LOW phase	**CANx-OUT** Configuration - process output words
1	TYPEOUT1.W2	0		
2	TYPEOUT2.W1	0		
3	TYPEOUT3.W1	0		

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C0865			0 Analog signal 1 Digital 16-31 2 HIGH phase	**CANx-OUT** Configuration - process output words
1	TYPEOUT1.W3	0		
2	TYPEOUT2.W2	0		
3	TYPEOUT3.W2	0		
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	1000	FIXED0 → 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		

Configuration

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[C0885]	R	1000	FIXED0 → Selection list 2	**R/L/Q** CW rotation Configuration of digital input signal
[C0886]	L	1000	FIXED0 → Selection list 2	**R/L/Q** CCW rotation Configuration of digital input signal
C0889		Disp		
1	(C0885)			
2	(C0886)			
[C0890]	N-SET	30020	pos-nout → Selection list 1	**MCTRL** Configuration - speed setpoint input
[C0891]	M-ADD	30021	pos-Mout → 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	30020	POS-POUT → Selection list 3	**MCTRL** Configuration - rotor position setpoint
[C0895]	PHI-LIM	19526	FCODE-472/6 → 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	1001	FIXED1 → Selection list 2	**MCTRL** Configuration - switch-on signal of phase controller
[C0898]	FLD-WEAK	1006	FIXED100% → Selection list 1	**MCTRL** Signal of field weakening
[C0899]	N/M-SWT	1000	FIXED0 → Selection list 2	**MCTRL** Switching between n and M control
[C0900]	QSP	1000	FIXED0 → Selection list 2	**MCTRL** Control signal for activation
[C0901]	I-SET	1000	FIXED0% → Selection list 1	**MCTRL** Loading I component of the speed controller
[C0902]	I-LOAD	1000	FIXED0 → Selection list 2	**MCTRL** Releasing signal for loading I component of the speed controller
[C0903]	P-ADAPT	1006	FIXED100% → Selection list 1	**MCTRL** Adaptation phase controller
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			
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	Set phase signal 1 rev. = 65536 inc

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C0909	SPEED LIMIT	1	1 2 3	+/- 175 % 0 ... +175 % -175 ... 0 %		**Limitation of direction of rotation** for speed setpoint
C0940	NUMERATOR	1	-32767	{1}	32767	**CONV1** Numerator
C0941	DENOMITATOR	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 pair (x1 / y1)
C0963	Y2	75.00	0.00	{0.01 %}	199.99	**CURVE1** Configuration - base point Ordinate of the pair (x2 / y2)
C0964	Y100	100.00	0.00	{0.01 %}	199.99	**CURVE1** Configuration - base point Ordinate of the pair (x 100 % / y100)
C0965	X1	50.00	0.01	{0.01 %}	100.00	**CURVE1** Configuration - base point Abscissa of the pair (x1 / y1)
C0966	X2	75.00	0.01	{0.01 %}	100.00	**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	
[C0990]	IN	1000	FIXEDPHI-0		→ Selection list 4	**PHINT1** Input signal configuration

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
[C0991]	RESET	1000	FIXED0		→ Selection list 2	**PHINT1** Configuration - reset signal
C0992	(C0990)	Disp	-32767	{1}	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}	2147483647	
C1010	FUNCTION	1	0 1 2 3 13 14 21 22	OUT = IN1 IN1 + IN2 IN1 - IN2 IN1 * IN2 / 2^{30} IN1 * IN2 IN1 / IN2 IN1 + IN2 (no limit) 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)					
C1020	FUNCTION	1	0 1 2 3 13 14 21 22	OUT = IN1 IN1 + IN2 IN1 - IN2 IN1 * IN2 / 2^{30} IN1 * IN2 IN1 / IN2 IN1 + IN2 (no limit) IN1 - IN2 (no limit)		**ARITPH2** Arithmetic function selection
[C1021]					→ Selection list 3	**ARITPH2** Input signal configuration
1	IN	1000	FIXED0INC			
2	IN	1000	FIXED0INC			
C1022		Disp	-2147483647	{1}	2147483647	
1	(C1021/1)					
2	(C1021/2)					
C1025	FUNCTION	1	0 1 2 3 13 14 21 22	OUT = IN1 IN1 + IN2 IN1 - IN2 IN1 * IN2 / 2^{30} IN1 * IN2 IN1 / IN2 IN1 + IN2 (no limit) IN1 - IN2 (no limit)		**ARITPH3** Arithmetic function selection
[C1026]					→ Selection list 3	**ARITPH3** Input signal configuration
1	IN	1000	FIXED0INC			
2	IN	1000	FIXED0INC			
C1027		Disp	-2147483647	{1}	2147483647	
1	(C1026/1)					
2	(C1026/2)					
C1090	OUTPUT SIGNAL		-2147483648	{1}	2147483647	**FEVAN1** Signal output

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
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]					→ Selection list 2	**FEVAN1** Configuration - digital input signals
1	LOAD	1000	FIXED0			
2	BUSY-IN	1000	FIXED0			
3	FAIL-IN	1000	FIXED0			
C1098	(C1096)	Disp	-32768	{1}	32767	
C1099		Disp				
1	(C1097/1)					
2	(C1097/2)					
3	(C1097/3)					
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%			
[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)					
C1105	FUNCTION	1	1 Return 2 Hold			**FCNT2** Function selection
[C1106]					→ Selection list 1	**FCNT2** Configuration - analog input signals
1	LD-VAL	1000	FIXED0%			
2	CMP-VAL	1000	FIXED0%			
[C1107]					→ Selection list 2	**FCNT2** Configuration - digital input signals
1	CLKUP	1000	FIXED0			
2	CLKDWN	1000	FIXED0			
3	LOAD	1000	FIXED0			
C1108		Disp	-32768	{1}	32768	
1	(C1106/1)					
2	(C1106/2)					
C1109		Disp				
1	(C1107/1)					
2	(C1107/2)					
3	(C1107/3)					
C1110	FUNCTION	1	1 Return 2 Hold			**FCNT3** Function selection

Configuration

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[C1111]			→ Selection list 1	**FCNT3** Configuration - analog input signals
1	LD-VAL	1000	FIXED0%	
2	CMP-VAL	1000	FIXED0%	
[C1112]			→ Selection list 2	**FCNT3** Configuration - digital input signals
1	CLKUP	1000	FIXED0	
2	CLKDWN	1000	FIXED0	
3	LOAD	1000	FIXED0	
C1113		Disp	-32768 {1} 32768	
1	(C1111/1)			
2	(C1111/2)			
C1114		Disp		
1	(C1112/1)			
2	(C1112/2)			
3	(C1112/3)			
C1120	SYNC MODE	2	0 off 1 CAN sync 2 Terminal sync	**SYNC1** Function selection
[C1121]			0 {1 ms} 13	**SYNC1**
1	SYNC CYCLE	2		Definition of the cycle time of the sync signals (in the 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 • only for terminal sync
2	SYNC WINDOW	0.200		Synchronisation window for the synchronisation edge of the terminal sync (LOW/HIGH edge) • only for terminal sync • 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	-2147483647 {1} 2147483647	
C1128	(C1125)	Disp	-2147483647 {1} 2147483647	
C1129	(C1126)	Disp	-2147483647 {1} 2147483647	
[C1130]			→ Selection list 1	**CONVPHPH2** Configuration - analog input signals
1	NUM	1000	FIXED0%	
2	DEN	1000	FIXED0%	
[C1131]	ACT	1000	FIXED0 → Selection list 2	**CONVPHPH2** Configuration - digital input signal
[C1132]	IN2	1000	FIXED0INC → Selection list 3	**CONVPHPH2** Input signal configuration

Code		Possible settings		Important
No.	**LCD**	**Lenze**	**Selection**	
C1135		Disp		
1	(C1130/1)			
2	(C1130/2)			
C1136	(C1131	Disp		
C1137	(C1132)	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		
C1180	IDENT MODE	0	0 inactive 1 Calculate control parameters from data set 2 Identify only parameters 3 Calculate only parameters for control system and control	**Identification mode of control parameters**
C1181	ID STATE	Disp		**Status: controller ident.**
			0 inactive	inactive
			1 busy	busy
			2 Error: no calculation	Error
			3 Error: no identification	
			4 Error: C0057 small	
			4 Error: n <> 0	
			6 Error: RSP	
			7 Error: C1185 big	
			8 Error: overtime	
			9 Error: bad condition	
			10 wait for start	Waiting for enable to start the movement
			11 motion	Waiting for end of movement
			12 wait for RSP	Waiting for controller inhibit for completion
			99 Error: internal	Internal error
C1182	PHI-ID PHASE	100	0.5 {0.1 rev} 3000	**phi max controller ident.**
C1183	N-ID MAX	100	10 {1 %} 100	**n max controller ident.**
C1184	M-ID MAX	100	10 {1 %} 100	**m max controller ident.**
C1185	M RISETIME	100	10 {1 ms} 10000	**M acceleration time**
C1186	OPTIMISE ID	0	0 Optimum control 1 Fault	**Optimisation: controller ident.**
C1187	INERTIA	0	0 {0.1 kg*cm^2} 214000	**Inertia**
C1188	FRICTION	0	0 {1 %} 100	**Friction load component (n-prop.)**

Configuration

Code		Possible settings		Important
No.	**LCD**	**Lenze**	**Selection**	
C1190	MOT. PTC-SEL.	0	0 standard 1 Characterist.	**Motor PTC selection**
C1191			0 {1 °C} 255	**Characteristic: Temp. 1** Selection of PTC temperature characteristic
1	CHAR.: TEMP 1	100		
2	CHAR.: TEMP 2	150		
C1192			0 {1 Ω} 30000	**Characteristic: Resistor 1** Selection of resistance characteristic for PTC
1	CHAR.: OHM 1	1670		
2	CHAR.: OHM 2	2225		
[C1195]	OUT.D2	1000	FIXED0INC → Selection list 3	**AIF** Configuration - phase signal
C1196	OUT.D2	Disp	-2147483647 {1} 2147483647	Input signal of AIF
C1197	IN.D2	Disp	-2147483647 {1} 2147483647	AIF-IN.D2
C1202	RATIO NUM.	1	1 {1} 65535	**Gearbox factor numerator** $i = \frac{C1202}{C1203} = \frac{n_{Motor}}{n_{Gearbox\_output}}$
C1203	RATIO DENUM.	1	1 {1} 65535	**Gearbox factor denominator**
C1204	FEED CONSTANT	1.0000	0.0001 {0.0001} 214000	**Feed constant** • Feed of the machine in units per revolution of the load side of the gearbox.
C1205	POS. RESOLUT.	Disp	0 {0.0001 inc/unit} 214000	**Position resolution** • The position resolution indicates the number of increments which resolve a unit determined by the user.
[C1206]	SET POLARITY	0	0 Not inverse 1 Inverse	**Polarity of position setpoint** • Reversal of the position direction
C1207			1 {1} 65335	**Position encoder - gearbox factor** • Gearbox factor between motor and position encoder. • Numerator/denominator corresponds to motor speed/encoder speed. • Encoder to motor shaft: 1/1
1	FDBK RAT NUM	1		
2	FDBK RAT DEN	1		
C1208	ACT POLARITY	0	0 not inverse 1 inverse	**Polarity - actual position** • >Inversion of the actual position, e.g. when using a separate position encoder behind the gearbox.
C1209	REF END-POINT	0	0 Ref-point 1 Real-0 61 VTPOS-No 060 71 VTPOS-No 070 101 VTPOS-No 100	**Homing end point** • Point where the drive is to be positioned after homing
C1210	POS. MODE	0	0 Absolute Pos 1 Relative Pos 2 Abs.Pos/Store	**Positioning mode** • With "absolute positioning" it is possible to carry out relative and absolute positioning processes. With "relative positioning" only relative processes can be carried out.
C1211	START PS NO.	1	1 {1} 32	**Start-PS no.** • Program set no. at which the positioning program is processed after the edge at the "PRG-START" input.
C1212	ACT. PS NO.	Disp	0 Prog. end 1 PS 01 2 PS 02 ... ... 31 PS 31 32 PS 32	**Actual PS no.** • Display of the current program set No. of operating mode.

Code No.	LCD	Possible settings: Lenze	Possible settings: Selection	Important
C1213	REF. MODE	0	0 +home 1 -home 2 +LIM,-home 3 -LIM,+home 4 +MARK,-home 5 -MARK,+home 6 +MARK,+TP 7 -MARK,-TP 8 +TP 9 -TP 10 +LIM,-TP 11 -LIM,+TP	**Homing mode** • Mode for homing (valid for manual mode and program homing).
C1214	REF TP-INPUT	4	1 TP-IN = X5/E1 2 TP-IN = X5/E2 3 TP-IN = X5/E3 4 TP-IN = X5/E4	**Homing touch probe** • Selection of the touch probe input terminal for homing acc. to modes 6...9. When using an incremental encoder, the TP input X5/E4 is particularly suitable.
C1215			0 +slope 1 -slope	**TP input edge** • Selection of the edge for the touch probe input terminals. (Applies to homing acc. to modes 6...9, TP positioning, TP storage)
1	TP-TRANS	0		
...	...	...		
4	TP-TRANS	0		
C1216	V-REF2 ACTIVE.	0	0 inactive 1 active	**Activating 2nd homing speed**
C1218			0 {0.0001 units} 214000	**Following error tolerance**
1	FOL.TOLERANCE	4.0000		
2	FOL.TOLERANCE	1.0000		
C1220		Disp	-214000 {0.0001 units} 214000	
1	POS-TARGET			Actual target position
2	POS-SETPOS			Actual position setpoint
3	POS-ACTPOS			Actual position
4	ACT.FOLLOW ERR			Actual following error
5	ACTPOS ABS.			Read in absolute value
6	REFMARK 0-IMP			Distance of REF-MARK to index pulse
7	ACT.HOME OFFS			Actual reference dimension offset
8	ACT.HOME POS.			Actual home position
9	ACT. WAY			Path still to be positioned
10	ACT. C1223			Real internal values of the codes C1223, C1224, C1240, C1250 (internal limitation possible: see chapter Troubleshooting, “Fault indication P18”)
11	ACT. C1224			
12	ACT. C1240			
13	ACT. C1250			
14	ACT. VNORM			Internal value for fault analysis
15	ACT. ANORM			

Configuration

Code		Possible settings		Important
No.	**LCD**	**Lenze**	**Selection**	
C1221		Disp	-2147483647 {1 inc} 2147483647	
1	POS-TARGET			Actual target position
2	POS-SETPOS			Actual position setpoint
3	POS-ACTPOS			Actual position
4	ACT.FOLLOWERR			Actual following error
5	ACTPOS ABS.			Read in absolute value
6	REFMARK 0-IMP			Distance of REF-MARK to index pulse
7	ACT.HOME OFFS			Actual reference dimension offset
8	ACT.HOME POS.			Actual home position
9	ACT. WAY			Path still to be positioned
10	ACT. C1223			Real internal values of the codes C1223, C1224, C1240, C1250 (internal limitation possible: see chapter Troubleshooting, “Fault indication P18”)
11	ACT. C1224			
12	ACT. C1240			
13	ACT. C1250			
14	ACT. VNORM			Internal value for fault analysis
15	ACT. ANORM			
[C1223]	POS. LIMIT+	16000	0 {0.0001 units} 214000	**Position limit positive**
[C1224]	POS. LIMIT-	-16000	-214000 {0.0001 units} 0	**Position limit negative**
C1225	HOME OFFSET	0	-214000 {0.0001 units} 214000	**Homing measure offset**
C1227	HOME POSITION	0	-214000 {0.0001 units} 214000	**Home position**
C1240	V-MAX	50	0.0001 {0.0001units/s} 214000	**v-max, maximum speed**
C1241	V-HOMING 2	2	0.01 {0.01 %vmax} 100	**Second homing speed**
C1242	V-HOMING	5	0.01 {0.01 %vmax} 100	**Homing speed**
C1243	V-MANUAL	5	0.01 {0.01 %vmax} 100	**Manual speed**
C1245		Disp	-199.99 {0.01 %vmax} 199.99	**POS-VSET, actual speed setpoint**
1	POS-VSET			
2	POS-VTRAV			
3	POS-VFINAL			
C1250	A-MAX	100	0.0001 {0.0001 units/s^2} 214000	**a-max, maximum acceleration/deceleration**
C1251	A-HOMING	10	0.01 {0.01 %amax} 100	**Homing acceleration/deceleration**
C1252	A-MANUAL	10	0.01 {0.01 %amax} 100	**Manual control acceleration/deceleration**
C1253	A-CANCEL	100	0.01 {0.01 %amax} 100	**PS-CANCEL delay**
C1255		Disp	-199.99 {0.01 %amax} 199.99	**POS_ASET, acceleration/deceleration**
1	POS-ASET			
2	POS-ACC			
3	POS-DCC			
C1256	S-RMP: JERK	1	0.064 {0.001 s} 10	**S-ramp: jerk-max**
C1257	S-RMP: FILTER	10	0 {1 rpm} 1000	**S-ramp: PARAM-RD filter**
C1260	MANUAL MODE	0	0 No stop 1 With stop	**Manual mode**
C1261			→ Selection list 20	**Intermediate stop target (no. in VTPOS)**
1	MANU-STP-NO	0	inactive	
2	MANU-STP-NO	1	VTPOS-No 001	
...	...	...		
14	MANU-STP-NO	14	VTPOS-No 014	
15	MANU-STP-NO	15	VTPOS-No 015	

Code No.	LCD	Lenze	Selection		Important
C1280	POS. CONTROL	0	0	{1} 65535	**Control word positioning**
			Bit 0	Program start	
			Bit 1	Program stop	
			Bit 2	Program reset	
			Bit 3	Program abort	
			Bit 4	Manual operation	
			Bit 5	Negative manual positioning	
			Bit 6	Positive manual positioning	
			Bit 7	Manual homing	
			Bit 8 ... 15	reserved	
C1283	POS. STATUS	Disp	0	program mode	**Positioning state**
			5	rdy to start	The state is only updated under the following conditions:
			10	started	• The power stage is supplied (DCTRL-RDY=1),
			11	started-dig	• No fault (DCTRL-TRIP=0, DCTRL-FAIL-QSP=0),
			12	started-rem	• The drive is enabled (DCTRL-CINH=0)
			15	started-break	• Quick stop (QSP) is not activated (MCTRL-QSP-OUT=0)
			20	program end	• Manual operation is not activated (POS-MANUAL=0, C1280.B4=0)
			25	stopped-dig	
			26	stopped-rem	
			30	STDBY mode	
			35	reset-dig	
			36	reset-rem	
			50	manual-dig	
			51	manual-rem	
			55	manu-neg-dig	
			56	manu-neg-rem	
			57	manu-pos-dig	
			58	manu-pos-rem	
			59	neg+pos active	
			62	manu-ref-dig	
			63	manu-ref-rem	
			80	POS-LOOP-INH	
			85	POS-PSET-SWT	
C1284	HOMING-STATUS	Disp	0	not REF-OK	**Homing status**
			1	REF-OK	
			5	homing by prg	
			10	manu-ref-dig	
			11	manu-ref-1280	
			20	abs encoder	
			25	ext abs encod	
C1285			0	Trip	**Configuration - P01 (negative limit switch)**
1	MONIT P01	4	4	Fail-QSP	
2	MONIT P02	4			
3	MONIT P04	4			
4	MONIT P05	4			
C1286			0	Trip	**Configuration - P14 (following error 1)**
1	MONIT P14	4	2	Warn	
2	MONIT P15	3	3	Off	
			4	Fail-QSP	
C1287			0	Trip	**Configuration - P06 (no reference)**
1	MONIT P06	4	4	Fail-QSP	
C1288			0	Trip	**Configuration - P12 (encoder limit)**
			2	Warn	
1	MONIT P12	4	3	Off	
			4	Fail-QSP	
C1289			0	Trip	**Configuration P17, P18**
1	MONIT P17	4	2	Warn	TP control
2	MONIT P18	2	3	Off	Range of representation limited/exceeded (position limits, speeds)
			4	Fail-QSP	

Configuration

Code		Possible settings		Important
No.	**LCD**	**Lenze**	**Selection**	
C1290			0 Trip 2 Warn 3 Off 4 Fail-QSP	**Configuration - P16 (Sync error)**
1	MONIT P16	4		
C1291			0 Trip 4 Fail-QSP	**Configuration - P07 (PS mode error)**
1	MONIT P07	4		
2	MONIT P08	4		
3	MONIT P09	4		
C1298	P18 DIAGNOSTIC	Disp	0 No P18 1 C1223 2 C1224 3 C1240 4 C1250 5 Vnorm 6 Anorm	**P18 diagnostics** Display of the code which led to an internal limitation.
C1299		Disp	0 {1 pcs} 65535	**Actual state of piece counter**
1	ACT. CNT			
2	ACT. CNT			
...	...			
32	ACT. CNT			
C1301			-214000 {0.0001 units} 214000	**Input VTPOS position value**
1	VTPOS-VALUE	0		
2	VTPOS-VALUE	0		
...	...	...		
60	VTPOS-VALUE	0		
C1302			0.01 {0.01 %vmax} 100	**Input VTVEL speeds**
1	VTVEL-VALUE	10		
2	VTVEL-VALUE	20		
...	...	...		
10	VTVEL-VALUE	100		
...	...	...		
30	VTVEL-VALUE	100		
C1303			0.01 {0.01 %amax} 100	**Input of VTACC accelerations/decelerations**
1	VTACC-VALUE	10		
2	VTACC-VALUE	20		
...	...	...		
10	VTACC-VALUE	100		
...	...	...		
30	VTACC-VALUE	100		
C1304			1 {1 pcs} 65535	**Input VTPCS piece numbers**
1	VTPCS-VALUE	1		
...	...	...		
30	VTPCS-VALUE	30		
C1305			0 {0.001 s} 65535	**Input VTTIME waiting times**
1	VTTIME-VALUE	1		
...	...	...		
30	VTTIME-VALUE	30		

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C1311			0 No pos funct. 1 Absolute PS 2 Relative PS 3 Homing 4 Set home pos. 5 Set target 6 Abs.TP-PS E01 7 Abs.TP-PS E02 8 Abs.TP-PS E03 9 Abs.TP-PS E04 11 Rel.TP-PS E01 12 Rel.TP-PS E02 13 Rel.TP-PS E03 14 Rel.TP-PS E04 16 Set Ref-Pos. 30 STDBY 31 STDBY-TP1 32 STDBY-TP2 33 STDBY-TP3 34 STDBY-TP4	**Program set mode**
1		0		
2		0		
...		...		
32		0		
C1312			→ Selection list 11	**PS target position (no. in VTPOS)**
1	TARGET-NO	0	Real zero	
2	TARGET-NO	0	Real zero	
...	...	...	...	
32	TARGET-NO	0	Real zero	
C1313				**PS positioning speed (no. in VTVEL)**
1	V-TRAVEL-NO	0	v-max	
2	V-TRAVEL-NO	0	v-max	
...	...	...	...	
32	V-TRAVEL-NO	0	v-max	
C1314			→ Selection list 16	**PS acceleration (no. in VTACC)**
1	ACC-NO	0	a-max	
2	ACC-NO	0	a-max	
...	...	...	...	
32	ACC-NO	0	a-max	
C1315			→ Selection list 16	**PS deceleration (no. in VTACC)**
1	DCC-NO	0	a-max	
2	DCC-NO	0	a-max	
...	...	...	...	
32	DCC-NO	0	a-max	
C1316			→ Selection list 15	**PS final speed (no. in VTVEL)**
1	V-FINAL-NO	0	Standstill	
2	V-FINAL-NO	0	Standstill	
...	...	...	...	
32	V-FINAL-NO	0	Standstill	
C1318			0 inactive 1 PFI 01 2 PFI 02 ... ... 32 PFI 32	**Wait for PFI (no. of the PFI)**
1	WAIT-PFI-NO	0		
2	WAIT-PFI-NO	0		
...	...	...		
32	WAIT-PFI-NO	0		
C1319			0 0 level 1 1 level	**Level for Wait-PFI**
1	WAIT-LEVEL	0		
2	WAIT-LEVEL	0		
...	...	...		
32	WAIT-LEVEL	0		

Configuration

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C1320			0 inactive 1 PFO 01 2 PFO 02 3 PFO 03 ... ... 31 PFO 31 32 PFO 32 100 All PFO's 101 PFO 01 ... 08 102 PFO 09 ... 16 103 PFO 17 ... 24 104 PFO 25 ... 32	**First switching PFO (no. of the PFO)** • Program function output 1: Set an output before positioning
1	PFO1-NO	0		
2	PFO1-NO	0		
...	...	...		
32	PFO1-NO	0		
C1321			0 0 level 1 1 level	**First switching PFO level**
1	PFO1-LEVEL	0		
2	PFO1-LEVEL	0		
...	...	...		
32	PFO1-LEVEL	0		
C1322			0 inactive 1 PFO 01 2 PFO 02 3 PFO 03 ... ... 31 PFO 31 32 PFO 32 100 All PFO's 101 PFO 01 ... 08 102 PFO 09 ... 16 103 PFO 17 ... 24 104 PFO 25 ... 32	**Second switching PFO (no. of the PFO)** • Program function output 2: Set an output after positioning
1	PFO2-NO	0		
2	PFO2-NO	0		
...	...	...		
32	PFO2-NO	0		
C1323			0 0 level 1 1 level	**Second switching PFO level**
1	PFO2-LEVEL	0		
2	PFO2-LEVEL	0		
...	...	...		
32	PFO2-LEVEL	0		
C1324			→ Selection list 18	**Waiting time (no. in VTTIME)**
1	WAITTIME-NO	0	inactive	
2	WAITTIME-NO	0	inactive	
...	...	...	...	
32	WAITTIME-NO	0	inactive	
C1325			0 inactive 1 PFI 01 2 PFI 02 ... ... 32 PFI 32	**JMP1: PFI no.** • Number of a PFI for branch 1
1	JMP1-PFI-NO	0		
2	JMP1-PFI-NO	0		
...	...	...		
32	JMP1-PFI-NO	0		
C1326			0 0 level 1 1 level	**JMP1: PFI level** • Level of a PFI for branch 1
1	JMP1-LEVEL	0		
2	JMP1-LEVEL	0		
...	...	...		
32	JMP1-LEVEL	0		
C1327			→ Selection list 19	**JMP1: PS no.** • Branch 1 on program set No. (PS). Entry of the program set No.
1	JMP1-PS	0	Prg. end	
2	JMP1-PS	0	Prg. end	
...	...	...	...	
32	JMP1-PS	0	Prg. end	

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C1328			→ Selection list 17	**JMP-PCS no.: Set piece number (no. in VTPCS)** • Selection of a set piece number from VTPCS for the piece number repeat function.
1	JMP-PCS-NO	0	inactive	
2	JMP-PCS-NO	0	inactive	
...	...	...	...	
32	JMP-PCS-NO	0	inactive	
C1329			→ Selection list 19	**JMP-PCS-PS: PS no.** • Branch PCS, if selected number from VTPCS has still not been reached. Entry of the program set No.
1	JMP-PCS-PS	0	Prg. end	
2	JMP-PCS-PS	0	Prg. end	
...	...	...	...	
32	JMP-PCS-PS	0	Prg. end	
C1330			→ Selection list 12	**TP window (no. in VTPOS)** • Selection of an area window for TP. In this area the TP is "sharp".
1	TP WINDOW	0	Trav. range	
2	TP WINDOW	0	Trav. range	
...	...	...	...	
32	TP WINDOW	0	Trav. range	
C1331			→ Selection list 13	**TP final distance (no. in VTPOS)** • Selection of a final distance from VTPOS for TP.
1	TP DISTANCE	0	Target = TP	
2	TP DISTANCE	0	Target = TP	
...	...	...	...	
32	TP DISTANCE	0	Target = TP	
C1333			→ Selection list 19	**JMP-TP: PS no.** • TP branch, if no touch probe occurred until the target position has been reached. Entry of the program set No.
1	JMP-TP-PS	0	Prg. end	
2	JMP-TP-PS	0	Prg. end	
...	...	...	...	
32	JMP-TP-PS	0	Prg. end	
C1334			0 inactive 1 PFI 01 2 PFI 02 ... ... 32 PFI 32	**JMP2: PFI-Nr.** • Number of a PFI for branch 2
1	JMP2-PFI-NO			
2	JMP2-PFI-NO			
...	...			
32	JMP2-PFI-NO			
C1335			0 0 level 1 1 level	**JMP2: PFI level** • Level of a PFI for branch 1.
1		0		
2		0		
...		...		
32		0		
C1336			→ Selection list 19	**JMP2: PS no.** • Branch 2 on program set No. (PS). Entry of the program set No.
1		0	Prg. end	
2		0	Prg. end	
...		...	...	
32		0	Prg. end	
C1349			→ Selection list 19	**JMP: PS no.** • Unconditioned branch to PS no.
1	JMP-PS	0	Prg. end	
2	JMP-PS	0	Prg. end	
...	...	...	...	
32	JMP-PS	0	Prg. end	
[C1350]			→ Selection list 3	**VTPOS** Input signal configuration
1	VTPOS-IN	1000	FIXED0INC	
...	...	...	...	
10	VTPOS-IN	1000	FIXED0INC	
C1351		Disp	-2147483647 {1 inc} 2147483647	**VTPOS**
1	VTPOS-IN			
...	...			
10	VTPOS-IN			

Configuration

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[C1352]			→ Selection list 3	**VTVEL** Input signal configuration
1	VTVEL-IN	1000	FIXED0INC	
...	...	...	...	
4	VTVEL-IN	1000	FIXED0INC	
C1353		Disp	-2147483647 {1} 2147483647	**VTVEL**
[C1354]			→ Selection list 3	**VTACC** Input signal configuration
1	VTACC-IN	1000	FIXED0INC	
...	...	...	...	
4	VTACC-IN	1000	FIXED0INC	
C1355		Disp	-2147483647 {1} 2147483647	**VTACC**
1	VTACC-IN			
...	...			
4	VTACC-IN			
[C1356]			→ Selection list 1	**VTPCS** Input signal configuration
1	VTPCS-IN	1000	FIXED0%	
...	...	...	...	
4	VTPCS-IN	1000	FIXED0%	
C1357		Disp	-32768 {1} 32767	**VTPCS**
1	VTPCS-IN			
...	...			
4	VTPCS-IN			
C1358			→ Selection list 1	**VTTIME** Input signal configuration
1	CFG:VTTIME-IN	1000	FIXED0%	
...	...	...	...	
4	CFG:VTTIME-IN	1000	FIXED0%	
C1359		Disp	-32768 {1} 32767	**VTTIME**
1	DIS:VTTIME-IN			
...	...			
4	DIS:VTTIME-IN			
[C1360]			→ Selection list 2	**POS** Configuration - digital input signals
1	CFG:PRG-START	53	DIGIN3	
2	CFG:PRG-STOP	20201	CAN-in2.b0	
3	CFG:PRG-RESET	55	DIGIN5	
4	CFG:LIM-NEG	51	DIGIN1	
5	CFG:LIM-POS	52	DIGIN2	
6	CFG:MANUAL	55	DIGIN5	
7	CFG:MANU-NEG	20202	CAN-in2.b1	
8	CFG:MANU-POS	20203	CAN-in2.b2	
9	CFG:MANU-REF	20204	CAN-in2.b3	
10	CFG:REF-MARK	54	DIGIN4	
11	CFG:TP1-ENABL-TP1	1000	FIXED0	
12	CFG:TP2-ENABL-TP2	1000	FIXED0	
13	CFG:TP3-ENABL-TP3	1000	FIXED0	
14	CFG:TP4-ENABL-TP4	1000	FIXED0	
15	CFG:PS-CANCEL	20208	CAN-in2.b7	
16	CFG:STDBY-STP	20205	CAN-IN2.B4	
17	CFG:S-RAMPS	19522	FCODE-471.B1	
18	CFG:PARAM-RD	20206	CAN-in2.b5	
19	CFG:LOOP-INH	20207	CAN-in2.b6	
20	CFG:PSET-SWT	1000	FIXED0	
21	CFG:ABS-SET	1000	FIXED0	
22	CFG:WAITSTATE	1000	FIXED0	

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C1361		Disp		POS
1	DIS:PRG-START			
2	DIS:PRG-STOP			
3	DIS:PRG-RESET			
4	DIS:LIM-NEG			
5	DIS:LIM-POS			
6	DIS:MANUAL			
7	DIS:MANU-NEG			
8	DIS:MANU-POS			
9	DIS:MANU-REF			
10	DIS:REF-MARK			
11	DIS:TP1-ENABL-TP1			
12	DIS:TP2-ENABL-TP2			
13	DIS:TP3-ENABL-TP3			
14	DIS:TP4-ENABL-TP4			
15	DIS:PS-CANCEL			
16	DIS:STDBY-STP			
17	DIS:S-RAMPS			
18	DIS:PARAM-RD			
19	DIS:LOOP-INH			
20	DIS:PSET-SWT			
21	DIS:ABS-SET			
22	DIS:WAITSTATE			
[C1362]			→ Selection list 1	**CFG: POS-START-PS** Configuration - analog input signals
1	CFG:START-PS	19517	FCODE-1211	
2	CFG:V-OVERRID	1006	FIXED100%	
3	CFG:A-OVERRID	1006	FIXED100%	
4	CFG:N-IN	1000	FIXED0%	
5	CFG:NOUT-GAIN	1006	FIXED100%	
6	CFG:M-IN	1000	FIXED0%	
7	CFG:MOUT-GAIN	1000	FIXED0%	
8	CFG:JERK-RED	1006	FIXED100%	
C1363		Disp	-32768 {1} 32767	POS
1	DIS:START-PS			
2	DIS:V-OVERRID			
3	DIS:A-OVERRID			
4	DIS:N-IN			
5	DIS:NOUT-GAIN			
6	DIS:M-IN			
7	DIS:MOUT-GAIN			
8	DIS:JERK-RED			
[C1364]			→ Selection list 3	**POS** Input signal configuration
1	CFG:PSET-EXT	1000	FIXED0INC	
2	CFG:ABS-IN	5000	MCTRL-phi-ang	
3	CFG:P-IN	1000	FIXED0INC	
C1365		Disp	-2147483647 {1 inc} 2147483647	POS
1	DIS:PSET-EXT			
2	DIS:ABS-IN			
3	DIS:P-IN			

Configuration

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
[C1370]					→ Selection list 2	**POS** Configuration - digital input signals
1	CFG:PFI	20201	CAN-in2.b0			
2	CFG:PFI	20202	CAN-in2.b1			
...	...	...	...			
30	CFG:PFI	20230	CAN-in2.b29			
31	CFG:PFI	53	DIGIN3			
32	CFG:PFI	54	DIGIN4			
C1371		Disp	0	{1 hex}	65535	**POS**
1	PFI-LOW					
2	PFI-HIGH					
C1372		Disp	0	{1 hex}	65535	**POS**
1	PFO-LOW					
2	PFO-HIGH					
C1380		Disp	-214000.0000	{0.0001 units}	214000.0000	**VTPOS**
1	VTPOS					
...	...					
104	VTPOS					
C1381		Disp	-2147483647	{1 inc}	2147483647	**VTPOS**
1	VTPOS					
...	...					
104	VTPOS					
C1382		Disp	0.01	{0.01 %vmax}	100.00	**VTVEL**
1	VTVEL					
...	...					
34	VTVEL					
C1383		Disp	-2147483647	{1 x/T}	2147483647	**VTVEL**
1	VTVEL					
...	...					
34	VTVEL					
C1384		Disp	0.01	{0.01 %amax}	100.00	**VTACC**
1	VTACC					
...	...					
34	VTACC					
C1385		Disp	-2147483647	{1 x/T2}	2147483647	**VTACC**
1	VTACC					
...	...					
34	VTACC					
C1386		Disp	0	{1 pcs}	65535	**VTPCS**
1	VTPCS					
...	...					
34	VTPCS					
C1387		Disp	0.000	{0.001 s}	65535.000	**VTTIME**
1	VTTIME					
...	...					
34	VTTIME					
[C1400]					→ Selection list 2	**TEACH1** Configuration - digital input signals
1	SET	1000	FIXED0			
2	NEXT	1000	FIXED0			
3	CLR	1000	FIXED0			
4	LOAD	1000	FIXED0			
[C1401]					→ Selection list 3	**TEACH1** Input signal configuration
1	L-IN	1000	FIXED0INC			

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C1402		Disp	-2147483647	{1}	2147483647	**TEACH1**
1	SET					
2	NEXT					
3	CLR					
4	LOAD					
C1403	CNT	Disp	0	{1}	65535	**TEACH1**
C1404		Disp	-2147483647	{1 inc}	2147483647	**TEACH1**
1	L-IN					
[C1405]					→ Selection list 1	**TEACH1**
1	LDVAL	1000	FIXED0%			
C1406		Disp	-32768	{1}	32768	**TEACH1**
1	LDVAL					
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	1.0000	0.0001	{0.0001}	100000.0000	**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]					→ Selection list 2	**FEVAN2** Configuration - digital input signals
1	LOAD	1000	FIXED0			
2	BUSY-IN	1000	FIXED0			
3	FAIL-IN	1000	FIXED0			
C1508	(C1506)	Disp	-32768	{1}	32767	
C1509		Disp				
1	(C1507/1)					
2	(C1507/2)					
3	(C1507/3)					
C1510	OUTPUT SIGNAL		-2147483648	{1}	2147483647	**FEVAN3** Signal output
C1511	CODE	141	2	{1}	2000	**FEVAN3** Target code of FEVAN3
C1512	SUBCODE	0	0	{1}	255	**FEVAN3** Target subcode FEVAN3
C1513	NUMERATOR	1.0000	0.0001	{0.0001}	100000.0000	**FEVAN3** Numerator
C1514	DENOMINATOR	0.0001	0.0001	{0.0001}	100000.0000	**FEVAN3** Denominator
C1515	OFFSET	0	0		1000000000	**FEVAN3** Offset
[C1516]	IN	1000	FIXED0%		→ Selection list 1	**FEVAN3** Configuration - analog input signal
[C1517]					→ Selection list 2	**FEVAN3** Configuration - digital input signals
1	LOAD	1000	FIXED0			
2	BUSY-IN	1000	FIXED0			
3	FAIL-IN	1000	FIXED0			
C1518	(C1516)	Disp	-32768	{1}	32767	

Configuration

Code No.	LCD	Possible settings: Lenze	Possible settings: Selection	Important
C1519		Disp		
1	(C1517/1)			
2	(C1517/2)			
3	(C1517/3)			
C1520	OUTPUT SIGNAL		-2147483648 {1} 2147483647	**FEVAN4** Signal output
C1521	CODE	141	2 {1} 2000	**FEVAN4** Target code of FEVAN4
C1522	SUBCODE	0	0 {1} 255	**FEVAN4** Target subcode FEVAN4
C1523	NUMERATOR	1.0000	0.0001 {0.0001} 100000.0000	**FEVAN4** Numerator
C1524	DENOMINATOR	0.0001	0.0001 {0.0001} 100000.0000	**FEVAN4** Denominator
C1525	OFFSET	0	0 1000000000	**FEVAN4** Offset
[C1526]	IN	1000	FIXED0% → Selection list 1	**FEVAN4** Configuration - analog input signal
[C1527]			→ Selection list 2	**FEVAN4** Configuration - digital input signals
1	LOAD	1000	FIXED0	
2	BUSY-IN	1000	FIXED0	
3	FAIL-IN	1000	FIXED0	
C1528	(C1526)	Disp	-32768 {1} 32767	
C1529		Disp		
1	(C1527/1)			
2	(C1527/2)			
3	(C1527/3)			
C1530	OUTPUT SIGNAL		-2147483648 {1} 2147483647	**FEVAN5** Signal output
C1531	CODE	141	2 {1} 2000	**FEVAN5** Target code of FEVAN5
C1532	SUBCODE	0	0 {1} 255	**FEVAN5** Target subcode FEVAN5
C1533	NUMERATOR	1.0000	0.0001 {0.0001} 100000.0000	**FEVAN5** Numerator
C1534	DENOMINATOR	0.0001	0.0001 {0.0001} 100000.0000	**FEVAN5** Denominator
C1535	OFFSET	0	0 1000000000	**FEVAN5** Offset
[C1536]	IN	1000	FIXED0% → Selection list 1	**FEVAN5** Configuration - analog input signal
[C1537]			→ Selection list 2	**FEVAN5** Configuration - digital input signals
1	LOAD	1000	FIXED0	
2	BUSY-IN	1000	FIXED0	
3	FAIL-IN	1000	FIXED0	
C1538	(C1536)	Disp	-32768 {1} 32767	
C1539		Disp		
1	(C1537/1)			
2	(C1537/2)			
3	(C1537/3)			
C1540	OUTPUT SIGNAL		-2147483648 {1} 2147483647	**FEVAN6** Signal output
C1541	CODE	141	2 {1} 2000	**FEVAN6** Target code of FEVAN6
C1542	SUBCODE	0	0 {1} 255	**FEVAN6** Target subcode FEVAN6

Code		Possible settings		Important
No.	**LCD**	**Lenze**	**Selection**	
C1543	NUMERATOR	1.0000	0.0001 {0.0001} 100000.0000	**FEVAN6** Numerator
C1544	DENOMINATOR	0.0001	0.0001 {0.0001} 100000.0000	**FEVAN6** Denominator
C1545	OFFSET	0	0 1000000000	**FEVAN6** Offset
[C1546]	IN	1000	FIXED0% → Selection list 1	**FEVAN6** Configuration - analog input signal
[C1547]			→ Selection list 2	**FEVAN6** Configuration - digital input signals
1	LOAD	1000	FIXED0	
2	BUSY-IN	1000	FIXED0	
3	FAIL-IN	1000	FIXED0	
C1548	(C1546)	Disp	-32768 {1} 32767	
C1549		Disp		
1	(C1547/1)			
2	(C1547/2)			
3	(C1547/3)			
C1550	FUNCTION	1	0 OUT = IN1 1 IN1 + IN2 2 IN1 - IN2 3 IN1 * IN2 / 2^{30} 13 IN1 * IN2 14 IN1 / IN2 15 IN1 % IN2 21 IN1 + IN2 (no limit) 22 IN1 - IN2 (no limit)	**ARITPH4** Arithmetic function selection
[C1551]			→ Selection list 3	**ARITPH4** Input signal configuration
1	IN	1000	FIXED0INC	
2	IN	1000	FIXED0INC	
C1552		Disp	-2147483647 {1} 2147483647	
1	(C1551/1)			
2	(C1551/2)			
C1555	FUNCTION	1	0 OUT = IN1 1 IN1 + IN2 2 IN1 - IN2 3 IN1 * IN2 / 2^{30} 13 IN1 * IN2 14 IN1 / IN2 15 IN1 % IN2 21 IN1 + IN2 (no limit) 22 IN1 - IN2 (no limit)	**ARITPH5** Arithmetic function selection
[C1556]			→ Selection list 3	**ARITPH5** Input signal configuration
1	IN	1000	FIXED0INC	
2	IN	1000	FIXED0INC	
C1557		Disp	-2147483647 {1} 2147483647	
1	(C1556/1)			
2	(C1556/2)			
C1560	FUNCTION	1	0 OUT = IN1 1 IN1 + IN2 2 IN1 - IN2 3 IN1 * IN2 / 2^{30} 13 IN1 * IN2 14 IN1 / IN2 15 IN1 % IN2 21 IN1 + IN2 (no limit) 22 IN1 - IN2 (no limit)	**ARITPH6** Arithmetic function selection

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[C1561]			→ Selection list 3	**ARITPH6** Input signal configuration
1	IN	1000	FIXED0INC	
2	IN	1000	FIXED0INC	
C1562		Disp	-2147483647 {1} 2147483647	
1	(C1551/1)			
2	(C1551/2)			
[C1570]			→ Selection list 2	**CONVDA1** Configuration - digital input signals
1	B0	1000	FIXED0	
2	B1	1000	FIXED0	
3	B2	1000	FIXED0	
4	B3	1000	FIXED0	
5	B4	1000	FIXED0	
6	B5	1000	FIXED0	
7	B6	1000	FIXED0	
8	B7	1000	FIXED0	
9	B8	1000	FIXED0	
10	B9	1000	FIXED0	
11	B10	1000	FIXED0	
12	B11	1000	FIXED0	
13	B12	1000	FIXED0	
14	B13	1000	FIXED0	
15	B14	1000	FIXED0	
16	SIGN	1000	FIXED0	
C1571	RESULT	Disp	0 {1 hex} 65536	**CONVDA1**
[C1573]			→ Selection list 2	**CONVDA2** Configuration - digital input signals
1	B0	1000	FIXED0	
2	B1	1000	FIXED0	
3	B2	1000	FIXED0	
4	B3	1000	FIXED0	
5	B4	1000	FIXED0	
6	B5	1000	FIXED0	
7	B6	1000	FIXED0	
8	B7	1000	FIXED0	
9	B8	1000	FIXED0	
10	B9	1000	FIXED0	
11	B10	1000	FIXED0	
12	B11	1000	FIXED0	
13	B12	1000	FIXED0	
14	B13	1000	FIXED0	
15	B14	1000	FIXED0	
16	SIGN	1000	FIXED0	
C1574	RESULT	Disp	0 {1 hex} 65536	**CONVDA2**

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
[C1576]			→ Selection list 2	**CONVDA3** Configuration - digital input signals
1	B0	1000	FIXED0	
2	B1	1000	FIXED0	
3	B2	1000	FIXED0	
4	B3	1000	FIXED0	
5	B4	1000	FIXED0	
6	B5	1000	FIXED0	
7	B6	1000	FIXED0	
8	B7	1000	FIXED0	
9	B8	1000	FIXED0	
10	B9	1000	FIXED0	
11	B10	1000	FIXED0	
12	B11	1000	FIXED0	
13	B12	1000	FIXED0	
14	B13	1000	FIXED0	
15	B14	1000	FIXED0	
16	SIGN	1000	FIXED0	
C1577	RESULT	Disp	0 {1 hex} 65536	**CONVDA3**
[C1580]	CONVAD1-IN	1000	FIXED0% → Selection list 1	**CONVAD1** Input signal configuration
C1581	(C1580)	Disp	-32768 {1} 32767	
[C1582]	CONVAD2-IN	1000	FIXED0% → Selection list 1	**CONVAD2** Input signal configuration
C1583	(C1582)	Disp	-32768 {1} 32767	
C1590	NUMERATOR	1	-32768 {1} 32767	**CONVAPH1** Numerator
C1591	DENUMERATOR	1	1 {1} 32767	**CONVAPH1** Denominator
C1593	CONVPH1-IN	1000	FIXED0% → Selection list 1	**CONVAPH1** Input signal configuration
C1594	(C01593)			
C1610	DIVISION	1	0 {1} 31	**CONVPHA2** Divisor in the power-of-two-format (2^{C0995})
[C1611]	IN	1000	FIXED0INC → Selection list 3	**CONVPHA2** Input signal configuration
C1612	(C1611)	Disp	-2147483647 {1} 2147483647	
C1615	DIVISION	1	0 {1} 31	**CONVPHA3** Divisor in the power-of-two-format (2^{C0995})
[C1616]	IN	1000	FIXED0INC → Selection list 3	**CONVPHA3** Input signal configuration
C1617	(C1616)	Disp	-2147483647 {1} 2147483647	
[C1640]	RESET	1000	FIXED0 → Selection list 2	**SP1**

Configuration

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C1641			FCODE1476/x FCODE1477/x FCODE0474/x VTPOSC-No.x	**SP1**
1	SP1-VALUE 1-1	1		Switching point output STATUS-01
2	SP1-VALUE 1-2	1		Switching point output STATUS-01
3	SP1-VALUE 2-1	1		Switching point output STATUS-02
4	SP1-VALUE 2-2	1		Switching point output STATUS-02
5	SP1-VALUE 3-1	1		Switching point output STATUS-03
6	SP1-VALUE 3-2	1		Switching point output STATUS-03
7	SP1-VALUE 4-1	1		Switching point output STATUS-04
8	SP1-VALUE 4-2	1		Switching point output STATUS-04
9	SP1-VALUE 5-1	1		Switching point output STATUS-05
10	SP1-VALUE 5-2	1		Switching point output STATUS-05
11	SP1-VALUE 6-1	1		Switching point output STATUS-06
12	SP1-VALUE 6-2	1		Switching point output STATUS-06
13	SP1-VALUE 7-1	1		Switching point output STATUS-07
14	SP1-VALUE 7-2	1		Switching point output STATUS-07
15	SP1-VALUE 8-1	1		Switching point output STATUS-08
16	SP1-VALUE 8-2	1		Switching point output STATUS-08
[C1642]	SP1-L-IN	1000	FIXED0INC →Selection list 3	**SP1**
C1643	(C1640)	Disp	0 … 1	
C1644	(C1642)	Disp	-1073741824 {1 inc} 1073741823	
C1645	MODE	0	0 on / off 1 centre/range	**SP1** Mode
[C1650]	SP2-RESET	1000	FIXED0 → Selection list 2	**SP2**
C1651			FCODE1476/1	**SP2**
1	SP2-VALUE 1-1	1		Switching point output STATUS-01
2	SP2-VALUE 1-2	1		Switching point output STATUS-01
3	SP2-VALUE 2-1	1		Switching point output STATUS-02
4	SP2-VALUE 2-2	1		Switching point output STATUS-02
5	SP2-VALUE 3-1	1		Switching point output STATUS-03
6	SP2-VALUE 3-2	1		Switching point output STATUS-03
7	SP2-VALUE 4-1	1		Switching point output STATUS-04
8	SP2-VALUE 4-2	1		Switching point output STATUS-04
9	SP2-VALUE 5-1	1		Switching point output STATUS-05
10	SP2-VALUE 5-2	1		Switching point output STATUS-05
11	SP2-VALUE 6-1	1		Switching point output STATUS-06
12	SP2-VALUE 6-2	1		Switching point output STATUS-06
13	SP2-VALUE 7-1	1		Switching point output STATUS-07
14	SP2-VALUE 7-2	1		Switching point output STATUS-07
15	SP2-VALUE 8-1	1		Switching point output STATUS-08
16	SP2-VALUE 8-2	1		Switching point output STATUS-08
[C1652]	SP2-L-IN	1000	FIXED0INC → Selection list 3	**SPC**
C1653	(C1650)	Disp	0 … 1	
C1654	(C1652)	Disp	-1073741824 {1 inc} 1073741823	
C1655	MODE	0	0 on / off 1 centre/range	**SP2** Mode
C1657			-30000 {1 ms} 30000	**SP2** Dead time
1	DEAD TIME	0		
...	...	0		
4	DEAD TIME	0		
C1658	HYSTERESIS	0	-32767 {1 inc} 32767	**SP2** Hysteresis

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C1659	FILTER	1	0 Filter off 1 Filter 1 ms 2 Filter 2 ms 4 Filter 4 ms 8 Filter 8 ms 16 Filter 16 ms	**SP2** Filters
C1660	ACT.SEL.	Disp	0 {1} 8	**SELPH1** Display of the actual selection
[C1661]	SELPH1-SELECT	1000	FIXED0% → Selection list 1	**SELPH1**
[C1662]			→ Selection list 3	**SELPH1** Input signal configuration
1	SELPH1-IN1	1000	FIXED0INC	
...	...	1000	FIXED0INC	
8	SELPH1-IN8	1000	FIXED0INC	
C1663	(C1661)	Disp	-32768 {1} 32767	
C1664	(C1662)	Disp	-2147483648 {1 inc} 147483647	
C1665	ACT.SEL.	Disp	0 {1} 88	**SELPH1** Display of the actual selection
[C1666]	SELPH2-SELECT	1000	FIXED0% → Selection list 1	**SELPH2**
[C1667]			→ Selection list 3	**SELPH2** Input signal configuration
1	SELPH1-IN1	1000	FIXED0INC	
...	...	1000	FIXED0INC	
8	SELPH1-IN8	1000	FIXED0INC	
C1668	(C1666)	Disp	-32768 {1} 32767	
C1669	(C1667)	Disp	-2147483648 {1 inc} 2147483647	
C1670	FUNCTION	1	1 IN1 = IN2 2 IN1 > IN2 3 IN1 < IN2 4 |IN1| = |IN2| 5 |IN1| > |IN2| 6 |IN1| < |IN2|	**CMPPH1** Function selection
C1671	HYSTERESIS	50	0 {1 inc} 1073741824	**CMPPH1** Hysteresis
C1672	WINDOW	0	0 {1 inc} 1073741824	**CMPPH1** Window
[C1673]			→ Selection list 3	**CMPPH1** Input signal configuration
1	IN	1000	FIXED0INC	
2	IN	1000	FIXED0INC	
C1674		Disp	-2147483647 {1 inc} 2147483647	**CMPPH1**
1	IN			
2	IN			
C1675	FUNCTION	1	1 IN1 = IN2 2 IN1 > IN2 3 IN1 < IN2 4 |IN1| = |IN2| 5 |IN1| > |IN2| 6 |IN1| < |IN2|	**CMPPH2** Function selection
C1676	HYSTERESIS	50	0 {1 inc} 1073741824	**CMPPH2** Hysteresis
C1677	WINDOW	0	0 {1 inc} 1073741824	**CMPPH2** Window
[C1678]			→ Selection list 3	**CMPPH2** Input signal configuration
1	IN	1000	FIXED0INC	
2	IN	1000	FIXED0INC	
C1679		Disp	-2147483647 {1 inc} 2147483647	**CMPPH2**
1	IN			
2	IN			

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C1680	FUNCTION	1	1 IN1 = IN2 2 IN1 > IN2 3 IN1 < IN2 4 |IN1| = |IN2| 5 |IN1| > |IN2| 6 |IN1| < |IN2|	**CMPPH3** Function selection
C1681	HYSTERESIS	50	0 {1 inc} 1073741824	**CMPPH3** Hysteresis
C1682	WINDOW	0	0 {1 inc} 1073741824	**CMPPH3** Window
[C1683]			→ Selection list 3	**CMPPH3** Input signal configuration
1	IN	1000	FIXED0INC	
2	IN	1000	FIXED0INC	
C1684		Disp	-2147483647 {1 inc} 2147483647	**CMPPH3**
1	IN			
2	IN			
[C1690]			→ Selection list 1	**DISA** Configuration - analog input signals
1	IN	1000	FIXED0%	
...	...	...	...	
10	IN	1000	FIXED0%	
C1691		Disp	-199.99 {0.01 %} 199.99	**DISA**
1	IN (%)			
...	...			
10	IN (%)			
C1692		Disp	-32768 {1} 32768	**DISA**
1	IN (VAL)			
...	...			
10	IN (VAL)			
C1693		Disp	0 {1 hex} 65536	**DISA**
1	IN (HEX)			
...	...			
10	IN (HEX)			
[C1695]			→ Selection list 3	**DISPH** Input signal configuration
1	IN	1000	FIXED0INC	
...	...	...	FIXED0INC	
10	IN	1000	FIXED0INC	
C1696		Disp	-2147483647 {1 inc} 2147483647	**DISPH**
1	IN			
...	...			
10	IN			
C1700		Disp	-2147483647 {1} 2147483647	**BCD1**
1	OUTPUT SIGNAL			
2	BCD RESULT			
C1701	CODE	141	11 {1} 2000	**BCD1** Code
C1702	SUBCODE	0	0 {1} 255	**BCD1** Subcode
C1703	NUMERATOR	1	0 {1} 100000	**BCD1** Numerator
C1704	DENOMINATOR	0.0001	0.0001 {0.0001} 100000.0000	**BCD1** Denominator
C1705	OFFSET	0	0 {1} 1000000000	**BCD1** Offset
C1706	BCD MODE	0	0 no hand-shake 1 with hand-shake	**BCD1** Mode

Code		Possible settings				Important
No.	LCD	Lenze	Selection			
C1707	BCD DELAY	10	0	{1 ms}	255	**BCD1** Select deceleration
[C1708]					→ Selection list 2	**BCD1** Configuration - digital input signals
1	READ	1000	FIXED0			
2	DATA1	1000	FIXED0			
3	DATA2	1000	FIXED0			
4	DATA3	1000	FIXED0			
5	DATA4	1000	FIXED0			
6	LOAD	1000	FIXED0			
7	BUSY-IN	1000	FIXED0			
8	FAIL-IN	1000	FIXED0			
C1709		Disp	0		1	**BCD1**
1	READ					
2	DATA1					
3	DATA2					
4	DATA3					
5	DATA4					
6	LOAD					
7	BUSY-IN					
8	FAIL-IN					
C1710		Disp	-2147483647	{1}	2147483647	**BCD2**
1	OUTPUT SIGNAL					
2	BCD RESULT					
C1711	CODE	141	11	{1}	2000	**BCD2** Code
C1712	SUBCODE	0	0	{1}	255	**BCD2** Subcode
C1713	NUMERATOR	1	0	{1}	100000	**BCD2** Numerator
C1714	DENOMINATOR	0.0001	0.0001	{0.0001}	100000.0000	**BCD2** Denominator
C1715	OFFSET	0	0	{1}	1000000000	**BCD2** Offset
C1716	BCD MODE	0	0 1	no hand-shake with hand-shake		**BCD2** Mode
C1717	BCD DELAY	10	0	{1 ms}	255	**BCD2** Select deceleration
[C1718]					→ Selection list 2	**BCD2** Configuration - digital input signals
1	READ	1000	FIXED0			
2	DATA1	1000	FIXED0			
3	DATA2	1000	FIXED0			
4	DATA3	1000	FIXED0			
5	DATA4	1000	FIXED0			
6	LOAD	1000	FIXED0			
7	BUSY-IN	1000	FIXED0			
8	FAIL-IN	1000	FIXED0			
C1719		Disp	0		1	**BCD2**
1	READ					
2	DATA1					
3	DATA2					
4	DATA3					
5	DATA4					
6	LOAD					
7	BUSY-IN					
8	FAIL-IN					

Configuration

Code		Possible settings		Important
No.	LCD	Lenze	Selection	
C1720		Disp	-2147483647 {1} 2147483647	**BCD3**
1	OUTPUT SIGNAL			
2	BCD RESULT			
C1721	CODE	141	11 {1} 2000	**BCD3** Code
C1722	SUBCODE	0	0 {1} 255	**BCD3** Subcode
C1723	NUMERATOR	1	0 {1} 100000	**BCD3** Numerator
C1724	DENOMINATOR	0.0001	0.0001 {0.0001} 100000.0000	**BCD3** Denominator
C1725	OFFSET	0	0 {1} 1000000000	**BCD3** Offset
C1726	BCD MODE	0	0 no hand-shake 1 with hand-shake	**BCD3** Mode
C1727	BCD DELAY	10	0 {1 ms} 255	**BCD3** Select deceleration
[C1728]			→ Selection list 2	**BCD3** Configuration - digital input signals
1	READ	1000	FIXED0	
2	DATA1	1000	FIXED0	
3	DATA2	1000	FIXED0	
4	DATA3	1000	FIXED0	
5	DATA4	1000	FIXED0	
6	LOAD	1000	FIXED0	
7	BUSY-IN	1000	FIXED0	
8	FAIL-IN	1000	FIXED0	
C1729		Disp	0 1	**BCD3**
1	READ			
2	DATA1			
3	DATA2			
4	DATA3			
5	DATA4			
6	LOAD			
7	BUSY-IN			
8	FAIL-IN			
C1799	DFOUT F_{MAX} [KHZ]	1250	20 {1} 1250	**DFOUT f_{max} (kHz)**

7.9 Selection lists

7.9.1 Selection list - signal links

List 1: Analog signal sources

000050 AIN1-OUT
000055:AIN2-OUT
000100:DFSET-NOUT
001000:FIXED0%
001006:FIXED100%
001007:FIXED-100%
005000:MCTRL-NSET2
005001:MCTRL-NACT
005002:MCTRL-MSET2
005003:MCTRL-MACT
005004:MCTRL-IACT
005005:MCTRL-DCVOLT
005009:MCTRL-PHI-ANA
005050:NSET-NOUT
005051:NSET-RFG-I
005100:MPOT1-OUT
005550:ADD1-OUT
005600:RFG1-OUT
005650:ASW1-OUT
005655:ASW2-OUT
005700:ANEG1-OUT
005705:ANEG2-OUT
006200:CONV1-OUT
006205:CONV2-OUT
006210:CONV3-OUT
006215:CONV4-OUT
006230:CONVPHA1-OUT
006232:CONVPHA2-OUT
006234:CONVPHA3-OUT
006300:S&H1-OUT
006350:CURVE1-OUT
006400:FCNT1-OUT
006405:FCNT2-OUT
006410:FCNT3-OUT
006550:TEACH1-CNT
006600:SYNC1-OUT3
007200:CONVDA1-OUT
007205:CONVDA2-OUT
007210:CONVDA3-OUT
010000:BRK1-M-SET
011200:RFGX1-OUT
011201:RFGX1-VSOUT
011300:SELA1-OUT1
011301:SELA1-OUT2
011302:SELA1-SELECT
015028:Utilisation
019500:FCODE-17
019502:FCODE-26/1
019503:FCODE-26/2
019504:FCODE-27/1
019505:FCODE-27/2
019506:FCODE-32
019507:FCODE-37
019510:FCODE-108/1
019511:FCODE-108/2
019512:FCODE-109/1
019513:FCODE-109/2
019515:FCODE-141
019517:FCODE-1211
019521:FCODE-472/1
019522:FCODE-472/2
019523:FCODE-472/3
019524:FCODE-472/4
019525:FCODE-472/5
019526:FCODE-472/6
019527:FCODE-472/7
019528:FCODE-472/8
019529:FCODE-472/9
019530:FCODE-472/10
019531:FCODE-472/11
019532:FCODE-472/12
019533:FCODE-472/13
019534:FCODE-472/14
019535:FCODE-472/15
019536:FCODE-472/16
019537:FCODE-472/17
019538:FCODE-472/18
019539:FCODE-472/19
019540:FCODE-472/20
019551:FCODE-473/1
019552:FCODE-473/2
019553:FCODE-473/3
019554:FCODE-473/4
019555:FCODE-473/5
019556:FCODE-473/6
019557:FCODE-473/7
019558:FCODE-473/8
019559:FCODE-473/9
019560:FCODE-473/10
020101:CAN-IN1.W1
020102:CAN-IN1.W2
020103:CAN-IN1.W3
020201:CAN-IN2.W1
020202:CAN-IN2.W2
020203:CAN-IN2.W3
020204:CAN-IN2.W4
020301:CAN-IN3.W1
020302:CAN-IN3.W2
020303:CAN-IN3.W3
020304:CAN-IN3.W4
025101:AIF-IN.W1
025102:AIF-IN.W2
025103:AIF-IN.W3
030000:POS-ACT-PS-NO
030010:POS-NSET
030020:POS-NOUT
030021:POS-MOUT
030030:POS-POUT-NORM
031301:VTTIME-OUT1
031302:VTTIME-OUT2
031303:VTTIME-OUT3
031304:VTTIME-OUT4
031351:VTPCS-OUT1
031352:VTPCS-OUT2
031353:VTPCS-OUT3
031354:VTPCS-OUT4

Configuration

List 2: Digital signal sources

000051:DIGIN1
000052:DIGIN2
000053:DIGIN3
000054:DIGIN4
000055:DIGIN5
000060:STATE-BUS-O
000065:DIGIN-CINH
000100:DFSET-ACK
000500:DCTRL-RDY
000501:DCTRL-CINH
000502:DCTRL-INIT
000503:DCTRL-IMP
000504:DCTRL-NACT=0
000505:DCTRL-CW/CCW
001000:FIXED0
001001:FIXED1
005001:MCTRL-QSP-OUT
005002:MCTRL-IMAX
005003:MCTRL-MMAX
005050:NSET-RFG-I=0
006000:DFRFG1-FAIL
006001:DFRFG1-SYNC
006400:FCNT1-EQUAL
006405:FCNT2-EQUAL
006410:FCNT3-EQUAL
006450:SP1-STATUS-01
006451:SP1-STATUS-02
006452:SP1-STATUS-03
006453:SP1-STATUS-04
006454:SP1-STATUS-05
006455:SP1-STATUS-06
006456:SP1-STATUS-07
006457:SP1-STATUS-08
006460:SP2-STATUS-01
006461:SP2-STATUS-02
006462:SP2-STATUS-03
006463:SP2-STATUS-04
006464:SP2-STATUS-05
006465:SP2-STATUS-06
006466:SP2-STATUS-07
006467:SP2-STATUS-08
006600:SYNC1-STAT
007150:CONVAD1-0
007151:CONVAD1-1
007152:CONVAD1-2
007153:CONVAD1-3
007154:CONVAD1-4
007155:CONVAD1-5
007156:CONVAD1-6
007157:CONVAD1-7
007158:CONVAD1-8
007159:CONVAD1-9
007160:CONVAD1-10
007161:CONVAD1-11
007162:CONVAD1-12
007163:CONVAD1-13
007164:CONVAD1-14
007165:CONVAD1-SIGN
007170:CONVAD2-0
007171:CONVAD2-1
007172:CONVAD2-2
007173:CONVAD2-3
007174:CONVAD2-4
007175:CONVAD2-5
007176:CONVAD2-6
007177:CONVAD2-7
007178:CONVAD2-8
007179:CONVAD2-9
007180:CONVAD2-10
007181:CONVAD2-11
007182:CONVAD2-12
007183:CONVAD2-13
007184:CONVAD2-14
007185:CONVAD2-SIGN
010000:BRK1-OUT
010001:BRK1-CINH
010002:BRK1-QSP
010003:BRK1-M-STORE
010250:R/L/Q-QSP
010251:R/L/Q-R/L
010500:AND1-OUT
010505:AND2-OUT
010510:AND3-OUT
010515:AND4-OUT
010520:AND5-OUT
010550:OR1-OUT
010555:OR2-OUT
010560:OR3-OUT
010565:OR4-OUT
010570:OR5-OUT
010600:NOT1-OUT
010605:NOT2-OUT
010610:NOT3-OUT
010615:NOT4-OUT
010620:NOT5-OUT
010650:CMP1-OUT
010655:CMP2-OUT
010700:DIGDEL1-OUT
010705:DIGDEL2-OUT
010750:TRANS1-OUT
010755:TRANS2-OUT
010900:FLIP1-OUT
010905:FLIP2-OUT
011000:CMPPH1-OUT
011005:CMPPH2-OUT
011010:CMPPH3-OUT
012000:PHINT1-FAIL
013000:FEVAN1-BUSY
013001:FEVAN1-FAIL
013005:FEVAN2-BUSY
013006:FEVAN2-FAIL
013010:FEVAN3-BUSY
013011:FEVAN3-FAIL
013015:FEVAN4-BUSY
013016:FEVAN4-FAIL
013020:FEVAN5-BUSY
013021:FEVAN5-FAIL
013025:FEVAN6-BUSY
013026:FEVAN6-FAIL
013050:BCD1-SEL1
013051:BCD1-SEL2
013052:BCD1-SEL3
013053:BCD1-SEL4
013054:BCD1-SEL5
013055:BCD1-SEL6
013056:BCD1-SEL7
013057:BCD1-SEL8
013058:BCD1-SIGN
013059:BCD1-NEW-DATA
013060:BCD1-EOT
013061:BCD1-DATA-FLT
013062:BCD1-BUSY
013063:BCD1-FAIL
013065:BCD2-SEL1
013066:BCD2-SEL2
013067:BCD2-SEL3
013068:BCD2-SEL4
013069:BCD2-SEL5
013070:BCD2-SEL6
013071:BCD2-SEL7
013072:BCD2-SEL8
013073:BCD2-SIGN
013074:BCD2-NEW-DATA
013075:BCD2-EOT
013076:BCD2-DATA-FLT
013077:BCD2-BUSY
013078:BCD2-FAIL
013080:BCD3-SEL1
013081:BCD3-SEL2
013082:BCD3-SEL3
013083:BCD3-SEL4
013084:BCD3-SEL5
013085:BCD3-SEL6
013086:BCD3-SEL7
013087:BCD3-SEL8
013088:BCD3-SIGN
013089:BCD3-NEW-DATA
013090:BCD3-EOT
013091:BCD3-DATA-FLT
013092:BCD3-BUSY
013093:BCD3-FAIL
015000:DCTRL-TRIP
015001:DCTRL-MESS
015002:DCTRL-WARN
015003:DCTRL-FAIL
015004:DCTRL-FAILQSP
015010:MONIT-LU
015011:MONIT-OU
015012:MONIT-EEr
015013:MONIT-OC1
015014:MONIT-OC2
015015:MONIT-LP1
015016:MONIT-OH
015017:MONIT-OH3
015018:MONIT-OH4
015019:MONIT-OH7
015020:MONIT-OH8
015021:MONIT-Sd2
015022:MONIT-Sd3
015023:MONIT-P03
015024:MONIT-P13
015026:MONIT-CE0
015027:MONIT-NMAX
015028:MONIT-OC5
015029:MONIT-SD5
015030:MONIT-SD6
015031:MONIT-SD7
015032:MONIT-H07
015033:MONIT-H10
015034:MONIT-H11
015040:MONIT-CE1
015041:MONIT-CE2
015042:MONIT-CE3
015043:MONIT-CE4
015301:MONIT-P01
015302:MONIT-P02
015304:MONIT-P04
015305:MONIT-P05
015306:MONIT-P06
015307:MONIT-P07
015308:MONIT-P08
015309:MONIT-P09
015312:MONIT-P12
015314:MONIT-P14
015315:MONIT-P15
015316:MONIT-P16
015317:MONIT-P17
015318:MONIT-P18
019500:FCODE-250
019521:FCODE-471.B0
019522:FCODE-471.B1
019523:FCODE-471.B2
019524:FCODE-471.B3
019525:FCODE-471.B4
019526:FCODE-471.B5
019527:FCODE-471.B6
019528:FCODE-471.B7
019529:FCODE-471.B8
019530:FCODE-471.B9
019531:FCODE-471.B10
019532:FCODE-471.B11
019533:FCODE-471.B12
019534:FCODE-471.B13
019535:FCODE-471.B14
019536:FCODE-471.B15
019537:FCODE-471.B16
019538:FCODE-471.B17
019539:FCODE-471.B18
019540:FCODE-471.B19
019541:FCODE-471.B20
019542:FCODE-471.B21
019543:FCODE-471.B22
019544:FCODE-471.B23
019545:FCODE-471.B24
019546:FCODE-471.B25
019547:FCODE-471.B26
019548:FCODE-471.B27
019549:FCODE-471.B28
019550:FCODE-471.B29
019551:FCODE-471.B30
019552:FCODE-471.B31
019751:FCODE-135.B0
019752:FCODE-135.B1
019753:FCODE-135.B2
019755:FCODE-135.B4
019756:FCODE-135.B5
019757:FCODE-135.B6
019758:FCODE-135.B7
019763:FCODE-135.B12

List 2 (continuation):

019764:FCODE-135.B13
019765:FCODE-135.B14
019766:FCODE-135.B15
020001:CAN-CTRL.B0
020002:CAN-CTRL.B1
020003:CAN-CTRL.B2
020005:CAN-CTRL.B4
020006:CAN-CTRL.B5
020007:CAN-CTRL.B6
020008:CAN-CTRL.B7
020013:CAN-CTRL.B12
020014:CAN-CTRL.B13
020015:CAN-CTRL.B14
020016:CAN-CTRL.B15
020101:CAN-IN1.B0
020102:CAN-IN1.B1
020103:CAN-IN1.B2
020104:CAN-IN1.B3
020105:CAN-IN1.B4
020106:CAN-IN1.B5
020107:CAN-IN1.B6
020108:CAN-IN1.B7
020109:CAN-IN1.B8
020110:CAN-IN1.B9
020111:CAN-IN1.B10
020112:CAN-IN1.B11
020113:CAN-IN1.B12
020114:CAN-IN1.B13
020115:CAN-IN1.B14
020116:CAN-IN1.B15
020117:CAN-IN1.B16
020118:CAN-IN1.B17
020119:CAN-IN1.B18
020120:CAN-IN1.B19
020121:CAN-IN1.B20
020122:CAN-IN1.B21
020123:CAN-IN1.B22
020124:CAN-IN1.B23
020125:CAN-IN1.B24
020126:CAN-IN1.B25
020127:CAN-IN1.B26
020128:CAN-IN1.B27
020129:CAN-IN1.B28
020130:CAN-IN1.B29
020131:CAN-IN1.B30
020132:CAN-IN1.B31
020201:CAN-IN2.B0
020202:CAN-IN2.B1
020203:CAN-IN2.B2
020204:CAN-IN2.B3
020205:CAN-IN2.B4
020206:CAN-IN2.B5
020207:CAN-IN2.B6
020208:CAN-IN2.B7
020209:CAN-IN2.B8
020210:CAN-IN2.B9
020211:CAN-IN2.B10
020212:CAN-IN2.B11
020213:CAN-IN2.B12
020214:CAN-IN2.B13
020215:CAN-IN2.B14
020216:CAN-IN2.B15
020217:CAN-IN2.B16
020218:CAN-IN2.B17
020219:CAN-IN2.B18
020220:CAN-IN2.B19
020221:CAN-IN2.B20
020222:CAN-IN2.B21
020223:CAN-IN2.B22
020224:CAN-IN2.B23
020225:CAN-IN2.B24
020226:CAN-IN2.B25
020227:CAN-IN2.B26
020228:CAN-IN2.B27
020229:CAN-IN2.B28
020230:CAN-IN2.B29
020231:CAN-IN2.B30
020232:CAN-IN2.B31
020301:CAN-IN3.B0
020302:CAN-IN3.B1
020303:CAN-IN3.B2
020304:CAN-IN3.B3
020305:CAN-IN3.B4
020306:CAN-IN3.B5
020307:CAN-IN3.B6
020308:CAN-IN3.B7
020309:CAN-IN3.B8
020310:CAN-IN3.B9
020311:CAN-IN3.B10
020312:CAN-IN3.B11
020313:CAN-IN3.B12
020314:CAN-IN3.B13
020315:CAN-IN3.B14
020316:CAN-IN3.B15
020317:CAN-IN3.B16
020318:CAN-IN3.B17
020319:CAN-IN3.B18
020320:CAN-IN3.B19
020321:CAN-IN3.B20
020322:CAN-IN3.B21
020323:CAN-IN3.B22
020324:CAN-IN3.B23
020325:CAN-IN3.B24
020326:CAN-IN3.B25
020327:CAN-IN3.B26
020328:CAN-IN3.B27
020329:CAN-IN3.B28
020330:CAN-IN3.B29
020331:CAN-IN3.B30
020332:CAN-IN3.B31
025001:AIF-CTRL.B0
025002:AIF-CTRL.B1
025003:AIF-CTRL.B2
025005:AIF-CTRL.B4
025006:AIF-CTRL.B5
025007:AIF-CTRL.B6
025008:AIF-CTRL.B7
025013:AIF-CTRL.B12
025014:AIF-CTRL.B13
025015:AIF-CTRL.B14
025016:AIF-CTRL.B15
025101:AIF-IN.B0
025102:AIF-IN.B1
025103:AIF-IN.B2
025104:AIF-IN.B3
025105:AIF-IN.B4
025106:AIF-IN.B5
025107:AIF-IN.B6
025108:AIF-IN.B7
025109:AIF-IN.B8
025110:AIF-IN.B9
025111:AIF-IN.B10
025112:AIF-IN.B11
025113:AIF-IN.B12
025114:AIF-IN.B13
025115:AIF-IN.B14
025116:AIF-IN.B15
025117:AIF-IN.B16
025118:AIF-IN.B17
025119:AIF-IN.B18
025120:AIF-IN.B19
025121:AIF-IN.B20
025122:AIF-IN.B21
025123:AIF-IN.B22
025124:AIF-IN.B23
025125:AIF-IN.B24
025126:AIF-IN.B25
025127:AIF-IN.B26
025128:AIF-IN.B27
025129:AIF-IN.B28
025130:AIF-IN.B29
025131:AIF-IN.B30
025132:AIF-IN.B31
030000:POS-STARTED
030001:POS-STOPED
030002:POS-ENDED
030003:POS-RESETED
030010:POS-STDBY-ACT
030011:POS-MANU-ACT
030012:POS-REF-OK
030013:POS-IN-TARGET
030014:POS-VTRAV-REA
030015:POS-VFIN-REAC
030016:POS-ACC-RAMP
030017:POS-DCC-RAMP
030101:POS-PF01
030102:POS-PF02
030103:POS-PF03
030104:POS-PF04
030105:POS-PF05
030106:POS-PF06
030107:POS-PF07
030108:POS-PF08
030109:POS-PF09
030110:POS-PF010
030111:POS-PF011
030112:POS-PF012
030113:POS-PF013
030114:POS-PF014
030115:POS-PF015
030116:POS-PF016
030117:POS-PF017
030118:POS-PF018
030119:POS-PF019
030120:POS-PF020
030121:POS-PF021
030122:POS-PF022
030123:POS-PF023
030124:POS-PF024
030125:POS-PF025
030126:POS-PF026
030127:POS-PF027
030128:POS-PF028
030129:POS-PF029
030130:POS-PF030
030131:POS-PF031
030132:POS-PF032
030200:POS-TP1-EN
030201:POS-TP1-RECOG
030202:POS-TP2-EN
030203:POS-TP2-RECOG
030204:POS-TP3-EN
030205:POS-TP3-RECOG
030206:POS-TP4-EN
030207:POS-TP4-RECOG

List 3: Phase signal sources

031080:VTPOS-OUT80
031081:VTPOS-OUT81
031082:VTPOS-OUT82
031083:VTPOS-OUT83
031084:VTPOS-OUT84
031085:VTPOS-OUT85
031086:VTPOS-OUT86
031087:VTPOS-OUT87
031088:VTPOS-OUT88
031089:VTPOS-OUT89
031090:VTPOS-OUT90
031091:VTPOS-OUT91
031092:VTPOS-OUT92
031093:VTPOS-OUT93
031094:VTPOS-OUT94
031095:VTPOS-OUT95
031096:VTPOS-OUT96
031097:VTPOS-OUT97
031098:VTPOS-OUT98
031099:VTPOS-OUT99
031100:VTPOS-OUT100
031101:VTPOS-OUT101
031102:VTPOS-OUT102
031103:VTPOS-OUT103
031104:VTPOS-OUT104
031201:VTVEL-OUT1
031202:VTVEL-OUT2
031203:VTVEL-OUT3
031204:VTVEL-OUT4
031251:VTACC-OUT1
031252:VTACC-OUT2
031253:VTACC-OUT3
031254:VTACC-OUT4

List 4: Phase difference signal sources

000050:DFIN-OUT
000100:DFSET-POUT
000250:DFOUT-OUT
001000:FIXEDPHI-0
005000:MCTRL-PHI-ACT
006000:DFRFG1-OUT
006220:CONV5-OUT
006600:SYNC1-OUT1
019521:FCODE-475/1
019522:FCODE-475/2
030000:POS-PHI-SET

List 5: Function blocks (see processing list)

000000:empty
000050:AIN1
000055:AIN2
000070:AOUT1
000075:AOUT2
000100:DFSET
000200:DFIN
000250:DFOUT
005050:NSET
005100:MPOT1
005520:ARITPH1
005525:ARITPH2
005530:ARITPH3
005535:ARITPH4
005540:ARITPH5
005545:ARITPH6
005550:ADD1
005600:RFG1
005650:ASW1
005655:ASW2
005700:ANEG1
005705:ANEG2
005775:SELPH1
005780:SELPH2
006000:DFRFG1
006200:CONV1
006205:CONV2
006210:CONV3
006215:CONV4
006220:CONV5
006230:CONVPHA1
006232:CONVPHA2
006234:CONVPHA3
006237:CONVPHPH2
006300:S&H1
006350:CURVE1
006400:FCNT1
006405:FCNT2
006410:FCNT3
006450:SP1
006460:SP2
006550:TEACH1
006600:SYNC1
007050:CONVAPH1
007055:CONVAPH2
007060:CONVAPH3
007150:CONVAD1
007170:CONVAD2
007200:CONVDA1
007205:CONVDA2
007210:CONVDA3
008000:DISA
008050:DISPH
010000:BRK1
010250:R/L/Q
010500:AND1
010505:AND2
010510:AND3
010515:AND4
010520:AND5
010550:OR1
010555:OR2
010560:OR3
010565:OR4
010570:OR5
010600:NOT1
010605:NOT2
010610:NOT3
010615:NOT4
010620:NOT5
010650:CMP1
010655:CMP2
010700:DIGDEL1
010705:DIGDEL2
010750:TRANS1
010755:TRANS2
010900:FLIP1
010905:FLIP2
011000:CMPPH1
011005:CMPPH2
011010:CMPPH3
012000:PHINT1
012050:PHDIV1
013000:FEVAN1
013005:FEVAN2
013010:FEVAN3
013015:FEVAN4
013020:FEVAN5
013025:FEVAN6
013050:BCD1
013065:BCD2
013080:BCD3
015100:MLP1
020000:CAN-OUT
025000:AIF-OUT
030000:POS
030050:POS-SRAMPS
031000:VTPOS
031200:VTVEL
031250:VTACC
031300:VTTIME
031350:VTPCS

List 10: Faults

000000:No fail
000011:OC1 trip
000012:OC2 trip
000015:OC5 trip
000022:LUQ trip
000032:LP1 trip
000050:OH trip
000053:OH3 trip
000057:OH7 trip
000058:OH8 trip
000061:CE0 trip
000062:CE1 trip
000063:CE2 trip
000064:CE3 trip
000065:CE4 trip
000070:U15 trip
000071:CCr trip
000072:Pr1 trip
000073:Pr2 trip
000074:PEr trip
000075:Pr0 trip
000077:Pr3 trip
000078:Pr4 trip
000079:PI trip
000082:Sd2 trip
000083:Sd3 trip
000085:Sd5 trip
000086:Sd6 trip
000087:Sd7 trip
000091:EEr trip
000105:H05 trip
000107:H07 trip
000110:H10 trip
000111:H11 trip
000151:P01 trip
000152:P02 trip
000153:P03 trip
000154:P04 trip
000155:P05 trip
000156:P06 trip
000157:P07 trip
000158:P08 trip
000159:P09 trip
000162:P12 trip
000163:P13 trip
000164:P14 trip
000165:P15 trip
000166:P16 trip
000167:P17 trip
000168:P18 trip
000200:NMAX trip
001030:LU message
001091:EEr message
002032:LP1 warning
002054:OH4 warning
002057:OH7 warning
002058:OH8 warning
002061:CE0 warning
002062:CE1 warning
002063:CE2 warning
002064:CE3 warning
002065:CE4 warning
002082:Sd2 warning
002083:Sd3 warning
002085:Sd5 warning
002086:Sd6 warning
002091:EER warning
002153:P03 warning
002163:P13 warning
002164:P14 warning
002165:P15 warning
002166:P16 warning
002167:P17 warning
002168:P18 warning
003091:EEr QSP
003151:P01 QSP
003152:P02 QSP
003154:P04 QSP
003155:P05 QSP
003156:P06 QSP
003157:P07 QSP
003158:P08 QSP
003159:P09 QSP
003162:P12 QSP
003163:P13 QSP
003164:P14 QSP
003165:P15 QSP
003166:P16 QSP
003167:P17 QSP
003168:P18 QSP

List 11:

000000:Real Zero
000001:VTPOS-No 001
000002:VTPOS-No 002
000003:VTPOS-No 003
000004:VTPOS-No 004
000005:VTPOS-No 005
000006:VTPOS-No 006
000007:VTPOS-No 007
000008:VTPOS-No 008
000009:VTPOS-No 009
000010:VTPOS-No 010
000011:VTPOS-No 011
000012:VTPOS-No 012
000013:VTPOS-No 013
000014:VTPOS-No 014
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000081:VTPOS-No 081
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000090:VTPOS-No 090
000091:VTPOS-No 091
000092:VTPOS-No 092
000093:VTPOS-No 093
000094:VTPOS-No 094
000095:VTPOS-No 095
000096:VTPOS-No 096
000097:VTPOS-No 097
000098:VTPOS-No 098
000099:VTPOS-No 099
000100:VTPOS-No 100
000101:VTPOS-No 101
000102:VTPOS-No 102
000103:VTPOS-No 103
000104:VTPOS-No 104

List 12:

000000:Trav. Range
000001:VTPOS-No 001
000002:VTPOS-No 002
000003:VTPOS-No 003
000004:VTPOS-No 004
000005:VTPOS-No 005
000006:VTPOS-No 006
000007:VTPOS-No 007
000008:VTPOS-No 008
000009:VTPOS-No 009
000010:VTPOS-No 010
000011:VTPOS-No 011
000012:VTPOS-No 012
000013:VTPOS-No 013
000014:VTPOS-No 014
000015:VTPOS-No 015
000016:VTPOS-No 016
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000092:VTPOS-No 092
000093:VTPOS-No 093
000094:VTPOS-No 094
000095:VTPOS-No 095
000096:VTPOS-No 096
000097:VTPOS-No 097
000098:VTPOS-No 098
000099:VTPOS-No 099
000100:VTPOS-No 100
000101:VTPOS-No 101
000102:VTPOS-No 102
000103:VTPOS-No 103
000104:VTPOS-No 104

List 13:

000000:Target = TP
000001:VTPOS-No 001
000002:VTPOS-No 002
000003:VTPOS-No 003
000004:VTPOS-No 004
000005:VTPOS-No 005
000006:VTPOS-No 006
000007:VTPOS-No 007
000008:VTPOS-No 008
000009:VTPOS-No 009
000010:VTPOS-No 010
000011:VTPOS-No 011
000012:VTPOS-No 012
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000080:VTPOS-No 080
000081:VTPOS-No 081
000082:VTPOS-No 082
000083:VTPOS-No 083
000084:VTPOS-No 084
000085:VTPOS-No 085
000086:VTPOS-No 086
000087:VTPOS-No 087
000088:VTPOS-No 088
000089:VTPOS-No 089
000090:VTPOS-No 090
000091:VTPOS-No 091
000092:VTPOS-No 092
000093:VTPOS-No 093
000094:VTPOS-No 094
000095:VTPOS-No 095
000096:VTPOS-No 096
000097:VTPOS-No 097
000098:VTPOS-No 098
000099:VTPOS-No 099
000100:VTPOS-No 100
000101:VTPOS-No 101
000102:VTPOS-No 102
000103:VTPOS-No 103
000104:VTPOS-No 104

List 14:

000000:v-max
000001:VTVEL-No 01
000002:VTVEL-No 02
000003:VTVEL-No 03
000004:VTVEL-No 04
000005:VTVEL-No 05
000006:VTVEL-No 06
000007:VTVEL-No 07
000008:VTVEL-No 08
000009:VTVEL-No 09
000010:VTVEL-No 10
000011:VTVEL-No 11
000012:VTVEL-No 12
000013:VTVEL-No 13
000014:VTVEL-No 14
000015:VTVEL-No 15
000016:VTVEL-No 16
000017:VTVEL-No 17
000018:VTVEL-No 18
000019:VTVEL-No 19
000020:VTVEL-No 20
000021:VTVEL-No 21
000022:VTVEL-No 22
000023:VTVEL-No 23
000024:VTVEL-No 24
000025:VTVEL-No 25
000026:VTVEL-No 26
000027:VTVEL-No 27
000028:VTVEL-No 28
000029:VTVEL-No 29
000030:VTVEL-No 30
000031:VTVEL-No 31
000032:VTVEL-No 32
000033:VTVEL-No 33
000034:VTVEL-No 34

List 15:

000000:Standstill
000001:VTVEL-No 01
000002:VTVEL-No 02
000003:VTVEL-No 03
000004:VTVEL-No 04
000005:VTVEL-No 05
000006:VTVEL-No 06
000007:VTVEL-No 07
000008:VTVEL-No 08
000009:VTVEL-No 09
000010:VTVEL-No 10
000011:VTVEL-No 11
000012:VTVEL-No 12
000013:VTVEL-No 13
000014:VTVEL-No 14
000015:VTVEL-No 15
000016:VTVEL-No 16
000017:VTVEL-No 17
000018:VTVEL-No 18
000019:VTVEL-No 19
000020:VTVEL-No 20
000021:VTVEL-No 21
000022:VTVEL-No 22
000023:VTVEL-No 23
000024:VTVEL-No 24
000025:VTVEL-No 25
000026:VTVEL-No 26
000027:VTVEL-No 27
000028:VTVEL-No 28
000029:VTVEL-No 29
000030:VTVEL-No 30
000031:VTVEL-No 31
000032:VTVEL-No 32
000033:VTVEL-No 33
000034:VTVEL-No 34

List 16:

000000:a-max
000001:VTACC-No 01
000002:VTACC-No 02
000003:VTACC-No 03
000004:VTACC-No 04
000005:VTACC-No 05
000006:VTACC-No 06
000007:VTACC-No 07
000008:VTACC-No 08
000009:VTACC-No 09
000010:VTACC-No 10
000011:VTACC-No 11
000012:VTACC-No 12
000013:VTACC-No 13
000014:VTACC-No 14
000015:VTACC-No 15
000016:VTACC-No 16
000017:VTACC-No 17
000018:VTACC-No 18
000019:VTACC-No 19
000020:VTACC-No 20
000021:VTACC-No 21
000022:VTACC-No 22
000023:VTACC-No 23
000024:VTACC-No 24
000025:VTACC-No 25
000026:VTACC-No 26
000027:VTACC-No 27
000028:VTACC-No 28
000029:VTACC-No 29
000030:VTACC-No 30
000031:VTACC-No 31
000032:VTACC-No 32
000033:VTACC-No 33
000034:VTACC-No 34

List 17:

000000:inactive
000001:VTPCS-No 01
000002:VTPCS-No 02
000003:VTPCS-No 03
000004:VTPCS-No 04
000005:VTPCS-No 05
000006:VTPCS-No 06
000007:VTPCS-No 07
000008:VTPCS-No 08
000009:VTPCS-No 09
000010:VTPCS-No 10
000011:VTPCS-No 11
000012:VTPCS-No 12
000013:VTPCS-No 13
000014:VTPCS-No 14
000015:VTPCS-No 15
000016:VTPCS-No 16
000017:VTPCS-No 17
000018:VTPCS-No 18
000019:VTPCS-No 19
000020:VTPCS-No 20
000021:VTPCS-No 21
000022:VTPCS-No 22
000023:VTPCS-No 23
000024:VTPCS-No 24
000025:VTPCS-No 25
000026:VTPCS-No 26
000027:VTPCS-No 27
000028:VTPCS-No 28
000029:VTPCS-No 29
000030:VTPCS-No 30
000031:VTPCS-No 31
000032:VTPCS-No 32
000033:VTPCS-No 33
000034:VTPCS-No 34

List 18:

000000:inactive
000001:VTTIME-No 01
000002:VTTIME-No 02
000003:VTTIME-No 03
000004:VTTIME-No 04
000005:VTTIME-No 05
000006:VTTIME-No 06
000007:VTTIME-No 07
000008:VTTIME-No 08
000009:VTTIME-No 09
000010:VTTIME-No 10
000011:VTTIME-No 11
000012:VTTIME-No 12
000013:VTTIME-No 13
000014:VTTIME-No 14
000015:VTTIME-No 15
000016:VTTIME-No 16
000017:VTTIME-No 17
000018:VTTIME-No 18
000019:VTTIME-No 19
000020:VTTIME-No 20
000021:VTTIME-No 21
000022:VTTIME-No 22
000023:VTTIME-No 23
000024:VTTIME-No 24
000025:VTTIME-No 25
000026:VTTIME-No 26
000027:VTTIME-No 27
000028:VTTIME-No 28
000029:VTTIME-No 29
000030:VTTIME-No 30
000031:VTTIME-No 31
000032:VTTIME-No 32
000033:VTTIME-No 33
000034:VTTIME-No 34

List 19:

000000:Prg. end
000001:PS 01
000002:PS 02
000003:PS 03
000004:PS 04
000005:PS 05
000006:PS 06
000007:PS 07
000008:PS 08
000009:PS 09
000010:PS 10
000011:PS 11
000012:PS 12
000013:PS 13
000014:PS 14
000015:PS 15
000016:PS 16
000017:PS 17
000018:PS 18
000019:PS 19
000020:PS 20
000021:PS 21
000022:PS 22
000023:PS 23
000024:PS 24
000025:PS 25
000026:PS 26
000027:PS 27
000028:PS 28
000029:PS 29
000030:PS 30
000031:PS 31
000032:PS 32

List 20:

000000:inactive
000001:VTPOS-No 001
000002:VTPOS-No 002
000003:VTPOS-No 003
000004:VTPOS-No 004
000005:VTPOS-No 005
000006:VTPOS-No 006
000007:VTPOS-No 007
000008:VTPOS-No 008
000009:VTPOS-No 009
000010:VTPOS-No 010
000011:VTPOS-No 011
000012:VTPOS-No 012
000013:VTPOS-No 013
000014:VTPOS-No 014
000015:VTPOS-No 015
000016:VTPOS-No 016
000017:VTPOS-No 017
000018:VTPOS-No 018
000019:VTPOS-No 019
000020:VTPOS-No 020
000021:VTPOS-No 021
000022:VTPOS-No 022
000023:VTPOS-No 023
000024:VTPOS-No 024
000025:VTPOS-No 025
000026:VTPOS-No 026
000027:VTPOS-No 027
000028:VTPOS-No 028
000029:VTPOS-No 029
000030:VTPOS-No 030
000031:VTPOS-No 031
000032:VTPOS-No 032
000033:VTPOS-No 033
000034:VTPOS-No 034
000035:VTPOS-No 035
000036:VTPOS-No 036
000037:VTPOS-No 037
000038:VTPOS-No 038
000039:VTPOS-No 039
000040:VTPOS-No 040
000041:VTPOS-No 041
000042:VTPOS-No 042
000043:VTPOS-No 043
000044:VTPOS-No 044
000045:VTPOS-No 045
000046:VTPOS-No 046
000047:VTPOS-No 047
000048:VTPOS-No 048
000049:VTPOS-No 049
000050:VTPOS-No 050
000051:VTPOS-No 051
000052:VTPOS-No 052
000053:VTPOS-No 053
000054:VTPOS-No 054
000055:VTPOS-No 055
000056:VTPOS-No 056
000057:VTPOS-No 057
000058:VTPOS-No 058
000059:VTPOS-No 059
000060:VTPOS-No 060
000061:VTPOS-No 061
000062:VTPOS-No 062
000063:VTPOS-No 063
000064:VTPOS-No 064
000065:VTPOS-No 065
000066:VTPOS-No 066
000067:VTPOS-No 067
000068:VTPOS-No 068
000069:VTPOS-No 069
000070:VTPOS-No 070
000071:VTPOS-No 071
000072:VTPOS-No 072
000073:VTPOS-No 073
000074:VTPOS-No 074
000075:VTPOS-No 075
000076:VTPOS-No 076
000077:VTPOS-No 077
000078:VTPOS-No 078
000079:VTPOS-No 079
000080:VTPOS-No 080
000081:VTPOS-No 081
000082:VTPOS-No 082
000083:VTPOS-No 083
000084:VTPOS-No 084
000085:VTPOS-No 085
000086:VTPOS-No 086
000087:VTPOS-No 087
000088:VTPOS-No 088
000089:VTPOS-No 089
000090:VTPOS-No 090
000091:VTPOS-No 091
000092:VTPOS-No 092
000093:VTPOS-No 093
000094:VTPOS-No 094
000095:VTPOS-No 095
000096:VTPOS-No 096
000097:VTPOS-No 097
000098:VTPOS-No 098
000099:VTPOS-No 099
000100:VTPOS-No 100
000101:VTPOS-No 101
000102:VTPOS-No 102
000103:VTPOS-No 103
000104:VTPOS-No 104

7.9.2 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/W	CINH
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	
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	

Configuration

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	
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	?	Ra	
C0201	24374	5F36h	E	1	VS	VS	?	Ra	
C0202	24373	5F35h	E	1	FIX32	VD	4	Ra	
C0203	24372	5F34h	E	1	VS	VS	?	Ra	
C0204	24371	5F33h	E	1	FIX32	VD	4	Ra	
C0206	24369	5F31h	E	1	VS	VS	?	Ra	
C0207	24368	5F30h	E	1	VS	VS	?	Ra	
C0208	24367	5F2Fh	E	1	VS	VS	?	Ra	
C0209	24366	5F2Eh	E	1	VS	VS	?	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	
C0260	24315	5EFBh	E	1	FIX32	VD	4	Ra/Wa	

Configuration

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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	
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	
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	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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	
C0430	24145	5E51h	A	4	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	10	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	2	I32	VH	4	Ra	
C0529	24046	5DEEh	E	1	FIX32	VD	4	Ra/Wa	
C0530	24045	5DEDh	E	1	FIX32	VD	4	Ra/Wa	
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	

Configuration

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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	
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	
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	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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	
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
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	

Configuration

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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	
C0744	23831	5D17h	E						
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	
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	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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	
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	FIX32	VD	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	

Configuration

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0865	23710	5C9Eh	A	3	FIX32	VD	4	Ra/Wa	
C0866	23709	5C9Dh	A	11	FIX32	VD	4	Ra	
C0867	23708	5C9Ch	A	5	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	
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	
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	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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	
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	
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	
C1020	23555	5C03h	E	1	FIX32	VD	4	Ra/Wa	
C1021	23554	5C02h	A	2	FIX32	VD	4	Ra/W	CINH
C1022	23553	5C01h	A	2	I32	VH	4	Ra	
C1025	23550	5BFEh	E	1	FIX32	VD	4	Ra/Wa	
C1026	23549	5BFDh	A	2	FIX32	VD	4	Ra/W	CINH
C1027	23548	5BFCh	A	2	I32	VH	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	A	3	FIX32	VD	4	Ra/W	CINH
C1098	23477	5BB5h	E	1	FIX32	VD	4	Ra	
C1099	23476	5BB4h	A	3	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	
C1105	23470	5BAEh	E	1	FIX32	VD	4	Ra/Wa	
C1106	23469	5BADh	A	2	FIX32	VD	4	Ra/W	CINH
C1107	23468	5BACh	A	3	FIX32	VD	4	Ra/W	CINH
C1108	23467	5BABh	A	2	FIX32	VD	4	Ra	
C1109	23466	5BAAh	A	3	FIX32	VD	4	Ra	
C1110	23465	5BA9h	E	1	FIX32	VD	4	Ra/Wa	
C1111	23464	5BA8h	A	2	FIX32	VD	4	Ra/W	CINH
C1112	23463	5BA7h	A	3	FIX32	VD	4	Ra/W	CINH
C1113	23462	5BA6h	A	2	FIX32	VD	4	Ra	
C1114	23461	5BA5h	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	

Configuration

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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	
C1130	23445	5B95h	A	2	FIX32	VD	4	Ra/W	CINH
C1131	23444	5B94h	E	1	FIX32	VD	4	Ra/W	CINH
C1132	23443	5B93h	E	1	FIX32	VD	4	Ra/W	CINH
C1135	23440	5B90h	A	2	FIX32	VD	4	Ra	
C1136	23439	5B8Fh	E	1	FIX32	VD	4	Ra	
C1137	23438	5B8Eh	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	
C1180	23395	5B63h	E	1	FIX32	VD	4	Ra/W	CINH
C1181	23394	5B62h	E	1	FIX32	VD	4	Ra	
C1182	23393	5B61h	E	1	FIX32	VD	4	Ra/Wa	
C1183	23392	5B60h	E	1	FIX32	VD	4	Ra/Wa	
C1184	23391	5B5Fh	E	1	FIX32	VD	4	Ra/Wa	
C1185	23390	5B5Eh	E	1	FIX32	VD	4	Ra/Wa	
C1186	23389	5B5Dh	E	1	FIX32	VD	4	Ra/Wa	
C1187	23388	5B5Ch	E	1	FIX32	VD	4	Ra/Wa	
C1188	23387	5B5Bh	E	1	FIX32	VD	4	Ra/Wa	
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	
C1202	23373	5B4Dh	E	1	FIX32	VD	4	Ra/W	CINH
C1203	23372	5B4Ch	E	1	FIX32	VD	4	Ra/W	CINH
C1204	23371	5B4Bh	E	1	FIX32	VD	4	Ra/W	CINH
C1205	23370	5B4Ah	E	1	FIX32	VD	4	Ra	
C1206	23369	5B49h	E	1	FIX32	VD	4	Ra/W	CINH
C1207	23368	5B48h	A	2	FIX32	VD	4	Ra/W	CINH
C1208	23367	5B47h	E	1	FIX32	VD	4	Ra/W	CINH
C1209	23366	5B46h	E	1	FIX32	VD	4	Ra/Wa	
C1210	23365	5B45h	E	1	FIX32	VD	4	Ra/Wa	
C1211	23364	5B44h	E	1	FIX32	VD	4	Ra/Wa	
C1212	23363	5B43h	E	1	FIX32	VD	4	Ra	
C1213	23362	5B42h	E	1	FIX32	VD	4	Ra/Wa	
C1214	23361	5B41h	E	1	FIX32	VD	4	Ra/Wa	
C1215	23360	5B40h	A	4	FIX32	VD	4	Ra/Wa	
C1216	23359	5B3Fh	E	1	FIX32	VD	4	Ra/Wa	
C1218	23357	5B3Dh	A	2	FIX32	VD	4	Ra/Wa	
C1220	23355	5B3Bh	A	15	FIX32	VD	4	Ra	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C1221	23354	5B3Ah	A	15	I32	VH	4	Ra	
C1223	23352	5B38h	E	1	FIX32	VD	4	Ra/W	CINH
C1224	23351	5B37h	E	1	FIX32	VD	4	Ra/W	CINH
C1225	23350	5B36h	E	1	FIX32	VD	4	Ra/Wa	
C1227	23348	5B34h	E	1	FIX32	VD	4	Ra/Wa	
C1240	23335	5B27h	E	1	FIX32	VD	4	Ra/Wa	
C1241	23334	5B26h	E	1	FIX32	VD	4	Ra/Wa	
C1242	23333	5B25h	E	1	FIX32	VD	4	Ra/Wa	
C1243	23332	5B24h	E	1	FIX32	VD	4	Ra/Wa	
C1245	23330	5B22h	A	3	FIX32	VD	4	Ra	
C1250	23325	5B1Dh	E	1	FIX32	VD	4	Ra/Wa	
C1251	23324	5B1Ch	E	1	FIX32	VD	4	Ra/Wa	
C1252	23323	5B1Bh	E	1	FIX32	VD	4	Ra/Wa	
C1253	23322	5B1Ah	E	1	FIX32	VD	4	Ra/Wa	
C1255	23320	5B18h	A	3	FIX32	VD	4	Ra	
C1256	23319	5B17h	E	1	FIX32	VD	4	Ra/Wa	
C1257	23318	5B16h	E	1	FIX32	VD	4	Ra/Wa	
C1260	23315	5B13h	E	1	FIX32	VD	4	Ra/Wa	
C1261	23314	5B12h	A	16	FIX32	VD	4	Ra/Wa	
C1280	23295	5AFFh	E	1	B16	VH	2	Ra/Wa	
C1283	23292	5AFCh	E	1	FIX32	VD	4	Ra	
C1284	23291	5AFBh	E	1	FIX32	VD	4	Ra	
C1285	23290	5AFAh	A	4	FIX32	VD	4	Ra/Wa	
C1286	23289	5AF9h	A	2	FIX32	VD	4	Ra/Wa	
C1287	23288	5AF8h	E	1	FIX32	VD	4	Ra/Wa	
C1288	23287	5AF7h	E	1	FIX32	VD	4	Ra/Wa	
C1289	23286	5AF6h	A	2	FIX32	VD	4	Ra/Wa	
C1290	23285	5AF5h	E	1	FIX32	VD	4	Ra/Wa	
C1291	23284	5AF4h	A	3	FIX32	VD	4	Ra/Wa	
C1298	23277	5AEDh	E	1	FIX32	VD	4	Ra	
C1299	23276	5AECh	A	32	FIX32	VD	4	Ra	
C1301	23274	5AEAh	A	60	FIX32	VD	4	Ra/Wa	
C1302	23273	5AE9h	A	30	FIX32	VD	4	Ra/Wa	
C1303	23272	5AE8h	A	30	FIX32	VD	4	Ra/Wa	
C1304	23271	5AE7h	A	30	FIX32	VD	4	Ra/Wa	
C1305	23270	5AE6h	A	30	FIX32	VD	4	Ra/Wa	
C1311	23264	5AE0h	A	32	FIX32	VD	4	Ra/Wa	
C1312	23263	5ADFh	A	32	FIX32	VD	4	Ra/Wa	
C1313	23262	5ADEh	A	32	FIX32	VD	4	Ra/Wa	
C1314	23261	5ADDh	A	32	FIX32	VD	4	Ra/Wa	
C1315	23260	5ADCh	A	32	FIX32	VD	4	Ra/Wa	
C1316	23259	5ADBh	A	32	FIX32	VD	4	Ra/Wa	
C1318	23257	5AD9h	A	32	FIX32	VD	4	Ra/Wa	
C1319	23256	5AD8h	A	32	FIX32	VD	4	Ra/Wa	
C1320	23255	5AD7h	A	32	FIX32	VD	4	Ra/Wa	
C1321	23254	5AD6h	A	32	FIX32	VD	4	Ra/Wa	
C1322	23253	5AD5h	A	32	FIX32	VD	4	Ra/Wa	
C1323	23252	5AD4h	A	32	FIX32	VD	4	Ra/Wa	
C1324	23251	5AD3h	A	32	FIX32	VD	4	Ra/Wa	
C1325	23250	5AD2h	A	32	FIX32	VD	4	Ra/Wa	
C1326	23249	5AD1h	A	32	FIX32	VD	4	Ra/Wa	
C1327	23248	5AD0h	A	32	FIX32	VD	4	Ra/Wa	

Configuration

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C1328	23247	5ACFh	A	32	FIX32	VD	4	Ra/Wa	
C1329	23246	5ACEh	A	32	FIX32	VD	4	Ra/Wa	
C1330	23245	5ACDh	A	32	FIX32	VD	4	Ra/Wa	
C1331	23244	5ACCh	A	32	FIX32	VD	4	Ra/Wa	
C1333	23242	5ACAh	A	32	FIX32	VD	4	Ra/Wa	
C1334	23241	5AC9h	A	32	FIX32	VD	4	Ra/Wa	
C1335	23240	5AC8h	A	32	FIX32	VD	4	Ra/Wa	
C1336	23239	5AC7h	A	32	FIX32	VD	4	Ra/Wa	
C1349	23226	5ABAh	A	32	FIX32	VD	4	Ra/Wa	
C1350	23225	5AB9h	A	10	FIX32	VD	4	Ra/W	CINH
C1351	23224	5AB8h	A	10	I32	VH	4	Ra	
C1352	23223	5AB7h	A	4	FIX32	VD	4	Ra/W	CINH
C1353	23222	5AB6h	A	4	I32	VH	4	Ra	
C1354	23221	5AB5h	A	4	FIX32	VD	4	Ra/W	CINH
C1355	23220	5AB4h	A	4	I32	VH	4	Ra	
C1356	23219	5AB3h	A	4	FIX32	VD	4	Ra/W	CINH
C1357	23218	5AB2h	A	4	FIX32	VD	4	Ra	
C1358	23217	5AB1h	A	4	FIX32	VD	4	Ra/Wa	
C1359	23216	5AB0h	A	4	FIX32	VD	4	Ra	
C1360	23215	5AAFh	A	22	FIX32	VD	4	Ra/W	CINH
C1361	23214	5AAEh	A	22	FIX32	VD	4	Ra	
C1362	23213	5AADh	A	8	FIX32	VD	4	Ra/W	CINH
C1363	23212	5AACh	A	8	FIX32	VD	4	Ra	
C1364	23211	5AABh	A	3	FIX32	VD	4	Ra/W	CINH
C1365	23210	5AAAh	A	3	I32	VH	4	Ra	
C1370	23205	5AA5h	A	32	FIX32	VD	4	Ra/W	CINH
C1371	23204	5AA4h	A	2	B16	VH	2	Ra	
C1372	23203	5AA3h	A	2	B16	VH	2	Ra	
C1380	23195	5A9Bh	A	104	FIX32	VD	4	Ra	
C1381	23194	5A9Ah	A	104	I32	VH	4	Ra	
C1382	23193	5A99h	A	34	FIX32	VD	4	Ra	
C1383	23192	5A98h	A	34	I32	VH	4	Ra	
C1384	23191	5A97h	A	34	FIX32	VD	4	Ra	
C1385	23190	5A96h	A	34	I32	VH	4	Ra	
C1386	23189	5A95h	A	34	FIX32	VD	4	Ra	
C1387	23188	5A94h	A	34	FIX32	VD	4	Ra	
C1400	23175	5A87h	A	4	FIX32	VD	4	Ra/W	CINH
C1401	23174	5A86h	E	1	FIX32	VD	4	Ra/W	CINH
C1402	23173	5A85h	A	4	FIX32	VD	4	Ra	
C1403	23172	5A84h	E	1	FIX32	VD	4	Ra	
C1404	23171	5A83h	E	1	I32	VH	4	Ra	
C1405	23170	5A82h	E	1	FIX32	VD	4	Ra/W	CINH
C1406	23169	5A81h	E	1	FIX32	VD	4	Ra	
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	A	3	FIX32	VD	4	Ra/W	CINH
C1508	23067	5A1Bh	E	1	FIX32	VD	4	Ra	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C1509	23066	5A1Ah	A	3	FIX32	VD	4	Ra	
C1510	23065	5A19h	E	1	I32	VH	4	Ra	
C1511	23064	5A18h	E	1	FIX32	VD	4	Ra/Wa	
C1512	23063	5A17h	E	1	FIX32	VD	4	Ra/Wa	
C1513	23062	5A16h	E	1	FIX32	VD	4	Ra/Wa	
C1514	23061	5A15h	E	1	FIX32	VD	4	Ra/Wa	
C1515	23060	5A14h	E	1	I32	VH	4	Ra/Wa	
C1516	23059	5A13h	E	1	FIX32	VD	4	Ra/W	CINH
C1517	23058	5A12h	A	3	FIX32	VD	4	Ra/W	CINH
C1518	23057	5A11h	E	1	FIX32	VD	4	Ra	
C1519	23056	5A10h	A	3	FIX32	VD	4	Ra	
C1520	23055	5A0Fh	E	1	I32	VH	4	Ra	
C1521	23054	5A0Eh	E	1	FIX32	VD	4	Ra/Wa	
C1522	23053	5A0Dh	E	1	FIX32	VD	4	Ra/Wa	
C1523	23052	5A0Ch	E	1	FIX32	VD	4	Ra/Wa	
C1524	23051	5A0Bh	E	1	FIX32	VD	4	Ra/Wa	
C1525	23050	5A0Ah	E	1	I32	VH	4	Ra/Wa	
C1526	23049	5A09h	E	1	FIX32	VD	4	Ra/W	CINH
C1527	23048	5A08h	A	3	FIX32	VD	4	Ra/W	CINH
C1528	23047	5A07h	E	1	FIX32	VD	4	Ra	
C1529	23046	5A06h	A	3	FIX32	VD	4	Ra	
C1530	23045	5A05h	E	1	I32	VH	4	Ra	
C1531	23044	5A04h	E	1	FIX32	VD	4	Ra/Wa	
C1532	23043	5A03h	E	1	FIX32	VD	4	Ra/Wa	
C1533	23042	5A02h	E	1	FIX32	VD	4	Ra/Wa	
C1534	23041	5A01h	E	1	FIX32	VD	4	Ra/Wa	
C1535	23040	5A00h	E	1	I32	VH	4	Ra/Wa	
C1536	23039	59FFh	E	1	FIX32	VD	4	Ra/W	CINH
C1537	23038	59FEh	A	3	FIX32	VD	4	Ra/W	CINH
C1538	23037	59FDh	E	1	FIX32	VD	4	Ra	
C1539	23036	59FCh	A	3	FIX32	VD	4	Ra	
C1540	23035	59FBh	E	1	I32	VH	4	Ra	
C1541	23034	59FAh	E	1	FIX32	VD	4	Ra/Wa	
C1542	23033	59F9h	E	1	FIX32	VD	4	Ra/Wa	
C1543	23032	59F8h	E	1	FIX32	VD	4	Ra/Wa	
C1544	23031	59F7h	E	1	FIX32	VD	4	Ra/Wa	
C1545	23030	59F6h	E	1	I32	VH	4	Ra/Wa	
C1546	23029	59F5h	E	1	FIX32	VD	4	Ra/W	CINH
C1547	23028	59F4h	A	3	FIX32	VD	4	Ra/W	CINH
C1548	23027	59F3h	E	1	FIX32	VD	4	Ra	
C1549	23026	59F2h	A	3	FIX32	VD	4	Ra	
C1550	23025	59F1h	E	1	FIX32	VD	4	Ra/Wa	
C1551	23024	59F0h	A	2	FIX32	VD	4	Ra/W	CINH
C1552	23023	59EFh	A	2	I32	VH	4	Ra	
C1555	23020	59ECh	E	1	FIX32	VD	4	Ra/Wa	
C1556	23019	59EBh	A	2	FIX32	VD	4	Ra/W	CINH
C1557	23018	59EAh	A	2	I32	VH	4	Ra	
C1560	23015	59E7h	E	1	FIX32	VD	4	Ra/Wa	
C1561	23014	59E6h	A	2	FIX32	VD	4	Ra/W	CINH
C1562	23013	59E5h	A	2	I32	VH	4	Ra	
C1570	23005	59DDh	A	16	FIX32	VD	4	Ra/W	CINH
C1571	23004	59DCh	E	1	B16	VH	2	Ra	

Configuration

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C1573	23002	59DAh	A	16	FIX32	VD	4	Ra/W	CINH
C1574	23001	59D9h	E	1	B16	VH	2	Ra	
C1576	22999	59D7h	A	16	FIX32	VD	4	Ra/W	CINH
C1577	22998	59D6h	E	1	B16	VH	2	Ra	
C1580	22995	59D3h	E	1	FIX32	VD	4	Ra/W	CINH
C1581	22994	59D2h	E	1	FIX32	VD	4	Ra	
C1582	22993	59D1h	E	1	FIX32	VD	4	Ra/W	CINH
C1583	22992	59D0h	E	1	FIX32	VD	4	Ra	
C1590	22985	59C9h	E	1	FIX32	VD	4	Ra/Wa	
C1591	22984	59C8h	E	1	FIX32	VD	4	Ra/Wa	
C1593	22982	59C6h	E	1	FIX32	VD	4	Ra/W	CINH
C1594	22981	59C5h	E	1	FIX32	VD	4	Ra	
C1595	22980	59C4h	E	1	FIX32	VD	4	Ra/Wa	
C1596	22979	59C3h	E	1	FIX32	VD	4	Ra/Wa	
C1598	22977	59C1h	E	1	FIX32	VD	4	Ra/W	CINH
C1599	22976	59C0h	E	1	FIX32	VD	4	Ra	
C1600	22975	59BFh	E	1	FIX32	VD	4	Ra/Wa	
C1601	22974	59BEh	E	1	FIX32	VD	4	Ra/Wa	
C1603	22972	59BCh	E	1	FIX32	VD	4	Ra/W	CINH
C1604	22971	59BBh	E	1	FIX32	VD	4	Ra	
C1610	22965	59B5h	E	1	FIX32	VD	4	Ra/Wa	
C1611	22964	59B4h	E	1	FIX32	VD	4	Ra/W	CINH
C1612	22963	59B3h	E	1	I32	VH	4	Ra	
C1615	22960	59B0h	E	1	FIX32	VD	4	Ra/Wa	
C1616	22959	59AFh	E	1	FIX32	VD	4	Ra/W	CINH
C1617	22958	59AEh	E	1	I32	VH	4	Ra	
C1640	22935	5997h	E	1	FIX32	VD	4	Ra/W	CINH
C1641	22934	5996h	A	16	FIX32	VD	4	Ra/Wa	
C1642	22933	5995h	E	1	FIX32	VD	4	Ra/W	CINH
C1643	22932	5994h	E	1	FIX32	VD	4	Ra	
C1644	22931	5993h	E	1	I32	VH	4	Ra	
C1645	22930	5992h	E	1	FIX32	VD	4	Ra/Wa	
C1650	22925	598Dh	E	1	FIX32	VD	4	Ra/W	CINH
C1651	22924	598Ch	A	16	FIX32	VD	4	Ra/Wa	
C1652	22923	598Bh	E	1	FIX32	VD	4	Ra/W	CINH
C1653	22922	598Ah	E	1	FIX32	VD	4	Ra	
C1654	22921	5989h	E	1	I32	VH	4	Ra	
C1655	22920	5988h	E	1	FIX32	VD	4	Ra/Wa	
C1657	22918	5986h	A	4	FIX32	VD	4	Ra/Wa	
C1658	22917	5985h	E	1	FIX32	VD	4	Ra/Wa	
C1659	22916	5984h	E	1	FIX32	VD	4	Ra/Wa	
C1660	22915	5983h	E	1	FIX32	VD	4	Ra	
C1661	22914	5982h	E	1	FIX32	VD	4	Ra/W	CINH
C1662	22913	5981h	A	8	FIX32	VD	4	Ra/W	CINH
C1663	22912	5980h	E	1	FIX32	VD	4	Ra	
C1664	22911	597Fh	A	8	I32	VH	4	Ra	
C1665	22910	597Eh	E	1	FIX32	VD	4	Ra	
C1666	22909	597Dh	E	1	FIX32	VD	4	Ra/W	CINH
C1667	22908	597Ch	A	8	FIX32	VD	4	Ra/W	CINH
C1668	22907	597Bh	E	1	FIX32	VD	4	Ra	
C1669	22906	597Ah	A	8	I32	VH	4	Ra	
C1670	22905	5979h	E	1	FIX32	VD	4	Ra/Wa	

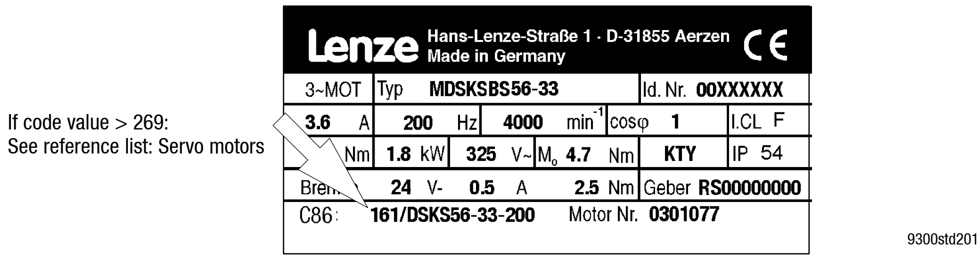
Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C1671	22904	5978h	E	1	I32	VH	4	Ra/Wa	
C1672	22903	5977h	E	1	I32	VH	4	Ra/Wa	
C1673	22902	5976h	A	2	FIX32	VD	4	Ra/W	CINH
C1674	22901	5975h	A	2	I32	VH	4	Ra	
C1675	22900	5974h	E	1	FIX32	VD	4	Ra/Wa	
C1676	22899	5973h	E	1	I32	VH	4	Ra/Wa	
C1677	22898	5972h	E	1	I32	VH	4	Ra/Wa	
C1678	22897	5971h	A	2	FIX32	VD	4	Ra/W	CINH
C1679	22896	5970h	A	2	I32	VH	4	Ra	
C1680	22895	596Fh	E	1	FIX32	VD	4	Ra/Wa	
C1681	22894	596Eh	E	1	I32	VH	4	Ra/Wa	
C1682	22893	596Dh	E	1	I32	VH	4	Ra/Wa	
C1683	22892	596Ch	A	2	FIX32	VD	4	Ra/W	CINH
C1684	22891	596Bh	A	2	I32	VH	4	Ra	
C1690	22885	5965h	A	10	FIX32	VD	4	Ra/W	CINH
C1691	22884	5964h	A	10	FIX32	VD	4	Ra	
C1692	22883	5963h	A	10	FIX32	VD	4	Ra	
C1693	22882	5962h	A	10	B16	VH	2	Ra	
C1695	22880	5960h	A	10	FIX32	VD	4	Ra/W	CINH
C1696	22879	595Fh	A	10	I32	VH	4	Ra	
C1700	22875	595Bh	A	2	I32	VH	4	Ra	
C1701	22874	595Ah	E	1	FIX32	VD	4	Ra/Wa	
C1702	22873	5959h	E	1	FIX32	VD	4	Ra/Wa	
C1703	22872	5958h	E	1	FIX32	VD	4	Ra/Wa	
C1704	22871	5957h	E	1	FIX32	VD	4	Ra/Wa	
C1705	22870	5956h	E	1	I32	VH	4	Ra/Wa	
C1706	22869	5955h	E	1	FIX32	VD	4	Ra/Wa	
C1707	22868	5954h	E	1	FIX32	VD	4	Ra/Wa	
C1708	22867	5953h	A	8	FIX32	VD	4	Ra/W	CINH
C1709	22866	5952h	A	8	FIX32	VD	4	Ra	
C1710	22865	5951h	A	2	I32	VH	4	Ra	
C1711	22864	5950h	E	1	FIX32	VD	4	Ra/Wa	
C1712	22863	594Fh	E	1	FIX32	VD	4	Ra/Wa	
C1713	22862	594Eh	E	1	FIX32	VD	4	Ra/Wa	
C1714	22861	594Dh	E	1	FIX32	VD	4	Ra/Wa	
C1715	22860	594Ch	E	1	I32	VH	4	Ra/Wa	
C1716	22859	594Bh	E	1	FIX32	VD	4	Ra/Wa	
C1717	22858	594Ah	E	1	FIX32	VD	4	Ra/Wa	
C1718	22857	5949h	A	8	FIX32	VD	4	Ra/W	CINH
C1719	22856	5948h	A	8	FIX32	VD	4	Ra	
C1720	22855	5947h	A	2	I32	VH	4	Ra	
C1721	22854	5946h	E	1	FIX32	VD	4	Ra/Wa	
C1722	22853	5945h	E	1	FIX32	VD	4	Ra/Wa	
C1723	22852	5944h	E	1	FIX32	VD	4	Ra/Wa	
C1724	22851	5943h	E	1	FIX32	VD	4	Ra/Wa	
C1725	22850	5942h	E	1	I32	VH	4	Ra/Wa	
C1726	22849	5941h	E	1	FIX32	VD	4	Ra/Wa	
C1727	22848	5940h	E	1	FIX32	VD	4	Ra/Wa	
C1728	22847	593Fh	A	8	FIX32	VD	4	Ra/W	CINH
C1729	22846	593Eh	A	8	FIX32	VD	4	Ra	

7.9.3 Motor selection list

7.9.3.1 Servo motors

Tip!

For the parameter setting of the drive the available motor type is to be entered under code C0086. This value can be taken from the nameplate.
Example: “161” indicates the motor designation ”DSKS56-33-200” in the display.



9300std201

C0086		Lenze motor type	C0081	C0087	C0088	C0089	C0090	Motor type	Thermal sensor
Value	Name		P_r [kW]	r_r [rpm]	I_r [A]	f_r [Hz]	a_r [V]		
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		

C0086		Lenze motor type	C0081	C0087	C0088	C0089	C0090	Motor type	Thermal sensor
Value	Name		P_r [kW]	r_r [rpm]	I_r [A]	f_r [Hz]	a_r [V]		
50	DSVA56-140	DSVAXX056-22	0.80	3950	2.4	140	390	Asynchronous servo motor	TKO (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: Servo motors

Tip!

The motors listed under “Nameplate data” are neither included in GDC nor in the software.

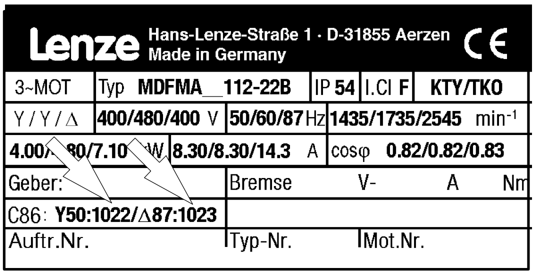
- Please enter the value listed under C0086 for your motor into GDC or the 9371BB operating module/9371BC keypad.
- Then check all codes listed in the table. Overwrite the entry in GDC or the 9371BB operating module/9371BC keypad with the values indicated in the table.
- The codes C0070 and C0071 must also be adapted to the dynamic behaviour of your machine.

Nameplate data		Data input													
		C0086	C0022	C0081	C0084	C0085	C0087	C0088	C0089	C0090	C0091	C0070	C0071	C0075	C0076
Field: C86	Field: Type		Imax [A]	P_r [kW]	R_s [Ω]	L σ [mH]	r_r [rpm]	I_r [A]	f_r [Hz]	a_r [V]	cos φ	V_{pn}	T_{nn}	V_{pi}	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

7.9.3.2 Three-phase AC asynchronous motor

Tip!

If the code value > 269:
See reference list of motor types MDXMA



Types DXRAXX

C0086 Value	Name	Nameplate	C0081 P_r [kW]	C0087 r_r [rpm]	C0088 I_r [A]	C0089 f_r [Hz]	C0090 a_r [V]	Motor type	Thermal sensor
210	DXRAXX071-12-50	DXRAXX071-12	0.25	1410	0.9	50	400	Asynchronous inverter motor (in star connection)	TKO (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				

Configuration

C0086		Nameplate	C0081	C0087	C0088	C0089	C0090	Motor type	Thermal sensor
Value	**Name**		P_r [kW]	r_r [rpm]	I_r [A]	f_r [Hz]	a_r [V]		
225	30kW-ASM-50	-	30.00	1470	52.0				
226	37kW-ASM-50	-	37.00	1470	66.0				
227	45kW-ASM-50	-	45.00	1480	82.0	50	400	Asynchronous inverter motor (in star connection)	–
228	55kW-ASM-50	-	55.00	1480	93.0				
229	75kW-ASM-50	-	75.00	1480	132.0				
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				TKO (Thermal contact)
258	DXRAXX112-12-87	DXRAXX112-12	7.10	2545	14.3				
259	DXRAXX132-12-87	DXRAXX132-12	9.7	2555	19.1	87	400	Asynchronous inverter motor (in delta connection)	
260	DXRAXX132-22-87	DXRAXX132-22	13.2	2555	25.4				
261	DXRAXX160-12-87	DXRAXX160-12	19.3	2565	36.5				
262	DXRAXX160-22-87	DXRAXX160-22	26.4	2565	48.4				
263	DXRAXX180-12-87	DXRAXX180-12	32.4	2575	57.8				
264	DXRAXX180-22-87	DXRAXX180-22	38.7	2560	67.4				
265	30kW-ASM-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 for motor type MDXMA

Tip!

The motors listed under “Nameplate data” are neither included in GDC nor in the software.

- Please enter the value listed under C0086 for your motor into GDC or the 9371BB operating module/9371BC keypad.
- Then check all codes listed in the table. Overwrite the entry in GDC or the 9371BB operating module/9371BC keypad with the values indicated in the table.
- The codes C0070 and C0071 must also be adapted to the dynamic behaviour of your machine.

Nameplate data		Data input													
		C0086	C0022	C0081	C0084	C0085	C0087	C0088	C0089	C0090	C0091	C0070	C0071	C0075	C0076
Field: C86	Field: Type		Imax [A]	P_r [kW]	R_s [Ω]	L σ [mH]	r_r [rpm]	I_r [A]	f_r [Hz]	a_r [V]	cos φ	V_{pn}	T_{nn}	V_{pi}	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

Configuration

Nameplate data		Data input													
		C0086	C0022	C0081	C0084	C0085	C0087	C0088	C0089	C0090	C0091	C0070	C0071	C0075	C0076
Field: C86	Field: Type		Imax [A]	P_r [kW]	R_s [Ω]	L σ [mH]	r_r [rpm]	I_r [A]	f_r [Hz]	a_r [V]	cos φ	V_{pn}	T_{nn}	V_{pi}	T_{ni}
1022	MDXMAxx-112-22	218	12.45	4.00	1.50	11.00	1435	8.30	50	400	0.82	6	300	2	2
1023	MDXMAxx-112-22	258	21.45	7.10	1.50	11.00	2545	14.30	87	400	0.83	6	300	1	2
1024	MDXMAxx-132-12	219	16.50	5.50	0.86	13.00	1450	11.00	50	400	0.84	6	300	1.5	2
1025	MDXMAxx-132-12	259	28.65	9.70	0.86	13.00	2555	19.10	87	400	0.83	6	300	1.3	2
1026	MDXMAxx-132-22	220	21.90	7.50	0.80	11.00	1450	14.60	50	400	0.85	6	300	1.5	2
1027	MDXMAxx-132-22	260	38.10	13.20	0.80	11.00	2555	25.40	87	400	0.84	6	300	0.95	1.8
1028	MDXMAxx-160-22	221	31.50	11.00	0.50	7.00	1460	21.00	50	400	0.85	6	300	1.9	2.2
1029	MDXMAxx-160-22	261	54.75	19.30	0.50	7.00	2565	36.50	87	400	0.85	6	300	1	2
1030	MDXMAxx-160-32	222	41.70	15.00	0.40	5.50	1460	27.80	50	400	0.87	6	300	1.7	2.5
1031	MDXMAxx-160-32	262	72.60	26.40	0.40	5.50	2565	48.40	87	400	0.86	6	300	1	1.8
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

Nameplate data		Data input													
		C0086	C0022	C0081	C0084	C0085	C0087	C0088	C0089	C0090	C0091	C0070	C0071	C0075	C0076
Field: C86	Field: Type		Imax [A]	P_r [kW]	R_s [Ω]	Lσ [mH]	r_r [rpm]	I_r [A]	f_r [Hz]	a_r [V]	cos φ	V_{pn}	T_{nn}	V_{pi}	T_{ni}
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
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

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EDSVS9332P-E

Lenze

System Manual
Part E

Troubleshooting and fault elimination

Global Drive

9300 serve position controller

This documentation is valid for 9300 position controllers as of version:

Type	Design	Hardware version and index	Software version and index	Variant	Explanation
33.932X	EP	2x	2x		(9321 - 9329)
33.933X	EP	2x	2x		(9330 - 9332)
33.932X	CP	2x	2x	- V003	Cold Plate (9321 - 9328)

Type

Design:
EP = Built-in unit IP20
CP = Cold Plate

Hardware version and index

Software version and index

Variant

Explanation

3.0 11/2004

Contents

Part E

8 Troubleshooting and fault elimination

- You can recognise immediately whether a fault has occurred, through display elements or status information.
- Analyse the fault
  – using the history buffer (8-3)
  – and the list "Fault messages" (8-5).
- The list "Fault messages" helps you to eliminate the fault.

8.1 Troubleshooting

Display on the controller

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

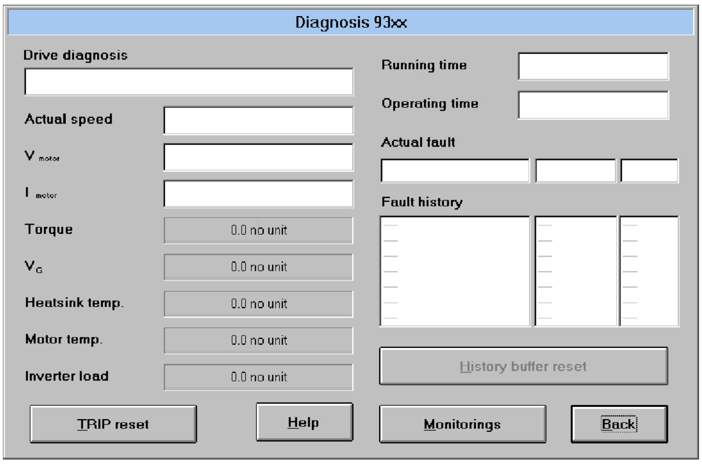
LED green	LED red	Cause	Check
■	☐	Controller enabled; no fault	
★	☐	Controller inhibit, switch-on inhibit	C0183; or C0168/1
☐	★	Fail	C0168/1
■	★	Warning, fail-QSP	C0168/1

■ : 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

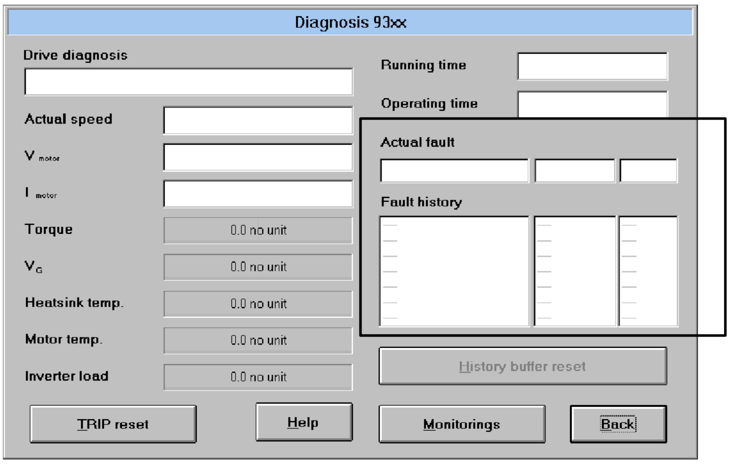
Display via the LECOM status word C0150

Bit	Meaning			
0	FREE 0	freely linkable		
1	IMP (pulse inhibit)	0 = enables pulses for power stage 1 = inhibits pulses for power stage		
2	FREE 2	freely linkable		
3	FREE 3	freely linkable		
4	FREE 4	freely linkable		
5	FREE 5	freely linkable		
j6	$f_d = 0$ (act. speed = 0)	$0 = [n \neq 0]$ $1 = [n = 0]$		
7	Ctrl. inhibit (controller inhibit)	0 = no controller inhibit 1 = controller inhibit		
8-11	Controller status	**hex**	**bin**	
		0	0000	Device initialisation
		2	0010	Switch-on inhibit
		3	0011	Operation inhibited (controller inhibit)
		6	0110	Operation enabled
		7	0111	Message active
		8	1000	Fault active
		9	1001	Power off
		A	1010	Fail-QSP
12	Warning	0 = no warning 1 = warning		
13	Message	0 = no message 1 = message		
14	FREE 14	freely linkable		
15	FREE 15	freely linkable		

8.2 Error analysis with the history buffer

- The history buffer is used to trace faults.
- Error messages are stored in the order of their occurence.

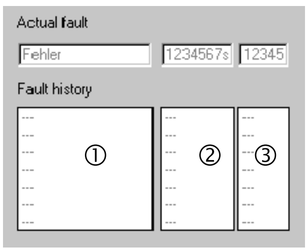
Double-click the entry "Diagnostics dialog" in the parameter menu of GDC to open the dialog box *Diagnosis 93xx*:



History buffer

8.2.1 Structure of the history buffer

- The history buffer provides 8 memory locations. The fields under "Fault history" show the memory locations 2 to 7.
- The fields under "Actual fault" show memory unit 1. It contains information on the active fault.
  – The first memory unit is written only after the elimination or acknowledgement of the active fault. This entry eliminates the last fault from the history buffer so that it can no longer be read.
- The history buffer holds three information units for every error that had occurred:

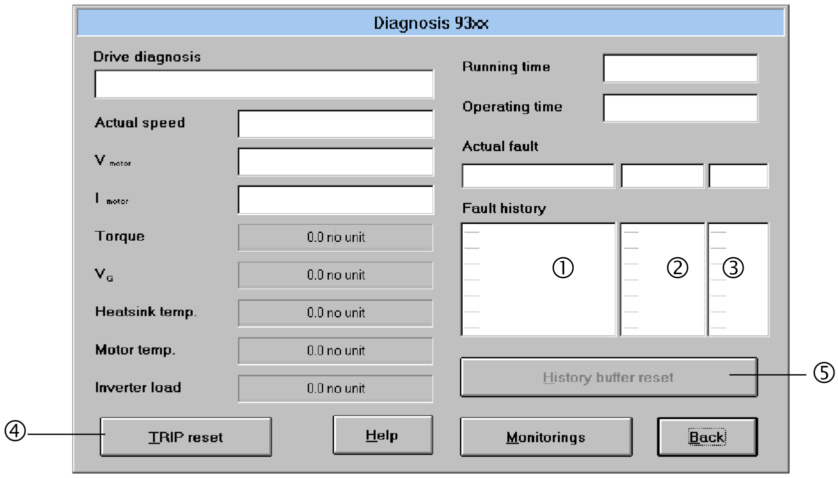


① Fault recognition and reaction
② Time of the fault
③ Frequency of the fault

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	History buffer location 1
			3	Memory location 2
			4	Memory location 3
			5	Memory location 4
			6	History buffer location 5
			7	History buffer location 6
			8	Memory unit 7

8.2.2 Working with the history buffer



Fault detection and reaction ①

- Contains the fault detection for every memory location and the reaction to the fault.
  – e.g. ”OH3 TRIP”
  – With a fieldbus, the faults are indicated by a fault number. (🕮 8-5, column 2)

Please note:

- For faults occuring at the same time with different reactions:
  – Only the reaction of the fault with the higest priority (priority = TRIP → Message → FAIL-QSP → Warning) is entered into the memory.
- For faults occuring at the same time and with the same reaction (e.g. 2 messages):
  – Only the fault which occurred first is entered.

Time ②

- Contains the times when the faults occurred
  – e.g. ”1234567 s”
  – Reference time is the mains switch-on time (see dialog box *Diagnosis 93xx*, top right field)

Please note:

- If a fault is immediately followed by another several times, only the time of the last occurrence is stored.

Frequency ③

- Contains the frequency of a fault immediately followed by the same fault. The time of the last occurrence is stored.

Reset fault ④

- Click **TRIP reset** to reset the fault

Delete history buffer ⑤

- This function is possible only when no fault is active.
- Click **History buffer reset** to delete the history buffer.

8.3 Fault messages

Tip!
If you use GDC or a fieldbus module to find out about the fault (C0168/x), the error message will be represented by an error number.

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning x = 3: FAIL-QSP	Error	Cause	Remedy
---	---	No fault	-	-
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 wiring 🕮 4-41
CDA 2)	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 screen 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 fault		Contact Lenze
H07	x107	Incorrect power stage	During initialization of the controller, an incorrect power stage was detected	Contact Lenze
H10	x110	Sensor fault - heatsink temperature	Sensor of the heatsink temperature detection indicates undefined 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 • 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. system 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.

Troubleshooting and fault elimination

Fault messages

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning x = 3: FAIL-QSP	Error	Cause	Remedy
nErr	x190	Difference between actual speed and setpoint exceeds set tolerance limits (C0576).	1. Motor torque not high enough 2. Mechanical drive overload 3. Error in encoder system / speed encoder defective 4. Tolerance too low (C0576)	1. Check limit values 2. Reduce mechanical load / adapt setpoint and quick stop ramp 3. Check speed encoder and replace if necessary 4. Increase tolerance window . The nErr window should be at least twice as big as for normal operation. • TIP: If you want to monitor the speed encoder, the error response should be set as TRIP.
OC1	x011	Short circuit	Short-circuit.	Find out 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 Continuous overload with I_{motor} > 1.05 x $I_{rx.}$	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 3)	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 3)	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 1)	x151	Negative limit switch	Negative limit switch was reached.	• Control drive in positive direction • Check terminal connection X5/E2.
P02 1)	x152	Positive limit switch	Positive limit switch was reached.	• Control drive in negative direction • Check terminal connection X5/E1.
P03	x153	First following error	Phase difference between set and actual position is larger than the contouring error limit set under C0255.	• Extend contouring 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 1)	x154	Negative position limit	Negative position limit (C1224) was not reached.	Find out why the value was not reached (e.g. ”incorrect” position targets, set function position value) and adjust the negative position limit (C1224) if necessary.

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning x = 3: FAIL-QSP	Error	Cause	Remedy
P05 1)	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 1)	x156	No reference	The homing point is unknown. For absolute positioning no homing was performed before the first positioning.	Perform one of the following functions and restart: • Manual homing. • Start homing in the program. • Set reference.
P07 1) 2)	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 1)	x158	Actual offset out of range.	Actual home offset (C1226) out of position limits. Fault of the program function "Set position value".	Adjust position limits if necessary, or check whether program function "Set position value" is to be applied.
P09 1)	x159	Impermissible programming	Impermissible programming	Check position program: • After a PS with final speed a PS with positioning has to follow; waiting for input is not permissible.
P12 1)	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 1)	x164	1st following error	The drive cannot follow the setpoint. Contouring error is higher than limit value in C1218/1.	• Increase current limit C0022 (observe max. motor current). • Reduce acceleration. • Check drive dimensioning. • Increase limit value under C1218.
P15 1)	x165	2nd following error	The drive cannot follow the setpoint. Following error is higher than 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 controller with delay. The required delay depends on the time between the sync telegrams.
			* C0362 displays the delay between two 2 sync telegrams (C0362 = 0, communication interrupted).	
P17 1)	x167	TP control error	Different function blocks use a TP input at the same time (e.g. FB DFSET and POS). A conflict occurs.	Configure another TP input for FB POS (not possible for DFSET) or switch off monitoring under C0580.

Troubleshooting and fault elimination

Fault messages

Display	**Error number** x = 0: TRIP x = 1: Message x = 2: Warning x = 3: FAIL-QSP	Error	Cause	Remedy
P18 [1]	x168	Internal limitation	The machine parameters C1202, C1203, C1204 ... can be selected within a defined range of values. In some cases, the internal range of values may be exceeded. In this event, the values are automatically limited to the minimum or maximum value. Warning P18 is indicated for your information.	
			C1298 = 1: The positive position limit in C1223 is outside the possible display range of $1 \le (C1223 * C1205) \le 1.07E9$ incr	Check machine parameters. If necessary, read the current value under C1220/10 and overwrite the value entered under C1223.
			C1298 = 2: The negative position limit in C1224 is outside the possible display range of $1 \le (C1224 * C1205) \le 1.07E9$ incr	Check machine parameters. If necessary, read the current value under C1220/11 and overwrite the value entered under C1224.
			C1298 = 3: The maximum speed v_{max} under C1240 is outside the possible display range of $1 \le (C1240 * C1205 * 16384) \le 2.14E9$ incr or $C1240 / C1204 * 60 * i \ge 1.5 * n_{max}$	Check machine parameters. If necessary, read the current value under C1220/12. C1220/12 indicates the limited value. Adapt the value under C1240 to C0011. $v_{max} \le n_{max} * v_k * 1/60 * 1/i$ $C1240 \le C0011 * C1204 * C1203 * 1/60 * 1/C1202$
			C1298 = 4: The maximum acceleration a_{max} in C1250 is outside the possible display range of $1 \le (C1250 * C1205 * 16.384 / 1000) \le 2.8634E7$ incr	Check machine parameters. If necessary, read the current value under C1220/13 and overwrite the value entered under C1250.
			C1298 = 5: An internal value range has been exceeded for a speed normalization. Valid range: $1 \le (C0011 * C1207/1 / C1207/2 * 65536/60000) \le 32767$	Check the entries under C0011, C1207/1.2.
PEr	x074	Program fault	A fault in the program was detected.	Send controller with data (on diskette) to Lenze.
PI	x079	Initializing error	• A fault was detected during transfer of parameter set between the controllers • Parameter set does not match controller.	Correct parameter set.
PR0 PR1 PR2 PR3 PR4	x075 x072 x073 x077 x078	Parameter set error	Fault when loading a parameter set. CAUTION: The factory setting is loaded automatically.	• Set the required parameters and store them under C0003. • For PR0 the supply voltage must be switched off additionally.
Sd2	x082	Resolver error	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.

Display	Error number x = 0: TRIP x = 1: Message x = 2: Warning x = 3: FAIL-QSP	Error	Cause	Remedy
Sd7	x087	Encoder fault	1. Absolute encoder with RS485 interface does not transmit data. 2. Defective encoder electronics • TIP: The encoder must not rotate during mains connection.	1. Check supply cable. Check encoder. 2. Replace defective encoder 3. Check voltage supply C0421. 4. No Stegmann encoder connected. • TIP: If the error message occurs after you have selected the absolute value encoder, disconnect and reconnect the mains voltage to remove the error message. The error message is caused by an encoder not initialised yet.
Sd8	x088	Encoder fault	1. The plug of the SinCos encoder or controller (terminal X8) is not plugged in properly. 2. A fault occurred in the connection cable of the SinCos-encoder 3. Defective encoder electronics	1. Check cable for open circuit or short circuit. 2. Replace defective encoder • TIP: Set the error reaction TRIP (code C0580 = 0) especially for monitoring encoder of a synchronous machine.

1) Error message only important for 9300 position controllers
2) Error message only important for 9300 cam profilers
3) Temperature detection via resolver or incremental encoder

8.4 Reset of fault messages

Reaction to failure	Re-commissioning measures	Danger notes
TRIP/ FAIL-QSP	• After fault elimination, an acknowledgement is required to restart the drive. • Acknowledge TRIP / FAIL-QSP as follows: – Global Drive Control: Click the ”TRIP reset” button in the ”Diagnostics 9300” dialog box. 8-4, (“Working with the history buffer”) – Keypad XT: Press STOP key. Then press RUN to enable the controller again. – 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 fault elimination, the message will be reset automatically.	The drive restarts automatically if the message is removed.
Warning	• After fault elimination, the warning will be reset automatically.	

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EDSVS9332P-K

Lenze

System Manual
Part K

Selection help

Application examples

Global Drive
9300 servo position controller

This documentation is valid for 9300 position controllers as of version:

Type	Design	Hardware version and index	Software version and index	Variant	Explanation
33.932X	EP	2x	2x		(9321 - 9329)
33.933X	EP	2x	2x		(9330 - 9332)
33.932X	CP	2x	2x	- V003	Cold Plate (9321 - 9328)

Type

Design:
EP = Built-in unit IP20
CP = Cold Plate

Hardware version and index

Software version and index

Variant

Explanation

3.0 11/2004

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See folder "Planning"

14 Application examples

14.1 Example 1: Dosing

The dosing application example describes different filling stations of a packing machine. The containers of these machine parts are to be filled using the least amount of space or the shortest possible time. It is also important that the exact amount is supplied via the feed screw. Two 9300 servo position controllers with optimised servo motors are used here as drive components.

The 9300 servo position controller contains functions which could previously only be offered by a superimposed control (e.g. PLC). Positioning tasks which are similar to this example can easily be achieved with a minimum expenditure using this controller.

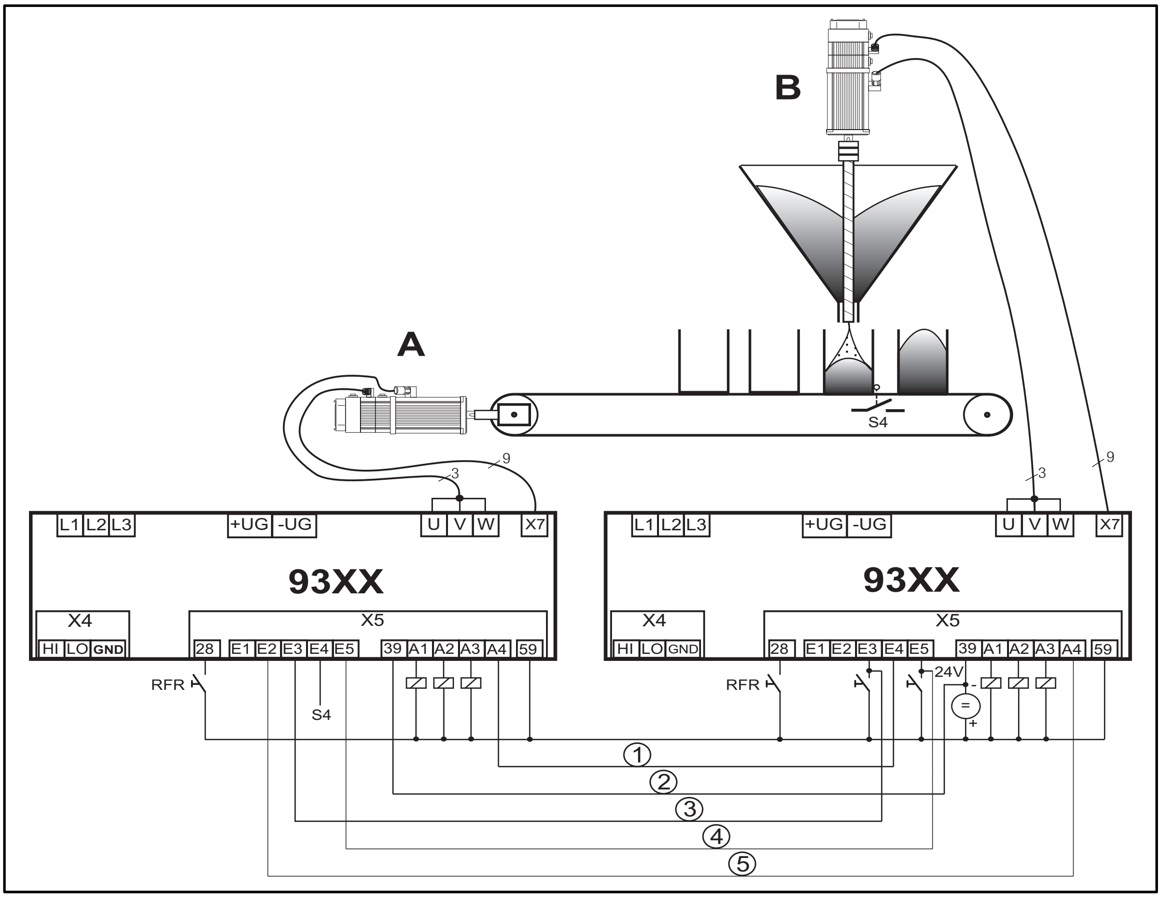

Fig. 14-1 Example of a relative positioning

Drive	Input	Function	Connecting cable
A	E1	Not assigned	
	E2	Handshake: start feed	⑤
	E3	Start program	③
	E4	Touch probe initiator (S4) for the detection of the container position	
	E5	Changeover of manual / program mode	
B	E1	Not used	
	E2	Not used	
	E3	Start program	③
	E4	Handshake: start dosing	①
	E5	Changeover of manual / program mode	④
	39	Reference potential	②

Application examples

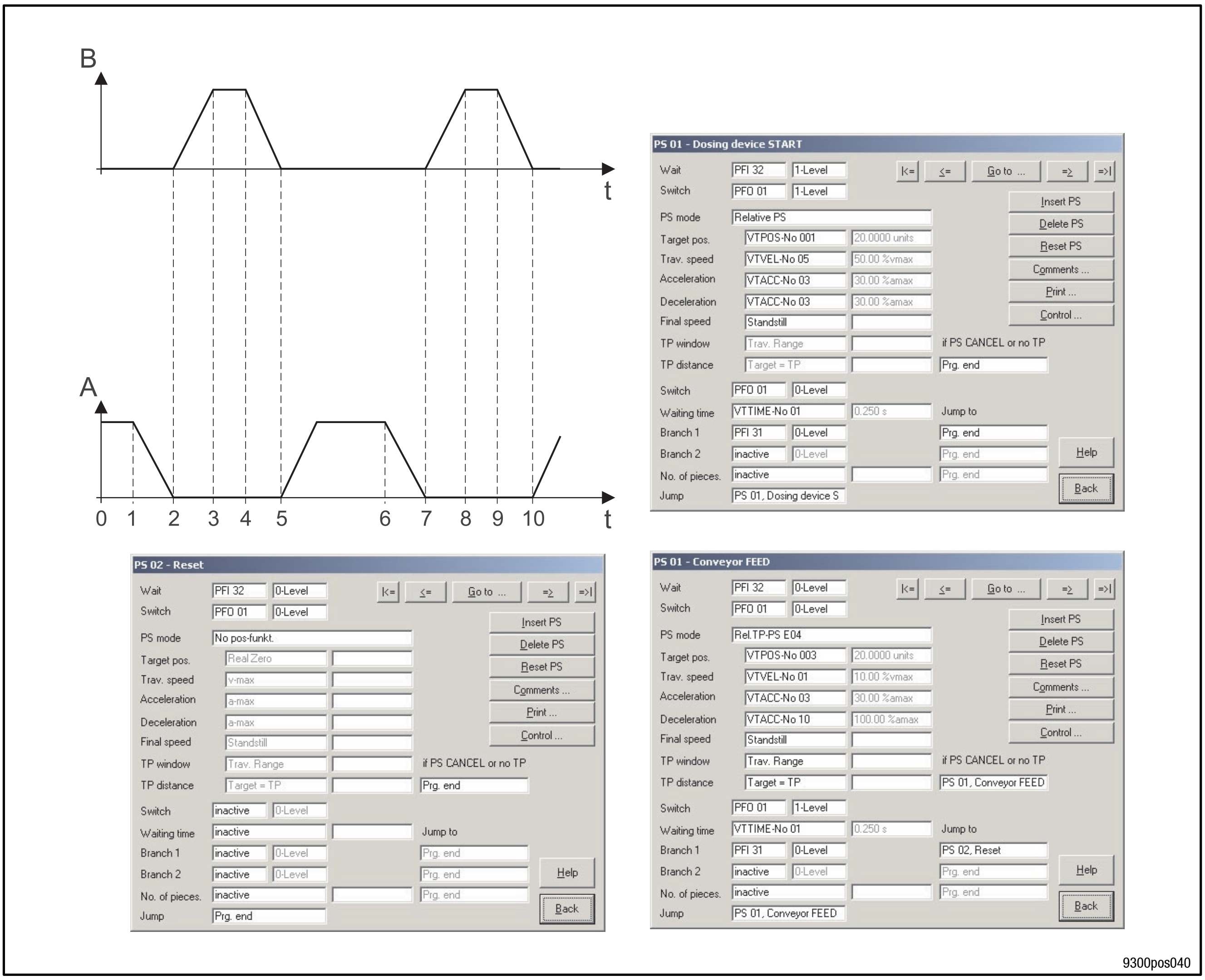

Fig. 14-2 Positioning profiles and input via the dialog boxes in GDC

Positioning profiles	
Time	**Description**
1, 6	Container has almost reached target position • Brake feed
2, 7	Container in target position • Start filling (observe dead time)
5, 10	Filling completed • Start feed, filled container leaves position sensor, empty container is positioned

Dosing drive B		
PS	**Time**	**Description**
01	0 - 2	Waiting for input POS-PFI 32, signal at X5/E4 (H level). The feed drive starts the dosing drive if the container is positioned.
	2 - 5	Filling according to program set parameters
	5	Start feed (drive A): switch POS-PFO1, X5/A4; L level • Jump to program set 1 (PS01)

Transport drive FEED A		
PS	**Time**	**Description**
01	2 - 5	Wait for input POS-PFI = 0 level
	5 - 6	Feed until TP(E4) reacts
	6 - 7	Cover final distance and stop
	7	Start dosing drive PFO 01 = H: A4 = High, then jump to PS01
02	Is required to complete the program.	

Application examples

Basis: Base configuration 20200

Terminal assignment					
Inputs	Function 1	Function 2	Function 3	**Outputs**	Function
X5/E1	Manual homing in negative direction			X5/A1	Reference known
X5/E2	Manual positioning in positive direction			X5/A2	Setpoint position reached
X5/E3	Program start	PS function (PFI 31)		X5/A3	Ready for operation
X5/E4	Home position switch	PS function (PFI 31)		X5/A4	PS function (POS-PF01)
X5/E5	Trip reset	Program reset	Manual positioning		

Assignment of CAN1			
Inputs	Function	**Outputs CAN-OUT1.**	Function
		W1	Actual speed
		D1	Actual position
CAN status word (bit 0.... bit15) 1: Pulse inhibit 2: Reference known 4: M_{max} (low active) 5: Target position reached 6: n_actual = 0 7: Controller inhibit CINH 12: Fault warning 13: Fault message 14: Fault quick stop 15: Ready for operation			

Assignment of CAN2					
Inputs CAN-IN2.	Function 1	Function 2	Function 3	**Outputs CAN-OUT2.**	Function
B0	PS function (POS-PFI1)	Program stop		B0	Trip
B1	PS function	Program reset		B1	Program completed
B2	PS function	Program start	Manual positioning off	B2	Positioning speed reached (acceleration completed)
B3	PS function	Start homing / manual		B3	PS function (POS-PF04)
B4	PS function	End of stand-by		B4	PS function
B5	PS function	New positioning profile parameters		B5	PS function
B6	PS function	No position control		B6	PS function
B7	PS function	Cancel PS		B7	PS function
B8 - B28	PS function			B8 - B28	PS function
B29	PS function (POS-PFI30)			B29	PS function
B30	PS function			B30	PS function
B31	PS function			B31	PS function (POS-PF032)

Assignment of CAN3			
Input	Function	**Output**	Function
CAN-IN2.D1			

Special functions			
Input	Function	**Output**	Function
C0471.B1	Activate S-profiles		

14.2 Example 2: Spray jet control

The combination of the spray jet control and the positioning of the workpiece are required for printing machines and painting equipment. Previously, a cam controller was used. However, mechanical inaccuracies and wear often led to bad results. The absolute positioning in the 9300 servo position controllers and open control structure enables the jet control to be provided with the corresponding messages. They can be read via a fieldbus or (as shown in the example) output via the terminals.

The spray jet control in Fig. 14-3 is an example of absolute positioning, which replaces former applications with mechanical cam groups.
These applications do not require mechanical limit switches or initiators that were used to be necessary to detect the position. Using the evaluation electronics of the 9300 servo position controller, the position information of the fed part is determined and positioned.

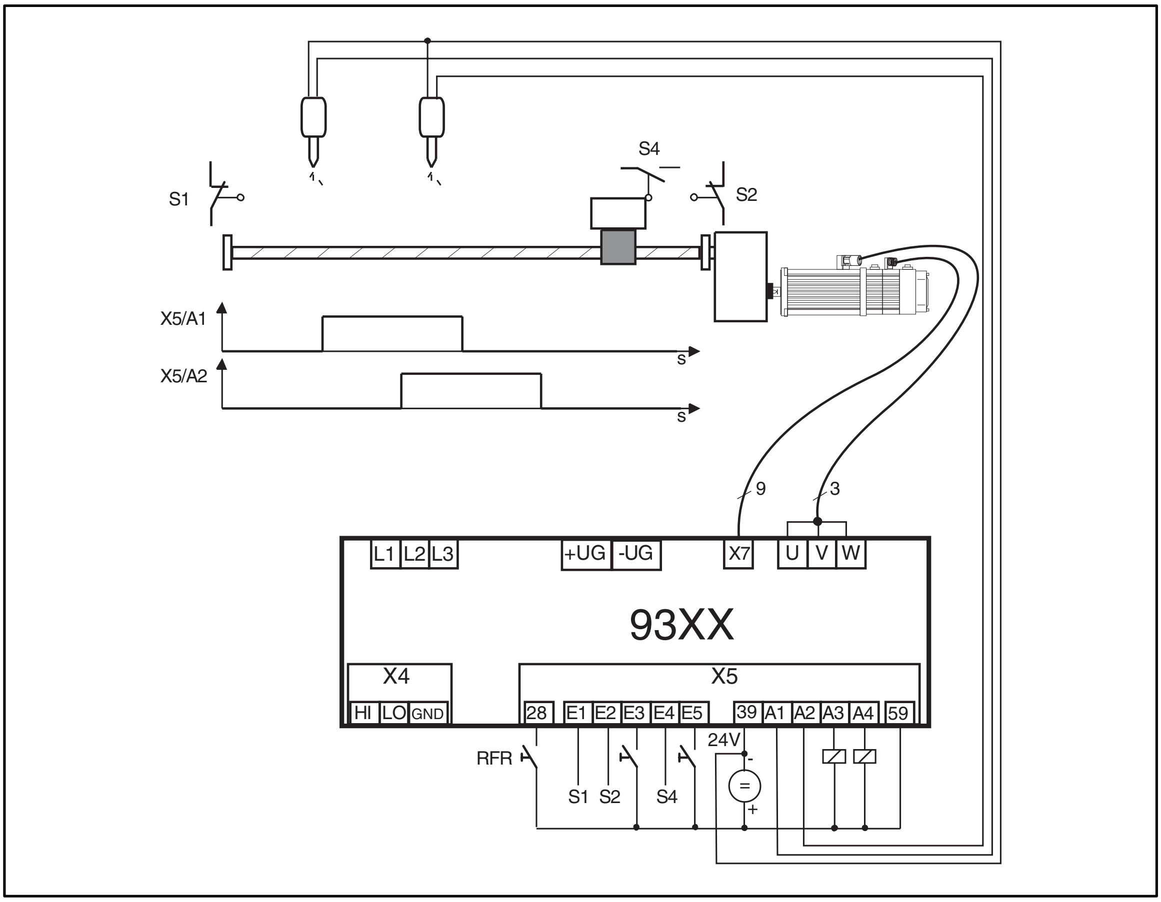

Fig. 14-3 Example of an absolute positioning with the function block 'SP1' (slow-down points)

Input	Function
E1	Limit switch (S1) negative direction
E2	Limit switch (S2) positive direction
E3	Start program
E4	Homing switch (S4)
E5	Changeover manual positioning / program mode

Application examples

Basis: Basic configuration 22000

Terminal assignment					
Inputs	Function 1	Function 2	Function 3	**Outputs**	Function
X5/E1	Limit switch negative direction	External setpoint off		X5/A1	Reference known
X5/E2	Limit switch positive direction	External setpoint off		X5/A2	Setpoint position reached
X5/E3	Program start	PS function		X5/A3	Ready for operation
X5/E4	Home position switch	PS function		X5/A4	PS function (POS-PF01)
X5/E5	Trip reset	Program reset	Manual positioning		

Assignment of CAN1			
Inputs	Function	**Outputs CAN-OUT1.**	Function
		W1	Actual speed
		D1	Actual position
		CAN status word (bit 0.... bit15) 1: Pulse inhibit 2: Reference known 4: M_{max} (low active) 5: Target position reached 6: n_act = 0 7: Controller inhibit CINH 12: Fault warning 13: Fault message 14: Fault quick stop 15: Ready for operation	

Assignment of CAN2					
Inputs CAN-IN2.	Function 1	Function 2	Function 3	**Outputs CAN-OUT2.**	Function
B0	PS function (POS-PFI1)	Program stop		B0	Trip
B1	PS function	Program reset		B1	Program completed
B2	PS function	Program start	Manual positioning off	B2	Positioning speed reached (acceleration completed)
B3	PS function			B3	PS function (POS-PF04)
B4	PS function			B4	PS function
B5	PS function			B5	PS function
B6	PS function			B6	PS function (POS-PF07)
B7	PS function	Cancel PS		B7	Slow-down point 1
B8 - B14	PS function			B8 - B14	Slow-down point 2 - 8
B15 - B17	PS function			B15 - B17	Touch probe recognised at X5/E1 - X5/E3
B18	PS function			B18	Touch probe enabled at X5/E4
B19	PS function			B19	PS function (POS-PF020)
B20 - B28	PS function			B20 - B28	PS function
B29	PS function (POS-PFI30)			B29	PS function
B30				B30	PS function
B31				B31	PS function (POS-PF032)

Adaptation to the example by extending the base configuration

Please establish the following connections:

DIGOUT 1 (terminal X5/A1	↔	SP1-STAT1
DIGOUT 2 (terminal X5/A2	↔	SP1-STAT2

Please observe:

- Description of the function block SP1
- GDC mask (if the program is used)
- Operating Instructions/Manual: Chapter 'Commissioning'

14.3 Example 3: Contouring control

Contouring control is an interesting solution for warehousing and complex transport tasks. These motion sequences often require complicated and expensive controls.Thanks to the different function blocks, such as AND, OR, NOR elements, the servo position controller is able to perform a variety of functions and features.

For a multi-axis application, the individual stations can be linked e.g. via the InterBus fieldbus. A superimposed control is required in these cases.

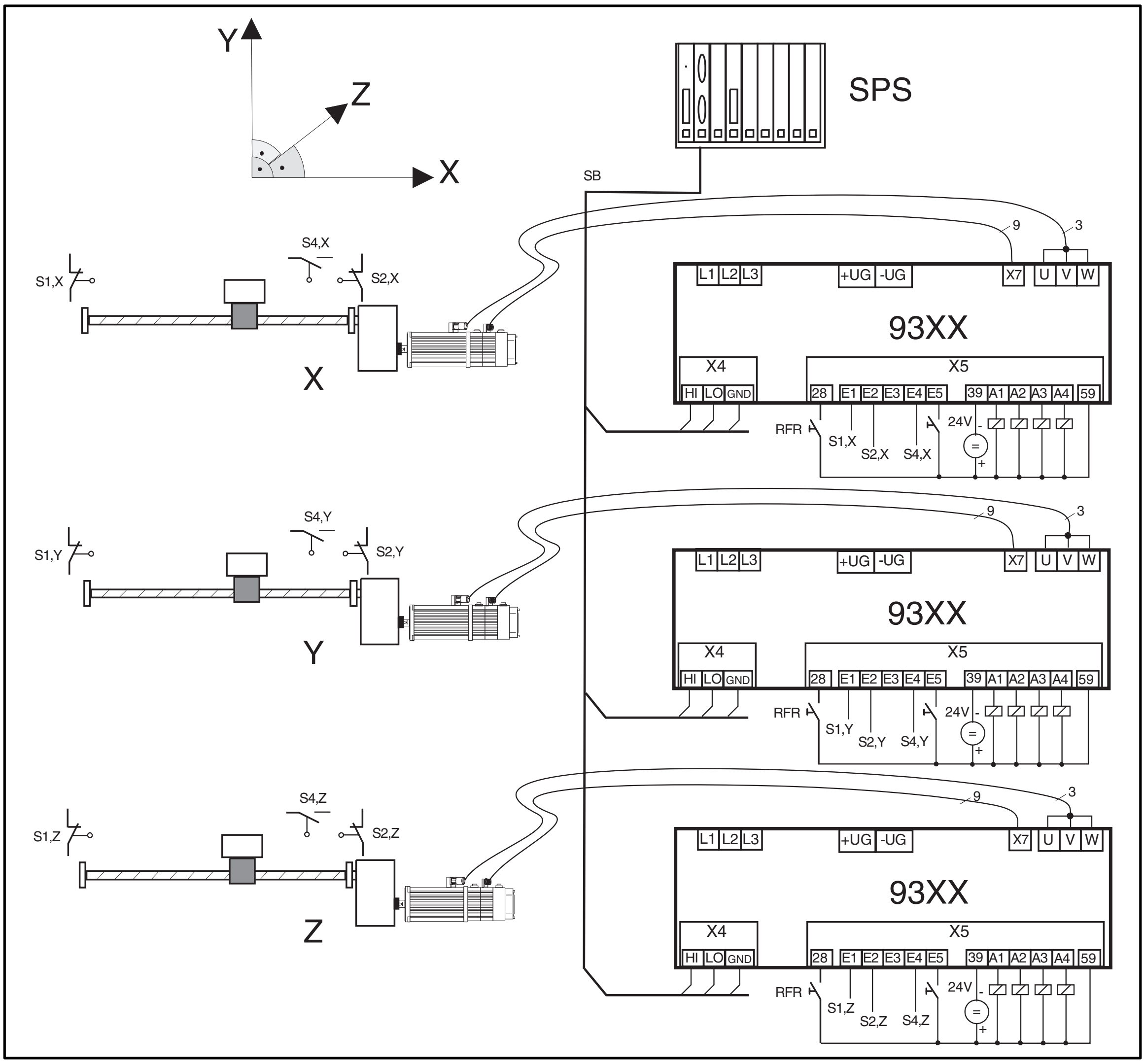

Fig. 14-4 Example of a multi-axis positioning

Input	Function
E1	Limit switch (S1X, S1Y, S1Z) negative direction
E2	Limit switch (S2X, S2Y, S2Z) positive direction
E3	Not assigned
E4	Reference switch (S4X, S4Y, S4Z)
E5	Changeover manual positioning / program mode

Abbreviations	Meaning
PLC	Programmable logic controller
SB	System bus (CAN)

Basis: Basic configuration 26000

Terminal assignment					
Inputs	Function 1	Function 2	Function 3	**Outputs**	Function
X5/E1	Negative manual positioning	External setpoint off		X5/A1	Synchronisation status
X5/E2	Positive manual positioning	External setpoint off		X5/A2	Following error 1
X5/E3	Program start	Actual position = external setpoint	PS function	X5/A3	Ready for operation
X5/E4	Home position switch	PS function		X5/A4	Reference known
X5/E5	Trip reset				

Assignment of CAN1			
Inputs	Function	**Outputs CAN-OUT1.**	Function
		W1	Actual speed
		D1	Actual position
		CAN status word (bit 0.... bit15) 1: Pulse inhibit 2: Reference known 4: M_{max} (low active) 5: Target position reached 6: n_act = 0 7: Controller inhibit CINH 12: Fault warning 13: Fault message 14: Fault quick stop 15: Ready for operation	

Assignment of CAN2					
Inputs CAN-IN2.	Function 1	Function 2	Function 3	**Outputs CAN-OUT2.**	Function
B0	PS function (POS-PFI1)	Program stop		B0	Trip
B1	PS function	Program reset		B1	Program completed
B2	PS function	Program start	Manual positioning off	B2	Positioning speed reached
B3	PS function			B3	PS function (POS-PF04)
B4	PS function			B4	PS function
B5	PS function			B5	PS function
B6	PS function			B6	PS function
B7	PS function	Cancel PS		B7	PS function
B8 - B29	PS function			B8 - B29	PS function
B30				B30	PS function
B31				B31	PS function (POS-PF032)

Assignment of CAN3			
Input CAN-IN2.	Function	**Outputs**	Function
D1			

Application examples

Adaptation to the example by extending the base configuration

Please establish the following connections:

POS-MANU-NEG	↔	CAN-IN2.B9
POS-MANU-POS	↔	CAN-IN2.B10B1
OR1-IN1	↔	FIXED0
OR1-IN2	↔	FIXED0
POS-LIM-NEG	↔	DIGIN1
POS-LIM-POS	↔	DIGIN2
POS-MANUAL	↔	CAN-IN2.B11
POS-LOOP-INH	↔	CAN-IN2.B4
POS-ABS-SET	↔	CAN-IN2.B4
POS-PSET-SWT	↔	NOT2-OUT
NOT2-IN	↔	CAN-IN2.B11

Function of the 'Contouring control' after changing the configuration

Input	Level	Function	
CAN-IN2.B4	HIGH	Switch off position control circuit	Accept position setpoint as actual position
CAN-IN2.B9	HIGH	Manual operation in negative direction	
CAN-IN2.B10	HIGH	Manual operation in positive direction	
CAN-IN2.B11	HIGH	Activate manual operation	

14.3.1 Commissioning of the contouring control

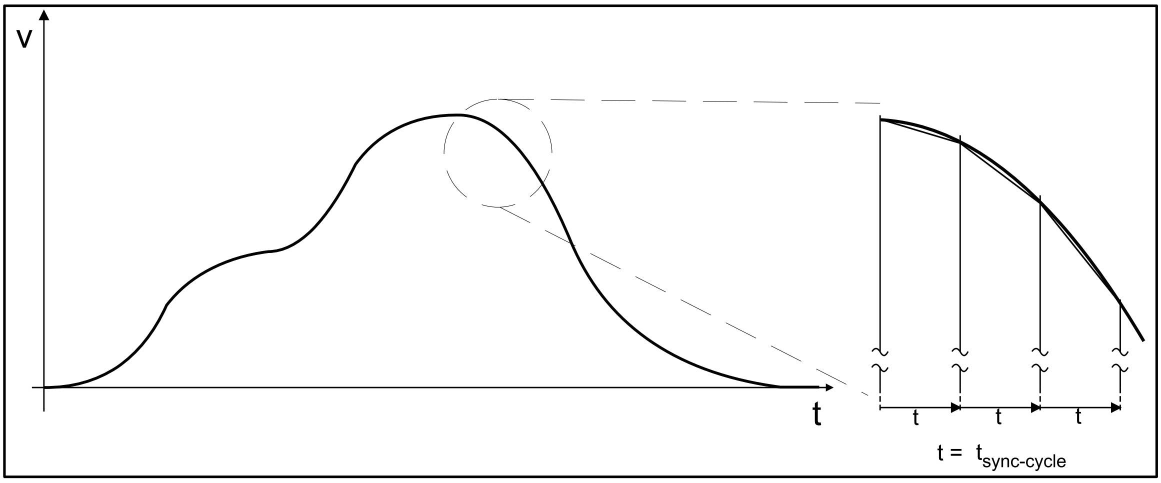

Fig. 14-5 Example of a positioning profile

How to commission the system bus (CAN)

- Control: slave 1 (drive X)
  - Node addresses: C0350 = 1
  - Position setpoint on byte 1 to 4 (see description CAN-IN3)
  - CAN-IN3 identifier = 385
  - Baud rate: C0351 → Adapt to control
    Reset mode: C0358 = 1
    Sync mode: C1120 = 1
    Sync cycle: C1121 → According to the time interval between the sync telegram and the control
  - Actual value = set setpoint (following error = 0)
    CAN-IN2.B4 = 1 (afterwards set CAN-IN2.B4 = 0)
- Control: slave 2 (drive Y)
  Node addresses 0350 = 2
  - CAN-IN3 identifier = 386
  - As slave 1
- Control: slave 3 (drive Z)
  Node addresses C0350 = 3
  - CAN-IN3 identifier = 387 (otherwise as slave 1)
- Telegram sequence
  - Send new position setpoint to slave 1, slave 2 and slave 3
  - Send sync telegram
  - All slaves reply with CAN-OUT1

Application examples

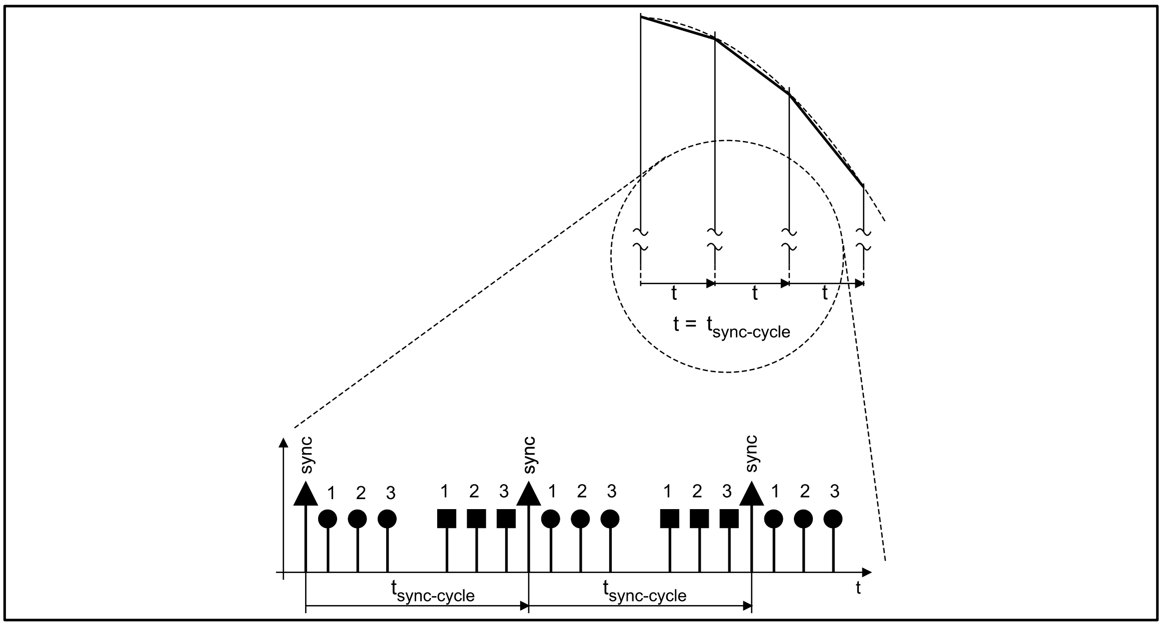

Fig. 1 Sequence of communication between master and slaves

Character	Explanation
●	Answer of the controller (CAN-IN1)
■	Send setpoint position (from the master) to the controller
1	Slave 1
2	Slave 2
3	Slave 3

Input of the target position by an external control (here: PLC)

- The setpoint position is determined by cyclic set phase increments ($t_{sync-cycle}$) in increments of milliseconds ($\pm$150μs).
  The input must be quartz-precise in the long term.
- The POS function block calculates the speed and the acceleration.
- Inputs in v_{max} (C1240) and a_{max} (C1250) have no effect.
- This means that speed profiles are possible in any form (e.g. cams).
- Activation by POSD-PSET-SWT = HIGH (e.g. FIXED1)

EDSVS9332P-L

Lenze

System Manual
Part L

Signal flow diagram

Global Drive

9300 servo position controller

This documentation is valid for 9300 position controllers as of version:

33.932X	EP	2x	2x		(9321 - 9329)
33.933X	EP	2x	2x		(9330 - 9332)
33.932X	CP	2x	2x	- V003	Cold Plate (9321 - 9328)

Type

Design:
EP = Built-in unit IP20
CP = Cold Plate

Hardware version and index

Software version and index

Variant

Explanation

3.0 11/2004

Contents

Part L

15 Signal flow diagram

The following signal flow diagrams show the basic configurations of the 9300 servo position controller:

- 1000
  – Simple speed control via analog inputs for short set-up.
- 20000
  – Absolute positioning via home position.
- 22000
  – Absolute positioning with slow-down points (cam controller) and teach function (reading positions and entry into variable tables)
- 26000
  – External contouring control to prepare for a multi-axis positioning. Phase setpoint input via system bus.

Signal-flow charts

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EDSVS9332P-M

Lenze

System Manual
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Glossary

Index

Global Drive

9300 servo position controller

This documentation is valid for 9300 position controllers as of version:

33.932X	EP	2x	2x		(9321 - 9329)
33.933X	EP	2x	2x		(9330 - 9332)
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Type

Design:
EP = Built-in unit IP20
CP = Cold Plate

Hardware version and index

Software version and index

Variant

Explanation

3.0 11/2004

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Part M

16 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 higher-level control and positioning control, 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

Glossary

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