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EDS9300UEV
00416037

Manual

Global Drive
Frequency inverter
9300 vector control

Contents of the Manual 9300

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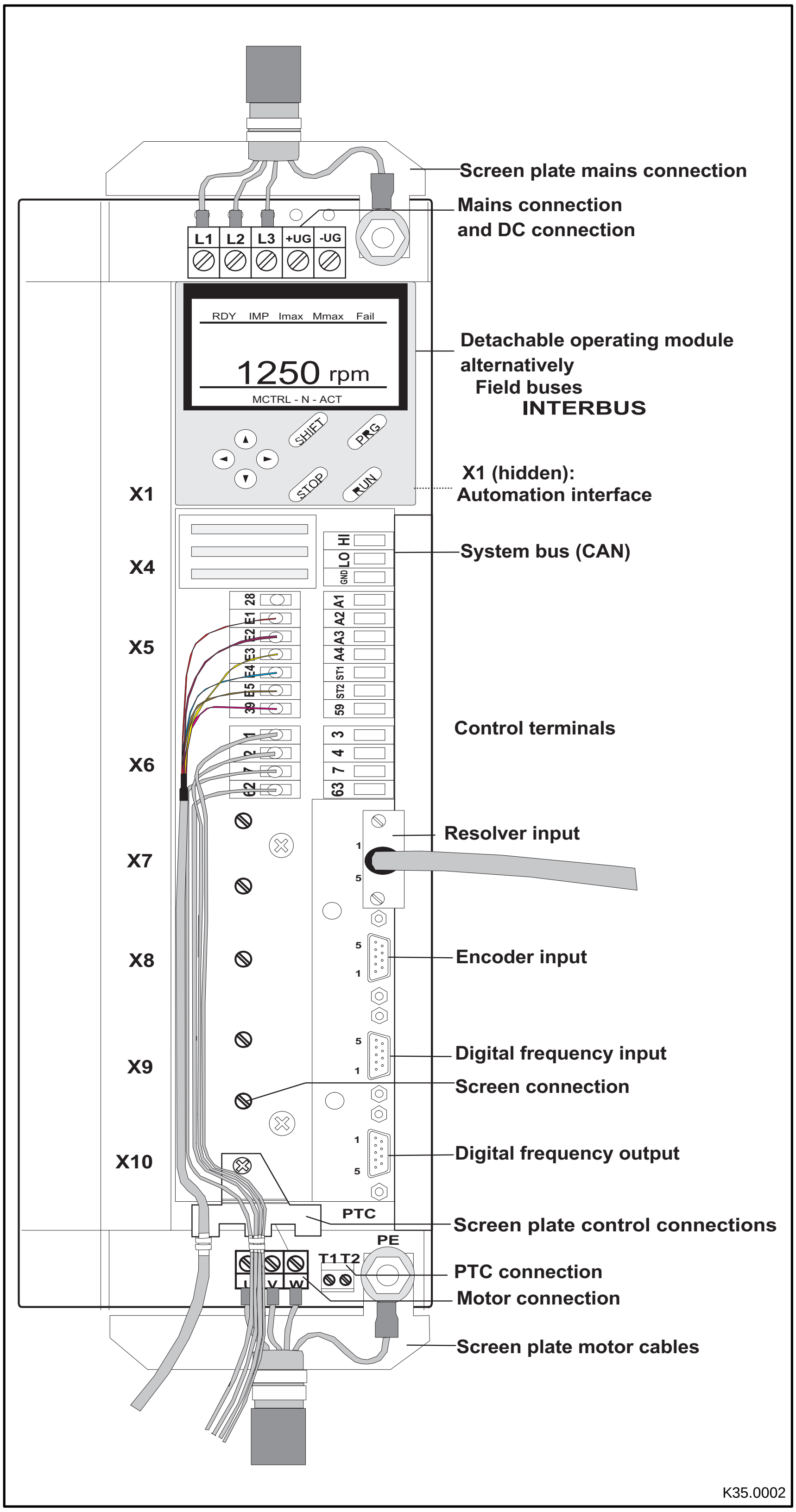
Explanation of symbols: ● part of the corresponding Manual

All documentation listed here contains a type designation and a material number at the top left edge.

The features and data specified in your Manual correspond to the controller version at the time of printing (print date: see inside cover of the parts). Lenze strives to keep all information up to the state of the latest controller version. If you should still find differences to your Manual, we kindly ask you to refer to the Operating Instructions included in the scope of supply or to contact your Lenze representative directly.


Screen plate mains connection
Mains connection
and DC connection
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L2
L3
+UG
-UG
RDY IMP Imax Mmax Fail
1250 rpm
MCTRL - N - ACT
SHIFT
PRG
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Detachable operating module
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00416038

Lenze

Manual
Part A

Global Drive

Frequency inverter
9300 vector control

This documentation is valid for controller types 9300 vector control as from the version

33.93XX - EV 3x 2x (9321 - 9333)

Type

Design:
E = Enclosure IP20

Hardware level and index

Software level and index

Explanation

We have thoroughly collected all specifications in this documentation and have checked it for compliance with the described hardware and software. However, differences cannot be excluded completely. We are not responsible or liable for possible consequential damage. We will include necessary corrections in subsequent editions.

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1 Preface and general information

1.1 How to use this Manual

- This Manual supplements the Operating Instructions of the frequency inverter 93XX vector control. It contains safety information which must be observed.
- It contains the Operating Instructions which were valid when the systems manual was printed and additional information on systems engineering, functionality and accessories.
  – In case of doubt, the Operating Instructions attached to the 93XX vector controller is valid.
- The Manual assists you in selecting and dimensioning the frequency inverter 93XX vector control and the accessories to ensure a safe and trouble-free operation. It contains safety information which must be observed.
- The systems 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 frequency inverter of the 9300 vector control series
Controller	Frequency inverter 93XX vector control
Drive system	Drive systems with frequency inverter 93XX vector control and other Lenze drive components

1.2 Legal regulationns

<table>
<tr><td rowspan="2">Labelling</td><td>Nameplate</td><td>CE-identification</td><td>Manufacturer</td></tr>
<tr><td>Lenze controllers are unambiguously designated by the contents of the nameplate.</td><td>Conforms to the EC Low-Voltage Directive</td><td>Lenze GmbH & Co KG
Postfach 101352
D-31763 Hameln</td></tr>
<tr><td>Application as directed</td><td colspan="3">Controller 93XX vector control
● must only be operated under the conditions prescribed in these Instructions.
● are components
– for open and closed loop control of variable speed drives with standard three-phase asynchronous motors or asynchronous servo 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 only for industrial purposes.
Drive systems with controllers 93XX vector control
● comply with the EMC Directive if they are installed according to the guidelines of CE-typical drive systems.
● can be used
– for operation at public and non-public mains
– for operation in industrial premises and residential areas.
● The user is responsible for the compliance of his application with the EC directives.
Any other use shall be deemed as inappropriate!</td></tr>
<tr><td>Liability</td><td colspan="3">● The information, data, and notes in these instructions met the state of the art at the time of printing. Claims on modifications referring to controllers which have already been supplied cannot be derived from the information, illustrations, and descriptions.
● The specifications, processes, and circuitry described in these instructions are for guidance only and must be adapted to your own specific application. Lenze does not take responsibility for the suitability of the process and circuit proposals.
● The specifications in these Instructions describe the product features without guaranteeing them.
● Lenze does not accept any liability for damage and operating interference caused by:
– Disregarding the operating instructions
– Unauthorized modifications to the controller
– Operating errors
– Improper working on and with the controller</td></tr>
<tr><td>Warranty</td><td colspan="3">● Warranty conditions: see Sales and Delivery Conditions of Lenze GmbH & Co KG.
● Warranty claims must be made to Lenze immediately after detecting the deficiency or fault.
● The warranty is void in all cases where liability claims cannot be made.</td></tr>
<tr><td rowspan="4">Disposal</td><td>Material</td><td>recycle</td><td>dispose</td></tr>
<tr><td>Metal</td><td>●</td><td>-</td></tr>
<tr><td>Plastic</td><td>●</td><td>-</td></tr>
<tr><td>Assembled PCBs</td><td>-</td><td>●</td></tr>
</table>

1.3 EC directives/Declaration of conformity

1.3.1 What is the purpose of EC directives?

EC directives are issued by the European Council and are intended for the determination of common technical requirements (harmonization) and certification procedures within the European Community. At the moment, there are 21 EC directives of product ranges. The directives are or will be converted to 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 directive are restricted to the essential requirements. Technical details are or will be determined by European harmonized standards.

1.3.2 What does the CE mark imply?

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

The attachment of 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 harmonized standards were considered in the evaluation procedure of conformity.

Controllers with the CE mark 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 given proof of the compliance with the CE directives and confirmed this by the declaration of conformity to the EMC CE directive.

1.3.3 EC Low Voltage Directive

(73/23/EEC)

amended by: CE Mark Directive (93/68/EEC)

General

- The Low Voltage Directive is effective for all electrical equipment for use with a rated voltage between 50 V and 1000V V AC and between 75 V and 1500 V DC and with normal ambient conditions. The use of e.g. electrical equipment in explosive atmospheres and electrical parts in passenger and goods lifts are excepted.
- The objective of the Low Voltage Directive is to ensure that only electrical equipment which does not endanger the safety of persons or animals is placed on the market. It should also be designed to conserve material assets.

1.3.3.1 EC Declaration of Conformity ’95

for the purpose of the EC Low Voltage Directive (73/23/EEC)

amended by: CE Mark Directive (93/68/EEC)

The 93XX controllers are developed, designed, and manufactured in compliance with the above mentioned EC directive under the sole responsibility of

Lenze GmbH & Co KG, Postfach 10 13 52, D-31763 Hameln

Considered standards:

Standard	
DIN VDE 0160 5.88 +A1 / 4.89 +A2 / 10.88 EN 50178 Classification VDE 0160 / 11.94	Electronic equipment for use in electrical power installations
DIN VDE 0100	Standards for the erection of power installations
EN 60529	IP Degrees of protection
IEC 249 / 1 10/86, IEC 249 / 2-15 / 12/89	Base material for printed circuits
IEC 326 / 1 10/90, EN 60097 / 9.93	Printed circuits, printed boards
DIN VDE 0110 /1-2 /1/89 /20/ 8/90	Creepage distances and clearances

Hameln, 01 January,1997

(i. V. Langner)
Product Manager

(i. V. Lackhove)
Project Manager

1.3.4 EC Directive Electromagnetic Compatibility

(89/336/EEC)

amended by: First Amendment Directive (92/31/EEC)
CE Mark Directive (93/68/EEC)

General

- The EC Electromagnetic Compatibility Directive is effective for "devices" which may cause electromagnetic interference or the operation of which may be impaired by such interference.
- The aim is to limit the generation of electromagnetic interference such that an operation without interferences of radio and telecommunication systems and other equipment is possible. The devices must also 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 after the integration of the controllers into a drive system, can this system be tested concerning the objectives of the EC EMC Directive and the compliance with the "Law about the Electromagnetic Compatibility of Devices".
- Lenze has evaluated the conformity of controllers on defined drive systems. These evaluated drive systems are called "CE-typical drive system" in the following.

  Therefore, the user of the controllers can
  – either determine the system components and their implementation into a drive system himself and declare the conformity under his own responsibility,
  – or install the drive system according to the CE-typical drive system evaluated by the inverter manufacturer who has already proved the conformity.

Components of the CE typical drive system

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

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

1.3.4.1 EC Declaration of Conformity ’95

in the sense of Electromagnetic Compatibility (89/336/EEC)

amended by: First Amendment Directive (92/31/EEC)
CE Mark Directive (93/68/EEC)

The 93XX controllers are no independent devices in the sense of the law about electromagnetic compatibility (EMVG of 9 Nov., 92 and 1st EMVGÄndG of 30 Aug, 95). The controller can only be evaluated in terms of EMC after it has been implemented into a drive system.

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declares the conformity of the described ”CE-typical drive system” with the 93XX controllers to the above mentioned EC Directive.

The conformity evaluation is based on the working paper of the product standard for drive systems:

IEC 22G-WG4 5/94	EMC product standard including specific test methods for power drive systems

Considered generic standards:

Generic standard	
EN 50081-1 /92	Generic standard for the emission of noise Part 1: Residential area, commercial premises, and small businesses
EN 50081-2 /93 (used in addition to the requirements of IEC 22G)	Generic standard for the emission of noise Part 2: Industrial premises The emission of noise in industrial premises is not limited in IEC 22G.
prEN 50082-2 3/94	Generic standard for noise immunity Part 2: Industrial premises The requirements of noise immunity for residential areas were not considered, since these are less strict.

Considered basic standards for the test of the noise emission:

Basic standard	Test	Limit value
EN 55022 7/92	Radio interference housing and mains Frequency range 0.15 - 1000 MHz	Class B for use in residential areas and commercial premises
EN 55011 7/92 (used in addition to the requirements of IEC 22G)	Radio interference housing and mains Frequency range 0.15 - 1000 MHz The emission of noise in industrial premises is not limited in IEC 22G.	Class A for use in industrial premises
IEC 801-2 /91	Electrostatic discharge on housing and heatsink	Severity 3 6 kV for contact, 8 kV clearance
IEC 1000-4-3	Electromagnetic fields Frequency range 26 - 1000 MHz	Severity 3 10 V/m
ENV 50140 /93	High-frequency field Frequency range 80 - 1000 MHz, 80% amplitude-modulated	Severity 3 10 V/m
	Fixed frequency 900 MHz with 200 Hz, 100 % modulated	10 V/m
IEC 801-4 /88	Fast transients, burst on power terminals	Severity 3 2 kV / 5 kHz
	Burst on bus and control cables	Severity 4 2 kV / 5 kHz
IEC 801-5	Surge test mains cables	Installation class 3

Hameln, 01 January,1997

(i. V. Langner)
Product Manager

(i. V. Lackhove)
Project Manager

1.3.5 EC Machinery Directive

(89/392/EEC)

amended by: First Amendment Directive (91/368/EEC)
Second Amendment Directive (93/44/EEC)
CE Mark Directive (93/68/EEC)

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 the processing, treatment, moving or packaging of a material.

1.3.5.1 EC Manufacturer’s Declaration

in the sense of the EC Machinery Directive (89/392/EEC)

amended by: First Amendment Directive (91/368/EEC)
Second Amendment Directive (93/44/EEC)
CE Mark Directive (93/68/EEC)

The 93XX controllers are developed, designed, and manufactured under the sole responsibility of

Lenze GmbH & Co KG, Postfach 10 13 52, D-31763 Hameln

Commissioning of the controllers is prohibited until it is proven that the machine where they are to be installed, corresponds to the EC Machinery Directive.

Hameln, 01 January,1997

(i. V. Langner)	(i. V. Lackhove)
Product Manager	Project Manager

2 Safety information

2.1 See Operating Instructions

Safety information

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Lenze

Manual
Part B

Technical data

Installation

Global Drive

Frequency inverter
9300 vector control

This documentation is valid for controller types 9300 vector control as from the version

33.93XX - EV 3x 2x (9321 - 9333)

- 33.93XX: Type
- EV: Design: E = Enclosure IP20
- 3x: Hardware level and index
- 2x: Software level and index
- (9321 - 9333): Explanation

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Part B

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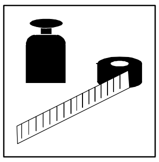
3 Technical data

3.1 Features

- Single axis in narrow design
  – thus space-saving installation
- Power range: 370 W to 90 kW
  – uniform control module and thus uniform connection for the control cables over the complete power range
- Power connections from the top (supply) and from the bottom (motor)
  – simple connection for multi-axis applications
- Optimum motor adaptation via automatic detection of the motor parameters
- Integrated process controller (PID)
  – for pressure, temperature, and flow-rate controls, dancer position controls
- V/f characteristic control for single drives and multi-motor applications (several motors connected to one drive)
- Vector-oriented control for single drives
  – Sensorless speed control
- Direct connection of an incremental encoder feedback is possible
  – Pluggable connection cable, TTL and HTL levels possible
- Digital synchronization system via digital frequency
  – Digital frequency input, suitable for TTL and HTL levels
  – error-free offset and gain setpoint transmission
  – speed synchronization
- DC bus connection for multi-axis applications
- 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
  – Control and operating functions can be extended easily
- System bus (CAN) for the connection of inverters of the 9300 series and for the extension of input and output terminals
- Approval of standard devices UL508, File No. 132659 (listed) (in preparation)
- Approval 9371 BB (BAE) UL 508, File No. 132659 (listed)



3.2 General data/Operating conditions

Field	Values
Vibration resistance	Germanischer Lloyd, general conditions
Permissible humidity	Humidity class F without condensation (average relative humidity 85 %)
Permissible temperature ranges	during transport of the controller: -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 ...+50 °C with derating
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 acc. to EN 50081-2, EN 50082-1, IEC 22G-WG4 (Cv) 21 Limit value class A acc. to EN 55011 (industrial area) with mains filter A Limit value class B acc. to EN55022 (residential area) with mains filter B and installation in a control cabinet
Noise immunity	Limit values maintained using mains filter. Requirements acc. to EN 50082-2, IEC 22G-WG4 (Cv) 21 . **Requirements** / **Standard** / **Severities** ESD / EN61000-4-2 / 3, i.e. 8 kV for air discharge and 6 kV for 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 on mains cable / IEC 1000-4-5 / 3, i. i. 1.2/50 µs, 1 kV phase-phase, 2 kV phase-PE
Insulation strength	Overvoltage category III acc. to VDE 0110
Packing	according to DIN 4180 9321 to 9333: Delivery packaging
Type of protection	IP20 IP41 on the heat-sink side for thermal separation (punching) NEMA 1: Protection against contact
Approvals	CE: Low Voltage Directive EMC directive UL508: Industrial Control Equipment UL508C: Power Conversion Equipment

3.3 Ratings (Operation with 120 % overload)

3.3.1 Operating conditions

- Operation permitted only:
  – With mains filter or mains choke
  – On mains voltage 3 AC / 400 V /50 Hz / 60 Hz
- Accessories on the mains side:
  – Fuses and cable cross-sections (📖 3-11)
  – Mains filter (📖 3-12)
  – For data of other components see systems manual, part I, “Accessories”
- When C0018 = 6 (default setting) and the maximum output current is exceeded (I_{rmax8} or I_{rmax16}), the chopping frequency is reduced automatically from 8 kHz to 2 kHz.

Technical data

3.3.2 Types 9321 to 9324

120 % overload capability		**Type**	**9321**	**9322**	**9323**	**9324**
		Order no.	EVF9321-EV	EVF9322-EV	EVF9323-EV	EVF9324-EV
	Version "Cold Plate"	**Type**	**9321-V003**	**9322-V003**	**9323-V003**	**9324-V003**
		Order no.	EVF9321-CV003	EVF9322-CV003	EVF9323-CV003	EVF9324-CV003
Mains voltage		U_r [V]	320 V ± 0 % ≤ U_r ≤ 440 V ± 0 % ; 45 Hz ... 65 Hz ± 0 %			
Alternative DC supply		U_G [V]	460 V ± 0 % ≤ U_G ≤ 620 V ± 0 %			
Mains current with mains filter/choke		I_r [A]	1.7	2.8	5.0	8.8
Ratings for operation on a mains: 3 AC / 400 V / 50 Hz / 60 Hz; 460 V ≤ $_G$ ≤ 620 V						
Motor power (4-pole ASM) at 2 kHz / 4 kHz / 8 kHz*		P_r [kW]	0.55	1.1	2.2	4.0
		P_r [hp]	0.75	1.5	2.9	5.4
Output power U, V, W at 2 kHz / 4 kHz / 8 kHz*		$S_{r2/4}$ [kVA] S_{r8} [kVA]	1.3 1.0	2.1 1.7	3.8 2.7	6.5 4.8
Output power $+U_G$, $-U_G$ 1)		P_{DC} [kW]	1.9	0.7	0.0	2.0
Output current	2/4 kHz*	$I_{r2/4}$ [A]	1.8	3.0	5.5	9.2
	8 kHz*	I_{r8} [A]	1.5	2.5	3.9	7.0
	optimum noise 8 kHz*	I_{r8} [A]	1.5	2.5	3.9	7.0
	optimum noise 16 kHz*	I_{r16} [A]	1.1	1.8	2.9	5.2
Max. output current for 60sec 2)	2/4 kHz*	$I_{rmax2/4}$ [A]	2.3	3.7	5.9	10.5
	8 kHz*	I_{rmax8} [A]	2.3	3.7	5.9	10.5
	optimum noise 8 kHz*	I_{rmax8} [A]	2.3	3.7	5.9	10.5
	optimum noise 16 kHz*	I_{rmax16} [A]	1.6	2.7	4.3	7.8
Motor voltage 3)		$_M$ [V]	0 - 3 × U_{Mains} / 0 Hz ... 50 Hz, optionally up to 600 Hz			
Power loss (operation with I_{rx})		P_V [W]	50	65	115	165
Power derating		[%/°C] [%/m]	40 %/°C < T_a < 50 °C: 2 %/°C (no UL approval) 1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l.: 5 %/1000 m			
Speed setpoint	Resolution	relative	2^{14} (related to C0011)			
	Analog setpoint selection	Linearity	± 0.5 % (max. selected signal level: 5 V or 10 V)			
		Temperature sensitivity	0 ... 40 °C: + 0.4 %			
		Offset	± 0 %			
Weight		m [kg]	4.9	4.9	5.8	6.0

1) This power can be additionally obtained from the DC bus when operating a matching motor

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

3) With mains choke / mains filter: max. output voltage = approx. 96 % of the mains voltage

* Chopper frequency of the inverter

3.3.3 Types 9325 to 9327

120 % overload capability		Type	9325	9326	9327
		Order no.	EVF9325-EV	EVF9326-EV	EVF9327-EV
	Version "Cold Plate"	Type	9325-V003	9326-V003	9327-V003
		Order no.	EVF9325-CV003	EVF9326-CV003	EVF9327-CV003
Mains voltage		U_r [V]	320 V ±0 % ≤ U_r ≤ 440 V ±0 % ; 45 Hz ... 65 Hz ±0 %		
Alternative DC supply		U_G [V]	460 V ±0 % ≤ U_G ≤ 620 V ±0 %		
Mains current with mains filter/choke		I_r [A]	15.0	20.5	39.0
Ratings for operation on a mains: 3 AC / 400 V / 50 Hz / 60 Hz; 460 V ≤ a_G ≤ 620 V					
Motor power (4-pole ASM) at 2 kHz / 4 kHz / 8 kHz*		P_r [kW]	7.5	11.0	22.0
		P_r [hp]	10.0	15.0	30.0
Output power U, V, W at 2 kHz / 4 kHz / 8 kHz*		$S_{r2/4}$ [kVA] S_{r8} [kVA]	11.1 9.0	16.3 16.3	29.8 22.2
Output power $+U_G$, $-U_G$ 1)		P_{DC} [kW]	0.0	0.0	10.2
Output current	2/4 kHz*	$I_{r2/4}$ [A]	15.0	23.5	43.0
	8 kHz*	I_{r8} [A]	13.0	23.5	32.0
	optimum noise 8 kHz*	I_{r8} [A]	13.0	23.5	29.0
	optimum noise 16 kHz*	I_{r16} [A]	9.7	15.2	21.0
Max. output current for 60sec 2)	2/4 kHz*	$I_{rmax2/4}$ [A]	19.5	35.3	48.0
	8 kHz*	I_{rmax8} [A]	19.5	35.3	48.0
	optimum noise 8 kHz*	I_{rmax8} [A]	19.5	35.3	43.0
	optimum noise 16 kHz*	I_{rmax16} [A]	14.5	22.9	31.0
Motor voltage 3)		U_M [V]	0 - 3 × U_{Mains} / 0 Hz ... 50 Hz, optionally up to 600 Hz		
Power loss (operation with I_{rx})		P_V [W]	260	360	640
Power derating		[%/K] [%/m]	40 °C < T_a < 50 °C: 2 %/°C (no UL approval) 1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l.: 5 %/1000 m		
Speed setpoint	Resolution	relative	2^{14} (related to C0011)		
	Analog setpoint selection	Linearity	±0.5 % (max. selected signal level: 5 V or 10 V)		
		Temperature sensitivity	0 ... 40 °C: +0.4 %		
		Offset	±0 %		
Weight		m [kg]	7.8	7.8	18.0

1) This power can be additionally obtained from the DC bus when operating a matching motor

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

3) With mains choke / mains filter: max. output voltage = approx. 96 % of the mains voltage

* Chopping frequency of the inverter (C0018)

Technical data

3.3.4 Types 9328 to 9330

120 % overload capability		**Type**	**9328**	**9329 4)**	**9330**
		Order no.	EVF9328-EV	EVF9329-EV	EVF9330-EV
	Version "Cold Plate"	**Type**	**9328-V003**	-	-
		Order no.	EVF9328-CV003	-	-
Mains voltage		U_r [V]	$320\ V \pm 0\ \% \leq U_r \leq 440\ V \pm 0\%$; 45 Hz ... 65 Hz ±0 %		
Alternative DC supply		U_G [V]	$460\ V \pm 0\ \% \leq U_G \leq 620\ V \pm 0\ \%$		
Mains current with mains filter / choke		I_r [A]	50.0	60.0	97.0
Ratings for operation on a mains: 3 AC / 400 V / 50 Hz / 60 Hz; 460 V ≤ a_G ≤ 620 V					
Motor power (4-pole ASM) at 2 kHz / 4 kHz / 8 kHz*		P_r [kW]	30.0	37.5	55.0
		P_r [hp]	40.0	50.0	74.0
Output power U, V, W at 2 kHz / 4 kHz / 8 kHz*		$S_{r2/4}$ [kVA] S_{r8} [kVA]	39.5 32.6	46.4 41.6	74.8 61.7
Output power $+U_G$, $-U_G$ 1)		P_{DC} [kW]	4.0	0.0	5.1
Output current	2/4 kHz*	$I_{r2/4}$ [A]	56.0	66.0	100.0
	8 kHz*	I_{r8} [A]	47.0	59.0	89.0
	optimum noise 8 kHz*	I_{r8} [A]	43.0	47.0	59.0
	optimum noise 16 kHz*	I_{r16} [A]	30.0	35.0	46.0
Max. output current for 60sec 2)	2/4 kHz*	$I_{rmax2/4}$ [A]	70.5	88.5	134.0
	8 kHz*	I_{rmax8} [A]	70.5	88.5	134.0
	optimum noise 8 kHz*	I_{rmax8} [A]	64.0	70.5	88.0
	optimum noise 16 kHz*	I_{rmax16} [A]	45.0	52.5	69.0
Motor voltage 3)		U_M [V]	0 - 3 × U_{Mains} / 0 Hz ... 50 Hz, optionally up to 600 Hz		
Power loss (operation with I_{rx})		P_v [W]	610		1350
Power derating		[%/°C] [%/m]	40 °C < T_a < 50 °C: 2 %/°C (no UL approval) 1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l.: 5 %/1000 m		
Speed setpoint	Resolution	relative	2^{14} (related to C0011)		
	Analog setpoint selection	Linearity	±0.5 % (max. selected signal level: 5 V or 10 V)		
		Temperature sensitivity	0 ... 40 °C: +0.4 %		
		Offset	±0 %		
Weight		m [kg]	18	18	36

1) This power can be additionally obtained from the DC bus when operating a matching motor

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

3) With mains choke / mains filter: max. output voltage = approx. 96 % of the mains voltage

4) Max. permissible operating ambient temperature : +35 °C

* Chopping frequency of the inverter (C0018)

3.3.5 Types 9331 to 9333

120 % overload capability		**Type**	**9331** [4]	**9332**	**9333** [4]
		Order no.	EVF9331-EV	EVF9332-EV	EVF9333-EV
Mains voltage		U_r [V]	320 V ±0 % ≤ U_r ≤ 440 V ±0 % ; 45 Hz ... 65 Hz ±0 %		
Alternative DC supply		U_G [V]	460 V ±0 % ≤ U_G ≤ 620 V ±0 %		
Mains current with mains filter/choke		I_r [A]	119.0	144.0	185.0
Ratings for operation on a mains: 3 AC / 400 V / 50 Hz / 60 Hz; 460 V ≤ U_G ≤ 620 V					
Motor power (4-pole ASM) at 2 kHz / 4 kHz / 8 kHz*		P_r [kW]	75.0	90.0	110.0
		P_r [hp]	100.0	120.0	148.0
Output power U, V, W at 2 kHz / 4 kHz / 8 kHz*		$S_{r2/4}$ [kVA] S_{r8} [kVA]	91.5 76.2	110.0 103.9	142.0 124.7
Output power $+U_G$, $-U_G$ [1]		P_{DC} [kW]	0	28.1	40.8
Output current	2/4 kHz*	$I_{r2/4}$ [A]	135.0	159.0	205.0
	8 kHz*	I_{r8} [A]	110.0	150.0	171.0
	optimum noise 8 kHz*	I_{r8} [A]	76.0	92.0	100.0
	optimum noise 16 kHz*	I_{r16} [A]	52.0	58.0	63.0
Max. output current for 60 sec [2]	2/4 kHz*	$I_{rmax2/4}$ [A]	165.0	225.0	270.0
	8 kHz*	I_{rmax8} [A]	165.0	225.0	221.0
	optimum noise 8 kHz*	I_{rmax8} [A]	114.0	138.5	150.0
	optimum noise 16 kHz*	I_{rmax16} [A]	78.0	87.0	94.0
Motor voltage [3]		U_M [V]	0 - 3 × U_{Mains} / 0 Hz ... 50 Hz, optionally up to 600 Hz		
Power loss (operation with I_{rx})		P_v [W]	1470	2100	2400
Power derating		[%/°C] [%/m]	40 °C < T_a < 50 °C: 2 %/°C (no UL approval) 1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l.: 5 %/1000 m		
Speed setpoint	Resolution	relative	2^{14} (related to C0011)		
	Analog setpoint selection	Linearity	±0.5 % (max. selected signal level: 5 V or 10 V)		
		Temperature sensitivity	0 ... 40 °C: +0.4 %		
		Offset	±0 %		
Weight		m [kg]	38	70	70

1) This power can be additionally obtained from the DC bus when operating a matching motor

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

3) With mains choke / mains filter: max. output voltage = approx. 96 % of the mains voltage

4) Max. permissible operating ambient temperature : +35 °C

* Chopping frequency of the inverter (C0018)

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Technical data

3.4 Ratings (Operation with 150 % overload)

3.4.1 Operating conditions

- Operation permitted only:
  – on mains voltage 3 AC / 400 ... 480 V / 50 Hz / 60 Hz
- Operate the controller types 9324, 9326, 9328 ... 9333 only with a suitable mains filter.
- Accessories on the mains side:
  – Fuses and cable cross-sections (🕮 3-11)
  – Mains filter (🕮 3-12)
  – For data of other components see systems manual, part I, “Accessories”
- When C0018 = 6 (default setting) and the maximum output current is exceeded (I_{rmax8}, the chopping frequency is reduced automatically from 8 kHz to 2 kHz.

3.4.2 Ratings for types 9321 to 9324

150 % overload capability		**Type**	**9321**		**9322**		**9323**		**9324**	
Mains voltage		U_r [V]	320 V ±0 % ≤ U_r ≤ 528 V ±0 % ; 45 Hz ... 65 Hz ±0 %							
Alternative DC supply		U_G [V]	460 V ±0 % ≤ U_G ≤ 740 V ±0 %							
Mains current with mains filter/choke without mains filter/choke		 I_{Mains} [A] I_{Mains} [A]	 1.5 2.1		 2.5 3.5		 3.9 5.5		 7.0 -	
Ratings for operation on a mains: 3 AC / 400 V / 50 Hz / 60 Hz; 460 V ≤ U_G ≤ 620 V or 3 AC / 480 V / 50 Hz / 60 Hz; 460 V ≤ U_G ≤ 740 V										
			400 V	480 V	400 V	480 V	400 V	480 V	400V	480 V
Motor power (4-pole ASM) at 2 kHz / 4 kHz / 8 kHz*		P_r [kW]	0.37	0.37	0.75	0.75	1.5	1.5	3.0	3.0
		P_r [hp]	0.5	0.5	1.0	1.0	2.0	2.0	4.0	4.0
Output power U, V, W at 2 kHz / 4 kHz / 8kHz*		$S_{r2/4}$ [kVA] S_{r8} [kVA]	1.0 1.0	1.2 1.2	1.7 1.7	2.1 2.1	2.7 2.7	3.2 3.2	4.8 4.8	5.6 5.6
Output power $+U_G$, $-U_G$		P_{DC} [kW]	1.9	2.3	0.7	0.9	0.0	0.0	2.0	2.5
Output current	2/4 kHz*	$I_{r2/4}$ [A]	1.5	1.5	2.5	2.5	3.9	3.9	7.0	7.0
	8 kHz*	I_{r8} [A]	1.5	1.5	2.5	2.5	3.9	3.9	7.0	7.0
	optimum noise 8 kHz*	I_{r8} [A]	1.5	1.5	2.5	2.5	3.9	3.9	7.0	7.0
	optimum noise 16 kHz*	I_{r16} [A]	1.1	1.1	1.8	1.8	2.9	2.9	5.2	5.2
Max. output current for 60 sec	2/4 kHz*	$I_{rmax2/4}$ [A]	2.2	2.2	3.7	3.7	5.8	5.8	10.5	10.5
	8 kHz*	I_{rmax8}[A]	2.2	2.2	3.7	3.7	5.8	5.8	10.5	10.5
	optimum noise 8 kHz*	I_{rmax8} [A]	2.2	2.2	3.7	3.7	5.8	5.8	10.5	10.5
	optimum noise 16 kHz*	I_{rmax16} [A]	1.6	1.6	2.7	2.7	4.8	4.3	7.8	7.8
Power loss (operation with I_{rx})		P_v [W]	50		65		100		150	

* Chopper frequency of the inverter

All other data (🕮 3-4)

3.4.3 Ratings for types 9325 to 9327

150 % overload capability		Type	9325		9326		9327	
Mains voltage		U_r [V]	$320\ V \pm 0\ \% \leq U_r \leq 528\ V \pm 0\ \%$; 45 Hz ... 65 Hz ±0 %					
Alternative DC supply		U_G [V]	$460\ V \pm 0\ \% \leq U_G \leq 740\ V \pm 0\ \%$					
Mains current with mains filter/choke without mains filter/choke		 I_{Mains} [A] I_{Mains} [A]	 12.0 16.8		 20.5 -		 29.0 43.5	
Ratings for operation on a mains: 3 AC / 400 V / 50 Hz / 60 Hz; 460 V ≤ U_G ≤ 620 V or 3 AC / 480 V / 50 Hz / 60 Hz; 460 V ≤ U_G ≤ 740 V								
			400 V	480 V	400 V	480 V	400 V	480 V
Motor power (4-pole ASM) at 2 kHz / 4 kHz / 8 kHz*		P_r [kW]	5.5	5.5	11.0	11.0	15.0	18.5
		P_r [hp]	7.5	7.5	15.0	15.0	20.0	25.0
Output power U, V, W at 2 kHz / 4 kHz / 8kHz*		$S_{r2/4}$ [kVA] S_{r8} [kVA]	9.0 9.0	10.8 10.8	16.3 16.3	18.5 18.5	22.2 22.2	26.6 26.6
Output power $+U_G$, $-U_G$		P_{DC} [kW]	0.0	0.0	0.0	0.0	10.2	11.8
Output current	2/4 kHz*	$I_{r2/4}$ [A]	13.0	13.0	23.5	22.3	32.0	30.4
	8 kHz*	I_{r8} [A]	13.0	13.0	23.5	22.3	32.0	30.4
	optimum noise 8 kHz*	I_{r8} [A]	13.0	13.0	23.5	22.3	29.0	27.0
	optimum noise 16 kHz*	I_{r16} [A]	9.7	9.7	15.2	14.6	21.0	19.0
Max. output current for 60 sec	2/4 kHz*	$I_{rmax2/4}$ [A]	19.5	19.5	35.0	33.5	48.0	48.0
	8 kHz*	I_{rmax8} [A]	19.5	19.5	35.0	33.5	48.0	48.0
	optimum noise 8 kHz*	I_{rmax8} [A]	19.5	19.5	35.0	33.5	43.0	41.0
	optimum noise 16 kHz*	I_{rmax16} [A]	14.5	14.5	22.9	21.8	31.0	29.0
Power loss (operation with I_{rx})		P_V [W]	210		360		430	

* Chopper frequency of the inverter

All other data (📖 3-5)

3.4.4 Ratings for types 9328 to 9330

150 % overload capability		Type	9328		9329		9330	
Mains voltage		U_r [V]	$320\ V \pm 0\ \% \leq U_r \leq 528\ V \pm 0\ \%$; 45 Hz ... 65 Hz ±0 %					
Alternative DC supply		U_G [V]	$460\ V \pm 0\ \% \leq U_G \leq 740\ V \pm 0\ \%$					
Mains current with mains filter/choke without mains filter/choke		 I_{Mains} [A] I_{Mains} [A]	 42.0 -		 55.0 -		 80.0 -	
Ratings for operation on a mains: 3 AC / 400 V / 50 Hz / 60 Hz; 460 V ≤ U_G ≤ 620 V or 3 AC / 480 V / 50 Hz / 60 Hz; 460 V ≤ U_G ≤ 740 V								
			400 V	480 V	400 V	480 V	400 V	480 V
Motor power (4-pole ASM) at 2 kHz / 4 kHz / 8 kHz*		P_r [kW]	22.0	30.0	30.0	37.0	45.0	55.0
		P_r [hp]	30.0	40.0	40.0	49.5	60.0	74.0
Output power U, V, W at 2 kHz / 4 kHz / 8kHz*		$S_{r2/4}$ [kVA] S_{r8} [kVA]	32.6 32.6	39.1 39.1	41.6 41.6	49.9 49.9	61.7 61.7	73.9 73.9
Output power $+U_G$, $-U_G$		P_{DC} [kW]	4.0	4.6	0.0	0.0	5.1	5.9
Output current	2/4 kHz*	$I_{r2/4}$ [A]	47.0	44.7	59.0	56.0	89.0	84.0
	8 kHz*	I_{r8} [A]	47.0	44.7	59.0	56.0	89.0	84.0
	optimum noise 8 kHz*	I_{r8} [A]	43.0	41.0	47.0	44.0	59.0	55.0
	optimum noise 16 kHz*	I_{r16} [A]	30.0	28.0	35.0	33.0	46.0	39.0
Max. output current for 60 sec	2/4 kHz*	$I_{rmax2/4}$ [A]	70.5	70.5	89.0	84.0	134.0	126.0
	8 kHz*	I_{rmax8} [A]	70.5	70.5	89.0	84.0	134.0	126.0
	optimum noise 8 kHz*	I_{rmax8} [A]	64.0	61.0	70.0	65.0	88.0	82.0
	optimum noise 16 kHz*	I_{rmax16} [A]	46.0	42.0	53.0	49.0	69.0	63.0
Power loss (operation with I_{rx})		P_V [W]	640		810		1100	

* Chopper frequency of the inverter

All other data (📖 3-6)

3.4.5 Ratings for types 9331 to 9333

150 % overload capability		**Type**	**9331**		**9332**		**9333**	
Mains voltage		U_r [V]	320 V ±0 % ≤ U_r ≤ 528 V ±0 % ; 45 Hz ... 65 Hz ±0 %					
Alternative DC supply		U_G [V]	460 V ±0% ≤ U_G ≤ 740 V ±0 %					
Mains current with mains filter/choke		I_{Mains} [A]	100.0		135.0		165.0	
Mains current without mains filter/choke		I_{Mains} [A]	-		-		-	
Ratings for operation on a mains: 3 AC / 400 V / 50 Hz / 60 Hz; 460 V ≤ U_G ≤ 620 V or 3 AC / 480 V / 50 Hz / 60 Hz; 460 V ≤ U_G ≤ 740 V								
			400 V	480 V	400 V	480 V	400 V	480 V
Motor power (4-pole ASM) at 2 kHz / 4 kHz / 8 kHz*		P_r [kW]	55.0	75.0	75.0	90.0	90.0	110.0
		P_r [hp]	74.0	100.0	100.0	120.0	120.0	148.0
Output power U, V, W at 2 kHz / 4 kHz / 8kHz*		$S_{r2/4}$ [kVA]	76.2	91.4	103.9	124.0	131.2	158.2
		S_{r8} [kVA]	76.2	91.4	103.9	124.0	124.7	149.0
Output power $+U_G$, $-U_G$		P_{DC} [kW]	0.0	0.0	28.1	32.4	40.6	47.1
Output current	2/4 kHz*	$I_{r2/4}$ [A]	110.0	105.0	150.0	125.0	180.0	171.0
	8 kHz*	I_{r8} [A]	110.0	105.0	150.0	125.0	171.0	162.0
	optimum noise 8 kHz*	I_{r8} [A]	76.0	71.0	92.0	87.0	100.0	94.0
	optimum noise 16 kHz*	I_{r16} [A]	52.0	49.5	58.0	55.0	63.0	55.0
Max. output current for 60 sec	2/4 kHz*	$I_{rmax2/4}$ [A]	165.0	157.0	225.0	213.0	270.0	256.0
	8 kHz*	I_{rmax8} [A]	165.0	157.0	225.0	213.0	221.0	211.0
	optimum noise 8 kHz*	I_{rmax8} [A]	114.0	107.0	136.0	130.0	150.0	141.0
	optimum noise 16 kHz*	I_{rmax16} [A]	78.0	72.0	87.0	83.0	94.0	83.0
Power loss (operation with I_{rx})		P_V [W]	1470		1960		2400	

* Chopper frequency of the inverter

All other data (📖 3-7)

3.5 Fuses and cable cross-sections

3.5.1 Operation of controllers in a UL-approved system

- Use only UL-approved fuses and fuse holders:
  – 500 V to 600 V in the mains input (AC)
  – 700 V in the DC bus circuit
  – Activation characteristic "H" or "K5"
- Only use UL-approved cables

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

3.5.2 Single drives with 120 % overload capability

The values in the table are valid for the operation of controllers with matching motor.

Type	Mains input L1, L2, L3, PE/motor connection U, V, W, PE Operation only with mains filter / mains choke				
	Fuse F1, F2, F3		E.l.c.b.	Cable cross-section 1)	
	VDE	UL	VDE	mm^2	AWG
9321	M 6A	5A	B 6A	1	17
9322	M 6A	5A	B 6A	1	17
9323	M 10A	10A	B 10A	1.5	15
9324	M 10A	10A	B 10A	1.5	15
9325	M 20A	20A	B 20A	4	11
9326	M 32A	25A	B 32A	6	10
9327	M 50A	50A	-	16	5
9328	M 63A	63A	-	25	3
9329	M 80A	80A	-	25	3
9330	M 125A	125A	-	70	2/0
9331	M 160A	175A	-	95	3/0
9332	M 160A	175A	-	95	3/0
9333	M 200A	200A	-	120	4/0

1) The valid local regulations must be observed

3.5.3 Single drives with 150 % overload capability

The values in the table are valid for the operation of controllers with matching motor.

Type	Mains input L1, L2, L3, PE/motor connection U, V, W, PE									
	Operation without mains filter / mains choke					Operation with mains filter / mains choke				
	Fuse		E.l.c.b.	Cable cross-section 1)		Fuse		E.l.c.b.	Cable cross-section 1)	
	VDE	UL	VDE	mm^2	AWG	VDE	UL	VDE	mm^2	AWG
9321	M 6A	5A	B 6A	1	17	M 6A	5A	B 6A	1	17
9322	M 6A	5A	B 6A	1	17	M 6A	5A	B 6A	1	17
9323	M 10A	10A	B 10A	1.5	15	M 10A	10A	B 10A	1.5	15
9324	-	-	-	-	-	M 10A	10A	B 10A	1.5	15
9325	M 32A	25A	B 25A	6	10	M 20A	20A	B 20A	4	11
9326	-	-	-	-	-	M 32A	25A	B 32A	6	10
9327	M 63A	-	-	16	5	M 35A	35A	-	10	7
9328	-	-	-	-	-	M 50A	50A	-	16	5
9329	-	-	-	-	-	M 80A	80A	-	25	3
9330	-	-	-	-	-	M 100A	100A	-	50	0
9331	-	-	-	-	-	M 125A	125A	-	70	2/0
9332	-	-	-	-	-	M 160A	175A	-	95	3/0
9333	-	-	-	-	-	M 200A	200	-	120	4/0

1) The valid local regulations must be observed

3.6 Mains filter

3.6.1 Mains filters for single drives with 120 % overload capability

The filter assignment is valid for the operation of controllers with a matching motor.

Type	Ratings (uk ≈ 6 %)		Lenze order number	
	Mains current	Inductance	for RFI degree A	for RFI degree B
9321	1.5 A	24.00 mH	EZN3A2400H002	EZN3B1500H003
9322	2.5 A	15.00 mH	EZN3A1500H003	EZN3B0900H004
9323	5.0 A	7.50 mH	EZN3A0750H005	EZN3B0750H005
9324	9.0 A	4.00 mH	EZN3A0400H009	EZN3B0400H009
9325	13.0 A	3.00 mH	EZN3A0300H013	EZN3B0250H015
9326	24.0 A	1.50 mH	EZN3A0150H024	EZN3B0150H024
9327	42.0 A	0.80 mH	EZN3A0080H042	EZN3B0080H042
9328	54.0 A	0.80 mH	EZN3A0060H054	EZN3B0060H054
9329	60.0 A	0.55 mH	EZN3A0055H060	EZN3B0055H060
9330	110.0 A	0.30 mH	EZN3A0030H110	EZN3B0030H110
9331	110.0 A	0.30 mH	EZN3A0030H110*	EZN3B0030H110*
9332	150.0 A	0.22 mH	EZN3A0022H150	EZN3B0022H150
9333	200.0 A	0.17 mH	EZN3A0017H200	EZN3B0017H200

* max. permissible operating ambient temperature : +35 °C

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

3.6.2 Mains filters for single drives with 150 % overload capability

The filter assignment is valid for the operation of controllers with a matching motor.

Type	Ratings (uk ≈ 6 %)		Lenze order number	
	Mains current	Inductance	for RFI degree A	for RFI degree B
9321	1.50 A	24.00 mH	EZN3A2400H002	EZN3B2400H002
9322	2.5 A	15.00 mH	EZN3A1500H003	EZN3B1500H003
9323	4.0 A	9.00 mH	EZN3A0900H004	EZN3B0900H004
9324	7.0 A	5.00 mH	EZN3A0500H007	EZN3B0500H007
9325	13.0 A	3.00 mH	EZN3A0250H013	EZN3B0250H013
9326	24.0 A	1.50 mH	EZN3A0150H024	EZN3B0150H024
9327	32.0 A	1.10 mH	EZN3A0110H030	EZN3B0110H030
9328	47.0 A	0.80 mH	EZN3A0080H042	EZN3B0080H042
9329	60.0 A	0.55 mH	EZN3A0055H060	EZN3B0055H060
9330	90.0 A	0.37 mH	EZN3A0037H090	EZN3B0037H090
9331	110.0 A	0.30 mH	EZN3A0030H110	EZN3B0030H110
9332	150.0 A	0.22 mH	EZN3A0022H150	EZN3B0022H150
9333	200.0 A	0.17 mH	EZN3A0017H200	EZN3B0017H200

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

3.7 Dimensions

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

4 Installation

4.1 Mechanical installation

4.1.1 Important notes

- Use the controllers only as built-in devices!
- Observe the free space requirements!
  – You can install several controllers next to each other without free space in a control cabinet.
  – Allow a free space of 100 mm at the top and at the bottom.
- Ensure unimpeded ventilation of cooling air and outlet of exhaust air.
- If the cooling air contains pollutants (dust, flakes, grease, aggressive gases), which may impair the function of the controller:
  – Take suitable preventive measures , e.g. separate air duct, installation of filters, regular cleaning, etc.
- Do not exceed the permissible range of the operating ambient temperature. (📖 3-2)
- If the controllers are permanently subjected to vibration or shaking:
  – 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)
  – Version V003, thermally separated with an external radiator in ”Cold Plate” technology (e.g. with convection cooling).

4.1.2 Standard assembly with fixing rails or fixing brackets

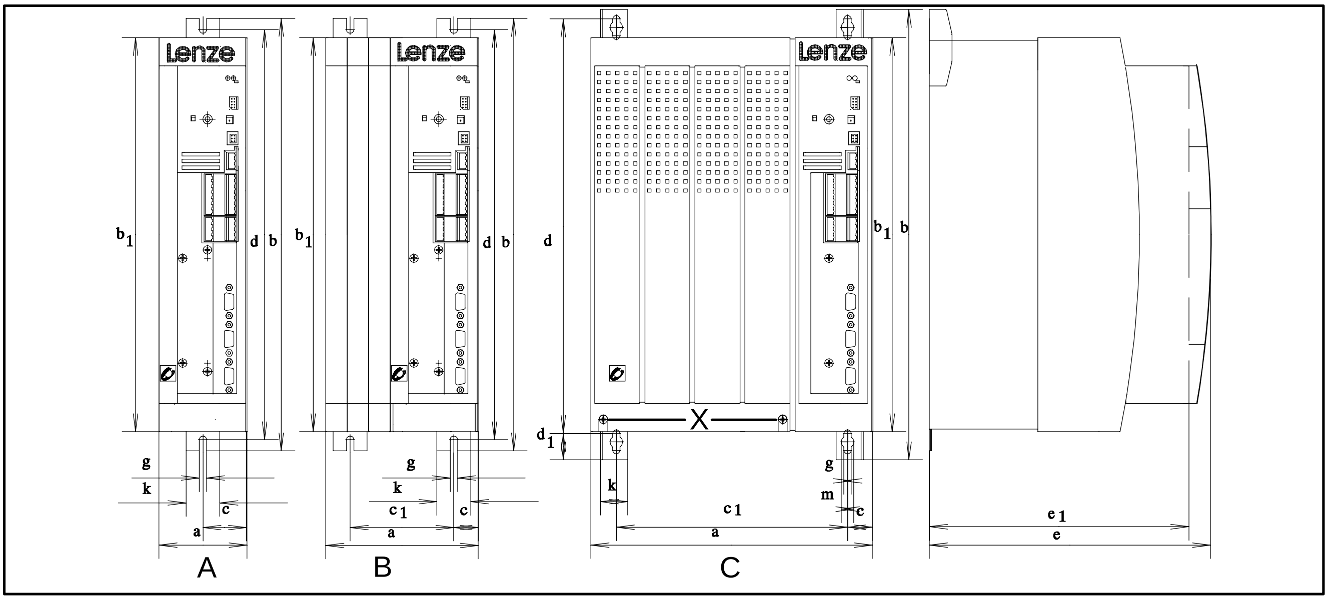

Fig. 4-1 Dimensions for assembly with fixing rails / fixing brackets

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	580	510	28.5	283	532	38	285	265	11	24	18
9331	C	340	672	591	28.5	283	624	38	285	265	11	28	18
9332, 9333	C	450	748.5	680	30.5	389	702	38	285	265	11	28	18

* When using a plug-on field bus module, allow a free space for assembling the connecting cable

All dimensions in mm

Controllers 9321 to 9326

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

Controller types 9327 to 9333

- 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 onto the controller housing

4.1.3 Assembly of the ”Cold Plate” version

4.1.3.1 General

Applications

- Use of radiators without independent blowers:
  - an intense pollution of the cooling air, for example, prevents the operation of external blowers, since it would have a negative effect not only on the correct functioning, but also on the operable life.
- High protection level with thermal separation:
  - if thermal separation must be achieved because of the heat developed within the control cabinet, and the level of protection for the external blower must be better than IP41.
- Use of the drive controller directly at the machine, with reduced mounting depth:
  - Parts of the machine construction take over the cooling function
- Common cooling units (water radiator, forced convection cooler, etc.) for all drive controllers are provided in the system concept.
- For continuous power outputs >22 kW convection cooling is technically not achievable. In such cases, forced convection (e.g with water cooling)is required.

4.1.3.2 Requirements for the cooler/radiator

The waste heat generated by the drive controller can be removed by coolers/radiators that operate with various media (air, water, oil etc.).

In addition to the characteristics specified by the user, the following points are important fro reliable operation of the drive controller:

- Good thermal contact with the cooler:
  - the contact area between the cooler and the drive controller must be at least as large as the cooling plate of the drive controller.
  - the surface flatness of the contact area must be within about 0.05 mm.
  - the cooler and heatsink must be attached using all the screwed joints that are specified.
  - (🕮 4-5 ff: further information)
- Thermal resistance $R_{thmin\ heatsink}$ (transition from cooler to cooling medium) must be within the values in the table. The values apply for
  - operating the drive controller under rated conditions. (🕮 3-3 ff.)
  - a maximum heatsink temperature of 75 °C; for measurement point: see Fig. 4-2, Fig. 4-3.

Drive controller / brake units	Cooling path	
	power to be dissipated P_{VAR} [W]	$R_{thmin\ heatsink}$ [°C/W]
9321-V003	24	1.45
9322-V003	42	0.85
9323-V003	61	0.57
9324-V003	105	0.33
9325-V003	180	0.19
9326-V003	360	0.10
9327-V003	410	0.085
9328-V003	610	0.057
9351-V003	100	0.3
9352-V003	63	0.3

4.1.3.3 Thermal response of the complete system

The thermal behaviour of a system is affected by several ambient factors. When dimensioning a control cabinet / a system, please observe the following points:

Ambient temperature of the drive controller

The rated data and the derating for higher temperatures still apply for the ambient temperature of the drive controller.

Heat dissipation inside control cabinets

In addition to the heat generated by the instruments, that is removed via the external coolers/radiators, there are further losses that must be taken into account during dimensioning:

- Losses within the drive controller:
  – these losses arise in the electronics supply, blower, DC-link(DC-bus) capacitors etc.
- Losses in the mains supply and motor side components:
  – the losses in these components can be found in the corresponding technical data (catalogue part I).
- Heat radiated by the external radiator in the enclosed space:
  – this portion of the thermal energy depends on the type of cooling aggregate, its mounting, and other factors.
  – no data available at present.
- 9327-V003 and 9328-V003 with other coolers:
  – no data available at present, empirical determination is necessary.

Heat distribution between common heatsinks/coolers within the control cabinet

If you assemble several components (drive controller, brake units etc.) on a common radiator/cooler, then care must be taken that the temperature of the drive heatsink does not exceed 75 °C.

4.1.3.4 Assembly preparation

- Apply heat-conducting paste before bolting together the cooler and the heatsink of the drive controller, to keep the thermal resistance as low as possible.
- The quantity of heat-conducting paste supplied in the package is sufficient for an area of approx. 1000 cm^2.

Applying the heat-conducting paste

1. Clean the area of contact between the heatsink and the cooler with methylated spirits.
2. Apply the heat-conducting paste thinly, with a palette knife or a brush.

4.1.3.5 Mounting the types 9321-V003 ... 9326-V003

- Mount the drive controller onto the heatsink, using the mounting brackets and the M5 x 20 bolts.
- Tightening torque: 3.4 Nm.

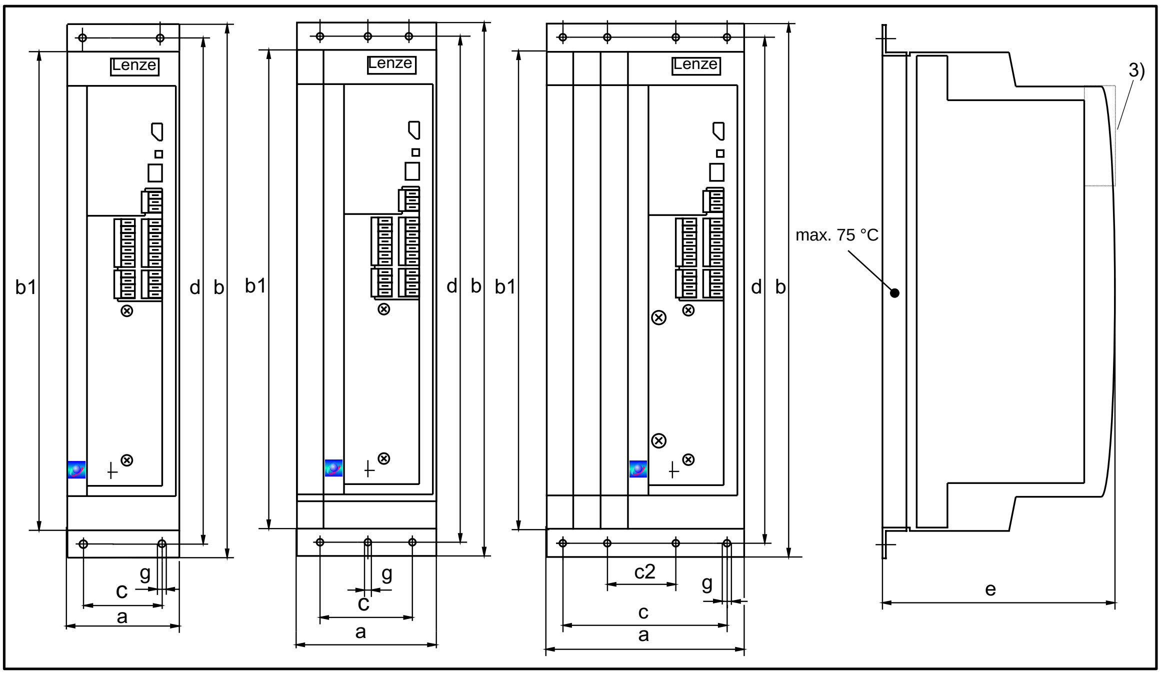

Fig. 4-2 Dimensions for 9321-V003 ... 9326-V003: mounting in a switchgear cabinet

[mm]	a	b	b1	c	c2	d	e *	g
9321-V003 9322-V003	78	381	350	48	-	367	168	6.5
9323-V003 9324-V003	97	381	350	67	-	367	168	6.5
9325-V003 9326-V003	135	381	350	105	38	367	168	6.5

* with pluggable fieldbus or I/O module:
Allow for the mounting depth and the space for installing the connecting cables

4.1.3.6 Mounting the types 9327-V003 and 9328-V003

- Fix the drive controller to the heatsink, using the M5 x 25 fixing bolts.
- Tightening torque: 3.4 Nm.

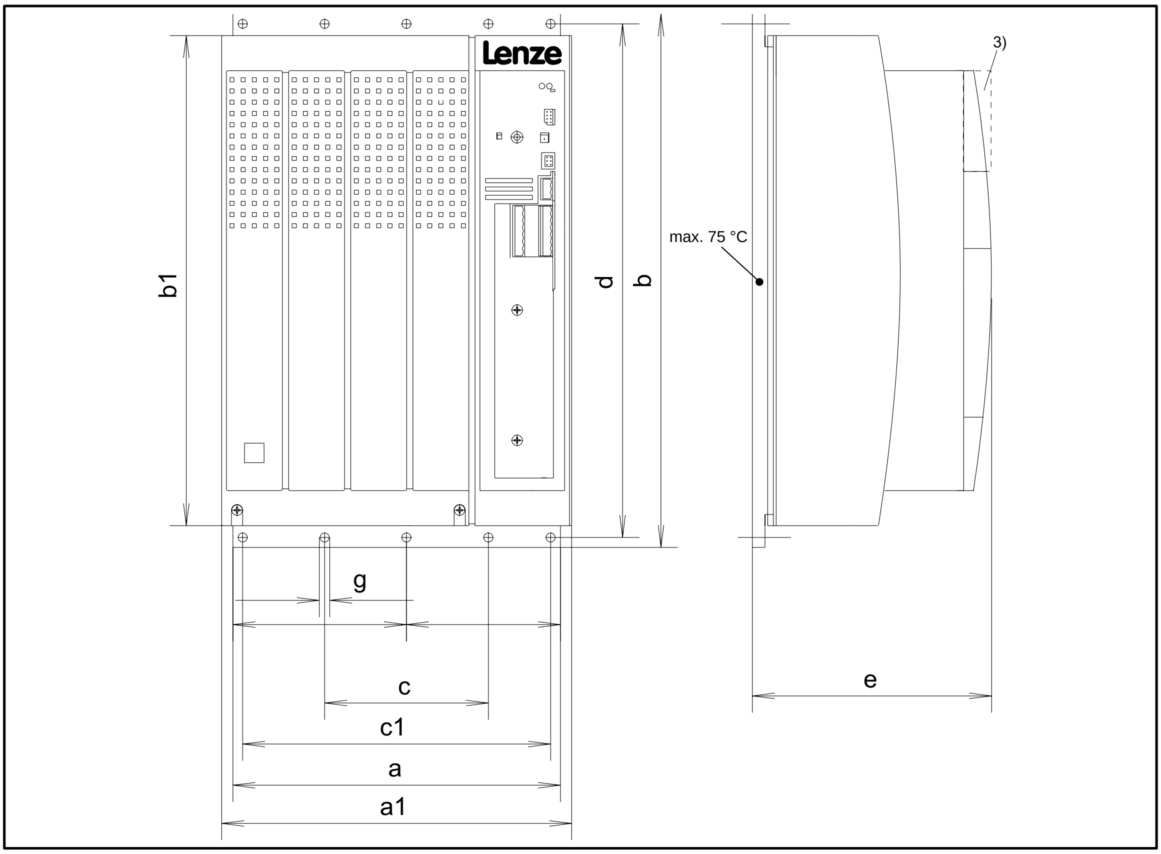

Fig. 4-3 Dimensions for 9327-V003 and 9328-V003: installation in a switchgear cabinet

[mm]	a	a1	b	b1	c	c1	d	e *	g
9327-V003 9328-V003	234	250	381	350	110	220	367	171	6.5

* with pluggable fieldbus or I/O module:
Allow for the mounting depth and the space for installing the connecting cables

4.2 Electrical installation

For information on the installation according to EMC see chapter 4.3. (📖 4-33)

4.2.1 Protection of persons

Danger!

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

Symbol on the RCCB	Meaning
∿	AC sensitive RCCB, type AC
∿ ⎍	pulse-current sensitive RCCB, type A)
⎓ ∿ ⎍	universal-current sensitive RCCB, type B

Definition

For “residual-current circuit breaker” the expression “RCCB” is used in the following text.

Protection of persons and animals

DIN VDE 0100 with residual-current operated protective devices (RCCB):
- The controllers have an internal mains rectifier. In the event of a short-circuit to frame, a DC fault current can prevent the activation of the AC-sensitive or pulse-current sensitive RCCB and thus block the protective function for all electrical equipment operated on this RCCB. We therefore recommend:
  - ”pulse-current sensitive RCCB” in systems with controllers on a single-phase AC mains.
  - ”universal-current RCCB” in systems with controllers on a 3-phase mains.

Rated fault current

Observe the rated fault current for the selection of the RCCB.
The RCCB may cause false tripping because of:
- capacitive leakage currents between cable screens (especially with long screened motor cables),
- the simultaneous connection of several controllers to the mains supply,
- use of RFI filters.

Installation

You can install RCCBs only between the mains supply and the controller.

Note for the use of universal-current sensitive RCCBs

- Universal-current sensitive RCCBs have been defined for the first time in the European standard EN 50178 (as of October 1997). The EN 50178 was harmonized and has been effective since October 1997. It supersedes the national standard VDE 0160. Universal-current sensitive RCCBs are also described in the IEC 755.
- RCCBs with a fated fault current of:
  - 30 mA are suitable only in systems with controllers on a single-phase AC mains supply.
  - 300 mA are suitable in systems with controllers on a 3-phase mains.

Mains isolation / Protection against contact

The control inputs and outputs of all controllers are isolated from the mains. Please observe the description of the protection against contact on the following page.

Replace defective fuses

Replace defective fuses with the prescribed type only when no voltage is applied.
- For single drives, the controller carries a hazardous voltage up to three minutes after mains disconnection.
- In a drive network, all controllers must be inhibited and disconnected from the mains.

Disconnect controller from the mains

Make a safety connection/disconnection between the controller and the mains only via a contactor on the input side.
- Please note that in a drive network all controllers must be inhibited.

Mains isolation

The controllers have an insulation (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 insulation according to VDE0160). The protection against contact is ensured without any further measures.

Danger!

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

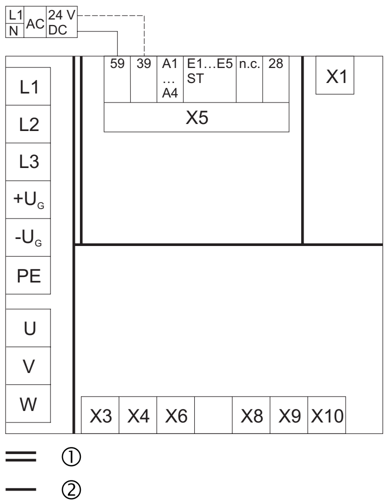

Fig. 4-4 Basic isolation on the controller

① reinforced insulation
② simple basic insulation

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4.2.2 Protection of the controller

Stop!

The controllers contain electrostatically sensitive components.

- The personnel must be free of electrostatic charge prior to assembly and service operations:
  – Discharging is possible by touching the PE fixing screw or another grounded metal part in the control cabinet.

- Length of the screws for the connection of the screen cable/screen plate for the types 9327 to 9333: < 12 mm.
- Frequent mains switching can overload the internal inrush-current limitation. For cyclic mains switching, the controller must not be switched more frequently than every three minutes.
- Operate the controller types 9324, 9326, 9328 and 9330 ... 9333 only with a suitable mains filter. (🕮 3-13)
- The controller is protected by external fuses. (🕮 3-11)
- In the event of condensation, connect the controller to the mains voltage only after the visible humidity has evaporated.
- Cover unused control inputs and outputs with plugs or with protective covers (included in the scope of supply) for the Sub-D inputs.

4.2.3 Motor protection

- Complete motor protection according to VDE:
  – By overcurrent relays or temperature monitoring
  – Required for group drives
  (motors connected in parallel to a controller)

  – We recommend using a PTC or thermostat with PTC characteristic (thermostats are standard in Lenze standard AC asynchronous DERAXX/DFRAXX) for temperature monitoring of the motor.
- When using motors with insulation which is not suitable for inverter operation:
  – Please contact your motor supplier.
  Lenze AC motors are designed for inverter operation.
- With the corresponding parameter setting, the controllers generate field frequencies up to 600 Hz:
  – When operating inappropriate motors, dangerous overspeeds may occur and result in the destruction of the drive.

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4.2.4 Mains types / mains conditions

Please observe the restrictions of each mains type!

Mains	Operation of the controllers	Notes
With grounded neutral (TT/TN mains)	No restrictions	• Observe controller ratings
with isolated neutral (IT mains)	Possible, if the controller is protected in the event of an earth fault in the mains supply • by suitable equipment for detecting an earth fault and • the controller is disconnected directly from the mains	A safe operation is not ensured at the inverter output in the event of an earth fault
With grounded phase	The operation is possible only with one version	Contact Lenze
DC supply via $+U_G/-U_G$	The DC voltage must be symmetrical with respect to PE	The controller will be destroyed if the $+U_G$ or $-U_G$ conductor is grounded

4.2.5 Interactions with compensation equipment

- Controllers only consume a very small fundamental reactive power from the AC mains. A compensation is therefore not necessary.
- If you operate controllers on mains with compensation equipment, you must use chokes for this equipment.
  – Please consult the supplier of the compensation equipment.

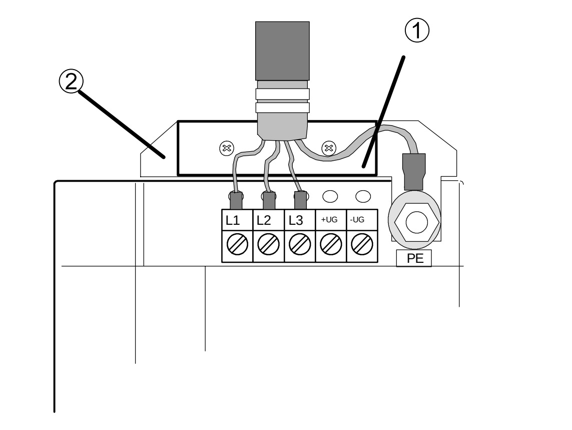
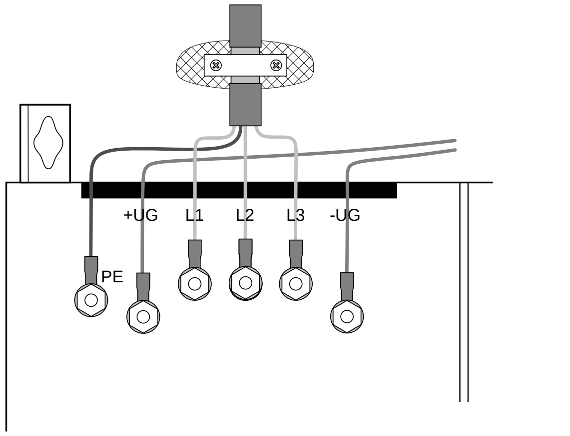
4.2.6 Specification of the cable used

- The cables used must comply with the required approvals of the application (e.g. UL).
- The prescribed minimum cross-sections for PE conductors must be maintained in all cases. The cross-section of the PE conductor must be at least as large as the cross-section of the power connections.
- The screening quality of a cable is determined by:
  – a good screen connection
  – a low screen resistance
  Only use screens with tin-plated or nickel-plated copper braids!
  Screens of steel braid are not suitable.
  – the contact ratio of the screen braid:
  at least 70 % to 80 % with cover angle 90 degrees

4.2.7 Power connections

Controller	Preparation 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 ... 9333	• 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 to 9326	Types 9327 to 9333
	
Make the correct screen connection with screened cables (required parts in the accessory kit): • Bolt screen plate ① to fixing brackets ②. • Fix screen using cable lugs. Do not use as a strain relief! • To improve the screen connection: Connect screen additionally at the stud next to the power connections.	Correct screen connection with screened cables: • Connect the screen with suitable clamp on the conducting control cabinet mounting plate. • To improve the screen connection: Connect screen additionally at the stud next to the power connections.

- Connect mains cables to the screw terminals L1, L2, L3.
- Connect cables for brake unit (935X), supply module (934X) or further controllers in the DC-bus connection to the screw terminals +UG, -UG at the top of the controller.
- Max. permissible cable cross-sections and screw tightening torques:

	Terminals		
Type	**max. permissible cable cross-sections**	**L1, L2, L3, +UG, -UG**	**PE connection**
9321 - 9326	4 mm^2 1)	0.5 ... 0.6 Nm (4.4 ... 5.3 lbin)	3.4 Nm (30 lbin)
9327 - 9329	25 mm^2 2)	4 Nm (35 lbin)	
9330 - 9331	95 mm^2 2)	7 Nm (62 lbin)	
9332 - 9333	120 mm^2 2)	12 Nm (106.2 lbin)	

1) with plug connector: 6 mm^2
with wire crimp cap: 4 mm^2
2) with ring cable lug: Cross-section is limited only by the cable entry in the housing

Fuses

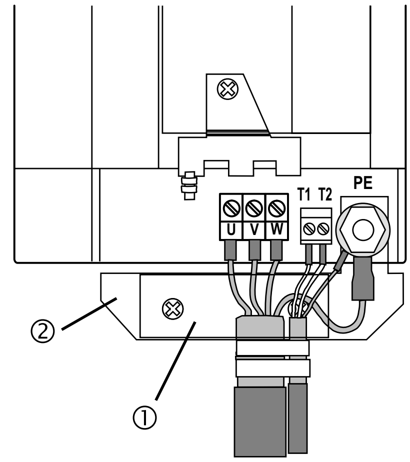
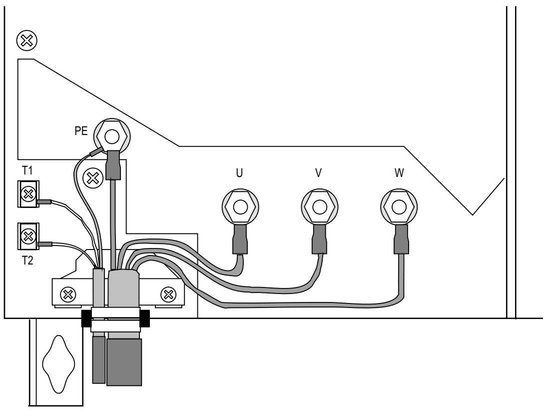
Fuses and cable cross-sections	The specifications in Chapter 3.5 are recommendations. (📖 3-11) They refer to the use • in control cabinets and machines • installation in the cable duct • max. ambient temperature +40 °C.
Selection of the cable cross-section	Take the voltage drop under load (acc. to DIN 18015 part 1: 3 %) into account for the selection. ≤ 3 %).
Protection of the cables and the controller on the AC side (L1, L2, L3)	• By standard commercial fuses. • Fuses in UL-conform plant 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 by "H" or "K5".
Protection of the cables and the drive controller on the DC side (+UG, -UG) (+UG, -UG)	• By means of recommended DC fuses. • The fuses /fuse holders recommended by Lenze are all UL approved.
For DC-bus connection or supply by means of a DC source	Please observe the notes in part F of the systems manual.
Connection of a brake unit	If the brake unit is connected to the terminals +UG / -UG, the fuses and cross-sections listed in Chapter 3.5 are not valid for the brake unit. These unit-specific data can be obtained from the technical documentation of the brake unit.
Further information	📖 3-11 Protection of the cables and controllers
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

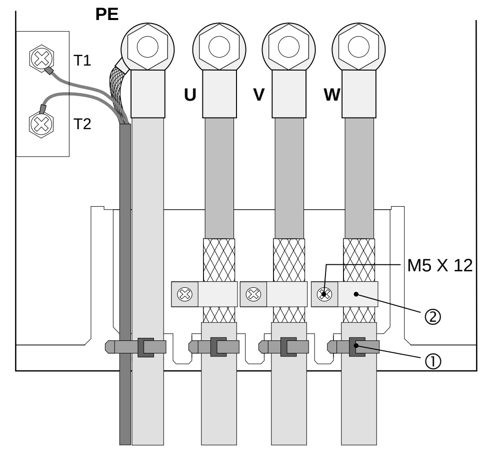
To ensure proper EMC suppression, we recommend using only screened motor cables.

Tip!

The screening of the motor cable is only required to comply with existing standards (e.g. VDE 0160, EN 50178).

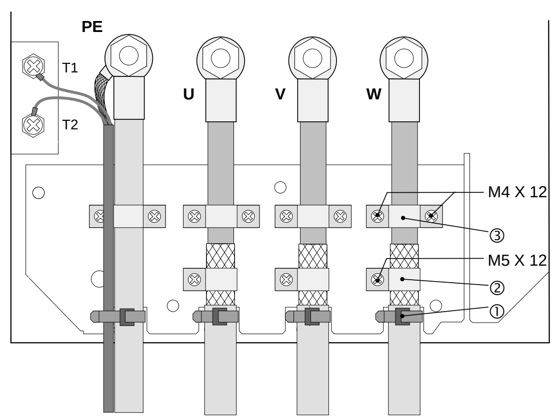
Types 9321 to 9326	
	Make a correct screen connection with screened cables (required parts in the accessory kit): • Bolt screen plate ① to fixing brackets ②. • Fix the screen of the motor cable and thermostat. Do not use as a strain relief! • To improve the screen connection: Connect screens additionally to the PE stud next to the motor connections.
Types 9327 to 9329	
	Make a correct screen connection with screened cables: • Fix the screen of the motor cable and thermostat. Do not use as a strain relief! • To improve the screen connection: Connect screens additionally to the PE stud next to the motor connections.

Types 9330 and 9331



- Carry out strain relief using cable binders ①.
- Make a correct screen connection with screened cables:
  – Apply motor cable screen to the screening plate using clamp and screws M5x12 ②.
  – Connect the thermostat screen to the PE stud next to the motor connections over a large surface.

Types 9332 and 9333



- Carry out strain relief using clamps and M4x12 bolts ③.
  – An additional strain relief/fixing is possible with cable binders ①.
- Make a correct screen connection with screened cables:
  – Apply motor cable screen to the screening plate using clamp and M5x12 bolts ②.
  – Connect the thermostat screen to the PE stud next to the motor connections over a large surface.

Installation

- The motor cable should be as short as possible, because of the positive effect on the drive characteristic.
  - – The table below indicates the relationship of the motor cable length and the (possibly) required output filters.
  - – For group drives (several motors connected to one controller) it is necessary to calculate the resulting cable length l_{res}:

$$l_{res} = \text{Total length of all motor cables} \cdot \sqrt{\text{number of motor cables}}$$

  - – The values in the table below apply for switching frequencies $\leq$ 8 kHz (C0018 = 0, 1, 2, 3, 4, 6). When the drive controller is operated with switching frequencies $>$ 8 kHz then other measures may be necessary. Please consult Lenze.
  - – When using unscreened motor cables, the data indicated in the table below are valid for the double motor-cable length.
  - – Please contact Lenze when the absolute or resulting motor-cable lengths are $>$ 200 m.

Stop!

- Observe the permissible chopping frequencies when using output filters and motor chokes.
  - – Set the controller to a fixed frequency (e.g. C0018 = 4 ⇒ 8 kHz fixed).

<table>
<tr><th>Type</th><th colspan="3">output filters additionally required in the motor cable</th></tr>
<tr><td>9321/9322/9323
9324/9325/9326</td><td>none</td><td>Motor filter / Motor choke</td><td>Sine filter</td></tr>
<tr><td>9327/9328</td><td rowspan="2">none</td><td>Motor filter / Motor choke</td><td rowspan="2">motor choke
(Contact Lenze)</td></tr>
<tr><td>9329/9330/9331
9332/9333</td><td>none</td></tr>
<tr><td>(resulting)
Motor cable length,
screened</td><td>0 ... 50 m</td><td>50 ... 100 m</td><td>100 ... 200 m</td></tr>
</table>

- Connect motor cables to the screw terminals U, V, W.
  – Observe correct pole connection.
  – Max. permissible cable cross-sections and screw tightening torques:

Type	Terminals				
	max. permissible cable cross-sections	U, V, W	PE connection	Screen/ Strain relief	T1, T2
9321 - 9326	4 mm² 1)	0.5 ... 0.6 Nm (4.4 ... 5.3 lbin)	3.4 Nm (30 lbin)	-	0.5 ... 0.6 Nm (4.4 ... 5.3 lbin)
9327 - 9329	25 mm² 2)	4 Nm (35 lbin)		-	
9330 - 9331	95 mm² 2)	7 Nm (62 lbin)		3.4 Nm (30 lbin)	
9332 - 9333	120 mm² 2)	12 Nm (106.2 lbin)		M4: 1.7 Nm (15 lbin) M5: 3.4 Nm (30 lbin)	

1) with plug connector: 6 mm²
with wire crimp cap: 4 mm²
2) with ring cable lug: Cross-section is limited only by the cable entry in the housing

Tip!
Switching on the motor side of the controller is permitted. (🕮 6-2)

4.2.7.3 Connection of a brake unit

- When connecting a brake unit (brake module 9351 with internal brake resistor or brake chopper 9351 with external brake resistor) observe the corresponding operating instructions in all cases.

Stop!
- Design the circuit such that if the temperature monitoring of the brake unit is released
  – the controllers are inhibited (X5/28 = LOW).
  – the mains is disconnected.

(🕮 4-33 or Fig. 4-6)

4.2.7.4 Connection diagram

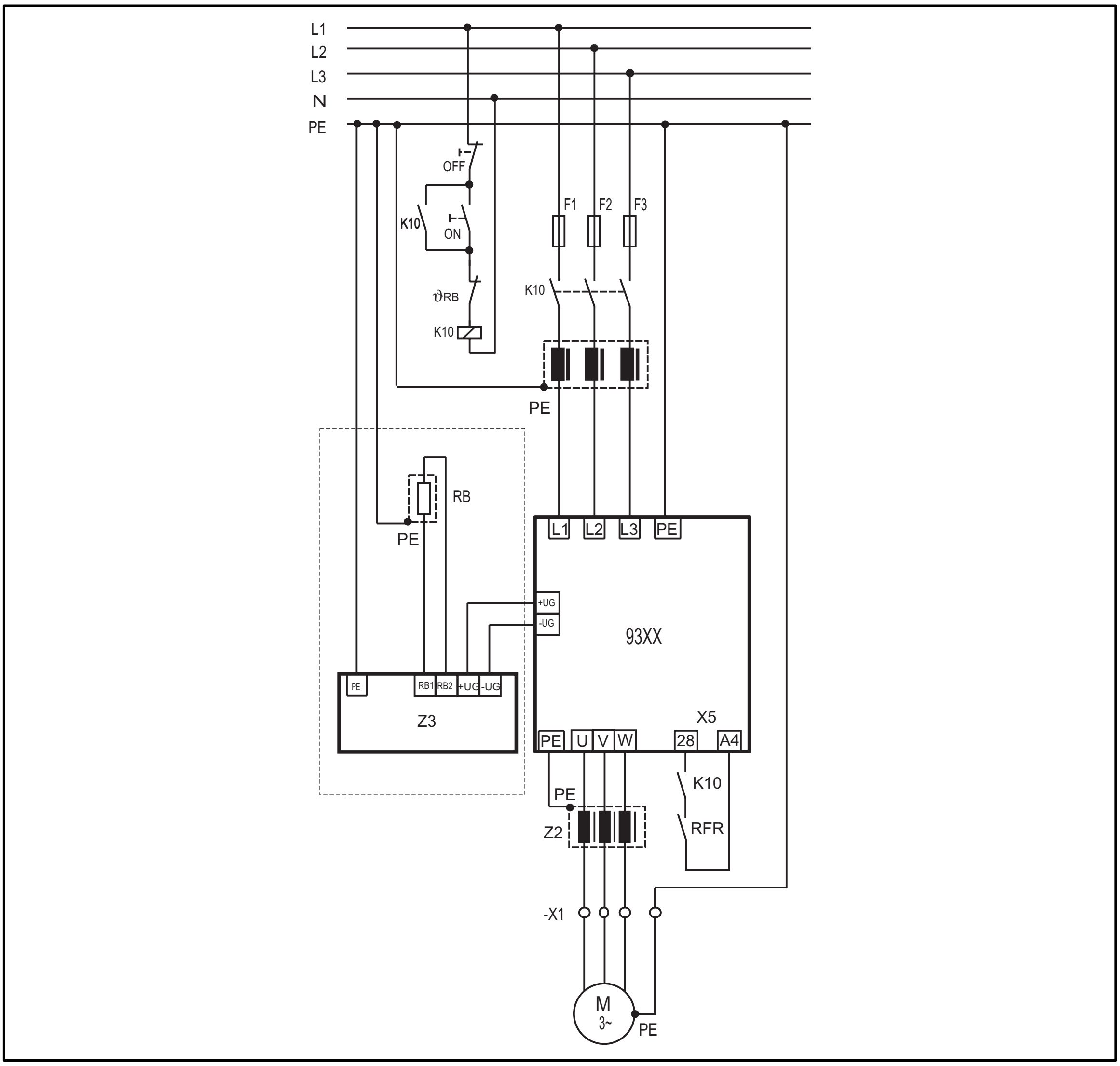


Fig. 4-5 Power connections 93XX

F1, F2, F3	Fuses
K10	Mains contactor
Z1	For mains choke / mains filters, see systems manual, part I, “Accessories”
	Operate types 9328-9333, 9324/9326 only with the assigned mains choke / mains filter
Z2	For motor filters / sine filters, see systems manual, part I, “Accessories”
Z3	For brake choppers / brake modules, see systems manual, part I, “Accessories”
RB	For brake resistors, see systems manual, part I, “Accessories”
ϑ_{RB}	Temperature monitoring for brake resistor
X1	Terminal strip in control cabinet

4.2.8 DC-bus connection of several drives

Decentralized supply with brake module

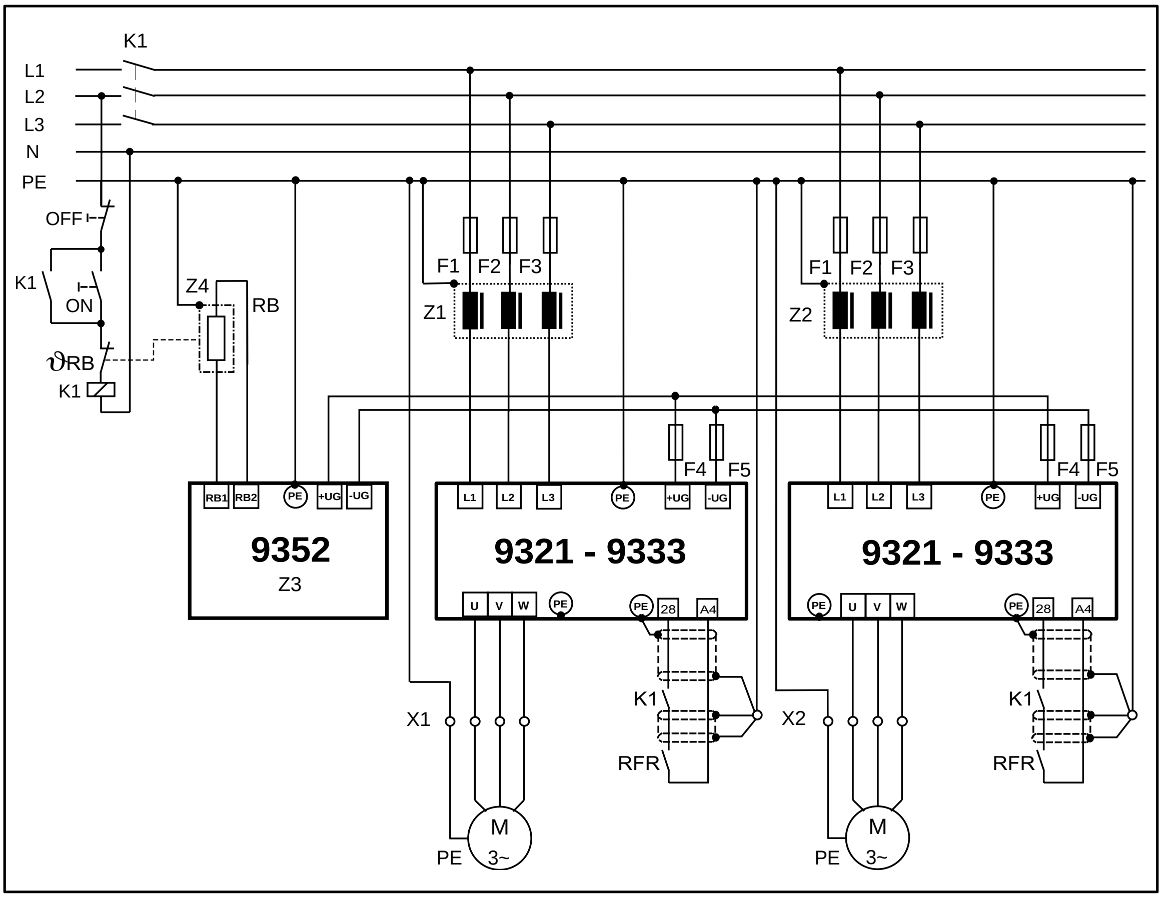


Fig. 4-6 Decentralized supply for DC-bus connection of several drives`

Z1, Z2	Mains filter (for dimensioning see systems manual, part F)
Z3	Brake chopper
Z4	Brake resistor (for r.m.s. current monitoring see systems manual, part F)
F1 ... F5	Fuses (📖 3-11 and 4-12)
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 bimetallic relay is required for the monitoring of the mains supply.

Tip!

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

Central supply with regenerative supply module

- When connecting a supply and energy recovery (regenerative) module, observe the corresponding operating instructions in all cases.

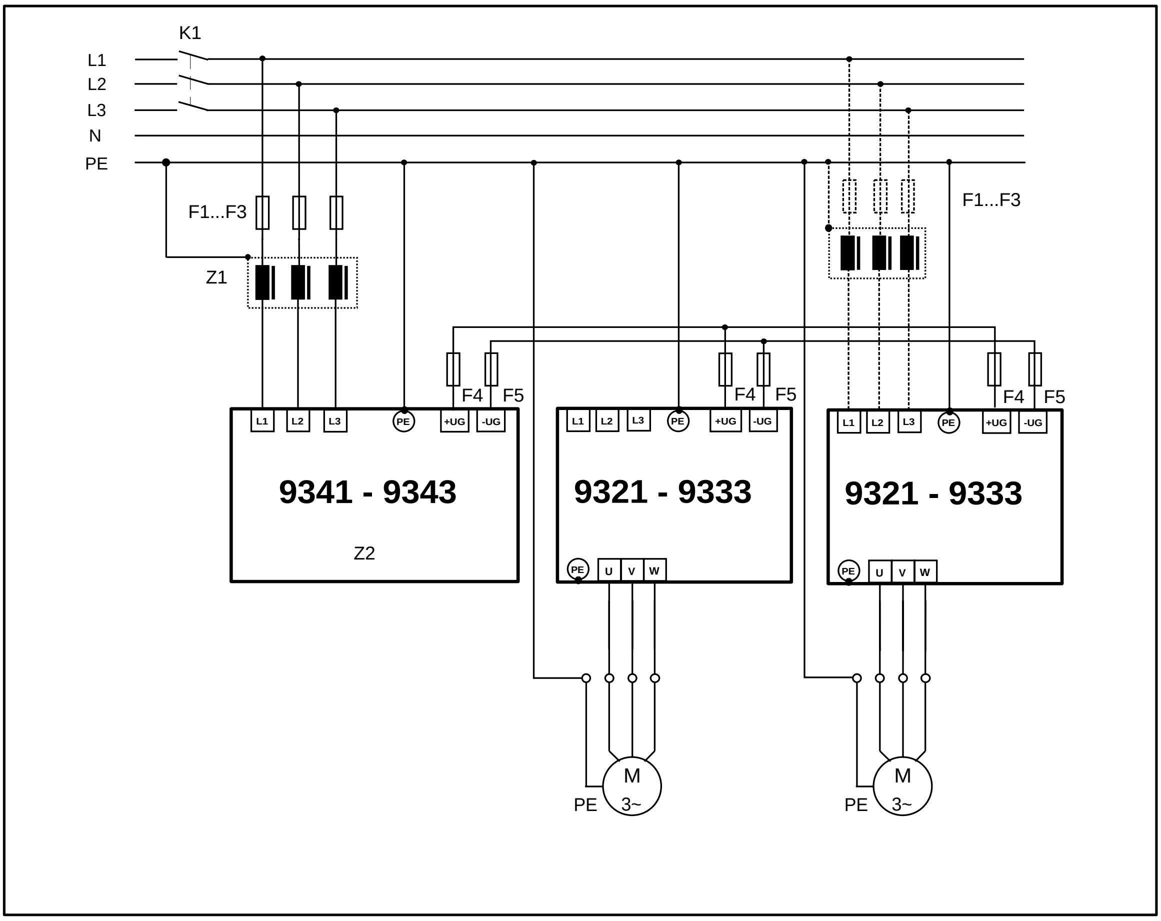


Fig. 4-7 Central supply for DC-bus connection of several drives

Z1	Mains filter
Z2	Supply module
F1 ... F5	Fuses (📖 3-11 and 4-12)
K1	Main contactor

Tip!

If the power supply of the supply module is not sufficient, a parallel supply can be installed via the mains input of the controller. In this case, the controller can only be operated with the assigned mains filters (at least acc. to limit value class A).

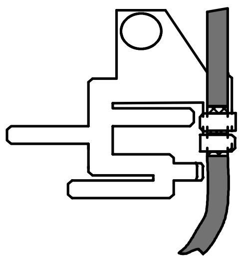
For dimensioning the mains filter, see Manual, part F.

4.2.9 Control connections

4.2.9.1 Control terminals

- 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 one-sided screening of all cables for analog signals, to avoid signal distortion.
- Attach the screening of the control cables to the common screening plate on the metal front surface (bolt length max. 12 mm).

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.

Assignment of the control terminals

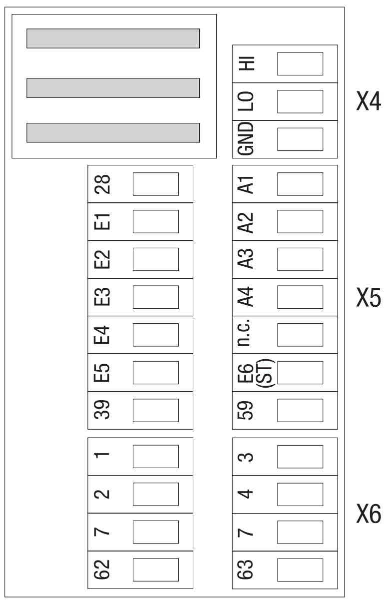
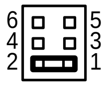
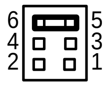


Fig. 4-8 Layout of the control connections on the front of the controller

X4	System bus
X5/E1 ... X5/E6 (ST)	DIGIN
X5/A1 ... X5/A4	DIGOUT
X6/1, X6/2	AIN1
X6/3, X6/4	AIN2

Installation

	Terminal	Use (Default setting is printed in bold)		Level	Data
Analog inputs	1, 2	Differential master-voltage input **(Main setpoint)**	 Jumper X3	-10 V to +10 V	Resolution: 5 mV (11 bit + sign)
		Differential master-current input	 Jumper X3	-20 mA to +20 mA	Resolution: 20 µA (10 Bit + sign)
	3, 4	Differential master-voltage input **(inactive)**	Jumper X3 has no effect	-10 V to +10 V	Resolution: 5 mV (11 bit + sign)
Analog outputs	62	Monitor 1 **(Actual speed)**		-10 V to +10 V; max. 2 mA	Resolution: 20 mV (9 bit + sign)
	63	Monitor 2 **(Actual motor current)**		-10 V to +10 V; max. 2 mA	Resolution: 20 mV (9 bit + sign)
	7	Internal ground, GND		-	-
Digital inputs	28	Controller enable (RFR)		HIGH	LOW: 0 ... +4 V HIGH: +13 ... +30 V Input current at 24 V: 8 mA per input Reading and writing of the inputs: once per msec (average value)
	E1	freely assignable **(remove CW rotation / QSP)**		HIGH	
	E2	freely assignable **(remove CCW rotation / QSP)**		HIGH	
	E3	freely assignable **(enable JOG-setpoint 1)**		HIGH	
	E4	freely assignable **(TRIP set)**		LOW	
	E5	freely assignable **(TRIP-reset)**		LOW-HIGH edge	
	E6 (ST)	freely assignable		HIGH	
Digital outputs	A1	freely assignable **(TRIP)**		LOW	LOW: 0 ... +4 V HIGH: +13 ... +30 V Output current: max. 50 mA per output (external resistance at least 480 Ω at 24 V) Updating of the outputs: once per msec
	A2	freely assignable **(n_{act} < n_x) - Q_{min}**		LOW	
	A3	freely assignable **(standby/ready to operate RDY)**		HIGH	
	A4	freely assignable **(Maximum current reached - I_{max})**		HIGH	
	39	Ground for digital inputs and outputs		-	
	59	Supply input for the control module: 24 V external (I > 1 A)		-	

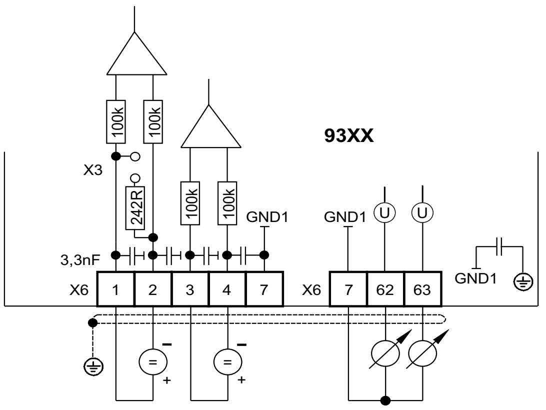
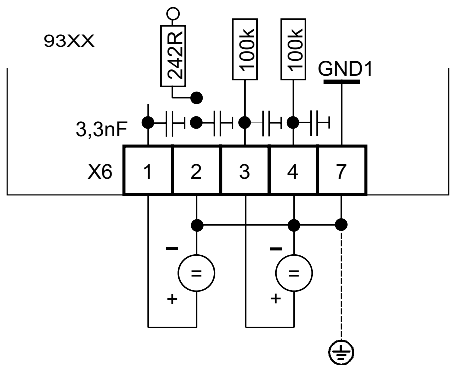
Tip!

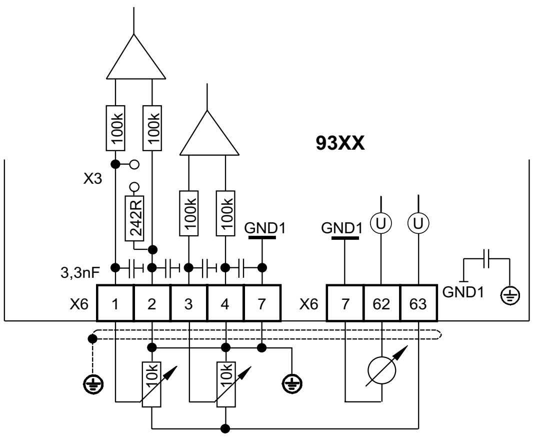
To change the jumper, remove plug-on module, if necessary.

Connection of analog signals

Analog signals are connected via the 2 × 4-pole terminal block X6.

Depending on the use of the analog inputs, the jumper of X3 must be set accordingly.

Connection for external supply voltage	
	**STOP!** ● The maximum permitted voltage difference between an external voltage source and the GND1 (terminal X6/7) of the controller is 10V (common mode). ● The maximum permitted voltage difference between GND1 (terminal X6/7) and the PE of the controller is 50 V.
	Limit the voltage difference ● by overvoltage clamping components or ● by direct connection of terminal(s) X6/2, X6/4 and X6/7 to GND1 and PE (see diagram at left).

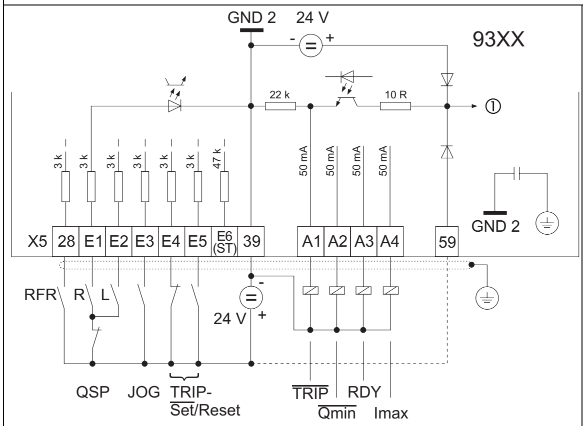
Connection for internal voltage supply	
	Configuration of the internal voltage supply: ● Set a freely assignable analog output (AOUTx) to HIGH level. ● e.g. terminal X6/63: Assign C0436 with FIXED100%.10V are thus applied across terminal X6/63. **Tip!** For this application, you may use one of the predefined configurations in C0005. The output is assigned automatically with FIXED100% (corresponds to 10 V at output X6/63) by C005 = XX1X (e.g. 1010 for speed control via terminals).

Connection of digital signals

Digital signals are connected via the 2 × 7-pole terminal block X5.

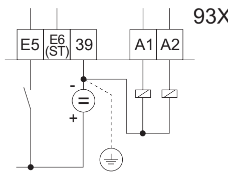
The levels of the digital inputs and outputs are PLC compatible.

Only use relays with low-current contacts for the switching of the signal cables (recommendation: relays with gold-plated contacts).

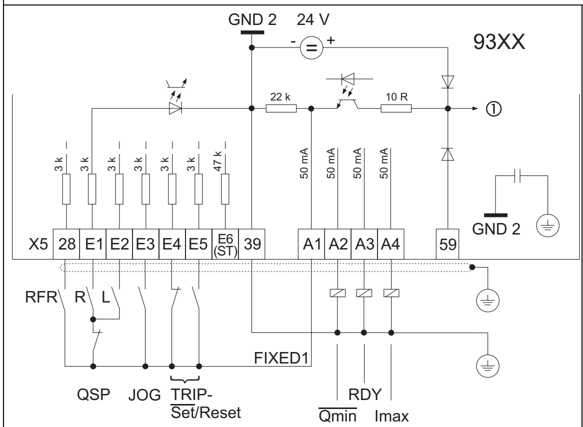
<table>
<tr><th colspan="2">Connection for external voltage supply</th></tr>
<tr><td>

① Supply voltage for the control card</td>
<td>The external voltage source supplies the digital inputs and outputs.

- If the external supply voltage is also to be used as an alternative supply for the control electronics (backup operation in case of mains failure):
  - For this, make the connection illustrated as a broken line.
  - The external voltage source must be able to drive a current > 1 A.
  - This ensures that all actual values are still detected and processed, even after mains disconnection.
- Connection of the external voltage source:
  - supply voltage at X5/59
  - external ground at X5/39

STOP!
The maximum permitted voltage difference between GND2 (terminal X5/39) and the PE of the controller is 50 V.</td></tr>
<tr><td>
</td>
<td>Limit the voltage difference

- by overvoltage clamping components or
- by a direct PE connection of X5/39 (see diagram at left).</td></tr>
</table>

<table>
<tr><th colspan="2">Connection for internal voltage supply</th></tr>
<tr><td>

① Supply voltage for the control card</td>
<td>Configuration of the internal voltage supply

- Set a freely assignable digital output (DIGOUTx) to HIGH level.
- For example terminal X5/A1: Assign C0117/1 with FIXED1 and C0118/1 = 0 (HIGH active). 24V are thus applied across terminal X5/A1.

Tip!
For this application, you may use one of the predefined configurations in C0005. The output is assigned automatically with FIXED1 (corresponds to 24 V at terminal X5/A1) by C0005 = XX1X (e.g. 1010 for speed control via terminals).</td></tr>
</table>

4.2.9.2 Automation interface (X1)

The automation interface (X1) is used for the connection of different plug-on modules

- Operating module
- Fieldbus modules (see System Manual, Part H)
  – RS232, RS485, fibre optics, Type 2102 (LECOM-A/B/LI),
  – INTERBUS, Type 2111
  – PROFIBUS-DP, Type 2131

4.2.9.3 System bus connection (X4)

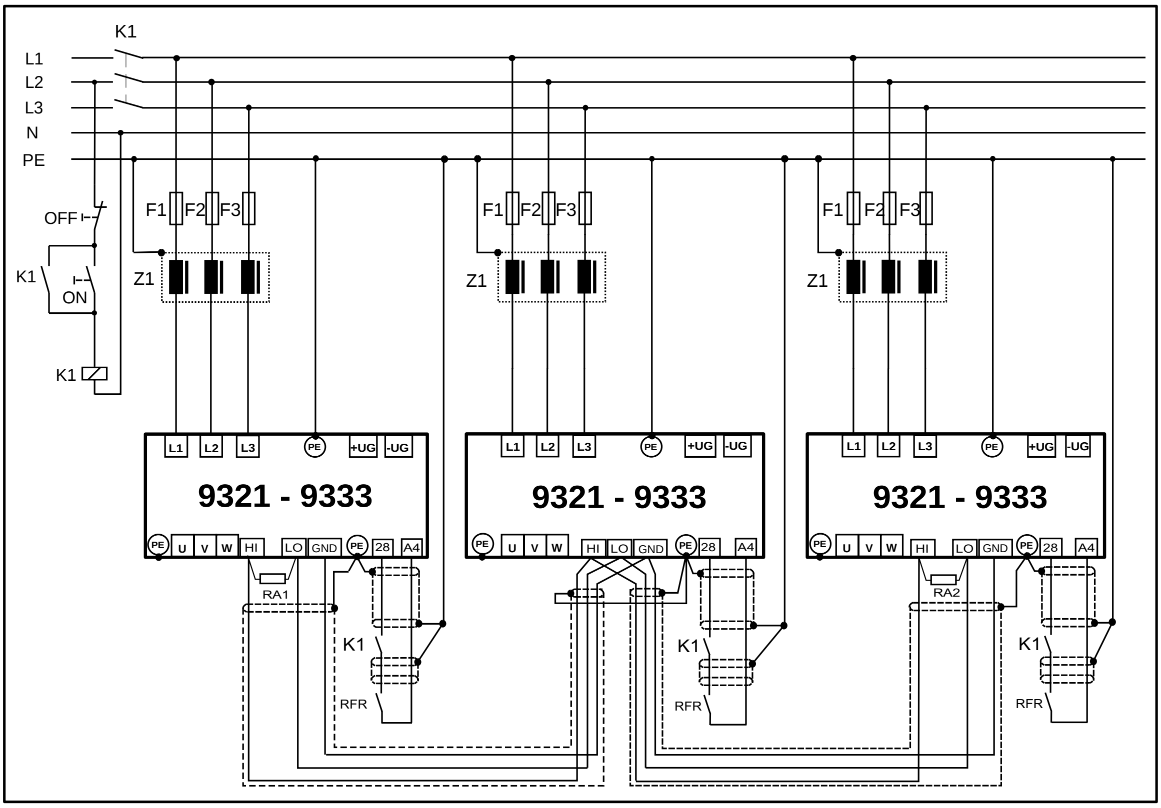


Fig. 4-9 System bus wiring

RA1, RA2 Termination resistor (120 Ω) for the system bus (included in accessory pack)

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

Installation

- 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 screening 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 screening Pair 1: CAN-LOW (LO) and CAN-HIGH (HI) Pair 2: 2*GND
Cable resistance	≤40 Ω/km	≤40 Ω/km
Capacitance per unit length	≤130 nF/km	≤60 nF/km

- Connection of the bus termination resistors:
  – Each 1 x resistor 120 Ω on the first and last bus participants.
  – On the 93XX controller, the resistor is 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 expansion:
  – 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 devices are possible
- Access to all Lenze parameters
- Master functions are integrated into the controller
  – Data exchange possible between controllers without the 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, decentralised inputs/outputs, operating terminal)
- Connection between several controllers

Tip!

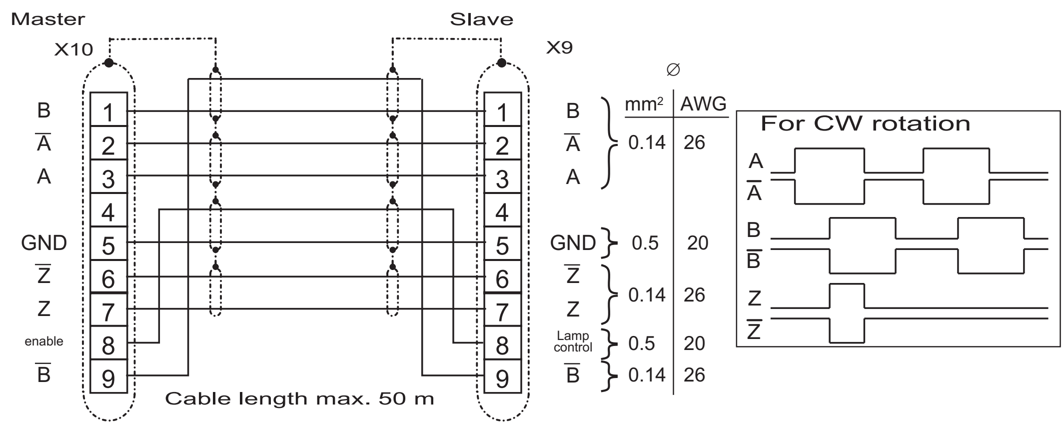
For further information on the system bus as well as possible applications and commissioning please consult the Manual, Part H.

4.2.9.4 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 screened cores (A, $\overline{A}$ / B, $\overline{B}$ / Z, $\overline{Z}$) (see connection diagram).

Digital frequency output X10	**Digital frequency input X9**
Features: • Sub-D female connector, 9-pole • Output frequency: 0 - 500 kHz • Current consumption per channel: max 20mA. • Two-track with inverse 5 V signals and zero track • X10 has a different basic setting depending on the selected configuration (C0005) – Factors setting: speed setpoint • Load capability: – For parallel connection, a maximum of three slaves can be connected. • When PIN 8 (EN) shows a LOW level, the master is initialized (e.g. if the mains was disconnected) . The slave can thus monitor the master.	Features: • Sub-D male connector, 9-pole • Can also be used as incremental encoder input (📖 4-28 ff) • Frequency: – 0 - 500 kHz / TTL-level – 0 - 200 kHz / HTL-level • Current consumption: max. 5 mA • Two-track with inverse signals and zero track • Can also be used without inverse signals, for incremental encoders with HTL-level (📖 4-28 ff) • Evaluation of the input signals through C0427 (see below) • PIN 8 serves to monitor the connected controller. For this, the monitoring SD3 must be activated. – Trip or warning is triggered when a LOW level is applied to PIN 8.



Pin assignment X10									Pin assignment X9								
1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
B	$\overline{A}$	A	+5 V	GND	$\overline{Z}$	Z	EN	$\overline{B}$	B	$\overline{A}$	A	+5 V	GND	$\overline{Z}$	Z	LC	$\overline{B}$

Evaluation of the input signals:

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

4.2.9.5 Feedback system

- You can attach an incremental encoder to the controller, either to input X8 or to input X9.
- The incremental encoder signal can be output for slaves at the digital frequency output X10.
- The connection is made as shown in the connection diagrams:
  - – Use twisted pair cables and screened pair cables.
  - – Connect the screen at both ends.
  - – Use the indicated cable cross-sections.

Incremental encoder at input X8

Tip!

- The evaluation of an incremental encoder through X8 cannot be activated if you use the master frequency input X9 **and** the master frequency output X10 in the signal configuration.
- This relationship does not apply if you set the master frequency output X10 to repeat the input signals on X8 or X9 (C0540 = 4 or 5).
  - – If necessary, remove the internal signal link of the function block (FB) DFIN to the following FB, to deactivate the master frequency input X9.

At input X8 you can only attach an incremental encoder with TTL-levels.

- Activate the feedback system:
  - – With C0025 = 100. Then set the no. of increments (1 ... 8192) with C0420 or
  - – with C0025 = 110, 111, 112 or 113. This setting simultaneously sets the no. of increments (512, 1024, 2048 or 4096).
- The incremental encoder obtains its supply voltage from the drive controller.
- Use C0421 to adjust the supply voltage V_{CC5_E} (5 V) for the incremental encoder and, if necessary, to compensate for the voltage drop in the cable to the incremental encoder ($\Delta a \approx 2$ * cable length * core resistance/m * $I_{encoder}$).
  - – The output V_{CC5_E} (X8/4) can be loaded with max. 200 mA.

Connection of the incremental encoder

Stop!
Observe the supply voltage for the incremental encoder that is used.

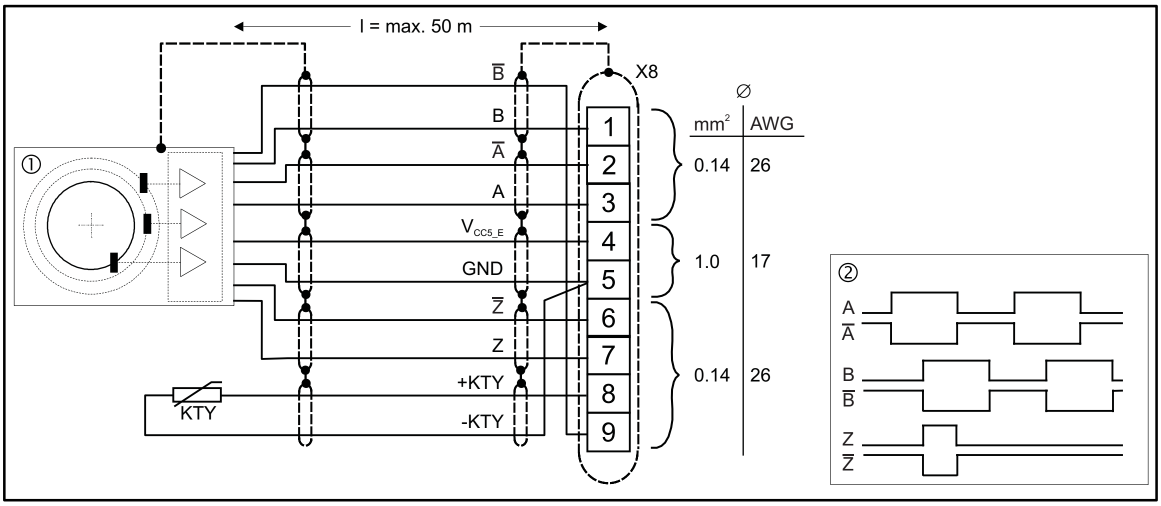


Fig. 4-10 Connection of the incremental encoder to input X8

① Incremental encoder with TTL-level
② Signal sequence for CW rotation

- Incremental encoders with two complementary 5 V signals with 90° electrical phase difference can be connected (TTL encoders).
  – 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 (-KTY)	$\overline{Z}$	Z	+KTY	$\overline{B}$

Terminal X8/8 🕮 4-31

Installation

Incremental encoder at input X9

Incremental encoders with HTL-level can only be connected to input X9.

- Activate the feedback system:
  – With C0025 = 101. Then set the no. of increments (1 ... 8192) with C0420

Connection of the incremental encoder

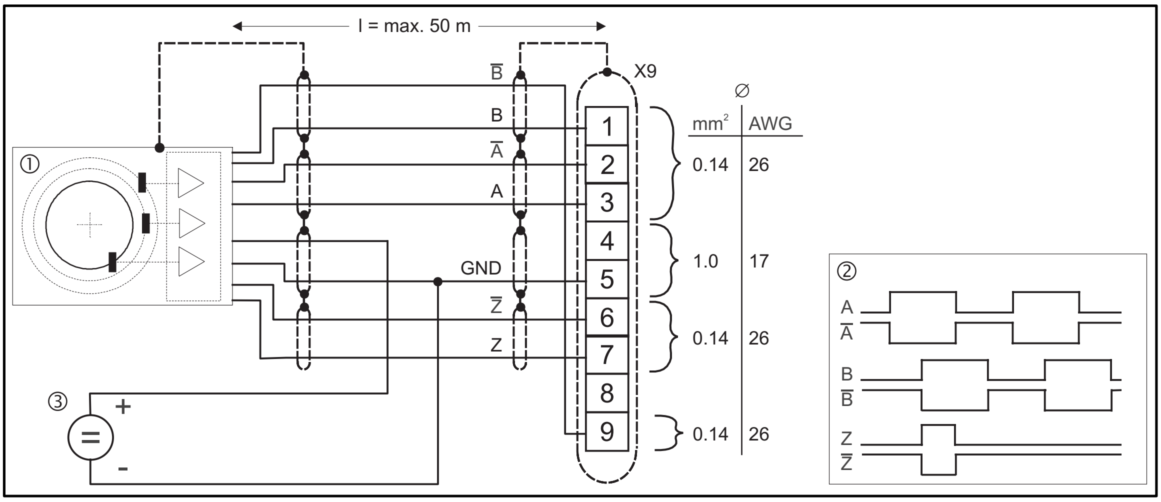


Fig. 4-11 Connection of the incremental encoder to input X9

① Incremental encoder with HTL-level
② Signal sequence for CW rotation
③ Supply voltage for the incremental encoder

- 9-pole Sub-D female connector
- Input frequency: 0 - 200 kHz
- Current consumption per channel: 5 mA

Assignment of the male connector (X9)									
Pin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Signal	B	Ā	A	+5 V	GND	Z̄	Z	-	B̄

Tip!

Incremental encoders with HTL-level, that only provide the A and B signals, can be connected to pin X9/2 (Ā) and pin X9/9 (B̄). The supply voltage for the incremental encoder is then applied to the A and B inputs (pin X9/3 and X9/1).

4.2.9.6 Motor temperature monitoring

Selection of the sensor type	• Thermal sensor KTY – “Linear” thermal sensor in the motor winding – standard in Lenze motors MDXKX and MDXQX • PTC thermistor – PTC thermistor with defined tripping temperature • Thermostat 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 bimetallic relay.
Alternative monitoring	Comparators (CMP1 ... CMP4) define the maximum motor current (locked-rotor current) for small speeds or motor standstill. A following timer unit (TRANS1, TRANS2) limits the time for the locked-rotor current. You can implement this function by linking the appropriate function blocks (see Manual).
Reactions	Depending on the type of temperature monitoring, different reactions can be provoked (🕮 7-195).

Stop!

Do not connect an external voltage to the inputs.

Motor	**Lenze motors with KTY temperature sensors**		**Lenze motors with thermostat**	**Motors of other brands with thermal sensor**
Connection	• Incremental encoder input X8: – X8/8 = +KTY, X8/5 = -KTY		Terminals T1/T2 next to the terminals U, V, W	
Fault indication	(MONIT-)OH3	(MONIT-)OH7	(MONIT-)OH8	
Possible reactions	• 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	can be set under C0121	fixed, (depending on the PTC/thermostat): PTC: at R ϑ > 1600 Ω	
Notes	• Monitoring is not active in the default setting. • A prerequisite for the temperature monitoring function is that the motor temperature monitoring is activated through C0594. This means that the KTY is monitored for open-circuit and short-circuit. • For further information on the connection of the thermal sensor, please consult the description of the corresponding feedback system.		• The monitoring is not active in the default setting. • The temperature monitoring using a thermostat or thermal sensor is activated under C0585 = 2 (Warning) or C0585 = 3 (Trip). • The connection is made according to DIN 44081 (see also Fig. 4-12).	
				• We recommend a Ziehl PTC (up to 150 °C) K15301075 or a thermostat.

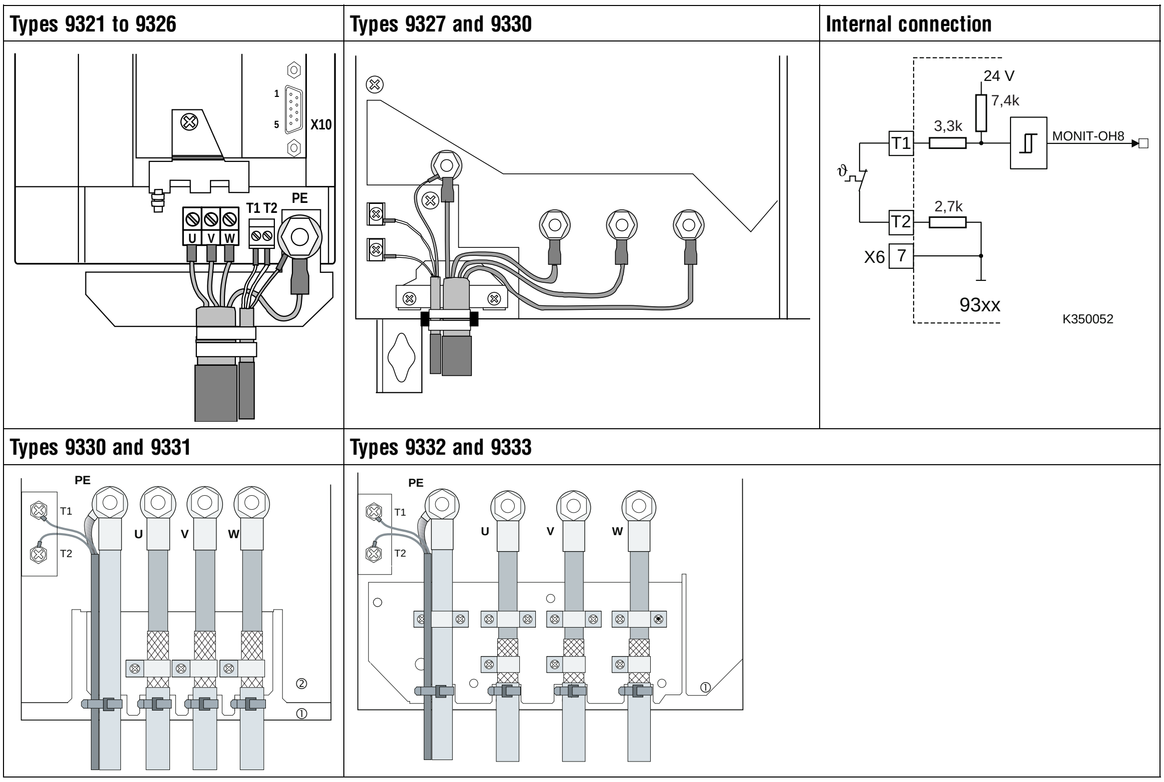


Fig. 4-12 Connection of a thermal sensor to the terminals T1 and T2 and internal connection

Tip!

- If you make up your own cables:
  – Always lay cables separately from motor cables.

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 – Screening – Grounding • 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: – the use of unscreened cables – the 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 grounded 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 the installation in accordance to 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.
Screening	• Connect the screen of the motor cable to the controller – to the screen connection of the controller. – additionally to the mounting plate with a surface as large as possible. – Recommendation: For the connection, use ground clamps on bare metal mounting surfaces. • If contactors, motor-protecting switches or terminals are located in the motor cable: – Connect the screens of the connected cables also to the mounting plate, with a surface as large as possible. • Connect the screen in the motor terminal box or on the motor housing to PE: – Metal glands at the motor terminal box ensure a connection of the screen and the motor housing. • If the mains cable between mains filter and controller is longer than 300mm: – Screen mains cables. – Connect the screen 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 screen 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 screen 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. • Screen the control cables: – Connect both screen ends of the digital control cables. – Connect one screen end of the analog control cables. – Always connect the screens to the screen connection at the controller over the shortest possible distance. • Use of the controllers in residential areas: – To limit the radio interference, use an additional screen damping $\geq$ 10 dB. This is usually achieved by installation in enclosed and grounded control cabinets made of metal.
Grounding	• Ground 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.

Installation

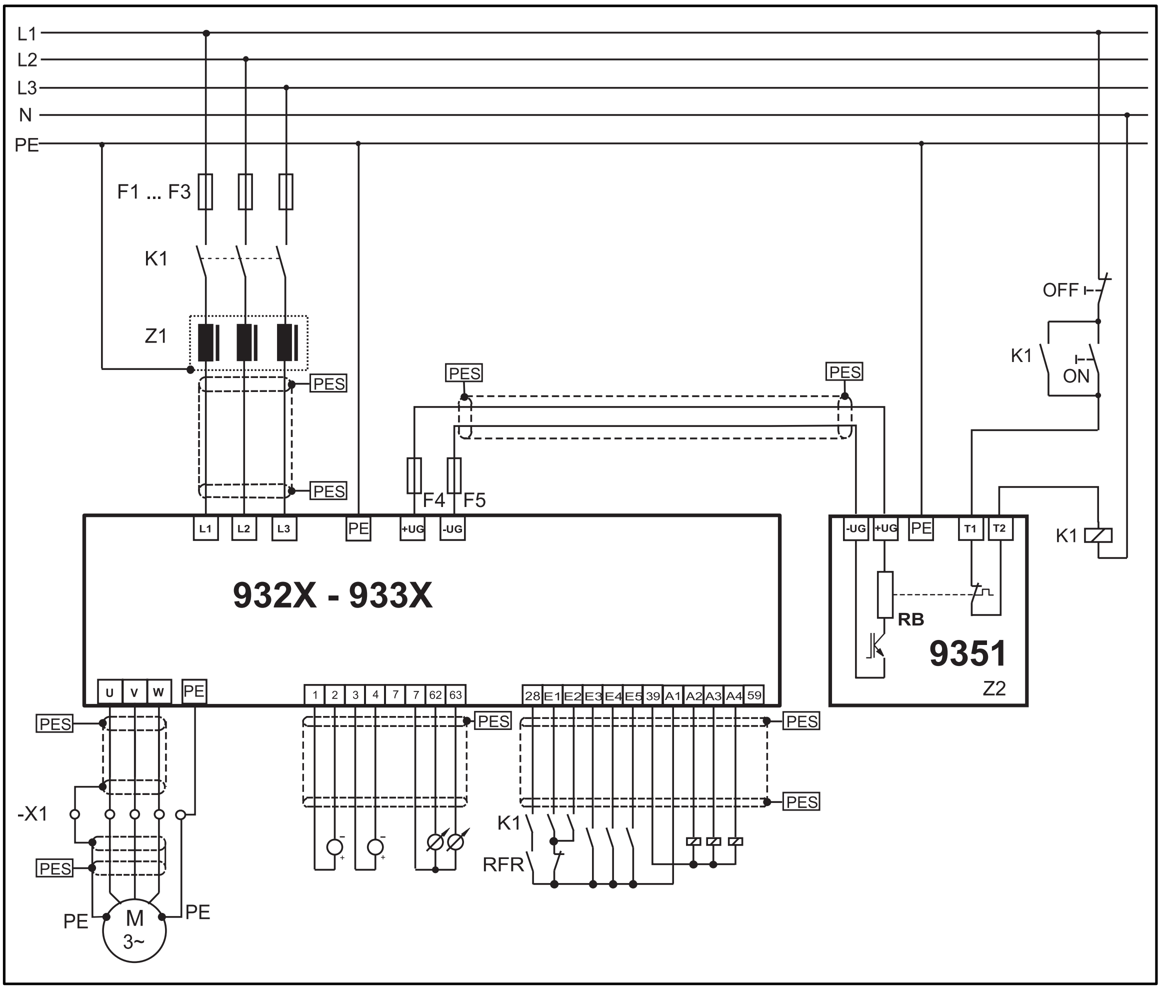


Fig. 4-13 Example of an installation in accordance with the EMC regulations

F1 ... F5	Fuses (3-11 and 4-12)
K1	Mains contactor
Z1	For mains filters “A” or “B” see systems manual, part I, “Accessories”
Z2	For brake modules, see systems manual, part I, “Accessories”
-X1	Terminal strip in control cabinet
PES	HF screen termination by large-surface PE connection (see ”Screening” in this chapter)

EDS9300U--VC
00416040

Lenze

Manual
Part C

Commissioning

During operation

Global Drive

Frequency inverter
9300 vector control

This documentation is valid for controller types 9300 vector control as from the version

33.93XX	-	EV	3x	2x	(9321 - 9333)

- 33.93XX: Type
- EV: Design: E = Enclosure IP20
- 3x: Hardware level and index
- 2x: Software level and index
- (9321 - 9333): Explanation

We have thoroughly collected all specifications in this documentation and have checked it for compliance with the described hardware and software. However, differences cannot be excluded completely. We are not responsible or liable for possible consequential damage. We will include necessary corrections in subsequent editions.

Version 2.0 07/00

Contents

Part C

Show/Hide Bookmarks

Contents

5 Commissioning

The controllers are factory-set to drive the following matching four-pole asynchronous standard motors without any further settings:

- 400 V, 50 Hz
- 460 V, 60 Hz
- 480 V, 60 Hz

You can use the operating module 9371BB or a PC with GDC and fieldbus module to adapt the controller to your application with only a few settings. (📖 5-3 and 5-6)

5.1 Initial switch-on

STOP

Stop!

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

- Power connection:
  - – Via L1, L2 and L3 (direct mains connection)
  - – Alternatively via terminals +UG, -UG (DC-bus connection, network of drives)
- Motor connection:
  - – In-phase connection to the motor (direction of rotation)
- Incremental encoder (direction of rotation), if any
- Control terminals:
  - – Reference potential for the control terminals is terminal X5/39.
  - – Controller enable: terminal X5/28
  - – Direction of rotation: terminal X5/E1 or X5/E2 (default setting)
  - – External setpoint input: terminals X6/1, X6/2 (reference potential: terminal X6/7)
- In the event of condensation, connect the controller to the mains voltage only after the visible humidity has evaporated.

Keep to the switch-on sequence!

5.2 Short commissioning (factory setting)

The following information on parameterization, including the assignment of the control terminals, refers to the basic configuration C0005 = 1000, speed control (default setting).

5.2.1 Switch-on sequence

Step	
1. Connect to the mains supply.	The controller is ready for operation after approx. 2 seconds.
2. Enter the direction of rotation.	• CW rotation: – Apply a HIGH signal (+12 ... +30 V) to terminal X5/E1. • CCW rotation: – Apply a HIGH signal (+12 ... +30 V) to terminal X5/E2.
3. Enter the setpoint.	Apply a voltage 0 ... +10 V to terminal X6/1, X6/2.
4. Enable controller.	Apply a HIGH signal (+12 ... +30 V) to terminal X5/28.
5. The drive is now running with the factory setting.	

5.2.2 Default setting of essential drive parameters

Setting		**Code**	**Default setting**		**Adaptation to the application**
Configuration		C0005	1000		Speed control
Machine data					📖 5-3 ff.
Speed range	Min. speed	C0010	0 rpm	only for analog setpoint input via AIN1, terminal X6/1, X6/2	📖 5-3
	Max. speed	C0011	3000 rpm		
Acceleration and deceleration times	Acceleration time	C0012	5.00 sec		📖 5-4
	Deceleration time	C0013	5.00 sec		
Current limits	Motor mode	C0022		I_{max} [A], maximum controller current	📖 5-5
	Generator mode	C0023		I_{max} [A], maximum controller current	
Drive performance					📖 5-6 ff.
Current Torque Power characteristic	Operating mode	C0006	5	V/f characteristic	
	V/f rated frequency	C0015	50 Hz		
	U_{min} setting	C0016	0 %		
	Slip compensation	C0021		Rated slip of the selected motor (depending on the motor)	
	Selection of the characteristic	C0014	0	linear	
	Motor voltage	C0090	400 V		

5.3 Adapt machine data

5.3.1 Determine speed range (n_{min}, n_{max})

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0010	minimum speed	0	0 {1 rpm} 36000	correct setting of C0087 and C0089 required	not higher than C0011
C0011	maximum speed	3000	0 {1 rpm} 36000		

Function

The speed setting range required for the application can be set via the speed input n_{min} and n_{max} :
- n_{min} corresponds to the speed at 0 % setpoint speed input.
- n_{max} corresponds to the speed at 100 % setpoint speed input.

Important

- With the setting $n_{min} > n_{max}$ the speed is limited to n_{max}.
- When entering the setpoint speed by means of JOG values n_{max} acts as a limit.
- n_{max} is an internal variable:
  – Use the LECOM interface only for important modifications, when the controller is inhibited.
- Observe the maximum speed of the motor!
- n_{min} is effective only:
  – for analog setpoint input via AIN1 (terminal X6/1 and X6/2).

Special features

Internal speed limits (p = pole pair number of the motor):
- Chopping frequency 16 kHz: n_{max} = 36000 rpm
- Chopping frequency 8 kHz: n_{max} = 36000/p rpm
- Chopping frequency 2/4 kHz: n_{max} = 36000/2p rpm

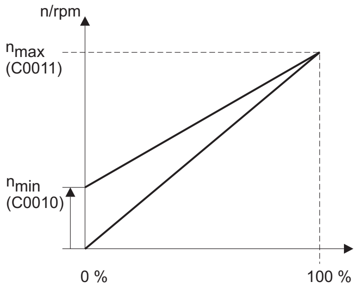


Fig. 5-1 Minimum and maximum speed

n/rpm	speed
n_{max}	Speed at 100 % setpoint speed
n_{min}	Speed at 0 % setpoint speed
0 ... 100 %	Setpoint

5.3.2 Setting acceleration and deceleration times (T_{ir}, T_{if})

Code	Name	Possible settings					IMPORTANT
		Lenze	Selection			Info	
C0012	Acceleration time	5.00	0.00	{0.01 sec}	9999.90	Acceleration time T_{ir} for the main setpoint of NSET	Related to the speed change 0...$n_{Max.}$
C0013	Deceleration time	5.00	0.00	{0.01 sec}	9999.90	Deceleration time T_{if} for the main setpoint of NSET	
C0105	QSP Tif	5.00	0.00	{0.01 sec}	9999.90	Deceleration time for quick stop (QSP)	

Function

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

Adjustment

- The acceleration and deceleration times refer to a speed change from 0 rpm to the max. speed set under C0011.
- Calculate the times T_{ir} and T_{if}, which you can set under C0012 and C0013.
  – t_{ir} and t_{if} are the desired times for the change between n_1 and n_2:

$$T_{ir} = t_{ir} \cdot \frac{n_{max}}{n_2 - n_1} \qquad T_{if} = t_{if} \cdot \frac{n_{max}}{n_2 - n_1}$$

Important

Under unfavourable operating conditions, too short acceleration and deceleration times can lead to the switch-off of the controller with the indication of TRIP overload (OC3). In these cases, set the acceleration and deceleration times in such a way that the drive can follow the speed profile without reaching $I_{max}$of the controller.

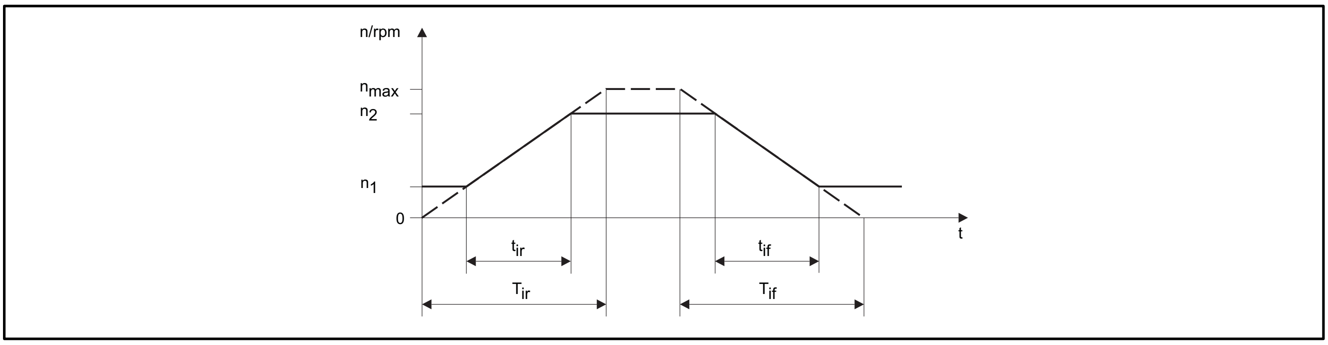


Fig. 5-2 Acceleration and deceleration times

n/rpm	speed
n_{max}	Speed at 100 % setpoint speed
n_1 ,n_2	Change of speed depending on t_{ir} or t_{if}
t	time

5.3.3 Set the current limits (I_{max}-limits)

Code	Name	Possible settings					IMPORTANT
		Lenze	Selection			Info	
C0022	I_{max} limit Motor mode	→	0.00	{0.01 A}	500.00		→ depending on C0086
C0023	I_{max} limit Generator mode	→	0.00	{0.01 A}	500.00		

Function

The controllers are equipped with a current-limit control which determines the dynamic response under load. The momentary motor current is compared with the limit values set under C0022 for motor load and under C0023 for generator load. If the current limits are exceeded, the controller changes its dynamic behaviour.

Adjustment

Set the acceleration and deceleration times in such a way that the drive can follow the speed profile without reaching I_{max} of the controller.

Controller performance when a limit value is reached

- During acceleration:
  - Increasing the acceleration ramp
- During deceleration:
  - Increasing the deceleration ramp:
- With increasing load and constant speed:
  - When the current limit of the motor mode is reached:
    Speed reduction to 0 rpm.
  - When the current limit in the generator mode is reached:
    Speed increase to$_{max}$ (C0011).
  - Stopping the speed change if the load falls below the limit value.

Important

- A correct current limitation control (PI controller: Vp = C0075, Tn = C0076) in the generator mode is possible only with a connected brake unit or in the DC bus connection with energy exchange.
- When using chopping frequencies > 8 kHz, set the current limits to the values specified in the ratings for "I_{max} for 60 sec" (derating at higher chopping frequencies).(📖 3-3 and 3-8)

5.4 Optimising the controller performance

The following settings are used to determine the current and torque behaviour as well as the performance of the connected motor.

The operating modes ”V/f-characteristic control” and ”vector control” are available for this.

Some decision-making aids make it easier to optimize the drive.

5.4.1 Input of the motor data

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

- If a LENZE motor is used:
  - Select the motor type under C0086 (see code table). The controller sets all other motor data automatically.
  - Select the operating mode under C0006 (V/f-characteristic control or vector control).
- If the motor type is not listed under C0086, enter the motor nameplate data. You can enter the following motor data manually:

Code	Name
C0006	Operating mode
C0022	Adapt I_{max} to the maximum motor current.
C0023	I_{max}-limit in the generator mode
C0081	Rated motor power
C0087	Rated motor speed
C0088	Rated motor current
C0089	Rated motor frequency
C0090	Rated motor voltage
C0091	Motor cos-phi φ

- To optimize the selected operating mode, start the motor identification for automatic detection of additional motor parameters (C0148 = 1). This is valid for the initial set-up and after changing the drive system.

Caution!

If the setting of the machine parameters is incorrect, the motor may reverse in the ”Vector control” mode after controller enable. (🕮 5-12)

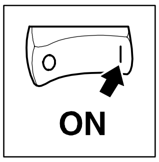
- Save the parameter set permanently under C0003, so that the established values are not lost when the mains supply is switched off.

ON

Tip!

- All required inputs are contained in the menu "motor/feedb." ("motor/feedback system").
- If you select a motor type under C0086, and subsequently change one of the above listed motor data, C0086 = 0 (COMMON) is set (i.e. no Lenze motor is used).

C0086 No.	Display	C0081 P_r [kW]	C0087 n_r [rpm]	C0088 I_r [A]	C0089 f_r [Hz]	C0090 a_r [V]	C0091 cos j	Motor type	Thermal sensor
9	DSGA056-22-100	0.24	2790	0.76	100		0.71		
10	MDSKA-56-140	0.80	3950	2.4	140		0.70		
11	MDFKA-71-120	2.20	3410	6.0	120		0.75		
12	MDSKA-71-140	1.70	4050	4.4	140		0.76		
13	MDFKA-80-60	2.10	1635	4.8	60		0.81		
14	MDSKA-80-70	1.40	2000	3.3	70	390	0.75		
15	MDFKA-80-120	3.90	3455	9.1	120		0.80		
16	MDSKA-80-140	2.30	4100	5.8	140		0.75		
17	MDFKA-90-60	3.80	1680	8.5	60		0.80		
18	MDSKA-90-80	2.60	2300	5.5	80		0.81		
19	MDFKA-90-120	6.90	3480	15.8	120		0.80	Asynchronous servo motor	KTY
20	MDSKA-90-140	4.10	4110	10.2	140	350	0.80		
21	MDFKA-100-60	6.40	1700	13.9	60		0.83		
22	MDSKA-100-80	4.00	2340	8.2	80	390	0.80		
23	MDFKA-100-120	13.20	3510	28.7	120		0.80		
24	MDSKA-100-140	5.20	4150	14.0	140	330	0.78		
25	MDFKA-112-60	11.00	1710	22.5	60		0.85		
26	MDSKA-112-85	6.40	2490	13.5	85	390	0.83		
27	MDFKA-112-120	20.30	3520	42.5	120		0.80		
28	MDSKA-112-140	7.40	4160	19.8	140	320	0.80		
30	MDFQA-100-50	10.6	1420	26.5	50		0.84		
31	MDFQA-100-100	20.30	2930	46.9	100		0.80		
32	MDFQA-112-28	11.50	760	27.2	28		0.87	Asynchronous servo motor enclosed-ventilated (in Y configuration)	
33	MDFQA-112-58	22.70	1670	49.1	58		0.85		
34	MDFQA-132-20	17.00	550	45.2	20	360	0.81		
35	MDFQA-132-42	35.4	1200	88.8	42		0.78		
40	MDFQA-112-50	20.10	1425	43.7	50		0.86		
41	MDFQA-112-100	38.40	2935	81.9	100		0.83	Asynchronous servo motor enclosed-ventilated (in Δ configuration)	
42	MDFQA-132-36	31.10	1030	77.4	36		0.78		
43	MDFQA-132-76	60.10	2235	144.8	76	340	0.80		
210	DXRA071-12-50	0.25	1410	0.9			0.69		
211	DXRA071-22-50	0.37	1398	1.2			0.70		
212	DXRA080-12-50	0.55	1400	1.7			0.66		TKO (Thermostat)
213	DXRA080-22-50	0.75	1410	2.3			0.67		
214	DXRA090-12-50	1.10	1420	2.7			0.77		
215	DXRA090-32-50	1.50	1415	3.6			0.77		
216	DXRA100-22-50	2.20	1425	4.8			0.80		
217	DXRA100-32-50	3.00	1415	6.6	50	400	0.81	Asynchronous inverter motor (in Y circuit)	
218	DXRA112-12-50	4.00	1435	8.3			0.82		
219	DXRA132-12-50	5.50	1450	11.0			0.84		
220	DXRA132-22-50	7.50	1450	14.6			0.85		
221	DXRA160-12-50	11.00	1460	21.0			0.85		
222	DXRA160-22-50	15.00	1460	27.8			0.87		
223	DXRA180-12-50	18.50	1470	32.8			0.90		
224	DXRA180-22-50	22.00	1456	38.8			0.90		



C0086 No.	Display	C0081 P_r [kW]	C0087 n_r [rpm]	C0088 I_r [A]	C0089 f_r [Hz]	C0090 a_r [V]	C0091 cos j	Motor type	Thermal sensor
250	DXRA071-12-87	0.45	2525	1.5	87	400	0.69	Asynchronous inverter motor (in Δ configuration)	TKO (Thermostat)
251	DXRA071-22-87	0.64	2515	2.0			0.70		
252	DXRA080-12-87	0.95	2515	2.9			0.66		
253	DXRA080-22-87	1.30	2525	4.0			0.67		
254	DXRA090-12-87	2.00	2535	4.7			0.77		
255	DXRA090-32-87	2.70	2530	6.2			0.77		
256	DXRA100-22-87	3.90	2535	8.3			0.80		
257	DXRA100-32-87	5.35	2530	11.4			0.81		
258	DXRA112-12-87	7.10	2545	14.3			0.82		
259	DXRA132-12-87	9.70	2555	19.1			0.84		
260	DXRA132-22-87	13.20	2555	25.4			0.85		
261	DXRA160-12-87	19.30	2565	36.5			0.85		
262	DXRA160-22-87	26.40	2565	48.4			0.87		
263	DXRA180-12-87	32.40	2575	57.8			0.90		
264	DXRA180-22-87	38.70	2560	67.4			0.90		
410	DXMA071-12-50	0.25	1400	0.8	50	400	0.70	Asynchronous geared motor (in Y configuration)	
411	DXMA071-32-50	0.37	1400	1.2			0.71		
412	DXMA080-12-50	0.55	1400	1.6			0.72		
413	DXMA080-32-50	0.75	1380	2.0			0.76		
414	DXMA090-12-50	1.10	1420	2.7			0.77		
415	DXMA090-32-50	1.50	1420	3.5			0.80		
416	DXMA100-12-50	2.20	1400	5.6			0.78		
417	DXMA100-32-50	3.00	1400	7.3			0.81		
418	DXMA112-32-50	4.00	1430	8.5			0.85		
440	DXMA071-12-87	0.43	2436	1.4	87		0.70	Asynchronous geared motor (in Δ configuration)	
441	DXMA071-32-87	0.64	2419	2.1			0.71		
442	DXMA080-12-87	0.95	2436	2.8			0.72		
443	DXMA080-32-87	1.30	2401	3.5			0.76		
444	DXMA090-12-87	2.00	2453	4.5			0.80		
445	DXMA090-32-87	2.70	2471	6.1			0.80		
446	DXMA100-12-87	3.90	2436	9.7			0.78		
447	DXMA100-32-87	5.40	2436	12.7			0.81		
448	DXMA112-22-87	7.10	2506	14.8			0.85		
449	DXMA112-32-50	5.50	1460	12.5	50		0.78		
450	DXMA132-22-50	7.50	1460	16.8			0.77		
451	DXMA132-32-50	9.20	1450	19.5			0.85		

5.4.2 Select operating mode

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
[C0006]	Operating mode	5	1 Vector control 5 V/f characteristic with constant U_{min} boost	Voltage characteristic C0014	for vector control: • Enter motor data and start motor identification

Function

- You set the operating mode of the controller under C0006.
  – The vector control enables a "sensorless speed control". Compared to the V/f characteristic control, the vector control achieves a considerably higher torque and a lower off-load current consumption.

How to select the correct mode

How to select the correct mode	Motor cable			
	screened ≤ 50 m unscreened ≤ 100 m		screened > 50 m unscreened > 100 m	
	C0006		C0006	
Single drives	recommended	alternatively	recommended	alternatively
with constant load	1	5	5	-
with extremely alternating loads	1	5	5	-
with heavy start conditions	1	5	5	-
Positioning and infeed drives with high dynamic response	1	5	5	-
Rewinder with dancer	1	5	-	-
Unwinder with dancer	5	-	-	-
Hoists	5	-	5	-
Pumps and blowers [1)]	5	-	5	-
Three-phase AC reluctance motors	5	-	5	-
Three-phase sliding rotor motors	5	-	5	-
Three-phase motors with fixed voltage-frequency characteristic	5	-	5	-
Group drives (the resulting motor cable length is decisive)	$I_{res} = \sqrt{i} \cdot (I_1 + I_2 + ... + I_i)$			
identical motors and identical loads	1	5	5	-
different motors and/or changing loads	5	-	5	-

1) A square voltage characteristic (C0014 = 1) is recommended.

5.4.3 Optimizing operating modes

5.4.3.1 Optimizing V/f characteristic control

Required codes

Code	Name	Possible settings				
		Lenze	Selection		Info	Important
[C0014]	Voltage characteristic	0	0 1	linear characteristic U ~ fd with constant V_{min} boost square-law characteristic U ~ fd^2 with constant V_{min} boost		
C0015	V/f rated frequency	50	0	{1 Hz} 5000		
C0016	a_{min} setting	0.00	0.00	{0.01 %} 100.00	FCODE	
C0021	Slip compensation	→	-20.00	{0.01 %} 20.00		→ Change of C0087 or C0089 sets C0021 to the calculated rated motor slip
C0090	Rated motor voltage	400	0	{1 V} 1000		

Setting sequence

1. Select the operating mode "V/f characteristic control" (C0006 = 5, factory setting).
2. Select V/f characteristic (C0014) if necessary
3. Set V/f rated frequency (C0015). Use the values specified on the motor nameplate.
4. Set rated motor voltage (C0090). Use the values specified on the motor nameplate.
5. Set Umin boost (C0016).

- Load-independent boost of the motor voltage for starting and operation at low speeds, to optimize the torque behaviour of the inverter.
- it is absolutely necessary to adapt C0016 to the asynchronous motor that is used, since the motor can otherwise be destroyed because of overheating.Observe the thermal behaviour of the connected motor for low speeds:
  – Experience shows that it is possible to drive standard asynchronous motors with insulation material Class B in the speed range 0.5 · n_r for a short time with their rated current.
  – Please ask the motor manufacturer for the exact setting values for the motor current.

A Operate motor in idle running with 5 ... 10 % of the rated speed (n_r):
  – $P_{Mot} \leq 7.5$ kW: $n_{set} \approx 10\ \%\ n_r$
  – $P_{Mot} > 7.5$ kW: $n_{set} \approx 5\ \%\ n_r$

B Increase V_{min} until you reach the following motor current:
  – **Motor in short-term operation** (up to 50 % n_r):
  for self-ventilated motors: $I_{motor} \leq I_{r\ motor}$
  for forced-ventilated motors: $I_{motor} \leq I_{r\ motor}$
  – **Motor in continuous operation** (up to 50 % n_r):
  for self-ventilated motors: $I_{motor} \leq 0.8 \cdot I_{r\ motor}$
  for forced-ventilated motors: $I_{motor} \leq I_{r\ motor}$

Important

Only change between V/f characteristic control (C0006 = 5) and vector control (C0006 = 1) when the controller is inhibited.

C0014 = 0
Linear characteristic

C0014 = 1
Square-law (quadratic) characteristic (e.g. for pumps, blowers)

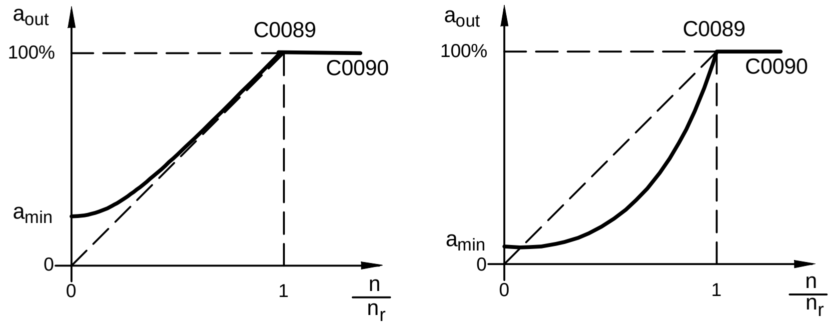


Fig. 5-3 Linear and square-law characteristic

5.4.3.2 Optimizing the vector control

Required codes

Code	Name	Possible settings				IMPORTANT
		Lenze	Selection		Info	
[C0014]	Voltage characteristic	0	0	linear characteristic U ~ fd with constant V_{min} boost		🕮 5-10
			1	square-law characteristic U ~ fd^2 with constant V_{min} boost		
C0081	Rated motor power	→	0.01	{0.01 kW}	500.00	→ depending on C0086
C0087	Rated motor speed	→	300	{1 rpm}	36000	
C0088	Rated motor current	→	0.5	{0.1 A}	500.0	
C0089	Rated motor frequency	→	10	{1 Hz}	5000	
C0090	Rated motor voltage	→	0	{1 V}	1000	
C0091	Motor cos-phi (p.f.) j	→	0.50	{0.01}	1.00	
C0092	Motor LS	0.0	0.0	{0.1 mH}	6553.0	

Setting sequence

1. Select the operating mode “Vector control” (C0006 = 1).
2. Select motor:
   – For Lenze motors with C0086.
   – For motors of other makes, enter the nameplate data of the connected motor (🕮 5-6).
3. Start motor identification (C0148 = 1).

Precise setting

4. If the motor identification does not result in an optimum operating behaviour, you can make a fine setting manually via C0092.
   – To achieve the maximum motor torque, increase the value under C0092 (max. +15 % of the value achieved by the motor identification).
   – If the control is not smooth at low speeds, reduce the value under C0092 (max. -15 % of the value achieved by the motor after identification).

Important

Only change between V/f characteristic control (C0006 = 5) and vector control (C0006 = 1) when the controller is inhibited.
When using motors of other brands:
For a correct display of the momentary speed and the reference torque, the rated frequency and rated power of the connected motor must be entered additionally.

5.4.3.3 Motor identification

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0148	Motor identification	0	0 Inhibit motor identification		
			1 Enable motor identification	Duration approx. 1 ... 2 min	Identification when the motor is at standstill

Function

The motor identification
- first optimizes the switching behaviour of the drive controller,
- then determines the internal motor parameters that are required for vector control, and
- measures the motor cable from the controller to the motor.

V/f characteristic control
In this operating mode, the motor identification is not mandatory. The drive controller operates with an internal default setting (factory setting), that has been defined for a motor with matching power and 10 m motor cable. The motor identification is necessary, however, if the smooth running does not meet your requirements.

Setting sequence

Manual motor identification with C0148

1. Setting controller inhibit
2. Select a Lenze motor under C0086 or enter motor data of the nameplate. (📖 5-6)
3. Start motor identification under C0148 = 1.
4. Remove the controller inhibit.
5. The motor identification takes approx. 1 ... 2 min (depending on the rated motor power). The motor is at standstill during this procedure.
6. After the motor identification is completed,
   – C0148 = 0 is set,
   – controller inhibit is set
   – a fault is indicated if the motor identification has failed.

Automatic motor identification with C0149

1. Select a Lenze motor under C0086 or enter motor data of the nameplate. (📖 5-6)
2. Use C0149 = 1 to activate the automatic motor identification, and store this setting in parameter set 1.
3. The motor identification starts automatically after switching on the mains supply and the subsequent enabling of the controller.
   – The motor identification takes approx. 1 ... 2 min (depending on the rated motor power). The motor is at standstill during this procedure.
4. After the motor identification is completed,
   – the controller inhibit is set, and the parameters that have been determined are automatically stored in parameter set 1,
   – a fault is indicated if the motor identification has failed. Acknowledging the fault with TRIP-reset will restart the motor identification.

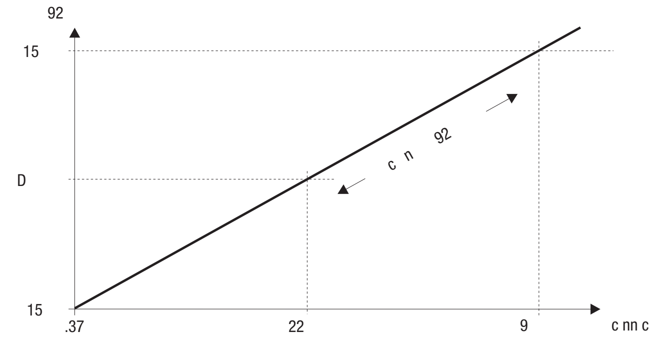
- After a failed motor identification, if you switch the mains supply for the controller off and on again, the motor identification will start again.
- With C0149 = 0 you can deactivate the automatic motor identification.

Caution!

If the setting of the machine parameters is incorrect, the motor may reverse in the "Vector control" mode after controller enable.

- Enter the nameplate data of the motor and start the motor identification.
- Under C0909 you can also inhibit a direction of rotation.
- It may be necessary to correct the stator inductance (C0092) manually, in individual cases.

Trend of the correction



Special features

- You can carry out the motor identification for different parameter sets, and thus configure each parameter set for another motor.

Important

- Save the parameter set permanently under C0003.
- You can save the determined values via GDC or the operating module and copy it to an identical motor-controller combination.
- Carry out the motor identification for every controller/motor combination. This ensures an optimum control behaviour.

5.5 Adaptation of the signal processing

The adaptation of the internal signal processing to the drive task (e.g. step control or dancer control) is made by the selection of a ready-made basic configuration. With the factory setting you can already operate the drive under speed control. (🕮 7-219)

- A detailed description of the individual basic configurations with terminal assignments, signal flow charts and application examples can be obtained from chapter 15. (🕮 15-1)
- Before you can load a basic configuration through C0005, you must first set the controller inhibit.
- If you change the configuration under C0005, the assignment of all inputs and outputs with their corresponding default assignments will be overwritten. If necessary, you will have to alter the function assignment to match the wiring.
  – To alter the function assignment to match a particular wiring, or to expand the signal processing, see ”Using function blocks”. (🕮 7-29)

6 During operation

- Replace defective fuses with the prescribed type only when no voltage is applied.
  There are no fuses in the controller.
- For cyclic mains switching:
  – Do not switch on the controller more frequently than every 3 minutes, otherwise the internal inrush-current limitation can be overloaded.
- Switching on the motor side:
  – Monitoring messages can be activated when switching the motor while the controller is enabled. (🕮 6-2)
- Depending on the controller settings, the connected motor can be overheated:
  – For instance, longer DC-braking operations.
  – Longer operation of self-ventilated motors at low speed.
- With the corresponding parameter setting, the controllers generate an output frequency of up to 600 Hz:
  – If an inappropriate motor is connected, a hazardous overspeed may occur.
- If you use the function "Flying restart circuit" (C0142 = 2, 3) on machines with low inertia and friction:
  – The motor can start for a short time or reverse direction for a short time after enabling the controller when the motor is at standstill. In this case, make a slight adjustment to the values under C0146 and C0147.

6.1 Status messages of the operating module

Status indications of the operating module		
Display	**on**	**off**
RDY	Ready for operation	Initializing or fault
IMP	Power outputs inhibited	Power outputs enabled
FAIL	Active fault (TRIP, message or warning)	No fault
I_{MAX}	• Motor current setpoint ≥ C0022 • DC-injection braking active	Motor current setpoint < C0022
M_{MAX}	Speed controller within its limits. Drive is torque-controlled.	Drive is speed-controlled

6.2 Information on operation

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 limit:
  – Allow at least 3 minutes between disconnection and reconnection.

- For mains supply switching it is irrelevant whether other controllers are supplied from the same mains rectifier.

6.2.1 Switching on the motor side

- Switching on the motor side of the controller is permitted.
- Please note:
  – Switching while a controller is enabled may cause the fault indication ”0Cx” (short-circuit / earth fault).
  – For long motor cables and operating controllers with smaller output power, leakage currents through parasitic cable capacitance may cause the fault indication ”OCx”.

6.3 Display functions

Actual speed displays

You can read out various actual values by 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]
C0058	Actual frequency at the inverter output [Hz]
C0061	Heatsink temperature [°C]
C0063	Motor temperature [°C]
C0064	Controller load [%]

Identification

- C0099 indicates the software version of the drive controller.
- C0093 shows you the controller type.

Show/Hide Bookmarks

EDS9300U--VD 5.1
00416041

Lenze

Manual
Part D5.1

Configuration

Global Drive

Frequency inverter
9300 vector control

This documentation is valid for controller types 9300 vector control as from the version

33.93XX - EV 3x 2x (9321 - 9333)

Type	33.93XX
Design: E = Enclosure IP20	EV
Hardware level and index	3x
Software level and index	2x
Explanation	(9321 - 9333)

Version 2.0 07/00

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7 Configuration

In practice, every application requires an adapted controller-internal configuration. In general, a number of different function blocks are available which must be linked together in a suitable configuration. (📖 7-32)

7.1 Basic configurations

Function block links for frequent applications are already stored in the basic configurations. They can be selected and activated under code C0005. You can select a four-digit number; every digit stands for particular features.

First digit

Defines the basic function of the configuration.

Configuration C0005	Basic function
1xxx	Speed control
2xxx	Step control
3xxx	Traversing control
4xxx	Torque control
5xxx	Digital frequency - master
6xxx	Digital frequency slave (bar)
7xxx	Digital frequency slave (cascade)
8xxx	Dancer position control (external diameter detection)
9xxx	Dancer position control (internal diameter detection)

Second digit

Defines the additional function. It extends the basic function.

Configuration C0005	Additional function
x0xx	No additional function
x1xx	Brake control via digital output X5/A2
x2xx	Setpoint selection via motor potentiometer
x3xx	PID controller for control of variables
x4xx	Mains failure detection
x5xx	Setpoint selection via digital frequency input
x6xx	Analog gearbox factor trimming
x7xx	Digital gearbox factor trimming
x8xx	Digital ramp generator

Tip!

The most important codes for the parameter setting of the basic configuration can be found in the **Global Drive Control (GDC)** and the operating module, in the menu items “Short set-up”.

Configuration

Third digit

Defines whether the voltage of the analog and digital control inputs will be supplied internally or externally. (4-21)

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

Fourth digit

Defines the controller interface for reading certain control signals (e.g. speed setpoint).

Configuration C0005	Interface
xxx0	Control terminals
xxx1	RS 232, RS 485 or fibre optics
xxx3	INTERBUS or PROFIBUS-DP
xxx5	System bus (CAN)

Tip!

- For application examples see chapter 15. (15-1 ff)
- Signal flow charts of the basic configurations can be obtained from chapter 16. (16-1 ff)

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 under C0005 which largely meets your requirements.
2. Add missing functions by:
   – reconfiguring inputs and/or outputs.
   – set the parameters for the function blocks. (🕮 7-30)
   – adding or removing function blocks . (🕮 7-36)
3. You can adapt the basic configuration with only a few setting to your application (Short Setup). (🕮 7-4 ff)
4. The setting of the motor data and the adaptation of the motor control is in general independent of the configuration and is described in the section "Commissioning". (🕮 5-1)

Tip!

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

7.1.2 Speed control (C0005 = 1000)

The configuration C0005 = 1000 has been developed mainly for single drives. The speed setpoint is entered via the analog input X6/1. The signal is processed internally together with the digital control signals.

Short Setup

Setting	Code	Explanation	Lenze default setting
Setpoint conditioning	C0010	Input of a minimum speed for setpoint = 0	0 rpm
	C0012	Acceleration time for the main setpoint	5.00 sec
	C0013	Deceleration time for the main setpoint	5.00 sec
	C0034	Changeover to current setpoint 4 ... 20 mA	0
	C0038/1...6	Input of prohibited ranges	0 rpm
	C0039/1	JOG speed, can be activated via digital input X5/E3	1500 rpm
	C0190	Activation of the additional setpoint channel	0
	C0220	Acceleration time for the additional setpoint	2.00 sec
	C0221	Deceleration time for the additional setpoint	2.00 sec
Motor control	C0006	Selection V/f-characteristic control or vector control	5
	C0011	Maximum speed	3000 rpm
	C0016	Voltage boost	0.00 %
	C0021	Slip compensation	depending on the controller
	C0022	Maximum current for motor mode	depending on the controller
	C0023	Maximum current for generator mode	depending on the controller
	C0105	Quick stop deceleration time	5.00 sec
	C0019	Threshold for automatic DC injection braking	0 rpm
	C0107	Holding time for automatic DC injection brake	0.00 sec
	C0036	Current setpoint for DC injection brake	0.00 A
	C0018	Inverter chopping frequency	6
	C0142	Behaviour after controller enable	1
For vector control or with incremental encoder	C0070	Gain of the speed controller	10
	C0071	Adjustment time of the speed controller	50 msec
	C0074	Influence of the speed controller (only for V/f-characteristic control)	10.00 %

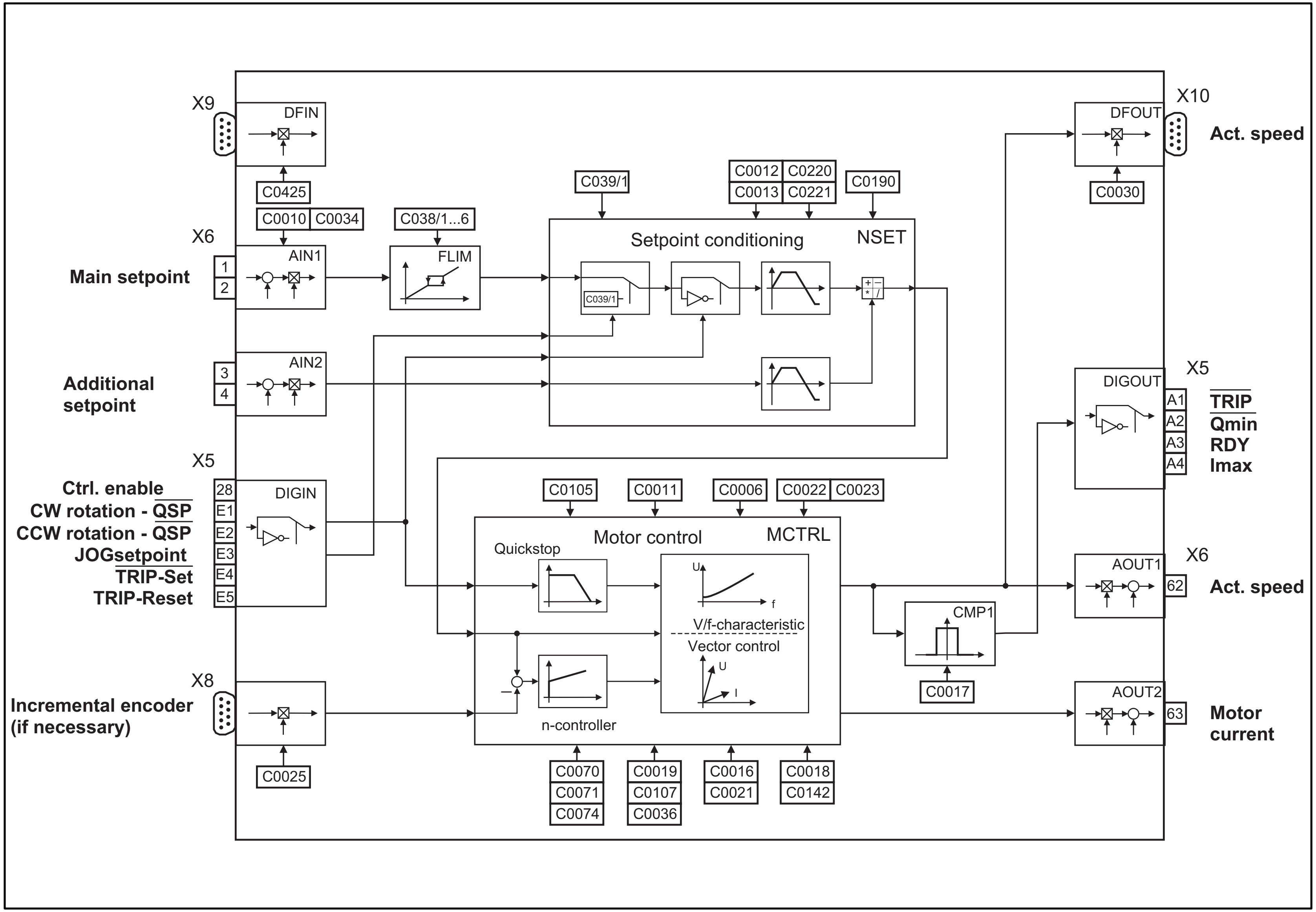


Fig. 7-1 Signal flow for configuration 1000: Speed control

7.1.3 Step control (C0005 = 2000)

The configuration C0005 = 2000 supports applications in which the drive has to perform a defined number of revolutions repetitively. In this way, pieces can be transported step by step on a conveyor belt or a worm conveyor can dose a specific amount repetitively.

Transportation speed and distance or dosing speed and amount can be controlled independently of each other via the two analog inputs. The execution of a step is started via the digital input X5/E4.

Tip!

For further information on parameterization refer to Part K, “Application examples”. (📖 15-6)

Short Setup

Setting	Code	Explanation	Lenze default setting
Setpoint conditioning	C0010	Input of a minimum speed for speed setpoint = 0	0 rpm
	C0012	Acceleration time for the speed setpoint	5.00 sec
	C0013	Deceleration time for the speed setpoint	5.00 sec
	C0034	Changeover to current setpoint 4 ... 20 mA	0
	C1351	Scaling constant for the distance input (Value = Number of revolutions for distance setpoint = 100 %, 65536 = 1 revolution)	6553600
	C0560/1	Internal distance setpoint, can be activated via digital input X5/E3	100 %
	C0940, C0941	Adaptation of the braking distance $\frac{[C0940]}{[C0941]} = \frac{[C0011] \cdot [C013] \cdot 65536}{120 \cdot [1351]}$	C0940 = 1 C0941 = 1
Motor control	C0006	Selection V/f-characteristic control or vector control	5
	C0011	Maximum speed	3000 rpm
	C0016	Voltage boost	0.00 %
	C0021	Slip compensation	depending on the controller
	C0022	Maximum current for motor mode	depending on the controller
	C0105	Quick stop deceleration time	5.00 sec
	C0019	Threshold for automatic DC injection braking	0 rpm
	C0107	Holding time for automatic DC injection brake	0.00 sec
	C0036	Current setpoint for DC injection brake	0.00 A
	C0018	Inverter chopping frequency	6
For vector control or with incremental encoder	C0070	Gain of the speed controller	10
	C0071	Adjustment time of the speed controller	50 msec
	C0074	Influence of the speed controller (only for V/f-characteristic control)	10.00 %

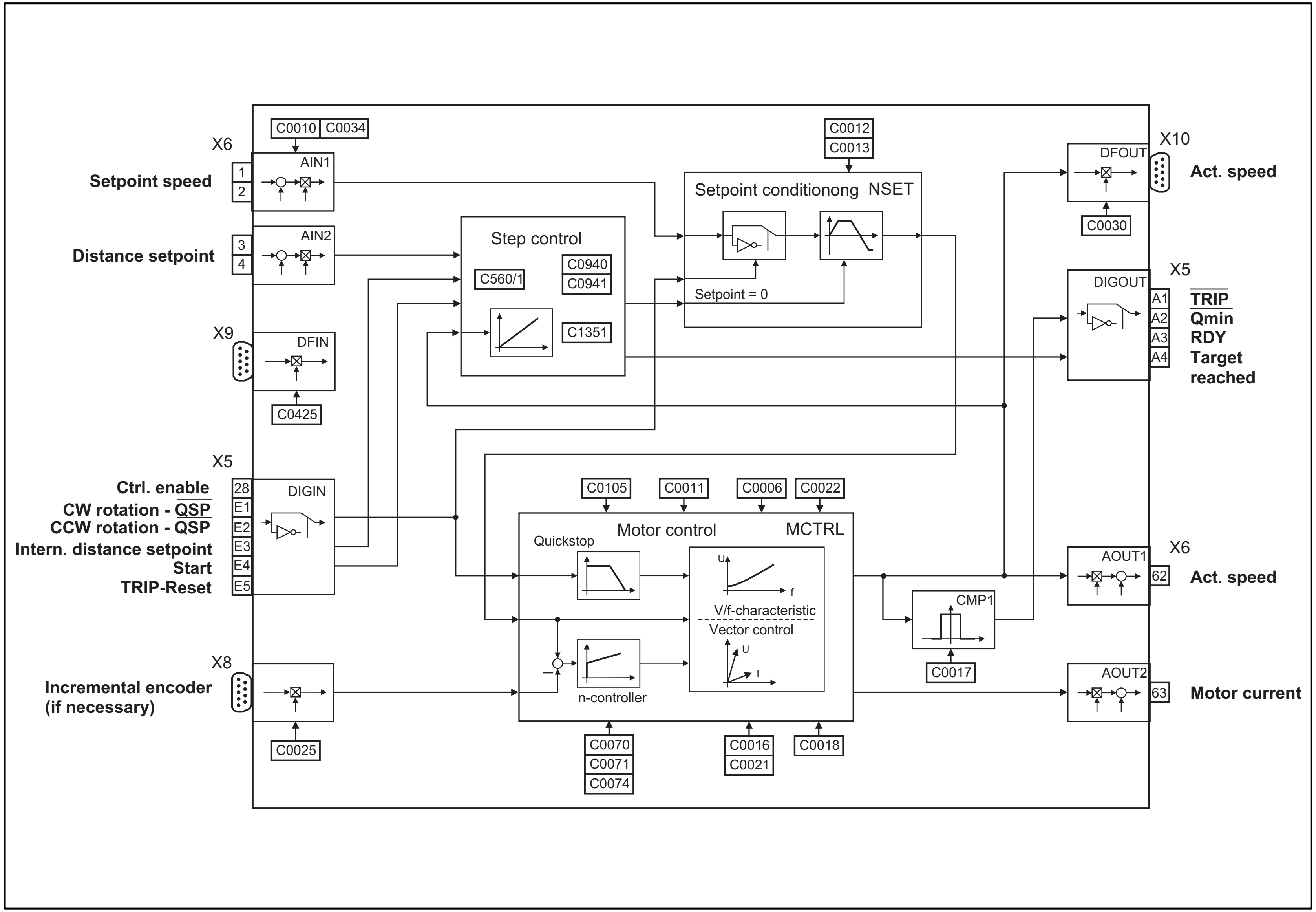


Fig. 7-2 Signal flow for configuration 2000: Step control

7.1.4 Traversing control (C0005 = 3000)

The configuration C0005 = 3000 has been developed for spindle drives which traverse the material on wind-up stands.

The winding drive speed, which controls the speed of the traversing drive, is transmitted via analog input 1. The specific reversal of rotational direction is controlled through the digital inputs X5/E1 and X5/E2. You can, for instance, use limit-switches as normally-closed contacts which inhibit the momentary direction of rotation.

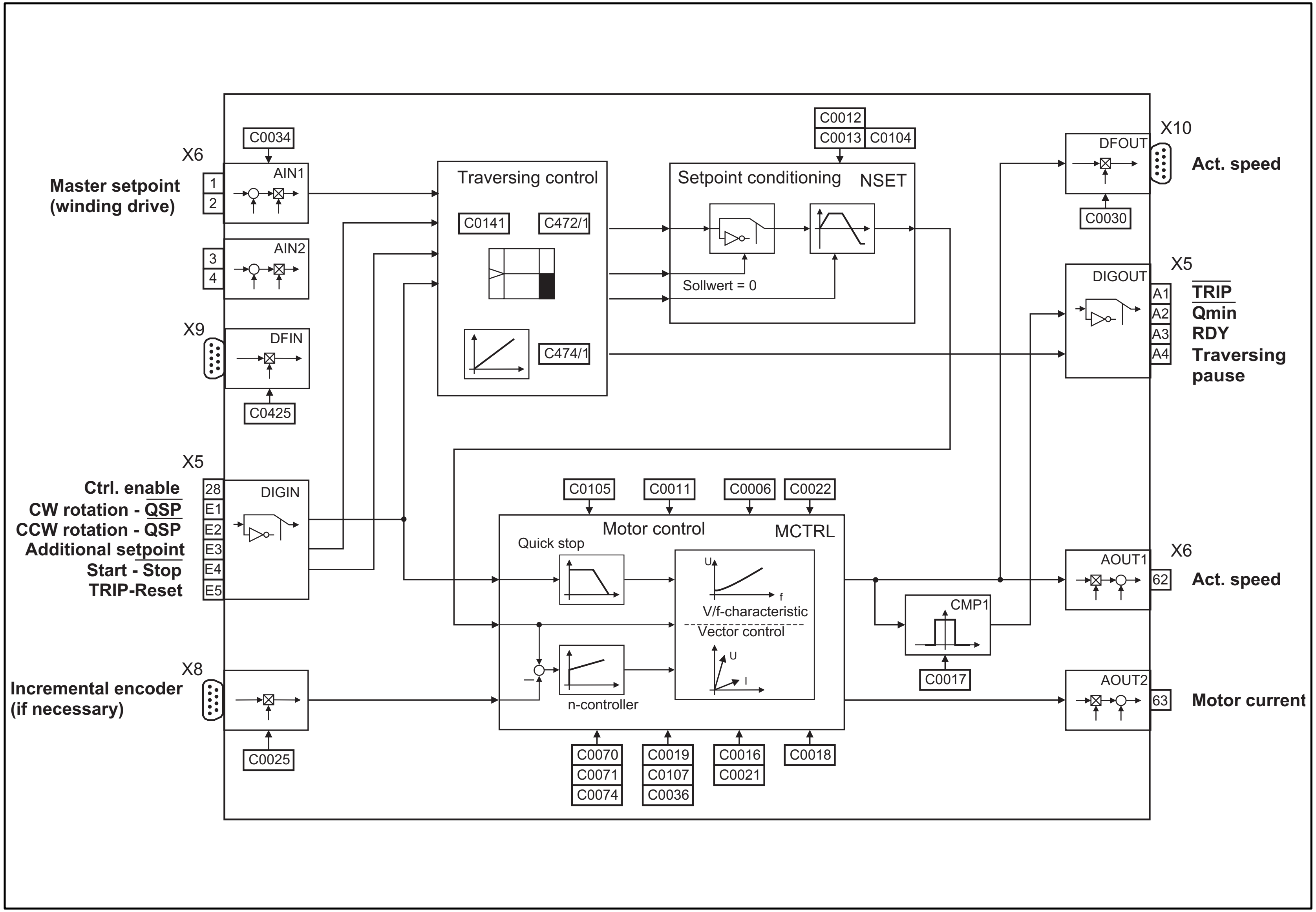
Tip!

For further information on parameterization refer to Part K, "Application examples". (📖 15-4)

Short Setup

Setting	Code	Explanation	Lenze default setting
Setpoint conditioning	C0012	Acceleration time	5.00 sec
	C0013	Deceleration time	5.00 sec
	C0034	Changeover to current setpoint 4 ... 20 mA	0
	C0141	Additional setpoint for jog operation through digital input X5/E3	0.00 %
	C0472/1	Setting of the traversing step	0.00 %
	C0474/1	Setting of the traversing break (65536 corresponds to a break of one motor revolution, if 100% master setpoint equals to 3000 rpm)	0
	C0104	Selection of the acceleration: constant distance (constant number of revolutions)	0
Motor control	C0006	Selection V/f-characteristic control or vector control	5
	C0011	Maximum speed	3000 rpm
	C0016	Voltage boost	0.00 %
	C0021	Slip compensation	depending on the controller
	C0022	Maximum current for motor mode	depending on the controller
	C0105	Quick stop deceleration time	5.00 sec
	C0019	Threshold for automatic DC injection braking	0 rpm
	C0107	Holding time for automatic DC injection brake	0.00 sec
	C0036	Current setpoint for DC injection brake	0.00 A
	C0018	Inverter chopping frequency	6
For vector control or with incremental encoder	C0070	Gain of the speed controller	10
	C0071	Adjustment time of the speed controller	50 msec
	C0074	Influence of the speed controller (only for V/f-characteristic control)	10 %

Fig. 7-3 Signal flow for configuration 3000: Traversing control



7.1.5 Torque control (C0005 = 4000)

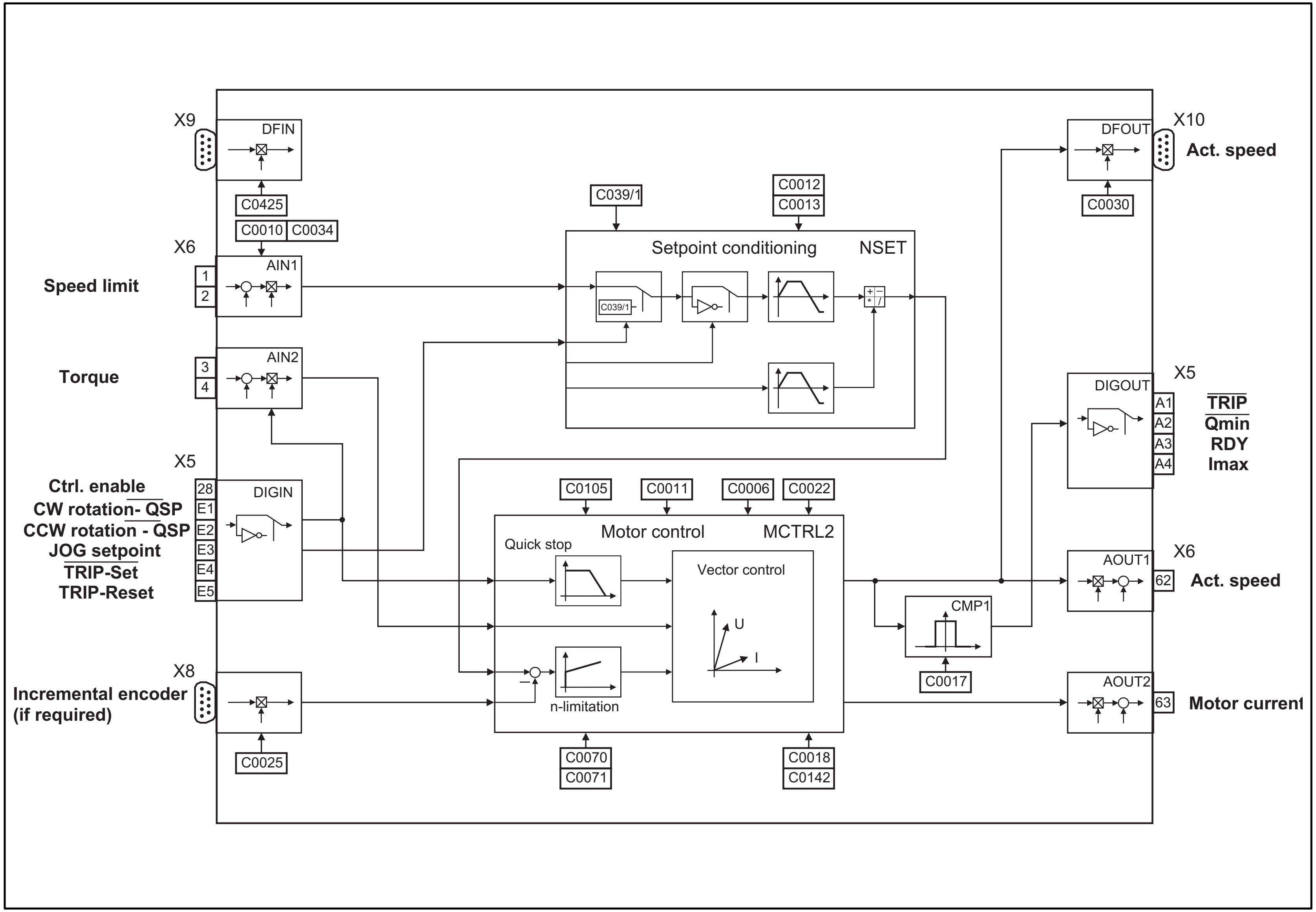
The drive can be controlled with a torque setpoint using the configuration C0005 = 4000.

The setpoint is selected via analog input X6/2. The direction of the torque results from the sign of the setpoint and the triggering of the digital inputs X5/E1 and X5/E2. The maximum permissible speed is set via analog input X6/1.

Short Setup

Setting	Code	Explanation	Lenze default setting
Setpoint conditioning	C0010	Input of a minimum value for the speed limitation	0 rpm
	C0012	Acceleration time for the speed limit	5.00 sec
	C0013	Deceleration time for the speed setpoint	5.00 sec
	C0034	Changeover to current setpoint 4 ... 20 mA	0
	C0039/1	JOG speed as a limit value, can be activated via digital input X5/E3	1500 rpm
Motor control	C0006	Selection V/f-characteristic control or vector control The direct control of the motor torque is possible only when the vector control is activated!	5
	C0011	Maximum speed	3000 rpm
	C0022	Maximum current for motor mode	depending on the controller
	C0105	Quick stop deceleration time	5.00 sec
	C0018	Inverter chopping frequency	6
	C0142	Behaviour after controller enable	1
For vector control or with incremental encoder	C0070	Gain of the limiting controller	10
	C0071	Adjustment time of the limiting controller	50 sec

Fig. 7-4 Signal flow for configuration 4000: Torque control



7.1.6 Digital frequency - master (C0005 = 5000)

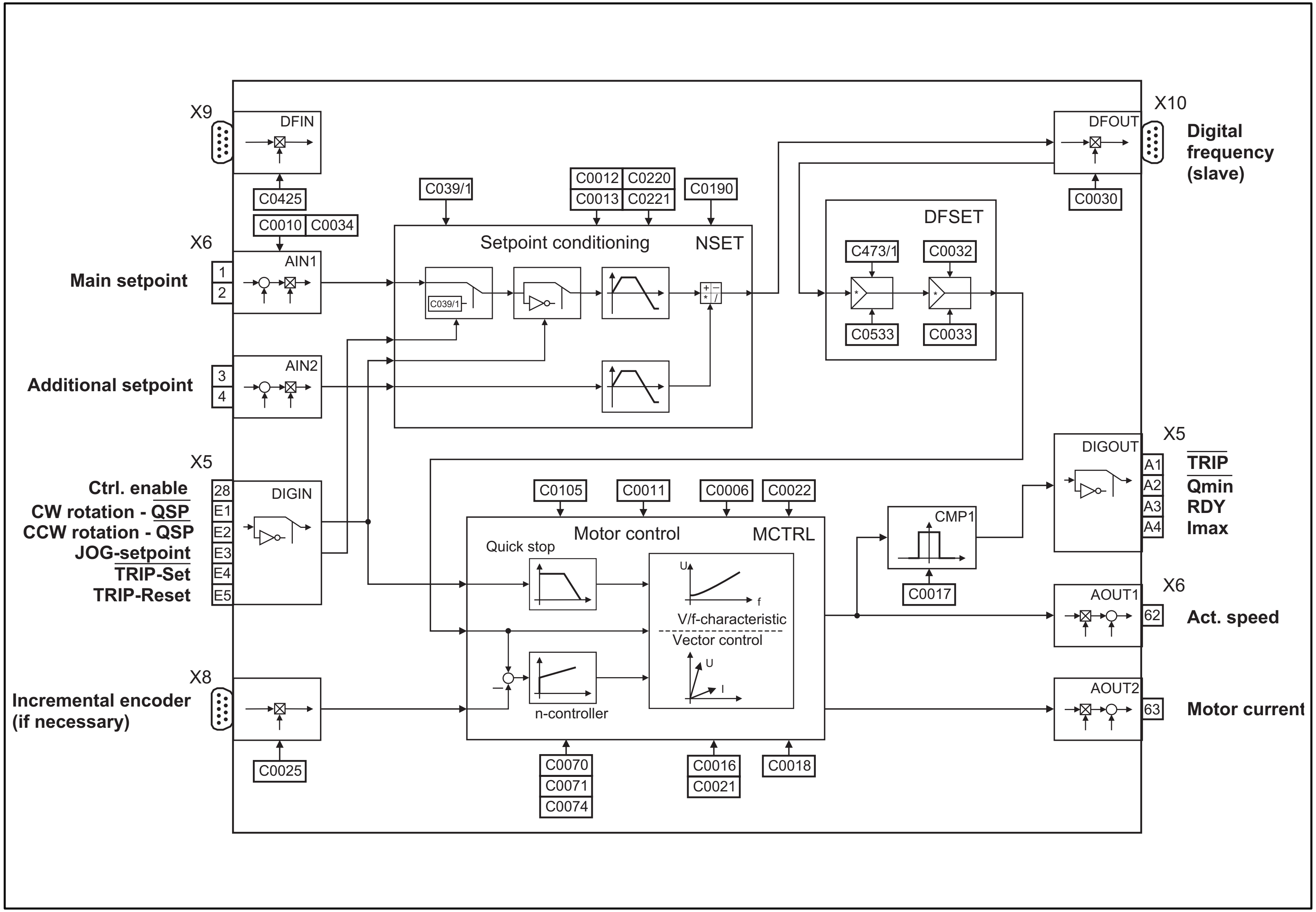
The configuration C0005 = 5000 is used to control a network of drives. The conditioned speed setpoint is used as a common reference variable in the master as well as in the slaves. The setpoint is passed on to the slaves via the digital frequency output X10.

Thanks to the adjustable rating of the reference variable, the speed ratio of the individual drive can be adapted to the process.

Short Setup

Setting	Code	Explanation	Lenze default setting
Setpoint conditioning	C0010	Input of a minimum speed for setpoint = 0	0 rpm
	C0012	Acceleration time for the main setpoint	5.00 sec
	C0013	Deceleration time for the main setpoint	5.00 sec
	C0034	Changeover to current setpoint 4 ... 20 mA	0
	C0039/1	JOG speed, can be activated via digital input X5/E3	1500 rpm
	C0190	Activation of the additional setpoint channel	0
	C0220	Acceleration time for the additional setpoint	2.00 sec
	C0221	Deceleration time for the additional setpoint	2.00 sec
Digital frequency processing	C0030	Selection digital frequency constant output X10	3
	C0473/1, C0533	Denominator, numerator - digital frequency rating	C0473/1 = 1 C0533 = 1
	C0032, C0033	Denominator, numerator - gearbox factor	C0032 = 1 C0033 = 1
Motor control	C0006	Selection V/f-characteristic control or vector control	5
	C0011	Maximum speed	3000 rpm
	C0016	Voltage boost	0.00 %
	C0021	Slip compensation	depending on the controller
	C0022	Maximum current for motor mode	depending on the controller
	C0105	Quick stop deceleration time	5.00 sec
	C0019	Threshold for automatic DC injection braking	0 rpm
	C0107	Holding time for automatic DC injection brake	0.00 sec
	C0036	Current setpoint for DC injection brake	0.00 A
	C0018	Inverter chopping frequency	6
For vector control or with incremental encoder	C0070	Gain of the speed controller	10
	C0071	Adjustment time of the speed controller	50 msec
	C0074	Influence of the speed controller (only for V/f-characteristic control)	10.00 %

Fig. 7-5 Signal flow for configuration 5000: Digital frequency - master



7.1.7 Digital frequency – slave (bus) (C0005 = 6000)

The configuration C0005 = 6000 is used to integrate the controller into a network of drives.

The digital frequency setpoint is read in from input X9 to control the drive. An evaluation is then made, so that the drive speed can be adjusted to suit the process.

An internal additional setpoint can also be activated via the digital input X5/E3.

The digital frequency setpoint is passed to the slaves without changes.

Short Setup

Setting	Code	Explanation	Lenze default setting
Setpoint conditioning	C0141	Additional setpoint, can be activated via digital input X5/E3	0.00 %
	C0671	Acceleration time for the additional setpoint	0.0 sec
	C0672	Deceleration time for the additional setpoint	0.00 sec
Digital frequency processing	C0425	Selection digital frequency constant input X9	3
	C0473/1, C0533	Denominator, numerator - digital frequency rating	C0473/1 = 1 C0533 = 1
	C0032, C0033	Denominator, numerator - gearbox factor	C0032 = 1 C0033 = 1
Motor control	C0006	Selection V/f-characteristic control or vector control	5
	C0011	Maximum speed	3000 rpm
	C0016	Voltage boost	0.00 %
	C0021	Slip compensation	depending on the controller
	C0022	Maximum current for motor mode	depending on the controller
	C0105	Quick stop deceleration time	5.00 sec
	C0019	Threshold for automatic DC injection braking	0 rpm
	C0107	Holding time for automatic DC injection brake	0.00 sec
	C0036	Current setpoint for DC injection brake	0.00 A
	C0018	Inverter chopping frequency	6
For vector control or with incremental encoder	C0070	Gain of the speed controller	10
	C0071	Adjustment time of the speed controller	50 msec
	C0074	Influence of the speed controller (only for V/f-characteristic control)	10.00 %

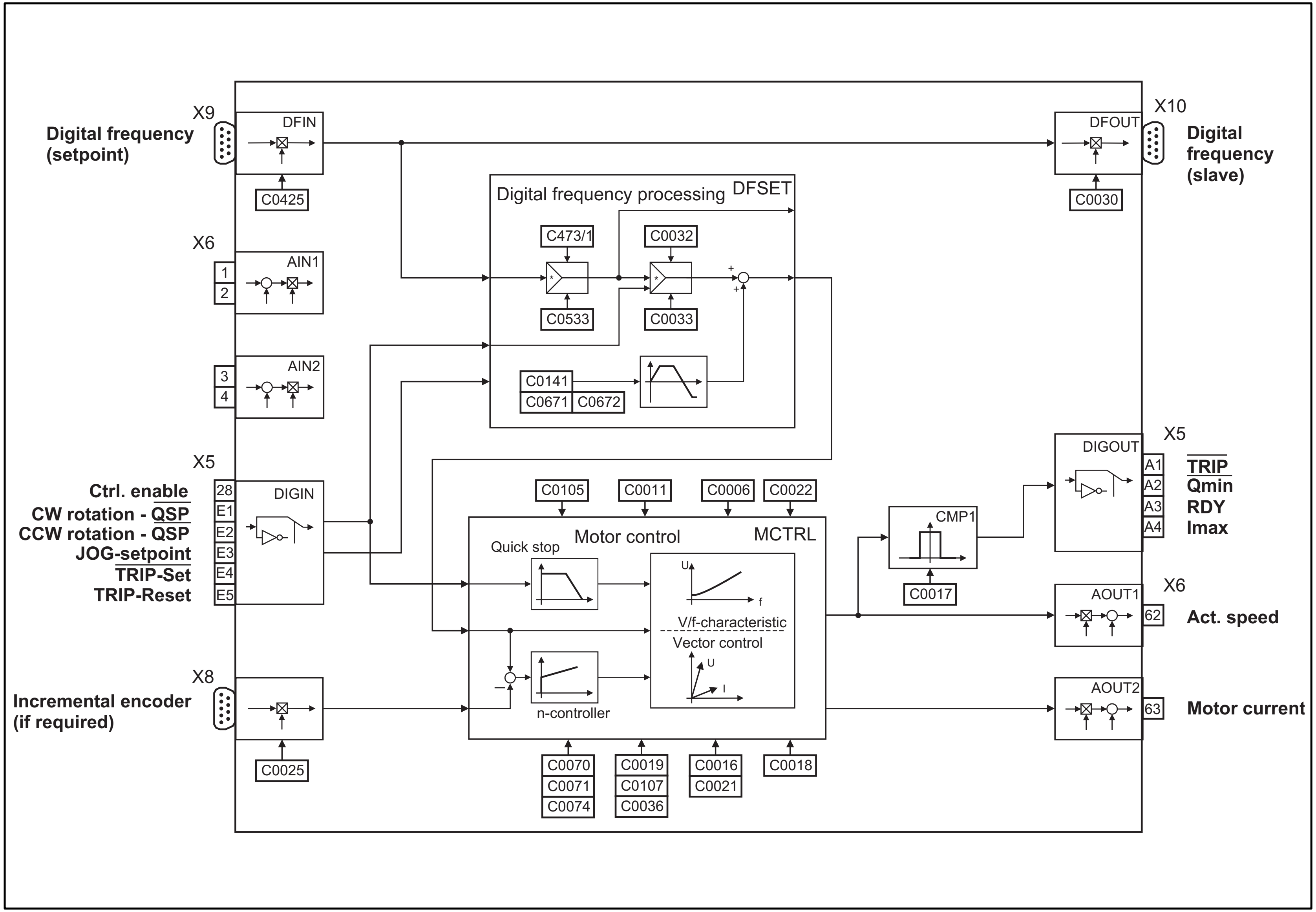


Fig. 7-6 Signal flow for configuration 6000: Digital frequency - slave (bus)

7.1.8 Digital frequency – slave (cascade) (C0005 = 7000)

The configuration C0005 = 7000 is used to integrate the controller into a network of drives.

The digital frequency setpoint is read in from input X9 to control the drive. An evaluation is then made, so that the drive speed can be adjusted to suit the process.

An internal additional setpoint can also be activated via the digital input X5/E3.

Unlike configuration 6000, the rated reference setpoint is passed on via the digital frequency output X10. Modifications of the rating thus also affect the subsequent drives.

Short Setup

Setting	Code	Explanation	Lenze default setting
Setpoint conditioning	C0141	Additional setpoint, can be activated via digital input X5/E3	0.00 %
	C0671	Acceleration time for the additional setpoint	0.0 sec
	C0672	Deceleration time for the additional setpoint	0.00 sec
Digital frequency processing	C0425	Selection digital frequency constant input X9	3
	C0473/1, C0533	Denominator, numerator - digital frequency rating	C0473/1 = 1 C0533 = 1
	C0032, C0033	Denominator, numerator - electronic gearbox factor	C0032 = 1 C0033 = 1
Motor control	C0006	Selection V/f-characteristic control or vector control	5
	C0011	Maximum speed	3000 rpm
	C0016	Voltage boost	0.00 %
	C0021	Slip compensation	depending on the controller
	C0022	Maximum current for motor mode	depending on the controller
	C0105	Quick stop deceleration time	5.00 sec
	C0019	Threshold for automatic DC injection braking	0 rpm
	C0107	Holding time for automatic DC injection brake	0.00 sec
	C0036	Current setpoint for DC injection brake	0.00 A
	C0018	Inverter chopping frequency	6
For vector control or with incremental encoder	C0070	Gain of the speed controller	10
	C0071	Adjustment time of the speed controller	50 msec
	C0074	Influence of the speed controller (only for V/f-characteristic control)	10.00 %

Tip!

In this configuration you cannot activate the incremental encoder input X8.

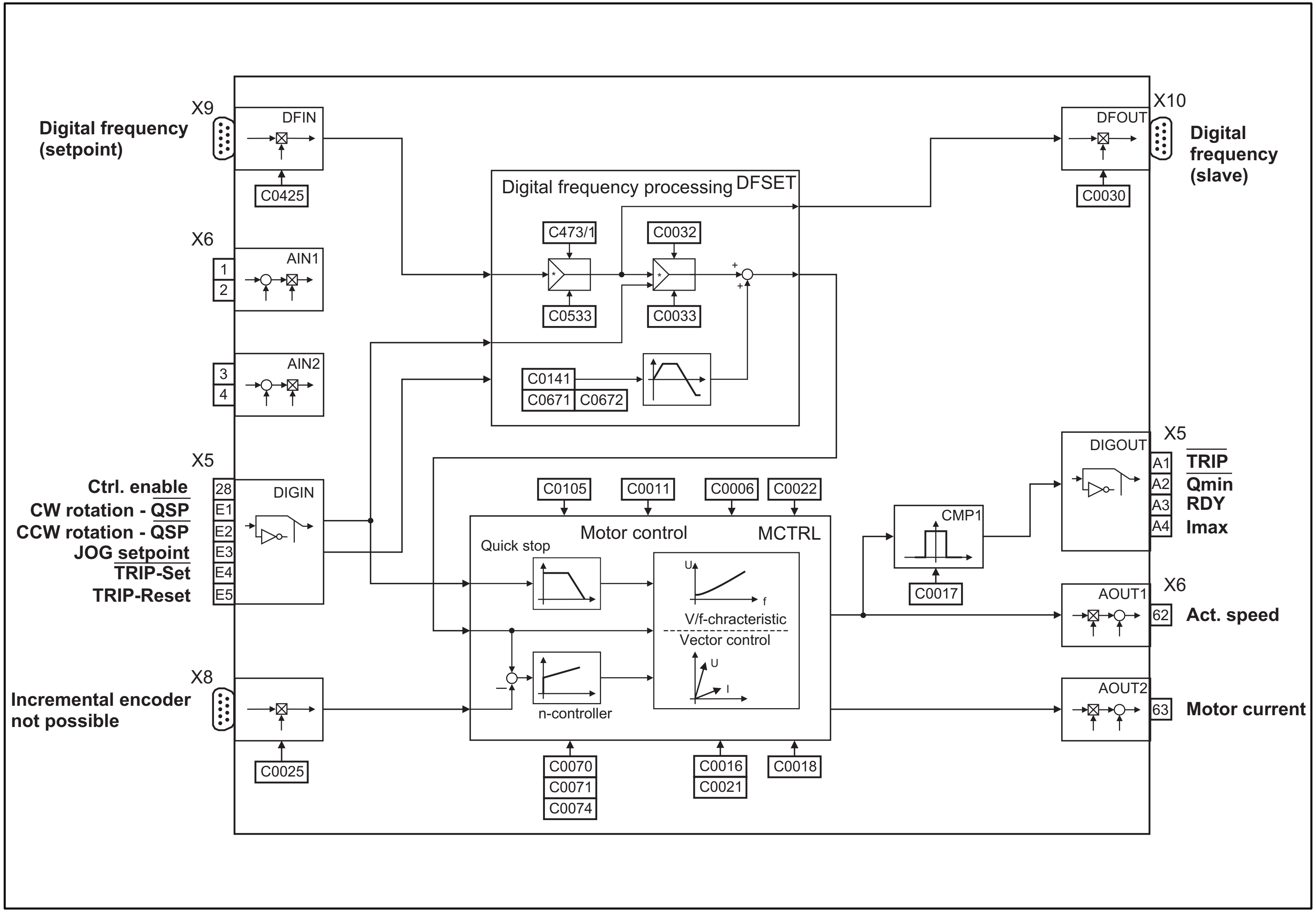


Fig. 7-7 Signal flow for configuration 7000: Digital frequency - slave (cascade)

7.1.9 Dancer position control (external diameter detection (C0005 = 8000)

The configuration C0005 = 8000 has been developed for winding drives with dancer position control and external diameter detection.

The drive is pre-controlled with the plant or material speed via a digital frequency signal.Depending on the actual dancer position, the dancer position controller generates a correction signal which is added to the precontrol signal. The result is a setpoint circumferential speed which can be used direct as a speed setpoint for a contact winder.

The speed setpoint for a core winder is obtained by rating the winding diameter. The analog signal generated by the diameter sensor is conditioned in the controller.

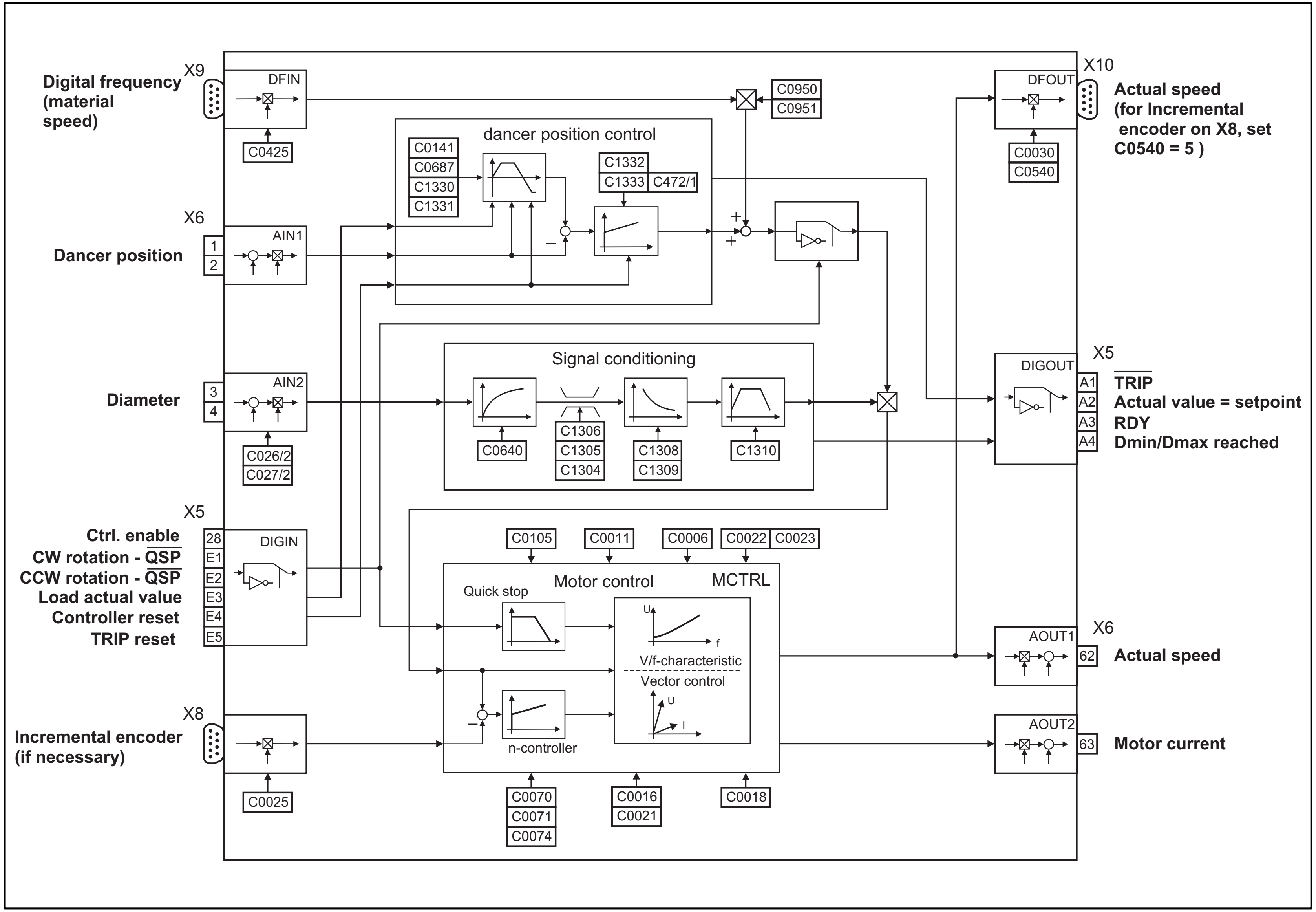
Short Setup

Setting	Code	Explanation	Lenze default setting
Digital frequency pilot control	C0425	Selection digital frequency constant input X9	3
	C0950	Numerator for the digital frequency rating	1
	C0951	Denominator for the digital frequency rating	1
Dancer position control	C0141	Dancer position setpoint	0.00 %
	C0687	Window actual dancer position = dancer position setpoint	1.00 %
	C1330	Acceleration time for the dancer position setpoint	1.0 sec
	C1331	Deceleration time for the dancer position setpoint	1.0 sec
	C1332	Gain of the dancer position controller	1.0
	C1333	Adjustment time of the dancer position controller	400 msec
	C0472/1	Influence of the dancer position controller	0.00 %
Diameter detection	C0026/2	Offset analog input X6/2	0.00 %
	C0027/2	Gain analog input X6/2	100.00 %
	C0640	Filter time constant of the actual diameter filter	20.00 sec
	C1304	Maximum diameter Dmax (corresponds to actual value = 100 %)	500 mm
	C1305	Lower diameter limit	50 mm
	C1306	Upper diameter limit	500 mm
	C1308	Selection arithmetic function 1/D	1
	C1309	Minimum diameter Dmin	50
	C1310	Acceleration/Deceleration time for the new initial diameter	0.000 sec
Motor control	C0006	Selection V/f-characteristic control or vector control	5
	C0011	Maximum speed	3000 rpm
	C0016	Voltage boost	0.00 %
	C0021	Slip compensation	depending on the controller
	C0022	Maximum current for motor mode	depending on the controller
	C0023	Maximum current for generator mode	depending on the controller
	C0105	Quick stop deceleration time	5.00 sec
	C0018	Inverter chopping frequency	6
For vector control or with incremental encoder	C0070	Gain of the speed controller	10
	C0071	Adjustment time of the speed controller	50 msec
	C0074	Influence of the speed controller (only for V/f-characteristic control)	10.00 %
	[C0540]	Selection of the signal output at digital frequency output X10	0

Tip!

In this configuration, you can activate the incremental encoder input X8, if you set the digital frequency input X10 to repeat the input signal at X8 (C0540 = 5).

Fig. 7-8 Signal flow for configuration 8000: Dancer position control (external diameter detection)



7.1.10 Dancer position control (internal diameter calculator (C0005 = 9000)

The configuration C0005 = 9000 has been developed for winding drives with dancer position control. Unlike configuration 8000, the diameter is calculated internally.

The drive is pre-controlled with the plant or material speed via a digital frequency signal. Depending on the actual dancer position, the dancer position controller generates a correction signal which is added to the precontrol signal. The result is a setpoint circumferential which produces the speed setpoint when multiplied with 1/D.

The winding diameter is calculated from the signals for the line speed and the winding speed. After changing the core, the new initial diameter can be loaded.

Tip!

For further information on parameterization refer to Part K, “Application examples”. (🕮 15-12)

Configuration

Short Setup

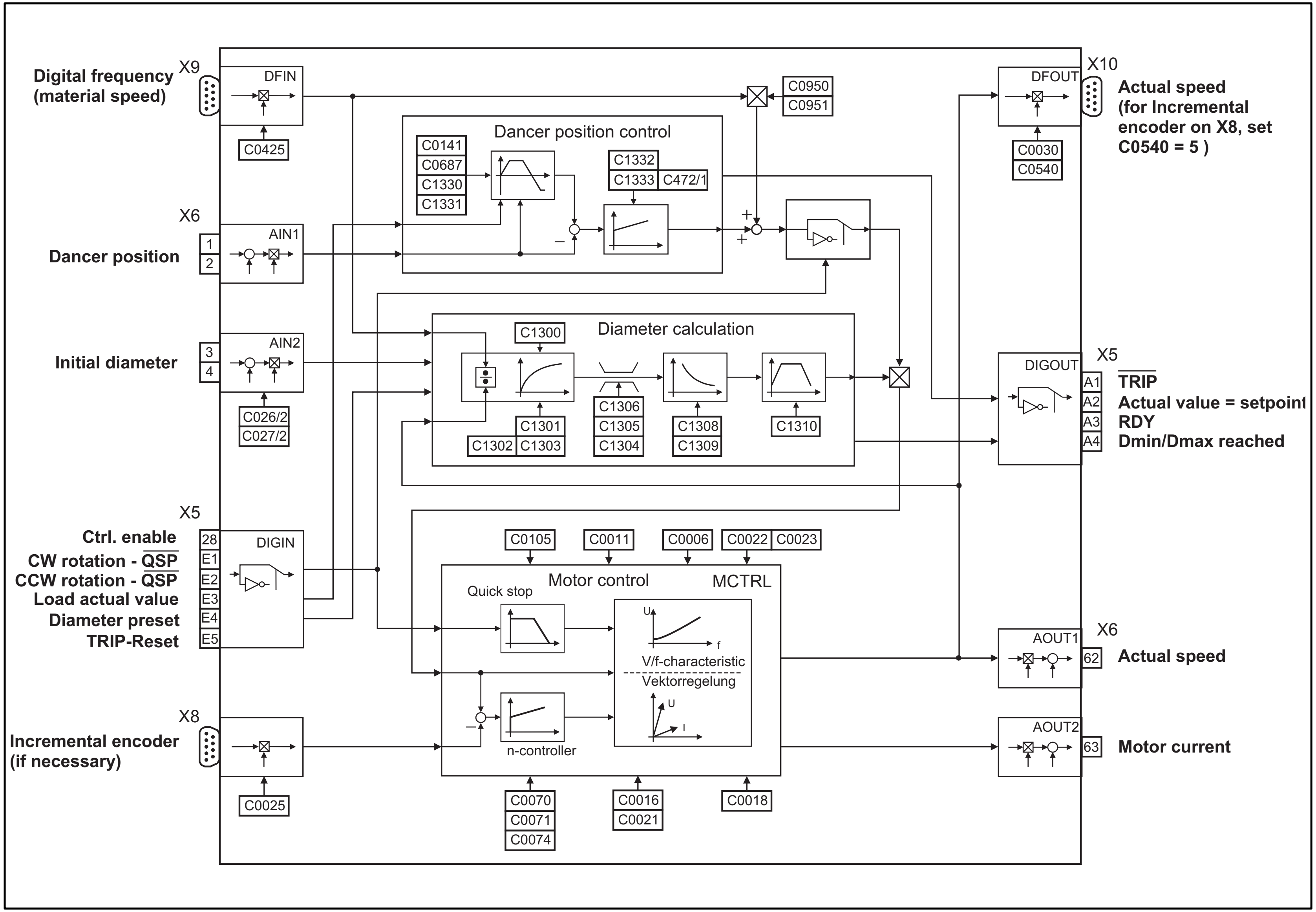
Setting	Code	Explanation	Lenze default setting
Digital frequency pilot control	C0425	Selection digital frequency constant input X9	3
Digital frequency pilot control	C0950	Numerator for the digital frequency rating	1
	C0951	Denominator for the digital frequency rating	1
Dancer position control	C0141	Dancer position setpoint	0.00 %
	C0687	Window actual dancer position = dancer position setpoint	1.00 %
	C1330	Acceleration time for the dancer position setpoint	1.0 sec
	C1331	Deceleration time for the dancer position setpoint	1.0 sec
	C1332	Gain of the dancer position controller	1.0
	C1333	Adjustment time of the dancer position controller	400 msec
	C0472/1	Influence of the dancer position controller	0.00 %
Diameter calculation	C1300	Rated speed for maximum diameter (C0051)	300 rpm
	C1301	Rated speed from digital frequency signal (C0426)	3000 rpm
	C1302	Calculation cycle	1.0
	C1303	Filter time constant for actual diameter	0.10 sec
	C1304	Maximum diameter Dmax (corresponds to actual value = 100 %)	500 mm
	C1305	Lower diameter limit	50 mm
	C1306	Upper diameter limit	500 mm
	C1308	Selection arithmetic function 1/D	1
	C1309	Minimum diameter Dmin	50
	C1310	Acceleration/Deceleration time for the new initial diameter	0.000 sec
Motor control	C0006	Selection V/f-characteristic control or vector control	5
	C0011	Maximum speed	3000 rpm
	C0016	Voltage boost	0.00 %
	C0021	Slip compensation	depending on the controller
	C0022	Maximum current for motor mode	depending on the controller
	C0023	Maximum current for generator mode	depending on the controller
	C0105	Quick stop deceleration time	5.00 sec
	C0018	Inverter chopping frequency	6
For vector control or with incremental encoder	C0070	Gain of the speed controller	10
	C0071	Adjustment time of the speed controller	50 msec
	C0074	Influence of the speed controller (only for V/f-characteristic control)	10.00 %
	[C0540]	Selection of the signal output at digital frequency output X10	0

Tip!

In this configuration, you can activate the incremental encoder input X8, if you set the digital frequency input X10 to repeat the input signal at X8 (C0540 = 5).

Show/Hide Bookmarks

Fig. 7-9 Signal flow for configuration 9000: Dancer position control (internal diameter calculation)



7.2 Control

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

Tip!

C0005 contains predefined configurations which allow a very simple change of the operating mode. (7-1)

Example: C0005 = 1005

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

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

- Assign the function block inputs to be controlled to "control objects" depending on the interface used. (7-32)
  - – Free control codes
    in the case of control via LECOM-A/B/LI (RS232, RS485 or optical fibre interface) or operating module.
  - – AIF objects
    for control using the field bus module.
  - – CAN objects
    in case of control using the system bus.
- Afterwards, the inputs can be controlled through these codes or input objects, by accessing them via the interface.

Example for a distribution of the control on terminals and LECOM-A (RS232):

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

1. Select C0780:
   – C0780 is the configuration code for the main setpoint NSET-N in the function block "Speed setpoint conditioning" (NSET).
2. Assign a free control code via a selection number.
   – e.g. 19515 (control code C0141)

The main speed setpoint is controlled by C0141.

7.3 Parameterization

- The parameter setting of the controller is used to adapt the drive to your applications.
- The complete parameter set is organized in codes which are consecutively numbered and always begin with ”C”. (📖 7-219)
- You can save the parameter set of an application.
  – Four parameter sets are available, so that the controller can be adjusted rapidly from one application to another.
  – When delivered, the parameter sets have Lenze default values.

7.3.1 Ways of parameterization

There are two ways of changing parameters:

- Using the operating module
- Using a superimposed host (PC or PLC) via field bus modules and operating programs (see systems manual, part I, ”Accessories”).

These instructions only describe the change of parameters using the operating module.

7.3.2 Structure of the parameter set

To simplify operation, the operating module 9371BB and the PC program GLOBAL DRIVE CONTROL (GDC) provide menu levels which will guide you rapidly to the desired codes:

- 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 types of parameter:
  – Absolute values of a physical variable
    (e. g. 400 V, 10 s)
  – Relative values of instrument variables
    (e.g. 50 % setpoint)
  – Codes for specific states
    (e.g. 0 = controller inhibited, 1 = controller enabled)
  – Display values
    These values can only be displayed and not changed.
    (e.g. actual motor current under C0054)

You can change absolute and relative values in discrete steps.

7.3.3 List of the selection menus

Operating module 9371 BB		Global Drive Control or LEMOC2	
Main menu	**Submenu**	**Main menu**	**Submenu**
USER menu		USER menu	
Code list		Code list	
Load / Store		Parameter set management	
Diagnostics		Diagnostics	
	Actual info		Momentary operation
	History		History
Short setup		Short setup	
	Setup V/f		V/f characteristic mode
	Setup vector		Motor control
	Speed control		Speed control
	Step control		Step control
	Lead screw		Traversing control
	Torque control		Torque control
	DF master		Digital frequency - master
	DF slave bus		Digital frequency slave bus
	DF slave cas		Digital frequency slave cascade
	Dancer control external		Dancer position control, external diameter detection
	Dancer control internal		Dancer position control, internal diameter detection
	UserMenue CFG		Configuration User Menu
Main FB		Main function blocks	
	NSET		NSET Speed preparation
	NSET-JOG		NSET-JOG JOG values
	NSET-RAMP1		NSET-RAMP1 Standard ramp generator
	MCTRL		MCTRL Motor control
	DFSET		DFSET Digital frequency processing
	DCTRL		DCTRL Device control
Terminal I/O		Terminal I/O	
	AIN1 X6.1/2		Analog input 1 X6.1/2
	AIN2 X6.3/4		Analog input 2 X6.3/4
	AOUT1 X6 62		Analog output 1 X6/62
	AOUT2 X6 63		Analog output 2 X6/63
	DIGIN		Digital inputs
	DIGOUT		Digital outputs
	DFIN		Digital frequency input
	DFOUT		Digital frequency output
Controller		Controller setting	
	Speed		speed
	Current		Current/Torque
Motor/Feedb.		Motor/Feedback system	
	Motor adj		Motor adjustment
	Feedback		Feedback systems
Monitoring		Monitoring	
LECOM/AIF		LECOM/AIF interface	
	LECOM-A/B		LECOM-A/B
	AIF interface		AIF data interface
	Status word		Status word

Operating module 9371 BB		Global Drive Control or LEMOC2	
Main menu	**Submenu**	**Main menu**	**Submenu**
System bus		System bus	
	Management		CAN management
	CAN-IN1		CAN-IN1 Input block 1
	CAN-OUT1		CAN-OUT1 Output block 1
	CAN-IN2		CAN-IN2 Input block 2
	CAN-OUT2		CAN-OUT2 Output block 2
	CAN-IN3		CAN-IN3 Input block 3
	CAN-OUT3		CAN-OUT3 Output block 3
	Status word		Status word
	FDO		FDO Free digital outputs
	Diagnostics		Diagnostics
FB config		FB configuration	
Func. blocks		Function blocks	
	ABS1		ABS1 Absolute value
	ADD1		ADD1 Addition
	ADD2		ADD2 Addition
	AIF-OUT		AIF-OUT Data interface
	AIN1		AIN1 Analog input1 (term. 1/2
	AIN2		AIN2 Analog input2 (term. 3/4
	AND1		AND1 Logic AND
	AND2		AND2 Logic AND
	AND3		AND3 Logic AND
	AND4		AND4 Logic AND
	AND5		AND5 Logic AND
	ANEG1		ANEG1 Analog NOT
	ANEG2		ANEG2 Analog NOT
	AOUT1		AOUT1 Analog output term. 62
	AOUT2		AOUT2 Analog output term. 63
	ARIT1		ARIT1 Arithmetic
	ARIT2		ARIT2 Arithmetic
	ARIT3		ARIT3 Arithmetic
	ASW1		ASW1 Analog switch
	ASW2		ASW2 Analog switch
	ASW3		ASW3 Analog switch
	BRK1		BRK1 Brake logic
	CAN-OUT1		CAN-OUT1 Output block 1
	CAN-OUT2		CAN-OUT2 Output block 2
	CAN-OUT3		CAN-OUT3 Output block 3
	CFG-FB		CFG FB configuration
	CMP1		CMP1 Analog comparator
	CMP2		CMP2 Analog comparator
	CMP3		CMP3 Analog comparator
	CMP4		CMP4 Analog comparator
	CONV1		CONV1 Converter
	CONV2		CONV2 Converter
	CONV3		CONV3 Converter
	CONV4		CONV4 Converter
	CONV5		CONV5 Converter
	CONVPHA1		CONVPHA1 32-bit conversion
	CURVE1		CURVE1 Curve function
	DB1		DB1 Analog dead band
	DCALC1		DCALC1 Diameter calculator
	DCTRL		DCTRL Device control

Configuration

Operating module 9371 BB		Global Drive Control or LEMOC2	
Main menu	**Submenu**	**Main menu**	**Submenu**
	DFIN		DFIN Digital frequency input
	DFOUT		DFOUT Digital frequency output
	DFRFG1		DFRFG1 Digital frequency ramp generator
	DFSET		DFSET Digital frequency processing
	DIGDEL1		DIGDEL1 Digital delay
	DIGDEL2		DIGDEL2 Digital delay
	DIGIN		DIGIN Digital input E1 - E5
	DIGOUT		DIGOUT Digital output A1 - A4
	DT1		DT1 Differential element
	FCNT1		FCNT1 Free-piece counter
	FDO		FDO Free digital outputs
	FEV-AN1		FEVAN1 Free analog input variable
	FIXSET		FIXSET Fixed setpoints
	FLIP1		FLIP1 Flip-Flop
	FLIP2		FLIP2 Flip-Flop
	FOLL1		FOLL1 Sensor compensation
	INT1		INT1 Integrator
	INT2		INT2 Integrator
	LIM1		LIM1 Limiter
	MCTRL1		MCTRL1 V/f characteristic control
	MCTRL2		MCTRL2 Motor control
	MFAIL		MFAIL Mains failure detection
	MPOT1		MPOT1 Motor potentiometer
	NLIM1		NLIM1 Limit speeds
	NOT1		NOT1 Logic NOT
	NOT2		NOT2 Logic NOT
	NOT3		NOT3 Logic NOT
	NOT4		NOT4 Logic NOT
	NOT5		NOT5 Logic NOT
	NSET		NSET Speed preparation
	NSET-JOG		NSET-JOG JOG values
	NSET-RAMP1		NSET-RAMP1 Standard ramp generator
	OR1		OR1 Logic OR
	OR2		OR2 Logic OR
	OR3		OR3 Logic OR
	OR4		OR4 Logic OR
	OR5		OR5 Logic OR
	OSZ		OSZ Oscilloscope function
	PCTRL1		PCTRL1 Process controller
	PCTRL2		PCTRL2 Process controller
	PT1-1		PT1-1 Delay element
	PT1-2		PT1-2 Delay element
	R/L/Q		R/L/Q CW-CCW-QSP
	SRFG1		SRFG1 S-shaped ramp generator
	SQRT1		SQRT1 Square-root calculator
	S&H1		S&H1 Sample & Hold
	STAT		STAT Digital status signals
	TRANS1		TRANS1 Signal evaluation
	TRANS2		TRANS2 Signal evaluation
FCODE		Free codes	
Identify		Identification	
	Drive		Controller
	Op Keypad		LECOM

7.4 Working with function blocks

You can configure the signal flow in the controller yourself, by connecting function blocks. In this way, you can easily adapt the controller to different applications.

7.4.1 Signal types

Every function block has a number of inputs and outputs that can be connected (linked) together. Corresponding to their functions, there are only certain types of signals at the inputs and outputs:

- Quasi analog signals
  - – Symbol: ○
  - – Unit: %
  - – Designation: a
  - – Value range: ±16384 = ±100 %
  - – Resolution: 16 bit
- Digital signals
  - – Symbol: □
  - – Unit: binary, with HIGH or LOW level
  - – Designation: d
  - – Resolution: 1 bit
- Speed signals
  - – Symbol: △
  - –
  - – Unit: rpm
  - – Abbreviation: phd
  - – Resolution: 16 bit
- Phase signals
  - – Symbol: ▲
  - – Unit: inc
  - – Designation: ph
  - – Resolution: 16 bit

You can only connect signal types of the same kind: e.g. an analog signal of a function block can only be connected to the analog input of the other function block. If you try to connect two different signal types, the connection will be rejected.

Tip!

A detailed description of all function blocks can be obtained from the Manual.

7.4.2 Elements of a function block

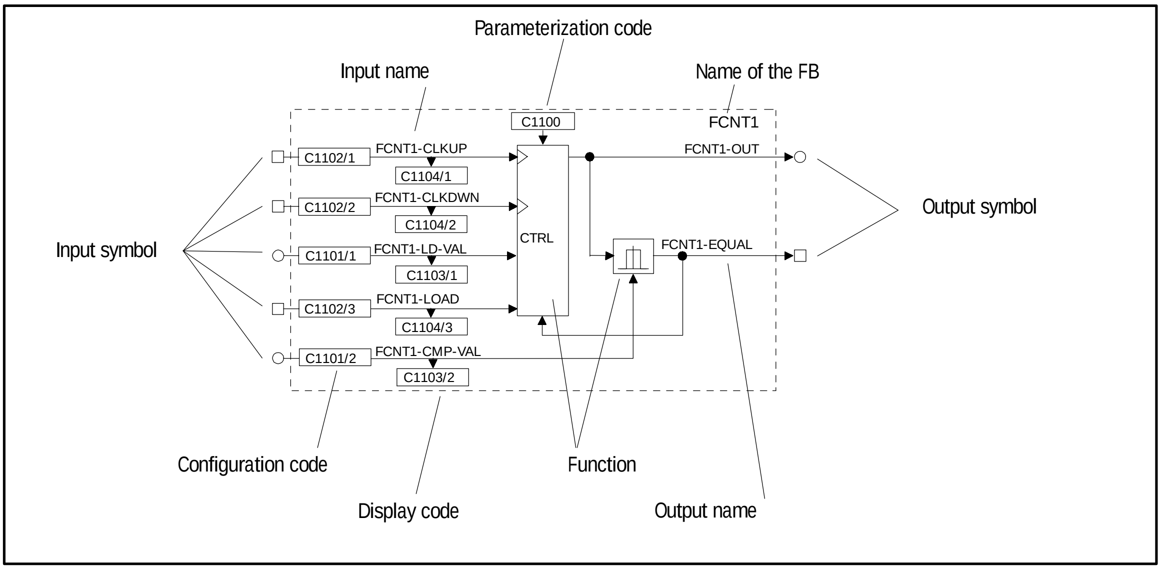


Fig. 7-10 The construction of a function block (FB). Example: FCNT1

Name of the FB

Identifies the FB unambiguously. FBs with the same function are distinguished by a number after their names.

Every FB is defined by a selection number. The input of the selection number into the processing table is always required for the calculation of the FB. (🕮 7-36)

The selection numbers can be obtained from selection list 5. (🕮 7-256)

Example:

(FCNT1, see Fig. 7-10)

- FCNT1 has the selection number 6400 (selection list 5).

Input symbol

Designates the signal type which is permitted as a signal source for this input. (🕮 7-29)

Tip!

You cannot configure inputs which are not connected.

Name of the input

Consists of the FB name and a designation. Inputs with the same function are distinguished by number behind their designation.

Configuration code

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

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

Display code

Displays the present input value. Inputs with identical codes are distinguished by the subcode. The subcode is attached to the code (Cxxxx/1). These codes are displayed via their subcodes.

Display codes cannot be processed.

Function

Displays the mathematical function as a block diagram (see Fig. 7-10).

Parameterization code

Adaptation of the function or the behaviour to the application. The settings are explained and shown in the text and/or the line diagram. (🕮 7-39)

Output symbol

Designates the signal type. Connections to inputs of the same signal type are possible. (🕮 7-29)

Every output is defined by a selection number.The selection numbers are divided into selection lists (1 to 4) according to the different signal types. An output is connected to an input by the selection numbers. (🕮 7-256)

Example:

(FCNT1, see Fig. 7-10)

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

Tip!

You cannot configure outputs which are not connected.

Name of the output

Consists of the FB name and a designation. Outputs with the same function are distinguished by a number behind their designation.

7.4.3 Connecting function blocks

General rules

- Every input has a signal input assigned to it.
- Each input can only have one signal source.
- Inputs of different function blocks can have the same signal source.
- You can only connect signals of the same type.

Stop!

Existing connections that are not wanted must be removed by reconfiguration. Otherwise, the drive cannot perform the desired function.

Tip!

For the visualization of existing connections, Lenze offers a network list generator (see Manual, Part I,"Accessories": GDC PC program).

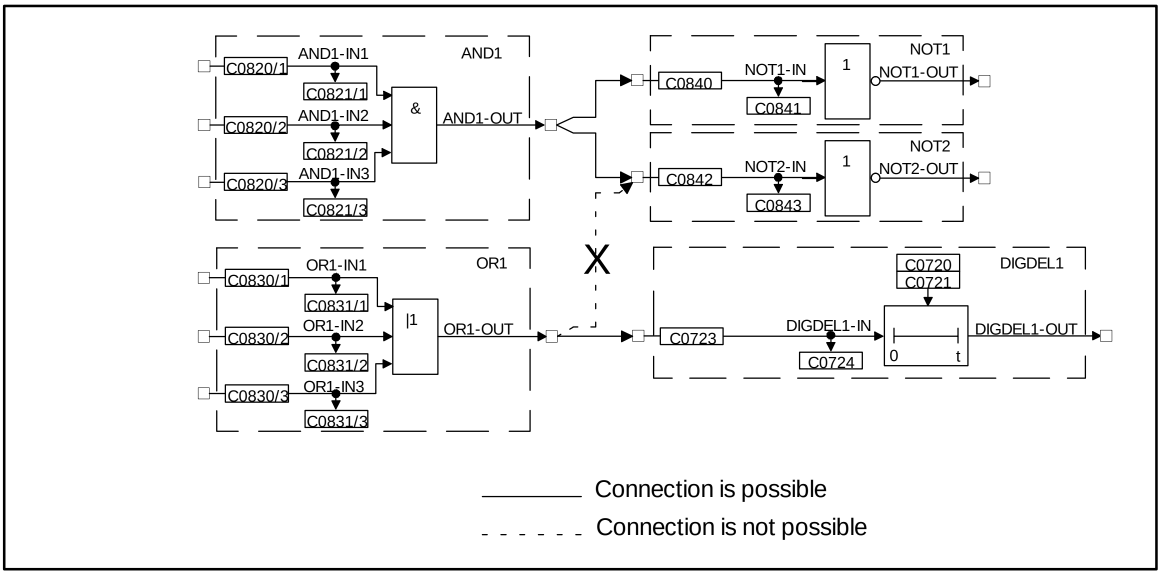


Fig. 7-11 Correct connection of function blocks

Basic procedure

1. Select the configuration code of the function block input which is to be changed.
2. Select the signal source for the function block input (e.g. 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 unwanted 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 the modified configuration in the desired parameter set.

Example

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

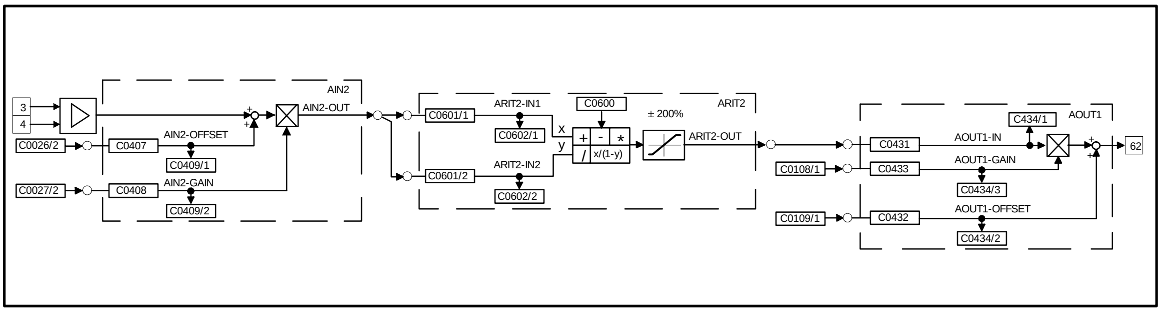


Fig. 7-12 Example of a simple configuration

Configuration

Making connections

1. Determine signal source for ARIT2-IN1:
   - Change to the code level using the arrow keys
   - With ▲ or ▼ select C0601/1.
   - Change to the parameter level using PRG.
   - With ▲ or ▼ .
   - Confirm using SH + PRG
   - Change to the code level again using PRG.
2. Determine signal source for ARIT2-IN2:
   - With ▲ Select C0601/2.
   - Change to the parameter level using PRG.
   - With ▲ or ▼ .
   - Confirm using SH + PRG
   - Change to the code level again using PRG.
3. Parameterize ARIT2:
   - With ▼ Select C0600.
   - 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:
   - With ▼ Select C0431.
   - 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:
   - With ▲ Select C0465 and subcode 8.
   - 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.

Show/Hide Bookmarks

Remove connections

- Since a source can have several targets, there may be further signal connections, which may not be wanted.
- Example:
  - – In the Lenze 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, it must be removed.

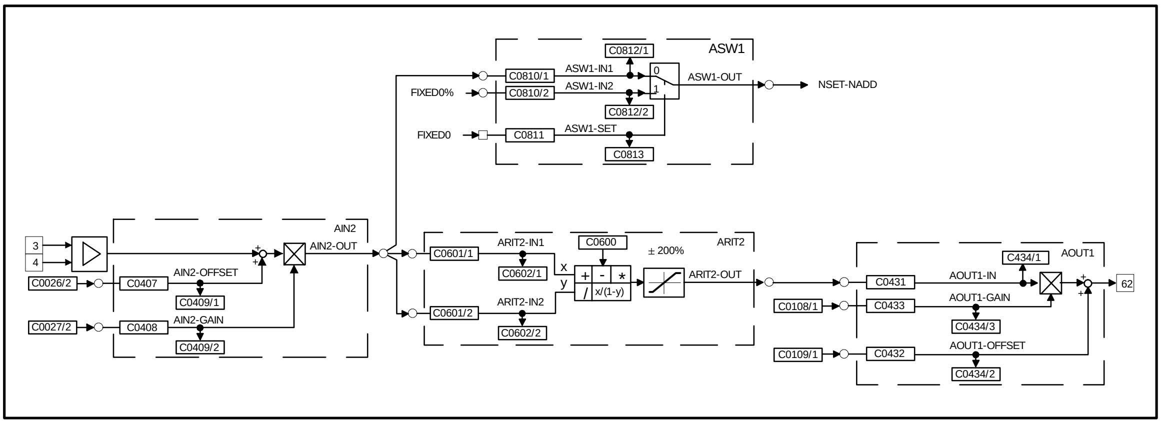


Fig. 7-13 Remove connections in a configuration

6. Remove connection between ASW1-IN1 and AIN2-OUT:
   - – With ▲ or ▼.
   - – Change to the parameter level using PRG.
   - – With ▲ 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.

7.4.4 Entries into the processing table

The 93XX controller provides a certain amount of processor time processing function blocks. Since the type and number of FB to be used depends on the application and can vary strongly, not all available FB are continually 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 you implement FBs into an existing configuration, they must be entered 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 an FB. If this time has elapsed, no further FBs can be integrated.

Entry sequence for FBs

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

Example:

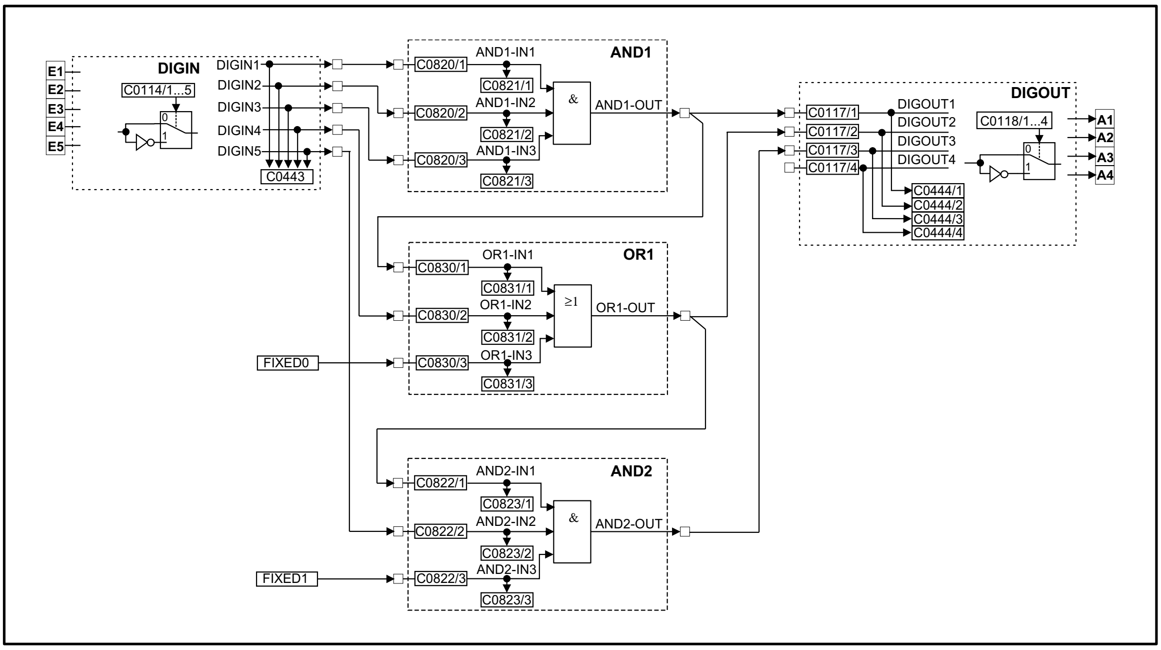


Fig. 7-14 Example of a configuration

Structure of the processing table for the configuration example Fig. 7-14:

1. DIGIN does not have to be entered into the processing table
2. The first FB is AND1, since it receives its input signals from DIGIN and only has successors.
3. The second FB is OR1, since its signal source is the output of AND1 (predecessor). This means that the output signal in AND1 must be generated first, before it can be processed in OR1. At the same time, OR1 has a successor. This means that OR1 must be entered in the processing table before the successor.
4. The third FB is AND2, since it has a predecessor (see 3.)
5. The entries in C0465 are:
   – Position 10: AND1 10500
   – Position 11: OR1 10550
   – Position 12: AND2 10505

This example was started with position 10, because positions 10 to 12 are not assigned in the Lenze default setting.

FBs do not have to be entered consecutively in the processing table. Empty positions in the processing table are permissible.

Tip!

Other FBs can also be entered between the FBs listed in the example.

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

The following function blocks are always executed, and do not have to be entered into the processing table:

- AIF-IN
- CANx-IN
- DIGIN
- DIGOUT
- FCODE (all free codes)
- MCTRL1, MCTRL2
- fixed signal sources (FIXED0, FIXED0%, etc.)

Frequent faults in the configuration

Malfunction	Cause	Remedy
FB only supplies an output signal = 0	FB was not entered into the processing table C0465	Enter FB
FB only supplies constant signals	FB was deleted from or overwritten in the processing table	Enter FB again, possibly under a different subcode (list position)
The output signal does not arrive at the following FB	The connection between the FBs has not been created	Make the connection (from the view of the next FB) through the configuration code (CFG)
FB cannot be entered in the table C0465	Residual processing time is too short (see C0466)	• Remove unused FBs (e.g. inputs and outputs not used) from the processing table • In networked drives, functions may be relocated to other controllers
The controller outputs the internally calculated signals with a delay	FB are processed in an incorrect sequence	Adapt processing table under C0465 to the signal flow

7.5 Description of the function blocks

7.5.1 Overview of the function blocks

Function block	Description	CPU time [ms]	Used in basic configuration C0005								
			1000	2000	3000	4000	5000	6000	7000	8000	9000
ABS1	Absolute value generator	4		•	•						
ADD1	Addition block 1	8		•	•			•		•	•
ADD2	Addition block 2										
AIF-IN	Field bus	-	•	•	•	•	•	•	•	•	•
AIF-OUT	Field bus	56	•	•	•	•	•	•	•	•	•
AIN1	Analog input X6/1, X6/2	10	•	•	•	•	•	•	•	•	•
AIN2	Analog input X6/3, X6/4	28	•	•	•	•	•	•	•	•	•
AND1	Logic AND, block1	6			•						
AND2	Logic AND, block2										
AND3	Logic AND, block3										
AND4	Logic AND, block4										
AND5	Logic AND, block5										
ANEG1	Analog inverter 1	4	•	•	•	•	•	•	•	•	•
ANEG2	Analog inverter 2					•		•	•	•	•
AOUT1	Analog output X6/62	12	•	•	•	•	•	•	•	•	•
AOUT2	Analog output X6/63		•	•	•	•	•	•	•	•	•
ARIT1	Arithmetic block 1	11		•	•					•	•
ARIT2	Arithmetic block 2										
ARIT3	Arithmetic block 3										
ASW1	Analog changeover 1	4				•		•	•	•	•
ASW2	Analog changeover 2							•	•		
ASW3	Analog changeover 3										
BRK1	Trigger holding brake	15									
CAN-IN	System bus	-	•	•	•	•	•	•	•	•	•
CAN-OUT	System bus	56	•	•	•	•	•	•	•	•	•
CMP1	Comparator 1	15	•	•	•	•	•	•	•	•	•
CMP2	Comparator 2			•	•						
CMP3	Comparator 3			•							
CMP4	Comparator 4										
CONV1	Conversion of analog signals	8		•	•						
CONV2	Conversion of analog signals										
CONV3	Conversion of speed signals into analog signals									•	•
CONV4	Conversion of speed signals into analog signals										
CONV5	Conversion of analog signals into speed signals				•						
CONVPHA1	32-bit conversion	6									
CURVE1	Curve function	15									
DB1	Dead band	7									
DCALC1	Diameter calculator	50								•	•
DCTRL	Device control	-	•	•	•	•	•	•	•	•	•
DFIN	Digital frequency input	5						•	•	•	•
DFOUT	Digital frequency output	35	•	•	•	•	•	•	•		
DFRFG1	Digital frequency ramp generator	40									
DFSET	Digital frequency processing	85					•	•	•		
DIGDEL1	Binary delay element 1	9			•						
DIGDEL2	Binary delay element 2										

Configuration

Function block	Description	CPU time [ms]	Used in basic configuration C0005								
			1000	2000	3000	4000	5000	6000	7000	8000	9000
DIGIN	Input terminals X5/E1...X5/E5	-	•	•	•	•	•	•	•	•	•
DIGOUT	Output terminals X5/A1...X5/A4	-	•	•	•	•	•	•	•	•	•
DT1-1	Differential element	12									
FCNT1	Free-piece counter	11									
FCODE16	Free control codes	-	•	•	•	•	•	•	•	•	•
FCODE17			•	•	•	•	•	•	•	•	•
FCODE26/1			•	•	•	•	•	•	•	•	•
FCODE26/2			•	•	•	•	•	•	•	•	•
FCODE27/1			•	•	•	•	•	•	•	•	•
FCODE27/2			•	•	•	•	•	•	•	•	•
FCODE32							•	•	•		
FCODE37											
FCODE108/1			•	•	•	•	•	•	•	•	•
FCODE108/2			•	•	•	•	•	•	•	•	•
FCODE109/1			•	•	•	•	•	•	•	•	•
FCODE109/2			•	•	•	•	•	•	•	•	•
FCODE141					•			•	•	•	•
FCODE175											
FCODE250											
FCODE471											
FCODE472/1					•					•	•
FCODE472/2											
FCODE472/3											
FCODE472/4											
FCODE472/5											
FCODE472/6											
FCODE472/7											
FCODE472/8											
FCODE472/9											
FCODE472/10											
FCODE472/11											
FCODE472/12											
FCODE472/13											
FCODE472/14											
FCODE472/15											
FCODE472/16											
FCODE472/17											
FCODE472/18											
FCODE472/19											
FCODE472/20											
FCODE473/1							•	•	•		
FCODE473/2											
FCODE473/3											
FCODE473/4											
FCODE473/5											
FCODE473/6											
FCODE473/7											
FCODE473/8											
FCODE473/9											
FCODE473/10											
FCODE474/1					•			•			
FCODE474/2								•			
FCODE475/1											
FCODE475/2											

Function block	Description	CPU time [ms]	Used in basic configuration C0005								
			1000	2000	3000	4000	5000	6000	7000	8000	9000
FDO	Free digital outputs	-	•	•	•	•	•	•	•	•	•
FEVAN1	Freely assignable input variable	4									
FIXSET1	Fixed setpoints	9		•	•						
FLIP1	D-flipflop 1	6			•						
FLIP2	D-flipflop 2										
FOLL1	Sensor compensation	22									
INT1	Integrator 1	25		•	•						
INT2	Integrator 2										
LIM1	Limiter	6									
MCTRL1	Motor control with V/f characteristic control	-								•	
MCTRL2	Motor control with vector control	-	•	•	•	•	•	•	•		•
MFAIL	Mains failure detection	40									
MLP1	Motor phase failure detection	30									
MONIT	Monitoring	-	•	•	•	•	•	•	•	•	•
MPOT1	motor potentiometer	20									
NLIM1	Limit frequencies	8	•								
NOT1	Logic NOT, block1	4		•	•						
NOT2	Logic NOT, block2										
NOT3	Logic NOT, block3										
NOT4	Logic NOT, block4										
NOT5	Logic NOT, block5										
NSET	Speed setpoint conditioning	70	•	•	•	•	•				
OR1	Logic OR, block1	6		•	•					•	•
OR2	Logic OR, block2									•	•
OR3	Logic OR, block3										
OR4	Logic OR, block4										
OR5	Logic OR, block5										
OSZ	Oscilloscope function	70									
PCTRL1	Process controller 1	58									
PCTRL2	Process controller 2	44								•	•
PT1-1	First order delay elements	8								•	
PT1-2											
R/L/Q	QSP / setpoint inversion	8	•	•	•	•	•	•	•	•	•
RFG1	Ramp generator	16						•	•		
S&H	Sample and Hold	4									
SQRT1	Root calculator	18									
SRFG1	S-shaped ramp generator	15									
STAT	Digital status signals	-	•	•	•	•	•	•	•	•	•
TRANS1	Binary flank evaluation	7		•	•						
TRANS2	Binary flank evaluation										

7.5.2 Absolute value generation (ABS)

This FB changes bipolar signals to unipolar signals.

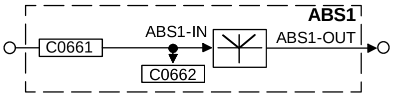


Fig. 7-15 Absolute value generator (ABS1)

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.

7.5.3 Addition (ADD)

These FBs add or subtract analog signals depending on the input used.

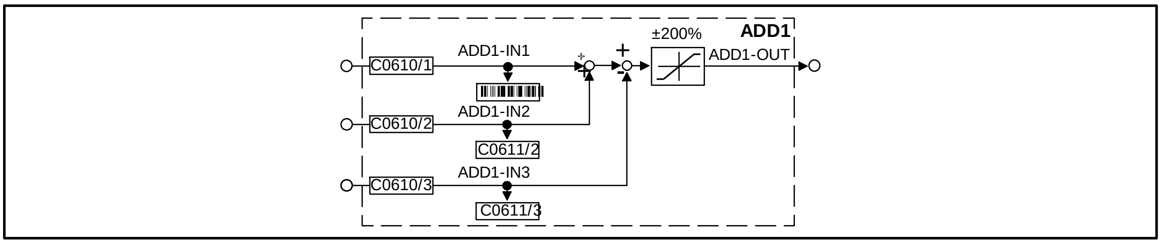


Fig. 7-16 Addition (ADD1)

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 ±200 %

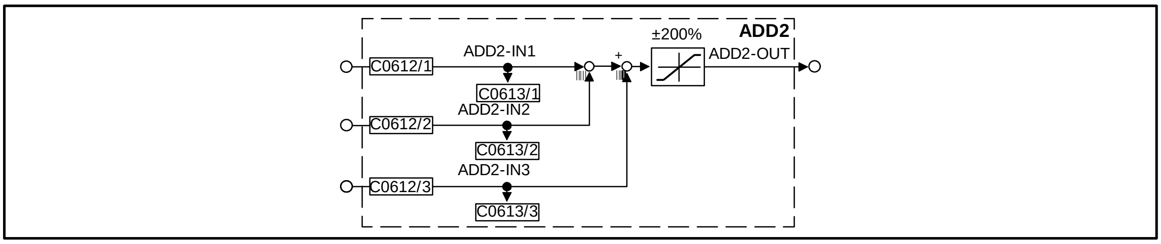


Fig. 7-17 Addition (ADD2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
ADD2-IN1	a	C0612/1	dec [%]	C0613/1	1	1000	Addition input
ADD2-IN2	a	C0612/2	dec [%]	C0613/2	1	1000	Addition input
ADD2-IN3	a	C0612/3	dec [%]	C0613/3	1	1000	Subtraction input
ADD2-OUT	a	-	-	-	-	-	limited to ±200 %

Function procedure

1. The value at ADDx-IN1 is added to the value of ADDx-IN2.
2. The result of the addition is limited to ±200 %.
3. The value of ADDx-IN3 is subtracted from the calculated result.
4. The result of the subtraction is then limited to ±200 %.

7.5.4 Automation interface (AIF-IN)

This FB is used as an interface for input signals from the connected field bus module (e.g. INTERBUS, PROFIBUS-DP) for setpoints and actual values as binary, analog or phase information.

Tip!

Please observe the corresponding Operating Instructions of the connected field bus module.

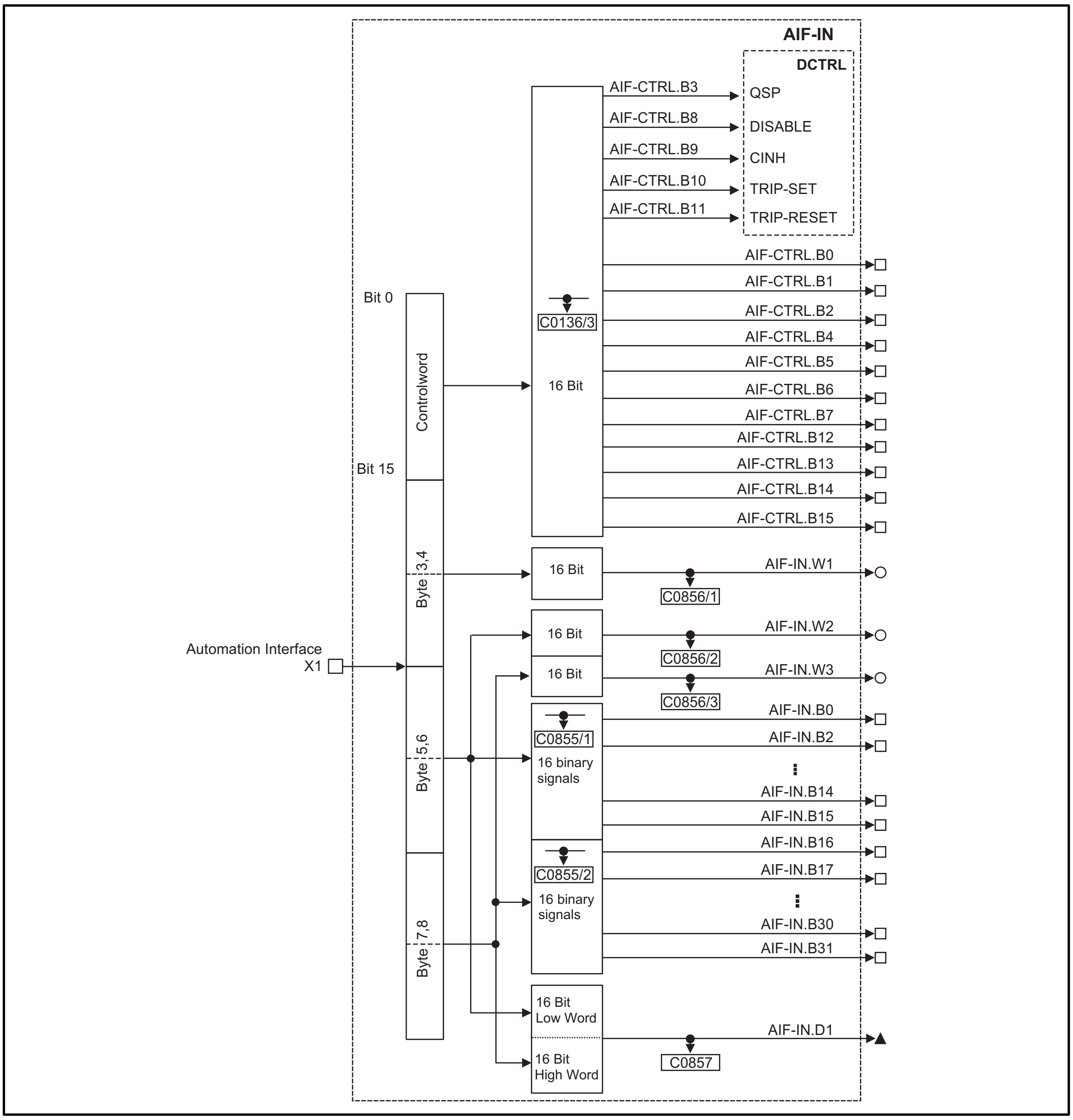


Fig. 7-18 Automation interface (AIF-IN)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
AIF-CTRL.B0	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B1	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B2	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B4	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B5	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B6	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B7	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B12	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B13	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B14	d	C0136/3	hex	-	-	-	-
AIF-CTRL.B15	d	C0136/3	hex	-	-	-	-
AIF-IN.W1	a	C0856/1	dec [%]	-	-	-	+16384 = +100 %
AIF-IN.W2	a	C0856/2	dec [%]	-	-	-	+16384 = +100 %
AIF-IN.W3	a	C0856/3	dec [%]	-	-	-	+16384 = +100 %
AIF-IN.D1	ph	C0857	dec [inc]	-	-	-	65536 = 1 revolution
AIF-IN.B0	d	C0855/1	hex	-	-	-	-
AIF-IN.B1	d	C0855/1	hex	-	-	-	-
AIF-IN.B2	d	C0855/1	hex	-	-	-	-
AIF-IN.B3	d	C0855/1	hex	-	-	-	-
AIF-IN.B4	d	C0855/1	hex	-	-	-	-
AIF-IN.B5	d	C0855/1	hex	-	-	-	-
AIF-IN.B6	d	C0855/1	hex	-	-	-	-
AIF-IN.B7	d	C0855/1	hex	-	-	-	-
AIF-IN.B8	d	C0855/1	hex	-	-	-	-
AIF-IN.B9	d	C0855/1	hex	-	-	-	-
AIF-IN.B10	d	C0855/1	hex	-	-	-	-
AIF-IN.B11	d	C0855/1	hex	-	-	-	-
AIF-IN.B12	d	C0855/1	hex	-	-	-	-
AIF-IN.B13	d	C0855/1	hex	-	-	-	-
AIF-IN.B14	d	C0855/1	hex	-	-	-	-
AIF-IN.B15	d	C0855/1	hex	-	-	-	-
AIF-IN.B16	d	C0855/2	hex	-	-	-	-
AIF-IN.B17	d	C0855/2	hex	-	-	-	-
AIF-IN.B18	d	C0855/2	hex	-	-	-	-
AIF-IN.B19	d	C0855/2	hex	-	-	-	-
AIF-IN.B20	d	C0855/2	hex	-	-	-	-
AIF-IN.B21	d	C0855/2	hex	-	-	-	-
AIF-IN.B22	d	C0855/2	hex	-	-	-	-
AIF-IN.B23	d	C0855/2	hex	-	-	-	-
AIF-IN.B24	d	C0855/2	hex	-	-	-	-
AIF-IN.B25	d	C0855/2	hex	-	-	-	-
AIF-IN.B26	d	C0855/2	hex	-	-	-	-
AIF-IN.B27	d	C0855/2	hex	-	-	-	-
AIF-IN.B28	d	C0855/2	hex	-	-	-	-
AIF-IN.B29	d	C0855/2	hex	-	-	-	-
AIF-IN.B30	d	C0855/2	hex	-	-	-	-
AIF-IN.B31	d	C0855/2	hex	-	-	-	-

Function

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

Control word (Byte 1, 2)

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

Byte 3, 4

Byte 3, 4 are the signal to AIF-IN.W1.

Byte 5, 6, and byte 7, 8

The meaning of these user data results from the different signal types which you can select. Depending on the requirement, these data can be evaluated as up to 2 analog signals, 32 digital signals or one phase signal. Mixed forms are also possible.

7.5.5 Automation interface (AIF-OUT)

This FB is used as an interface for output signals to the connected field bus module (e.g. INTERBUS, PROFIBUS-DP) for setpoints and actual values as binary, analog or phase information.

Tip!
Please observe the corresponding Operating Instructions of the connected field bus module.

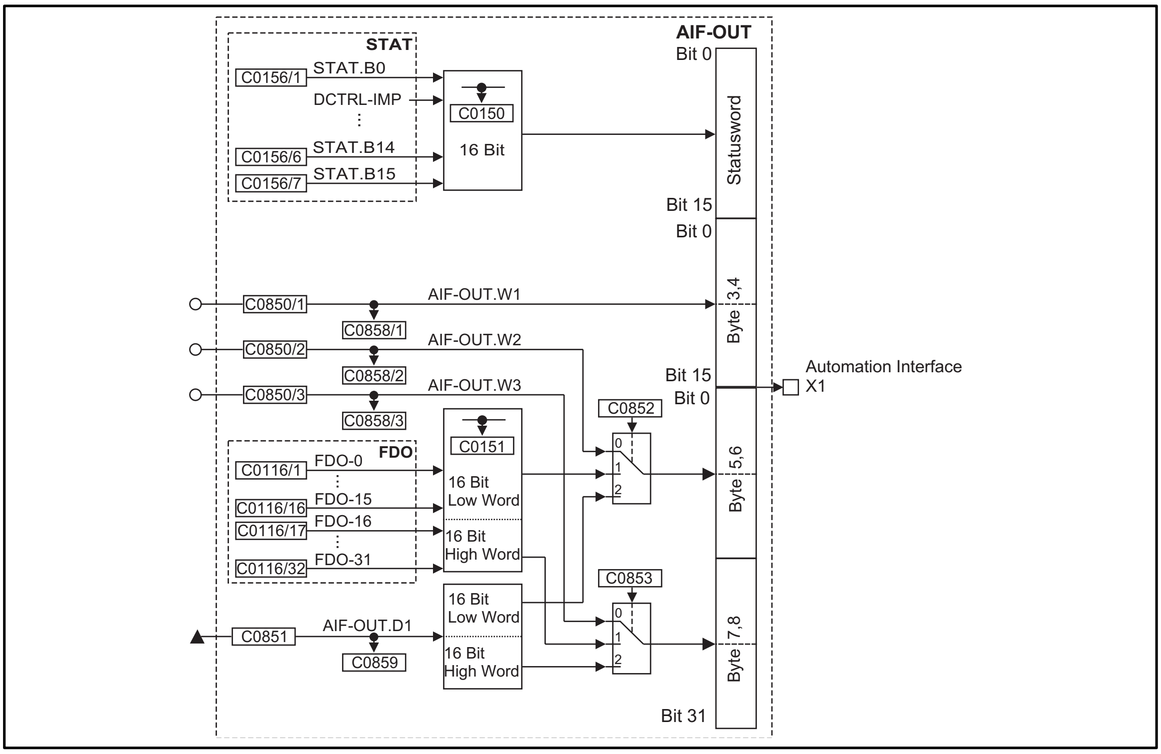


Fig. 7-19 Automation interface (AIF-OUT)

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 revolution = 65536

Function

The input signals of this FB are copied to the 8 byte user data of the AIF object and laid on the connected field bus module. The meaning of the user data can be determined very easily with C0852 and C0853 and the corresponding configuration codes.

Status word (Byte 1, 2)

Here, the status word of the function block STAT is mapped.Some of the bits are freely assignable. (🕮 7-191)

Byte 3, 4

The analog signal at AIF-OUT.W1 is output.

Byte 5, 6

- C0852 = 0
  – The analog signal to AIF-OUT.W2 is output.
- C0852 = 1
  – Bits 0 ... 15 of FDO are output.
- C0852 = 2
  – The LOW WORD from AIF-OUT.D1 is output.

Byte 7, 8

- C0853 = 0
  – The analog signal at AIF-OUT.W3 is output.
- C0853 = 1
  – Bits 16 ... 31 of FDO are output.
- C0853 = 2
  – The HIGH WORD of AIF-OUT.D1 is output.

Example

You want to output 16 digital signals of FDO and the LOW WORD of AIF-OUT.D1:

- The LOW-WORD of AIF-OUT.D1 can only be output on byte 5 and 6.
  – For this, C0852 is set to 2. The phase signal at C0851 is output on byte 5 and 6.
- For the digital signals, only the bits 16 ... 31 (byte 7 and 8) are available:
  – For this, C0853 is set to 1. Bit 16 ... 31 (FDO) are output on byte 7 and 8.

7.5.6 Analog inputs via terminal X6/1,2 and X6/3,4 (AIN)

These FBs are the interface for analog signals as setpoint input, actual value input and parameter control.

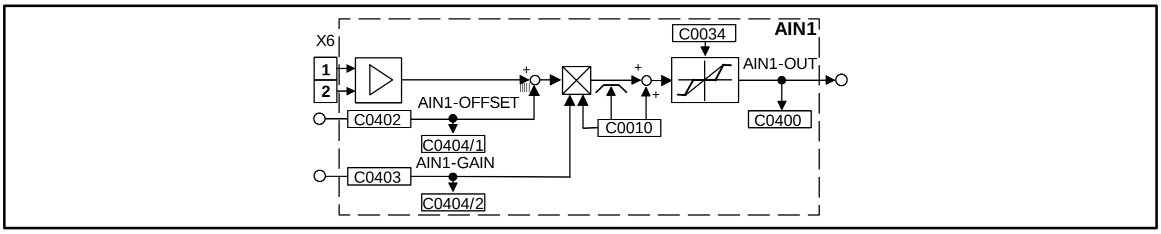


Fig. 7-20 Analog input via terminal X6/1,2 (AIN1)

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	C0400	dec [%]	-	-	-	-

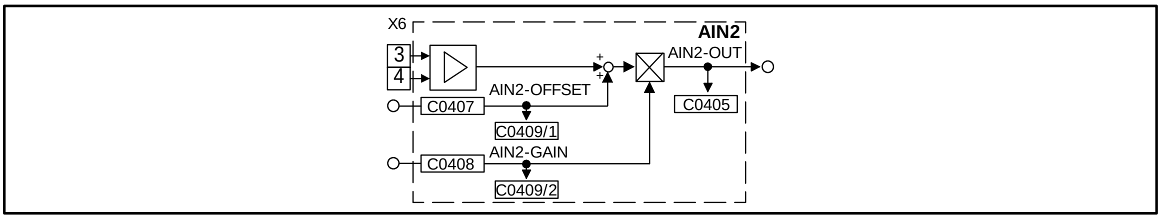


Fig. 7-21 Analog input via terminal X6/3, 4 (AIN2)

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	C0406	dec [%]	-	-	-	-

Function

- Offset
  – The value at AINx-OFFSET is added to the value at AINx-IN.
  – The result of the addition is limited to ±200%.
- Gain
  – The limited value (after offset) is multiplied with the value at AINx-GAIN.
  – The signal is then limited to ±200 %.
- The signal is output at AINx-OUT.

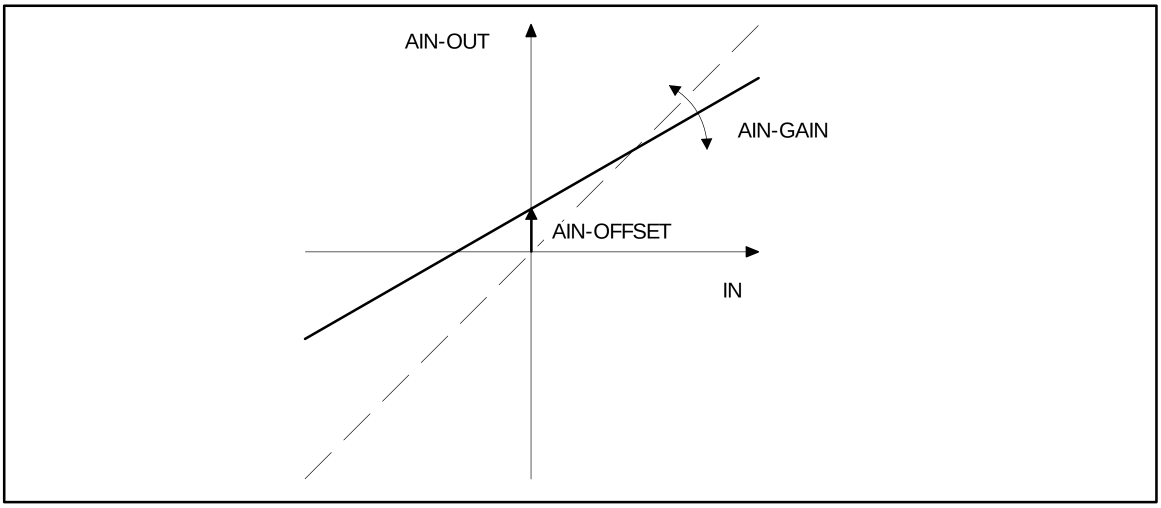


Fig. 7-22 Offset and gain of the analog input

Special feature of AIN1

- A minimum speed can be set under C0010. The signal gain is reduced such that the signal at AIN1-OUT = 100 % with a setpoint of 10 V at X6/1 and X6/2.
  – Setting range: 0 ... 36000 rpm
  – Setting range: 0 rpm (function inactive)
  – Input limits: C0010 < C0011
  – AIN1-OFFSET and AIN1-GAIN are independent of C0010.
- A dead band element can be integrated into the output signal at AIN1 via C0034. You can achieve the function 4 ... 20 mA as a current master value together with the jumper setting X2 (controller front).
- The signal at X6/1 and X6/2 is read cyclically (1 ms).

Special feature of AIN2

- The signal at X6/3 and X6/4 is read cyclically (250 μs).

7.5.7 Logic AND (AND)

These FBs carry out logic AND operations of digital signals. You can use these FBs for the control of functions or the generation of status information.

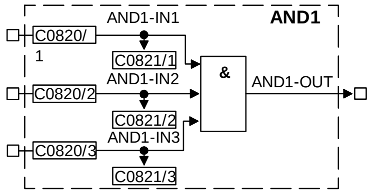


Fig. 7-23 Logic AND (AND1)

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	-	-	-	-	-	-

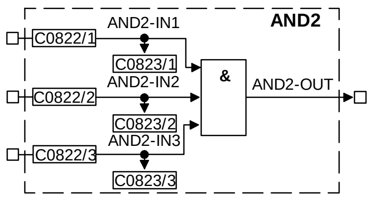


Fig. 7-24 Logic AND (AND2)

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 block library

Logic AND (AND)

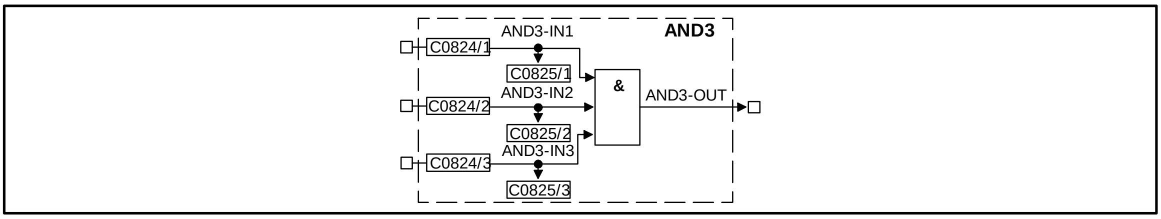


Fig. 7-25 Logic AND (AND3)

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	-	-	-	-	-	-

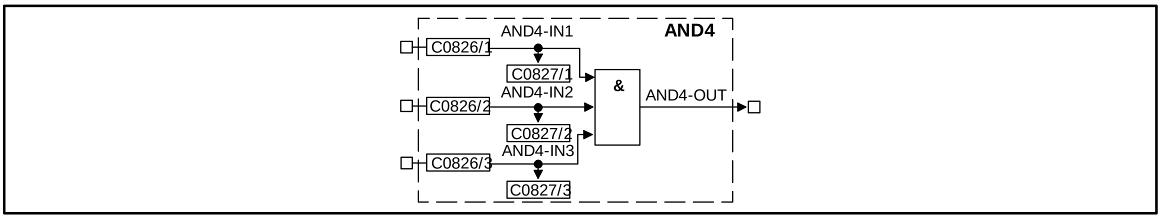


Fig. 7-26 Logic AND (AND4)

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	-	-	-	-	-	-

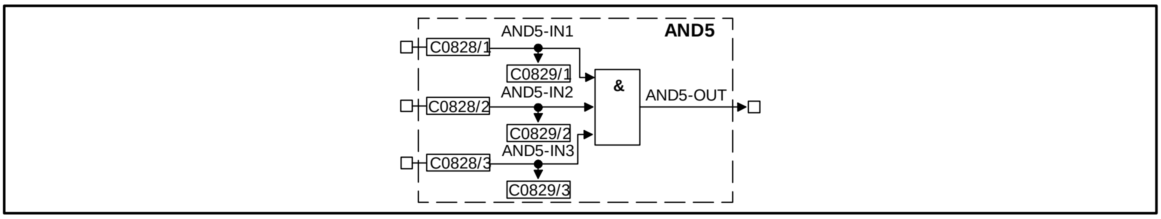


Fig. 7-27 Logic AND (AND5)

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

0 = LOW
1 = HIGH

In a contactor control, the function corresponds to a series connection of normally-open contacts.

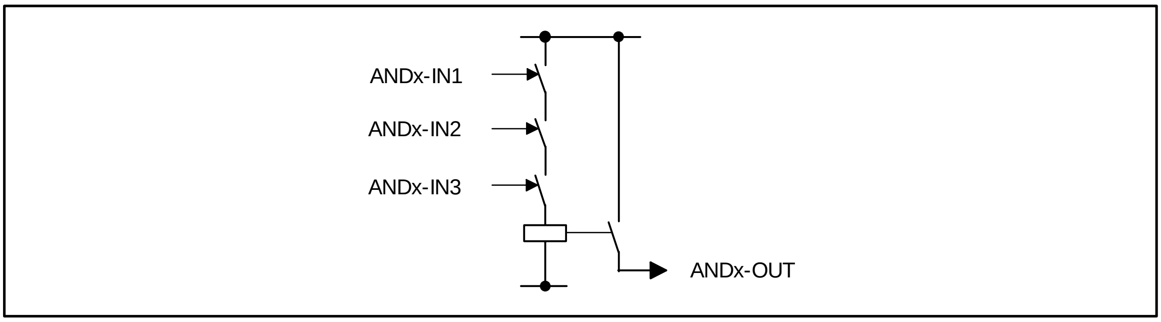


Fig. 7-28 AND function as a series connection of normally-open contacts

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.

7.5.8 Inversion (ANEG)

These FBs invert the sign of an analog signal. The input value is multiplied with -1 and then output.

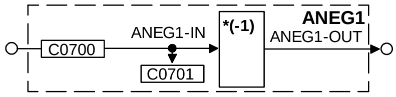


Fig. 7-29 Inverter (ANEG1)

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

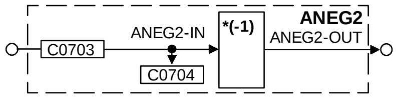


Fig. 7-30 Inverter (ANEG2)

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

7.5.9 Analog outputs via terminals X6/62 and X6/63 (AOUT)

These FB are used to output internal analog signals as voltage signals and e.g. display values or setpoints for slaves.

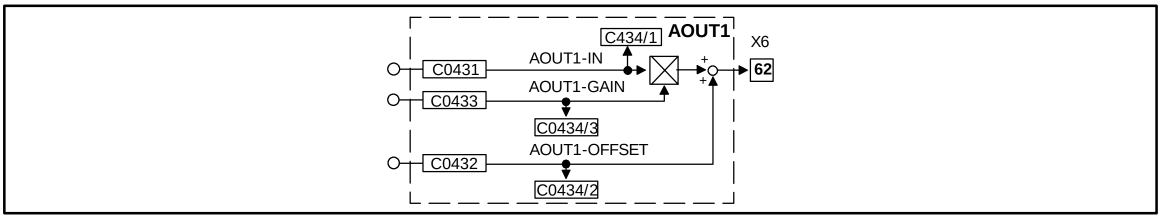


Fig. 7-31 Analog output via terminal X6/62 (AOUT1)

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

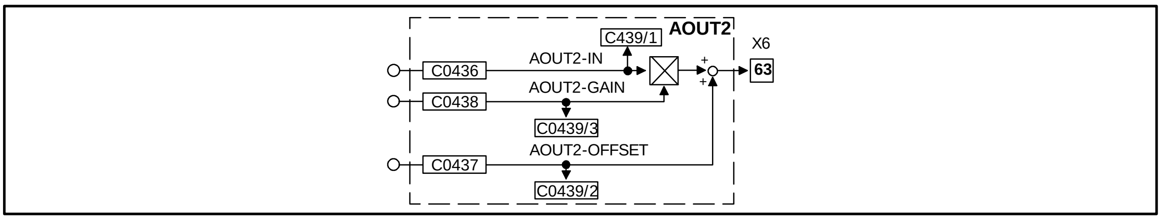


Fig. 7-32 Analog output via terminal X6/63 (AOUT2)

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

Function

- Gain
  – The value at AOUTx-IN is multiplied with the value at AOUTx-GAIN.
  – Example for the multiplication of analog signals:
  100 % · 100 % = 100 %
  – The result of the multiplication is limited to ±200%.
- Offset
  – The limited value (after the gain) is added to the value at AOUTx-OFFSET.
  – The result of the addition is limited to ±200%.
- The result of the calculation is mapped in such a way that 100% = 10 V. This signal is output at terminal X6/62 or X6/63.

Example:

AOUT1-IN = 50 %

AOUT1-GAIN = 100 %

AOUT1-OFFSET = 10 %

Signal at terminal X6/62:
((50 % · 100 %) = 50 %) + 10 % = 60 %) = 6 V

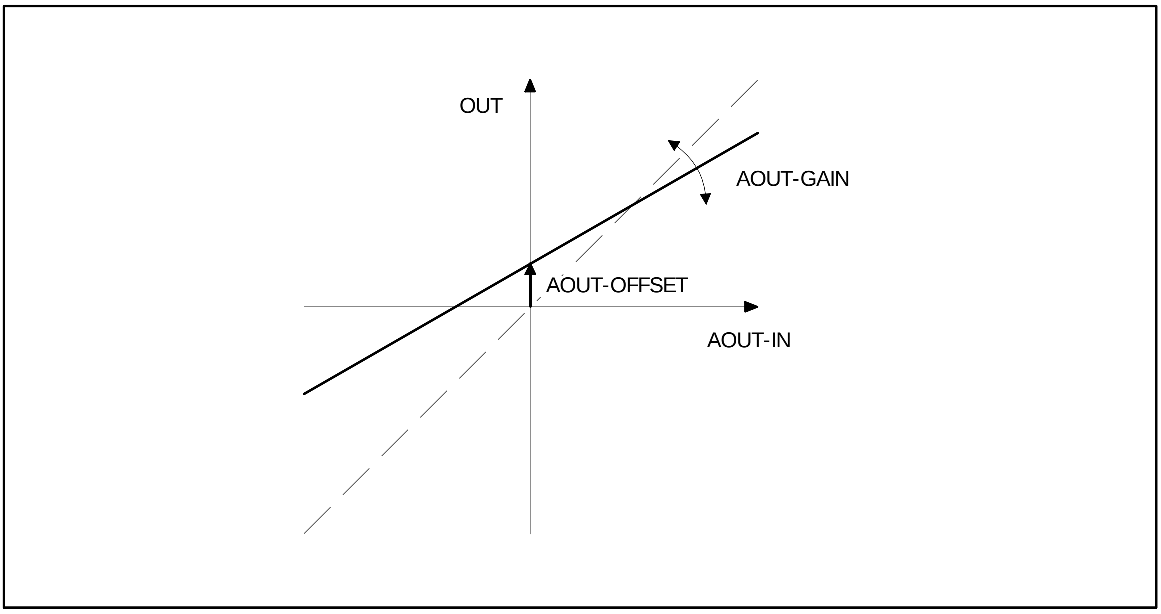


Fig. 7-33 Offset and gain of the analog output

7.5.10 Arithmetics (ARIT)

These FBs link two analog signals arithmetically.

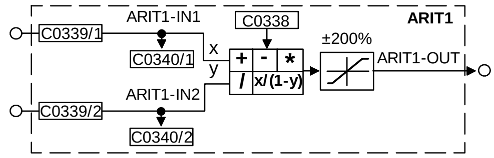


Fig. 7-34 Arithmetics (ARIT1)

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 ±200 %

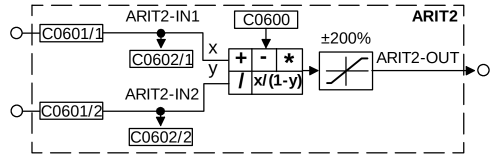


Fig. 7-35 Arithmetics (ARIT2)

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 ±200 %

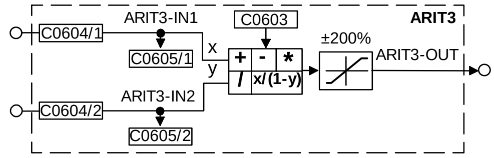


Fig. 7-36 Arithmetics (ARIT3)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
ARIT3-IN1	a	C0605/1	dec [%]	C0604/1	1	1000	-
ARIT3-IN2	a	C0605/2	dec [%]	C0604/2	1	1000	-
ARIT3-OUT	a	-	-	-	-	-	limited to ±200 %

Function block library

Arithmetics (ARIT)

Function

Code	Value	Function
C0338 for ARIT1 C0600 for ARIT2 C0603 for ARIT3	0	• ARITx-OUT = ARITx-IN1 – ARITx-IN2 is not processed
	1	• ARITx-OUT = ARITx-IN1 + ARITx-IN2 – Example: 100 % = 50 % + 50 %
	2	• ARITx-OUT = ARITx-IN1 - ARITx-IN2 – Example: 50 % = 100 % - 50 %
	3	• ARITx-OUT = ARITx-IN1 * ARITx-IN2 – Example: 100 % = 100 % * 100 %
	4	• ARITx-OUT = ARITx-IN1 / |ARITx-IN2| – Example: 1 % = 100% / 100%
	5	• ARITx-OUT = ARITx-IN1 / (100 % - ARITx-IN2) – Example: 200 % = 100 % / (100 % - 50 %)

7.5.11 Toggling (ASW)

These FBs toggle between two analog signals, thus enabling two different initial diameters for winding, for instance.

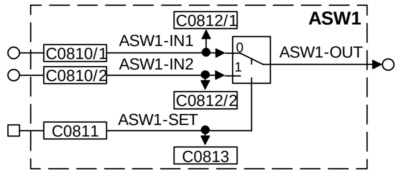


Fig. 7-37 Toggling (ASW1)

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	-	-	-	-	-	-

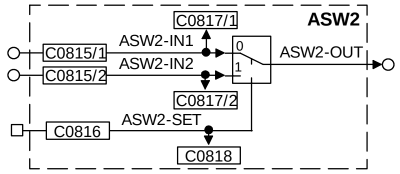


Fig. 7-38 Toggling (ASW2)

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	-	-	-	-	-	-

Function block library

Toggling (ASW)

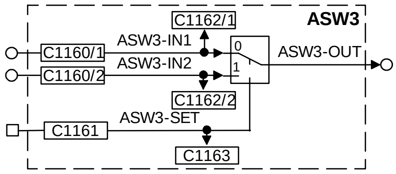


Fig. 7-39 Toggling (ASW3)

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	-	-	-	-	-	-

Function

Control signal	Output signal
ASWx-SET = HIGH	ASWx-OUT = ASWx-IN2
ASWx-SET = LOW	ASWx-OUT = ASWx-IN1

7.5.12 Holding brake (BRK)

This FB triggers a holding brake. You can use it e.g. in configurations for lift and travelling drives and active loads.

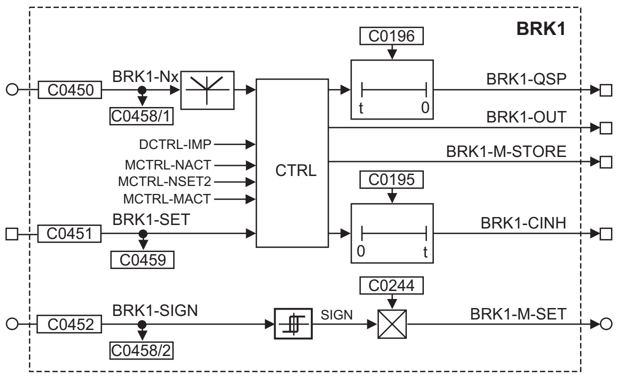


Fig. 7-40 Holding brake (BRK1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
BRK1-SET	d	C0459	bin	C0451	2	1000	-
BRK1-NX	a	C0458/1	dec [%]	C0450	1	1000	Speed threshold from which the drive can output the signal "close brake". The signal source for this input can be a control code, a fixed value or any other analog output of a FB.
BRK1-SIGN	a	C0458/2	dec [%]	C0452	1	1000	Direction of the torque with which the drive has to build a torque against the brake.The signal source for this input can be a control code, a fixed value or any other analog output of a FB.
BRK1-M-SET	a	-	dec [%]	C0244	-	0.00	Holding torque of the DC injection brake 100 % = value of C0057
BRK1-T-ACT	a	-	dec	C0195	-	99.9	Brake engaging time
BRK1-T-RELEASE	a	-	dec	C0196	-	0.0	Brake disengaging time

Tip!
The function block processes the absolute values of the signals MCTRL-NACT, MCTRL-MACT, MCTRL-NSET2 and BRK1-Nx.

Range of functions

- Close brake
- Open brake (release)
- Set controller inhibit

7.5.12.1 Close brake

Function procedure

1. The function is activated using BRK1-SET = HIGH.
   – At the same time, BRK1-QSP is set to HIGH. You can use this signal to decelerate the drive to zero speed via a deceleration ramp.
2. If the setpoint speed exceeds the value at BRK1-Nx, BRK1-OUT = HIGH.
   – Invert the signal at the digital output if you need a protection against wire breakage (e. g. via C0118).
3. A time element is triggered when BRK1-OUT = HIGH. After the time set under C0195 has elapsed, BRK1-CINH is set to HIGH.
   – This signal is used to set controller inhibit (inside the controller). In general, the brake close time is set here. This is necessary because the brake does not engage immediately when BRK1-OUT = HIGH and the drive must therefore provide a holding torque for the time set.

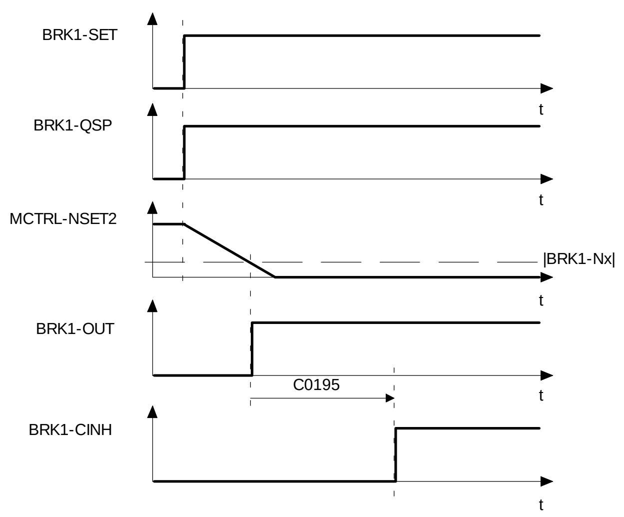


Fig. 7-41 Signal sequence when the brake is closed

7.5.12.2 Open the brake

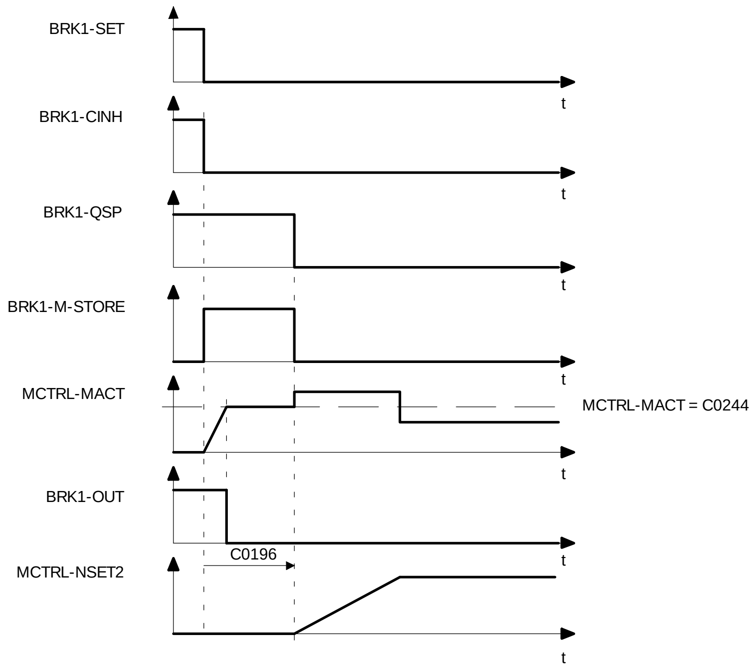


Fig. 7-42 Signal sequence when the brake is opened (released)

Function procedure

1. With BRK-SET = LOW, BRK-CINH is immediately set LOW. At the same time, BRK-M-STORE is set HIGH.
   – You can use this signal to create a defined torque in the drive, before the brake opens. In hoists, for instance, a "lowering" during the load transfer is thus avoided. The signal is reset only after the time set under C0196 has elapsed.
2. Once the torque has reached the value (holding torque) set under C0244, BRK-OUT = LOW.
3. When the input is reset, a time element is triggered. After the time set under C0196 has elapsed, BRK-QSP = LOW.
   – This signal is used e.g. to enable the setpoint integrator after the brake disengaging time has elapsed.

Tip!

- When the brake is disengaged before the brake disengaging time (C0196) has elapsed and an actual speed is detected which is higher than the value at BRK-Nx, BRK-QSP = LOW and BRK-M-STORE = LOW. The drive can immediately operated speed-controlled.
- For an optimum starting behaviour, the time under C0196 should not be much longer than the actual brake disengaging time.

7.5.12.3 Set pulse inhibit

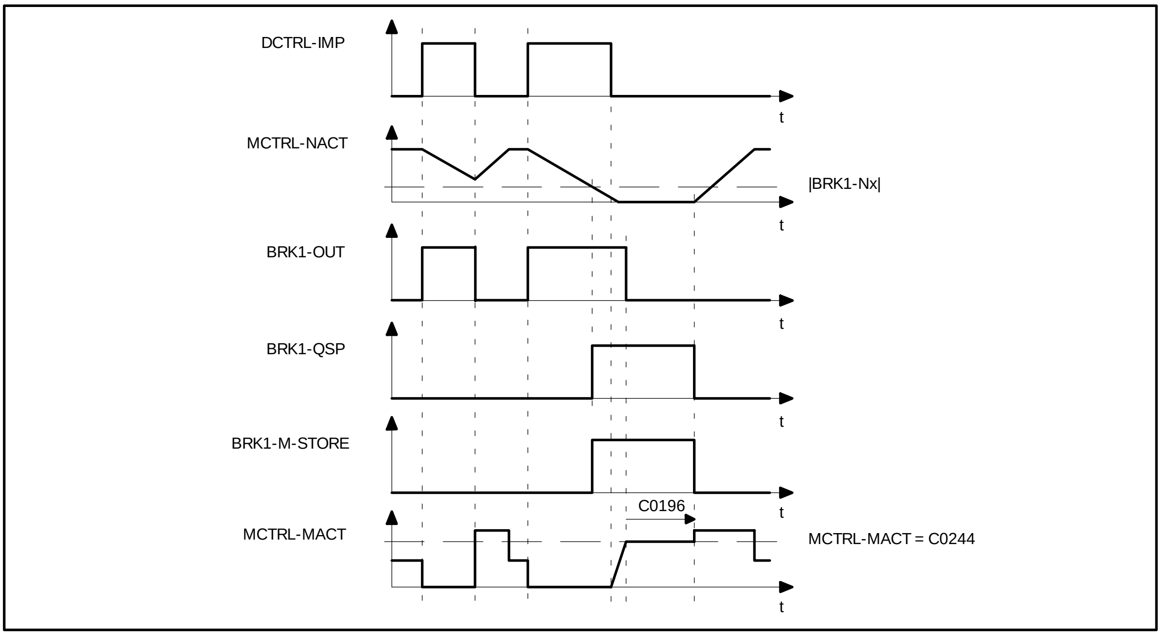


Fig. 7-43 Brake control with IMP (possible only when using an incremental encoder).

Function procedure

1. When pulse inhibit (IMP) by controller inhibit or a fault (LU, OU, ...), BRK-OUT changes immediately to HIGH.
   – The drive is then braked by its mechanical brake.
2. When pulse inhibit is reset (DCTRL-CINH = LOW) before the actual speed has fallen below the threshold BRK-Nx, BRK-OUT changes immediately to LOW (possible only with incremental encoder).
   – The drive synchronizes itself to the momentary speed and follows its setpoint.
   – The drive starts once the threshold was undershot. (🕮 7-63)

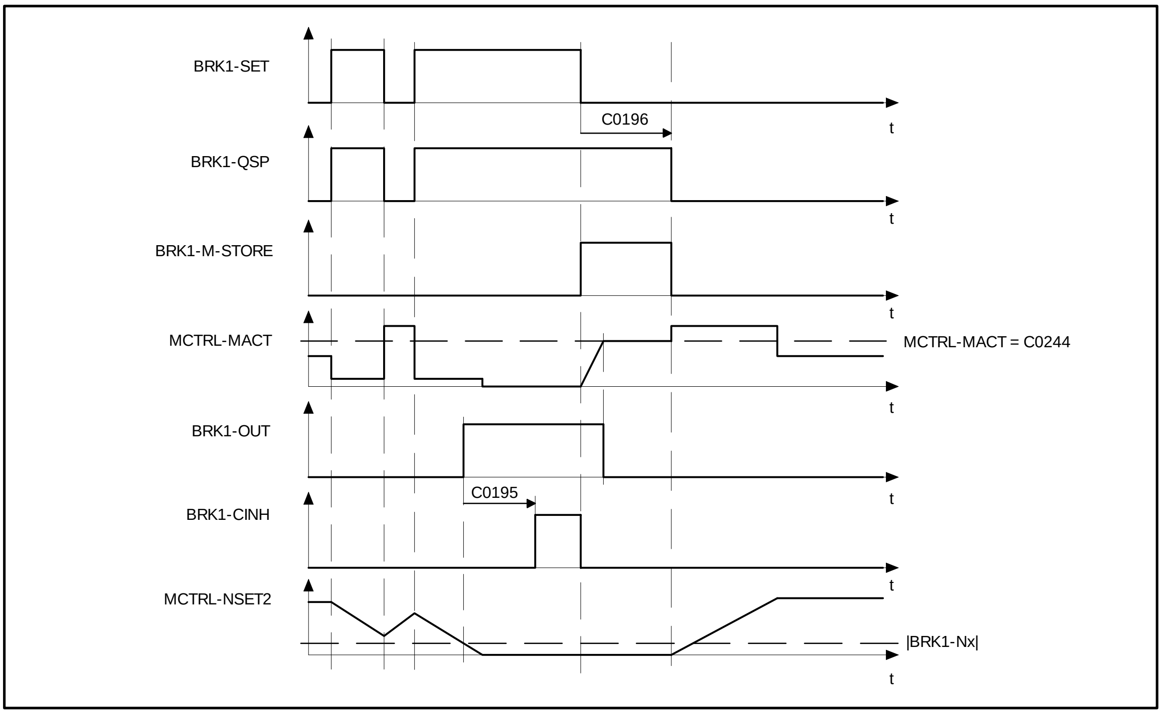


Fig. 7-44 Stopping and starting switching cycle

7.5.13 System bus (CAN-IN)

These FBs are the interface for input signals from the system bus for setpoints and actual values as binary, analog, or phase information. (Part H "System bus in 93XX")

CAN-IN1

This FB is used for cyclic data traffic with higher-level master systems. For the transmission, a special telegram, the sync telegram, must be generated.

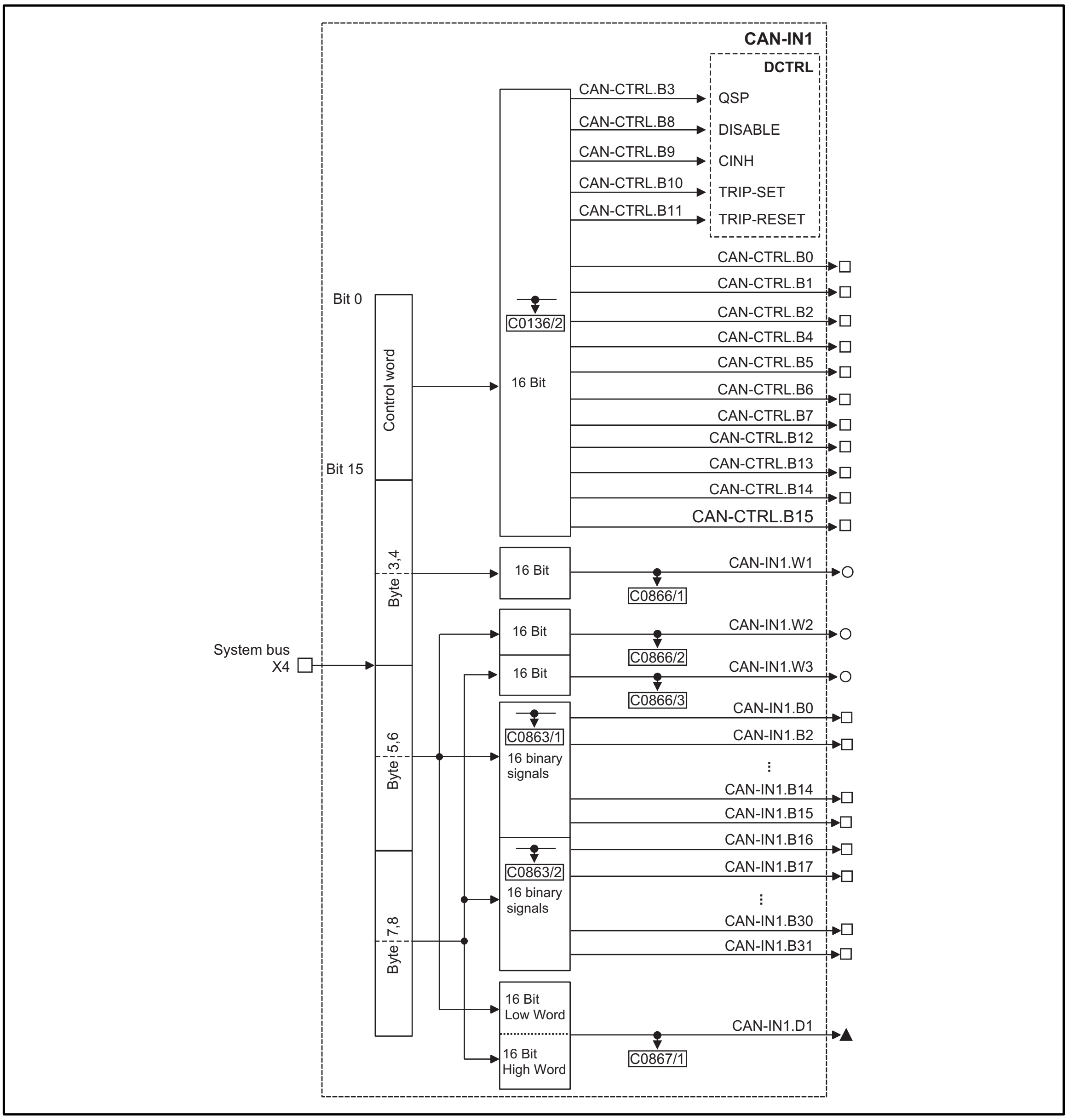


Fig. 7-45 System bus (CAN-IN1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CAN-CTRL.B0	d	C0136/2	hex	-	-	-	-
CAN-CTRL.B1	d	C0136/2	hex	-	-	-	-
CAN-CTRL.B2	d	C0136/2	hex	-	-	-	-
CAN-CTRL.B4	d	C0136/2	hex	-	-	-	-
CAN-CTRL.B5	d	C0136/2	hex	-	-	-	-
CAN-CTRL.B6	d	C0136/2	hex	-	-	-	-
CAN-CTRL.B7	d	C0136/2	hex	-	-	-	-
CAN-CTRL.B12	d	C0136/2	hex	-	-	-	-
CAN-CTRL.B13	d	C0136/2	hex	-	-	-	-
CAN-CTRL.B14	d	C0136/2	hex	-	-	-	-
CAN-CTRL.B15	d	C0136/2	hex	-	-	-	-
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 revolution
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 CAN object are converted into suitable signal types. The signals can be used via further function blocks.

Control word (byte 1, 2)

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

Byte 3, 4

Byte 3, 4 are the signal to CAN-IN1.W1.

Byte 5, 6 and byte 7, 8

The meaning of these user data can be selected among different signal types. Depending on the requirement, these data can be evaluated as up to 2 analog signals, 32 digital signals or one phase signal.Mixed forms are also possible.

CAN-IN2

This FB is used for data traffic between the controllers and the data exchange to decentralized input and output terminals. Data exchange with higher-level master systems is also possible.

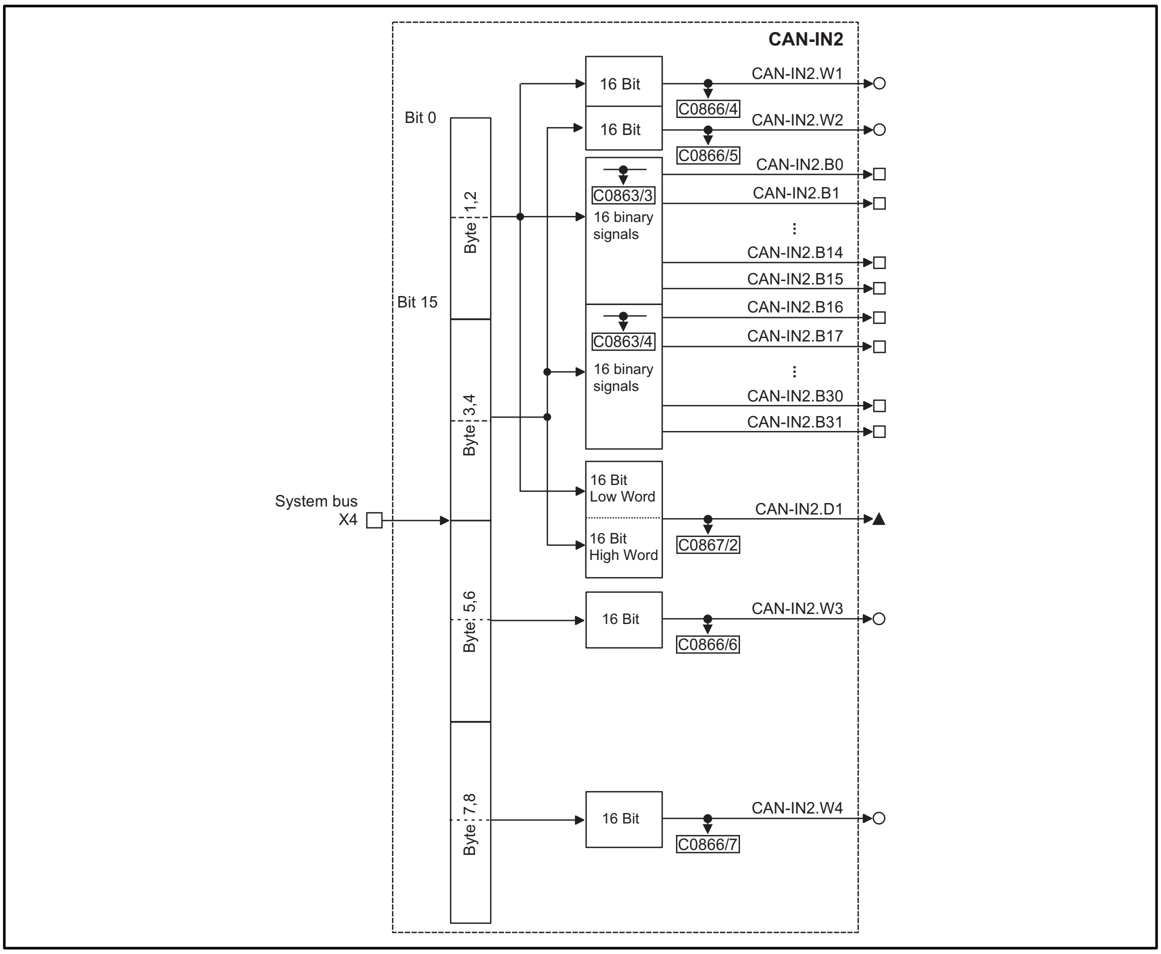


Fig. 7-46 System bus (CAN-IN2)

Function block library

System bus (CAN-IN)

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 revolution
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 CAN object are converted into suitable signal types. The signals can be used via further function blocks.

Byte 1, 2 and byte 3, 4

The meaning of these user data can be selected among different signal types. Depending on the requirement, these data can be evaluated as up to 2 analog signals, 32 digital signals or one phase signal.Mixed forms are also possible.

Byte 5, 6

Byte 5, 6 form the signal to CAN-IN2.W3.

Byte 7 and 8

Byte 7, 8 form the signal to CAN-IN2.W4.

CAN-IN3

This FB is used for data traffic between the controllers and the data exchange to decentralized input and output terminals. Data exchange with higher-level master systems is also possible.

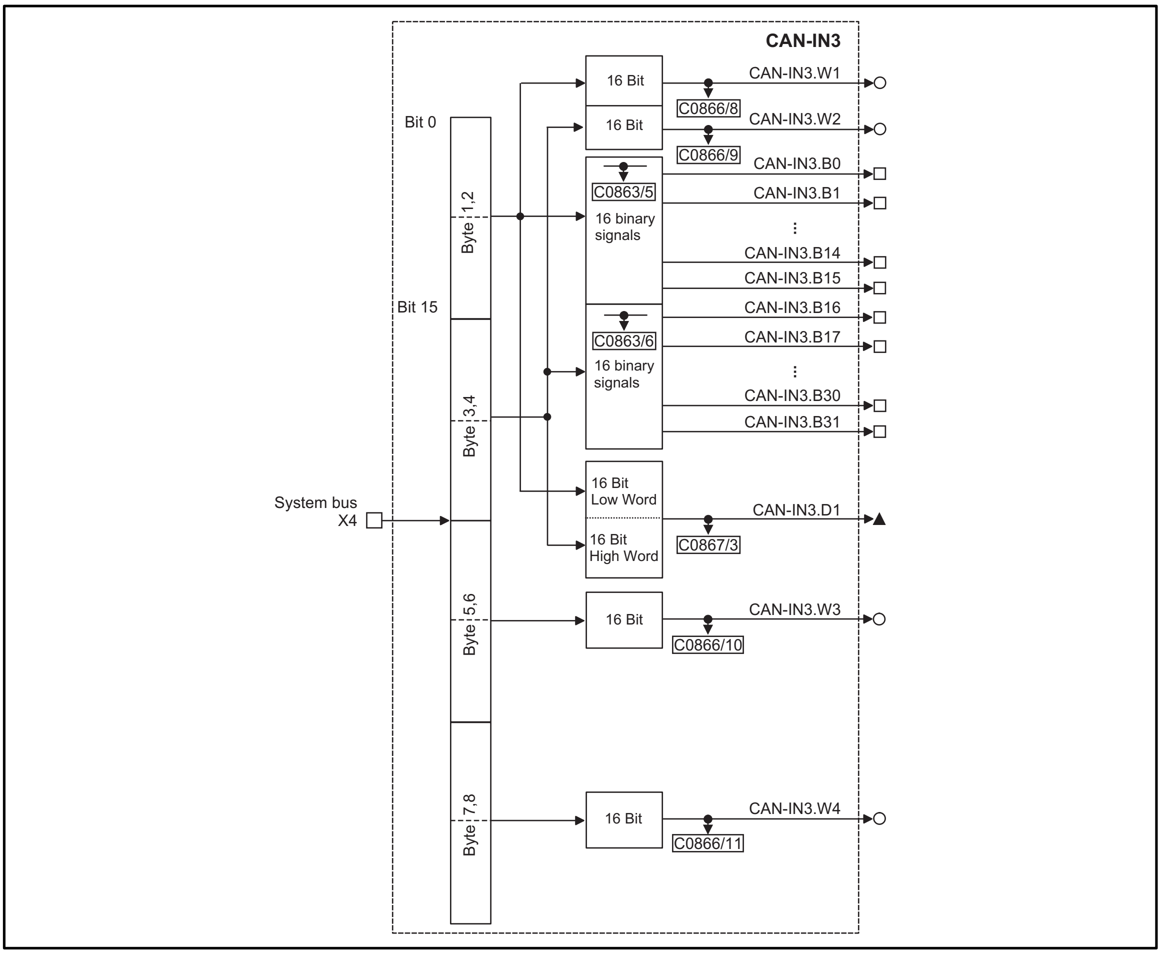


Fig. 7-47 System bus (CAN-IN3)

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 revolution
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 from the 8 byte user data of the CAN object are transformed into suitable signal types. The signals can be used via further function blocks.

Byte 1, 2 and byte 3 4

The meaning of these user data can be selected among different signal types. Depending on the requirement, these data can be evaluated as up to 2 analog signals, 32 digital signals or one phase signal.Mixed forms are also possible.

Byte 5, 6

Byte 5, 6 form the signal to CAN-IN3.W3.

Byte 7, 8

Byte 7, 8 form the signal to CAN-IN3.W4.

7.5.14 System bus (CAN-OUT)

These FBs are the interface for output signals to the system bus for setpoint and actual values as binary, analog or phase information. (📖 7-66)

CAN-OUT1

This FB is used for data traffic with higher-level master systems. For the transmission, a special telegram, the sync telegram, must be generated.

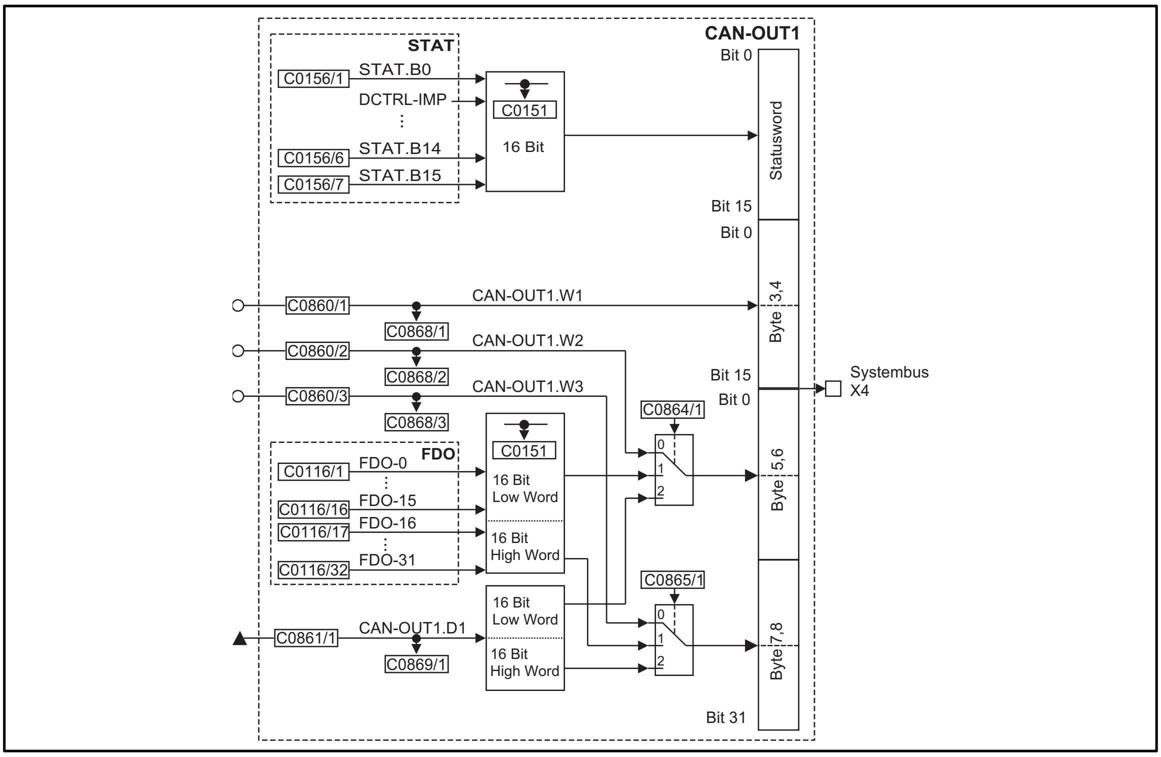


Fig. 7-48 System bus (CAN-OUT1)

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 revolution = 65536

Function block library

System bus (CAN-OUT)

Function

The input signals of this FB are copied to the 8 byte user data of the AIF object and laid on the system bus. The meaning of the user data can be determined very easily with C0864/1 and C0865/1 and the corresponding configuration codes.

Status word (Byte 1, 2)

Here, the status word of the function block STAT is mapped. Some of the bits are freely assignable.
(📖 7-191: Function block STAT)

Byte 3, 4

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

Byte 5, 6 and byte 7 8

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

Example:

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

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

This means that the analog signal is led via CAN-OUT1.W2. For this, set C0864/1 = 0. The output is on byte 5 and 6. An analog signal source is assigned to the input under configuration code C0860/2.

CAN-OUT2

This FB is used for data traffic between the controllers and the data exchange to decentralized outputs. Data exchange with higher-level master systems is also possible.

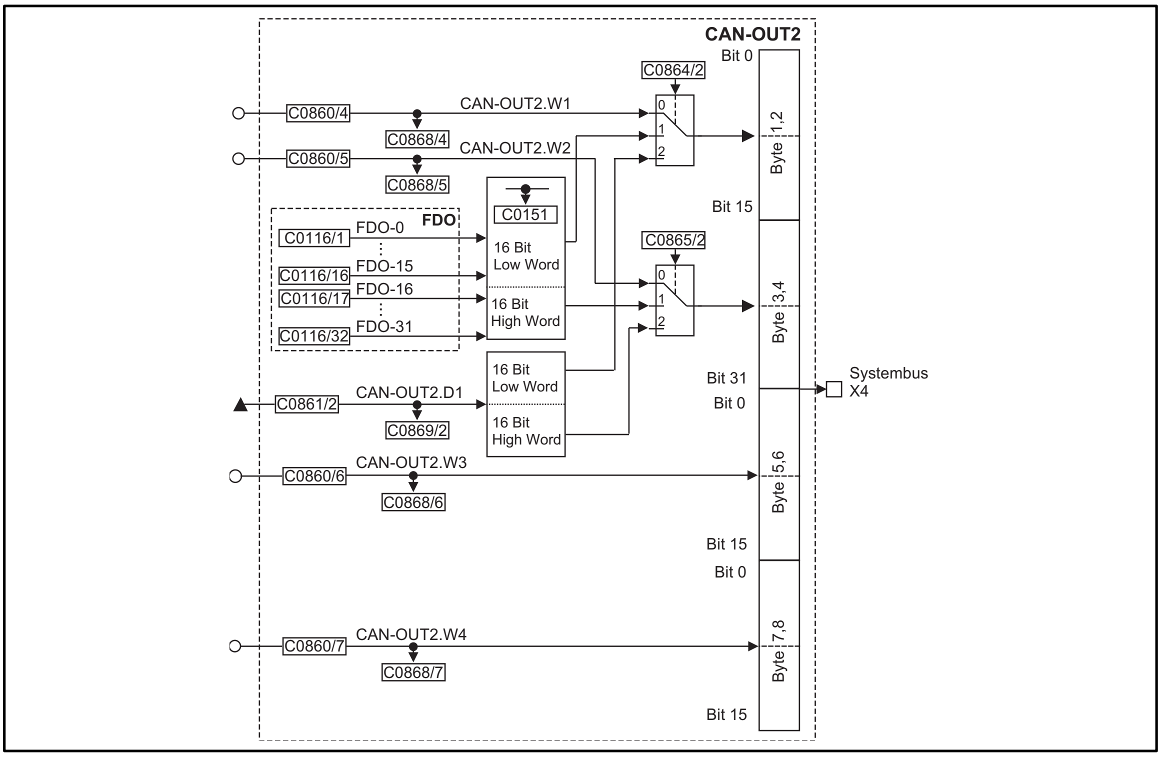


Fig. 7-49 System bus (CAN-OUT2)

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 revolution = 65536

Function

The input signals of this FB are copied to the 8 byte user data of the AIF object and laid on the system bus. The meaning of the user data can be determined very easily with C0864/2 and C0865/2 and the corresponding configuration codes.

Byte 1, 2 and byte 3, 4

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

Byte 5, 6

Here, the signal to CAN-OUT2.W3 is inserted.

Byte 7, 8

Here, the signal to CAN-OUT2.W4 is inserted.

CAN-OUT3

This FB is used for data traffic between the controllers and the data exchange to decentralized outputs. Data exchange with higher-level master systems is also possible.

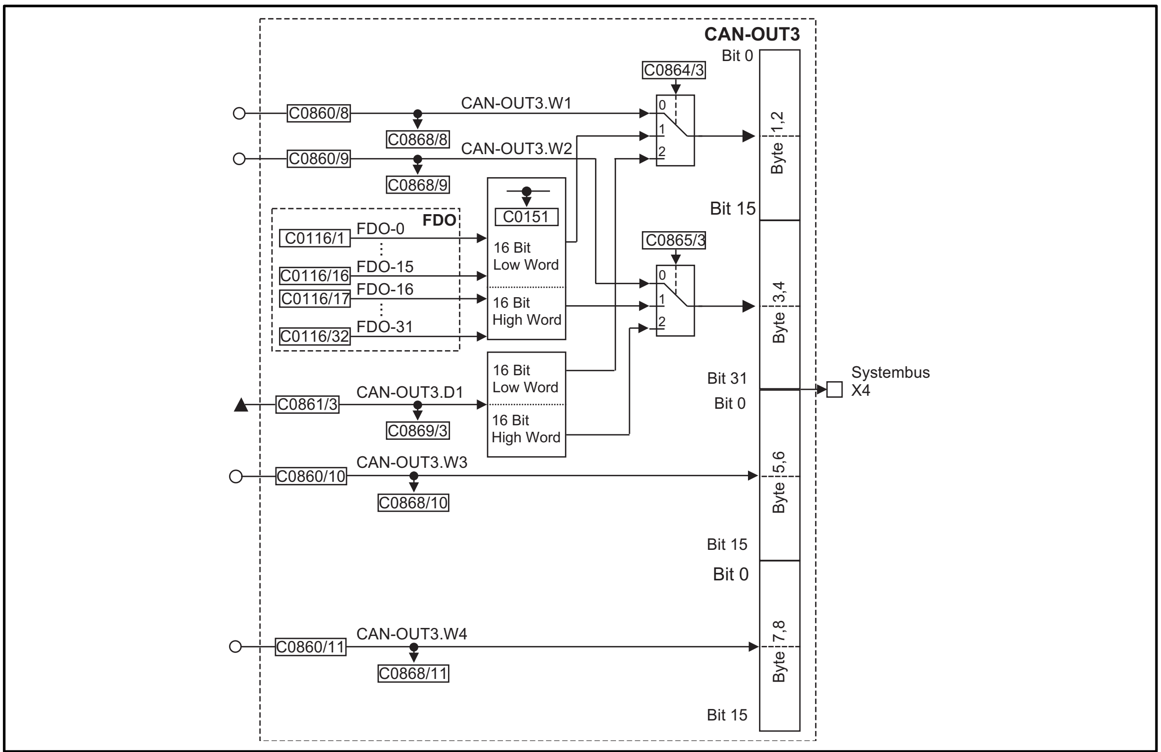


Fig. 7-50 System bus (CAN-OUT3)

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 revolution = 65536

Function

The input signals of this FB are copied to the 8 byte user data of the AIF object and laid on the system bus. The meaning of the user data can be determined very easily with C0864/3 and C0865/3 and the corresponding configuration codes.

Byte 1, 2, and byte 3, 4

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

Byte 5, 6

Here, the signal to CAN-OUT3.W3 is inserted.

Byte 7, 8

Here, the signal to CAN-OUT3.W4 is inserted.

7.5.15 Comparison (CMP)

These FBs compare two analog signals. Comparators can be used a threshold switches. Different comparing functions are available.

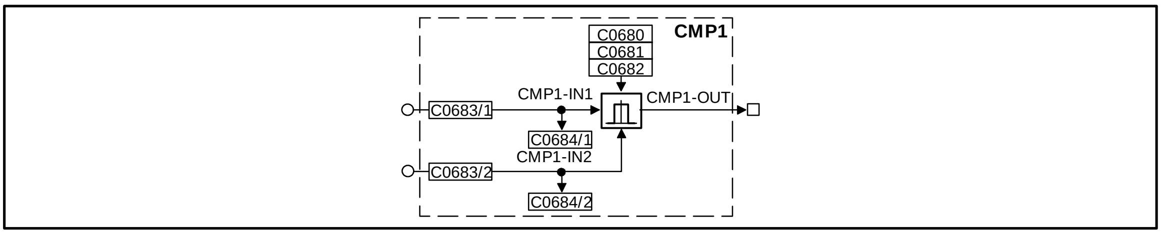


Fig. 7-51 Comparison (CMP1)

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	d	-	-	-	-	-	-

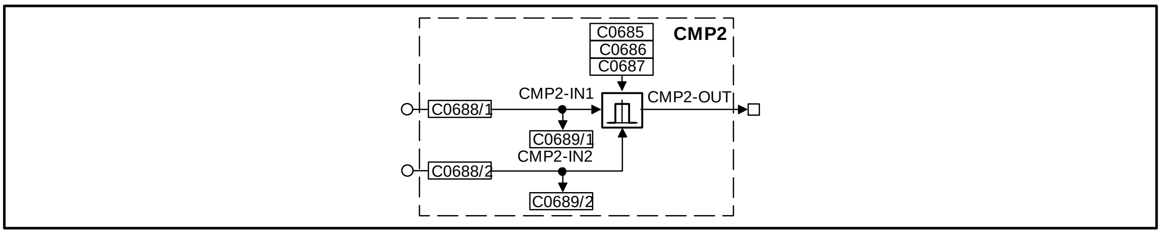


Fig. 7-52 Comparison (CMP2)

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	d	-	-	-	-	-	-

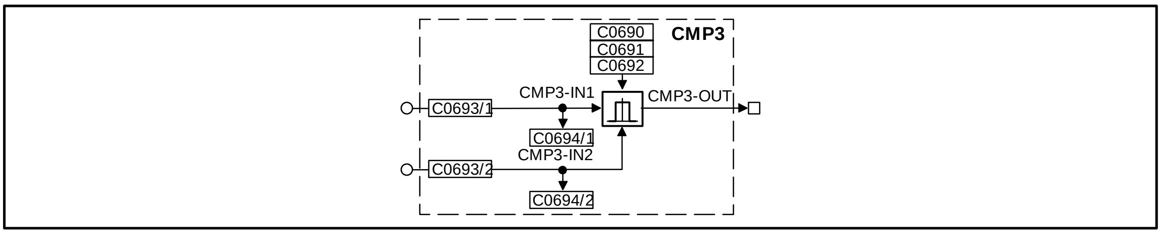


Fig. 7-53 Comparison (CMP3)

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	d	-	-	-	-	-	-

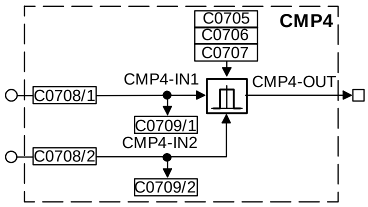


Fig. 7-54 Comparison (CMP4)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
CMP4-IN1	a	C0709/1	dec [%]	C0708/1	1	1000	-
CMP4-IN2	a	C0709/2	dec [%]	C0708/2	1	1000	-
CMP4-OUT	a	-	-	-	-	-	-

Range of functions

	Code			
	CMP1	**CMP2**	**CMP3**	**CMP4**
Comparing function	C0680	C0685	C0690	C0705
Hysteresis	C0681	C0686	C0691	C0706
Window	C0682	C0687	C0693	C0707

The description of CMP1 serves as an example. It is also valid for CMP2 ... CMP4.

The following comparing functions are available:

- CMP1-IN1 = CMP1-IN2
- CMP1-IN1 > CMP1-IN2
- CMP1-IN1 < CMP1-IN2
- |CMP1-IN1| = |CMP1-IN2|
- |CMP1-IN1| > |CMP1-IN2|
- |CMP1-IN1| < |CMP1-IN2|

7.5.15.1 Function 1: CMP1-IN1 = CMP1-IN2

- Selection: C0680 = 1
- This function compares two signals. For instance, you can compare the actual speed and the setpoint speed ($n_{act.} = n_{set}$).
- The exact function can be obtained from the line diagram.

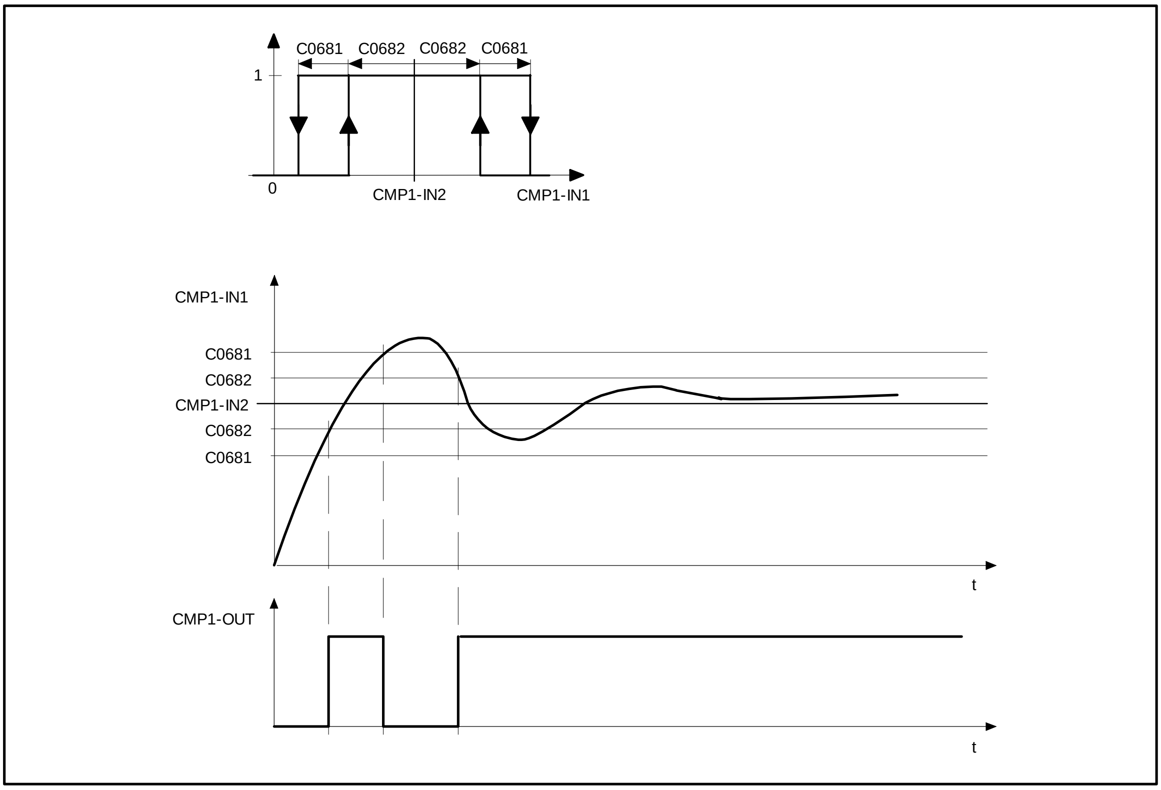


Fig. 7-55 Equality of signals (CMP1-IN1 = CMP1-IN2)

Function procedure

1. Under C0682, set the window where the equality is to be effective.
2. Under C0681 you set a hysteresis if the input signals are not stable and therefore the output oscillates.

7.5.15.2 Function 2: CMP1-IN1 > CMP1-IN2

- Selection: C0680 = 2
- This function is used to find out whether the actual speed is higher than a limit value ($n_{act.} > n_x$)" for one direction of rotation.

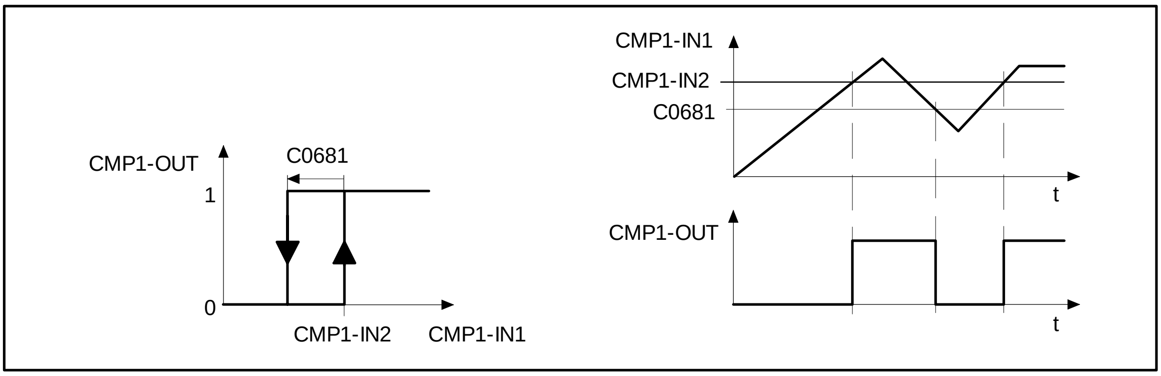


Fig. 7-56 Exceeding signal values (CMP1-IN1 > CMP1-IN2)

Function procedure

1. If the value at CMP1-IN1 exceeds the value at CMP1-IN2, CMP1-OUT changes from LOW to HIGH.
2. If the value at CMP1-IN1 undershoots the value at CMP1-IN2 minus C0681 again, CMP1-OUT changes from HIGH to LOW.

7.5.15.3 Function 3: CMP1-IN1 < CMP1-IN2

- Selection: C0680 = 3
- This function is used to find out whether the actual speed is lower than a limit value ($n_{act.} < n_x$)" for one direction of rotation.

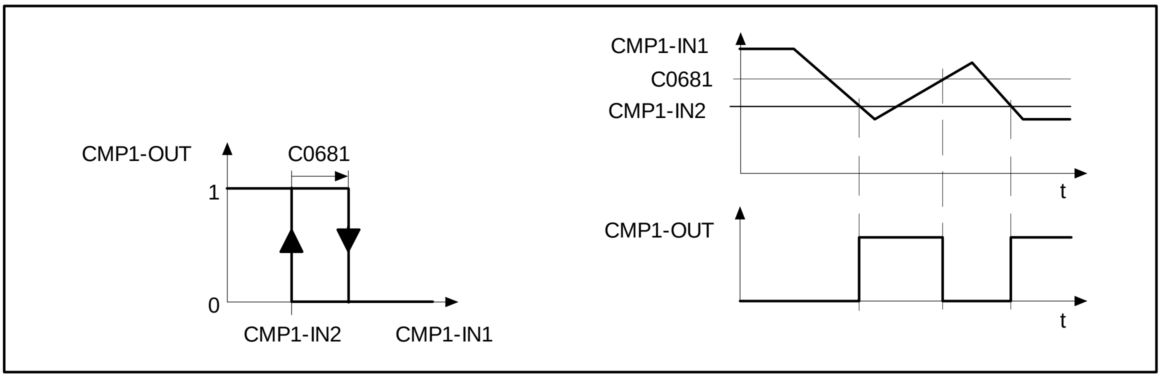


Fig. 7-57 Undershooting signal values (CMP1-IN1 < CMP1-IN2)

Function procedure

1. If the value at CMP1-IN1 falls below the value at CMP1-IN2, CMP1-OUT changes from LOW to HIGH.
2. If the value at CMP1-IN1 exceeds the value at CMP1-IN2 plus C0681 again, CMP1-OUT changes from HIGH to LOW.

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

- Selection: C0680 = 4
- This function is used to carry out the comparison "$|n_{act.}| = |n_x|$" for instance.
- This function is the same as function 1. (📖 7-81)
  – However, the absolute value of the input signals (without sign) is created before the signals are processed.

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

- Selection: C0680 = 5
- This function is used to carry out the comparison "$|n_{act.}| > |n_x|$" independently of the direction of rotation.
- This function is the same as function 3. (📖 7-82)
  – However, the absolute value of the input signals (without sign) is created before the signals are processed.

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

- Selection: C0680 = 6
- This function is the same as function 2. (📖 7-82)
  – However, the absolute value of the input signals (without sign) is created before the signals are processed.
- This function is used to carry out the comparison "$|n_{act.}| < |n_x|$" independently of the direction of rotation.

7.5.16 Conversion (CONV)

These FBs convert analog signals or convert signals into another signal type. The conversion factor as numerator and denominator is calculated using residual value processing.

CONV1

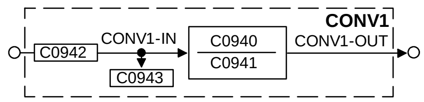


Fig. 7-58 Conversion (CONV1)

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 FB is used to multiply analog signals with a specified factor. The calculation is done according to the following formula:

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

Example:

- You want to multiply an analog signal with 1.12.
- For this, enter C0940 = 112 and C0941 = 100.

CONV2

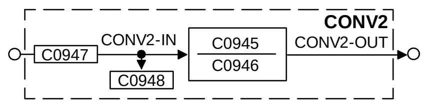


Fig. 7-59 Conversion (CONV2)

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 FB is used to multiply analog signals with a specified factor. The calculation is done according to the following formula:

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

CONV3

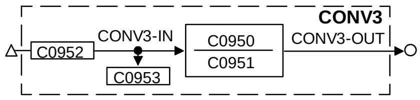


Fig. 7-60 Conversion (CONV3)

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 FB is used to convert speed signals into analog signals. The conversion is done according to the formula:

$$\text{CONV3-OUT} = \text{CONV3-IN} \cdot \frac{100\ \%}{15000\ \text{rpm}} \cdot \frac{\text{C0950}}{\text{C0951}}$$

CONV4

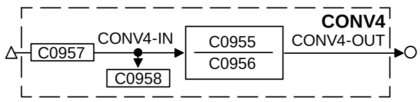


Fig. 7-61 Conversion (CONV4)

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 FB is used to convert speed signals into analog signals. The conversion is done according to the formula:

$$\text{CONV4-OUT} = \text{CONV4-IN} \cdot \frac{100\ \%}{15000\ \text{rpm}} \cdot \frac{\text{C0955}}{\text{C0956}}$$

CONV5

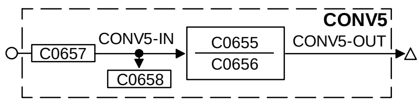


Fig. 7-62 Conversion (CONV5)

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 FB is used to convert analog signals into speed signals. The conversion is done according to the formula:

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

7.5.17 Conversion phase to analog (CONVPHA)

This FB converts a phase signal into an analog signal.

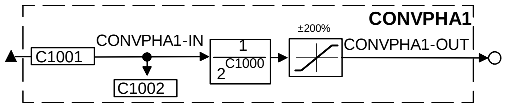


Fig. 7-63 Conversion phase to analog (CONVPHA1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	List	
CONVPHA1-IN	ph	C1002	dec [inc]	C1001	3	1000	-
CONVPHA1-OUT	a	-	-	-	-	-	limited to ±200 %, residual value processing

Function

- The conversion with adaptation using divisor is as follows:

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

7.5.18 Characteristic function (CURVE)

This FB converts analog signals according to the programmed characteristic.

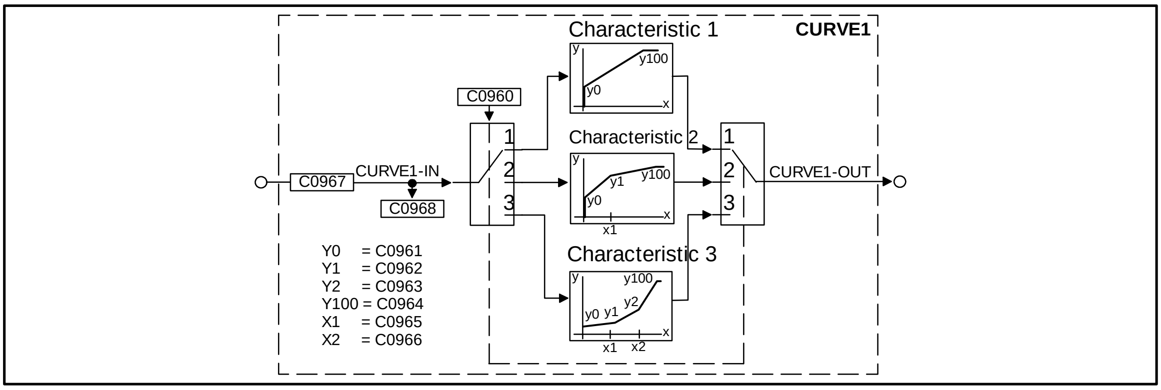


Fig. 7-64 Characteristic function (CURVE1)

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

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

Function

- A linear interpolation is carried out between the co-ordinates.
- For negative values at CURVE1-IN, setting values of the interpolation points are processed as inverted values (see diagrams).
  – If this is not desired, add an ABS or a LIM function block in front of or behind the CURVE function block.

7.5.18.1 Characteristic with two co-ordinates

C0960 = 1

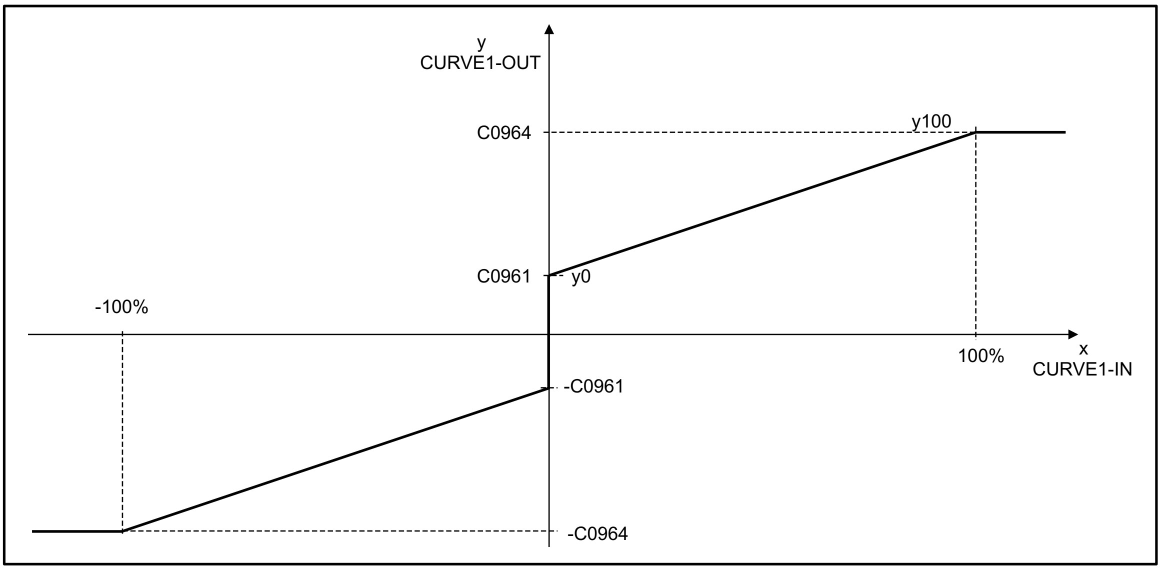


Fig. 7-65 Characteristic with two co-ordinates

7.5.18.2 Characteristic with three co-ordinates

C0960 = 2

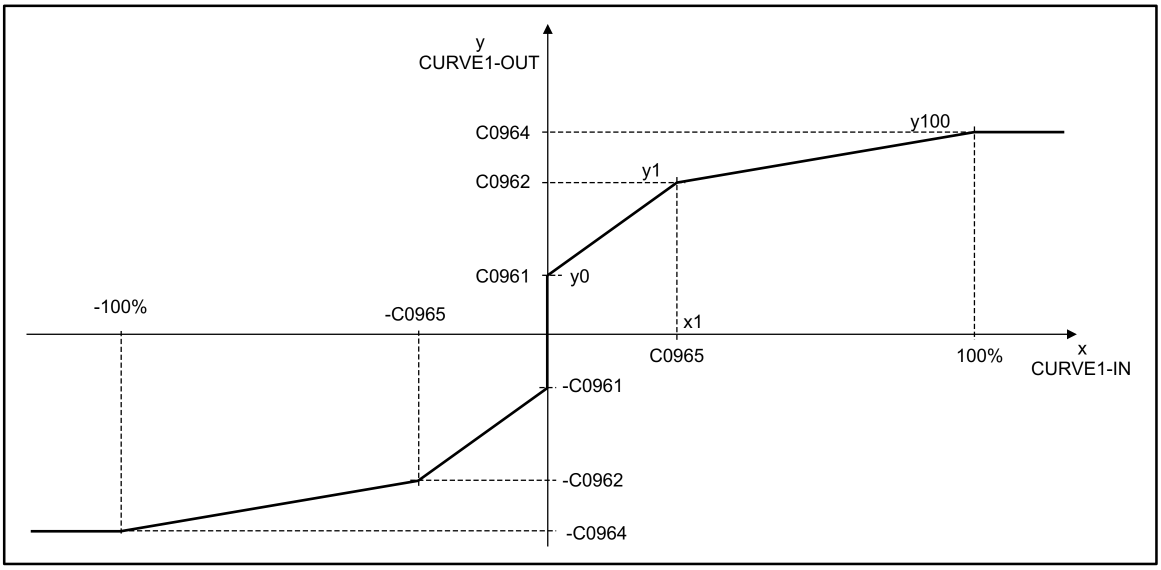


Fig. 7-66 Characteristic with three co-ordinates

7.5.18.3 Characteristic with four co-ordinates

C0960 = 3

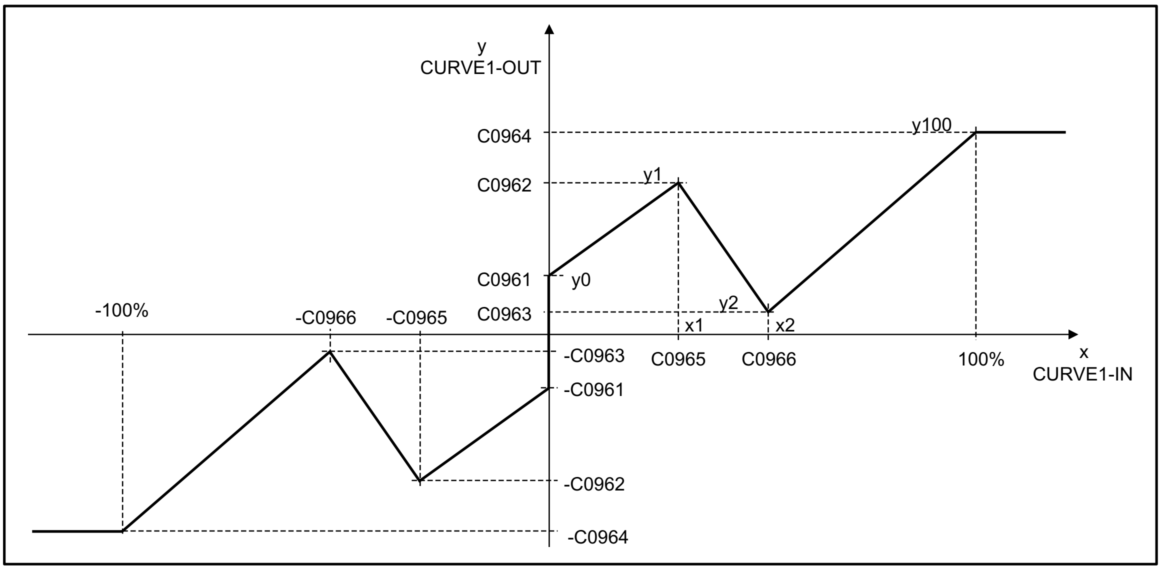


Fig. 7-67 Characteristic with four co-ordinates

7.5.19 Dead band (DB)

This FB sets input signals around the zero point to zero (e.g. disturbance on analog input voltages).

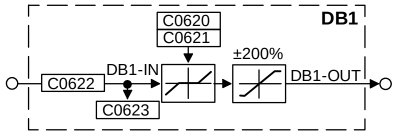


Fig. 7-68 Dead band (DB1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DB1-IN	a	C0623	dec [%]	C0622	1	1000	-
DB1-OUT	a	-	-	-	-	-	limited to ±200 %

Function

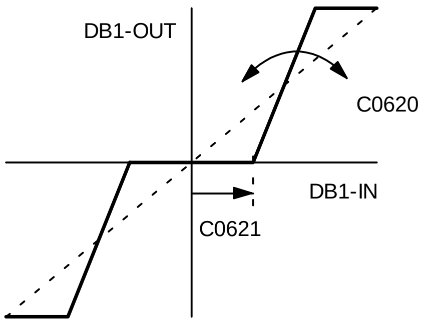


Fig. 7-69 Dead band and gain

- You parameterize the dead band under C0621.
- You change the gain under C0620.

7.5.20 Diameter calculator (DCALC)

This FB calculates the current reel diameter in winding drives.

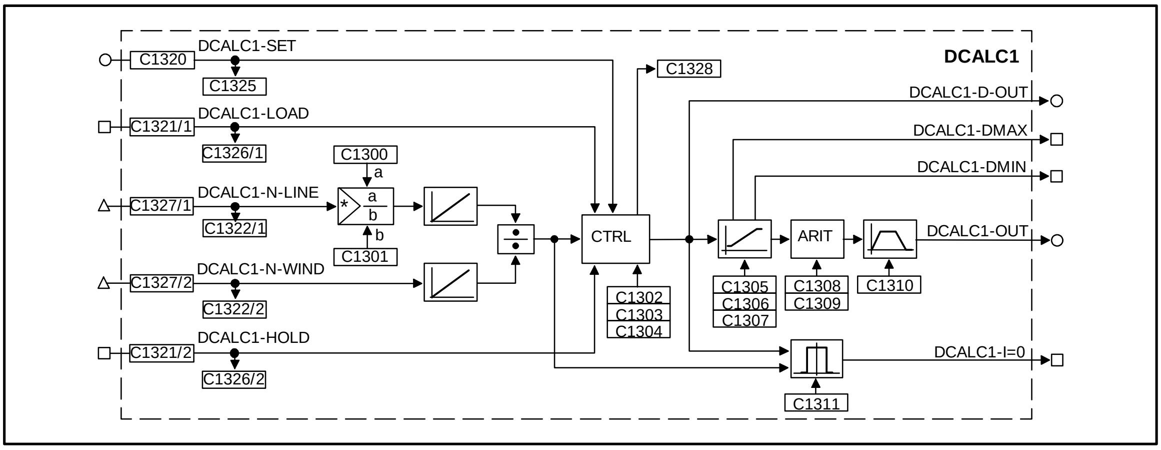


Fig. 7-70 Diameter calculator (DCALC1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DCALC1-SET	a	C1325	dec [%]	C1320	1	1000	-
DCALC1-LOAD	d	C1326/1	bin	C1321/1	2	1000	-
DCALC1-N-LINE	phd	C1322/1	dec [rpm]	C1327/1	3	1000	Speed signal of the line drive
DCALC1-N-WIND	phd	C1322/2	dec [rpm]	C1327/2	3	1000	Speed signal of the winding drive
DCALC1-HOLD	d	C1326/2	bin	C1321/2	2	1000	HIGH = Holds the achieved diameter and resets the integrators.
DCALC1-D-OUT	a	-	-	-	-	-	-
DCALC1-DMAX	d	-	-	-	-	-	HIGH = diameter has reached d_{max}
DCALC1-DMIN	d	-	-	-	-	-	HIGH = diameter has reached d_{min}
DCALC1-OUT	a	-	-	-	-	-	-
DCALC1-I=0	d	-	-	-	-	-	-

Range of functions

- Setting the initial value
- Calculating the diameter
- Displaying the diameter
- Holding the current value
- Limiting the diameter
- Converting the diameter in 1/d
- Web break monitoring

7.5.20.1 Setting the initial value

An initial value is set via the inputs

- DCALC1-SET (initial value) and
- DCALC1-LOAD (transfer signal).

The value is accepted without being filtered.

7.5.20.2 Calculating the diameter

- The current diameter is calculated from the speed signals at DCALC1-N-LINE and DCALC1-N-WIND.
  – The signal at DCALC1-N-LINE must correspond to the circumferential speed of the reel.
  – The signal at DCALC1-N-WIND must be proportional to the winding speed.
- The signal at DCALC-N-LINE is adapted via C1300 and C1301 so that the calculated value corresponds to the actual diameter. The nominal winding diameter $d_{max}$is entered under C1304.
  – When using the nominal winding diameter d_{max} enter the value at the input DCALC1-N-WIND under C1300 and the value at the input DCALC1-N-LINE under C1301.
- The diameter is calculated by dividing the input signals DCALC1-N-LINE and DCALC1-N-WIND.
- A high resolution is achieved by cyclic integration of the input signals. The integration interval is set under C1302.
- A 1st order low pass filters the calculated values. The filter time constant is set under C1303.

7.5.20.3 Displaying the diameter

- C1328 displays the current diameter.
  – For the conversion of the scaled calculated value into the absolute value [mm], the reference diameter d_{max} is entered under C1304.
  – DCALC1-D displays the current diameter. The signal is scaled to the value in C1304.

7.5.20.4 Holding/Saving the current value

- If the input DCALC1-HOLD = HIGH,
  – the diameter value calculated last is held,
  – the integrators are reset.
- The current diameter value is saved when the controller is switched off.
  – The value saved last is loaded when the controller is switched on.

7.5.20.5 Limiting the diameter

- C1305 defines the minimum diameter (d_{min}).
- C1306 defines the maximum diameter (d_{max}).

The diameter is entered in [mm].

Displaying the limit

- When DCALC1-DMIN = HIGH the minimum diameter is reached.
- When DCALC1-DMAX = HIGH the maximum diameter is reached.

A hysteresis for resetting the display signal is set under C1307. The input in [%] refers to the absolute values in C1305 and C1306.

7.5.20.6 Converting the diameter in 1/d

In configurations with speed precontrol it is common to multiply the precontrol signal with the reciprocal signal of the winding diameter.

C1308 defines the conversion of the calculated diameter (d) which is output at DCALC1-OUT:

- C1308 = 0
  – DCALC1-OUT = d
- C1308 = 1
  – DCALC1-OUT = 1/d

For the conversion into 1/d, C1309 defines the reference value of the diameter. When this reference value is reached, the signal at DCALC1-OUT is to be 100%.

- In general, C1309 corresponds to the minimum diameter in C1305 (d_{min}).

C1310 > 0 s activates a ramp function generator. The ramp function generator ensures a smooth transition when new diameter values are set.

7.5.20.7 Web break monitoring

A window comparator compares the calculated value with the value which was filtered last.

- C1311 defines in [%] the max. difference between the two values.
- DCALC1-I=0 changes to LOW when the max. difference is exceeded.

7.5.21 Device control (DCTRL)

This FB controls the device to specified states (e.g. trip, trip reset, quick stop or controller inhibit).

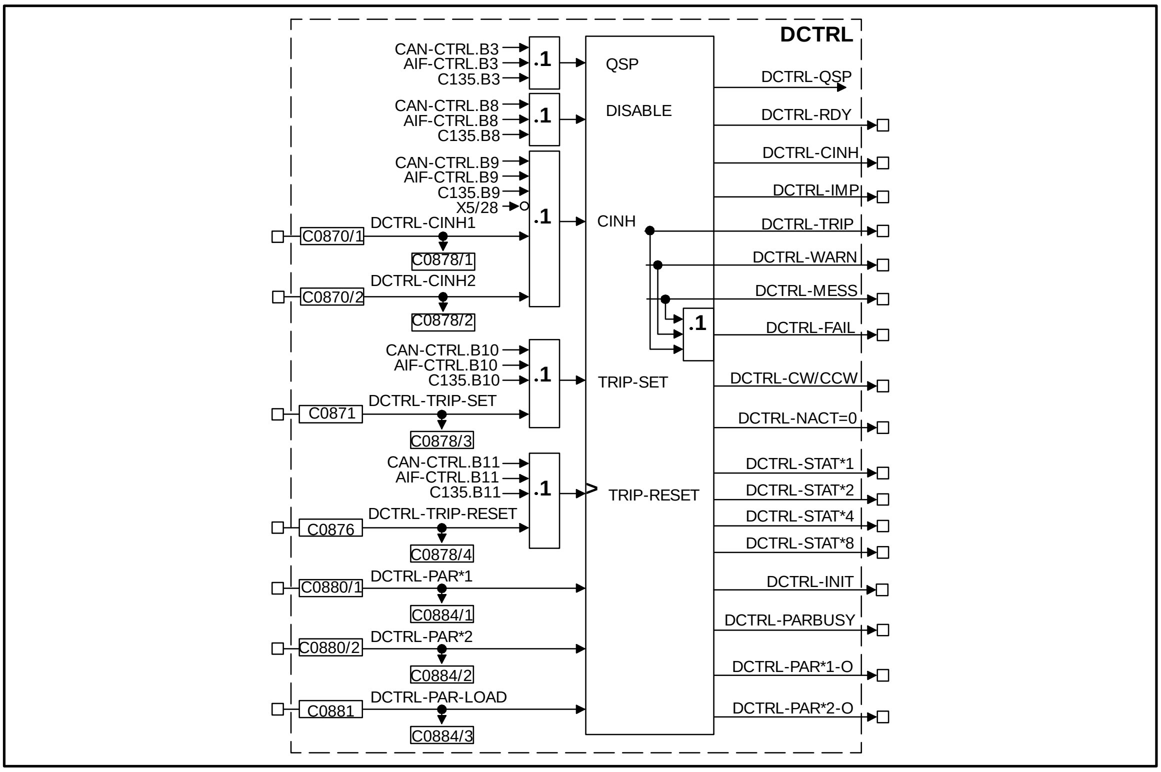


Fig. 7-71 Device control (DCTRL)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DCTRL-CINH1	d	C0878/1	bin	C0870/1	2	1000	HIGH = inhibit controller
DCTRL-CINH2	d	C0878/2	bin	C0870/2	2	1000	HIGH = inhibit controller
DCTRL-TRIP-SET	d	C0878/3	bin	C0871	2	54	HIGH = fault indication EEr
DCTRL-TRIPRESET	d	C0878/4	bin	C0876	2	55	LOW-HIGH signal = Trip reset
DCTRL-PAR*1	d	C0884/1	bin	C0880/1	2	1000	Select parameter set
DCTRL-PAR*2	d	C0884/2	bin	C0880/2	2	1000	Select parameter set
DCTRL-PAR-LOAD	d	C0884/3	bin	C0881	2	1000	LOW-HIGH signal = Load parameter set
DCTRL-RDY	d	-	-	-	-	-	HIGH = Ready for operation
DCTRL-CINH	d	-	-	-	-	-	HIGH = Controller reset
DCTRL-IMP	d	-	-	-	-	-	HIGH = High-resistance power output stages
DCTRL-TRIP	d	-	-	-	-	-	HIGH = Active fault
DCTRL-WARN	d	-	-	-	-	-	HIGH = Active warning
DCTRL-MESS	d	-	-	-	-	-	HIGH = Active message
DCTRL-FAIL	d	-	-	-	-	-	-
DCTRL-CW/CCW	d	-	-	-	-	-	LOW = CW rotation, HIGH = CCW rotation
DCTRL-NACT=0	d	-	-	-	-	-	HIGH = Motor speed < C0019
DCTRL-STAT*1	d	-	-	-	-	-	general status (binary coded)
DCTRL-STAT*2	d	-	-	-	-	-	general status (binary coded)
DCTRL-STAT*4	d	-	-	-	-	-	general status (binary coded)
DCTRL-STAT*8	d	-	-	-	-	-	general status (binary coded)
DCTRL-INIT	d	-	-	-	-	-	-
DCTRL-PARBUSY	d	-		-	-	-	HIGH = Change of parameter set active
DCTRL-PAR*1-O	d	-	-	-	-	-	Parameter set X active (binary coded)
DCTRL-PAR*2-0	d	-	-	-	-	-	Parameter set X active (binary coded)

Range of functions

- Quick stop (QSP)
- Operation inhibited (DISABLE)
- Controller inhibit (CINH)
- TRIP-SET
- TRIP-RESET
- Changing the parameter set (PAR)
- Controller state

7.5.21.1 Quick stop (QSP)

If QSP is activated, the drive is decelerated to zero speed via the deceleration ramp C0105.

- QSP is activated via three inputs:
  – Control word CAN-CTRL.B3 from CAN-IN1
  – Control word AIF-CTRL.B 3 from AIF-IN
  – Control word C0135.B3
- All inputs are linked by an OR-operation
- QSP can also be activated via the input MCTRL-QSP in the FB MCTRL. (📖 7-139)

7.5.21.2 Operating inhibited (DISABLE)

When the operation is inhibited, the output stages are inhibited and all controllers are reset. When the operation is inhibited, the drive cannot be started by the controller enable command.

- The function is activated via three inputs:
  – Control word CAN-CTRL.B8 from CAN-IN1
  – Control word AIF-CTRL.B8 from AIF-IN
  – Control word C0135.B8
- All inputs are linked by an OR-operation.

7.5.21.3 Controller inhibit (CINH)

When the controller is inhibited, the output stages are inhibited and all controllers are reset.

- The function is activated via six inputs:
  – Terminal X5/28 (LOW = controller inhibit)
  – Control word CAN-CTRL.B9 from CAN-IN1
  – Control word AIF-CTRL.B9 from AIF-IN
  – Control word C0135.B9
  – Free inputs DCTRL-CINH1 and DCTRL-CINH2
- All inputs are linked by an OR-operation.

7.5.21.4 TRIP-SET

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

- The function is activated via four inputs:
  – Control word CAN-CTRL.B10 from CAN-IN1
  – Control word AIF-CTRL.B10 from AIF-IN
  – Control word C0135.B10
  – Free input DCTRL-TRIP-SET
- All inputs are linked by an OR-operation.

7.5.21.5 TRIP-RESET

TRIP-RESET resets an active trip once the cause of fault has been eliminated. If the cause of fault is still active, there is no reaction.

- The function is activated via four inputs:
  – Control word CAN-CTRL.B11 from CAN-IN1
  – Control word AIF-CTRL.B11 from AIF-IN
  – Control word C0135.B11
  – Free input DCTRL-TRIP-RESET
- All inputs are linked by an OR-operation.
- The function can only be performed by a LOW-HIGH edge of the signal resulting from the OR operation.

Tip!
If one of the inputs is set to HIGH, no LOW-HIGH edge can occur at the resulting signal.

7.5.21.6 Changing the parameter set (PAR)

The controller loads and uses the selected parameter set.

- The parameter set to be loaded is selected via the inputs DCTRL-PAR*1 and DCTRL-PAR*2. The inputs are binary coded (1 of 4).

PAR*2	PAR*1	Selected parameter set
0	0	Parameter set 1
0	1	Parameter set 2
1	0	Parameter set 3
1	1	Parameter set 4

- With a LOW-HIGH - signal at the input DCTRL-PAR-LOAD the controller changes to the selected parameter set.
- The parameter set can be changed only if the controlled inhibit is activated. (📖 7-96)

Tip!

If the parameter set to be loaded via terminal X5/Ex is selected before connecting the supply voltage, the LOW-HIGH signal at the input DCTRL-PAR-LOAD is not necessary. In this case, the controller loads automatically the selected parameter set.

- The controller is not ready for approx. 1 s. DCTRL- RDY shows LOW during this time.

7.5.21.7 Controller state

The state is binary coded in the outputs DCTRL-STAT*x.

STAT*8	STAT*4	STAT*2	STAT*1	Action of the controller
0	0	0	0	Initialization after connection of the supply voltage
0	0	0	1	Lock mode, Protection against restart active C0142
0	0	1	1	Drive is in controller inhibit mode
0	1	1	0	Controller enabled
0	1	1	1	The release of a monitoring function resulted in a ”message”
1	0	0	0	The release of a monitoring function resulted in a ”trip”

7.5.22 Digital frequency input (DFIN)

This FB calculates a speed signal from the rectangular signals at X9. The signal change are detected every 1 ms and result directly in the output value.

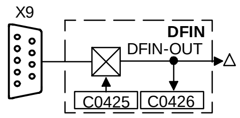


Fig. 7-72 Digital frequency input (DFIN)

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

Function

- The input X9 is designed for TTL as well as for HTL signals. (4-21 ff, digital frequency input X9)
- The conversion constant is set under C0425. The output signal can thus be adapted to a connected encoder or a controller when a digital frequency cascade or a digital frequency bus is used.
- The input of a zero track is optional.
- The evaluation of the following input signals is possible under C0427:

C0427 = 0

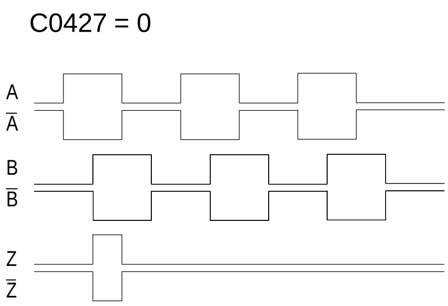


Fig. 7-73 Signal sequence with phase shift (CW rotation)

- CW rotation:
  – Track A leads track B by 90 ° (positive value at DFIN-OUT).
- CCW rotation:
  – Track A lags track B by 90 ° (negative value at DFIN-OUT).

C0427 = 1

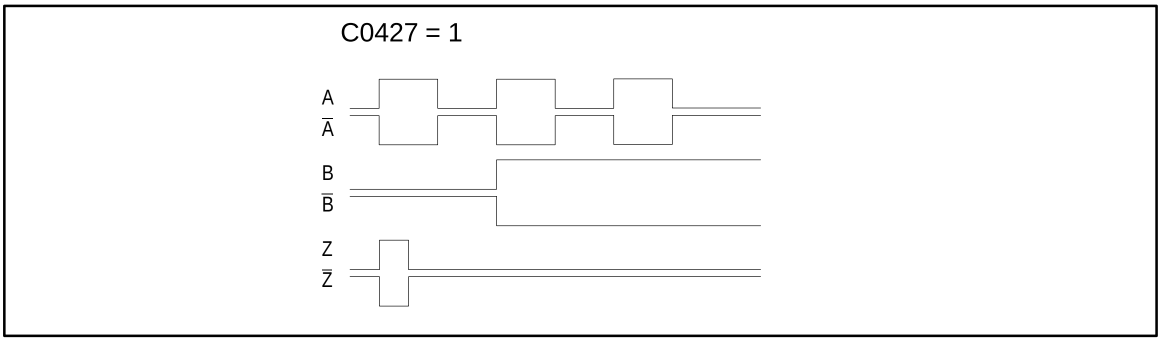


Fig. 7-74 Control of the direction of rotation by track B

- 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

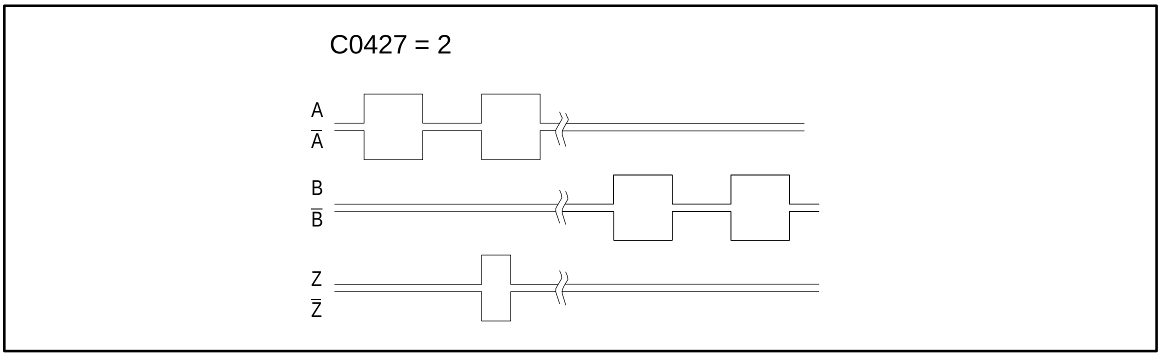


Fig. 7-75 Control of speed and direction of rotation via track A or track B

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

Function block library

Digital frequency input (DFIN)

Transmission function

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

Example:

Input frequency = 200 kHz

C0425 = 3 (corresponds to 2048 inc/rev)

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

Signal adaptation

Signal adaptations other than the squaring under C0425 can be achieved by connecting FB (e.g. CONV3 or CONV4).

Example:

The FB CONV3 converts the speed signal into a quasi-analog signal.

The conversion is done according to the formula:

$$\text{CONV3-OUT [\%]} = f\,[\text{Hz}] \cdot \frac{0.4}{\text{Increments from C0425}} \cdot \frac{\text{C0950}}{\text{C0951}}$$

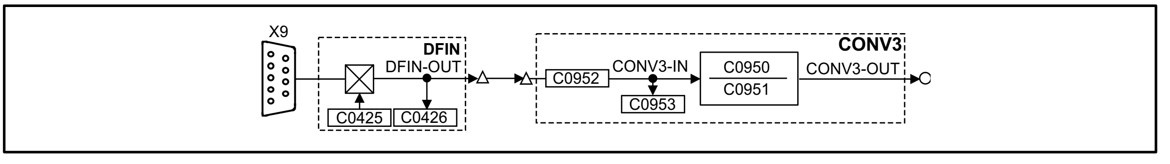


Fig. 7-76 Digital frequency input (DFIN) with connected converter

Tip!

When a digital frequency is output with C0540 = 0 or 1 and an incremental encoder is evaluated using X8, you can no longer use the digital frequency input (DFIN). This relationship does not apply if you set the digital frequency output (DFOUT) to repeat the input signals on X8 or X9 (C0540 = 4 or 5).

7.5.23 Digital frequency output (DFOUT)

This FB generates rectangular signals from an analog signal or a speed signal. The rectangular signals are output via X10. Alternatively you set the digital frequency output to X8 or X9.

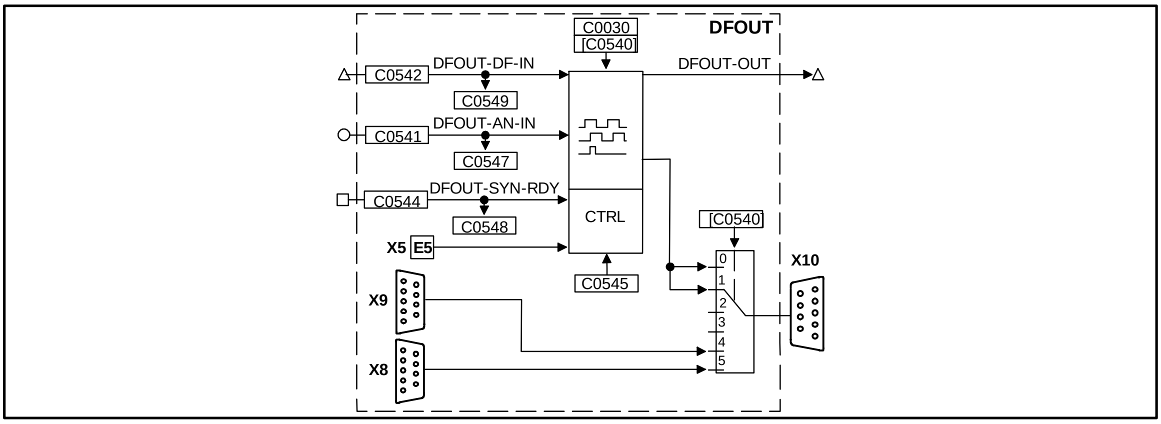


Fig. 7-77 Digital frequency output (DFOUT)

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	-	-	-	-	-

Range of functions

- Output signals on 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

7.5.23.1 Output signals on X10

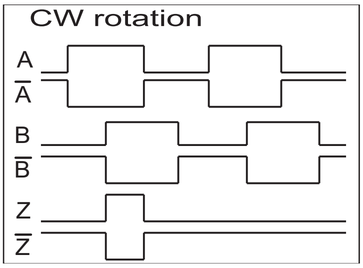


Fig. 7-78 Signal sequence for CW rotation (definition)

- The output signals correspond to the simulation of an incremental encoder:
  - Track A, track B and the zero track (if necessary) as well as the corresponding inverted tracks are output.
  - The levels are TTL compatible.
- The signal sequence in the diagram occurs if the input values are positive (CW rotation).
- If the input values are negative (CCW rotation), track B leads track A by 90**5** 5 .
- The zero pulse is output according to the function set under C0540.
- You set the encoder constant of the encoder simulation under C0030.
- Under C0540 you define, which input signal or which signal source is to be active.

[C0540]	Signal at X10
0	DFOUT-AN-IN is output at X10; external input of the zero track is possible
1	DFOUT-DF-IN is output at X10; external input of the zero track is possible
2	no function
3	no function
4	The signal at input X9 is amplified electrically and is output directly (C0030 is without function)
5	The signal at input X8 is amplified electrically and is output directly (C0030 is without function)

Tip!

C0540 = 0 and C0540 = 1 is not possible when a connection to the digital frequency input (DFIN) was established and an incremental encoder was connected via X8 (C0025 = 100, 110 ... 113).

7.5.23.2 Output of an analog signal

- Set C0540 = 0.
  – The value at input DFOUT-AN-IN is converted into a frequency.

Transmission function

$$f\,[\mathrm{Hz}] = \mathrm{DFOUT} - \mathrm{AN} - \mathrm{IN}\,[\%] \cdot \frac{\text{Increments from C0030}}{100} \cdot \frac{\mathrm{C0011}}{60}$$

Example:

DFOUT-AN-IN = 50 %

C0030 = 3, this corresponds to 2048 inc/rev.

C0011 = 3000 rpm

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

Generate zero pulse

An artificial zero pulse can be generated for the output frequency.

- Set the input DFOUT-SYN-RDY = HIGH.
- A LOW-HIGH edge at terminal X5/E5 generates the zero pulse 360° later.
  – Then, a zero pulse is generated every 360**5** according to C0030.
- Under C0545, you can shift the zero pulse by up to 360 **5** (65536 inc = 360 °).

7.5.23.3 Output of a speed signal

- Set C0540 = 1.
  – The value at input DFOUT-DF-IN is converted into a frequency.

Transmission function

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

Example:

DFOUT-DF-IN = 3000 rpm

C0030 = 3 (corresponds to 2048 inc/rev.)

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

Generate zero pulse

An artificial zero pulse can be generated for the output frequency.

- Set the input DFOUT-SYN-RDY = HIGH.
- A LOW-HIGH edge at terminal X5/E5 generates the zero pulse 360° later.
  – Then, a zero pulse is generated every 360 ° according to C0030.
- Under C0545, you can shift the zero pulse by up to 360 **5** (65536 inc = 360 °).

7.5.23.4 Direct output of X8 (C0540 = 4)

- The input signals at X8 are amplified electrically and output directly.
- The signals depend on the assignment of input X8.
- C0030, C0545 and output DFOUT-OUT have no function.
- The zero track is output only if it is connected to X8.

7.5.23.5 Direct output of X9 (C0540 = 5)

- The input signals at X9 are amplified electrically and output directly.
- The signals depend on the assignment of input X9.
- C0030, C0545 and output DFOUT-OUT have no function.
- The zero track is output only if it is connected to X9.

7.5.24 Digital frequency ramp function generator (DFRFG)

This FB generates acceleration and deceleration ramps for digital frequency operation. The drive is thus controlled phase-synchronously to the digital frequency.

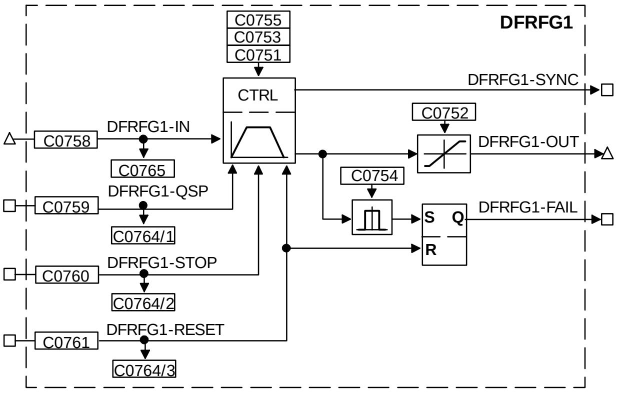


Fig. 7-79 Digital frequency ramp function generator (DFRFG1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
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

Range of functions

- Profile generator
- Quick stop
- Ramp generator stop
- RESET
- Detect phase difference

7.5.24.1 Profile generator

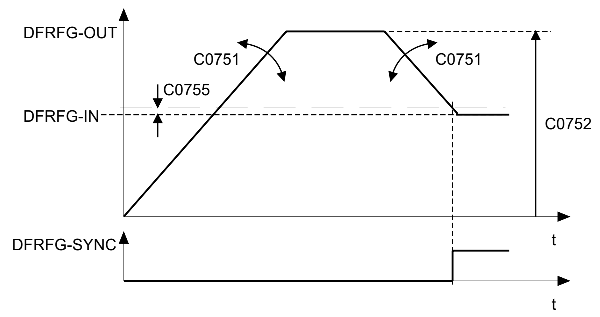


Fig. 7-80 Synchronize on DFRFG

The profile generator generates ramps which compensate the fault automatically. If you do not need this compensation, set DFRFG-RESET = HIGH.

- Set the acceleration and deceleration time under C0751.
- Set the max. speed under C0752.
- When the actual angle has achieved its setpoint and the output signal corresponds to the input signal, the output DFRFG1-SYNC changes to HIGH. At the same time, the FB switches the profile generator inactive.
- Set the change-over point under C0755.

Stop!

Do not use this function to operate the drive at the torque limit M_{max}, I_{max}.

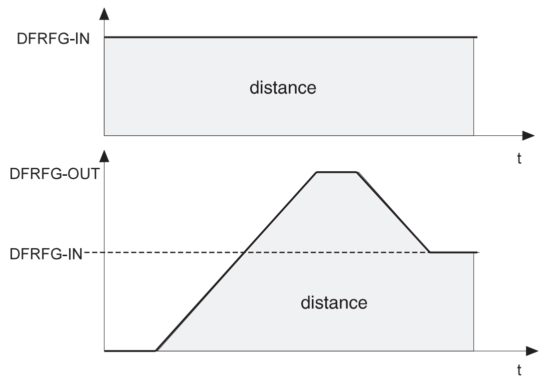


Fig. 7-81 Speed-time diagram DFRFG

The number of increments at DFRFG1-IN (master drive) provide the set phase. The set phase can be represented as a distance. In the speed-time diagram, the distance covered (phase) is shown as the area under the speed profile. When synchronization is reached, master and slave have covered the same distance (phase).

7.5.24.2 Quick stop (QSP)

QSP removes the drive from the network and brakes it to standstill. Setpoints and actual values are still detected.

- QSP is activated using DFRFG1-QSP = HIGH.
- Set the deceleration time under C0753.
- After having reset QSP, the set phase is reached via the profile generator.

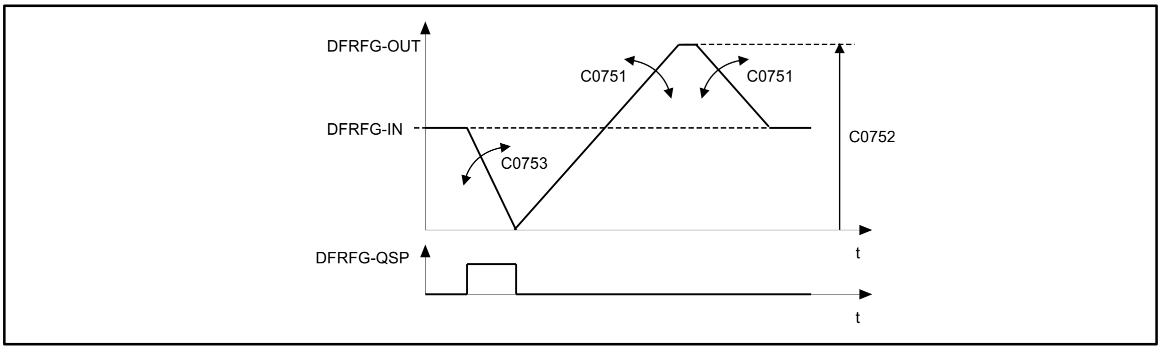


Fig. 7-82 Quick stop DFRFG

7.5.24.3 Ramp generator stop

“Ramp function generator stop” freezes the profile generator state during operation. Setpoints and actual values are still detected.

- The function is activated using DFRFG1-STOP = HIGH.
- The last status is output at DFRFG1-OUT.
- Approach of the setpoint phase via the profile generator after reset of the stop request.
- After having reset the ”Ramp function generator stop”, the set phase is reached via the profile generator.

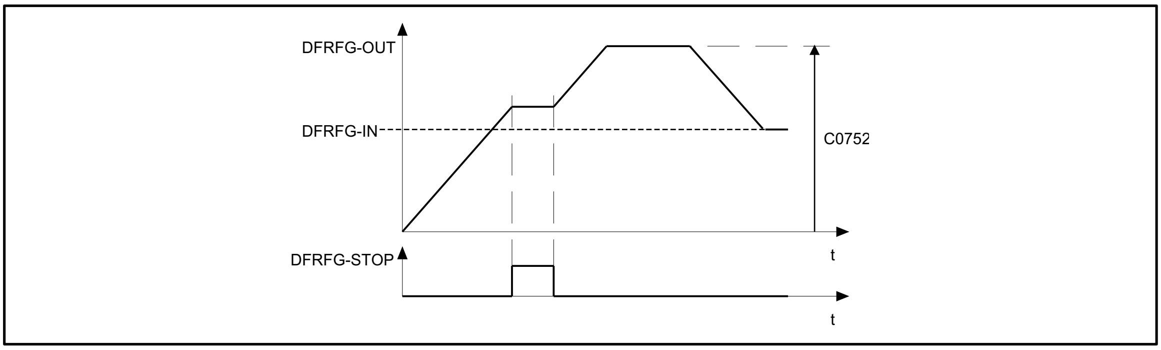


Fig. 7-83 Ramp generator stop

7.5.24.4 RESET

RESET resets internally added setpoints and actual values.

- The function is activated using DFRFG1-RESET = HIGH.
- The profile generator is activated.
- The set phase is detected using a HIGH-LOW signal at DFRFG1-RESET.

7.5.24.5 Detect phase difference

The phase difference between setpoint and actual phase is monitored.

- Set the monitoring limit under C0754.
- When the monitoring responds, DFRFG1-FAIL = HIGH.
- The signal is saved until DFRFG1-RESET = HIGH.
- The profile generator can accept a phase difference of up to ±2140000000 inc (= 32000 revolutions).

7.5.25 Digital frequency processing (DFSET)

This FB conditions the digital frequency for the controller. You can enter values for the stretch factor and gearbox factor and trim speed or phase.

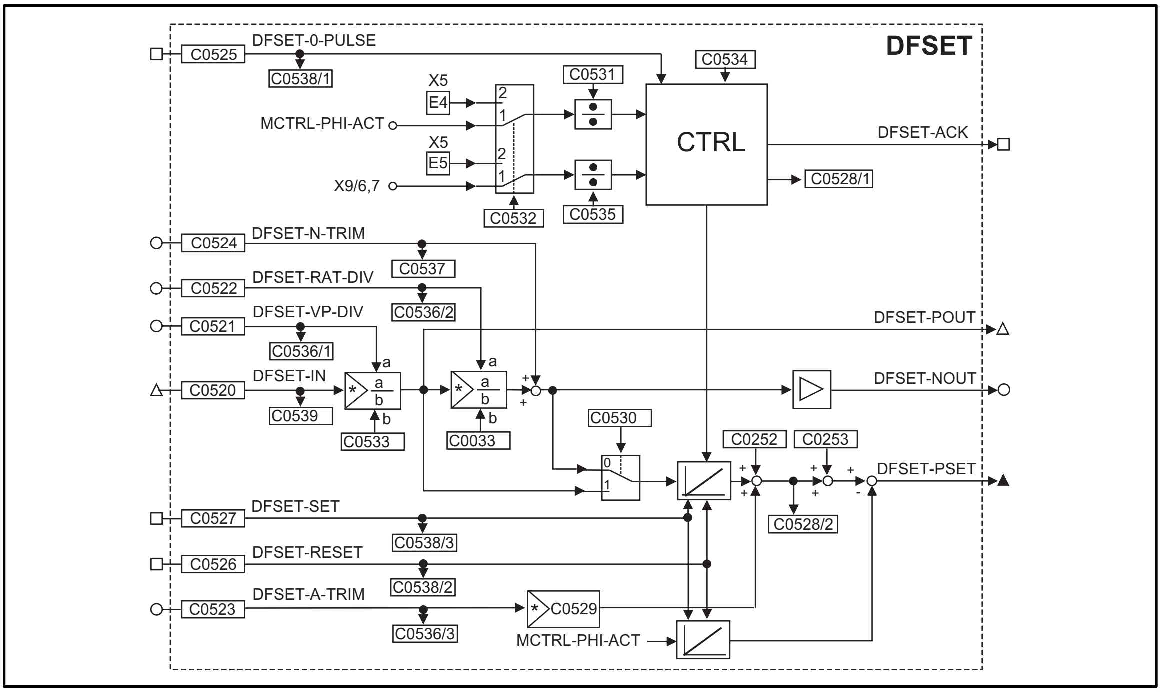


Fig. 7-84 Digital frequency processing (DFSET)

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-A-TRIM	a	C0536/3	dec [inc]	C0523	1	Phase trimming 100% = 16384 inc
DFSET-VP-DIV	a	C0536/1	dec	C0521	1	Numerator stretch factor 100 % = 16384 inc
DFSET-RAT-DIV	a	C0536//2	dec	C0522	1	Numerator gearbox factor 100 % = 16384 inc
DFSET-0-PULSE	d	C0538/1	bin	C0525	2	HIGH = Enabling of zero pulse synchronizing
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	-	-	-	-	Contouring error for phase controller
DFSET-ACK	d	-	-	-	-	HIGH = Synchronizing is performed

Range of functions

- Setpoint conditioning with stretch and gearbox factor
- Processing of correction values
- Synchronizing on zero track or touch probe

7.5.25.1 Setpoint conditioning with stretch and gearbox factor

Stretch factor

The stretch factor defines the ratio using which the drive is to run faster or slower than the setpoint.

- The stretch factor evaluates the setpoints at DFSET-IN. DFSET-POUT outputs the result.
- The stretch factor results from numerator and denominator.
  – You can enter the numerator as a variable from the analog signal source or as a fixed value from a code.
  – Enter the denominator under C0533.
- Relationship:

$$\text{DFSET–POUT} = \text{DFSET–IN} \cdot \frac{\text{DFSET–VP–DIV}}{\text{C0533}}$$

Stop!
When the stretch factor is calculated, the input signal at DFSET-VP-DIV is entered in an unscaled way. A signal of 100 % results in a numerator of 16384.

Gearbox factor

The gearbox factor defines the ratio using which the drive speed can be changed additionally.

- The stretch factor evaluates the setpoint at DFSET-IN multiplied by the stretch factor. DFSET-NOUT outputs the result.
- The gearbox factor results from numerator and denominator.
  – You can enter the numerator as a variable from the analog signal source or as a fixed value from a code.
  – Enter the denominator under C0033.
- Relationship:

$$\text{DFSET} - \text{NOUT} = \text{Stretch factor} \cdot \frac{\text{DFSET} - \text{RAT} -}{\text{C0033}}$$

$$\text{DFSET–NOUT} = \text{DFSET–IN} \cdot \frac{\text{DFSET–VP–DIV}}{\text{C0533}} \cdot \frac{\text{DFSET–RAT–DIV}}{\text{C0033}}$$

Stop!
When the stretch factor is calculated, the input signal at DFSET-RAT-DIV is entered in an unscaled way. A signal of 100 % results in a numerator of 16384.

7.5.25.2 Processing of correction values

Speed trimming

The speed trimming is used to add correction values, e.g. by a superimposed closed-loop control. This allows acceleration or deceleration of the drive.

- An analog value at DFSET-N-TRIM is added to the speed setpoint.

Phase trimming

The phase trimming adds a setpoint at DFSET-A-TRIM to the setpoint phase. The rotor position leads or lags the setpoint with the number of increments provided. The phase trimming is performed within a range of ±32767 increments (corresponds to ±1/2 revolution). The source can be any analog signal.

- The input is done in increments (one revolution corresponds to 65536 increments).
- When analog values are entered, 100% correspond to 1/4 revolution = 16384 increments.
- You can extend the setting range with a multiplier (C0529).

Phase offset

The phase offset (C0252) adds a fixed phase offset to the setpoint.

Speed-proportional phase setting

With speed-proportional phase offset, the phase leads or lags with increasing speed.

- Enter the offset in increments under C0253.
- The set phase offset is reached at 15000 rpm of the drive (linear relationship).

Tip!

Phase corrections are useful only when the controller is operated with incremental encoder feedback and the calculated following error (DFSET-PSET) is used for the correction of the setpoint speed.

7.5.25.3 Synchronizing on zero track or touch probe

Tip!

Drive synchronization is useful only if the controller is operated with incremental encoder feedback and the calculated following error (DFSET-PSET) is used for the correction of the setpoint speed.

The synchronization is selected under C0532.

- C0532 = 1 (zero pulse)
  - The synchronization is performed on the zero track of the digital frequency input X9 and the zero track of the feedback system set under C0490.
- C0532 = 2 (Touch probe)
  - The synchronization is performed using the terminals X5/E4 (actual pulse) and X5/E5 (setpoint pulse).

Touch probe initators can have delay times which cause a speed-dependent phase offset.

- Set the correction for the phase offset under C0429.
- Formula for correction value at C0429:

  Correction value at C0429 $=$ 16384 $\cdot$ Correction value

- Please obtain the values from the data sheet of the initiator or contact the manufacturer.

Stop!

When the synchronization via terminals X5/E4 and X5/E5 (C0532 = 2) is activated, make sure that no other control signals are taken from these terminals. If the configuration is changed under C0005, the terminals are assigned to a basic setting.

Synchronization mode

For the synchronization, different modes are available which can be set under C0534.

C0534	Synchronization mode	Note
0	Inactive	function inactive
1	Continuous synchronization with correction in the shortest possible way	
2	Continuous synchronization with correction in the shortest possible way	After LOW-HIGH signal at DFSET-0-Pulse the zero track is synchronized once
10	Single synchronization, a phase deviation is corrected in the shortest possible way	After LOW-HIGH signal at DFSET-0-Pulse the zero track is synchronized once
11	Single synchronization, a phase deviation is corrected in CW direction	After LOW-HIGH signal at DFSET-0-Pulse the zero track is synchronized once
12	Single synchronization, a phase deviation is corrected in CCW direction	After LOW-HIGH signal at DFSET-0-Pulse the zero track is synchronized once
13	Single synchronization, 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 LOW-HIGH signal at DFSET-0-Pulse the zero track is synchronized once

7.5.26 Delay (DIGDEL)

These FBs delay digital signals. You can use the FB for the control of other functions or the generation of status information.

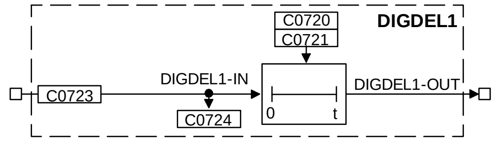


Fig. 7-85 Delay (DIGDEL1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DIGDEL1-IN	d	C0724	bin	C0723	2	1000	-
DIGDEL1-OUT	d	-	-	-	-	-	-

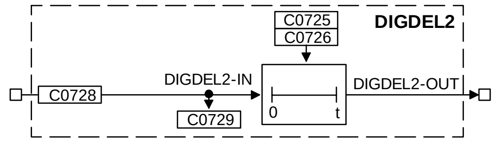


Fig. 7-86 Delay (DIGDEL2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
DIGDEL2-IN	d	C0729	bin	C0728	2	1000	-
DIGDEL-OUT	d	-	-	-	-	-	-

Range of functions

- On-delay
- Off-delay
- General delay

7.5.26.1 On-delay

- C0720 = 0 (DIGDEL1)
- C0725 = 0 (DIGDEL2)

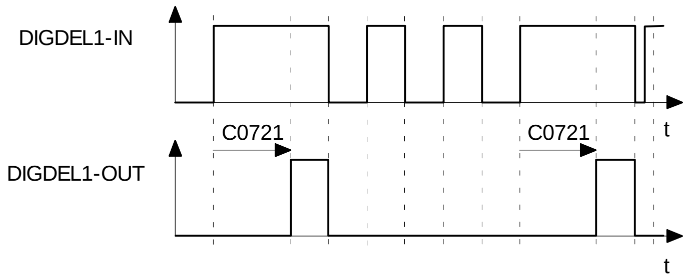


Fig. 7-87 On-delay (DIGDEL1)

In this function, the time-element operates like a retriggerable monoflop:

Function procedure

1. A LOW-HIGH edge at DIGDELx-IN starts the time element.
2. After the delay set under C0721 (DIGDEL1) or C0726 (DIGDEL2) has elapsed, DIGDELx-OUT changes to HIGH.
3. A HIGH-LOW signal at DIGDELx-IN resets the time element and changes DIGDELx-OUT to LOW.

7.5.26.2 Off-delay

- C0720 = 1 (DIGDEL1)
- C0725 = 1 (DIGDEL2)

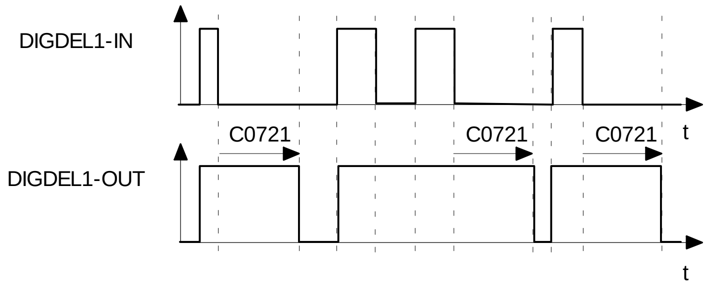


Fig. 7-88 Off-delay (DIGDEL1)

Function procedure

1. A LOW-HIGH signal at DIGDELx-IN changes DIGDELx-OUT to HIGH and resets the time element.
2. A HIGH-LOW signal at DIGDELx-IN starts the time element.
3. After the delay set under C0721 (DIGDEL1) or C0726 (DIGDEL2) has elapsed, DIGDELx-OUT changes to LOW.

7.5.26.3 General delay

- C0720 = 2 (DIGDEL1)
- C0725 = 2 (DIGDEL2)

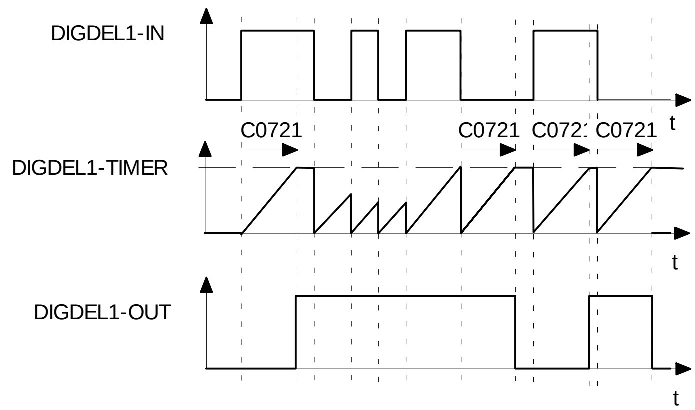


Fig. 7-89 General delay (DIGDEL1)

Function procedure

1. Any signal at DIGDELx-IN starts the time element.
2. When the timer has reached the upper limit (DIGDEL1: C0721, DIGDEL2: C0726), DIGDELx-OUT is set to the same value applied at DIGDELx-IN.

7.5.27 Digital inputs (DIGIN)

This FB reads digital signals at the terminals X5/E1 ... X5/E5 and X5/ST and conditions them.

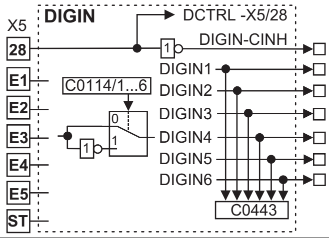


Fig. 7-90 Digital inputs (DIGIN)

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	-	-	-	-
DIGIN6	d	C0443	dec	-	-	-	-

Function

The terminals X5/E1 to X5/E5 and X5/ST are scanned every millisecond. The level for every input can be inverted.

- Select the desired input under C0114 with the corresponding subcode (e.g. subcode C0114/3 for input X5/E3)
- Select the desired level:
  - 0 = Level not inverted (HIGH active)
  - 1 = Level inverted (LOW active)

7.5.28 Digital outputs (DIGOUT)

This FB conditions digital signals and output them at terminals X5/A1 ... X5/A4.

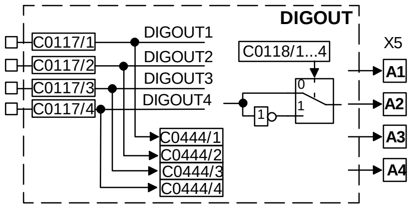


Fig. 7-91 Digital outputs (DIGOUT)

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.

- Select the desired output under C0118 with the corresponding subcode (e.g. subcode C0118/3 for output X5/A3)
- Select the desired level:
  - 0 = Level not inverted (HIGH active)
  - 1 = Level inverted (LOW active)

7.5.29 Differentiator (DT1)

This FB is used for the differentiation of signals. For instance, you can calculate the acceleration of the drive (dv/dt) as it is needed when acceleration is added.

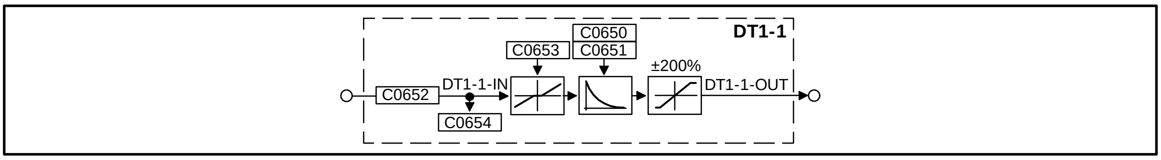


Fig. 7-92 Differentiator (DT1-1)

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 ±200 %

Function

- The gain K is set under C0650.
- The delay T_v is set under C0651.
- The input sensitivity can be reduced under C0653.
  – The FB only evaluates the specified most significant bits, according to the setting.

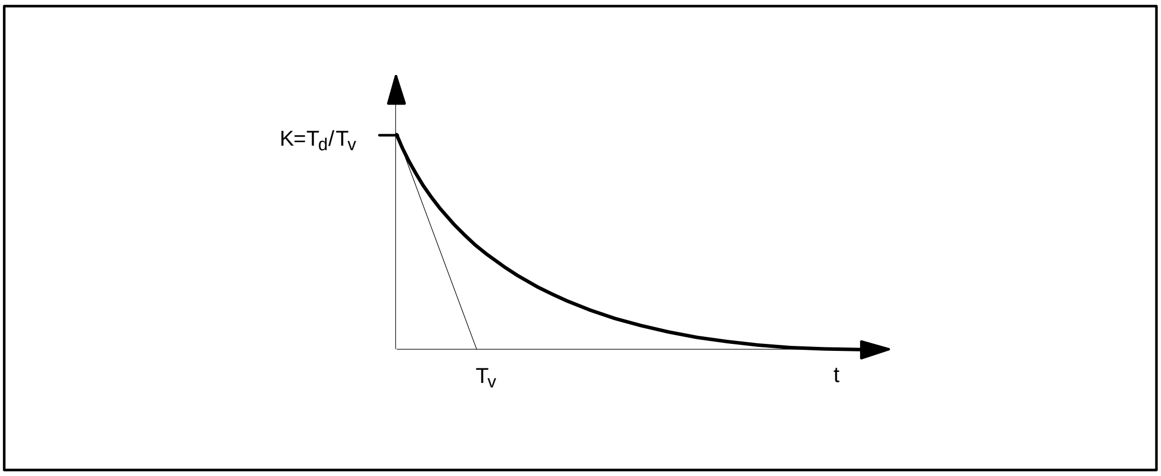


Fig. 7-93 Delay time T_v

7.5.30 Counter (FCNT)

This FB is used for digital counting up and down.

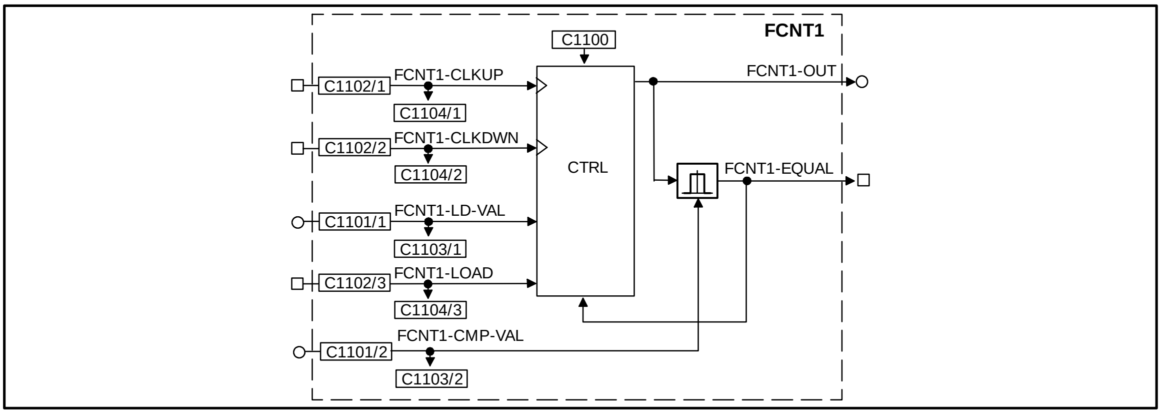


Fig. 7-94 Counter (FCNT1)

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 %
FCNT1-EQUAL	d	-	-	-	-	HIGH = comparison value reached

Range of functions

- Setting start value
- Counting up/down
- Comparing counter

7.5.30.1 Setting start value

The counter is initialized with defined values via the inputs FCNT1-LD-VAL and FCNT1-LOAD.

- As long as FCNT1-LOAD = HIGH, the value at FCNT1-LD-VAL (start value) is switched to FCNT1-OUT.
- When FCNT1-LOAD = LOW, the counter is enabled for counting up and down.
- When FCNT1-LOAD = HIGH, the counter is reset to the value at FCNT1-LD-VAL.

7.5.30.2 Counting up/down

- A LOW-HIGH signal at FCNT1-CLKUP increases the counter by 1.
- A LOW-HIGH signal at FCNT1-CLKDWN reduces the counter by 1.

7.5.30.3 Comparing counter

C1100 = 1

- If |FCNT1-OUT| ≥ |FCNT1-CMP-VAL|:
  – FCNT1-EQUAL = HIGH for 1 ms.
  – The counter is reset to the start value at FCNT1-LD-VAL.

Tip!

If the signal at FCNT1-EQUAL 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

- If |FCNT1-OUT| = |FCNT1-CMP-VAL|:
  – The counter is stopped.

7.5.31 Free digital outputs (FDO)

This FB is used to link free digital signals which are to be transmitted to a field bus.

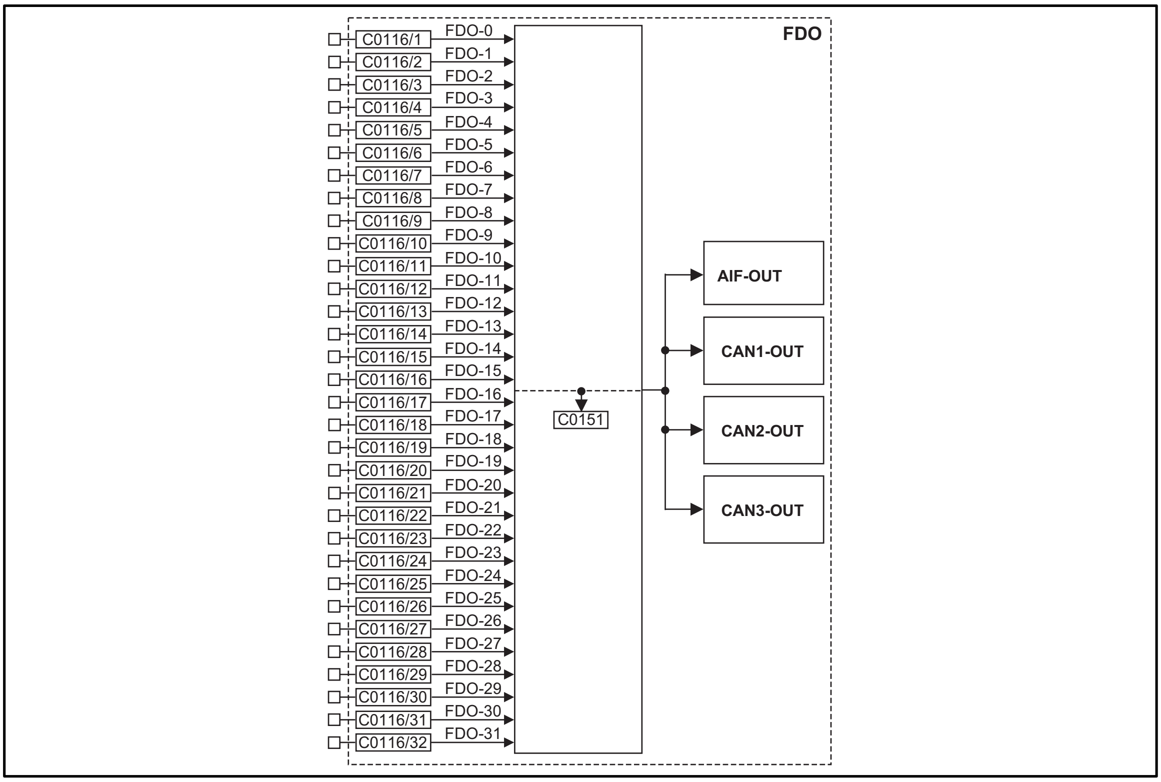


Fig. 7-95 Free digital outputs (FDO)

Function block library

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 is marked with FDO-x (e.g. FDO-0 for the LSB and FDO-31 for the MSB).
- The data word is transferred to the function blocks AIF-OUT, CAN-OUT1, CAN-OUT2, and CAN-OUT3.

7.5.32 Code assignment (FEVAN)

This FB transfers analog signals to any code. At the same time, it converts the signal to the data format of the target code.

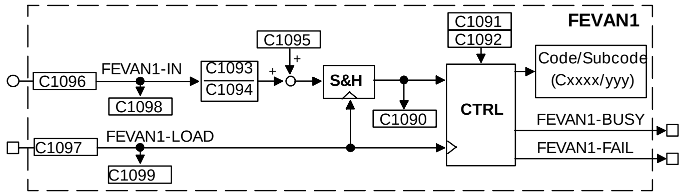


Fig. 7-96 Code assignment (FEVAN1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
FEVAN1-IN	a	C1098	dec	C1096	1	Input value
FEVAN1-LOAD	d	C1099	bin	C1097	2	A LOW-HIGH edge transmits the converted signal to the target code.
FEVAN1-BUSY	d	-	-	-	-	HIGH = transmitting
FEVAN1-FAIL	d	-	-	-	-	● HIGH = transmission failed – A LOW-HIGH edge at FEFAN1-LOAD switches FEFAN1-FAIL = LOW.
-	-	C1090	-	-	-	Display of the converted signal

Range of functions

- Data transmission
- Conversion

7.5.32.1 Data transmission

The data transmission is started with a LOW-HIGH signal at FEVAN1-LOAD. FEVAN1-BUSY = HIGH is set for the time of transmission.

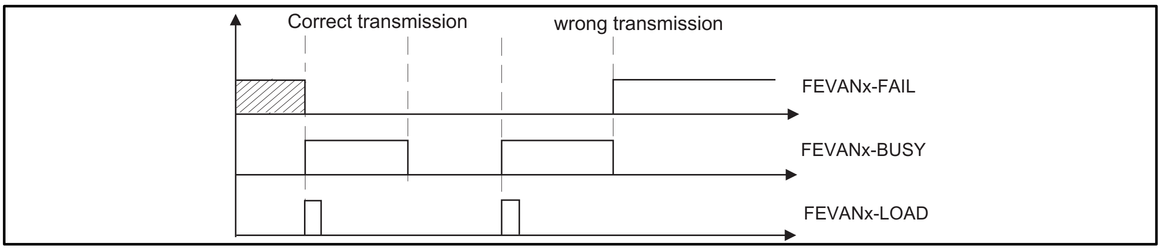


Fig. 7-97 Signal flow

Transmission errors can occur, if:

- the target code is not available
- the target subcode is not available
- the transmitted data are out of the target code limits
- the target code is inhibited since it can only be written if the controller is inhibited. (📖 7-219, C0040)

Cyclic data transmission

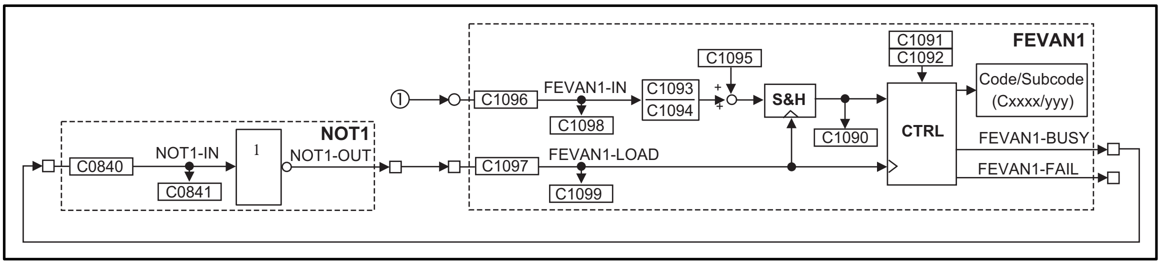


Fig. 7-98 Example for a cycle data transmission to a target code

① Input signal which is to be transmitted to the target code

7.5.32.2 Conversion

The analog input signal at FEVAN1-IN is converted into the corresponding value of the target using C1093 (numerator) and C1094 (denominator). At the same time, it is adapted to the suitable data format.

Tip!

Make sure that the input signal is processed unscaled (100% correspond to 16384) when determining the values for C1093 and C1094.

For the decimal positions of the target code, always multiply the value to be transmitted with the factor 10000.

Mandatory:

$$\text{Value of the target code} = \left[\text{Input signal } [\%] \cdot \frac{16384}{100} \cdot \frac{C1093}{C1094} + C1095\right] \cdot \frac{1}{10000}$$

Example 1

A signal of 100 % is to result in a maximum current I_{max} (C0022) of 10 A.

- The input signal of 100 % results in an input value of 16384.
- The value to be transmitted (C1090) must be 100000 (10 A · 10000).
- Enter these values in C1093 (numerator) and C1094 (denominator):

$$\frac{C1093}{C1094} = \frac{\text{Value to be transmitted}}{\text{Input value}} = \frac{100000}{16384}$$

Example 2

A signal of 10 % ... 50 % is to result in an acceleration time T_{ir} (C0012) of 1.5 s ... 7.5 s.

- The input signal of 50 % results in an input value of 8192.
- The value to be transmitted (C1090) must be 75000 (7.5 s · 10000).
- Enter these values in C1093 (numerator) and C1094 (denominator):

$$\frac{C1093}{C1094} = \frac{\text{Value to be transmitted}}{\text{Input value}} = \frac{75000}{8192}$$

7.5.33 Programming of fixed setpoints (FIXSET)

This FB is used to change an analog signal source to programmed fixed values.

You can use these fixed values e.g. for different dancer setpoint positions in a dancer position control or different stretch ratios (gearbox factor) for a speed ratio synchronizing with digital frequency coupling.

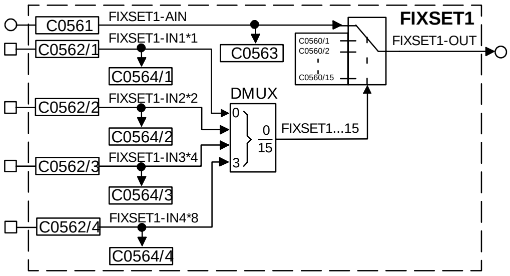


Fig. 7-99 Programming of fixed setpoints (FIXSET1)

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 parameterization and handling is the same as for the JOG setpoints in FB NSET. (🕮 7-168)

- Parameterization of the fixed setpoints
  – The individual fixed setpoints are parameterized by the subcodes of C0560.
- Output of the selected fixed setpoint:
  – If the binary inputs are triggered with a HIGH signal, a fixed setpoint from the table is switched to the output.
- Range:
  – The values for the fixed setpoint can be between -200 % and +200 %.

7.5.33.1 Enable of the FIXSET1 setpoints

Number of required fixed setpoints	Number of the inputs to be assigned
1	at least 1
1 ... 3	at least 2
4 ... 7	at least 3
8 ... 15	4

Decoding table of the binary input signals:

Output signal FIXSET1-OUT =	1st input FIXSET1-IN1	2nd input FIXSET1-IN2	3rd input FIXSET1-IN3	4th input FIXSET1-IN4
FIXSET1-AIN	0	0	0	0
C0560/1	1	0	0	0
C0560/2	0	1	0	0
C0560/3	1	1	0	0
C0560/4	0	0	1	0
C0560/5	1	0	1	0
C0560/6	0	1	1	0
C0560/7	1	1	1	0
C0560/8	0	0	0	1
C0560/9	1	0	0	1
C0560/10	0	1	0	1
C0560/11	1	1	0	1
C0560/12	0	0	1	1
C0560/13	1	0	1	1
C0560/14	0	1	1	1
C0560/15	1	1	1	1

0 = LOW
1 = HIGH

7.5.34 Flipflop (FLIP)

These FBs are D-flipflops. This function is used to evaluate and save digital signals.

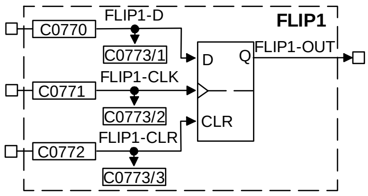


Fig. 7-100 Flipflop (FLIP1)

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	-	-	-	-	-	-

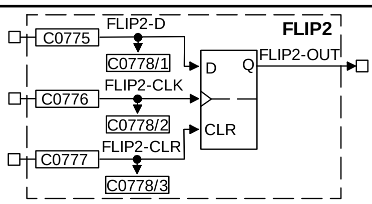


Fig. 7-101 Flipflop (FLIP2)

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

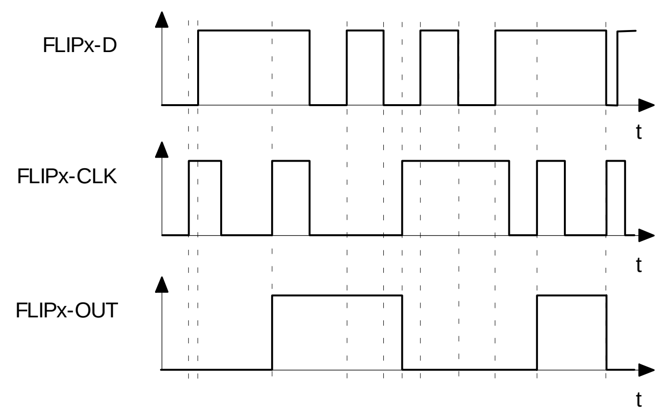


Fig. 7-102 Sequence of a flipflop

- A LOW-HIGH signal at the input FLIPx-CLK changes the signal at the input FLIPx-D to the output FLIPx-OUT and saves it until
  – another LOW-HIGH edge is applied at the input FLIPx-CLK or
  – the input FLIPx-CLR is set HIGH.
- The input FLIPx-CLR always has priority.
  – If the input FLIPx-CLR = HIGH, the output FLIPx-OUT = LOW and held as long as FLIPx-CLR = HIGH.

7.5.35 Curve follower (FOLL)

This FB is used to evaluate slowly changing process variables and use them for drive control.

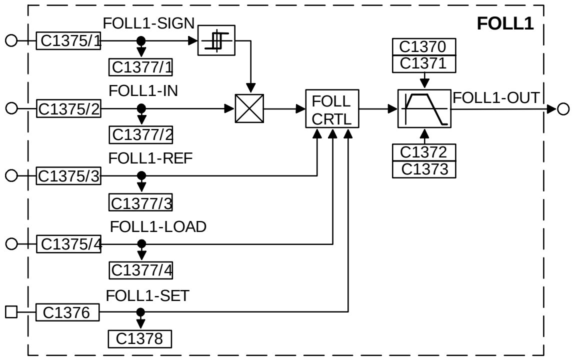


Fig. 7-103 Curve follower (FOLL1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
FOLL1-SIGN	a	C1377/1	dec [%]	C1375/1	1	1000	-
FOLL1-IN	a	C1377/2	dec [%]	C1375/2	1	1000	-
FOLL1-REF	a	C1377/3	dec [%]	C1375/3	1	1000	-
FOLL1-LOAD	a	C1377/4	dec [%]	C1375/4	1	1000	-
FOLL1-SET	d	C1378	bin	C1376	2	1000	-
FOLL1-OUT	a	-	-	-	-	-	-

Function

- Basic function
- Setting the initial value
- Saving the initial value

7.5.35.1 Basic function

- If the input signal at FOLL1-IN exceeds the reference value at FOLL1-REF, the ramp function generator starts and the output signal at FOLL1-OUT has the same direction as the input signal.
- You can change the sign of the input signal at FOLL1-IN with a negative signal at the input FOLL1-SIGN.
  - If the input signal at FOLL1-IN exceeds the reference value at FOLL1-REF, the ramp function generator starts and the output signal at FOLL1-OUT has the opposite direction as the input signal.

Setting range of the ramp generator

- C1370 defines the upper limit $FOLL_{max}$ in [%]
- C1371 defines the lower limit $FOLL_{min}$ in [%]

Acceleration and deceleration time of the ramp function generator

- C1372 defines the acceleration time $FOLL_{Tir}$ in [s]
- C1373 defines the deceleration time $FOLL_{Tif}$ in [s]

7.5.35.2 Setting the initial value

An initial value is set via the inputs

- FOLL1-SET (analog signal) or
- FOLL1-LOAD (digital signal).

7.5.35.3 Saving the initial value

- The reached output value is saved when the controller is switched off.
  - The value saved last is loaded when the controller is switched on.

7.5.36 Integrator (INT)

These FBs calculate a rotary phase from a speed signal. The rotary phase is output as a phase signal and as analog signal.

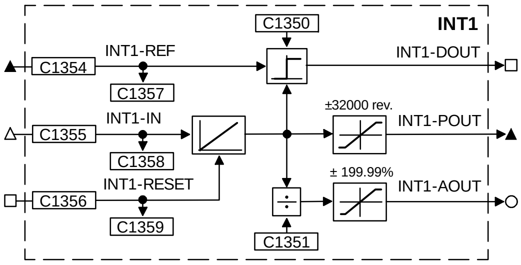


Fig. 7-104 Integrator (INT1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
INT1-REF	ph	C1357	dec [inc]	C1354	3	1000	-
INT1-IN	phd	C1358	dec [rpm]	C1355	4	1000	-
INT1-RESET	d	C1359	bin	C1356	2	1000	HIGH = sets the integrator to zero
INT1-DOUT	d	-	-	-	-	-	-
INT1-POUT	ph	-	-	-	-	-	-
INT1-AOUT	a	-	-	-	-	-	Limited to ±199.99 %

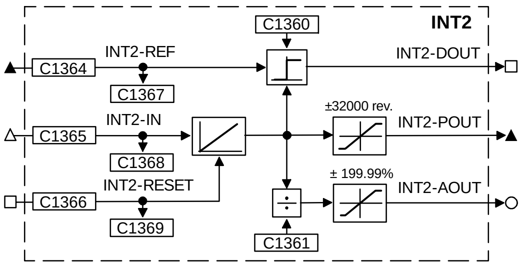


Fig. 7-105 Integrator (INT2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
INT2-REF	ph	C1367	dec [inc]	C1364	3	1000	-
INT2-IN	phd	C1368	dec [rpm]	C1365	4	1000	-
INT2-RESET	d	C1369	bin	C1366	2	1000	HIGH = sets the integrator to zero
INT2-DOUT	d	-	-	-	-	-	-
INT2-POUT	ph	-	-	-	-	-	-
INT2-AOUT	a	-	-	-	-	-	Limited to ±199.99 %

Range of functions

- Output of rotary phase as phase signal
- Comparing the rotary phase with reference value
- Output of rotary phase as analog signal
- Resetting the phase signal

7.5.36.1 Output of rotary phase as phase signal

The speed signal at INTx-IN is integrated to a rotary phase. The rotary phase is then output as a phase signal at INTx-POUT.

A rotary phase of 360 ° (one revolution) corresponds to 65536 increments (inc).

7.5.36.2 Comparing the rotary phase with reference value

You can compare the achieved rotary phase at INTx-IN to a reference value.

A rotary phase of 360 ° (one revolution) corresponds to 65536 increments (inc).

- Apply a phase signal at INTx-REF as reference value.
- If the rotary phase (integrated speed signal at INTx-IN) the reference value at INTx-REF, INTx-DOUT switches to HIGH.
- The following comparing functions are available:

Function block	Code	Value	Function
INT1	C1350	0	INT1-DOUT = HIGH, if rotary phase ≥ reference value
		1	INT1-DOUT = HIGH, if |rotary phase | ≥ reference value
INT2	C1360	0	INT2-DOUT = HIGH, if rotary phase ≥ reference value
		1	INT2-DOUT = HIGH, if |rotary phase | ≥ reference value

7.5.36.3 Output of rotary phase as analog signal

The speed signal at INTx-IN is integrated to a rotary phase. To convert the rotary phase into an analog signal, it is scaled using C1351 (INT1) or C1361 (INT2). The rotary phase is then output as an output signal at INTx-POUT.

The conversion (subsequent for INT1) is done according to the formula:

$$\text{INT1-AOUT} = \frac{\text{Rotary angle [inc]}}{\text{C1351}} \cdot 100\ \%$$

A rotary phase of 360 ° (one revolution) corresponds to 65536 increments (inc).

Example

The rotary phase for 100 revolutions is to result in an analog signal of 100%.

Solution:

- 100 revolutions correspond to a rotary phase of 100 · 65536 inc = 6553600 inc.
- Enter this value under C1351.

7.5.36.4 Resetting the phase signal

The calculated rotary phase is reset to zero with INTx-RESET = HIGH.

7.5.37 Limitation (LIM)

This FB limits the input signal to an adjustable range.

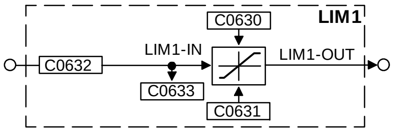


Fig. 7-106 Limitation (LIM1)

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).

7.5.38 Internal motor control with V/f characteristic control (MCTRL1)

This FB controls the motor. Since an internal motor control is always performed, an entry into the processing table is not necessary.

The controller is set to V/f characteristic control (C0006 = 5) in the Lenze default setting. This means that the controller can be immediately commissioned with analog setpoint input via X6/1, X6/2 and connected asynchronous standard motor (50 Hz/400 V).

The V/f characteristic control is suitable for single drive, multi-motor drives, synchronous motors, reluctance motors and asynchronous motors.

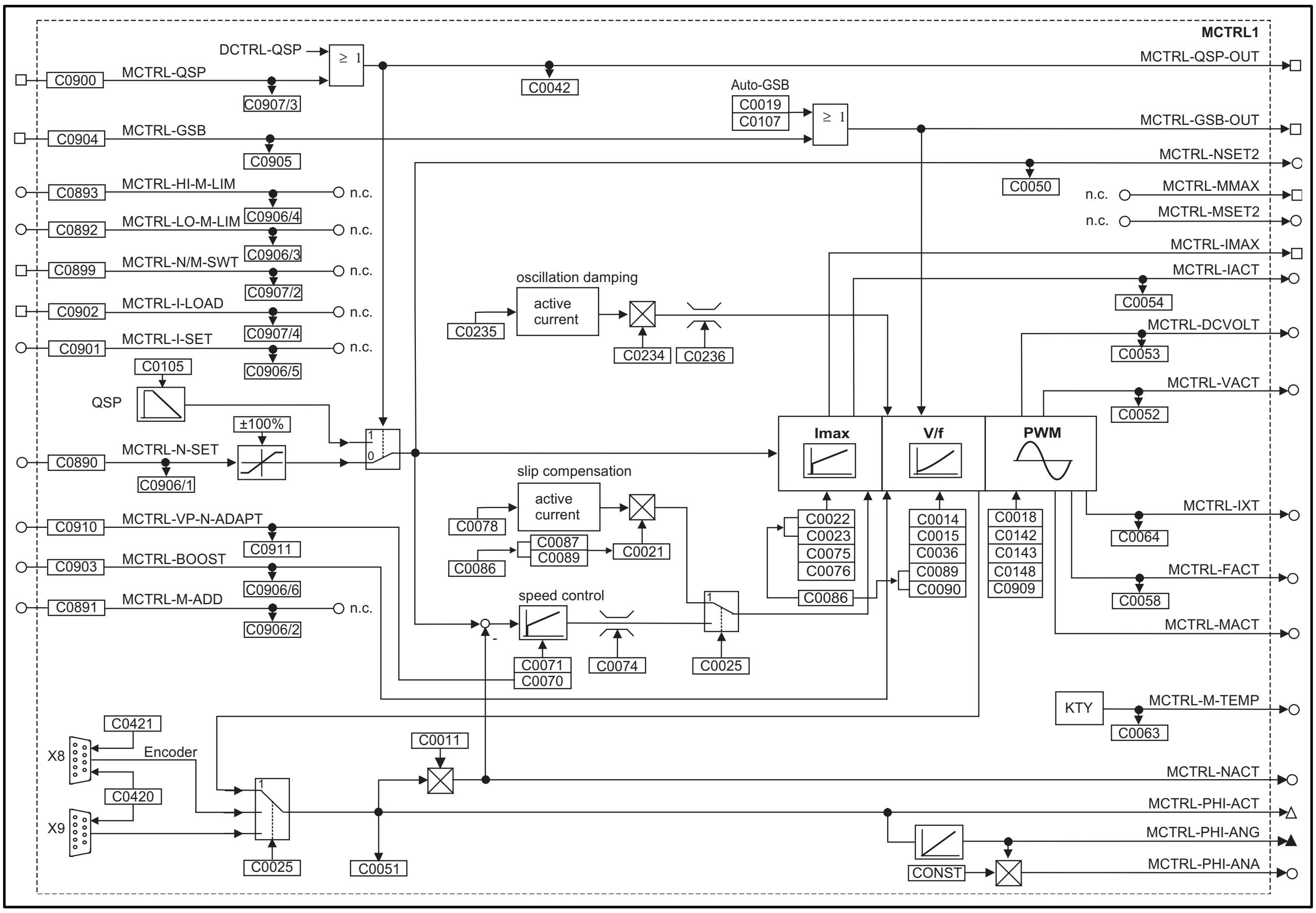


Fig. 7-107 Internal motor control with V/f characteristic control (MCTRL1)

Function block library

Internal motor control with V/f characteristic control (MCTRL1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
MCTRL-QSP	d	C0907/3	bin	C0900	2	10250	HIGH = Drive performs QSP
MCTRL-GSB	d	C0905	bin	C0904	2	1000	HIGH = Motor is braked
MCTRL-HI-M-LIM	a	C0906/4	dec [%]	C0893	1	19523	Not connected
MCTRL-LO-M-LIM	a	C0906/3	dec [%]	C0892	1	5700	Not connected
MCTRL-N/M-SWT	d	C0907/2	bin	C0899	2	1000	Not connected
MCTRL-I-LOAD	d	C0907/4	bin	C0902	2	1000	Not connected
MCTRL-I-SET	a	C0906/5	dec [%]	C0901	1	1006	Not connected
MCTRL-N-SET	a	C0906/1	dec [%]	C0890	1	5050	Input speed setpoint
MCTRL-VP-N-ADAPT	a	C0911	dec [%]	C0910	1	1006	Gain adaptation of the speed controller
MCTRL-M-ADD	a	C0906/2	dec [%]	C0891	1	1000	Not connected
MCTRL-BOOST	a	C0906/6	dec [%]	C0903	1	5015	Boost of the motor voltage
MCTRL-QSP-OUT	d	C0042	bin	-	-	-	HIGH = Drive performs QSP
MCTRL-GSB-OUT	d	-	-	-	-	-	HIGH = DC injection braking released
MCTRL-NSET2	a	C0050	dec [%]	-	-	-	In [%] of n_{max} (C0011)
MCTRL-MMAX	d	-	-	-	-	-	Not connected
MCTRL-MSET2	a	C0056	dec [%]	-	-	-	Not connected
MCTRL-IMAX	d	-	-	-	-	-	HIGH = Drive operates at its current limit C0022
MCTRL-IACT	a	C0054	dec [%]	-	-	-	100 % = C0022
MCTRL-DCVOLT	a	C0053	dec [%]	-	-	-	100 % = 1000 V
MCTRL-VACT	a	C0052	dec [%]	-	-	-	100 % = U_{NMotor} (C0090)
MCTRL-IXT	a	C0064	dec [%]	-	-	-	Controller load I x t during the last 180 s
MCTRL-FACT	a	C0058	dec [%]	-	-	-	100.00 % = 1000.0 Hz
MCTRL-MACT	a	-	-	-	-	-	In [%] of M_{max} (C0057)
MCTRL-M-TEMP	a	C0063	dec [%]	-	-	-	Motor temperature (only for motors with thermal sensor)
MCTRL-NACT	a	-	-	-	-	-	In [%] of n_{max} (C0011)
MCTRL-PHI-ACT	phd	C0051	dec [%]	-	-	-	100 % = C0011
MCTRL-PHI-ANG	ph	-	-	-	-	-	65536 inc = one revolution
MCTRL-PHI-ANA	a	-	-	-	-	-	Actual phase as analog signal: 90 ° = 100 %

Range of functions

- Speed setpoint input, setpoint limitation
- Setting the V/f characteristic
- Slip compensation
- Speed control
- Limiting the output current
- Automatic speed detection after controller enable - flying restart circuit
- Quick stop (QSP)
- DC injection braking (GSB)
- Automatic DC braking
- Oscillation damping / Load change damping
- Inhibiting a direction of rotation

7.5.38.1 Speed setpoint input, setpoint limitation

Speed setpoint input

- The signal at the input MCTRL-N-SET is the setpoint speed in [%] and always refers to the maximum speed (C0011).
- In most basic configurations, MCTRL-N-SET is connected to the function block NSET (speed setpoint conditioning).
  – You can also connect MCTRL-N-SET to any other analog output signal of a function block.

Speed setpoint limitation

- The speed setpoint at MCTRL-N-SET is always limited to ±100 % of the maximum speed n_{max} (C0011).
- The motor control converts the speed setpoint into a frequency setpoint, which is limited to a maximum frequency, in dependence on the chopping frequency f_{chop}.
  – The maximum frequency at the inverter, in dependence on the chopping frequency, is:

Chopping frequency f_{chop}	Maximum frequency
16 kHz	600 Hz
8 kHz	300 Hz
2/4 kHz	150 Hz

7.5.38.2 Setting the V/f characteristic

The motor voltage characteristic is set via the input of the motor ratings.

You can increase the motor voltage via the input MCTRL-BOOST. The input is connected to C0016 (freely assignable) in all basic configurations.

- To adapt the motor voltage boost to your application, you can also connect the input with other function blocks.

Optimizing the V/f characteristic control: (📖 5-10)

7.5.38.3 Slip compensation

A frequency correction which is proportional to the effective component of the motor current largely compensates the motor slip under load. This increases the speed accuracy considerably.

- If you select a motor under C0086 or change the rated speed under C0087, the controller calculates the rated motor slip and enters the value under C0021.
  – Parameterize C0021, if you want to optimize the speed stiffness of the motor.
  – Parameterize C0078 (filter time for the slip compensation), if you want to change the motor reaction time on load changes (dynamically ↔ slow).

Tip!

Set C0021 = 0, if you operate synchronous or reluctance motors.

7.5.38.4 Speed control

With feedback operation, a PI controller will control the slip.

Activating the speed control

The speed control is activated when you select an incremental encoder under C0025. (🕮 4-28)

Parameterizing the speed controller

- C0070: Gain V_p
- C0071: Adjustment time T_n
- C0074: Influence of the speed controller

Tip!

If the speed controller influence is adapted to the motor slip to be expected, the motor cannot accelerate in an uncontrolled way when the incremental encoder fails.

Adaptation of the speed controller

You can change the speed controller gain online via the input MCTRL-VP-N-ADAPT. The gain set under C0070 is the reference value for an input signal of 100%.

- You can influence the gain (C0070) by adapting a function block (e.g. CURVE) to MCTRL-VP-N-ADAPT.
- The adaptation is switched off in the Lenze default setting.

7.5.38.5 Limiting the output current

The limitation of the output current is mainly used for the protection of the controller and the stabilization of the control.

When the maximum permissible motor load is exceeded, you can adapt the max. output current of the controller accordingly.

Current limits

- Enter the maximum motor current under C0022.
- Enter the maximum generator current under C0023.

When you select a motor (via C0086), the maximum current of which is clearly lower than the output current of the controller, the maximum motor current (C0022) is limited automatically to 200% of the rated motor current.

Function

In V/f characteristic control, a PI controller (Vp = C0075, Tn = C0076) prevents an overshoot of the max. permissible motor current by reducing (motor overload) or increasing (generator overload) the output frequency.

The speed controller is limited when the motor current has reached the limit set under C0022 or C0023 (controller supplies max. output current). In this state

- the motor cannot follow the speed setpoint,
- switches MCTRL-IMAX = HIGH,
- the controller changes to a lower chopping frequency when automatic chopping frequency setting (C0018 = 0 or 6) was selected. This means that a disconnection is not necessary.

7.5.38.6 Automatic speed detection after controller enable - flying restart circuit

Thanks to the flying restart circuit, the controller can be enabled while the motor is running. It detects automatically the current motor speed and starts the motor control with this speed. This prevents a motor braking to zero speed with subsequent acceleration.

Activation

- C0142 = 2: Flying restart circuit active after start enable (start lock)
- C0142 = 3: Flying restart circuit active after controller enable and start (auto-start)

Parameterization

- C0145: Selection of the reference for searching
  – C0145 = 0: Maximum speed (C0011), with unknown motor speed
  – C0145 = 1: Latest current motor speed (Lenze default setting)
  – C0145 = 2: Setpoint speed with known motor speed
- C0146: Influences the current value when searching
  – Decrease the value for motors with low centrifugal mass (the speed already increases during searching).
- C0147: Influences the searching speed
  – One search operation takes approx. 1 to 2 s. For large motors, it may be necessary to reduce the searching speed (decrease value).

7.5.38.7 Quick stop (QSP)

After a signal, the motor is decelerated to standstill when an internal ramp function generator has been activated.

Function

- Quick stop is active, when
  – MCTRL-QSP = HIGH,
  – the control word DCTRL-QSP is applied.
  – DC injection braking is not active (DC injection braking has priority over quick stop).
- When quick stop is active,
  – the motor decelerates to standstill with the deceleration time set under C0105,
  – MCTRL-QSP-OUT = HIGH.

7.5.38.8 DC injection braking (GSB)

After a signal, the motor is braked by injecting a DC.

Parameterization

- C0036
  – Setting the DC using which the motor is braked.

Function

- MCTRL-GSB = HIGH
  – The motor is braked.
- MCTRL-GSB = LOW
  – The motor is not braked.
- When MCTRL-GSB-OUT = HIGH, the function DC injection braking is active.

Tip!

- DC injection braking has priority over quick stop (QSP).
- The holding time (C0107) is not affected. The motor remains in the braked state until MCTRL-GSB = LOW.

Stop!

Excessive DC (C0036) and excessive braking time can cause a thermal overload of the motor.

7.5.38.9 Automatic DC injection braking

The automatic injection braking triggers the function DC injection braking (GSB) as soon as a speed threshold has been undershot.

Parameterization

- C0036
  – Setting the DC using which the motor is braked.
- C0019
  – Setting the speed threshold when GSB is to be released.
- C0107
  – Setting the holding time for DC injection braking.

Function

- After the holding time set under C0107 has elapsed, the inverter sets automatically pulse inhibit.
- DC injection braking is active when MCTRL-GSB-OUT = HIGH.

Tip!

Automatic DC injection braking has priority over quick stop (QSP).

7.5.38.10 Oscillation damping / Load change damping

A frequency adjustment due to a change of the effective current causes

- the tendency to oscillations of the motor under no-load to be suppressed,
- a more flexible drive performance during a load change. This reduces clearly the overvoltage in the DC bus caused by a short-term generator mode.

Function

When the effective current is differentiated, an oscillation of the connected motor is detected. To avoid disturbance of the derived adding of frequency, this difference is filtered (C0235) and set und influence (C0234) and limitation (C0236) such that shock loads hardly affect the output frequency.

The oscillation damping operated optimally as from approx. 400 rpm. The motor oscillation damping under no-load conditions is well tuned with the Lenze default setting of C0234 (influence), C0235 (filter time) and C0236 (limitation).

Should permanent load changes occur (e.g. operation of a displacement compressor) it is recommended to reduce the influence of the slip compensation (C0021). In this case, it may be necessary to set the motor extremely ”soft” (C0021 = negative values).

7.5.38.11 Inhibiting a direction of rotation

If the motor is allowed to rotate in only one direction, you can set this by generating the output frequency under C0909.

- C0909 = 1
  – The motor rotates in both directions.
- C0909 = 2
  – The motor only rotates in positive direction (view to the motor shaft in CW rotation).
- C0909 = 3
  – The motor only rotates in negative direction (view to the motor shaft in CCW rotation).

7.5.39 Internal motor control with vector control (MCTRL2)

This FB controls the motor. Since an internal motor control is always performed, an entry into the processing table is not necessary.

The torque yield with vector control (C0006 = 1) is clearly higher than with V/f characteristic control, with identical motor current. The motor is monitored and controlled using an internal motor model. This means that an optimum motor performance is achieved at all times.

The vector control is suitable for single drives, multi-motor drives of the same type solid coupled, asynchronous motors.

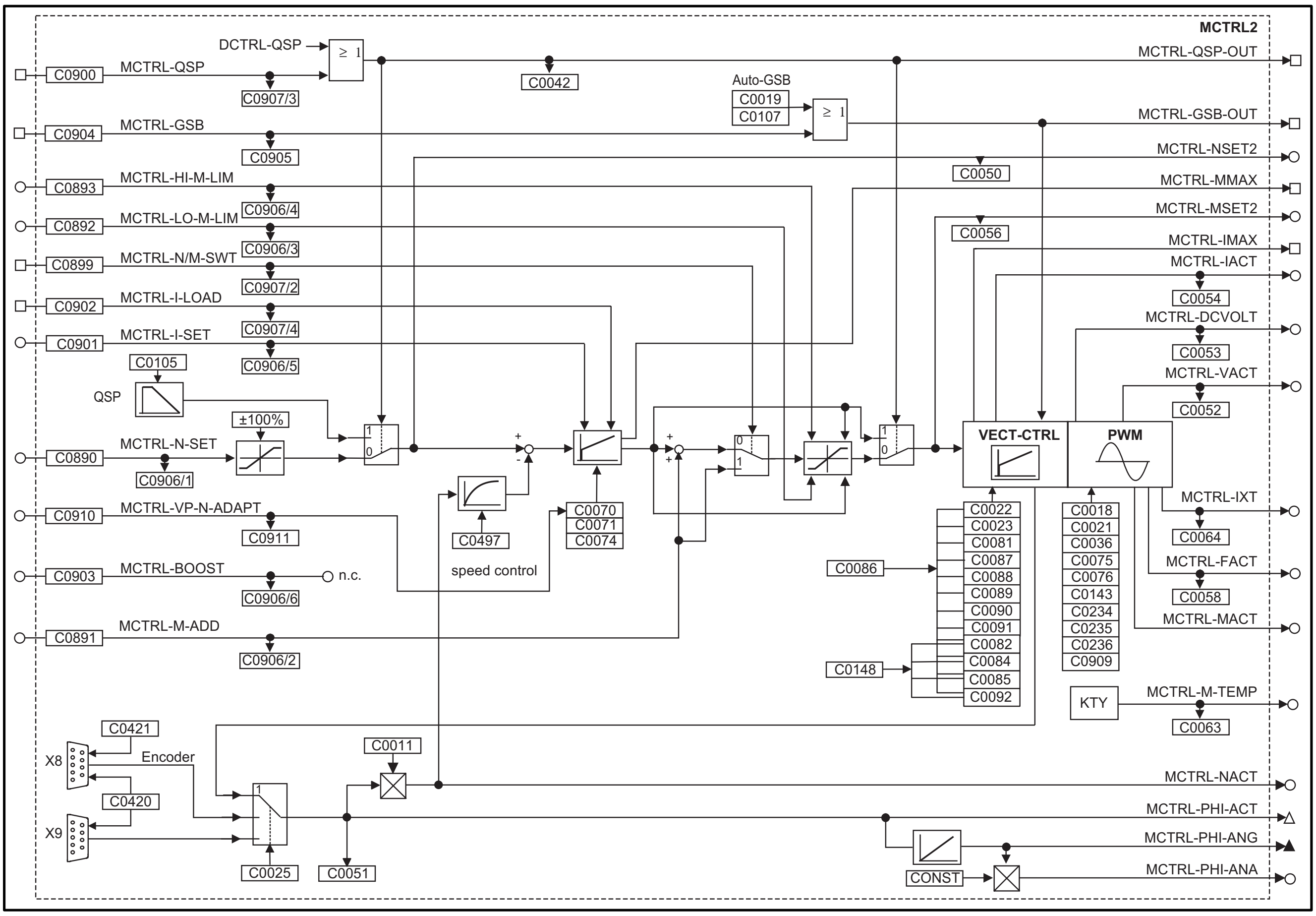


Fig. 7-108 Internal motor control with vector control (MCTRL2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
MCTRL-QSP	d	C0907/3	bin	C0900	2	10250	HIGH = Drive performs QSP
MCTRL-GSB	d	C0905	bin	C0904	2	1000	HIGH = Motor is braked
MCTRL-HI-M-LIM	a	C0906/4	dec [%]	C0893	1	19523	Upper torque limit in [%] of C0057
MCTRL-LO-M-LIM	a	C0906/3	dec [%]	C0892	1	5700	Lower torque limit in [%] of C0057
MCTRL-N/M-SWT	d	C0907/2	bin	C0899	2	1000	LOW = speed control active HIGH = torque control active
MCTRL-I-LOAD	d	C0907/4	bin	C0902	2	1000	HIGH = I component of the n-controller is accepted by MCTRL-I-SET
MCTRL-I-SET	a	C0906/5	dec [%]	C0901	1	1006	Input to set the I-component of the speed controller
MCTRL-N-SET	a	C0906/1	dec [%]	C0890	1	5050	Input speed setpoint
MCTRL-VP-N-ADAPT	a	C0911	dec [%]	C0910	1	1006	Gain adaptation of the speed controller
MCTRL-M-ADD	a	C0906/2	dec [%]	C0891	1	1000	Additional torque setpoint or torque setpoint
MCTRL-BOOST	a	C0906/6	dec [%]	C0903	1	5015	Not connected
MCTRL-QSP-OUT	d	C0042	bin	-	-	-	HIGH = Drive performs QSP
MCTRL-GSB-OUT	d	-	-	-	-	-	HIGH = DC injection braking released
MCTRL-NSET2	a	C0050	dec [%]	-	-	-	In [%] of n_{max} (C0011)
MCTRL-MMAX	d	-	-	-	-	-	HIGH = Speed controller operates within its limit
MCTRL-MSET2	a	C0056	dec [%]	-	-	-	In [%] of M_{max} (C0057)
MCTRL-IMAX	d	-	-	-	-	-	HIGH = Drive operates at its current limit C0022
MCTRL-IACT	a	C0054	dec [%]	-	-	-	100 % = C0022
MCTRL-DCVOLT	a	C0053	dec [%]	-	-	-	100 % = 1000 V
MCTRL-VACT	a	C0052	dec [%]	-	-	-	100 % = U_{NMotor} (C0090)
MCTRL-IXT	a	C0064	dec [%]	-	-	-	Controller load I x t during the last 180 s
MCTRL-FACT	a	C0058	dec [%]	-	-	-	100.00 % = 1000.0 Hz
MCTRL-MACT	a	-	-	-	-	-	In [%] of M_{max} (C0057)
MCTRL-M-TEMP	a	C0063	dec [%]	-	-	-	Motor temperature (only for motors with thermal sensor)
MCTRL-NACT	a	-	-	-	-	-	In [%] of n_{max} (C0011)
MCTRL-PHI-ACT	phd	C0051	dec [%]	-	-	-	100 % = C0011
MCTRL-PHI-ANG	ph	-	-	-	-	-	65536 inc = one revolution
MCTRL-PHI-ANA	a	-	-	-	-	-	Actual phase as analog signal: 90 ° = 100 %

Function block library

Internal motor control with vector control (MCTRL2)

Range of functions

- Speed setpoint input, setpoint limitation
- Speed control
- Torque limitation
- Limiting the output current
- Torque control with speed limitation
- Automatic speed detection after controller enable - flying restart circuit
- Quick stop (QSP)
- DC injection braking (GSB)
- Automatic DC braking
- Oscillation damping / Load change damping
- Inhibiting a direction of rotation

7.5.39.1 Speed setpoint input, setpoint limitation

Speed setpoint input

- The signal at the input MCTRL-N-SET is the setpoint speed in [%] and always refers to the maximum speed (C0011).
- In most basic configurations, MCTRL-N-SET is connected to the function block NSET (speed setpoint conditioning).
  – You can also connect MCTRL-N-SET to any other analog output signal of a function block.

Speed setpoint limitation

- The speed setpoint at MCTRL-N-SET is always limited to ±100 % of the maximum speed n_{max} (C0011).
- The motor control converts the speed setpoint into a frequency setpoint, which is limited to a maximum frequency, in dependence on the chopping frequency f_{chop}.
  – The maximum frequency at the inverter, in dependence on the chopping frequency, is:

Chopping frequency f_{chop}	Maximum frequency
16 kHz	600 Hz
8 kHz	300 Hz
2/4 kHz	150 Hz

7.5.39.2 Speed control

A PI controller compares the setpoint speed to the actual value of the motor model and generates a setpoint torque from the speed difference.

Parameterizing the speed controller

- C0070: Gain V_p
- C0071: Adjustment time T_n
- C0074: Influence of the speed controller when operating with incremental encoder. The value in [%] refers to the maximum speed.
  – Should the incremental encoder fail, an uncontrolled acceleration of the motor is avoided.

Adaptation of the speed controller

You can change the speed controller gain online via the input MCTRL-VP-N-ADAPT. The gain set under C0070 is the reference value for an input signal of 100%.

- You can influence the gain (C0070) by adapting a function block (e.g. CURVE) to MCTRL-VP-N-ADAPT.
- The adaptation is switched off in the Lenze default setting.

Slip compensation

When you activate the vector control (C0006 = 1), C0021 is set to 0 (slip compensation = 0).

- Then, you can change the value under C0021 to optimize the speed control accuracy.

Behaviour when setpoint speed = 0

With setpoint speed = 0 (MCTRL-N-SET = 0) and actual speed ≈ 0 (MCTRL-NACT ≈ 0) the speed controller is switched off. The motor only receives its magnetizing current.

Behaviour in the braking mode with very low speed

Stop!

A long braking with very low speed may result in an unstable vector control. Remedy:

- Pass the critical speed range faster.
- Use speed feedback.

Temperature detection

For motors with temperature sensing (KTY83-110), the controller can consider temperature changes in its motor model. The accuracy and stability of the vector control is thus considerably reduced.

- Connection of the sensor:
  – X8/5 = -KTY (red/white/blue)
  – X8/8 = +KTY (brown/green/black)

Tip!

You can also use the thermal sensor (KTY) without speed feedback.

- If you activate the monitoring function SD6 (C0594) the temperature feedback is activated at the same time.
- First activate the temperature feedback and then start the motor identification to take into account the motor temperature.
- You can also activate and parameterize the monitoring functions OH3 (C0583) and OH7 (C0584).
- The current motor temperature is displayed under C0063.

Set integral component

To initialize the speed controller with a starting torque, you can describe the integral component of the speed controller using MCTRL-I-SET (start value) and MCTRL-I-LOAD (control signal).

- With MCTRL-I-LOAD = HIGH
  – the speed controller adds the value at MCTRL-I-SET to its integral component,
  – the proportional component is switched off.
- With MCTRL-I-LOAD = LOW, the speed controller is active.

Operation with speed feedback

You change from vector control to operation with external speed feedback by selecting the incremental encoder under C0025. With external speed feedback it is possible to operate the motor in all four torque - speed quadrants.

Information on connection: (🕮 4-28)

7.5.39.3 Torque limitation

you can set an external torque limitation using the inputs MCTRL-LO-M-LIM and MCTRL-HI-M-LIM.

- MCTRL-HI-M-LIM defines the upper torque limit in [%] of C0057.
- MCTRL-LO-M-LIM defines the lower torque limit in [%] of C0057.
- For quick stop (QSP), the torque limitation is deactivated.
- If the motor torque achieves the limit
  – the drive can no longer follow the setpoint speed,
  – switches MCTRL-MMAX = HIGH.

Motor stall protection

To operate the motor with stall protection, the drive reduces the limit values at MCTRL-HI-M-LIM and MCTRL-LO-M-LIM as from the nominal point of the motor (field weakening range).

- Effect:
  – The maximum torque which is available in the field weakening range is reduced.
- Remedy:
  – If the torque in the field weakening range is too low, you can increase the limit at MCTRL-HI-M-LIM und MCTRL-LO-M-LIM to 200 %.
  – This means that the torque limits will be reduced as from 200% of the rated speed.

Tip!

The maximum torque set under C0057 refers to the basic speed range (zero speed up to rated motor speed) and is calculated from the nameplate ratings and the setting of the maximum motor current under C0022.

7.5.39.4 Limiting the output current

The limitation of the output current is mainly used for the protection of the controller and the stabilization of the control.

When the maximum permissible motor load is exceeded, you can adapt the max. output current of the controller accordingly.

Current limits

- Enter the maximum motor current under C0022.
- Enter the maximum generator current under C0023.

When you select a motor (via C0086), the maximum current of which is clearly lower than the output current of the controller, the maximum motor current (C0022) is limited automatically to 200% of the rated motor current.

Function

In the vector control mode, the limits are maintained by the automatic limitation of the speed controller.

The speed controller is limited when the motor current has reached the limit set under C0022 or C0023 (controller supplies max. output current). In this state

- the motor cannot follow the speed setpoint,
- switches MCTRL-IMAX = HIGH,
- the controller changes to a lower chopping frequency when automatic chopping frequency setting (C0018 = 0 or 6) was selected. This means that a disconnection is not necessary.

7.5.39.5 Torque control with speed limitation

You can change over from vector control to torque control with speed limitation.

Tip!

In the basic configurations C0005 = 4xxx, the torque control with speed limitation is already preset.

- Torque control with speed limitation is active with MCTRL-N/M-SWT = HIGH.
  - The torque control with torque input via MCTRL-M-ADD is active.
  - MCTRL-M-ADD acts as a bipolar torque setpoint.
  - The sign of the speed limitation value at MCTRL-N-SET is generated automatically from the sign of the setpoint torque at MCTRL-M-ADD. This means that the speed limitation is active in both directions of rotation.
  - The actual torque is available at the output MCTRL-MACT.

Stop!

If the motor is to generate a holding torque at standstill, the setpoint torque must not fall below a specified limit.

- The vector control may become unstable with a setpoint torque <10 % ... 20 % in dependence on the motor type and accuracy of the identified motor parameters.
- Operate the motor with speed feedback, when the required holding torque is in the critical range (📖 7-145 ff).

7.5.39.6 Automatic speed detection after controller enable - flying restart circuit

Thanks to the flying restart circuit, the controller can be enabled while the motor is running. It detects automatically the current motor speed and starts the motor control with this speed. This prevents a motor braking to zero speed with subsequent acceleration.

Activation

- C0142 = 2: Flying restart circuit active after start enable (start lock)
- C0142 = 3: Flying restart circuit active after controller enable and start (auto-start)

Parameterization

- C0145: Selection of the reference for searching
  – C0145 = 0: Maximum speed (C0011), with unknown motor speed
  – C0145 = 1: Latest current motor speed (Lenze default setting)
  – C0145 = 2: Setpoint speed with known motor speed
- C0146: Influences the current value when searching
  – Decrease the value for motors with low centrifugal mass (the speed already increases during searching).
- C0147: Influences the searching speed
  – One search operation takes approx. 1 to 2 s. For large motors, it may be necessary to reduce the searching speed (decrease value).

Tip!

With known motor speed only:

- You can do without flying restart circuit when a suitable setpoint becomes immediately active after controller enable (e.g. setpoint to NSET-CINH-VAL).
  – This reduces flying restarts to approx. 200 ms.

7.5.39.7 Quick stop (QSP)

After a signal, the motor is decelerated to standstill when an internal ramp function generator has been activated.

Function

- Quick stop is active, when
  – MCTRL-QSP = HIGH,
  – the control word DCTRL-QSP is applied.
  – DC injection braking is not active (DC injection braking has priority over quick stop).
- When quick stop is active,
  – the motor decelerates to standstill with the deceleration time set under C0105,
  – a torque control is deactivated and the motor is controlled by the speed controller.
  – the torque limitation MCTRL-LO-M-LIM and MCTRL-HI-M-LIM is deactivated,
  – MCTRL-QSP-OUT = HIGH.

Tip!

When the motor is at standstill, the field current is injected into the motor.

7.5.39.8 DC injection braking (GSB)

After a signal, the motor is braked by injecting a DC.

Parameterization

- C0036
  – Setting the DC using which the motor is braked.

Function

- MCTRL-GSB = HIGH
  – The motor is braked.
- MCTRL-GSB = LOW
  – The motor is not braked.
- When MCTRL-GSB-OUT = HIGH, the function DC injection braking is active.

Tip!

- DC injection braking has priority over quick stop (QSP).
- The holding time (C0107) is not affected. The motor remains in the braked state until MCTRL-GSB = LOW.

Stop!

Excessive DC (C0036) and excessive braking time can cause a thermal overload of the motor.

7.5.39.9 Automatic DC injection braking

The automatic injection braking triggers the function DC injection braking (GSB) as soon as a speed threshold has been undershot.

Parameterization

- C0036
  – Setting the DC using which the motor is braked.
- C0019
  – Setting the speed threshold when GSB is to be released.
- C0107
  – Setting the holding time for DC injection braking.

Function

- After the holding time set under C0107 has elapsed, the inverter sets automatically pulse inhibit.
- DC injection braking is active when MCTRL-GSB-OUT = HIGH.

Tip!

Automatic DC injection braking has priority over quick stop (QSP).

7.5.39.10 Oscillation damping / Load change damping

A frequency adjustment due to a change of the effective current causes

- the tendency to oscillations of the motor under no-load to be suppressed,
- a more flexible drive performance during a load change. This reduces clearly the overvoltage in the DC bus caused by a short-term generator mode.

Function

When the effective current is differentiated, an oscillation of the connected motor is detected. To avoid disturbances of the derived adding of frequency, this difference is filtered (C0235) and set und influence (C0234) and limitation (C0236) such that shock loads hardly affect the output frequency.

The oscillation damping operated optimally as from approx. 400 rpm. The motor oscillation damping under no-load conditions is well tuned with the Lenze default setting of C0234 (influence), C0235 (filter time) and C0236 (limitation).

7.5.39.11 Inhibiting a direction of rotation

If the motor is allowed to rotate in only one direction, you can set this by generating the output frequency under C0909.

- C0909 = 1
  – The motor rotates in both directions.
- C0909 = 2
  – The motor only rotates in positive direction (view to the motor shaft in CW rotation).
- C0909 = 3
  – The motor only rotates in negative direction (view to the motor shaft in CCW rotation).

7.5.40 Mains failure control (MFAIL)

This FB is used to stop a drive/network of drives in a controlled way. The drive/network of drives would coast without this function.

Tip!

The basic configurations speed control with mains failure control (C0005 = 15xx) and digital frequency master (C0005 = 55xx) already provide application examples which you can load directly.

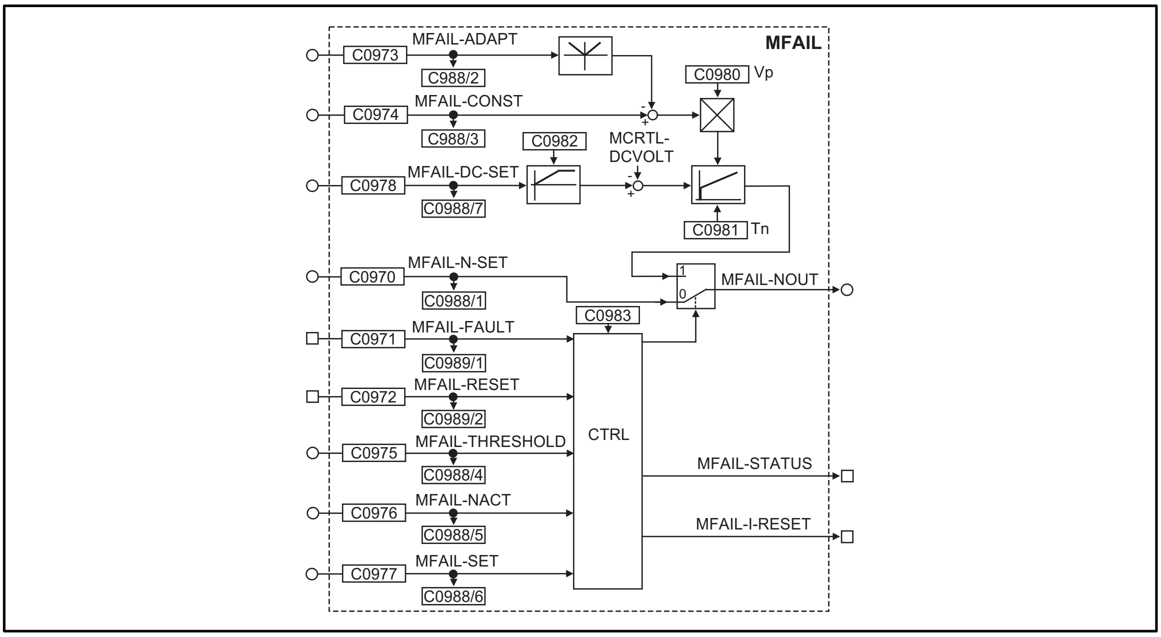


Fig. 7-109 Mains failure control (MFAIL)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
MFAIL-N-SET	a	C0988/1	dec [%]	C0970	1	1000	Speed setpoint in [%] of C0011
MFAIL-ADAPT	a	C0988/2	dec [%]	C0973	1	1000	Dynamic adaptation of the proportional gain of the UGset controller in [%] of C0980
MFAIL-KONST	a	C0988/3	dec [%]	C0974	1	1000	Proportional gain of the U_{Gset} controller in [%] of C0980
MFAIL-THRESHOLD	a	C0988/4	dec [%]	C0975	1	1000	Restart threshold in [%] of C0011
MFAIL-NACT	a	C0988/5	dec [%]	C0976	1	1000	Comparison value for the restart threshold in [%] of C0011
MFAIL-SET	a	C0988/6	dec [%]	C0977	1	1000	Speed start point for the deceleration in [%] of C0011
MFAIL-DC-SET	a	C0988/7	dec [%]	C0978	1	1000	Voltage setpoint on which the DC bus voltage is to be maintained, 100% = 1000V
MFAIL-FAULT	d	C0989/1	bin	C0971	2	1000	HIGH = activates the mains failure control
MFAIL-RESET	d	C0989/2	bin	C0972	2	1000	HIGH = reset
MFAIL-N-OUT	a	-	-	-	-	-	Speed setpoint in [%] of C0011
MFAIL-STATUS	d	-	-	-	-	-	HIGH = mains failure control active
MFAIL-I-RESET	d	-	-	-	-	-	HIGH = mains failure control active, the drive is braking

Range of functions

- Mains failure detection
- Mains failure detection
- Restart protection
- Reset of the mains failure control
- Dynamic adaptation of the control parameters
- Fast mains recovery (KU)
- Application examples

7.5.40.1 Mains failure detection

The type of the mains failure detection to be used depends on the drive system used.

A failure of the voltage supply of the power stage is detected:

- by the level of the DC bus voltage or
- from an external system (e.g. supply module 934X or voltage measuring relay).
- Different systems can be combined.

Mains failure detected by the level of the DC bus voltage

Use with single drives or multi-axis drives, which do not use external monitoring systems.

- For this, you can use a comparator (e.g. CMP2). Set the signal links:
  – C0688/1 = 5005 (MCTRL-DCVOLT to CMP2-IN1)
  – C0688/2 = 19540 (free code C0472/20 to CMP2-IN2)
  – C0971 = 10655 (CMP2-OUT to MFAIL-FAULT)
  – Set function of the comparator CMP2 with C0685 = 3

Enter the function blocks CMP2 and MFAIL in free positions of the processing table in C0465.

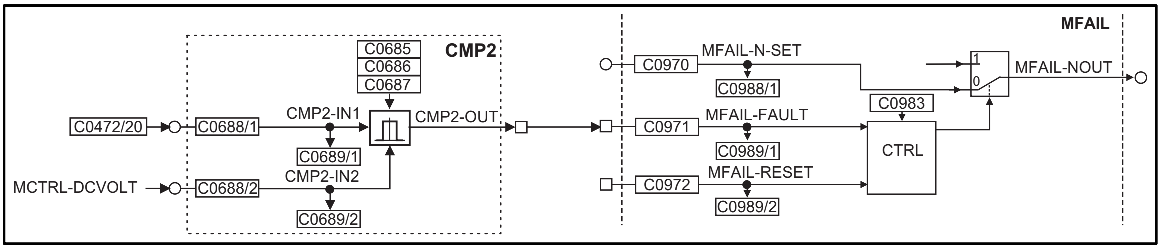


Fig. 7-110 Example of a mains failure detection with internal function blocks (section)

Main failure detection of the supply module

- A digital output of the supply module 934x is switched to the function block MFAIL via the digital inputs DIGIN of the 93XX controller. In the example, input X5/E4 is used. Set the signal links:
  - – C0971 = 54 (DIGIN4 to MFAIL-FAULT)
  - – C0871 = 1000 (remove DCTRL-TRIP-SET from terminal X5/E4)
  - – Select level (HIGH or LOW active) with C0114/4

Enter the FB MFAIL in a free position of the processing table in C0465.

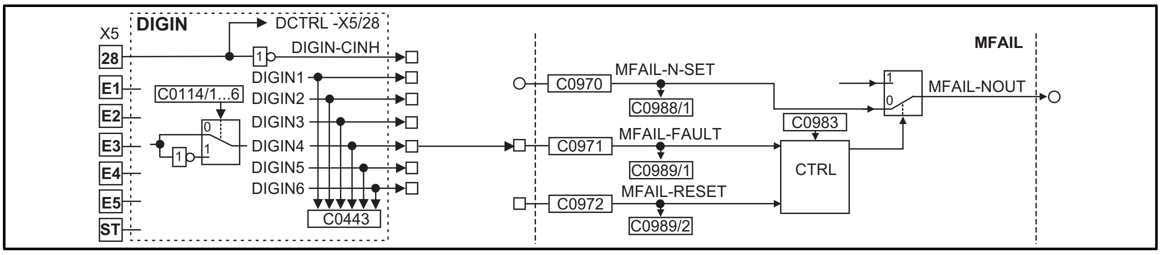


Fig. 7-111 Example of a mains failure detection by an external monitoring system

Combination of these methods

- These methods are combined via an OR link with an internal function block. OR5 is used in the example. Set the signal links:
  - – C0688/1 = 5005 (MCTRL-DCVOLT to CMP2-IN1)
  - – C0688/2 = 19540 (free code C0472/20 to CMP2-IN2)
  - – Set function of the comparator CMP2 with C0685 = 3
  - – C0838/1 = 10655 (CMP2-OUT to OR5-IN1)
  - – C0838/2 = 54 (DIGIN5 to OR5-IN2)
  - – C0971 = 10570 (OR5-OUT to MFAIL-FAULT)

Enter the function blocks CMP2, OR5 and MFAIL in free positions of the processing table in C0465.

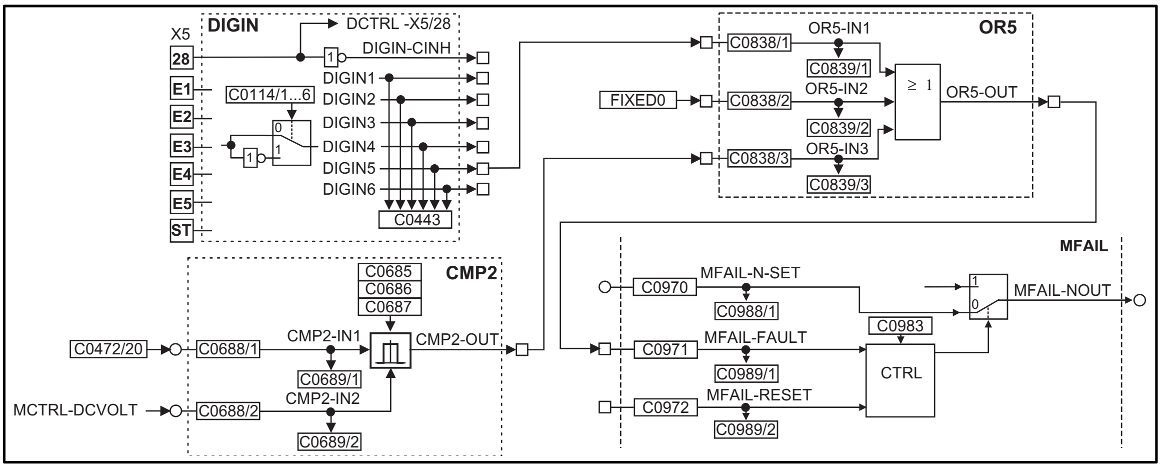


Fig. 7-112 Example of a mains failure detected by different sources

7.5.40.2 Mains failure control

Integration of the FB into the signal flow of the controller

As an example, the function block is integrated into the basic configuration C0005 = 1000 (speed control):

1. Generate speed setpoint channel:
   – C0970 = 5050 (NSET-NOUT to MFAIL-N-SET)
   – C0890 = 6100 (MFAIL-NOUT to MCTRL-N-SET)
2. Determine start value for the sequence (here actual speed):
   – C0977 = 6100 (MFAIL-NOUT to MFAIL-SET)
3. Determine source for the setpoint of the DC bus voltage (here by a freely connectable code FCODE C0472/19):
   – C0978 = 19539 (C0472/19 to MFAIL-DC-SET)
4. Determine source for the activation of the mains failure control. (📖 7-153) :
5. Generate proportional gain and adaptation of the DC bus voltage controller:
   – C0974 = 1006 (FIXED100% to MFAIL-CONST)
   – C0973 = 1000 (FIXED0% to MFAIL-ADAPT)
6. Achieve restart protection
   – C0976 = 6100 (MFAIL-NOUT to MCTRL-NACT)
   – C0975 = 19538 (C0472/18 to MFAIL-THRESHLD)
   – First enter approx. 2 % under C0472/18 (reference: N_{max} C0011)
7. Connect reset input (here with terminal X5/E5 TRIP-RESET):
   – C0972 = 55 (DIGIN5 to MFAIL-RESET)
8. Enter all function blocks used (except for codes and digital inputs DIGIN) in free positions of the processing table in C0465.

Tip!

Save all settings non-volatile in a parameter set under C003.

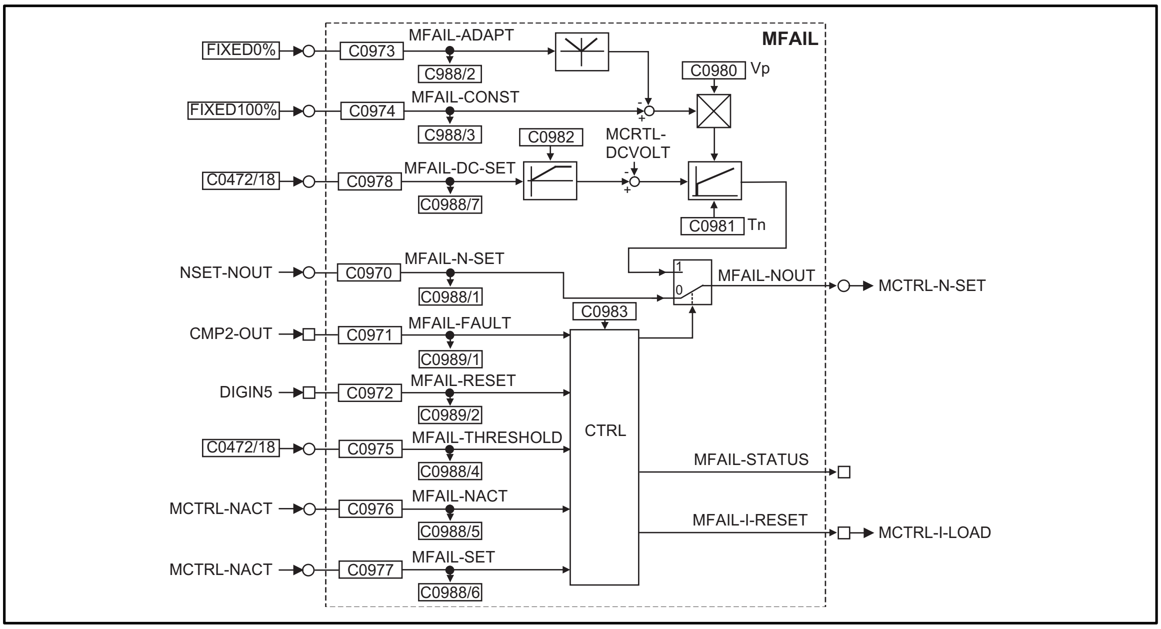


Fig. 7-113 Link for the basic configuration C0005 = 1000

Activation

- MFAIL-FAULT = HIGH activates the mains failure control.
- MFAIL-FAULT = LOW triggers a timing element. After the time set under C0983 has elapsed, the mains failure control is completed/canceled. (📖 7-161, mains recovery)
  – The drive is accelerated to the speed setpoint if the restart protection is not active.
  – The drive is still braked to zero speed when the restart protection is active. (📖 7-160, restart protection)
  – If the restart protection is active, the drive can only be reset with MFAIL-RESET = HIGH.

Function

The controller gains the required energy from the rotational energy of the driven machine. The driven machine is braked via the power loss of the controller and the motor. The speed deceleration ramp is shorter than for an uncontrolled system (coasting drive).

With the activation,

- the DC bus voltage is controlled to the value at the MFAIL-DC-SET input.
- an internally generated speed setpoint is output at the MFAIL-N-OUT output. The drive can thus be braked to zero speed (via the speed setpoint).
  – The value at input MFAIL-SET is the start value for the controlled deceleration. This input is generally connected to the output MCTRL-NACT (actual speed) or MCTRL-NSET2, MFAIL-NOUT (speed setpoint).
  – The speed deceleration ramp (and thus the brake torque) results from the moment of inertia of the driven machine(s), the power loss, and the parameterization.

Stop!

- If a connected brake unit is activated, the drive is braked with the maximum possible torque (I_{max}). In this case, it may be necessary to adapt the parameterization (see description of the parameterization).
- If the power stage is not supplied, the drive cannot generate a standstill torque (important for active loads such as hoists).

Parameterization

The parameters to be set, depend strongly on the motor used, the inertia of the driven machine and the drive configuration (single drive, drive network, master - slave operation, etc.). This function must therefore be adapted to the individual application in every case.

The following specifications refer to the description of the mains failure detection. (📖 7-153)

Important settings prior to the initial set-up:

1. Save the previous setting in a parameter set (e.g. parameter set 4)

STOP

Stop!

For internal voltage supply of the terminals (C0005 = xx1x) terminal X6/63 is used as a voltage source for external potentiometers. In this case, measure across terminals +UG, -UG.

2. Measure the DC bus voltage with an oscilloscope (channel 1):
   – With a suitable voltage divider across terminals +UG, -UG or
   – provide the DC bus voltage e.g. at terminal X6/62. For this, set C0436 = 5005 (MCTRL-DCVOLT). 1 V at terminal X6/62 = 100 V at +UG, -UG.
3. Measure the speed with an oscilloscope (channel 2):
   – Provide the speed e.g. at terminal X6/62 (default setting). For this, set C0431 = 5001 (MCTRL-NACT). 10 V at terminal X6/62 correspond to N_{max} (C0011).
4. Provide the threshold for the mains failure detection in C0472/20. The provision depends on the setting in C0173.
   – Set the threshold approx. 50 V above the threshold LU (example for C0173 = 0,1; C0472/20 = 48 % corresponds to 480 V).

Mains voltage range	C0173 =	Switch-off threshold LU	Switch-on threshold LU	Switch-off threshold OU	Switch-on threshold OU
< 400 V	0	285 V	430 V	770 V	755 V
400 V	1	285 V	430 V	770 V	755 V
400 V ... 460 V	2	328 V	473 V	770 V	755 V
480 V without brake chopper	3	342 V	487 V	770 V	755 V
Operation with brake chopper (up to 480 V)	4	342 V	487 V	800 V	785 V

STOP

Stop!

This setpoint must be below the threshold of any brake unit which may be connected.If a connected brake unit is activated, the drive is braked with the maximum possible torque (I_{max}). The desired operating behaviour is lost.

5. Set the setpoint on which the DC bus voltage is to be controlled:
   – Set the setpoint to approx. 700 V (C0472/18 = 70 %).

Commissioning

The commissioning should be carried out with motors without load.

1. The drive is started with a LOW-HIGH signal at X5/E5.
2. Set the acceleration time Tir:
   – Set the setpoint speed to 100 %, operate the controller with maximum speed.
   – Inhibit controller via terminal X5/28 (you can also use any other controller inhibit source, CINH) and measure deceleration time until standstill.
   – Set approx. 1/10 of the deceleration time in C0982.
3. Setting the retrigger time

- In case of mains failure detection by detecting the DC bus voltage level:
  – Set the deceleration time measured in item 2.
- In case of mains failure detection via an external system (e.g. supply module 934X):
  – Under C0983, set the time in which the drive is to be continued to be braked in a controlled way for short-term mains recovery.

4. Switch off supply voltage (mains or DC bus).
   – The oscilloscope should display the following characteristic:

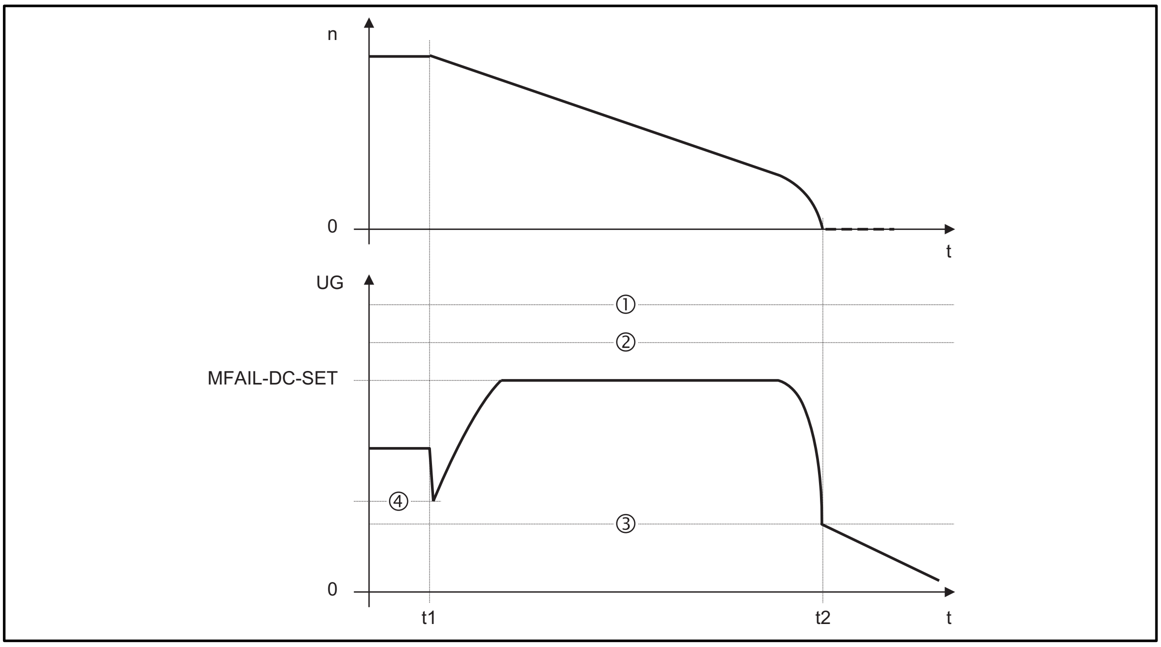


Fig. 7-114 Schematic representation with activated mains failure control (ideal characteristic)

① Switch-off threshold OU
② Switch-on threshold brake unit
③ Switch-off threshold LU
④ Threshold CMP2-OUT
t1 Mains failure
t2 Zero speed reached

Fine tuning

Repeat the following items several times.

1. Try to obtain a very low final speed before the controller reaches the undervoltage threshold LU:
   – Increase the proportional gain V_p (C0980).
   – Reduce the adjustment time T_n (C0981).
2. Try to avoid activation of the brake unit or the overvoltage threshold OU:
   – Increase the adjustment time T_n (C0981) until the characteristic in Fig. 7-114 is almost reached.
   – Reduce additionally the setpoint of the DC bus voltage at the input MFAIL-DC-SET (in the example C0472/19), if necessary.
3. An increase of the deceleration time or reduction of the brake torque (see Fig. 7-115) is only possible with restrictions:
   – An increase of the acceleration time T_{ir} (C0982) reduces the initial brake torque and increases the deceleration time.
   – An increase of the adjustment time T_n (C0981) reduces the brake torque and increases the deceleration time. If the adjustment times under C0981 are too long, the controller reaches the LU threshold before zero speed is reached. The drive is therefore no longer controlled.
4. Re-establish signal connections which may be used, to the outputs of the controller (terminals X6).

Tip!

Save all settings non-volatile in a parameter set under C003.

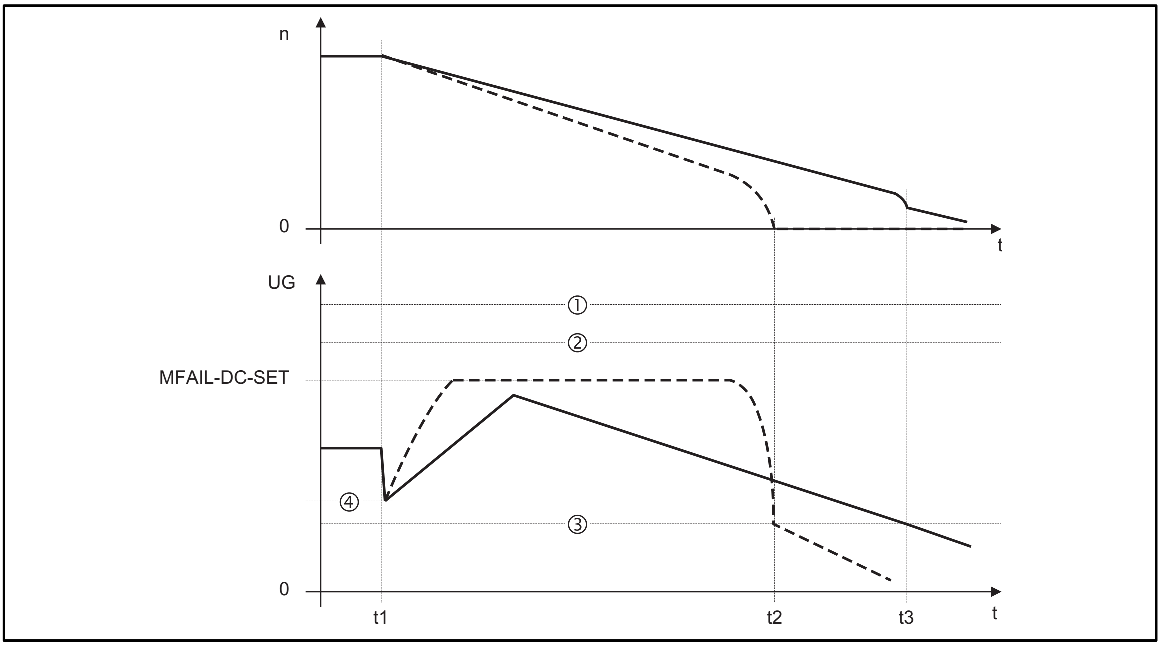


Fig. 7-115 Schematic with different brake torques

①	Switch-off threshold OU
②	Switch-on threshold brake unit
③	Switch-off threshold LU
④	Threshold CMP2-OUT
t = t1	Mains failure
t = t2	Zero speed with higher brake torque (short adjustment time)
t = t3	Drive decelerates with lower brake torque (higher adjustment time) to the LU switch-off threshold without reaching zero speed.
t > t3	Drive is no longer controlled (is braked by friction)

7.5.40.3 Restart protection

The integrated restart protection is to avoid a restart in the lower speed range, after the supply voltage was interrupted for a short time only (mains recovery before the drive has come to standstill).

- Set the restart protection. (📖 7-155, item 6.)
- Under C0472/18, enter the threshold in [%] of N_{max} (C0011) below which no automatic start is wished after mains recovery.
  – Speed after mains recovery < threshold in C0472/18: Drive is still braked in a controlled way. This function can only be completed by MFAIL-RESET = HIGH.
  – Speed after mains recovery > threshold in C0472/18 Drive accelerates to its setpoint along the set ramps.
- The function is deactivated by:
  – C0472/18 = 0 % or
  – C0975 = 1000 (FIXED0% to MFAIL-THRESHLD)
- Reset with MFAIL-RESET = HIGH:
  – Reset is required after every mains connection
  – Reset is displayed by MFAIL-STATUS = HIGH, if MFAIL-FAULT = LOW.

7.5.40.4 Reset of the mains failure control

- The mains failure control is reset with MFAIL-RESET = HIGH (in the example with terminal X5/E5).
- The reset pulse is always required if:
  – the restart protection is active.
  – the restart protection is used and the supply (mains or DC supply) was switched on.

7.5.40.5 Dynamic adaptation of the control parameters

In special cases, a dynamic modification of the proportional gain may be useful. For this, two inputs (MFAIL-CONST and MFAIL-ADAPT) are available at the function block MFAIL. The resulting proportional gain results from:

$$V_p = C0980 \cdot \frac{\text{MFAIL-CONST} - |\text{MFAIL-ADAPT}|}{100\ \%}$$

7.5.40.6 Fast mains recovery (KU)

The fast mains recovery causes a restart of the controller unless the restart protection is active. The drive accelerates to its setpoint. If this is not wanted, the restart can be delayed via the retrigger time C0983, or avoided together with the restart protection.

A fast mains recovery occurs:

- due to the system, the mains recovery is indicated by the mains failure detection via the level of the DC bus voltage (🕮 7-153)
- because of a "short interrupt" (KU) of the utility company (e.g. in case of thunderstorms).
- because of faulty components in the supply cables (e.g. slip rings)

Set the retrigger time C0983 higher than the measured deceleration time during braking.

7.5.40.7 Application example

Drive network with digital frequency coupling

STOP

Stop!

In drive networks which are connected via pulse trains (a master and one or more slaves):

- The mains failure detection must only be activated for the master.
  – Integrate the mains failure control into the signal flow accordingly.
- All controllers must be operated in the DC bus connection via the terminals +UG, -UG. Observe the specifications in the Chapter Dimensioning.

7.5.41 Motor potentiometer (MPOT)

This FB is used as an alternative setpoint source which is triggered by two inputs.

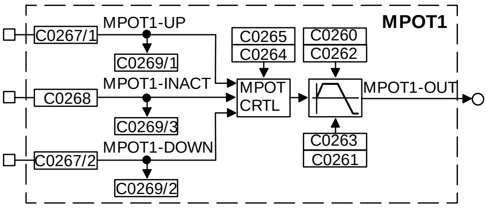


Fig. 7-116 Motor potentiometer (MPOT1)

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	-	-	-	-		-

Range of functions

- Control of the motor potentiometer
- Deactivation of the motor potentiometer
- Initialization of the motor potentiometer

7.5.41.1 Control of the motor potentiometer

- MPOT1-UP = HIGH
  – The motor potentiometer approaches its upper limit.
- MPOT1-DOWN = HIGH
  – The motor potentiometer approaches its lower limit.
- MPOT1-UP = LOW and MPOT1-DOWN = LOW or
  MPOT1-UP = HIGH and MPOT1-DOWN = HIGH:
  – The motor potentiometer does not change its output signal.

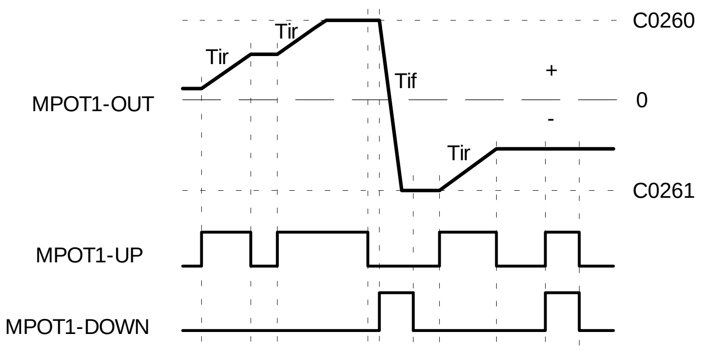


Fig. 7-117 Control signals of the motor potentiometer

7.5.41.2 Deactivation of the motor potentiometer

You can deactivate the function of the motor potentiometer using the input MPOT1-INACT.

- The motor potentiometer function is deactivated with MPOT1-INACT = HIGH.
- The input MPOT1-INACT has priority over the inputs MPOT1-UP and MPOT1-DOWN.
- When the function is deactivated, the output signal at MPOT1-OUT follows the function set under C0264. You can set the following functions under C0264:

C0264	Meaning
0	No further action; the output MPOT1-OUT keeps its value
1	The motor potentiometer returns to 0 % with the corresponding Ti time
2	The motor potentiometer approaches its lower limit (C0261) with the corresponding deceleration time
3	The motor potentiometer immediately changes its output to 0% **(important for emergency stop function)**
4	The motor potentiometer immediately changes its output to the lower limit (C02619
5	The motor potentiometer approaches its upper limit (C0260) with the corresponding Ti time

If the deactivation of the motor potentiometer is cancelled with MPOT1-INACT = LOW, the subsequent function depends on

- the momentary output signal,
- the set limits (C0261: lower limit, C0260: upper limit),
- the control signals MPOT1-UP and MPOT1-DOWN.

If the output value is out of the limits, the output signal approaches the next limit with the suitable T_i time (C0262: acceleration time T_{ir}, C0263: deceleration time T_{if}). This function is independent of the control inputs MPOT1-UP and MPOT1-DOWN

If the output value is within the limits, the output signal follows the selected control function MPOT1-UP, MPOT1-DOWN or no action.

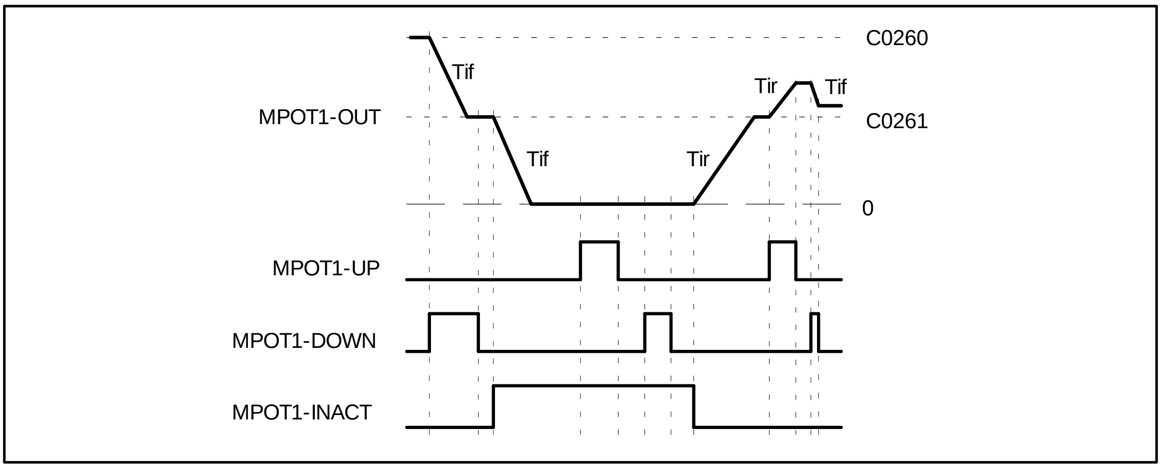


Fig. 7-118 Deactivation of the motor pot via the input MPOT1-INACT

7.5.41.3 Initialization of the motor potentiometer

Under C0265, you can activate different initialization functions for the mains switch-on.

- C0265 = 0
  – The current output value is saved before mains disconnection or mains failure. The motor potentiometer starts with this value after mains connection.
- C0265 = 1
  – The motor potentiometer starts with the lower limit (C0261) after mains connection.
- C0265 = 2
  – The motor potentiometer starts with 0% after mains connection.

If the initialization is completed, the motor potentiometer follows the applied control function.

7.5.42 Blocking frequencies (NLIM)

This FB blocks signals in max. three speed ranges which can be defined. The output signal skips the defined ranges. If you use the output signal as setpoint speed, the motor only passes the blocked ranges.

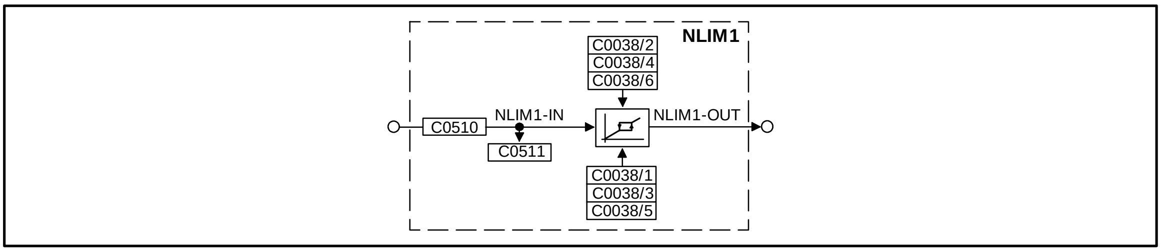


Fig. 7-119 Blocking frequencies (NLIM1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NLIM1-IN	a	C0511	dec [%]	C0510	1	1000	-
NLIM1-OUT	a	-	-	-	-	-	-

Function

A blocked speed range is activated by entering a lower and an upper speed limit.

The output signal remains at the lower limit of the block range until the input signal has over- or undershot the blocked speed range.

Code	Choice	Function	
C0038/1	0 {1 rpm} 36000 0 = Function not active	Blocked speed range 1	defines the lower limit
C0038/2			defines the upper limit
C0038/3		Blocked speed range 2	defines the lower limit
C0038/4			defines the upper limit
C0038/5		Blocked speed range 3	defines the lower limit
C0038/6			defines the upper limit

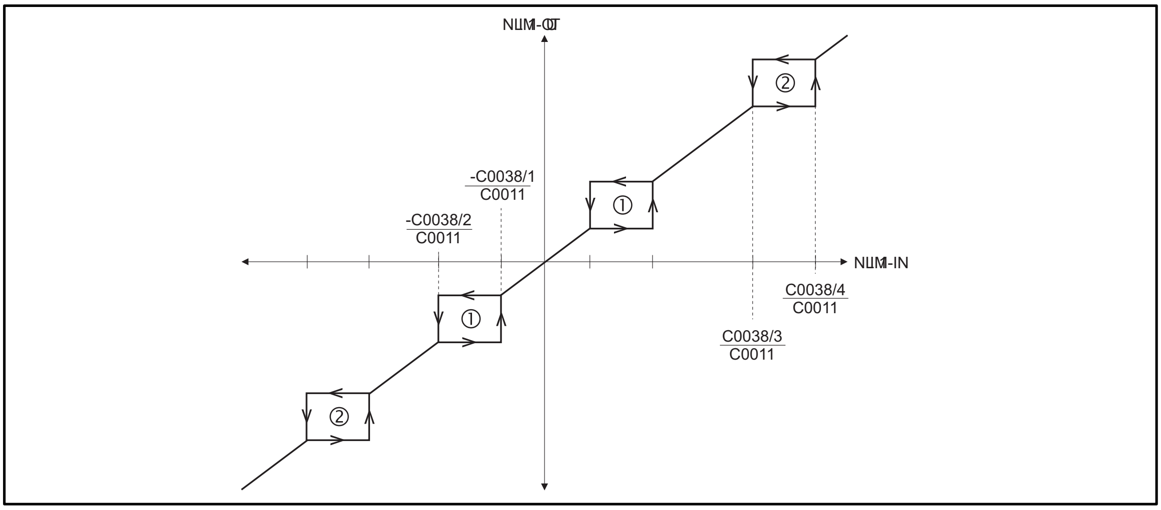


Fig. 7-120 Representation of the upper and lower limits of the blocked speed ranges

① Blocked speed range 1
② Blocked speed range 2

7.5.43 Logic NOT

These FB enable a long inversion of digital signals. You can use the FBs for the control of functions or the generation of status information.

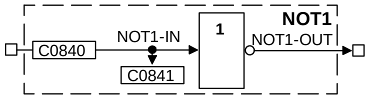


Fig. 7-121 Logic NOT

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NOT1-IN	d	C0841	bin	C0840	2	1000	-
NOT1-OUT	d	-	-	-	-	-	-

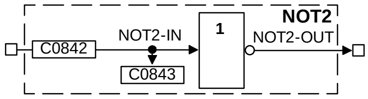


Fig. 7-122 Logic NOT (NOT2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NOT2-IN	d	C0843	bin	C0842	2	1000	-
NOT2-OUT	d	-	-	-	-	-	-

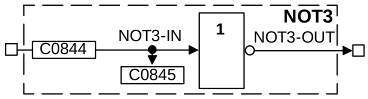


Fig. 7-123 Logic NOT (NOT3)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NOT3-IN	d	C0845	bin	C0844	2	1000	-
NOT3-OUT	d	-	-	-	-	-	-

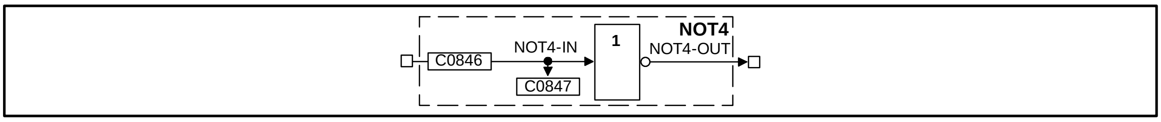


Fig. 7-124 Logic NOT (NOT4)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NOT4-IN	d	C0847	bin	C0846	2	1000	-
NOT4-OUT	d	-	-	-	-	-	-

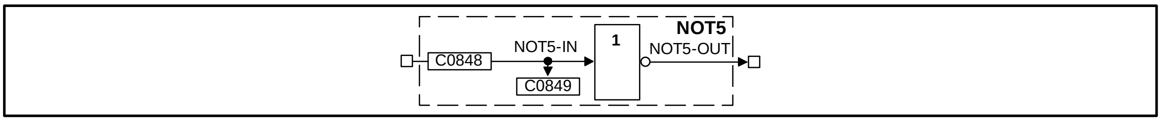


Fig. 7-125 Logic NOT (NOT5)

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

0 = LOW
1 = HIGH

In a contactor control, the function corresponds to a change from a normally-open to a normally-closed contact.

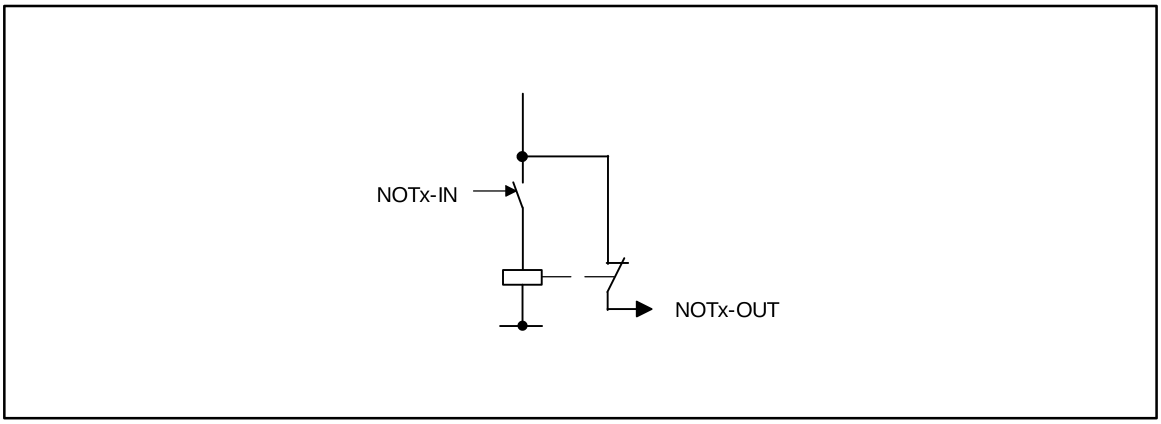


Fig. 7-126 Function of NOT as a change from a normally-open to a normally-closed contact

7.5.44 Speed preprocessing (NSET)

This FB includes a number of functions to generate a setpoint speed. Analog as well as digital input signals are processed.

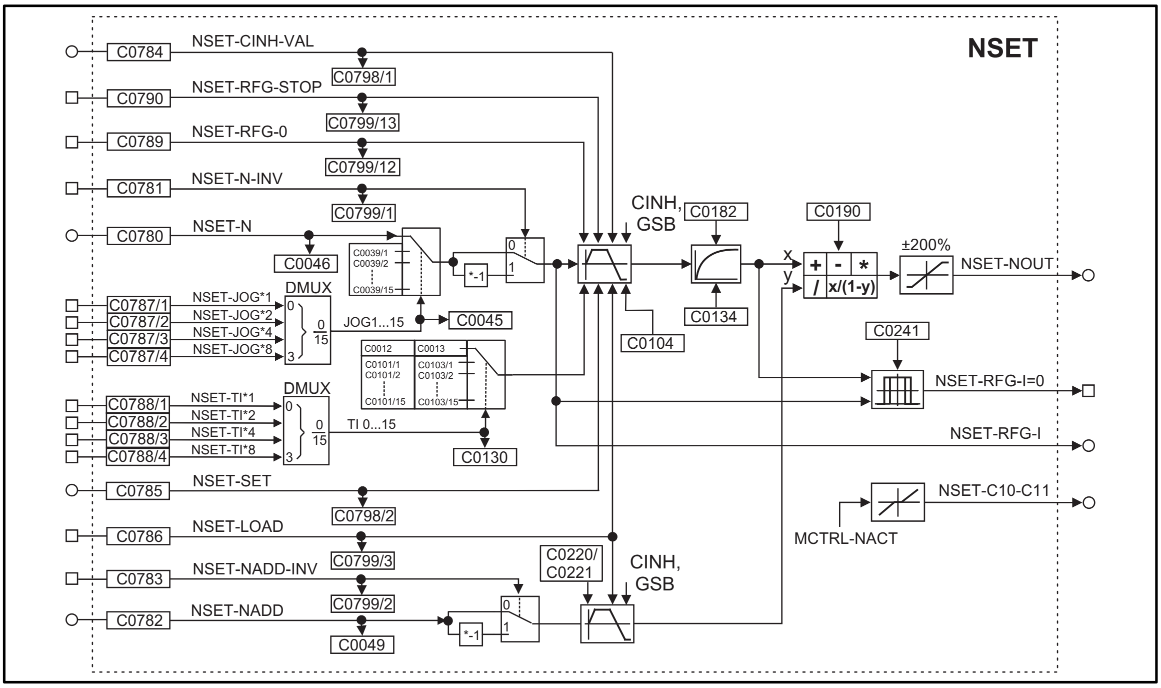


Fig. 7-127 Preprocessing of setpoint speed (NSET)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
NSET-N	a	C0046	dec [%]	C0780	1	50	Provided for main setpoint; other signals are permissible
NSET-NADD	a	C0047	dec [%]	C0782	1	5650	Provided for additional setpoint; other signals are permissible
NSET-JOG*1	d	C0799/4	bin	C0787/1	2	53	Selection and control of overriding "fixed setpoints" for the main setpoint
NSET-JOG*2	d	C0799/5	bin	C0787/2	2	1000	
NSET-JOG*4	d	C0799/6	bin	C0787/3	2	1000	
NSET-JOG*8	d	C0799/7	bin	C0787/4	2	1000	
NSET-TI*1	d	C0799/8	bin	C0788/1	2	1000	Selection and control of alternative "fixed setpoints" for the main setpoint
NSET-TI*2	d	C0799/9	bin	C0788/2	2	1000	
NSET-TI*4	d	C0799/10	bin	C0788/3	2	1000	
NSET-TI*8	d	C0799/11	bin	C0788/4	2	1000	
NSET-N-INV	d	C0799/1	bin	C0781	2	10251	Control of the signal inversion for the main setpoint
NSET-NADD-INV	d	C0799/2	bin	C0783	2	1000	Control of the signal inversion for the additional setpoint
NSET-RFG-0	d	C0799/12	bin	C0789	2	1000	The main setpoint integrator is led to zero via the momentary T_i times
NSET-RFG-STOP	d	C0799/13	bin	C0790	2	1000	Holding (freezing) of the main setpoint integrator to its momentary value
NSET-CINH-VAL	a	C0798/1	dec [%]	C0784	1	5001	The signal is generated which the main setpoint integrator is to be accepted when the controller is inhibited
NSET-SET	a	C0798/2	dec [%]	C0785	1	5000	The signal is generated which the main setpoint integrator is to be accepted when the NSET-LOAD input is set
NSET-LOAD	d	C0799/3	bin	C0786	2	5001	Control of the two ramp generators in special situations e.g. QSP
NSET-OUT	a	-	-	-	-	-	Limitation to ±200 %
NSET-RFG-I=0	d	-	-	-	-	-	-
NSET-RFG-I	a	-	-	-	-	-	-
NSET-C10-C11	a	-	-	-	-	-	-

Range of functions

- Main setpoint channel
- JOG setpoints
- Setpoint inversion
- Ramp generator for the main setpoint
- Acceleration functions
- S ramp
- Arithmetic operation
- Additional setpoint

7.5.44.1 Main setpoint channel

- 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 switches the input to inactive. The following signal conditioning uses the JOG value instead.
- The signals in the main setpoint channel are limited to the range of ±200 %.

7.5.44.2 JOG setpoints

You can parameterize the JOG setpoints under C0039/1 to C0039/15.

- JOG values are fixed values which are defined under C0039/1 ... C0039/15.
- You can activate JOG values via the inputs NSET-JOG*x.
- The four inputs NSET-JOG*x are binary coded so that 15 JOG values can be called.
- The decoding for the enabling of the JOG values is carried out according to the following table:

Output signal	1st input NSET-JOG*1	2nd input NSET-JOG*2	3rd input NSET-JOG*4	4th input NSET-JOG*8
NSET-N	0	0	0	0
JOG 1	1	0	0	0
JOG 2	0	1	0	0
JOG 3	1	1	0	0
JOG 4	0	0	1	0
JOG 5	1	0	1	0
JOG 6	0	1	1	0
JOG 7	1	1	1	0
JOG 8	0	0	0	1
JOG 9	1	0	0	1
JOG 10	0	1	0	1
JOG 11	1	1	0	1
JOG 12	0	0	1	1
JOG 13	1	0	1	1
JOG 14	0	1	1	1
JOG 15	1	1	1	1

0 = LOW

1 = HIGH

- If all inputs are assigned with 0, the input NSET-N is active.
- The number of inputs which you must assign, depends on the number of the required JOG setpoints. A maximum of four inputs and thus 15 possibilities can be selected. The digital signal source is assigned under C0787 and the corresponding subcode.

Number of the required JOG setpoints	Number of the inputs to be assigned
1	at least 1
1 ... 3	at least 2
4 ... 7	at least 3
8 ... 15	4

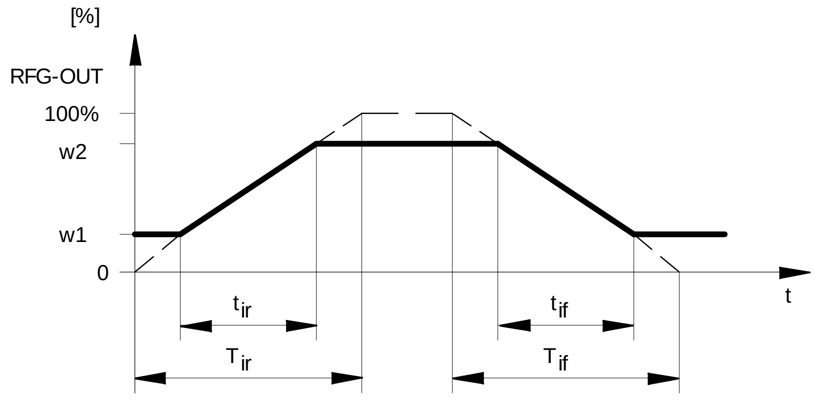
7.5.44.3 Setpoint inversion

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 =HIGH.

7.5.44.4 Ramp generator for the main setpoint

The setpoint is then led via a ramp generator with linear characteristic. Thus, setpoint step-changes are transformed into a ramp.



$$T_{ir} = t_{ir}\frac{100\%}{w2 - w1} \qquad T_{if} = t_{if}\frac{100\%}{w2 - w1}$$

Fig. 7-128 Acceleration and deceleration times of the ramp generator

- The ramps can be adjusted separately for acceleration and deceleration.
  - 16 acceleration and deceleration times can be switched active via the inputs NSET-TI*x (for table and function see JOG setpoints; they are decoded according to the signal graphic).
  - The T_i times can only be activated in pairs.
- The controller inhibit (CINH) is set, the ramp generator accepts the value which was applied at 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 generator is stopped. Changes at the input of the ramp generator have no effect on the output.
- NSET-RFG-0 = HIGH
  - The ramp generator decelerates to zero along its deceleration ramp.
- It is also possible to load the ramp generator with a defined value in advance. For this, the input NSET-LOAD must be set to HIGH. As long as this input is set, the value at the input NSET-SET is accepted by the ramp generator and provided at the output.

Priorities:

CINH	NSET-LOAD	NSET-RFG-0	NSET-RFG-STOP	Function
0	0	0	0	RFG follows the input value via the set ramps
0	0	0	1	The value at the output of RFG is frozen
0	0	1	0	RFG decelerates to zero along the set deceleration ramp
0	0	1	1	
0	1	0	0	RFG accepts the value applied at the input NSET-SET and provides it to its output
0	1	0	1	
0	1	1	0	
0	1	1	1	
1	0	0	0	RFG accepts the value applied at the input NSET-CINH-VAL and provides it to its output
1	0	0	1	
1	0	1	0	
1	0	1	1	
1	1	0	0	
1	1	0	1	
1	1	1	0	
1	1	1	1	

0 = LOW
1 = HIGH

7.5.44.5 Acceleration functions

For the linear ramp generator, the following acceleration function can be selected under C0104:

Code	Function	Application
C0104 = 0	The drive starts and stops with constant acceleration. The actual time of acceleration is proportional to the applied setpoint and the activated T_i time. Mandatory: $t_{acc} = T_i \cdot \frac{n_{set}}{n_{max}}$	
C0104 = 1	The drive starts and stops within the activated T_i time. The applied setpoint has no influence on the time of acceleration, Mandatory: $t_{acc} = T_i$	When a fixed time is used for the acceleration, e.g. a network of drives is accelerated and stopped synchronously. The individual drives can have different speeds.
C0104 = 2	The drive starts and stops with a defined number of revolutions or via a defined distance. The actual time of acceleration results from the applied setpoint and the activated T_i time. Mandatory: $t_{acc} = T_i \cdot \frac{n_{max}}{n_{set}}$	When the drive is accelerated via a specified distance, this distance which is defined by the $T_i$time, is covered when the drive is stopped (e.g. for mark-controlled positioning of the drive). The speed has no effect.

Starting and stopping with the defined time or distance is possible only with the control signal at NSET-RFG-0 **and** after controller enable.

7.5.44.6 S ramp

A PT1 element is connected to the linear ramp generator. This arrangement implements an S ramp for an almost jerk-free acceleration and deceleration.

- The PT1 element is connected and disconnected by C0134.
- The time constant is set under C0182.

7.5.44.7 Arithmetic operation

The output value is led to an arithmetic function which links the main setpoint and the additional setpoint. The arithmetic operation is selected under C0190 (see table below).

C0190	Function	Example
0	Output = X (Y is not processed)	-
1	Output = X + Y	100 % = 50 % + 50 %
2	Output = X - Y	50 % = 100 % - 50%
3	Output = X * Y	100 % = 100 % * 100%
4	Output = X/|Y|	1 % = 100 % / 100%
5	Output = X/(100% - Y)	200 % = 100 % / (100 % - 50 %)

7.5.44.8 Additional setpoint

- You can link an additional setpoint (e.g. a correction signal) to the main setpoint via the input NSET-NADD.
- You can invert the signal at NSET-ADD using NSET-NADD-INV = HIGH before the signal acts on the ramp generator. The ramp generator has a linear characteristic with an acceleration time T_{ir} (C0220) and a deceleration time T_{if} (C0221).
- With NSET-LOAD = HIGH or with setting controller inhibit the ramp generator is set to zero and held there without considering the T_i times.

7.5.45 Logic OR

These FBs enable a logic OP operation of digital signals. You can use the FBs for the control of functions or the generation of status information.

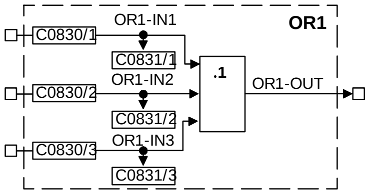


Fig. 7-129 Logic OR (OR1)

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	-	-	-	-	-	-

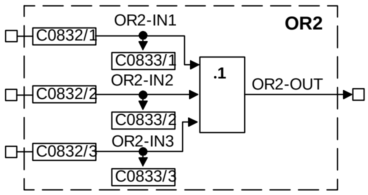


Fig. 7-130 Logic OR (OR2)

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	-	-	-	-	-	-

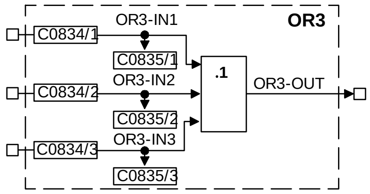


Fig. 7-131 Logic OR (OR3)

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	-	-	-	-	-	-

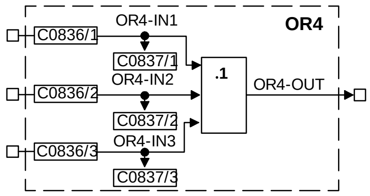


Fig. 7-132 Logic OR (OR4)

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	-	-	-	-	-	-

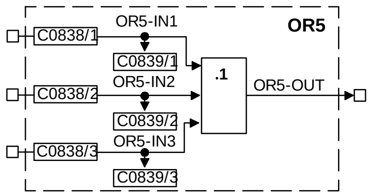


Fig. 7-133 Logic OR (OR5)

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 block library

Logic OR

Function

ORx-IN1	ORx-IN2	ORx-IN3	ORx-OUT
0	0	0	0
1	0	0	0
0	1	0	0
1	1	0	0
0	0	1	0
1	0	1	0
0	1	1	0
1	1	1	1

0 = LOW
1 = HIGH

In a contactor control, the function corresponds to a parallel connection of normally-open contacts.

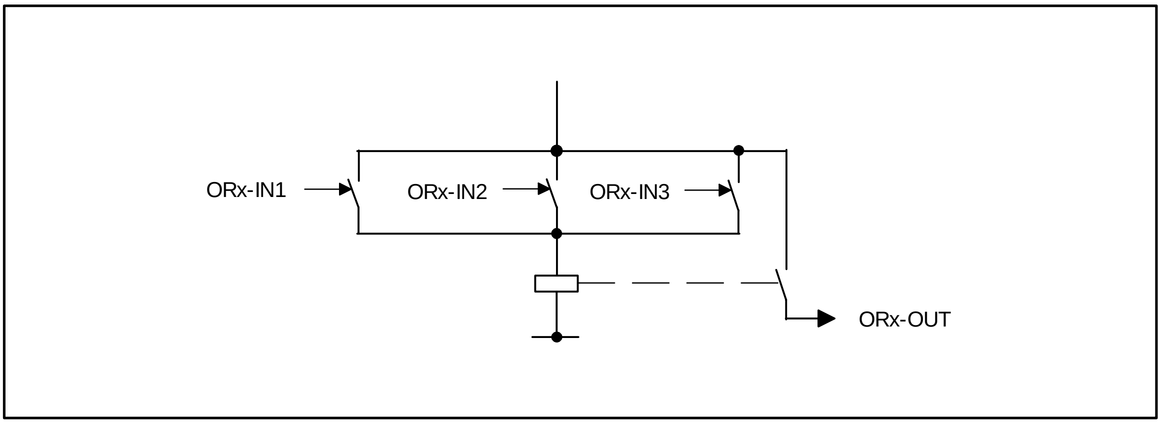


Fig. 7-134 Function of the OR operation as a parallel connection of normally-open contacts

Tip!

If only two inputs are required, use the inputs ORx-IN1 and ORx-IN2. Assign the input ORx-IN3 with the signal source FIXED0.

7.5.46 Oscilloscope function (OSZ)

This FB detects any measurement variables (e.g. setpoint speed, actual speed, torque, etc.) to support you in the commissioning of drives and to facilitate troubleshooting.

Measurement signals are displayed using **Global Drive Control (GDC)**.

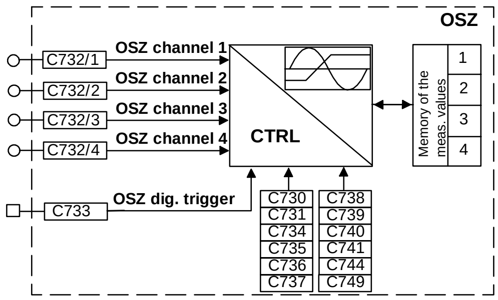


Fig. 7-135 Oscilloscope function (OSZ)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
OSZ CHANNEL 1	a	-	-	C0732/1	1	-	-
OSZ CHANNEL 2	a	-	-	C0732/2	1	-	-
OSZ CHANNEL 3	a	-	-	C0732/3	1	-	-
OSZ CHANNEL 4	a	-	-	C0732/4	1	-	-
OSZ-DIG-TRIGGER	d	-	-	C0733/1	2	-	-

Range of functions

The FB consists of three units:

- Trigger check
  – Monitoring the digital trigger source for a valid trigger result
- Processing the measured signal
  – Linking the measurement inputs
  – Calculating the time
  – Monitoring the analog trigger source for a valid trigger result
- Memory of the measured values
  – Scaling the ring buffer memory
  – Saving measured data in the ring buffer memory
  – Saving measured points for the reconstruction of the graphic

Tip!

For a comprehensive description refer to the user's manual "Oscilloscope function".

7.5.47 Process controller (PCTRL)

You can use these FBs for the control of state variables such as pressure, level, dancer position, etc.

Setpoint and actual value are sent to the process controller via the corresponding inputs and processed according to the selected control algorithm (PID-, PI- or P-algorithm).

- You can adapt the gain in the FB PCTRL1.
- The FB PCTRL2 is optimal for control circuits which must be activated or deactivated online.

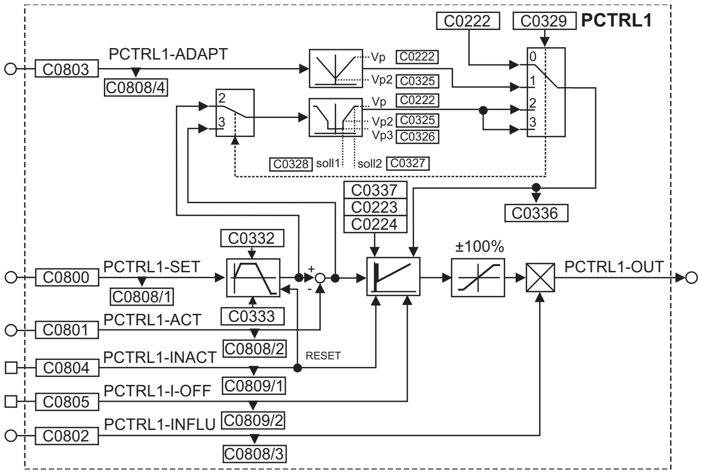


Fig. 7-136 Process controller (PCTRL1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
PCTRL1-SET	a	C0808/1	dec [%]	C0800	1	1000	Input for process setpoint. Possible value range: ±200 %. The time of step-change signals can be decelerated via the ramp generator (C0332 for the acceleration time; C0333 for the deceleration time).
PCTRL1-ACT	a	C0808/2	dec [%]	C0801	1	1000	Input for actual value; value range +200 %
PCTRL1-INFLU	a	C0808/3	dec [%]	C0802	1	1000	Evaluation (influence) of the output signal; value range ±200 %
PCTRL1-ADAPT	a	C0808/4	dec [%]	C0803	1	1000	Changing the gain V_p; Value range ±200 % (online)
PCTRL1-INACT	d	C0809/1	bin	C0804	2	1000	HIGH = Inactivation of the process controller (online)
PCTRL1-I-OFF	d	C0809/2	bin	C0805	2	1000	HIGH = switch off I component (online) LOW = switch off I component (online)
PCTRL1-OUT	a	-	-	-	-	-	-

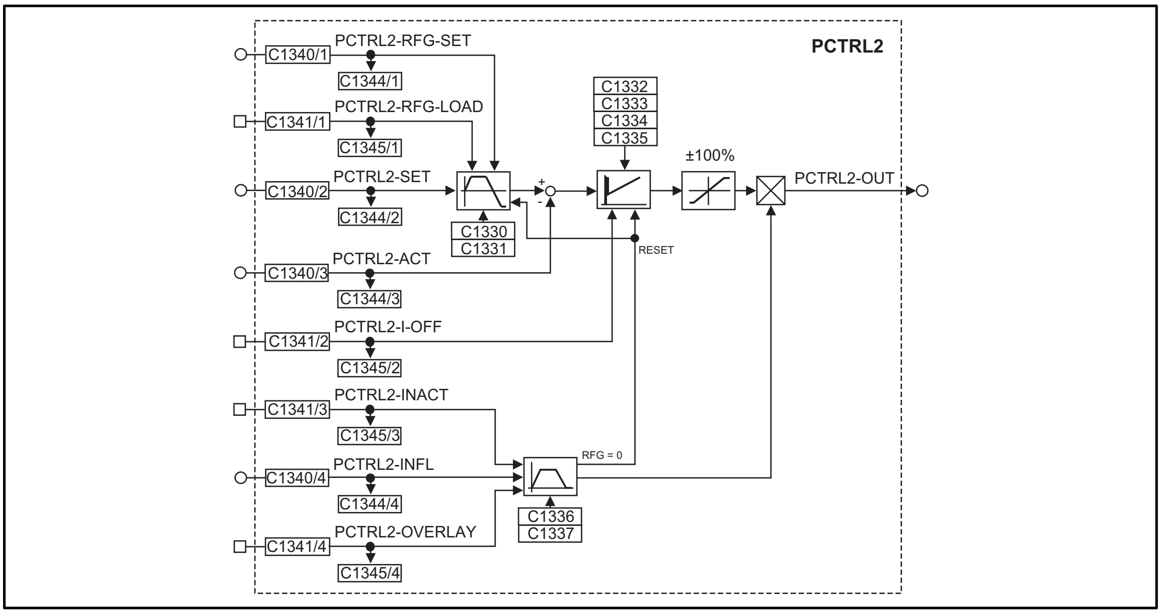


Fig. 7-137 Process controller (PCTRL2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
PCTRL2-RFG-SET	a	C1344/1	dec [%]	C1340/1	1	1000	The process setpoint is shown at PCTRL2-SET with any start value via a ramp generator. The function is activated using PCTRL-RFG-LOAD.
PCTRL2-RFG-LOAD	d	C1345/1	bin	C1341/1	2	1000	HIGH = Function of PCTRL2-RFG-SET is active
PCTRL2-SET	a	C1344/2	dec [%]	C1340/2	1	1000	Input for process setpoint. Possible value range: ±200 %. The time of step-change signals can be decelerated via the ramp generator (C1330 for the acceleration time; C1331 for the deceleration time).
PCTRL2-ACT	a	C1344/3	dec [%]	C1340/3	1	1000	Input for actual value; value range ±200 %
PCTRL2-INFL	a	C1344/4	dec [%]	C1340/4	1	1000	Evaluation (influence) of the output signal; value range ±200 %
PCTRL2-I-OFF	d	C1345/2	bin	C1341/2	2	1000	HIGH = switch off I component (online) LOW = switch off I component (online)
PCTRL2-INACT	d	C1345/3	bin	C1341/3	2	1000	HIGH = Inactivation of the process controller (online)
PCTRL2-OVERLAY	d	C1345/4	bin	C1341/4	2	1000	HIGH = Show influence LOW = Hide influence
PCTRL2-OUT	a	-	-	-	-	-	-

Range of functions

- Control characteristic
- Ramp generator
- Value range of the output signal
- Evaluating the output signal
- Deactivating the process controller

7.5.47.1 Control characteristic

In the default setting, the PID algorithm is active.

- The D component is deactivated with
  – C0224 = 0 for PCTRL1,
  – C1334 = 0 for PCTRL2.
- The I-component is switched on or off online via the PCTRLx-I-OFF input. For this, the input is assigned a digital signal source (e.g. one of the freely assignable digital input terminals). If the I-component is to be switched off permanently, the input is assigned the signal source FIXED1.
  – PCTRLx-I-OFF = HIGH switches off the I-component.
  – PCTRLx-I-OFF = LOW switches on the I-component.
- The adjustment time T_n is parameterized via
  – C0223 for PCTRL1,
  – C1333 for PCTRL2.

Gain V_p for PCTRL1

You can adapt the gain V_p in different ways. The function for the provision of the gain V_p is selected under C0329:

- C0329 = 0
  – The gain V_p is entered under C0222.
- C0329 = 1
  – The gain V_p is entered using the input PCTRL1-ADAPT. The input value is led via a linear characteristic. The shape of the characteristic is set under C0222 (upper limit) and C0325 (lower limit). The value under C0222 is valid if the input value = +100 % or -100 %. The value under C0325 is valid if the input value = 0 %.

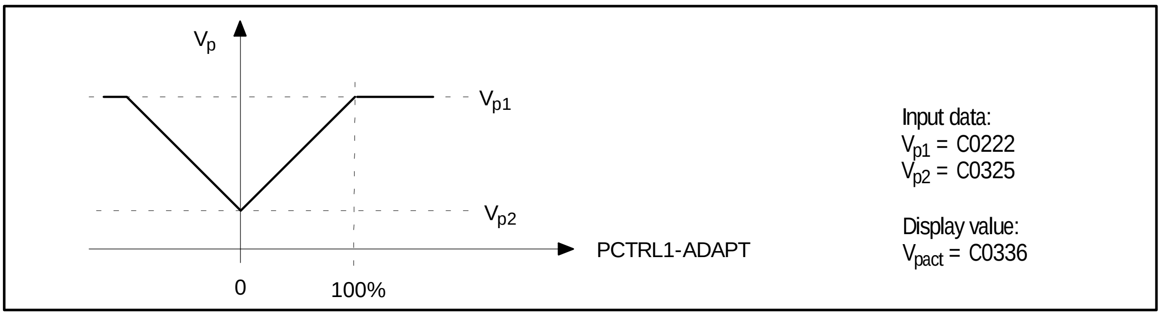


Fig. 7-138 The gain V_p is entered via input PCTRL1-ADAPT

- C0329 = 2
  – The input of gain V_p is derived from the process setpoint PCTRL1-SET. The setpoint is obtained after the ramp generator and calculated via the characteristic with three co-ordinates.

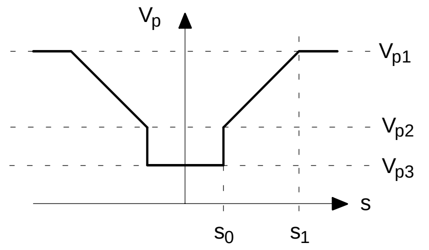


Fig. 7-139 The input of gain V_p is derived from the process setpoint PCTRL1-SET

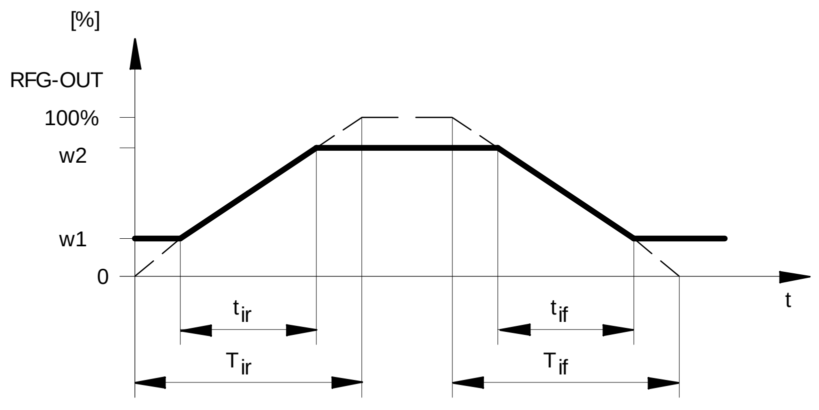
- C0329 = 3
  – The input of gain V_p is derived from the control difference and led via the characteristic generation as C0329 = 2.

Gain V_p for PCTRL2

The gain V_p is entered under C1332.

7.5.47.2 Ramp generator

The setpoint PCTRLx-SET is led by a ramp generator with linear characteristic. Thus, setpoint step-changes at the input can be transformed into a ramp.



$$T_{ir} = t_{ir}\frac{100\%}{w2 - w1} \qquad T_{if} = t_{if}\frac{100\%}{w2 - w1}$$

Fig. 7-140 Acceleration and deceleration times of the ramp generator

	Set ramps for acceleration and deceleration		Reset ramp generator (the ramp generator is set to 0)
	Acceleration time t_{ir}	Deceleration time t_{if}	
PCTRL1	C0332	C0333	PCTRL1-INACT = HIGH
PCTRL2	C1330	C1331	PCTRL2-INACT = HIGH

Load ramp generator (only PCTRL2)

A jerk-free acting of the process controller is possible only when the setpoint ramp generator has previously been loaded with the actual value.

- PCTRL2-RFG-LOAD = HIGH activates the function.
- The start value (e.g. the actual value) is entered via PCTRL2-RFG-SET.

7.5.47.3 Value range of the output signal

Range of the process controller	PCTRL1	PCTRL2	Limitation
Bipolar (default setting)	C0337 = 0	C1335 = 0	Limits the output value to ±100 %
Unipolar	C0337 = 1	C1335 = 1	Limits the output value to 0 ... +100 %

7.5.47.4 Evaluating the output signal

After the limitation, the output signal is evaluated.

PCTRL1

You can enter the influence of the process controller via PCTRL1-INFLU.

- With PCTRL1-INFLU = 100 %, the output signal of the controller is output unchanged. The influence changes in relation to the value at PCTRL1-INFLU.

PCTRL2

The overlay function of the process controller can be slowly activated or deactivated using an internal ramp generator.

- The influence of the process controller is entered via PCTRL2-INFL.
- The influence is activated with PCTRL2-OVERLAY = HIGH.
- The influence is deactivated with PCTRL2-OVERLAY = LOW.
- Ramps for activation and deactivation:
  – C1336 = Acceleration time T_{ir}
  – C1337 = Deceleration time T_{if}

7.5.47.5 Deactivating the process controller

- The process controller is deactivated using PCTRLx-INACT = HIGH.
  – PCTRLx-OUT is set to zero.
  – The I-component is set to zero.
  – The ramp generator is set to zero.

7.5.48 Delay (PT1)

These FBs are low-pass filters. They filter and delay analog signals.

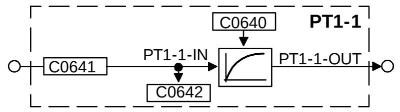


Fig. 7-141 Delay (PT1-1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
PT1-1-IN	a	C0642	dec [%]	C0641	1	1000	-
PT1-1-OUT	a	-	-	-	-	-	-

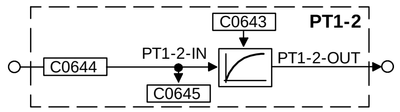


Fig. 7-142 Delay (PT1-2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
PT1-2-IN	a	C0645	dec [%]	C0644	1	1000	-
PT1-2-OUT	a	-	-	-	-	-	-

Function

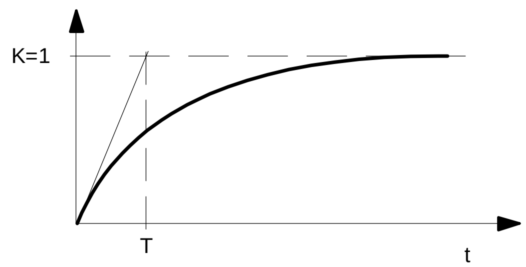


Fig. 7-143 Delay behaviour of PT1

- The delay T is set under C0640 (PT1-1) or C0643 (PT1-2).
- The proportional value is fixed at K = 1.

7.5.49 Ramp function generator (RFG)

This FB converts step changes into ramps. The output signal follows the input signal with limited rate of rise.

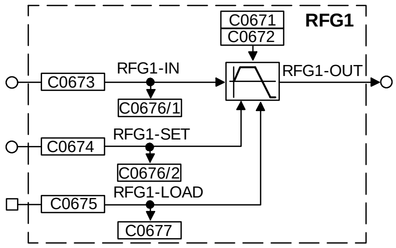


Fig. 7-144 Ramp generator (RFG1)

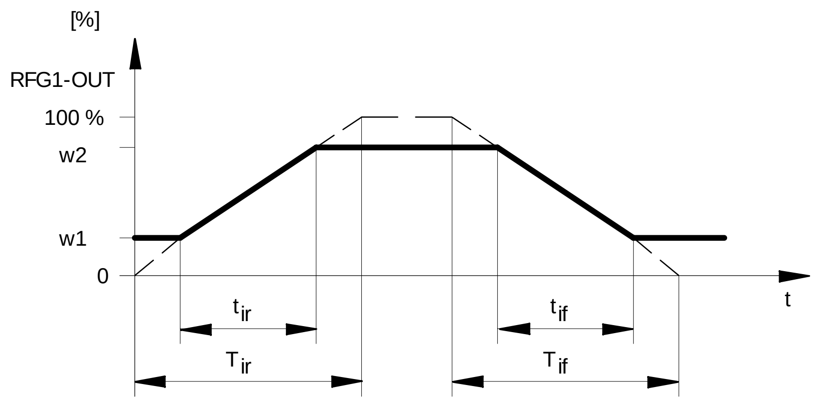
Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
RFG1-IN	a	C0676/1	dec [%]	C0673	1	1000	-
RFG1-SET	a	C0676/2	dec [%]	C0674	1	1000	-
RFG1-LOAD	d	C0677	-	C0675	2	1000	-
RFG1-OUT	a	-	-	-	-	-	-

Range of functions

- Ramp function generator
- Load ramp generator

7.5.49.1 Ramp function generator

The maximum speed of change with which the output signal can follow the input signal, is parameterized via the acceleration and deceleration time of the ramp function generator. They refer to a change of the output signal from 0 to 100%. The times to be set T_{ir} and T_{if} are to be calculated as follows:



$$T_{ir} = t_{ir} \cdot \frac{100\,\%}{w2 - w1} \qquad T_{if} = t_{if} \cdot \frac{100\,\%}{w2 - w1}$$

Fig. 7-145 Acceleration and deceleration times of the ramp function generator

Here, t_{ir} and t_{if} are the desired times for the change between w1 and w2. You can set the calculated value under C0671 (T_{ir}) and C0672 (T_{if}).

7.5.49.2 Load ramp function generator

You can initialize the ramp function generator with defined values via the inputs RFG1-SET and RFG1-LOAD.

- As long as RFG1-LOAD = HIGH, the value at RFG1-SET is switched to RFG1-OUT.
- If the RFG1-LOAD = LOW, the ramp function generator accelerates from this value to its input value at REG1-IN via the set T_i times.

7.5.50 CW/CCW/Quick stop (R/L/Q)

This FB evaluates the input of the direction of rotation protected against wire breakage. If there is no signal for the direction of rotation, quick stop is released.

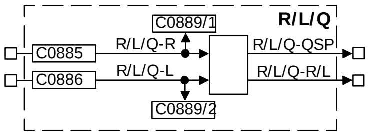


Fig. 7-146 CW/CCW/Quick stop (R/L/Q)

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, the two outputs are initialized as follows:

Inputs		Outputs	
R/L/Q-R	R/L/Q-L	R/L/Q-R/L	R/L/Q-QSP
-	-	0	1

0 = LOW
1 = HIGH

- After the initialization, the following relationship results in dependence of the input signals:

Inputs		Outputs	
R/L/Q-R	R/L/Q-L	R/L/Q-R/L	R/L/Q-QSP
0	0	0/1*	1
1	0	0	0
0	1	1	0
1	1	unchanged	unchanged

0 = LOW
1 = HIGH
* If you have selected a direction of rotation and then set both inputs to LOW, the signal state at R/L/Q-R/L will not change.

7.5.51 Sample & Hold (S&H)

This FB can accept analog signals and save them non-volatile. The saved value is also available after mains disconnection.

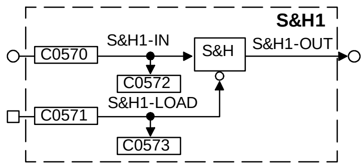


Fig. 7-147 Sample & Hold (S&H1)

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 and S&H-OUT outputs the value which was accepted last.
- Saving before mains disconnection:
  – The value which was accepted last is saved non-volatile in the internal memory before the supply voltage is switched off. When the supply voltage is switched on, the saved value is loaded into the FB S&H1.

7.5.52 Square-root calculator (SQRT)

This FB calculates the square-root from the absolute value of the input signal and then adds the sign again. This is used to convert state variables with their relationship.

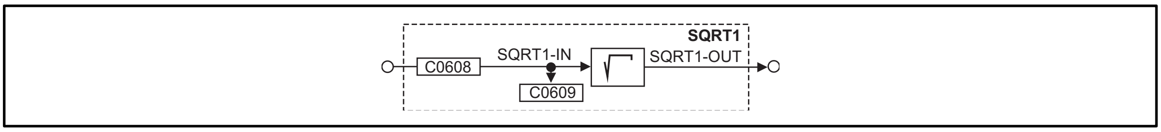


Fig. 7-148 Square-root calculator (SQRT1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
SQRT1-IN	a	C0609	dec [%]	C0608	1	1000	-
SQRT1-OUT	a	-	-	-	-	-	-

Function

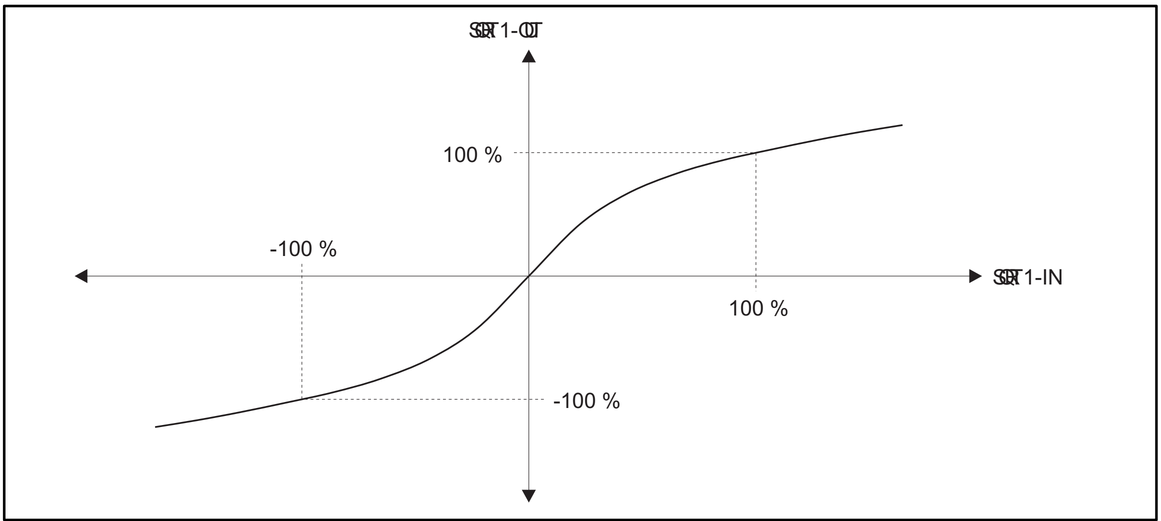


Fig. 7-149 Characteristic of the output signal at SQRT1-OUT to the input signal at SQRT1-IN

When the input signal at SQRT1-IN = 100 %, the output signal at SQRT1-OUT = 100 %.

7.5.53 S-ramp function generator (SRFG)

This FB converts setpoint step changes into S-shaped ramps. Thus, you can accelerate the drive practically jolt-free.

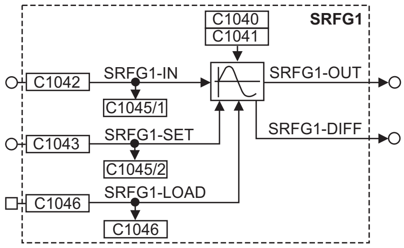


Fig. 7-150 S-ramp function generator (SRFG1)

Signal				Source		Note
Name	Type	DIS	DIS format	CFG	List	
SRFG1-IN	a	C1045/1	dec [%]	C1042	1	Input
SRFG1-SET	a	C1045/2	dec [%]	C1043	1	Start value for the ramp function generator, acceptance when SRFG1-LOAD = High
SRFG1-LOAD	d	C1046	bin	C0144	2	HIGH = accepts the value at SRFG1-SET and supplies it to SRFG1-OUT; SRFG1-DIFF remains at 0 %
SRFG1-OUT	a	-	-	-	-	Output limited to ±100 %
SRFG1-DIFF	a	-	-	-	-	Output limited to ±100 %, supplies the acceleration of the ramp function generator

Range of functions

- Ramp function generator
- Load ramp function generator

7.5.53.1 Ramp function generator

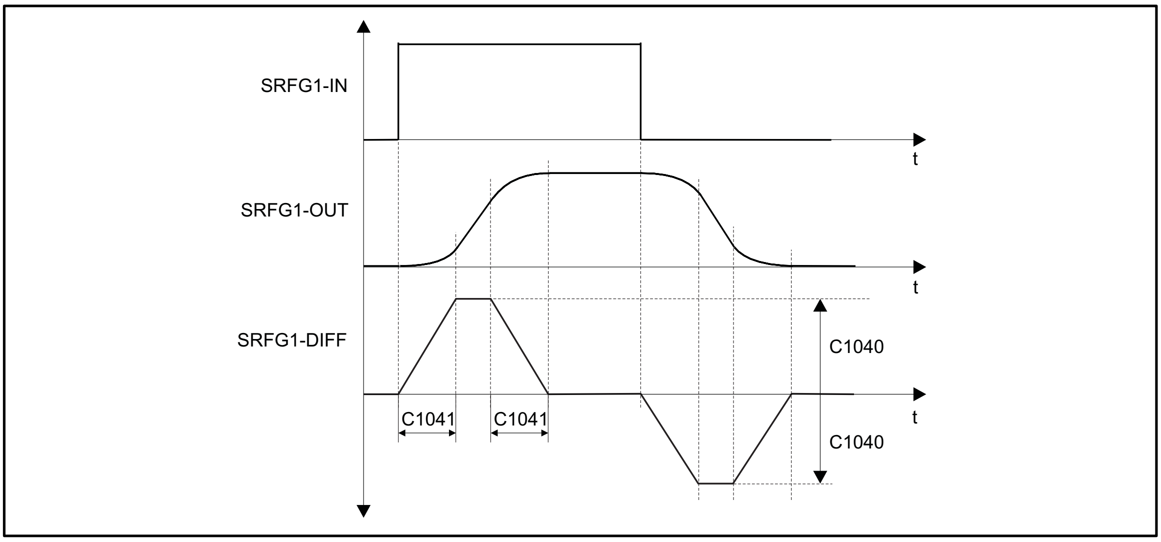


Fig. 7-151 Characteristic of the ramp function generator

The s-shaped characteristic of the output signal is parameterized via the max. acceleration (C1040) and the rounding time (C1041).

- The max. acceleration is entered as a percentage, which the output signal is allowed to pass per second.
- During the rounding time (C1041), from zero acceleration to maximum acceleration (or from maximum acceleration to zero acceleration), the acceleration changes in a linear way.
  – The acceleration characteristic (signal at SRFG-DIFF) in Fig. 7-151 shows the linear rising or falling of the signal during the rounding time (C1041).

Calculation of the max. acceleration

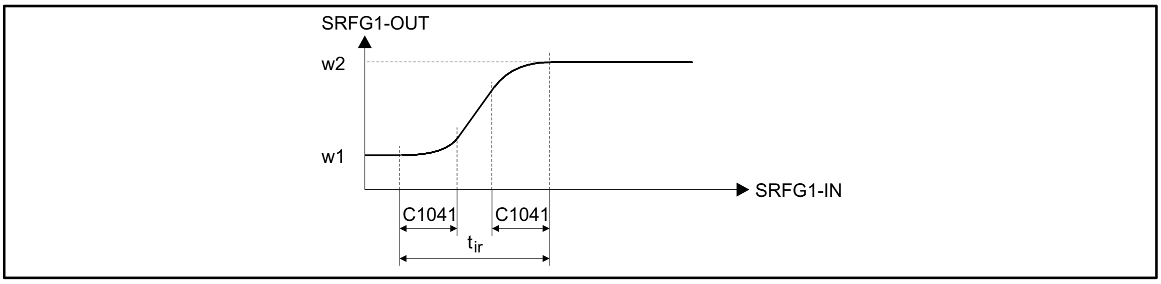


Fig. 7-152 Signal characteristic with jolt-free acceleration

Calculate the necessary max. acceleration for the change between w1 and w2 in the desired time t_{ir} according to the following formula:

$$C1040 = \frac{W1 - W2}{t_{ir} - C1041}$$

7.5.53.2 Load ramp function generator

You can initialize the ramp function generator with defined values via the inputs SRFG1-SET and SRFG1-LOAD.

- As long as SRFG1-LOAD = HIGH, the value at SRFG1-SET is switched to SRFG1-OUT.
- When SRFG1-LOAD = LOW, the ramp generator accelerates from this value to its input value at SRFG1-IN via the set S-shape.

7.5.54 Output of digital status signals (STAT)

The FB accepts digital signals of the function blocks and the status of the controller and passes them on to C0150 and to the FB AIF-OUT and CAN-OUT1.

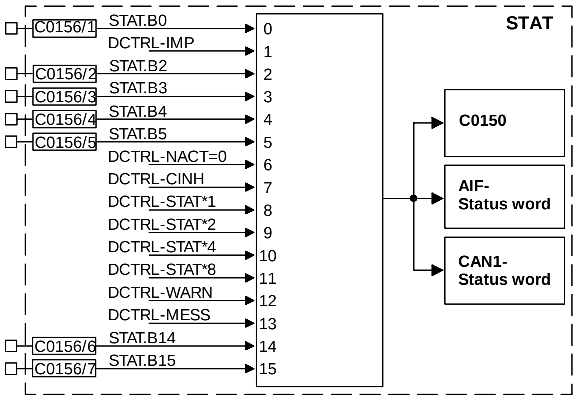


Fig. 7-153 Output of digital status signals (STAT)

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 least significant bit).
- The status word is transferred to code C0150 and to the function blocks AIF-OUT, CAN-OUT1, CAN-OUT2, and CAN-OUT1.
- The inputs with the name DCTRL-xxxx are directly accepted from the function block DCTRL. (🕮 7-94)

7.5.55 Edge evaluation (TRANS)

These FBs evaluate the switching edges of the input signals and generate pulses. The pulse length can be set.

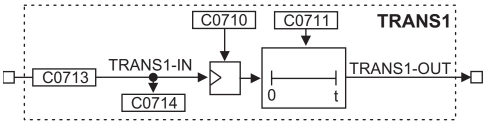


Fig. 7-154 Edge evaluation (TRANS1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TRANS1-IN	d	C0714	bin	C0713	2	1000	-
TRANS1-OUT	d	-	-	-	-	-	-

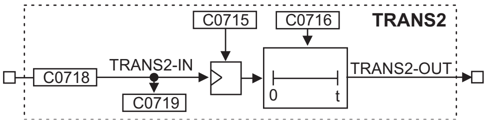
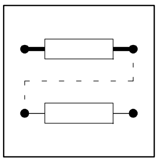


Fig. 7-155 Edge evaluation (TRANS2)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TRANS2-IN	d	C0719	bin	C0718	2	1000	-
TRANS2-OUT	d	-	-	-	-	-	-

Range of functions

- Evaluate positive edge
- Evaluate negative edge
- Evaluate positive or negative edge



7.5.55.1 Evaluate positive edge

- C0710 = 0 (TRANS1)
- C0715 = 0 (TRANS2)

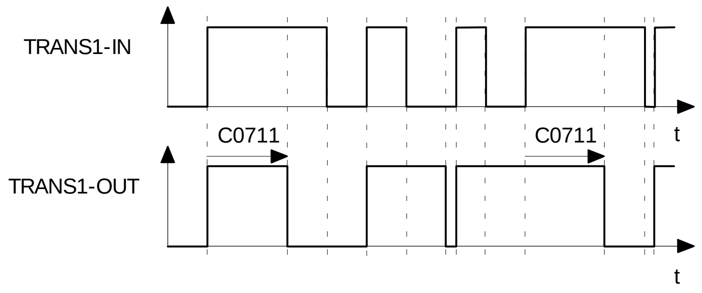


Fig. 7-156 Evaluation of positive edges (TRANS1)

Function procedure

1. With a LOW-HIGH edge at TRANSx-IN, TRANSx-OUT = HIGH.
2. After the time set under C0711 (TRANS1) or C0716 (TRANS2) has elapsed, TRANSx-OUT switches to LOW again.
   – Every new trigger event (LOW-HIGH edge at TRANSx-IN) switches TRANSx-OUT = HIGH and restarts the elapsing time.

7.5.55.2 Evalute negative edge

- C0710 = 1 (TRANS1)
- C0715 = 1 (TRANS2)

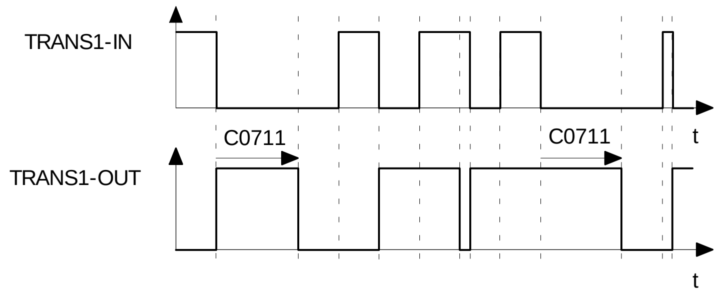


Fig. 7-157 Evaluation of negative edges (TRANS1)

Function procedure

1. With a HIGH-LOW edge at TRANSx-IN, TRANSx-OUT = HIGH.
2. After the time set under C0711 (TRANS1) or C0716 (TRANS2) has elapsed, TRANSx-OUT switches to LOW again.
   – Every new trigger event (LOW-HIGH edge at TRANSx-IN) switches TRANSx-OUT = HIGH and restarts the elapsing time.

7.5.55.3 Evaluate positive or negative edge

- C0710 = 2 (TRANS1)
- C0715 = 2 (TRANS2)

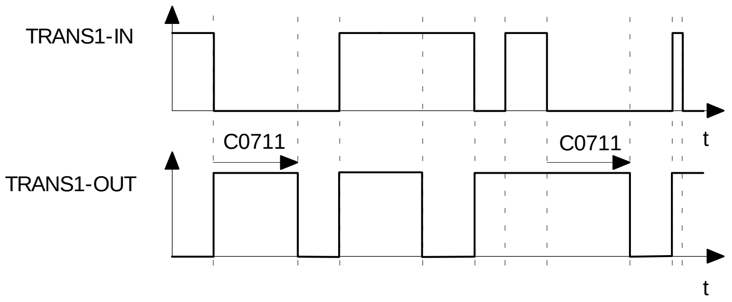


Fig. 7-158 Evaluation of positive and negative edges (TRANS1)

Function procedure

1. With a HIGH-LOW edge or a LOW-HIGH edge at TRANSx-IN, TRANSx-OUT = HIGH.
2. After the time set under C0711 (TRANS1) or C0716 (TRANS2) has elapsed, TRANSx-OUT switches to LOW again.
   – Every new trigger event (LOW-HIGH edge or HIGH-LOW edge at TRANSx-IN) switches TRANSx-OUT = HIGH and restarts the elapsing time.

7.6 Monitoring

Various monitoring functions protect the drive from impermissible operating conditions.

If a monitoring function is activated,

- the corresponding set reaction is triggered, (📖 7-195)
- a digital output is set if it is assigned to the corresponding reaction,
- the fault code is entered in position 1 in the history buffer. (📖 8-2)

7.6.1 Reactions

The controller can react to interference in four different ways:

- TRIP (highest priority)
- Message
- Warning
- OFF=no reaction (lowest priority)

For some operating faults, you can determine the reaction of the controller. (📖 7-197)

TRIP

Status indications of the operating module in case of TRIP		
RDY	IMP	FAIL
□	■	■

■ : on □ : off ★: blinking

Drive behaviour:

- Switches the power outputs U, V, W to a high resistance until TRIP is reset
- The drive idles (no control!).
- After TRIP reset, the drive accelerates to its setpoint along the set ramps. (📖 8-6)

Configuration

Message

Status indications of the operating module in the event of a message		
RDY	IMP	FAIL
☐	■	■

■ : on ☐ : off ★: blinking

Drive behaviour:

- Switches the power outputs U, V, W to a high resistance as long as the fault is active.
- Short-term fault ≤ 0.5 sec:
  – The drive idles (no control!), as long as the fault is present.
  – If the fault is eliminated, the drive accelerates to its setpoint with maximum torque.
- Long-term fault > 0.5 sec:
  – The drive idles (no control!), as long as the fault is present.
  – Homing points are lost.
  – If the fault is eliminated, the drive moves to its setpoint along the set ramps.

Danger!
The drive restarts automatically if the fault is eliminated.

Warning

Status indication of the operating module in the event of a warning		
RDY	IMP	FAIL
☐	■	■

■ : on ☐ : off ★: blinking

Drive behaviour:

- The drive operates under control.

OFF

- No reaction on operating faults! Monitoring is deactivated.

Stop!
The drive may be destroyed if the monitoring functions are deactivated.

7.6.2 Overview of the monitoring functions

Overview of the fault sources detected by the controller, and the corresponding reactions.

Fault indication			Possible reactions					Description
Display	Error code	Meaning	T	M	W	off	Code	
CCr	T: 71	System fault	●	-	-	-	-	-
CE0	T: 61 W: 2061	Communication error (AIF)	✓	-	✓	●	C0126	🕮 7-199
CE1	T: 62 W: 2062	Communication error at the process data input object CAN-IN1 (time monitoring can be set under C0357/1)	✓	-	✓	●	C0591	🕮 7-199
CE2	T: 63 W: 2063	Communication error at the process data input object CAN-IN2 (time monitoring can be set under C0357/2)	✓	-	✓	●	C0592	
CE3	T: 64 W: 2064	Communication error at the process data input object CAN-IN3 (time monitoring can be set under C0357/3)	✓	-	✓	●	C0593	
CE4	T: 65 W: 2065	BUS-OFF state (many communication errors occurred)	✓	-	✓	●	C0595	🕮 7-199
EEr	T: 91 W: 2091 M: 1091	External monitoring	●	✓	✓	✓	C0581	🕮 7-200
H05	T: 105	Internal fault	●	-	-	-	-	-
H07	T: 107	Internal fault; during initialization of the controller, an incorrect power stage was detected	●	-	-	-	-	-
H10	T: 110	Sensor fault heat sink temperature	●	-	-	✓	C0588	🕮 7-201
H11	T: 111	Sensor fault: indoor temperature	●	-	-	✓		
ID1	T: 140	Motor identification failed - characteristic	●	-	-	-	-	-
ID2	T: 141	Motor identification failed - motor data	●	-	-	-	-	-
LP1	T: 32 W: 2032	Motor phase failure detection (function block must be entered in C0465)	✓	-	✓	●	C0597	🕮 7-205
LU	M: 1030	Undervoltage in the DC bus	-	●	-	-	-	🕮 7-216
NMAX	T: 200	Maximum speed exceeded (C0596)	●	-	-	-	-	🕮 7-202
OC1	T: 11	Short-circuit	●	-	-	-	-	🕮 7-210
OC2	T: 12	Earth fault	●	-	-	-	-	🕮 7-211
OC3	T: 13	Overload during acceleration or deceleration	●	-	-	-	-	🕮 7-212
OC5	W: 2015	I x t overload	-	-	●	-	-	🕮 7-213
OH	T: 50	Heat sink temperature 1 (max. permissible, fixed)	●	-	-	-	-	🕮 7-214
OH3	T: 53	Motor temperature 1 (max. permissible, fixed)	✓	-	-	●	C0583	🕮 7-206
OH4	W: 2054	Heat sink temperature 2 (adjustable; C0122)	-	-	●	✓	C0582	🕮 7-215
OH7	W: 2057	Motor temperature 2 (can be set; code: C0121)	-	-	✓	●	C0584	🕮 7-207
OH8	T: 58 W: 2058	Motor temperature (fixed) via inputs T1/T2	✓	-	✓*	●	C0585	🕮 7-208
OU	M: 1020	Overvoltage in the DC bus	-	●	-	-	-	🕮 7-217

Fault indication			Possible reactions					Description
Display	Error code	Meaning	T	M	W	off	Code	
PEr	T: 74	Program error	●	-	-	-	-	-
PI	T: 79	Fault during initialization	●	-	-	-	-	-
PR0	T: 75	General fault in parameter sets	●	-	-	-	-	-
PR1	T: 72	Fault in parameter set 1	●	-	-	-	-	-
PR2	T: 73	Fault in parameter set 2	●	-	-	-	-	-
PR3	T: 77	Fault in parameter set 3	●	-	-	-	-	-
PR4	T: 78	Fault in parameter set 4	●	-	-	-	-	-
Sd3	T: 83 W: 2083	Encoder fault at X9 PIN 8	✓	-	✓*	●	C0587	🕮 7-204
Sd5	T: 85 W: 2085	Encoder fault at X6/1 X6/2 (C0034 = 1)	✓	-	✓	●	C0598	🕮 7-204
Sd6	T: 86 W:2086	Sensor fault motor temperature (X8)	✓	-	✓	●	C0594	🕮 7-209

T: TRIP M: Message W: Warning ●: Lenze ✓: possible -: not possible
✓*: possible, but the motor could be destroyed, if the error is not eliminated in time

Tip!

The information in the row ”Error code” is read from C0168/x if the history buffer is accessed via a field bus module or system.

7.6.3 Communication monitoring

These monitoring functions indicate a faulty communication with the field bus or system bus.

7.6.3.1 Communication monitoring (CE0)

This monitoring reacts when there was a communication error with a field bus module connected to an automation interface X1.

Remedy:

- Plug in field bus module correctly and bolt

Features:

- LECOM no.: 61, 2061
- Reaction: TRIP, WARNING or OFF

7.6.3.2 Communication monitoring (CE1, CE2, CE3)

The fault indication CE1 (CAN-IN1), CE2 (CAN-IN2) or CE3 (CAN-IN3) is released when no data or faulty data are received within the monitoring time (C0357/1 ... C0357/3). The corresponding CAN-IN object still receives data.

Remedy:

- Check cable at X4
- Check transmitter
- Increase monitoring time (C0357/1 ... C0357/3)

Features:

- LECOM
  – No.: 62, 2062 (CE1)
  – No.: 63, 2063 (CE2)
  – No.: 64, 2064 (CE3)
- Reaction: TRIP, WARNING or OFF

7.6.3.3 Communication monitoring (CE4)

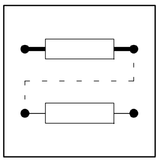
If faulty telegrams occur too frequently, the controller changes to the BUS-OFF state and outputs the fault indication CE4.

Remedy:

- Check bus terminator at X4
- Check screen contact of the cables
- Check PE connection
- Check bus load
  – Reduce baud rate (observe cable length)

Features:

- LECOM
  – No.: 65, 2065 (CE4)
- Reaction: TRIP, WARNING or OFF



7.6.4 Process monitoring

7.6.4.1 Monitoring of the external encoder (EEr)

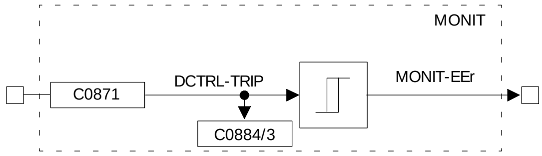


Fig. 7-159 Monitoring by the external encoder (EEr)

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 the Lenze default setting, this signal is obtained from terminal X5/E4. You can connect external encoders using which you can provoke the desired reaction in the controller.

You can also use any other binary signal source.

Features:

- LECOM no.: 91, 1091, 2091
- Reaction: TRIP, MESSAGE, WARNING or OFF

7.6.4.2 Monitoring of the internal thermal sensors (H10, H11)

Function

The fault indication H10 (heat sink temperature) or H11 (internal temperature) is released when a fault in the internal temperature detection was detected during mains connection.

A collective trip message is displayed when one of these monitoring functions are released. A fault indication is saved in the history buffer only.

There is no additional binary output which you can link.

Remedy:

- Contact Lenze
- The controller can only be reset by mains switching

Features:

- LECOM
  – No.: 110 (H10)
  – No.: 111 (H11)
- Reaction: TRIP or OFF

7.6.4.3 Maximum speed monitoring (NMAX)

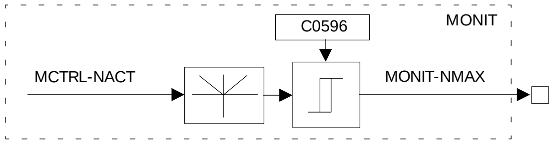


Fig. 7-160 Maximum speed monitoring (NMAX)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
MCTRL-NACT	-	-	-	-	-	-	Cannot be reassigned
MONIT-NMAX	d	-	-	-	-	-	-

Function

You can enter a maximum speed under C0596, independently of the direction of rotation. The monitoring reacts, if:

- the current speed exceeds the limit C0596
- the current 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, plant-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)

7.6.4.4 Monitoring of the encoder at X9 (Sd3)

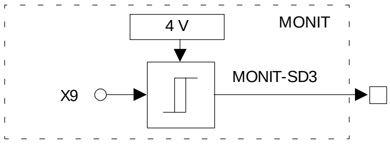


Fig. 7-161 Monitoring of the encoder at X9 (Sd3)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
X10	-	-	-	-	-	-	-
MONIT-SD3	d	-	-	-	-	-	-

Function

The monitoring reacts if pin 8 at the digital frequency input X9 is not supplied. Therefore, an interrupt of the digital frequency coupling can be displayed.

Remedy:

- Check cable for open circuit
- Assign X9 PIN 8 with 5V or switch off monitoring (C0587 = 3)

Features:

- LECOM no.: 83, 2083
- Reaction: TRIP, WARNING or OFF

7.6.4.5 Monitoring of the encoder at X6/1, X6/2 (Sd5)

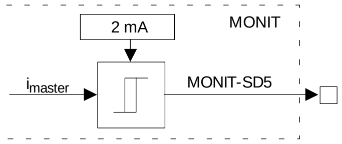


Fig. 7-162 Monitoring of the encoder at X6/1, X6/2 (Sd5)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
i_{master}	-	-	-	-	-	-	-
MONIT-SD5	d	-	-	-	-	-	-

Function

The monitoring reacts if the current master signal (i_{master}= 4 mA ... 20 mA) falls below 2 mA. To activate the monitoring function, set the analog input (AIN1) to current master value processing with 4 ... 20 mA (C0034 = 1).

Remedy:

- Check connecting cables for open circuit
- Check current master value encoder

Features:

- LECOM no.: 85, 2085
- Reaction: TRIP, WARNING or OFF

7.6.5 Motor monitoring

These monitoring functions protect the motor and the process.

7.6.5.1 Monitoring of the motor phases (LP1)

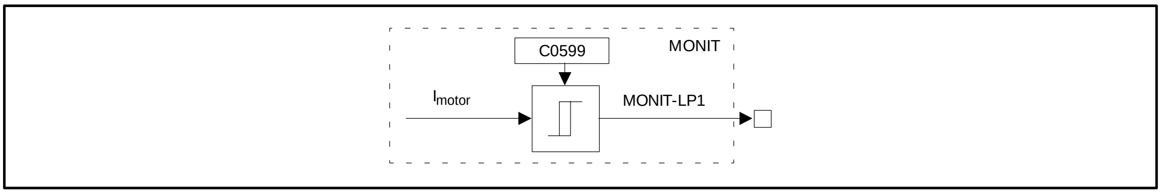


Fig. 7-163 Monitoring of the motor phases (LP1)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
I_{MOTOR}	-	-	-	-	-	-	-
MONIT-LP1	d	-	-	-	-	-	-

Function

This monitoring reacts if a power interrupt in a phase of the motor connection is detected or the current limit is set too high. Set the threshold under C0599.

Tip!
This can also be an interrupt in the motor winding.

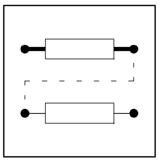
Remedy:

- Check motor
- Check supply module
- Reduce current limit under C0599

Features:

- LECOM-no.: 32, 2032
- Reaction: TRIP, WARNING or OFF

Stop!
To activate the monitoring of the motor phases, enter the FB MLP1 in the processing table.



7.6.5.2 Monitoring of the motor temperature, with fixed threshold (OH3)

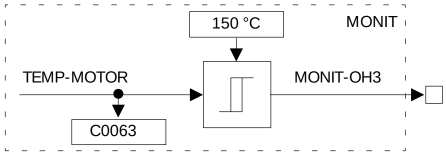


Fig. 7-164 Monitoring of the motor temperature, with fixed threshold (OH3)

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 connector X8 is available as input.

Features:

- LECOM no.: 53
- Reaction: TRIP or OFF

7.6.5.3 Monitoring of the motor temperature, with adjustable threshold (OH7)

The 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 unacceptable noise in continuous operation, can also be triggered.

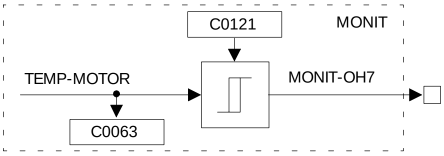


Fig. 7-165 Monitoring of the motor temperature, with adjustable threshold (OH7)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
TEMP-MOTOR	-	C0063	dec	-	-	-	-
MONIT-OH7	d	-	-	-	-	-	-

Function

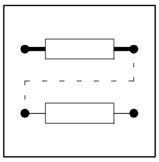
The signal OH7 is derived from a comparator with hysteresis.

Here, the same conditions apply as for the OH3 monitoring, since here the same input is 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



Configuration

7.6.5.4 Monitoring of the motor temperature (OH8)

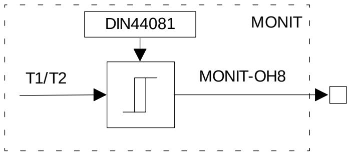


Fig. 7-166 Monitoring of the motor temperature (OH8)

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 (DIN44081). (📖 4-31)

STOP

Stop!

If you use this input as a protection and you set the monitoring to WARNING or OFF, the motor may be destroyed in case of further overload.

Features:

- LECOM no.: 58, 2058
- Reaction: TRIP, WARNING or OFF

7.6.5.5 Monitoring of the sensor for motor temperature detection (Sd6)

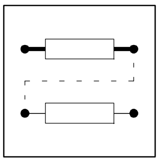
This monitoring reacts if a short-circuit or an open circuit was detected at the sensor input X8/pin 5, pin8.

Remedy:

- Check connecting cables of the thermal sensor for short-circuit or open circuit.

Features:

- LECOM no.: 86, 2086
- Reaction: TRIP, WARNING or OFF



7.6.6 Monitoring functions of the controller

7.6.6.1 Short-circuit monitoring (OC1)

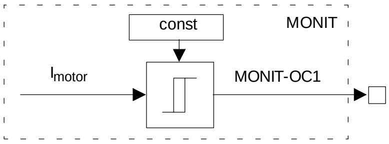


Fig. 7-167 Short-circuit monitoring (OC1)

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 can also react if an **earth fault** has been detected.

Remedy:

- Disconnect controller from the mains and eliminate short-circuit

Features:

- LECOM no.: 11
- Reaction: TRIP (cannot be modified)

7.6.6.2 Earth-fault monitoring (OC2)

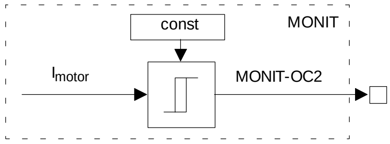


Fig. 7-168 Earth-fault monitoring (OC2)

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.

Possible earth fault causes:

- Short-circuit to frame of the machine
- Short-circuit of a phase to the screen
- Short-circuit of a phase to PE

Remedy:

- Disconnect controller from the mains and eliminate earth-fault

Features:

- LECOM no.: 12
- Reaction: TRIP (cannot be modified)

7.6.6.3 Monitoring of overload during acceleration and deceleration (OC3)

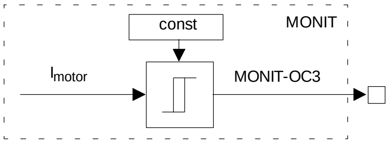


Fig. 7-169 Overload during acceleration or deceleration OC3

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
I_{MOTOR}	-	-	-	-	-	-	-
MONIT-OC3	d	-	-	-	-	-	-

Function

The motor current has reached non-permissible values caused by dynamic acceleration or deceleration. For safety reasons the operation is interrupted.

Remedy:

- Reduce acceleration of the drive (increase acceleration and deceleration times)
- Reduce dynamic load of the controller

Features:

- LECOM no.: 13
- Reaction: TRIP (cannot be modified)

7.6.6.4 Monitoring of the I x t overload (OC5)

The output current of the controller is monitored.

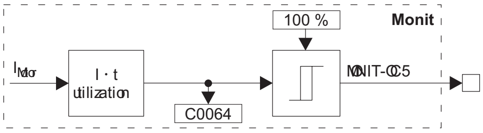


Fig. 7-170 Monitoring of the I x t overload (OC5)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
I_{MOTOR}	-	C0064	dec [%]	-	-	-	-
MONIT-OC5	d	-	-	-	-	-	-

Function

The controller load results from the average value of the motor current over a time of 180 s. A 100% load is obtained when the controller supplies the rated output current of I_{r8} with 150% overload capacity and a chopping frequency of f_{chop} = 8 kHz. C0064 shows the momentary load.

When the controller load exceeds 100%, the monitoring reacts.

Remedy:

- You can ignore the fault indication when the controller has been dimensioned for 120% overload capacity (operation at 3 AC / 400V).
- Reduce controller load

Features:

- LECOM no.: 2015
- Reaction: WARNING

Tip!

Automatic reactions for permanent overload:

- The chopping frequency is reduced, when C0018 = 0 or C0018 = 6 (🕮 7-138 or 7-148)
- and/or the output current is reduced.

7.6.6.5 Monitoring of the heat sink temperature, with fixed threshold (OH)

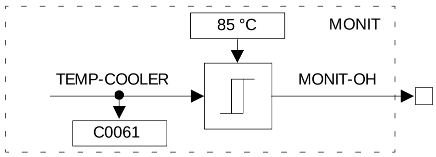


Fig. 7-171 Monitoring of the heat sink temperature, with fixed threshold (OH)

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 threshold is 85 °C and is fixed. The hysteresis is also fixed and amounts to 5K, i.e. the reclosing point is 80 °C.

Tripping can have the following causes:

- The ambient temperature is too high.
  Remedy:
  – Install a blower 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

Features:

- LECOM no.: 50
- Reaction: TRIP (cannot be modified)

7.6.6.6 Monitoring of the heat sink temperature, with adjustable threshold (OH4)

The 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, blowers which would cause an unacceptable noise in continuous operation, can also be triggered.

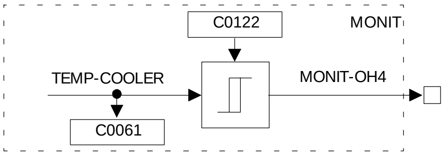


Fig. 7-172 Monitoring of the heat sink temperature, with adjustable threshold (OH4)

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 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

7.6.6.7 Low voltage monitoring in the DC bus (LU)

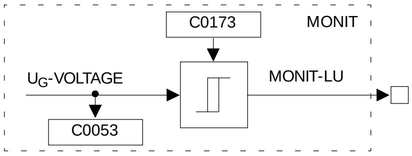


Fig. 7-173 Low voltage monitoring in the DC bus (LU)

Signal				Source			Note
Name	Type	DIS	DIS format	CFG	List	Lenze	
U_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 reacts if the DC bus voltage (terminals $+U_G$und $-U_G$) falls below the threshold LU which was 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)

7.6.6.8 Monitoring of overvoltage in the DC bus (OU)

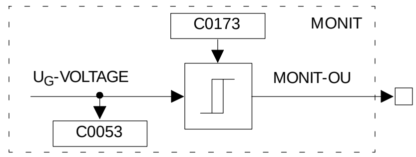


Fig. 7-174 Monitoring of overvoltage in the DC bus (OU)

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 reacts if the DC bus voltage (terminals $+U_G$und $-U_G$) exceeds the threshold OU which was set under code 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).

A frequent overvoltage message indicates an incorrect dimensioning of the drive. This means that the brake 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.

Features:

- LECOM no.: 1020
- Reaction: MESSAGE (cannot be modified)

7.6.7 Fault display via digital output

You can assign the fault indications TRIP, message, and warning in the function block DIGOUT to digital outputs (e.g. the terminals X5/A1...0 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 DCTRL-TRIP or DCTRL-MESS or DCTRL-WARN in the parameter level.

Display TRIP, Message, Warning collectively (collective indication):

1. Assign DCTRL-TRIP, DCTRL-MESS and DCTRL-WARN to an OR element.
2. Select digital output in the code level under C0117 and subcode.
3. Assign output of the OR element (ORx-OUT) 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).

Show/Hide Bookmarks

EDS9300U--VD 5.2
00416043

Lenze

Manual
Part D5.2

Code table

Selection list

Table of attributes

Global Drive

Frequency inverter
9300 vector control

This documentation is valid for controller types 9300 vector control as from the version

33.93XX - EV 3x 2x (9321 - 9333)

Code	Explanation
33.93XX	Type
E	Design: E = Enclosure IP20
3x	Hardware level and index
2x	Software level and index
(9321 - 9333)	Explanation

Version 2.0 07/00

Contents

Part D5.2

Contents

7.7 Code table

How to read the code table:

Row	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		LCD display of the operating module
Lenze		Factory setting of the code
	→	The row "Important" contains further information
Selection	1 {1 %} 99	Minimum value {smallest step/unit} maximum value
Info	-	Meaning of the code
IMPORTANT	-	Additional, important explanation of the code

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0002	Par load	0	0 Load default	Load factory setting into RAM	Load parameter set
			1 Load PS1 2 Load PS2 3 Load PS3 4 Load PS4	Load parameter set x into the RAM and activate	• Parameter set 1 is loaded automatically after every mains connection.
			11 Load ext PS1 12 Load ext PS2 13 Load ext PS3 14 Load ext PS4	Load parameter set x from the operating module into the RAM and activate	
			20 ext -> EEPROM	Transmit all parameter sets from the operating module to the controller and store non-volatile	
C0003	Par save	0	0 Ready	Saving completed	Save parameter set
			1 Save PS1 2 Save PS2 3 Save PS3 4 Save PS4	Non-volatile save of current parameter set x	
			11 Save extern	Save all parameter sets to the operating module	
C0004	Op-display	56	All available codes	Operating display	Operating module shows selected code in the operating level, if no other status indications of C0183 are active.

Configuration

Code	Name	Possible settings				IMPORTANT
		Lenze	Selection		Info	
[C0005]	Signal CFG	1000			Signal configuration (predefined basic configurations)	
			0000	Common	Modified basic configuration	
			0100	CFG:empty	All internal connections are removed	
			10xx 11xx 12xx 13xx 14xx 15xx	Speed mode Speed 100 Speed 200 Speed 300 Speed 400 Speed 500	Speed control	The **first** digit indicates the predefined basic function • 1xxx: Speed control • 2xxx: Step control • 3xxx: Traversing control • 4xxx: Torque control • 5xxx: Digital frequency - master • 6xxx: Digital frequency - slave (bus) • 7xxx: Digital frequency - slave (cascade) • 8xxx: Dancer control (external diameter detection) • 9xxx: Dancer control (internal diameter detection) The **second** digit indicates additional functions • x0xx: No additional function • x1xx: Brake control • x2xx: Setpoint input via motor potentiometer • x3xx: PID controller • x4xx: Mains failure control • x5xx: Setpoint input via digital frequency • x6xx: Gearbox factor Analog trimming • x7xx: Gearbox factor Digital trimming • x8xx: Digital frequency ramp generator 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: Control terminals • xxx1: RS232, RS485, Fibre optics • xxx3: INTERBUS or PROFIBUS-DP • xxx5: System bus (CAN)
			20xx 21xx 25xx	Step mode Step 100 Step 500	Step control	
			30xx 35xx	Leadscrew Lead 500	Traversing control	
			40xx 41xx 45xx	Torque mode Torque 100 Torque 500	Torque control with speed limiting	
			50xx 51xx 52xx 54xx 55xx 56xx 57xx	DF mst DF mst 100 DF mst 200 DF mst 400 DF mst 500 DF mst 600 DF mst 700	Master for digital frequency coupling	
			60xx 63xx 66xx 67xx 68xx	DF slv bus DF slv bus 300 DF slv bus 600 DF slv bus 700 DF slv bus 800	Slave to digital frequency bus	
			70xx 76xx 77xx	DF slv cas DF slv cas 600 DF slv cas 700	Slave to digital frequency cascade	
			80xx	Dancer ctrl extern	Dancer position control (external diameter detection)	
			90xx	Dancer ctrl intern	Dancer position control (internal diameter detection)	

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
[C0006]	Op mode	5		Operating mode of motor control	
			1 vector ctrl	Sensorless control	
			5 V/f	V/f characteristic with constant U_{min} boost	
C0009	LECOM address	1	1 {1} 99	Controller address	Bus device number when operated via interface ● 10, 20, ..., 90 reserved for broadcast to device groups for RS232, RS485, fibre optics.
C0010	Nmin	0	0 {1 rpm} 36000	Minimum speed ● C0059 must be set correctly ● C0010 < C0011 ● only for analog setpoint input via AIN1	Reference values for the absolute and relative setpoint selection, for the acceleration and deceleration times ● For parameterization via interface: Large changes in one step should only be made when the controller is inhibited.
C0011	Nmax	3000	0 {1 rpm} 36000	Maximum speed	
C0012	Tir (acc)	5.00	0.00 {0.01 sec} 9999.90	Acceleration time T_{ir} for the main setpoint of NSET	Related to the speed change 0...$n_{Max.}$
C0013	Tif (dec)	5.00	0.00 {0.01 sec} 9999.90	Deceleration time T_{if} for the main setpoint of NSET	Related to the speed change 0...$n_{Max.}$
C0014	V/f charact.	0	0 linear	Linear V/f characteristic	
			1 square-law	Square-law V/f characteristic	
C0015	Rated freq	50	0 {1 Hz} 5000		Identical to C0089
C0016	FCODE V boost	0.00	0.00 {0.01 %} 100.00	Freely assignable code for relative analog signals	Voltage boost
C0017	FCODE (Qmin)	50	-36000 {1 rpm} 36000	Switching threshold $n_{act} < n_x$	n_{act} < C0017 activates the comparator output CMP1-OUT
C0018	fchop	6	0 16/8/2 kHz sin	Optimum noise reduction with automatic changeover to lower chopping frequencies	Observe derating indications for high chopping frequencies
			1 2 kHz sin	Operation with optimum power	
			2 4 kHz f_top	Operation with optimum power	
			3 8 kHZ f_top	Operation with optimum power	
			4 8 kHz sin	Operation with optimum power	
			5 16 kHz sin	Operation with optimum noise reduction	
			6 8/2 kHz sin	Optimum power reduction with automatic changeover to lower chopping frequencies	
C0019	Thresh nact=0	0	-36000 {1 rpm} 36000	Threshold when n_{act} = 0 is recognized.	Going below this threshold releases the automatic DC injection braking, when the holding time under C0107 > 0
C0020	turn value	100	0 {1 %} 200	Smooth running of the motor	Manual influence on the smooth running of the motor
C0021	Slipcomp	→	-20.00 {0.01 %} 20.00	Slip compensation	→ Change of C0087 or C0089 sets C0021 to the calculated rated motor slip
C0022	I_{max} current	→	0 {0.01 A} 500.00	I_{max}- limit in the motor mode	→ depending on C0086 ● Input of the maximum motor current
C0023	I_{max} gen.	→	0 {0.01 A} 500.00	I_{max}- limit in the generator mode	→ depending on C0086 ● Input of the maximum generator current

Configuration

Code	Name	Possible settings					IMPORTANT
		Lenze	Selection			Info	
[C0025]	Feedback type	1				Selection of the feedback system	• Use only incremental encoder with 5 V TTL-level on X8 • Use only incremental encoder with HTL-level on X9
			1	no feedback		no feedback (sensorless control)	
			100	IT (C420) - X8		Incremental encoder on X8, and setting of no. of increments through C0420	
			101	IT (C420) - X9		Incremental encoder on X9, and setting of no. of increments through C0420	
			110 111 112 113	IT-512-5V IT-1024-5V IT-2048-5V IT-4096-5V		Incremental encoder on X8, with selection of following no. of increments: 110 = 512 111 = 1024 112 = 2048 113 = 4096	
C0026						Freely assignable code for relative analog signals	Used for:
1	FCODE (offset)	0.00	-199.99	{0.01 %}	199.99		Offset for terminal X6/1,2
2	FCODE (offset)	0.00					Offset for terminal X6/3,4
C0027						Freely assignable code for relative analog signals	Used for:
1	FCODE (gain)	100.00	-199.99	{0.01 %}	199.99		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		Constant for the digital frequency output in increments per turn	
C0032	FCODE Gearbox	1	-32767	{1}	32767	Freely assignable code	Used for: Gearbox factor numerator
C0033	Gearbox denom	1	1	{1}	32767	Gearbox factor (denominator) for DFSET	
C0034	Mst current	0	0 1 2	-10 V ... +10 V +4 mA ... +20 mA -20 mA ... +20 mA		Selection: Master voltage/master current for setpoint input	
C0036	DC brk value	0.00	0.00	{0.01 A}	500.00	Brake current	
C0037	Set-value rpm	0	-36000	{1 rpm}	36000	Setpoint input in rpm	
C0038						Functions of FB NLIM1	Input of speed ranges which can only be used dynamically Suppresses a static behaviour in an impermissible range
1	N 1 start	0	0	{1 rpm}	36000		
2	N 1 stop	0					
3	N 2 start	0					
4	N 2 stop	0					
5	N 3 start	0					
6	N 3 stop	0					
C0039						Fixed speeds (JOG setpoints) can be selected for NSET using digital inputs	
1	JOG setpoint	1500	-36000	{1 rpm}	36000		
2	JOG setpoint	1000					
3	JOG setpoint	500					
4	JOG setpoint	200					
5	JOG setpoint	100					
6	JOG setpoint	50					
7	JOG setpoint	0					
8	JOG setpoint	0					
9	JOG setpoint	0					
...	...	...					
14	JOG setpoint	0					
15	JOG setpoint	0					

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0040	Ctrl enable	0	0 Ctrl inhibit 1 Ctrl enable	Controller inhibit	• Write: – controls the code • Read: – reads the controller status
C0042	DIS: QSP		0 QSP inactive 1 QSP active	Quick stop status	display only
C0043	Trip reset	0	0 no/trip reset 1 trip active	reset current trip Active trip	Reset of an active trip: • Set C0043 = 0
C0045	DIS: act JOG		0 Nset active 1 JOG 1 2 JOG 2 ... 15 JOG 15	Active JOG setpoint	display only
C0046	DIS: N		-199.99 {0.01 %} 199.99	Main setpoint	display only
C0049	DIS: NADD		-199.99 {0.01 %} 199.99	Additional setpoint	display only
C0050	MCTRL-NSET2		-100.00 {0.01 %} 100.00	n_{set} at the speed controller input	display only
C0051	MCTRL-NACT		-36000 {1 rpm} 36000	Actual speed	display only
C0052	MCTRL-Umot		0 {1 V} 800	Actual motor voltage	display only
C0053	UG-VOLTAGE		0 {1 V} 900	DC bus voltage	display only
C0054	IMot		0.0 {0.1 A} 500.0	Actual motor current	display only
C0056	MCTRL-MSET2		-100 {1 %} 100	Torque setpoint (output of the speed controller)	display only
C0057	Max Torque		0 {1 Nm} 500	Maximum possible torque of the drive configuration	display only • depending on C0022, C0086
C0058	MCTRL-FACT	0.0	-600.0 {0.1 Hz} 600.0	Frequency at the inverter output	display only
C0059	Mot pole no.		1 {1} 50	Pole pair number of the motor	display only
C0061	Heatsink temp		0 {1 °C} 100	Heatsink temperature	display only
C0063	Mot temp		0 {1 °C} 200	Motor temperature	display only
C0064	Utilization		0 {1 %} 150	Controller load I x t during the last 180 sec	display only • C0064 > 100 % releases OC5 warning • C0064 > 140 % limits the output current to the rated controller current
C0067	Act trip		see selection list 10 All fault indications	Present fault indication	display only
C0070	Vp speed-CTRL	10	0.0 {0.1} 255.9	V_{pn} speed controller	
C0071	Tn speed-CTRL	50	1 {1 msec} 6000 6000 msec = switched off	T_{nn} speed controller	
C0074	value N	10.00	0.00 {0.01 %} 100.00	max. setpoint difference in percent	Limitation of the speed controller influence in feedback operation
C0075	Vp curr-CTRL	0.20	0.00 {0.01} 0.99	V_{pi} Current controller	• V_{pi} current controller for vector control • Maximum current controller for V/f characteristic control
C0076	Tn curr-CTRL	10.0	0.1 {0.1 msec} 2000.0 2000 ms switched off	T_{ni} Current controller	• T_{ni} current controller for vector control • Maximum current controller for V/f characteristic control
C0077	Ti field-CTRL	4.0	0.3 {0.1 msec} 5000.0	T_i Field controller	

Configuration

Code	Name	Possible settings					IMPORTANT
		Lenze	Selection			Info	
C0078	Tn slip-CTRL	100	1	{1 msec}	6000	T_n slip controller	• Filter time for slip compensation (C0021) • only for V/f characteristic control (C0006 = 5)
[C0081]	Mot power	→ 0.80	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
[C0082]	Mot Rr	→	0.000	{0.001 Ω}	65.000	Motor rotor resistance	→ Value is obtained after motor identification (C0148)
[C0084]	Mot Rs	→	0.00	{0.01 mΩ}	100000.00	Motor stator resistance	
[C0085]	Mot Lss	→	0.0	{0.1 mH}	6500.0	Motor leakage inductance	
[C0086]	Mot type	→				Selection motor type	→ depending on the controller • Change of C0086 resets C0022, C0081, C0087, C0088, C0089, C0090, C0091 to the assigned factory setting
			0	COMMON		no Lenze motor	
			9	DSGA056-22-100		SDSGAXX056-22, f_r : 100 Hz	Lenze asynchronous servo motors with integrated temperature monitoring via incremental encoder feedback
			10	MDSKA56-140		MDSKAXX056-22, f_r : 140 Hz	
			11	MDFKA71-120		MDFKAXX071-22, f_r : 120 Hz	
			12	MDSKA71-140		MDSKAXX071-22, f_r : 140 Hz	
			13	MDFKA80-60		MDFKAXX080-22, f_r : 60 Hz	
			14	MDSKA80-70		MDSKAXX080-22, f_r : 70 Hz	
			15	MDFKA80-120		MDFKAXX080-22, f_r : 120 Hz	
			16	MDSKA80-140		MDSKAXX080-22, f_r : 140 Hz	
			17	MDFKA90-60		MDFKAXX090-22, f_r : 60 Hz	
			18	MDSKA90-80		MDSKAXX090-22, f_r : 80 Hz	
			19	MDFKA90-120		MDFKAXX090-22, f_r : 120 Hz	
			20	MDSKA90-140		MDSKAXX090-22, f_r : 140 Hz	
			21	MDFKA100-60		MDFKAXX100-22, f_r : 60 Hz	
			22	MDSKA100-80		MDSKAXX100-22, f_r : 80 Hz	
			23	MDFKA100-120		MDFKAXX100-22, f_r : 120 Hz	
			24	MDSKA100-140		MDSKAXX100-22, f_r : 140 Hz	
			25	MDFKA112-60		MDFKAXX112-22, f_r : 60 Hz	
			26	MDSKA112-85		MDSKAXX112-22, f_r : 85 Hz	
			27	MDFKA112-120		MDFKAXX112-22, f_r : 120 Hz	
			28	MDSKA112-140		MDSKAXX112-22, f_r : 140 Hz	
			30	MDFQA-100-50		MDFQAXX100, f_r : 50 Hz	Lenze asynchronous servo motors in star connection with integrated temperature monitoring via thermostat
			31	MDFQA-100-100		MDFQAXX100, f_r : 100 Hz	
			32	MDFQA-112-28		MDFQAXX112, f_r : 28 Hz	
			33	MDFQA-112-58		MDFQAXX112, f_r : 58 Hz	
			34	MDFQA-132-20		MDFQAXX132, f_r : 20 Hz	
			35	MDFQA-132-42		MDFQAXX132, f_r : 42 Hz	
			40	MDFQA-112-50		MDFQAXX112, f_r : 50 Hz	Lenze asynchronous servo motors in Δ connection with integrated temperature monitoring via incremental encoder feedback
			41	MDFQA-112-100		MDFQAXX100, f_r : 100 Hz	
			42	MDFQA-132-36		MDFQAXX036, f_r : 36 Hz	
			43	MDFQA-132-76		MDFQAXX076, f_r : 76 Hz	

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
[C0086]	Mot type		210 DXRA071-12-50	DXRAXX071-12, f_d: 50 Hz	Lenze inverter motor in star connection
			211 DXRA071-22-50	DXRAXX071-22, f_d: 50 Hz	
			212 DXRA080-12-50	DXRAXX080-12, f_d: 50 Hz	
			214 DXRA090-12-50	DXRAXX090-12, f_d: 50 Hz	
			215 DXRA090-32-50	DXRAXX090-32, f_d: 50 Hz	
			216 DXRA100-22-50	DXRAXX100-22, f_d: 50 Hz	
			217 DXRA100-32-50	DXRAXX100-32, f_d: 50 Hz	
			218 DXRA112-12-50	DXRAXX112-12, f_d: 50 Hz	
			219 DXRA132-12-50	DXRAXX132-12, f_d: 50 Hz	
			220 DXRA132-22-50	DXRAXX132-22, f_d: 50 Hz	
			221 DXRA160-12-50	DXRAXX160-12, f_d: 50 Hz	
			222 DXRA160-22-50	DXRAXX160-22, f_d: 50 Hz	
			223 DXRA180-12-50	DXRAXX180-12, f_d: 50 Hz	
			224 DXRA180-22-50	DXRAXX180-22, f_d: 50 Hz	
			250 DXRA071-12-87	DXRAXX071-12, f_d: 87 Hz	Lenze inverter motor in **D** connection
			251 DXRA071-22-87	DXRAXX071-22, f_d: 87 Hz	
			252 DXRA080-12-87	DXRAXX080-12, f_d: 87 Hz	
			254 DXRA090-12-87	DXRAXX090-12, f_d: 87 Hz	
			255 DXRA090-32-87	DXRAXX090-32, f_d: 87 Hz	
			256 DXRA100-22-87	DXRAXX100-22, f_d: 87 Hz	
			257 DXRA100-32-87	DXRAXX100-32, f_d: 87 Hz	
			258 DXRA112-12-87	DXRAXX112-12, f_d: 87 Hz	
			259 DXRA132-12-87	DXRAXX132-12, f_d: 87 Hz	
			260 DXRA132-22-87	DXRAXX132-22, f_d: 87 Hz	
			261 DXRA160-12-87	DXRAXX160-12, f_d: 87 Hz	
			262 DXRA160-22-87	DXRAXX160-22, f_d: 87 Hz	
			263 DXRA180-12-87	DXRAXX180-12, f_d: 87 Hz	
			264 DXRA180-22-87	DXRAXX180-22, f_d: 87 Hz	
			410 DXMA071-12-50	DXMAXX071-12, f_d: 50 Hz	Lenze asynchronous gearbox motor in star connection with integrated temperature monitoring via thermostat
			411 DXMA071-32-50	DXMAXX071-32, f_d: 50 Hz	
			412 DXMA080-12-50	DXMAXX080-12, f_d: 50 Hz	
			413 DXMA080-32-50	DXMAXX080-32, f_d: 50 Hz	
			414 DXMA090-12-50	DXMAXX090-12, f_d: 50 Hz	
			415 DXMA090-32-50	DXMAXX090-32, f_d: 50 Hz	
			416 DXMA100-12-50	DXMAXX100-12, f_d: 50 Hz	
			417 DXMA100-32-50	DXMAXX100-32, f_d: 50 Hz	
			418 DXMA112-32-50	DXMAXX112-32, f_d: 50 Hz	
			440 DXMA071-12-87	DXMAXX071-12, f_d: 87 Hz	Lenze asynchronous gearbox motor in **D** connection with integrated temperature monitoring via thermal contact
			441 DXMA071-32-87	DXMAXX071-32, f_d: 87 Hz	
			442 DXMA080-12-87	DXMAXX080-12, f_d: 87 Hz	
			443 DXMA080-32-87	DXMAXX080-32, f_d: 87 Hz	
			444 DXMA090-12-87	DXMAXX090-12, f_d: 87 Hz	
			445 DXMA090-32-87	DXMAXX090-32, f_d: 87 Hz	
			446 DXMA100-12-87	DXMAXX100-12, f_d: 87 Hz	
			447 DXMA100-32-87	DXMAXX100-32, f_d: 87 Hz	
			448 DXMA112-22-87	DXMAXX112-22, f_d: 87 Hz	
			449 DXMA112-32-50	DXMAXX112-32, f_d: 50 Hz	
			450 DXMA132-22-50	DXMAXX132-22, f_d: 50 Hz	
			451 DXMA132-32-50	DXMAXX132-32, f_d: 50 Hz	
[C0087]	Mot speed	→	50 {1 rpm} 36000	Rated motor speed	→ depending on C0086 • Change of C0086 resets value to the assigned default setting • Change of C0087 sets C0086 = 0
[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 • Change of C0088 sets C0086 = 0
[C0089]	Mot frequency	→ 50	10 {1 Hz} 5000	Rated motor frequency	→ depending on C0086 • Change of C0086 resets value to the assigned default setting • Change of C0089 sets C0086 = 0

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
[C0090]	Mot voltage	→ 400	0 {1 V} 1000	Rated motor voltage	→ depending on C0086 • Change of C0086 resets value to the assigned default setting • Change of C0090 sets C0086 = 0
[C0091]	Mot cos-phi (p.f.)	→	0.50 {0.01} 1.00	Motor cos φ	→ depending on C0086 • Change of C0086 resets value to the assigned default setting • Change of C0091 sets C0086 = 0
C0092	Mot LS	→	0.0 {0.1 mH} 6500.0	Motor stator inductance	→ Value is obtained after motor identification (C0148)
C0093	Drive ident		 0 invalid 1 none 93xx 9321 VC	Controller identification Lenze frequency inverter type 93XX Vector Control	display only
C0094	PASSWORD	0	0 {1} 9999		
[C0096] 1 2	 AIF protect CAN protect	 0 0	0 no password protection 1 Read protection 2 Write protection 3 Read/Write protection	extended password protection	SUB1: Fieldbus (AIF) SUB2: System bus (CAN)
C0099	S/W version		x.xx	Software version	display only
C0101 1 2 ... 15	 add Tir add Tir ... add Tir	 0.00 0.00 ... 0.00	 0.00 {0.01 sec} 9999.90	Additional acceleration times T_{ir} for the main setpoint of NSET	Related to the speed change 0...$n_{Max.}$
C0103 1 2 ... 15	 add Tif add Tif ... add Tif	 0.00 0.00 ... 0.00	 0.00 {0.01 sec} 9999.90	Additional deceleration times T_{if} for the main setpoint of NSET	Related to the speed change 0...$n_{Max.}$
C0104	Select acc	0	0 a=const 1 t=const 2 s=const	constant acceleration constant time constant distance	Selection of the acceleration and deceleration time reference for RFG = 0 or from RSP
C0105	QSP Tif	5.00	0.00 {0.01 sec} 9999.90	Deceleration time for quick stop (QSP)	Related to the speed change 0...$n_{Max.}$
C0107	Holding time	0.00	0.00 {0.01 sec} 9999.90	Holding time for automatic DC injection braking	
C0108 1 2	 FCODE (gain) FCODE (gain)	 100.00 100.00	 -199.99 {0.01 %} 199.99	Freely assignable code for relative analog signals	
C0109 1 2	 FCODE (offset) FCODE (offset)	 0.00 0.00	 -199.99 {0.01 %} 199.99	Freely assignable code for relative analog signals	
C0114 1 2 3 4 5 6	 DIGIN pol DIGIN pol DIGIN pol DIGIN pol DIGIN pol DIGIN pol	 0 0 0 1 0 0	 0 HIGH active 1 LOW active	Terminal polarity X5/E1 X5/E2 X5/E3 X5/E4 X5/E5 X5/E6 (ST)	
[C0116] 1 2 ... 31 32	 CFG: FDO CFG: FDO ... CFG: FDO CFG: FDO	 1000 1000 ... 1000 1000	see selection list 2 FIXED 0 FIXED 0 ... FIXED 0 FIXED 0	Signal configuration FDO FDO 0 FDO 1 ... FDO 30 FDO 31	Free digital outputs can only be evaluated when networked with automation interfaces.

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
[C0117] 1 2 3 4	 CFG: DIGOUT CFG: DIGOUT CFG: DIGOUT CFG: DIGOUT	→ 15000 10650 500 5003	see selection list 2 DCTRL-TRIP CMP1-OUT DCTRL-RDY MCTRL-MMAX	Signal configuration DIGOUT X5/A1 X5/A2 X5/A3 X5/A4	→ depending on C0005
C0118 1 2 3 4	 DIGOUT pol DIGOUT pol DIGOUT pol DIGOUT pol	 1 1 0 0	 0 High active 1 Low active	Terminal polarity DIGOUT X5/A1 X5/A2 X5/A3 X5/A4	
C0121	OH7 limit	150	45 {1 °C} 150	Temperature threshold for early-warning motor temperature (OH7 fault)	
C0122	OH4 limit	85	45 {1 °C} 95	Temperature threshold for warning heat sink temperature (fault OH4)	
C0125	Baud rate	0	0 9600 baud 1 4800 baud 2 2400 baud 3 1200 baud 4 19200 baud	LECOM baud rate for 2102 module	
C0126	MONIT CE0	3	0 Trip 2 Warning 3 Off	Configuration monitoring: communication error with automation interface CE0	
C0130	DIS: act Ti		 0 C12/C13 1 Ti 1 2 Ti 2 ... 14 Ti 14 15 Ti 15	active $T_i$times of NSET C0012/C0013 active T_{ir1}/T_{if1} active T_{ir2}/T_{if2} active ... T_{ir14}/T_{if14} active T_{ir15}/T_{if15} active	display only
C0134	RFG charac	0	0 linear 1 S-shaped	linear S-shaped	Ramp characteristic for main setpoint
C0135	Control word		0 {1} 65535	Control word when networked with automation interfaces	Decimal control word • Device evaluates information 16 bit, binary coded
C0136 1 2 3	 DIS: CTRLWORD DIS: CTRLWORD DIS: CTRLWORD			 Control word in DCTRL Control word in CAN-IN1 Control word in AIF-IN	display only
C0141	FCODE (setval)	0.00	-199.99 {0.01 %} 199.99	Freely assignable code for relative analog signals	used as main setpoint in the configurations C0005 = xxx1
C0142	Start options	1	 0 Start lock 1 Auto start 2 flying lock 3 Flying restart	Start options 0 = Start protection 1 = Automatic start 2 = Flying restart circuit 3 = Flying restart circuit active during start	are executed: • after mains connection • after message (t > 0.5s) • after trip
C0143	limit 2 kHz	0.0	0.0 {0.1 Hz} 20.0	Switching threshold 2 kHz, depending on the rotary field	The controller changes automatically to 2 kHz when this value falls below the threshold
C0144	OH switch	1	0 Switch off 1 Switch on	Switching threshold 2 kHz, temperature-dependent Ref: C0122	When the OH4 threshold is reached, the controller switches automatically to 2 kHz
C0145	select ref	1	 0 REF: C0011 1 REF: N-ACT 2 REF: N-SET		Reference for flying restart start value during searching

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0146	flying restart current	0	-500 {1} 500		Influences the current during the flying restart
C0147	fly dt-f	0	-82 {1} 82		Frequency steps during the flying restart
C0148	ident run	0	 0 WRK stop 1 WRK run	Motor identification 0 = Stop 1 = Start	Identification when the motor is at standstill
C0149	Auto ident	0	 0 Id inactive 1 Id active	Auto-Ident 0 = inactive 1 = active	starts the motor-identification automatically after enabling the controller, and stores the values that are detected in parameter set 1
C0150	Status word		0 {1} 65535	Status word when networked with automation interfaces	Decimal status word • display only • binary interpretation returns bit-states
C0151	DIS: FDO (DW)		output signals configured with C0116	Hexadecimal signal assignment of the free digital outputs.	• display only • binary interpretation returns bit-states
C0155	Status word 2		0 {1} 65535	Status word 2	Extended decimal status word • display only • binary interpretation returns bit-states
[C0156] 1 2 3 4 5 6 7	 CFG: STAT.B0 CFG: STAT.B2 CFG: STAT.B3 CFG: STAT.B4 CFG: STAT.B5 CFG: STAT.B14 CFG: STAT.B15	 2000 5002 5003 5050 10650 505 500	see selection list 2 DCTRL-PAR*1-O MCTRL-IMAX MCTRL-MMAX NSET-RFG I=O CMP1-OUT DCTRL-CW/CCW DCTRL-RDY	Configuration of the free bits of the status word	
C0157 1 2 3 4 5 6 7	 DIS: STAT.B0 DIS: STAT.B2 DIS: STAT.B3 DIS: STAT.B4 DIS: STAT.B5 DIS: STAT.B14 DIS: STAT.B15		 0 1	Status of the free bits of the status word	display only
C0161	Act trip		see selection list 10 All fault indications (see chapter LEERER MERKER)	Present fault indication (as under C0168/1)	display only
C0167	Reset failmem	0	0 No reset 1 Reset	 Clears the history buffer	
C0168 1 2 3 4 5 6 7 8	 Fail no. act Fail no. old1 Fail no. old2 Fail no. old3 Fail no. old4 Fail no. old5 Fail no. old6 Fail no. old7		see selection list 10 All fault indications (see chapter LEERER MERKER)	Faults occurred now active last last but one last but two last but three last but four last but five last but six	History buffer • List of fault occurred • display only
C0169 1 2 3 4 5 6 7 8	 Failtime act Failtime old1 Failtime old2 Failtime old3 Failtime old4 Failtime old5 Failtime old6 Failtime old7		corresponding mains switch-on time	Occurrence of the faults now active last last but one last but two last but three last but four last but five last but six	History buffer • List of times when the faults have occurred under C0168 • related to C0179 • display only

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0170 1 2 3 4 5 6 7 8	 Counter act Counter old1 Counter old2 Counter old3 Counter old4 Counter old5 Counter old6 Counter old7			Fault frequency now active last last but one last but two last but three last but four last but five last but six	History buffer • List of how often the faults have occurred consecutively under C0168 • display only
[C0173]	UG limit	1		Adaptation of DC-bus voltage thresholds	• 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	
C0178	Op timer	0	0 {1 sec} 4294967295	Elapsed operating time meter	Time when the controller was enabled
C0179	Mains timer	0	0 {1 sec} 4294967295	Mains switch-on time meter	Time when the mains was switched on
C0182	Ti S-shaped	20.00	0.01 sec {0.01 sec} 50.00 sec	T_i time of the S-shaped ramp generator for NSET	Determines the S-shape • low values ⇒ small S rounding • high values ⇒ large S rounding
C0183	Diagnostics		 0 OK 101 Init 102 Trip 103 RFG P-OFF 104 IMP Message 105 Power off 111 BSP C135 112 BSP AIF 113 BSP CAN 121 CINH term 28 122 CINH int 1 123 CINH int 2 124 CINH C135/STP 125 CINH AIF 126 CINH CAN 141 Lock mode 142 IMP 151 QSP ext term 152 QSP C135/STP 153 QSP AIF 154 QSP CAN 161 DC brk extern 162 Dc brk C135 163 DC brk AIF 164 DC brk CAN 170 Ident run 250 Warning	Drive diagnostics No fault Initialization phase TRIP active Emergency stop was released Message active Operation inhibited Controller inhibited via X5/28 DCTRL-CINH1 DCTRL-CINH2 STOP key of 9371BB Controller inhibited via AIF Controller inhibited via CAN Restart protection active Power outputs with high resistance QSP via MCTRL-QSP QSP via STOP key QSP via AIF QSP via CAN DC injection braking via terminal DC injection braking via C0135 DC injection braking via AIF DC injection braking via CAN Motor identification active Warning active	• display only • indicates fault or status information • if several items or fault or status information are to be shown, the information with the smallest number is displayed

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0190	NSET arit	0	0 OUT = C46 1 C46 + C49 2 C46 - C49 3 C46 * C49 4 C46 / C49 5 C46/(100 - C49)	Arithmetics block in the function block NSET	Connects main setpoint C0046 and additional setpoint C0049
C0195	BRK T act	99.9	0.0 {0.1 sec} 99.9 99.9 sec = infinite	Brake engaging time	Engaging time of the mechanical holding brake (see technical data of the brake). • after the time elapsed under C0195, the status "mechanical brake closed" is reached
C0196	BRK T release	0.0	0.0 {0.1 sec} 60.0	Brake disengaging time	Disengaging time of the mechanical holding brake (see technical data of the brake). • After time has elapsed under C0195, the status "mechanical brake closed" is reached
C0200	S/W Id			Software identification	display only
C0201	S/W date			Software release date	display only
C0203	Comm. no.		x / xxxx / xxxxx	Commission number	display only
C0204	Serial-No.		0 {1} 65535	Serial number	display only
C0206	Product date			Production date	display only
C0207	DL info 1			Download-Info 1	display only
C0208	DL info 2			Download-Info 2	display only
C0209	DL info 3			Download-Info 3	display only
C0220	NSET Tir add	2.00	0.00 {0.01 sec} 9999.90	Acceleration time T_{ir} of the additional setpoint for NSET	Related to the speed change 0...$n_{Max.}$
C0221	NSET Tif add	2.00	0.00 {0.01 sec} 9999.90	Deceleration time T_{if} of the additional setpoint for NSET	Related to the speed change 0...$n_{Max.}$
C0222	PCTRL1 Vp	1.0	0.1 {0.1} 500.0	Gain V_p of PCTRL1	
C0223	PCTRL1 Tn	400	20 {1 msec} 99999 99999 msec = switched off	Adjustment time T_n of PCTRL1	
C0224	PCTRL1 Kd	0.0	0.0 {0.1} 5.0	Differential component K_d of PCTRL1	
C0234	damp value	20	-100 {1 %} 100	Oscillation damping, limitation of the difference	Influences the oscillation tendency of the drive
C0235	damping	5	1 {1 msec} 600	Filter time of the active current (oscillation damping)	Influences the oscillation tendency of the drive
C0236	damp limit	0.2	0.0 {0.1 Hz} 20.0	max. influence of the oscillation damping	Influences the oscillation tendency of the drive
C0241	CMP RFG I = O	1.00	0.00 {0.01 %} 100.00 100 % = n_{max}	Threshold ramp generator for main setpoint Input = output	
C0244	BRK M set	0.00	0.00 {0.01 %} 100.00 100 % = value of C0057	Holding torque of the DC injection brake	
C0250	FCODE 1Bit				
C0252	phase offset	0	-245760000 {1 inc} 245760000	Phase offset for DFSET	Fixed phase offset for digital frequency configuration • 1 rev. = 65536 inc
C0253	Angle n-trim	→ 4000	-32767 {1 inc} 32767	Phase trimming for DFSET	→ speed-dependent phase trimming depending on C0005, C0025 • The change of C0005 or C0025 resets C0253 to the default setting • 1 rev. = 65536 inc • C0253 is reached at 15000 rpm
C0260	MPOT1 high	100.00	-199.99 {0.01 %} 199.99	Upper limit of motor potentiometer	mandatory: • C0260 > C0261

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0261	MPOT1 low	-100.0	-199.99 {0.01 %} 199.99	Lower limit of motor potentiometer	mandatory: ● C0261 < C0260
C0262	MPOT1 Tir	10.0	0.1 {0.1 sec} 6000.0	Motor pot acceleration time T_{ir}	Related to change 0...100 %
C0263	MPOT1 Tif	10.0	0.1 {0.1 sec} 6000.0	Motor pot deceleration time T_{if}	Related to change 0...100 %
C0264	MPOT1 on/off	0	 0 No function 1 Down to 0% 2 Down to C261 3 Jump 0 % 4 Jump to C261 5 Up to C260	Deactivation function of motor pot no change Deceleration with T_{if} to 0% Deceleration with T_{if} to C0261 Inhibit with T_{if} = 0 to 0 % Inhibit with T_{if} = 0 to C0261 Acceleration with T_{ir} to C0260	● Function which is executed when motor pot is deactivated via the input MPOT1-INACTIVE.
C0265	MPOT1 init	0	 0 Power off 1 C261 2 0 %	Initialization function of motor pot Value during mains failure lower limit of C0261 0 %	● Value which is accepted during mains switching and activated motor pot.
[C0267]			see selection list 2	Configuration of the digital inputs of motor pot MPOT1	
1	CFG: UP	1000	FIXED 0	Digital input acceleration	
2	CFG: DOWN	1000	FIXED 0	Digital input deceleration	
[C0268]	CFG: INACT	1000	see selection list 2 FIXED 0	Configuration of the motor pot input MPOT1-INACTIVE	
C0269				Input signals motor potentiometer	display only
1	DIS: UP				
2	DIS: DOWN				
3	DIS: INACTIVE				
C0325	Vp2 adapt	1.0	0.1 {0.1} 500.0	Process controller adaptation gain (V_{p2}) of PCTRL1	
C0326	Vp3 adapt	1.0	0.1 {0.1} 500.0	Process controller adaptation gain (V_{p3}) of PCTRL1	
C0327	Set2 adapt	100.00	0.00 {0.01 %} 100.00	Process controller adaptation n_{set2} of PCTRL1	Set speed threshold of the process controller adaptation mandatory ● C0327 > C0328
C0328	Set1 adapt	0.00	0.00 {0.01 %} 100.00	Process controller adaptation n_{set1} of PCTRL1	Set speed threshold of the process controller adaptation mandatory ● C0328 < C0327
C0329	Adapt on/off	0	 0 no 1 Extern Vp 2 Setpoint 3 Ctrl diff	Activate process controller adaptation of PCTRL1 no process controller adaptation external via input Adaptation via setpoint Adaptation via control difference	
C0332	PCTRL1 Tir	0	0 {1 sec} 10000	Process controller acceleration time t_{ir} of PCTRL1	Related to a setpoint change 0...100 %
C0333	PCTRL1 Tif	0	0 {1 sec} 10000	Process controller deceleration time t_{ir} of PCTRL1	Related to a setpoint change 0...100 %
C0336	DIS: act Vp		0.0 {0.1} 500.0	Process controller momentary V_p of PCTRL1	display only
C0337	Bi/unipolar	0	0 bipolar 1 unipolar	Process controller range bipolar/unipolar of PCTRL1	

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0338	ARIT1 funct	1	0 OUT = IN1 1 IN1 + IN2 2 IN1 - IN2 3 IN1 * IN2 4 IN1 / IN2 5 IN1/(100 - IN2)	Function arithmetic block ARIT1	links inputs IN1 and IN2
[C0339] 1 2	 CFG: IN CFG: IN	 1000 1000	see selection list 1 FIXED 0 % FIXED 0 %	Configuration arithmetic block ARIT1	
C0340 1 2	 DIS: IN DIS: IN		-199.99 {0.01 %} 199.99	Input signals arithmetic block ARIT1	display only
[C0350]	CAN address	1	1 {1} 63	CAN bus node address	
[C0351]	CAN baud rate	0	0 500 kBit/s 1 250 kBit/sec 2 125 kBit/sec 3 50 kBit/sec 4 1000 kBit/sec 5 20 kBit/sec	CAN bus baud rate	
[C0352]	CAN mst	0	0 Slave 1 Master	Install CAN bus master operation	
C0353 1 2 3	 CAN addr sel1 CAN addr sel2 CAN addr sel3	 0 0 0	 0 C0350 1 C0354	Source for CAN bus IN/OUT addresses	
C0354 1 2 3 4 5 6	 IN1 addr2 OUT1 addr2 IN2 addr2 OUT2 addr2 IN3 addr2 OUT3 addr2	 129 1 257 258 385 386	 1 {1} 512	CAN bus IN/OUT node addresses	
C0355 1 2 3 4 5 6	 CAN-IN1 Id CAN-OUT1 Id CAN-IN2 Id CAN-OUT2 Id CAN-IN3 Id CAN-OUT3 Id		 0 {1} 2047	CAN bus identifier	display only
C0356 1 2 3 4	 CAN boot up CAN-OUT2 cycle CAN-OUT3 cycle CAN delay	 3000 0 0 20	 0 {1 msec} 65000	CAN bus time settings	
[C0357] 1 2 3	 CE1monit time CE2monit time CE3monit time	 3000 3000 3000	 0 {1 msec} 65000	CAN bus monitoring time for I_{rx}	
C0358	Reset node	0	0 no function 1 CAN reset	Install CAN bus reset node	
C0359	CAN state	0	0 Operational 1 Pre-Operat. 2 Warning 3 Bus off	CAN bus status:	display only

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0360				Telegram counter	display only
			0 {1} 65535	(number of telegrams)	• for values > 65535, the counting restarts with 0
1	Message OUT			all sent	
2	Message IN			all received	
3	Message OUT1			sent to CAN-OUT1	
4	Message OUT2			sent to CAN-OUT2	
5	Message OUT3			sent to CAN-OUT3	
6	Message POUT1			sent to parameter channel 1	
7	Message POUT2			sent to parameter channel 1	
8	Message IN1			received from CAN-IN1	
9	Message IN2			received from CAN-IN2	
10	Message IN3			received from CAN-IN3	
11	Message PIN1			received from parameter channel 1	
12	Message PIN2			received from parameter channel 2	
C0361			0.00 {0.01 %} 100.00	CAN bus load	• display only
1	Load OUT			all sent	• To ensure a perfect operation, the total bus load (all connected devices) should be less than 80%
2	Load IN			all received	
3	Load OUT1			sent to CAN-OUT1	
4	Load OUT2			sent to CAN-OUT2	
5	Load OUT3			sent to CAN-OUT3	
6	Load POUT1			sent to parameter channel 1	
7	Load POUT2			sent to parameter channel 2	
8	Load IN1			received from CAN-IN1	
9	Load IN2			received from CAN-IN2	
10	Load IN3			received from CAN-IN3	
11	Load PIN1			received from parameter channel1	
12	Load PIN2			received from parameter channel2	
C0364			see selection list 2	Activate process data externally	Change over from pre-operation to operation
	CFG:CAN active	1000	FIXED 0		
C0365	DIS:CAN activ		0 1	Input signal CAN active	display only
C0366	Sync Response	1	0 no sync response 1 sync response	0 = no response 1 = response	switch of response to a sync telegram from a master
C0367	Sync Rx ID	128	1 {1} 256	receive ID	Setting for a variable sync identifier for group building, for transfer of the data to the FB CAN-IN1
C0368	Sync Tx ID	128	1 {1} 256	transmit ID	variable setting of an identifier for generating a sync telegram
C0369	Sync Tx Time	0	0 {1} 65000	Sync transmission time	Transmission interval for the object set in C0368

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0400	DIS: OUT		-199.99 {0.01 %} 199.99	Output of AIN1	display only
[C0402]	CFG: OFFSET	19502	see selection list 1 FCODE26/1	Configuration offset of AIN1	
[C0403]	CFG: GAIN	19504	see selection list 1 FCODE27/1	Configuration gain of AIN1	
C0404 1 2	 DIS: OFFSET DIS: GAIN		 -199.99 {0.01 %} 199.99	Input signals of AIN1	display only
C0405	DIS: OUT		-199.99 {1 %} 199.99	Output of AIN2	display only
[C0407]	CFG: OFFSET	19503	see selection list 1 FCODE26/2	Configuration offset of AIN2	
[C0408]	CFG: GAIN	19505	see selection list 1 FCODE27/2	Configuration gain of AIN2	
C0409 1 2	 DIS: OFFSET DIS: GAIN		 -199.99 {0.01 %} 199.99	Input signals of AIN2	display only
[C0420]	Encoder const	512	1 {1 inc/rev} 8192	Incremental encoder constant for incremental encoder inputs X8 and X9 in increments per turn	Use incremental encoder with HTL-level only at incremental encoder input X9
[C0421]	Encoder volt	5.0	5.0 {0.1 V} 8.0	Supply voltage for incremental encoder	a wrong entry can destroy the incremental encoder!
C0425	DFIN const	3	0 256 inc/rev 1 512 inc/rev 2 1024 inc/rev 3 2048 inc/rev 4 4096 inc/rev 5 8192 inc/rev 6 16384 inc/rev	Constant for the digital frequency input in increments per turn	
C0426	DIS: OUT		-36000 {1 rpm} 36000	Output signal of DFIN	display only
C0427	DFIN function	0	0 2-phase 1 A pulse/B dir 2 Pulse A or B	DFIN function	
C0429	TP5 delay	0	-32767 {1 inc} 32767	TP5 delay	
[C0431]	CFG: IN	5001	see selection list 1 MCTRL-NACT	Configuration input of AOUT1	
[C0432]	CFG: OFFSET	19512	see selection list 1 FCODE109/1	Configuration offset of AOUT1	
[C0433]	CFG: GAIN	19510	see selection list 1 FCODE108/1	Configuration gain of AOUT1	
C0434 1 2 3	 DIS: IN DIS: OFFSET DIS: GAIN		 -199.99 {0.01 %} 199.99	Input signals of AOUT1	display only
[C0436]	CFG: IN	5002	see selection list 1 MCTRL-MSET2	Configuration input of AOUT2	
[C0437]	CFG: OFFSET	19513	see selection list 1 FCODE109/2	Configuration offset of AOUT2	
[C0438]	CFG: GAIN	19511	see selection list 1 FCODE108/2	Configuration gain of AOUT2	
C0439 1 2 3	 DIS: IN DIS: OFFSET DIS: GAIN		 -199.99 {0.01 %} 199.99	Input signals of AOUT2	display only
C0443	DIS: DIGIN-OUT		0 {1} 255	Signals at X5/E1 to X5/E5 decimal value	display only • Binary interpretation indicates terminal signals

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0444 1 2 3 4	 DIS: DIGOUT1 DIS: DIGOUT2 DIS: DIGOUT3 DIS: DIGOUT4		 0 1	Signals at X5/A1 to X5/A4	display only
[C0450]	 CFG: NX	 1000	see selection list 1 FIXED 0 %	Configuration analog input of BRK1	
[C0451]	 CFG: ON	 1000	see selection list 2 FIXED 0	Configuration digital input of BRK1	
[C0452]	 CFG: SIGN	 1000	see selection list 1 FIXED 0 %	Configuration analog input of BRK1	
C0458 1 2	 DIS: NX DIS: SIGN		 -199.99 {0.01 %} 199.99	Analog input signals of BRK1	display only
C0459	DIS: ON		0 1	Digital input signal of BRK1	display only
C0464	Customer I/F		0 original 1 changed	Status of selected basic configuration	display only ● Reassignment of terminals in a basic configuration from C0005 does not change C0005 and sets C0464 = 1 ● Adding or removing function blocks or changing the signal flow among the function blocks in a basic configuration of C0005 sets C0005 = 0 and C0464= 1
[C0465] 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 ... 19 ... 22 ... 25 ... 28 ... 31 ... 41 42 ... 49 50	 FB list FB list FB list FB list FB list FB list FB list FB list FB list FB list FB list FB list FB list FB list FB list FB list ... FB list ... FB list ... FB list ... FB list ... FB list ... FB list FB list ... FB list FB list	→ 200 0 50 0 0 55 0 0 10250 0 0 0 5650 0 0 5050 0 5700 0 10650 0 70 0 75 0 250 0 25000 20000 0 0 0	See selection list 5	Processing list of function blocks Contained in the program of signal processing (sequence in which the function blocks are processed)	→ depending on C0005 Change of C0005 loads assigned processing list → Valid for C0005 = 1000 ● After changing the signal flow, adapt the processing list in every case. Otherwise, the device may use the wrong signals! ● The function blocks DIGIN, DIGOUT, AIF-IN, CAN-IN, and MCTRL are always processed, and do not have to be entered in the list.
C0466	CPU T remain			Residual process time for the processing of function blocks	display only

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
[C0469]	Fct STP key	2		Function of the STOP key of the operating module	Function is activated when pressing the STOP key.
			0 inactive 1 CINH 2 QSP	Deactivated Controller inhibit Quick stop	
C0470				Freely assignable code for digital signals	The data words C0470 and C0471 are in parallel and are identical
1	FCODE bit 0-7	0	0 {1} 255		
2	FCODE bit 8-15	0			
3	FCODE bit 16-23	0			
4	FCODE bit 24-31	0			
C0471	FCODE 32 bit	0	0 {1} 4294967296	Freely assignable code for digital signals	The data words C0470 and C0471 are in parallel and are identical
C0472				Freely assignable code for relative analog signals	
1	FCODE analog	0.00	-199.99 {0.01 %} 199.99		
2	FCODE analog	0.00			
3	FCODE analog	100.00			
...	...	...			
19	FCODE analog	0.00			
20	FCODE analog	0.00			
C0473				Freely assignable code for absolute analog signals	
1	FCODE abs	1	-32767 {1} 32767		
2	FCODE abs	1			
3	FCODE abs	0			
...	...	...			
9	FCODE abs	0			
10	FCODE abs	0			
C0474				Freely assignable code for phase signals	1 turn = 65536 inc
1	FCODE PH	0	-2000000000 {1} 200000000		
2	FCODE PH	0			
C0475				Freely assignable code for phase difference signals	
1	FCODE DF	0	-16000 {1} 16000		
2	FCODE DF	0			
C0497	Nact-filter	2.5	0.0 {0.1 msec} 50.0 0 msec = switched off	Time constant actual speed	
C0510	CFG: IN1	1000	see selection list 1 FIXED0%	Configuration NLIM1	
C0511	DIS: IN1		-199.99 {0.01 %} 199.99	Input signal of NLIM1	display only

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
[C0517]			0.00 {0.01} 1999.00	User menu with up to 32 entries	• The numbers of the desired codes are entered under the subcodes. • The input is done in the format xxx.yy – xxx: Code number – yy: Subcode for code • There is no check 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	64.00	C0064/0 Utilisation		
5	User menu	183.00	C0183 Diagnostics		
6	User menu	168.01	C0168/1 Fault no. act		
7	User menu	39.01	JOG setpoint		
8	User menu	86.00	C0086/0 Mot type		
9	User menu	148.00	Ident run		
10	User menu	22.00	Imax current		
11	User menu	23.00	Imax gen.		
12	User menu	11.00	Nmax		
13	User menu	12.00	Tir (acc)		
14	User menu	13.00	Tif (dec)		
15	User menu	16.00	FCODE V boost		
16	User menu	70.00	Vp speed-CTRL		
17	User menu	71.00	Tn speed-CTRL		
18	User menu	75.00	Vp curr-CTRL		
19	User menu	76.00	Tn curr-CTRL		
20	User menu	142.00	Start options		
21	User menu	92.00	Mot LS		
22	User menu	36.00	DC brk value		
23	User menu	93.00	Drive ident		
24	User menu	99.00	S/W version		
...	...	0	not assigned		
31	User menu	94.00	C0094/0 Password		
32	User menu	3.00	C0003/0 Par save		
[C0520]	CFG: IN	1000	See selection list 4 FIXEDPHI0	Configuration input of DFSET	
[C0521]	CFG: VP-DIV	1000	see selection list 1 FIXED0%	Configuration gain factor numerator of DFSET	
[C0522]	CFG: RAT-DIV	1000	see selection list 1 FIXED0%	Configuration gearbox factor numerator of DFSET	
[C0523]	CFG: A-TRIM	1000	see selection list 1 FIXED0%	Configuration phase trimming of DFSET	
[C0524]	CFG: N-TRIM	1000	see selection list 1 FIXED0%	Configuration speed trimming of DFSET	
[C0525]	CFG: 0-PULSE	1000	see selection list 2 FIXED0	Configuration one-time zero pulse is activation of DFSET	
[C0526]	CFG: RESET	1000	see selection list 2 FIXED0	Configuration reset integrators of DFSET	
[C0527]	CFG: SET	1000	see selection list 2 FIXED0	Configuration set integrators of DFSET	
C0528					display only
1	DIS: 0-pulse A		-2000000000 {1} 2000000000	Phase difference between two zero pulses	
2	DIS: Offset			Offset of C0523*C0529 + C0252	
C0529	Multip offset	1	-20000 {1} 20000	Offset multiplier	
C0530	DF evaluation	0	0 with g factor 1 no g factor	Evaluation of the setpoint integrator of DFSET (with/without gearbox factor)	Evaluation of the setpoint integrator of DFSET
C0531	Act 0 div	1	1 {1} 16384	Actual zero pulse divider of DFSET	
C0532	0-pulse/TP	1	1 0-pulse 2 Touch probe	Selection zero pulse of the feedback system or touch probe for DFSET	
C0533	Vp denom	1	1 {1} 32767	Gain factor denominator of DFSET	

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0534	0-pulse fct	0	0 Inactive 1 Continuous 2 Cont. switch 10 Once, fast way 11 Once, CW 12 Once, CCW 13 Once, 2*0-puls	Zero pulse function of DFSET	
C0535	Set 0 div	1	1 {1} 16384	Set zero pulse divider of DFSET	
C0536 1 2 3	 DIS: VP-DIV DIS: RAT-DIV DIS: A-TRIM		-32767 {1} 32767	Absolute analog input signals of DFSET	display only
C0537	DIS: N-TRIM		-199.99 {0.01 %} 199.99	Relative analog input signal of DFSET	display only
C0538 1 2 3	 DIS: 0-PULSE DIS: RESET DIS: SET		0 1	Digital input signals of DFSET	display only
C0539	DIS: IN		-36000 {1 rpm} 36000	Input signal of DFSET	display only
[C0540]	Function	0	0 Analog input	Analog input	
			1 PH diff input	Phase difference input	X9 is inhibited if 0 or 1 was selected
			2 Res + int 0	inactive	
			3 Res + ext 0	inactive	
			4 X10 = X9	X9 is output on X10	The input signals get a gain
			5 X10 = X8	X8 is output on X10	
[C0541]	CFG: AN-IN	5001	see selection list 1 MCTRL-NACT	Configuration analog input of DFOUT	
[C0542]	CFG: DF-IN	1000	See selection list 4 FIXEDPHI 0	Configuration digital frequency input of DFOUT	
[C0544]	CFG: SYN-RDY	1000	see selection list 2 FIXED 0	Configuration synchronization signal for the zero pulse of DFOUT	
C0545	PH offset	0	0 {1 inc} 65535	Phase offset of DFOUT	1 turn = 65535 inc
C0546	Min inc/turn	1000	1 {1 inc} 1800000000		1 turn = 65535 inc
C0547	DIS: AN-IN		-199.99 {0.01 %} 199.99	Relative analog input signal of DFOUT	display only
C0548	DIS: SYN-RDY			Digital input signal of DFOUT	display only
C0549	DIS: DF-IN		-32767 {1 rpm} 32767	Absolute analog input signal of DFOUT	display only
C0560 1 2 3 4 5 ... 14 15	 Fix set-value Fix set-value Fix set-value Fix set-value Fix set-value ... Fix set-value Fix set-value	 100.00 75.00 50.00 25.00 0.00 ... 0.00 0.00	-199.99 {0.01 %} 199.99	Fixed setpoints of FIXSET1	
[C0561]	CFG: AIN	1000	see selection list 1 FIXED0%	Configuration analog input of FIXSET1	
[C0562] 1 2 3 4	 CFG: IN CFG: IN CFG: IN CFG: IN	 1000 1000 1000 1000	see selection list 2 FIXED0 FIXED0 FIXED0 FIXED0	Configuration digital inputs of FIXSET1	
C0563	DIS: AIN		-199.99 {0.01 %} 199.99	Analog input signal of FIXSET1	display only

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0564 1 2 3 4	 DIS: IN DIS: IN DIS: IN DIS: IN		 0 1	Digital input signals of FIXSET1	display only
[C0570]	 CFG: IN	 1000	see selection list 1 FIXED0%	Configuration analog input of S&H1	
[C0571]	 CFG: LOAD	 1000	see selection list 2 FIXED0	Configuration digital input of S&H1	
C0572	DIS: IN		-199.99 {0.01 %} 199.99	Analog input signal of S&H1	display only
C0573	DIS: LOAD		0 1	Digital input signal of S&H1	display only
C0581	MONIT EEr	0	0 TRIP 1 IMP 2 Warning 3 Off	Configuration monitoring EEr (external fault)	
C0582	MONIT OH4	2	2 Warning 3 Off	Configuration monitoring OH4 (heat sink temperature)	
C0583	MONIT OH3	3	0 TRIP 3 Off	Configuration monitoring OH3 (motor temperature fixed)	
C0584	MONIT OH7	3	2 Warning 3 Off	Configuration monitoring OH7 (motor temperature adjustable)	
C0585	MONIT OH8	3	0 TRIP 2 Warning 3 Off	Configuration monitoring OH8 (motor temperature adjustable)	Temperature monitoring via PTC input
C0587	MONIT SD3	3	0 TRIP 2 Warning 3 Off	Configuration monitoring SD3 (encoder at X9)	
C0588	MONIT H10/H11	3	0 TRIP 3 Off	Configuration monitoring H10 and H11 (thermal sensors in the controller)	
C0591	MONIT CE1	3	0 TRIP 2 Warning 3 Off	Configuration monitoring CE1 (CAN-IN1 fault)	
C0592	MONIT CE2	3	0 TRIP 2 Warning 3 Off	Configuration monitoring CE2 (CAN-IN2 fault)	
C0593	MONIT CE3	3	0 TRIP 2 Warning 3 Off	Configuration monitoring CE3 (CAN-IN3 fault)	
C0594	MONIT SD6	3	0 TRIP 2 Warning 3 Off	Configuration monitoring SD6 (motor temperature sensor)	
C0595	MONIT CE4	3	0 TRIP 2 Warning 3 Off	Configuration monitoring CE4 (CAN bus off)	
C0596	Nmax limit	4000	0 {1 rpm} 36000	Monitoring: Speed of the machine	
C0597	MONIT LP1	0	0 TRIP 2 Warning 3 Off	Configuration monitoring motor phase failure	
C0598	MONIT SD5	3	0 TRIP 2 Warning 3 Off	Configuration monitoring master current at X5/1.2 < 2mA	
C0599	Limit LP1	5.0	1.0 {0.1 %} 10.0	Current limit LP1	Current limit for the motor phase failure monitoring LP1

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0600	Function	1	0 OUT = IN1 1 IN1 + IN2 2 IN1 - IN2 3 IN1 * IN2 4 IN1 / IN2 5 IN1/(100 - IN2)	Function arithmetic block ARIT2	links inputs IN1 and IN2
[C0601] 1 2	 CFG: IN CFG: IN	 1000 1000	see selection list 1 FIXED 0 % FIXED 0 %	Configuration analog inputs of ARIT2	
C0602 1 2	 DIS: IN DIS: IN		-199.99 {0.01 %} 199.99	Analog input signals of ARIT2	display only
C0603	Function	1	0 OUT = IN1 1 IN1 + IN2 2 IN1 - IN2 3 IN1 * IN2 4 IN1 / IN2 5 IN1/(100 - IN2)	Function arithmetic block ARIT3	links inputs IN1 and IN2
[C0604] 1 2	 CFG: IN CFG: IN	 1000 1000	see selection list 1 FIXED0% FIXED0%	Configuration analog inputs of ARIT3	
C0605 1 2	 DIS: IN DIS: IN		-199.99 {0.01 %} 199.99	Analog input signals of ARIT3	display only
[C0608]	 CFG: IN	 1000	Selection list 1 FIXED0%	Configuration analog input of SQRT1	
C0609	DIS: IN		-199.99 {0.01 %} 199.99	Analog input signals of SQRT1	display only
[C0610] 1 2 3	 CFG: IN CFG: IN CFG: IN	 1000 1000 1000	see selection list 1 FIXED0% FIXED0% FIXED0%	Configuration analog inputs of addition block ADD1	Adds inputs IN1, IN2 and IN3
C0611 1 2 3	 DIS: IN DIS: IN DIS: IN		-199.99 {0.01 %} 199.99	Analog input signals of ADD1	display only
[C0612]	 CFG: IN CFG: IN CFG: IN	 1000 1000 1000	see selection list 1 FIXED0% FIXED0% FIXED0%	Configuration analog inputs of addition block ADD2	Adds inputs IN1, IN2 and IN3
C0613 1 2 3	 DIS: IN DIS: IN DIS: IN		-199.99 {0.01 %} 199.99	Analog input signals of ADD2	display only
C0620	DB1 gain	1.00	-10.00 {0.01} 10.00	Gain dead band component DB1	
C0621	DB1 value	1.00	0.00 {0.01 %} 100.00	Dead band of DB1	
[C0622]	 CFG: IN	 1000	see selection list 1 FIXED0%	Configuration analog input of DB1	
C0623	DIS: IN		-199.99 {0.01 %} 199.99	Analog input signal of DB1	display only
C0630	Max limit	100.00	-199.99 {0.01 %} 199.99	Upper limit of limiter LIM1	
C0631	Min limit	-100.0	-199.99 {0.01 %} 199.99	Lower limit of limiter LIM1	
[C0632]	 CFG: IN	 1000	see selection list 1 FIXED0%	Configuration analog input of LIM1	
C0633	DIS: IN		-199.99 {0.01 %} 199.99	Analog input signal of LIM1	display only
C0640	Delay T	20.00	0.01 {0.01 s} 50.00	Time constant of the PT1-1 component	
[C0641]	 CFG: IN	 1000	see selection list 1 FIXED0%	Configuration analog input of PT1-1	
C0642	DIS: IN		-199.99 {0.01 %} 199.99	Analog input signal of PT1-1	display only

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0643	Delay T	20	0 {1 sec} 50	Time constant of the PT1-2 component	
[C0644]	CFG: IN	1000	see selection list 1 FIXED0%	Configuration analog input of PT1-2	
C0645	DIS: IN		-199.99 {0.01 %} 199.99	Analog input signal of PT1-2	display only
C0650	DT1-1 gain	1.00	-320.00 {0.01} 320.00	Gain of DT1-1 component	
C0651	Delay T	1.000	0.005 {0.001 sec} 5.000	Time constant of DT1-1	
[C0652]	CFG: IN	1000	see selection list 1 FIXED0%	Configuration analog input of DT1-1	
C0653	Sensibility	1	1 15-bit 2 14-bit 3 13-bit 4 12-bit 5 11-bit 6 10-bit 7 9-bit	Input sensitivity of DT1-1	
C0654	DIS: IN		-199.99 {0.01 %} 199.99	Analog input signal of DT1-1	display only
C0655	Numerator	1	-32767 {1} 32767	Numerator for CONV5	
C0656	Denominator	1	1 {1} 32767	Denominator for CONV5	
[C0657]	CFG: IN	1000	see selection list 1 FIXED0%	Configuration analog input of CONV5	
C0658	DIS: IN		-199.99 {0.01 %} 199.99	Analog input signal of CONV5	display only
[C0661]	CFG: IN	1000	see selection list 1 FIXED0%	Configuration analog input absolute-value generator ABS1	
C0662	DIS: IN		-199.99 {0.01 %} 199.99	Analog input signal of ABS1	display only
C0671	RFG1 Tir	0.0	0.00 {0.01 sec} 9999.00	Acceleration time T_{ir} of ramp generator RFG1	
C0672	RFG1 Tif	0.00	0.00 {0.01 sec} 9999.00	Deceleration time T_{if} of RFG1	
[C0673]	CFG: IN	1000	see selection list 1 FIXED0%	Configuration analog input of RFG1	
[C0674]	CFG: SET	1000	see selection list 1 FIXED0%	Configuration set input of RFG1	
[C0675]	CFG: LOAD	1000	see selection list 2 FIXED0	Configuration digital input of RFG1	
C0676 1 2	 DIS: IN DIS: SET		 -199.99 {0.01 %} 199.99	Analog input signals of RFG1	display only
C0677	DIS: LOAD		0 1	Digital input signal of RFG1	display only
C0680	Function	6	1 IN1 = IN 2 2 IN 1 > IN2 3 IN 1 < IN2 4 |IN1| = |IN2| 5 |IN1| > |IN2| 6 |IN1| < |IN2|	Function comparator CMP1	Compares the inputs IN1 and IN2
C0681	Hysteresis	1.00	0.00 {0.01 %} 100.00	Hysteresis of CMP1	
C0682	Window	1.00	0.00 {0.01 %} 100.00	Window of CMP1	
[C0683] 1 2	 CFG: IN CFG: IN	 5001 19500	see selection list 1 MCTRL-NACT FCODE17	Configuration analog inputs of CMP1	
C0684 1 2	 DIS: IN DIS: IN		 -199.99 {0.01 %} 199.99	Analog input signals of CMP1	display only
C0685	Function	1	1 IN1 = IN 2 2 IN 1 > IN2 3 IN 1 < IN2 4 |IN1| = |IN2| 5 |IN1| > |IN2| 6 |IN1| < |IN2|	Function comparator CMP2	Compares the inputs IN1 and IN2

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0686	Hysteresis	1.00	0.00 {0.01 %} 100.00	Hysteresis of CMP2	
C0687	Window	1.00	0.00 {0.01 %} 100.00	Window of CMP2	
[C0688] 1 2	 CFG: IN CFG: IN	 1000 1000	see selection list 1 FIXED0% FIXED0%	Configuration analog inputs of CMP2	
C0689 1 2	 DIS: IN DIS: IN		 -199.99 {0.01 %} 199.99	Analog input signals of CMP2	display only
C0690	Function	1	1 IN1 = IN 2 2 IN 1 > IN2 3 IN 1 < IN2 4 |IN1| = |IN2| 5 |IN1| > |IN2| 6 |IN1| < |IN2|	Function comparator CMP3	Compares the inputs IN1 and IN2
C0691	Hysteresis	1.00	0.00 {0.01 %} 100.00	Hysteresis of CMP3	
C0692	Window	1.00	0.00 {0.01 %} 100.00	Window of CMP3	
[C0693] 1 2	 CFG: IN CFG: IN	 1000 1000	see selection list 1 FIXED0% FIXED0%	Configuration analog inputs of CMP3	
C0694 1 2	 DIS: IN DIS: IN		 -199.99 {0.01 %} 199.99	Analog input signals of CMP3	display only
[C0700]	CFG: IN	 19523	see selection list 1 FCODE472/3	Configuration input of ANEG1	
C0701	DIS: IN		-199.99 {0.01 %} 199.99	Input signal of ANEG1	display only
[C0703]	 CFG: IN	 1000	see selection list 1 FIXED0%	Configuration input of ANEG2	
C0704	DIS: IN		-199.99 {0.01 %} 199.99	Input signal ANEG2	display only
C0705	Function	1	1 IN1 = IN 2 2 IN 1 > IN2 3 IN 1 < IN2 4 |IN1| = |IN2| 5 |IN1| > |IN2| 6 |IN1| < |IN2|	Function comparator CMP4	Compares the inputs IN1 and IN2
C0706	Hysteresis	1	0 {1 %} 100	Hysteresis of CMP4	
C0707	Window	1	0 {1 %} 100	Window of CMP4	
[C0708] 1 2	 CFG: IN CFG: IN	 1000 1000	see selection list 1 FIXED0% FIXED0%	Configuration analog inputs of CMP4	
C0709 1 2	 DIS: IN DIS: IN		 -199.99 {0.01 %} 199.99	Analog input signals of CMP4	display only
C0710	Function	0	0 Rising edge 1 Falling edge 2 Both edges	Function of edge evaluation TRANS1	
C0711	Pulse T	0.001	0.001 {0.001 sec} 60.000	Pulse duration of TRANS1	
[C0713]	 CFG: IN	 1000	see selection list 2 FIXED0	Configuration digital input of TRANS1	
C0714	DIS: IN		0 1	Digital input signal of TRANS1	display only
C0715	Function	0	0 Rising trans 1 Falling trans 2 Both trans	Function edge evaluation TRANS2	
C0716	Pulse T	0.001	0.001 {0.001 sec} 60.000	Pulse time of TRANS2	
[C0718]	 CFG: IN	 1000	see selection list 2 FIXED0	Configuration digital input of TRANS2	
C0719	DIS: IN		0 1	Digital input signal of TRANS2	display only
C0720	Function	2	0 On delay 1 Off delay 2 On/Off delay	Function digital delay element DIGDEL1	

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0721	Delay T	1.000	0.001 {0.001 sec} 60.000	Delay time of DIGDEL1	
[C0723]	 CFG: IN	 1000	see selection list 2 FIXED0	Configuration digital input of DIGDEL1	
C0724	DIS: IN		0 1	Digital input signal of DIGDEL1	display only
C0725	Function	0	0 On delay 1 Off delay 2 On/Off delay	Function digital delay component DIGDEL2	
C0726	Delay T	1.00	0.001 {0.001 sec} 60.000	Delay time of DIGDEL2	
[C0728]	 CFG: IN	 1000	see selection list 2 FIXED0	Configuration digital input of DIGDEL2	
C0729	DIS: IN		0 1	Digital input signal of DIGDEL2	display only
C0730	Mode	0	0 Start measurement 1 Stop measurement	Start / Stop of the measurement recording of OSZ	
C0731	Status		0 Measurement completed 1 Measurement active 2 Trigger recognized 3 Cancel 4 Cancel after trigger 5 Read memory	current operating state of OSZ	display only
[C0732] 1 2 3 4	 CFG: channel 1 CFG: channel 2 CFG: channel 3 CFG: channel 4	 1000 1000 1000 1000	see selection list 1 FIXED0% FIXED0% FIXED0% FIXED0%	Configuration analog inputs of OSZ	
[C0733] 1	 CFG: Dig. Trigger	 1000	see selection list 2 FIXED0	Configuration trigger input of OSZ	
C0734	Trigger source	0	0 dig. trigger input 1 Channel 1 2 Channel 2 3 Channel 3 4 Channel 4	Selection of the trigger source of OSZ	
C0735	Trigger level	0	-32767 {1} 32767	Set trigger level for channel 1 ... 4 of OSZ	
C0736	Trigger edge	0	0 LOW/HIGH edge 1 HIGH/LOW edge	Selection of the trigger edge of OSZ	
C0737	Trigger delay	0.0	-100.0 {0.1 %} 999.99	Setting pre- and post-triggering of OSZ	
C0738	Scanning period	3	3 1 msec 4 2 msec 5 5 msec 6 10 msec 7 20 msec 8 50 msec 9 100 msec 10 200 msec 11 500 msec 12 1 sec 13 2 sec 14 5 sec 15 10 sec 16 20 sec 17 50 sec 18 1 min 19 2 min 20 5 min 21 10 min	Selection of the scanning period of OSZ	
C0739	Number of channels	4	1 {1} 4	Number of channels to be measured of OSZ	

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0740 1	 during start	 0	 0 {1} 16383	Determine start point when reading the data memory of OSZ Deliberate selection of a memory block	
2	Free/Inhibit	0	0 Data reading inhibited 1 Data reading enabled	The data memory of OSZ must be enabled for reading	
C0741 1 2 3 4	 DIS: Version DIS: Memory size DIS: Data width DIS: Number of channels			OSZ Sub1 Version Sub2 Memory size Sub3 Data width Sub4 Number of channels	display only
C0742	DIS: Data block length			Data block length of OSZ	display only
C0743	DIS: Read data block			Reading an 8 byte data block	display only
C0744	Memory size	2048	512 0 1024 1 1536 2 2048 3 3072 4 4096 5 8192 6	Adapt memory depth of the measurement task	
C0749 1 2 3	 DIS: Cancel index DIS: Index trigger DIS: Index end			Information on saving the measured values	display only
C0750	Vp denom	16	1 $V_p = 1$ 2 $V_p = 1/2$ 4 $V_p = 1/4$ 8 $V_p = 1/8$ 16 $V_p = 1/16$ 32 $V_p = 1/32$ 64 $V_p = 1/64$ 128 $V_p = 1/128$ 256 $V_p = 1/256$ 512 $V_p = 1/512$ 1024 $V_p = 1/1024$ 2048 $V_p = 1/2048$ 4096 $V_p = 1/4096$ 8192 $V_p = 1/8192$ 16384 $V_p = 1/16384$	Denominator gain of position controller of DFRFG1	
C0751	DFRFG1 Tir	1.000	0.000 {0.001 sec} 999.900	Acceleration time T_{ir} of DFRFG1	
C0752	Max speed	3000	1 {1 rpm} 16000	Maximum make up speed of DFRFG1	
C0753	DFRFG1 QSP	0.000	0.000 {0.001 sec} 999.900	Deceleration time T_{if} for QSP of DFRFG1	
C0754	PH error	→	10 {1 inc} 2000000000	Contouring error of DFRFG1	→ 2000000000 1 rev. = 65535 inc
C0755	Syn window	100	0 {1 inc} 65535	Synchronization window of DFRFG1	
C0756	Offset	0	-1000000000 {1 inc} 1000000000	DFRFG1 Offset	→ 2000000000 1 turn = 65535 inc
C0757	Function	0	0 No TP start 1 With TP start	DFRFG1 function	
[C0758]	 CFG: IN	 1000	See selection list 4 FIXEDPHI0	Configuration phase input of DFRFG1	
[C0759]	 CFG: QSP	 1000	see selection list 2 FIXED0	Configuration digital input (triggering QSP) of DFRFG1	

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
[C0760]	CFG: STOP	1000	see selection list 2 FIXED0	Configuration digital input (ramp generator stop) of DFRFG1	
[C0761]	CFG: RESET	1000	see selection list 2 FIXED0	Configuration digital input (reset integrators) of DFRFG1	
C0764 1 2 3	 DIS: QSP DIS: STOP DIS: RESET		0 1	Digital input signals of DFRFG1	display only
C0765	DIS: IN		-32767 {1 rpm} 32767	Absolute analog input signal of DFRFG1	display only
[C0770]	CFG: D	1000	see selection list 2 FIXED0	Configuration data input of FLIP1	
[C0771]	CFG: CLK	1000	see selection list 2 FIXED0	Configuration clock input of FLIP1	
[C0772]	CFG: CLR	1000	see selection list 2 FIXED0	Configuration reset input of FLIP1	
C0773 1 2 3	 DIS: D DIS: CLK DIS: CLR		0 1	Digital input signals of FLIP1	display only
[C0775]	CFG: D	1000	see selection list 2 FIXED0	Configuration data input of FLIP2	
[C0776]	CFG: CLK	1000	see selection list 2 FIXED0	Configuration clock input of FLIP2	
[C0777]	CFG: CLR	1000	see selection list 2 FIXED0	Configuration reset input of FLIP2	
C0778 1 2 3	 DIS: D DIS: CLK DIS: CLR		0 1	Digital input signals of FLIP2	display only
[C0780]	CFG: N	1000	see selection list 1 FIXED0%	Configuration main setpoint input of NSET	
[C0781]	CFG: N-INV	10251	see selection list 2 R/L/Q-R/L	Configuration main setpoint inversion of NSET	
[C0782]	CFG: NADD	5650	see selection list 1 ASW1-OUT	Configuration additional setpoint input of NSET	
[C0783]	CFG: NADD-INV	1000	see selection list 2 FIXED0	Configuration additional setpoint inversion of NSET	
[C0784]	CFG: CINH-VAL	5001	see selection list 1 MCTRL-NACT	Configuration output signal with controller inhibit of NSET	
[C0785]	CFG: SET	5000	see selection list 1 MCTRL-NSET2	Configuration ramp generator of NSET	
[C0786]	CFG: LOAD	5001	see selection list 2 MCTRL-QSP-OUT	Configuration digital input (load ramp generator) of NSET	
[C0787] 1 2 3 4	 CFG: JOG*1 CFG: JOG*2 CFG: JOG*4 CFG: JOG*8	 53 1000 1000 1000	see selection list 2 DIGIN3 FIXED0 FIXED0 FIXED0	Configuration JOG selection and JOG activation of NSET	Binary interpretation
[C0788] 1 2 3 4	 CFG: TI*1 CFG: TI*2 CFG: TI*4 CFG: TI*8	 1000 1000 1000 1000	see selection list 2 FIXED0 FIXED0 FIXED0 FIXED0	Configuration Ti selection and Ti activation of NSET	• Binary interpretation • Tir and Tif pairs are identical
[C0789]	CFG: RFG-0	1000	see selection list 2 FIXED0	Configuration digital input (ramp generator 0) of NSET	
[C0790]	CFG: RFG-STOP	1000	see selection list 2 FIXED0	Configuration digital input (ramp generator stop) of NSET	

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0798				Analog input signals of NSET	display only
1	DIS: CINH-VAL		-199.99 {0.01 %} 199.99		
2	DIS: SET				
C0799				Digital input signals of NSET	display only
1	DIS: N-INV		0 1		
2	DIS: NADD-INV				
3	DIS: LOAD				
4	DIS: JOG*1				
5	DIS: JOG*2				
6	DIS: JOG*4				
7	DIS: JOG*8				
8	DIS: TI*1				
9	DIS: TI*2				
10	DIS: TI*4				
11	DIS: TI*8				
12	DIS RFG-0				
13	DIS: RFG-STOP				
[C0800]	CFG: SET	1000	see selection list 1 FIXED0%	Configuration setpoint input of process controller PCTRL1	
[C0801]	CFG: ACT	1000	see selection list 1 FIXED0%	Configuration actual value input of PCTRL1	
[C0802]	CFG: INFLU	1000	see selection list 1 FIXED0%	Configuration evaluation input of PCTRL1	
[C0803]	CFG: ADAPT	1000	see selection list 1 FIXED0%	Configuration adaptation input of PCTRL1	
[C0804]	CFG: INACT	1000	see selection list 2 FIXED0	Configuration deactivation input of PCTRL1	
[C0805]	CFG: I-OFF	1000	see selection list 2 FIXED0	Configuration digital input (switch off I-component) of PCTRL1	
C0808				Analog input signals of PCTRL1	display only
1	DIS: SET		-199.99 {0.01 %} 199.99		
2	DIS: ACT				
3	DIS: INFLU				
4	DIS: ADAPT				
C809				Digital input signals of PCTRL1	display only
1	DIS: INACT		0 1		
2	DIS: I-OFF				
[C0810]			see selection list 1	Configuration analog inputs of analog switch ASW1	
1	CFG: IN	55	AIN2-OUT		
2	CFG: IN	1000	FIXED0%		
[C0811]	CFG: SET	1000	see selection list 2 FIXED0	Configuration set input of ASW1	
C0812				Analog input signals of ASW1	display only
1	DIS: IN		-199.99 {0.01 %} 199.99		
2	DIS: IN				
C0813	DIS: SET		0 1	Digital input signal of ASW1	display only
[C0815]			see selection list 1	Configuration analog inputs of analog switch ASW2	
1	CFG: IN	1000	FIXED0%		
2	CFG: IN	1000	FIXED0%		
[C0816]	CFG: SET	1000	see selection list 2 FIXED0	Configuration set input of ASW2	
C0817				Analog input signals of ASW2	display only
1	DIS: IN		-199.99 {0.01 %} 199.99		
2	DIS: IN				
C0818	DIS: SET		0 1	Digital input signal of ASW2	display only
[C0820]			see selection list 2	Configuration digital inputs of the AND element AND1	
1	CFG: IN	1000	FIXED0		
2	CFG: IN	1000	FIXED0		
3	CFG: IN	1000	FIXED0		

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0821				Digital input signals of AND1	display only
1	DIS: IN		0 1		
2	DIS: IN				
3	DIS: IN				
[C0822]			see selection list 2	Configuration digital inputs of the AND element AND2	
1	CFG: IN	1000	FIXED0		
2	CFG: IN	1000	FIXED0		
3	CFG: IN	1000	FIXED0		
C0823				Digital input signals of AND2	display only
1	DIS: IN		0 1		
2	DIS: IN				
3	DIS: IN				
[C0824]			see selection list 2	Configuration digital inputs of the AND element AND3	
1	CFG: IN	1000	FIXED0		
2	CFG: IN	1000	FIXED0		
3	CFG: IN	1000	FIXED0		
C0825				Digital input signals of AND3	display only
1	DIS: IN		0 1		
2	DIS: IN				
3	DIS: IN				
[C0826]			see selection list 2	Configuration digital inputs of the AND element AND4	
1	CFG: IN	1000	FIXED0		
2	CFG: IN	1000	FIXED0		
3	CFG: IN	1000	FIXED0		
C0827				Digital input signals of AND4	display only
1	DIS: IN		0 1		
2	DIS: IN				
3	DIS: IN				
[C0828]			see selection list 2	Configuration digital inputs of the AND element AND5	
1	CFG: IN	1000	FIXED0		
2	CFG: IN	1000	FIXED0		
3	CFG: IN	1000	FIXED0		
C0829				Digital input signals of AND5	display only
1	DIS: IN		0 1		
2	DIS: IN				
3	DIS: IN				
[C0830]			see selection list 2	Configuration digital inputs of the OR element OR1	
1	CFG: IN	1000	FIXED0		
2	CFG: IN	1000	FIXED0		
3	CFG: IN	1000	FIXED0		
C0831				Digital input signals of OR1	display only
1	DIS: IN		0 1		
2	DIS: IN				
3	DIS: IN				
[C0832]			see selection list 2	Configuration digital inputs of the OR element OR2	
1	CFG: IN	1000	FIXED0		
2	CFG: IN	1000	FIXED0		
3	CFG: IN	1000	FIXED0		
C0833				Digital input signals of OR2	display only
1	DIS: IN		0 1		
2	DIS: IN				
3	DIS: IN				
[C0834]			see selection list 2	Configuration digital inputs of the OR element OR3	
1	CFG: IN	1000	FIXED0		
2	CFG: IN	1000	FIXED0		
3	CFG: IN	1000	FIXED0		
C0835				Digital input signals of OR3	display only
1	DIS: IN		0 1		
2	DIS: IN				
3	DIS: IN				

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
[C0836]			see selection list 2	Configuration digital inputs of the OR element OR4	
1	CFG: IN	1000	FIXED0		
2	CFG: IN	1000	FIXED0		
3	CFG: IN	1000	FIXED0		
C0837				Digital input signals of OR4	display only
1	DIS: IN		0 1		
2	DIS: IN				
3	DIS: IN				
[C0838]			see selection list 2	Configuration digital inputs of the OR element OR5	
1	CFG: IN	1000	FIXED0		
2	CFG: IN	1000	FIXED0		
3	CFG: IN	1000	FIXED0		
C0839				Digital input signals of OR5	display only
1	DIS: IN		0 1		
2	DIS: IN				
3	DIS: IN				
[C0840]	CFG: IN	1000	see selection list 2 FIXED0	Configuration digital input of the digital NOT element NOT1	
C0841	DIS: IN		0 1	Digital input signal of NOT1	display only
[C0842]	CFG: IN	1000	see selection list 2 FIXED0	Configuration digital input of the digital NOT element NOT2	
C0843	DIS: IN		0 1	Digital input signal of NOT2	display only
[C0844]	CFG: IN	1000	see selection list 2 FIXED0	Configuration digital input of the digital NOT element NOT3	
C0845	DIS: IN		0 1	Digital input signal of NOT3	display only
[C0846]	CFG: IN	1000	see selection list 2 FIXED0	Configuration digital input of the digital NOT element NOT4	
C0847	DIS: IN		0 1	Digital input signal of NOT4	display only
[C0848]	CFG: IN	1000	see selection list 2 FIXED0	Configuration digital input of the digital NOT element NOT5	
C0849	DIS: IN		0 1	Digital input signal of NOT5	display only
[C0850]			see selection list 1	Configuration process output words for automation interface AIF (X1)	
1	CFG: OUT.W1	1000	FIXED0%		
2	CFG: OUT.W2	1000	FIXED0%		
3	CFG: OUT.W3	1000	FIXED0%		
[C0851]			See selection list 3	Configuration 32-bit phase information	
1	CFG: OUT.D1	1000	FIXED0INC		
C0852	Type OUT.W2	0	0 analog 1 digital 0-15 2 low phase	Configuration process output word 2 for automation interface AIF (X1)	
C0853	Type OUT.W3	0	0 analog 1 digital 16-31 2 high phase	Configuration process output word 3 for automation interface AIF (X1)	
C0855	DIS: IN (0-15) ` DIS: IN (16-31)		0 FFFF	Hexadecimal process input word for automation interface AIF (X1)	display only
C0856				Process input words decimal	display only 100% = 16384
1	DIS: IN.W1		-199.99 {0.01%} 199.99		
2	DIS: IN.W2				
3	DIS: IN.W3				
C0857	DIS: IN.D1		-2147483648 {1} 2147483647	32-bit phase information	display only
C0858				Process output words	display only 100% = 16384
1	DIS: OUT.W1		-199.99 {0.01 %} 199.99		
2	DIS: OUT.W2				
3	DIS: OUT.W3				
C0859	DIS: OUT.D1		-2147483648 {1} 2147483647	32-bit phase information	display only

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
[C0860]			see selection list 1	Configuration process output words for system bus output blocks (CAN)	
1	CFG: OUT1.W1	1000	FIXED0%		
2	CFG: OUT1.W2	1000	FIXED0%		
3	CFG: OUT1.W3	1000	FIXED0%		
4	CFG: OUT2.W1	1000	FIXED0%		
5	CFG: OUT2.W2	1000	FIXED0%		
6	CFG: OUT2.W3	1000	FIXED0%		
7	CFG: OUT2.W4	1000	FIXED0%		
8	CFG: OUT3.W1	1000	FIXED0%		
9	CFG: OUT3.W2	1000	FIXED0%		
10	CFG: OUT3.W3	1000	FIXED0%		
11	CFG: OUT3.W4	1000	FIXED0%		
[C0861]			See selection list 3	Configuration 32-bit phase information for system bus output blocks (CAN)	
1	CFG: OUT1.D1	1000	FIXED0INC		
2	CFG: OUT2.D1	1000	FIXED0INC		
3	CFG: OUT3.D1	1000	FIXED0INC		
C0863				Process input words for system bus (CAN)	display only
1	DIS: IN1 dig0		0 FFFF		
2	DIS: IN1 dig16				
3	DIS: IN2 dig0				
4	DIS: IN2 dig16				
5	DIS: IN3 dig0				
6	DIS: IN3 dig16				
C0864				Configuration process output words for system bus (CAN)	
1	Type OUT1.W2	0	0 analog sign		
2	Type OUT2.W1	0	1 digital 0-15		
3	Type OUT3.W1	0	2 low phase		
C0865				Configuration process output words for system bus (CAN)	
1	Type OUT1.W3	0	0 analog sign		
2	Type OUT2.W2	0	1 digital 16-31		
3	Type OUT3.W2	0	2 high phase		
C0866				Process input words for system bus (CAN)	display only 100% = 16384
1	DIS: IN1.W1		-199.99 {0.01 %} 199.99		
2	DIS: IN1.W3				
3	DIS: IN2.W1				
4	DIS: IN2.W2				
5	DIS: IN2.W3				
6	DIS: IN2.W4				
7	DIS: IN3.W1				
8	DIS: IN3.W2				
9	DIS: IN3.W3				
10	DIS: IN3.W3				
11	DIS: IN3.W4				
C0867				32-bit phase information for system bus (CAN)	display only
1	DIS: IN1.D1		-2147483648 {1} 2147483647		
2	DIS: IN2.D1				
3	DIS: IN3.D1				
C0868				Process output words system bus (CAN)	display only 100% = 16384
1	DIS: OUT1.W1		-199.99 {0.01 %} 199.99		
2	DIS: OUT1.W2				
3	DIS: OUT1.W3				
4	DIS: OUT2.W1				
5	DIS: OUT2.W2				
6	DIS: OUT2.W3				
7	DIS: OUT2.W4				
8	DIS: OUT3.W1				
9	DIS: OUT3.W2				
10	DIS: OUT3.W3				
11	DIS: OUT3.W4				
C0869				32-bit phase information for system bus (CAN)	display only
1	DIS: OUT1.D1		-2147483648 {1} 2147483647		
2	DIS: OUT2.D1				
3	DIS: OUT3.D1				

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
[C0870]			see selection list 2	Configuration digital inputs (inhibit controller) of DCTRL	
1	CFG: CINH	1000	FIXED0		
2	CFG: CINH	1000	FIXED0		
[C0871]	CFG: TRIP-SET	54	see selection list 2 DIGIN 4	Configuration digital input (TRIP-Set) of DCTRL	
[C0876]	CFG: TRIP-RES	55	see selection list 2 DIGIN 5	Configuration digital input (TRIP-Reset) of DCTRL	
C0878			0 1	Digital input signals of DCTRL	display only
1	DIS: CINH1				
2	DIS: CINH2				
3	DIS: TRIP-SET				
4	DIS: TRIP-RES				
C0879				Reset of control words	• C0879 = 1 performs one reset
1	Reset C135	0	0 no reset		
2	Reset AIF	0	1 reset		
3	Reset CAN	0			
[C0880]			see selection list 2	Configuration Select parameter set of DCTRL	
1	CFG: PAR*1	1000	FIXED0		
2	CFG: PAR*2	1000	FIXED0		
[C0881]	CFG:PAR-LOAD	1000	see selection list 2 FIXED0	Configuration Load parameter set of DCTRL	
C0884				Signals for parameter set selection of DCTRL	display only
1	DIS: PAR*1				
2	DIS: PAR*2				
3	DIS: PAR-LOAD				
[C0885]	CFG: R	51	see selection list 2 DIGIN 1	Configuration digital input (CW rotation) of CW/CCW/Q	
[C0886]	CFG: L	52	see selection list 2 DIGIN 2	Configuration digital input (CCW rotation) of CW/CCW/Q	
C0889				Digital input signals of R/L/Q	display only
1	DIS: R		0 1		
2	DIS: L				
[C0890]	CFG: N-SET	5050	see selection list 1 NSET-NOUT	Configuration speed setpoint input motor control MCTRL	
[C0891]	CFG: M-ADD	1000	see selection list 1 FIXED0%	Configuration torque setpoint input of MCTRL	
[C0892]	CFG: LO-M-LIM	5700	see selection list 1 ANEG1-OUT	Configuration lower torque limit of MCTRL	
[C0893]	CFG: HI-M-LIM	19523	see selection list 1 FCODE472/3	Configuration upper torque limit of MCTRL	
[C0899]	CFG: N/M-SWT	1000	see selection list 2 FIXED0	Configuration changeover between speed control and torque control MCTRL	
[C0900]	CFG: QSP	10250	see selection list 2 R/L/Q-QSP	Configuration control signal to activate QSP of MCTRL	
[C0901]	CFG: I-SET	1000	see selection list 1 FIXED0%	Configuration Load I-component of the MCTRL speed controller	
[C0902]	CFG: I-LOAD	1000	see selection list 2 FIXED0	Configuration release signal to load the I-component of the MCTRL speed controller	
[C0903]	CFG: BOOST	5015	see selection list 1 MCTRL-BOOST	Configuration of input MCTRL-BOOST	Standard = FCODE16
[C0904]	CFG: DC-BREAK	1000	see selection list 2 FIXED0	Configuration input signal MCTRL-GSB of MCTRL	
C0905	DIS: DC-BREAK		0 1	Input signal MCTRL-GSB of MCTRL	display only

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C0906 1 2 3 4 5 6	 DIS: N-SET DIS: M-ADD DIS: LO-MLIM DIS: HI-MLIM DIS: I-SET DIS: BOOST		 -199.99 {0.01 %} 199.99	Analog input signals of MCTRL	display only
C0907 2 3 4	 DIS: N/M-SWT DIS: QSP DIS: I-LOAD		 0 1	Digital input signals of MCTRL	display only
C0909	speed limit	1	1 +/- 175 % 2 0 .. +175 % 3 -175 .. 0 %	Speed limitation for the MCTRL speed setpoint	
C0910	 CFG: Vp-Adapt	 1006	see selection list 1 FIXED100%	Configuration analog input signal for adaption of speed controller gain in MCTRL1	for varying N-gain, join to CURVE-OUT of FB CURVE
C0911	DIS: Vp-Adapt		-199.99 {0.01 %} 199.99	Analog input signal of MCTRL1	display only
C0940	Numerator	1	-32767 {1} 32767	Numerator for CONV1	
C0941	Denominator	1	1 {1} 32767	Denominator for CONV1	
[C0942]	 CFG: IN	 1000	see selection list 1 FIXED0%	Configuration analog input signal CONV1	
C0943	DIS: IN		-199.99 {0.01 %} 199.99	Analog input signal of CONV1	display only
C0945	Numerator	1	-32767 {1} 32767	Numerator for CONV2	
C0946	Denominator	1	1 {1} 32767	Denominator for CONV2	
[C0947]	 CFG: IN	 1000	see selection list 1 FIXED0%	Configuration analog input signal CONV2	
C0948	DIS: IN		-199.99 {0.01 %} 199.99	Analog input signal of CONV2	display only
C0950	Numerator	1	-32767 {1} 32767	Numerator for CONV3	
C0951	Denominator	1	1 {1} 32767	Denominator for CONV3	
[C0952]	 CFG: IN	 1000	See selection list 4 FIXEDPHI0	Configuration input speed signal CONV3	
C0953	DIS: IN		-32767 {1 rpm} 32767	Absolute input signal of CONV3	display only
C0955	Numerator	1	-32767 {1} 32767	Numerator for CONV4	
C0956	Denominator	1	1 {1} 32767	Denominator for CONV4	
[C0957]	 CFG: IN	 1000	See selection list 4 FIXEDPHI0	Configuration input speed Eingang signal CONV4	
C0958	DIS: IN		-32767 {1 rpm} 32767	Absolute input signal of CONV4	display only
C0960	Function	1	1 Function1 2 Function2 3 Function3	Characteristic CURVE1-IN	
C0961	y0	0.00	0.00 {0.01 %} 199.99	Ordinate of the value pair (x = 0 % / y0) of CURVE1	
C0962	y1	50.00	0.00 {0.01 %} 199.99	Ordinate of the value pair (x1 / y1) of CURVE1	
C0963	y2	75.00	0.00 {0.01 %} 199.99	Ordinate of the value pair (x2 / y2) of CURVE1	
C0964	y100	100.00	0.00 {0.01 %} 199.99	Ordinate of the value pair (x = 100 % / y100) of CURVE1	
C0965	x1	50.00	0.01 {0.01 %} 100.00	Abscissa of the value pair (x1 / y1) of CURVE1	
C0966	x2	75.00	0.01 {0.01 %} 100.00	Abscissa of the value pair (x2 / y2) of CURVE1	
[C0967]	 CFG: IN	 1000	see selection list 1 FIXED0	Configuration characteristic CURVE1-IN	

Code	Name	Possible settings					IMPORTANT
		Lenze	Selection			Info	
C0968	DIS: IN		-199.99	{0.01 %}	199.99	Relative analog input signal of CURVE1	display only
[C0970]	CFG: N-SET	1000	see selection list 1 FIXED0%			Configuration of mains failure control MFAIL	
[C0971]	CFG: FAULT	1000	see selection list 2 FIXED0			Configuration input mains failure detected of MFAIL	
[C0972]	CFG: RESET	1000	see selection list 2 FIXED0			Configuration reset mains failure control of MFAIL	
[C0973]	CFG: ADAPT	1000	see selection list 1 FIXED0%				
[C0974]	CFG: CONST	1000	see selection list 1 FIXED0%				
[C0975]	CFG: THRESHLD	1000	see selection list 1 FIXED0%				
[C0976]	CFG: NACT	1000	see selection list 1 FIXED0%				
[C0977]	CFG: SET	1000	see selection list 1 FIXED0%			Configuration speed start value for MFAIL	
[C0978]	CFG: DC-SET	1000	see selection list 1 FIXED0%			Configuration setpoint DC bus voltage for MFAIL	
C0980	MFAIL Vp	0.500	0.001	{0.001}	31.000	Gain Vp of MFAIL	
C0981	MFAIL Tn	100	20	{1 msec}	2000	Time constant of MFAIL	
C0982	MFAIL Tir	2.000	0.001	{0.001 sec}	16.000	Acceleration time Tir of MFAIL	
C0983	Retrigger T	1.000	0.001	{0.001 sec}	60.000		
C0988						Analog input signals of MFAIL	display only
1	DIS: N-SET		-199.99	{0.01 %}	199.99		
2	DIS: ADAPT						
3	DIS: CONST						
4	DIS: THRESHLD						
5	DIS: NACT						
6	DIS: SET						
7	DIS: DC-SET						
C0989						Digital input signals of MFAIL	display only
1	DIS: FAULT		0		1		
2	DIS: RESET						
C1040	Acceleration	100.000	0.001	{0.001}	5000.000	SRFG1 acceleration	
C1041	Jerk	0.200	0.001	{0.001}	999.999	SRFG1 jerk	
[C1042]	CFG: IN	1000	see selection list 1 FIXED0%			Configuration: SRFG1-IN	
[C1043]	CFG: SET	1000	see selection list 1 FIXED0%			Configuration of the signal SRFG1-SET	
[C1044]	CFG: LOAD	1000	see selection list 1 FIXED0%			Configuration of the signal SRFG1-LOAD	
C1045						Analog input signals of SRFG1	display only
1	DIS: IN		-199.99	{0.01 %}	199.99		
2	DIS: SET						
C1046	DIS: LOAD		0		1	Digital input signal of SRFG1	display only
C1090	Output signal		-2147483648	{1}	2147483647	Output signal signal output	display only
C1091	Code	141	2	{1}	2000	FEVAN1 Code	
C1092	Subcode	0	0	{1}	255	FEVAN1 Subcode	
C1093	Numerator	1.0000	0.0001	{0.0001}	100000.0000	FEVAN1 numerator	
C1094	Denomiator	0.0001	0.0001	{1}	100000.0000	FEVAN1 denominator	
C1095	Offset	0	0	{1}	1000000000	FEVAN1 Offset	
[C1096]	CFG: IN	1000	see selection list 1 FIXED0%			Configuration analog input of FEVAN1	

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
[C1097] 1 2 3	 CFG: LOAD CFG: BUSY-IN CFG: FAIL-IN	 1000 1000 1000	see selection list 2 FIXED0 FIXED0 FIXED0	Configuration digital inputs of FEVAN1	
C1098	DIS: IN		-32768 {1} 32767	Digital input signal of FEVAN1	display only
C1099	DIS: LOAD		0 1	Digital input signal of FEVAN1-LOAD	display only
C1100	Function	1	1 Return 2 Hold	Functions of FCNT1	
[C1101] 1 2	 CFG: LD-VAL CFG: CMP-VAL	 1000 1000	see selection list 1 FIXED0% FIXED0%	Configuration analog inputs of FCNT1	
[C1102] 1 2 3	 CFG: CLKUP CFG: CLKDWN CFG: LOAD	 1000 1000 1000	see selection list 2 FIXED0 FIXED0 FIXED0	Configuration digital inputs of FCNT1	
C1103 1 2	 DIS: LD-VAL DIS: CMP-VAL		-32768 {1} 32768	Analog input signals of FCNT1	display only
C1104 1 2 3	 DIS: CLKUP DIS: CLKDWN DIS: LOAD		0 1	Digital input signals of FCNT1	display only
[C1160] 1 2	 CFG: IN CFG: IN	 1000 1000	see selection list 1 FIXED0% FIXED0%	Configuration analog inputs of ASW3	
[C1161]	CFG: SET	1000	see selection list 2 FIXED0	Configuration digital input of ASW3	
C1162 1 2	 DIS: IN DIS: IN		-199.99 {0.01 %} 199.99	Analog input signals of ASW3	display only
C1163	DIS: SET		0 1	Digital input signal of ASW3	display only
C1300	N-motor/Dmax	300	0 {1 rpm} 32767	Nominal speed winding drive	
C1301	N-line max	3000	0 {1 rpm} 32767	Nominal speed line drive	
C1302	calc cycle	1.0	0.1 {0.1 rev} 100.0	Calculation cycle	
C1303	time const	0.10	0.01 {0.01 sec} 50.00	Filter time constant	
C1304	D_{max}	500	1 {1 mm} 10000	Nominal winding diameter	
C1305	lower D-limit	50	1 {1 mm} 10000	Minimum winding diameter	
C1306	upper D-limit	500	1 {1 mm} 10000	Maximum winding diameter	
C1307	hyst D-limit	1.00	0.00 {0.01 %} 100.0	Hysteresis for D_{min} /D_{max} output	
C1308	arit function	1	0 DCALC1-OUT = D 1 DCALC1-OUT = 1/D	Arithmetic function	
C1309	D_{min}	50	1 {1 mm} 10000	Winding diameter	
C1310	Ti-time	0.000	0.000 {0.001 sec} 999.900	Acceleration and deceleration time	
C1311	window D-calc	1.00	0.00 {0.01 %} 100.00	Window for permissible diameter deviation	
[C1320]	CFG: SET	1000	see selection list 1 FIXED0%	Configuration analog input of DCALC1	
[C1321] 1 2	 CFG: LOAD CFG: HOLD	 1000 1000	see selection list 2 FIXED 0 FIXED 0	Configuration digital inputs of DCALC1	
C1322 1 2	 DIS: N-LINE DIS: N-WIND		-32767 {1 rpm} 32767	Winding inputs of DCALC1	display only
C1325	DIS: SET		-199.99 {0.01 %} 199.99	Analog input signal of DCALC1	display only

Configuration

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C1326				Digital input signals of DCALC1	display only
1	DIS: LOAD		0 1		
2	DIS: HOLD				
[C1327]			See selection list 3	Configuration winding inputs of DCALC1	
1	CFG: N-LINE	1000	FIXED0INC		
2	CFG: N-WIND	1000	FIXED0INC		
C1328	DIS: D-ACT		0 {1 mm} 10000	Momentary winding diameter of DCALC1	display only
C1330	PCTRL2 Tir	1.0	0.1 {0.1 sec} 6000.0	Process controller acceleration time t_{ir} of PCTRL2	Related to a setpoint change 0...100 %
C1331	PCTRL2 Tif	1.0	0.1 {0.1 sec} 6000.0	Process controller deceleration time t_{if} PCTRL2	Related to a setpoint change 0...100 %
C1332	PCTRL2 V_P	1.0	0.1 {0.1} 500.0	Gain V_p of PCTRL2	
C1333	PCTRL2 Tn	400	20 {1 msec} 99999	Adjustment time T_n of PCTRL2	
C1334	PCTRL2 Kd	0.0	0.0 {0.1} 5.0	Differential component K_d of PCTRL2	
C1335	bi-/unipolar	0	0 bipolar 1 unipolar	Function setting range of PCTRL2	
C1336	Tir overlay	1.0	0.1 {0.1 sec} 6000.0	Acceleration time T_{ir} of ramp generator controls the influence of the process controller PCTRL2	
C1337	Tif overlay	1.0	0.1 {0.1 sec} 6000.0	Deceleration time T_{if} of ramp generator controls the influence of the process controller PCTRL2	
[C1340]			see selection list 1	Configuration analog inputs of PCTRL2	
1	CFG: RFG-SET	1000	FIXED0%		
2	CFG: SET	1000	FIXED0%		
3	CFG: ACT	1000	FIXED0%		
4	CFG: INFL	1000	FIXED0%		
[C1341]			see selection list 2	Configuration digital inputs of PCTRL2	
1	CFG: RFG-LOAD	1000	FIXED0		
2	CFG: I-OFF	1000	FIXED0		
3	CFG: INACT	1000	FIXED0		
4	CFG: OVERLAY	1000	FIXED0		
C1344				Analog input signals of PCTRL2	display only
1	DIS: RFG-SET		-199.99 {0.01 %} 199.99		
2	DIS: SET				
3	DIS: ACT				
4	DIS: INFL				
C1345				Digital input signals of PCTRL2	display only
1	DIS: RFG-LOAD		0 1		
2	DIS: I-OFF				
3	DIS: INACT				
4	DIS: OVERLAY				
C1350	INT1 funktion	0	0 ABS > REF 1 |ABS| >= REF	Comparison selection of INT1	
C1351	INT1 scaling	6553600	65536 {1} 1000000000	Scaling constant for INT1	
[C1354]			See selection list 3	Configuration 32-bit input of INT1	
	CFG: REF	1000	FIXED0INC		
[C1355]			See selection list 4	Configuration phase input of INT1	
	CFG: IN	1000	FIXEDPHI-0		
[C1356]			see selection list 2	Configuration digital input of INT1	
	CFG: RESET	1000	FIXED0		
C1357	DIS: REF		-199.99 {0.01} 199.99	32 Bit input of INT1	display only
C1358	DIS: IN		-32767 {1 rpm} 32767	Phase input of INT1	display only
C1359	DIS: RESET		0 1	Digital input of INT1	display only

Code	Name	Possible settings			IMPORTANT
		Lenze	Selection	Info	
C1360	INT2 funktion	0	0 ABS > REF 1 |ABS| >= REF	Comparison selection of INT2	
C1361	INT2 scaling	6553600	65536 {1} 1000000000	Scaling constant for INT2	
[C1364]	CFG: REF	1000	See selection list 3 FIXED0INC	Configuration 32 Bit input of INT2	
[C1365]	CFG: IN	1000	See selection list 4 FIXEDPHI-0	Configuration phase input of INT2	
[C1366]	CFG: RESET	1000	see selection list 2 FIXED0	Configuration digital input of INT2	
C1367	DIS: REF		-199.99 {0.01} 199.99	32 Bit input of INT2	display only
C1368	DIS: IN		-32767 {1 rpm} 32767	Phase input of INT2	display only
C1369	DIS: RESET		0 1	Digital input of INT2	display only
C1370	FOLL max	100.00	-199.99 {0.01 %} 199.99	Upper limit of FOLL1	
C1371	FOLL min	-100.00	-199.99 {0.01 %} 199.99	Lower limit of FOLL1	
C1372	FOLL Tir	10.0	0.1 {0.1 sec} 6000.0	Acceleration time of FOLL1	
C1373	FOLL Tif	10.0	0.1 {0.1 sec} 6000.0	Deceleration time of FOLL1	
[C1375] 1 2 3 4	 CFG: SIGN CFG: IN CFG: REF CFG: LOAD	 1000 1000 1000 1000	see selection list 1 FIXED0% FIXED0% FIXED0% FIXED0%	Configuration of analog input signals of FOLL1	
[C1376]	CFG: SET	1000	see selection list 2 FIXED 0	Configuration digital input of FOLL1	
C1377 1 2 3 4	 DIS: SIGN DIS: IN DIS: REF DIS: LOAD		-199.99 {0.01 %} 199.99	Configuration of analog input signals of FOLL1	display only
C1378	DIS: SET		0 1	Digital input signal of FOLL1	display only
C1810	S/W Id keypad				
C1811	S/W date keypad				

7.8 Selection lists

Selection list 1: Analog output signals (○)							
000050	AIN1-OUT	006100	MFAIL-NOUT	019500	FCODE-17	020101	CAN-IN1.W1
000055	AIN2-OUT	006150	DB1-OUT	019502	FCODE-26/1	020102	CAN-IN1.W2
000100	DFSET-NOUT	006200	CONV1-OUT	019503	FCODE-26/2	020103	CAN-IN1.W3
001000	FIXED0%	006205	CONV2-OUT	019504	FCODE-27/1	020201	CAN-IN2.W1
001006	FIXED100%	006210	CONV3-OUT	019505	FCODE-27/2	020202	CAN-IN2.W2
001007	FIXED-100%	006215	CONV4-OUT	019506	FCODE-32	020203	CAN-IN2.W3
005000	MCTRL-NSET2	006230	CONVPHA1-OUT	019507	FCODE-37	020204	CAN-IN2.W4
005001	MCTRL-NACT	006300	S&H1-OUT	019510	FCODE-108/1	020301	CAN-IN3.W1
005002	MCTRL-MSET2	006350	CURVE1-OUT	019511	FCODE-108/2	020302	CAN-IN3.W2
005003	MCTRL-MACT	006400	FCNT1-OUT	019512	FCODE-109/1	020303	CAN-IN3.W3
005004	MCTRL-IACT	010000	BRK1-M-SET	019513	FCODE-109/2	020304	CAN-IN3.W4
005005	MCTRL-DCVOLT	011000	DCALC1-D-OUT	019515	FCODE-141	025101	AIF-IN.W1
005006	MCTRL-VACT	011001	DCALC1-OUT	019521	FCODE-472/1	025102	AIF-IN.W2
005007	MCTRL-FACT	011050	PCTRL2-OUT	019522	FCODE-472/2	025103	AIF-IN.W3
005008	MCTRL-IxT	011100	INT1-AOUT	019523	FCODE-472/3		
005009	MCTRL-PHI-ACT	011105	INT2-AOUT	019524	FCODE-472/4		
005010	MCTRL-M-TEMP	011150	FOLL1-OUT	019525	FCODE-472/5		
005015	MCTRL-BOOST			019526	FCODE-472/6		
005050	NSET-NOUT			019527	FCODE-472/7		
005051	NSET-RFG-I			019528	FCODE-472/8		
005052	NSET-C10-C11			019529	FCODE-472/9		
005100	MPOT1-OUT			019530	FCODE-472/10		
005150	PCTRL1-OUT			019531	FCODE-472/11		
005250	NLIM1-OUT			019532	FCODE-472/12		
005500	ARIT1-OUT			019533	FCODE-472/13		
005505	ARIT2-OUT			019534	FCODE-472/14		
005510	ARIT3-OUT			019535	FCODE-472/15		
005540	SQRT1-OUT			019536	FCODE-472/16		
005550	ADD1-OUT			019537	FCODE-472/17		
005555	ADD2-OUT			019538	FCODE-472/18		
005600	RFG1-OUT			019539	FCODE-472/19		
005610	SRFG1-OUT			019540	FCODE-472/20		
005611	SRFG1-DIFF			019551	FCODE-473/1		
005650	ASW1-OUT			019552	FCODE-473/2		
005655	ASW2-OUT			019553	FCODE-473/3		
005660	ASW3-OUT			019554	FCODE-473/4		
005700	ANEG1-OUT			019555	FCODE-473/5		
005705	ANEG2-OUT			019556	FCODE-473/6		
005750	FIXSET1-OUT			019557	FCODE-473/7		
005800	LIM1-OUT			019558	FCODE-473/8		
005850	ABS1-OUT			019559	FCODE-473/9		
005900	PT1-1-OUT			019560	FCODE-473/10		
005905	PT1-2-OUT						
005950	DT1-1-OUT						

Selection list 2: Digital output signals (□)

000051	DIGIN1	010650	CMP1-OUT	019500	FCODE-250	019751	FCODE-135.B0
000052	DIGIN2	010655	CMP2-OUT	019521	FCODE-471.B0	019752	FCODE-135.B1
000053	DIGIN3	010660	CMP3-OUT	019522	FCODE-471.B1	019753	FCODE-135.B2
000054	DIGIN4	010665	CMP4-OUT	019523	FCODE-471.B2	019755	FCODE-135.B4
000055	DIGIN5	010700	DIGDEL1-OUT	019524	FCODE-471.B3	019756	FCODE-135.B5
000056	DIGIN6(ST)	010705	DIGDEL2-OUT	019525	FCODE-471.B4	019757	FCODE-135.B6
000065	DIGIN-CINH	010750	TRANS1-OUT	019526	FCODE-471.B5	019758	FCODE-135.B7
000100	DFSET-ACK	010755	TRANS2-OUT	019527	FCODE-471.B6	019763	FCODE-135.B12
000500	DCTRL-RDY	010900	FLIP1-OUT	019528	FCODE-471.B7	019764	FCODE-135.B13
000501	DCTRL-CINH	010905	FLIP2-OUT	019529	FCODE-471.B8	019765	FCODE-135.B14
000502	DCTRL-INIT	011000	DCALC1-DMAX	019530	FCODE-471.B9	019766	FCODE-135.B15
000503	DCTRL-IMP	011001	DCALC1-DMIN	019531	FCODE-471.B10		
000504	DCTRL-NACT=0	011002	DCALC1-I=0	019532	FCODE-471.B11		
000505	DCTRL-CW/CCW	011100	INT1-DOUT	019533	FCODE-471.B12		
001000	FIXED0	011105	INT2-DOUT	019534	FCODE-471.B13		
001001	FIXED1	013000	FEVAN1-BUSY	019535	FCODE-471.B14		
002000	DCTRL-PAR*1	013001	FEVAN1-FAIL	019536	FCODE-471.B15		
002001	DCTRL-PAR*2	015000	DCTRL-TRIP	019537	FCODE-471.B16		
002002	DCTRL-PAR-BUSY	015001	DCTRL-MESS	019538	FCODE-471.B17		
005001	MCTRL-QSP-OUT	015002	DCTRL-WARN	019539	FCODE-471.B18		
005002	MCTRL-IMAX	015003	DCTRL-FAIL	019540	FCODE-471.B19		
005003	MCTRL-MMAX	015010	MONIT-LU	019541	FCODE-471.B20		
005006	MCTRL-GSB-OUT	015011	MONIT-OU	019542	FCODE-471.B21		
005050	NSET-RFG-I=0	015012	MONIT-EEr	019543	FCODE-471.B22		
006000	DFRFG1-FAIL	015013	MONIT-OC1	019544	FCODE-471.B23		
006001	DFRFG1-SYNC	015014	MONIT-OC2	019545	FCODE-471.B24		
006100	MFAIL-STATUS	015015	MONIT-LP1	019546	FCODE-471.B25		
006101	MFAIL-I-RESET	015016	MONIT-OH	019547	FCODE-471.B26		
006400	FCNT1-EQUAL	015018	MONIT-OH4	019548	FCODE-471.B27		
010000	BRK1-OUT	015020	MONIT-OH8	019549	FCODE-471.B28		
010001	BRK1-CINH	015026	MONIT-CE0	019550	FCODE-471.B29		
010002	BRK1-QSP	015027	MONIT-NMAX	019551	FCODE-471.B30		
010003	BRK1-M-STORE	015028	MONIT-OC5	019552	FCODE-471.B31		
010250	R/L/Q-QSP	015029	MONIT-SD5				
010251	R/L/Q-R/L	015031	MONIT-SD7				
010500	AND1-OUT	015032	MONIT-H07				
010505	AND2-OUT	015033	MONIT-H10				
010510	AND3-OUT	015034	MONIT-H11				
010515	AND4-OUT	015040	MONIT-CE1				
010520	AND5-OUT	015041	MONIT-CE2				
010550	OR1-OUT	015042	MONIT-CE3				
010555	OR2-OUT	015043	MONIT-CE4				
010560	OR3-OUT	015044	MONIT-OC3				
010565	OR4-OUT	015045	MONIT-ID1				
010570	OR5-OUT	015046	MONIT-ID2				
010600	NOT1-OUT						
010605	NOT2-OUT						
010610	NOT3-OUT						
010615	NOT4-OUT						
010620	NOT5-OUT						

Configuration

Selection list 2: Digital output signals (□) continued)							
020001	CAN-CTRL.B0	020201	CAN-IN2.B0	020301	CAN-IN3.B0	025001	AIF-CTRL.B0
020002	CAN-CTRL.B1	020202	CAN-IN2.B1	020302	CAN-IN3.B1	025002	AIF-CTRL.B1
020003	CAN-CTRL.B2	020203	CAN-IN2.B2	020303	CAN-IN3.B2	025003	AIF-CTRL.B2
020005	CAN-CTRL.B4	020204	CAN-IN2.B3	020304	CAN-IN3.B3	025005	AIF-CTRL.B4
020006	CAN-CTRL.B5	020205	CAN-IN2.B4	020305	CAN-IN3.B4	025006	AIF-CTRL.B5
020007	CAN-CTRL.B6	020206	CAN-IN2.B5	020306	CAN-IN3.B5	025007	AIF-CTRL.B6
020008	CAN-CTRL.B7	020207	CAN-IN2.B6	020307	CAN-IN3.B6	025008	AIF-CTRL.B7
020013	CAN-CTRL.B12	020208	CAN-IN2.B7	020308	CAN-IN3.B7	025013	AIF-CTRL.B12
020014	CAN-CTRL.B13	020209	CAN-IN2.B8	020309	CAN-IN3.B8	025014	AIF-CTRL.B13
020015	CAN-CTRL.B14	020210	CAN-IN2.B9	020310	CAN-IN3.B9	025015	AIF-CTRL.B14
020016	CAN-CTRL.B15	020211	CAN-IN2.B10	020311	CAN-IN3.B10	025016	AIF-CTRL.B15
020101	CAN-IN1.B0	020212	CAN.IN2.B11	020312	CAN-IN3.B11	025101	AIF-IN.B0
020102	CAN-IN1.B1	020213	CAN-IN2.B12	020313	CAN-IN3.B12	025102	AIF-IN.B1
020103	CAN-IN1.B2	020214	CAN-IN2.B13	020314	CAN-IN3.B13	025103	AIF-IN.B2
020104	CAN-IN1.B3	020215	CAN-IN2.B14	020315	CAN-IN3.B14	025104	AIF-IN.B3
020105	CAN-IN1.B4	020216	CAN-IN2.B15	020316	CAN-IN3.B15	025105	AIF-IN.B4
020106	CAN-IN1.B5	020217	CAN-IN2.B16	020317	CAN-IN3.B16	025106	AIF-IN.B5
020107	CAN-IN1.B6	020218	CAN-IN2.B17	020318	CAN-IN3.B17	025107	AIF-IN.B6
020108	CAN-IN1.B7	020219	CAN-IN2.B18	020319	CAN-IN3.B18	025108	AIF-IN.B7
020109	CAN-IN1.B8	020220	CAN-IN2.B19	020320	CAN-IN3.B19	025109	AIF-IN.B8
020110	CAN-IN1.B9	020221	CAN-IN2.B20	020321	CAN-IN3.B20	025110	AIF-IN.B9
020111	CAN-IN1.B10	020222	CAN-IN2.B21	020322	CAN-IN3.B21	025111	AIF-IN.B10
020112	CAN-IN1.B11	020223	CAN-IN2.B22	020323	CAN-IN3.B22	025112	AIF-IN.B11
020113	CAN-IN1.B12	020224	CAN-IN2.B23	020324	CAN-IN3.B23	025113	AIF-IN.B12
020114	CAN-IN1.B13	020225	CAN-IN2.B24	020325	CAN-IN3.B24	025114	AIF-IN.B13
020115	CAN-IN1.B14	020226	CAN-IN2.B25	020326	CAN-IN3.B25	025115	AIF-IN.B14
020116	CAN-IN1.B15	020227	CAN-IN2.B26	020327	CAN-IN3.B26	025116	AIF-IN.B15
020117	CAN-IN1.B16	020228	CAN-IN2.B27	020328	CAN-IN3.B27	025117	AIF-IN.B16
020118	CAN-IN1.B17	020229	CAN-IN2.B28	020329	CAN-IN3.B28	025118	AIF-IN.B17
020119	CAN-IN1.B18	020230	CAN-IN2.B29	020330	CAN-IN3.B29	025119	AIF-IN.B18
020120	CAN-IN1.B19	020231	CAN-IN2.B30	020331	CAN-IN3.B30	025120	AIF-IN.B19
020121	CAN-IN1.B20	020232	CAN-IN2.B31	020332	CAN-IN3.B31	025121	AIF-IN.B20
020122	CAN-IN1.B21			020400	CAN-SYNC-OUT	025122	AIF-IN.B21
020123	CAN-IN1.B22					025123	AIF-IN.B22
020124	CAN-IN1.B23					025124	AIF-IN.B23
020125	CAN-IN1.B24					025125	AIF-IN.B24
020126	CAN-IN1.B25					025126	AIF-IN.B25
020127	CAN-IN1.B26					025127	AIF-IN.B26
020128	CAN-IN1.B27					025128	AIF-IN.B27
020129	CAN-IN1.B28					025129	AIF-IN.B28
020130	CAN-IN1.B29					025130	AIF-IN.B29
020131	CAN-IN1.B30					025131	AIF-IN.B30
020132	CAN-IN1.B31					025132	AIF-IN.B31

Selection list 3: Phase signals (▲)		Selection list 4: Speed signals (△)		Selection list 5: Function blocks			
000100	DFSET-PSET	000050	DFIN-OUT	000000	empty	010000	BRK1
001000	FIXED0INC	000100	DFSET-POUT	000050	AIN1	010250	R/L/Q
005000	MCTRL-PHI-ANG	000250	DFOUT-OUT	000055	AIN2	010500	AND1
011100	INT1-POUT	001000	FIXEDPHI-0	000070	AOUT1	010505	AND2
011105	INT2-POUT	005000	MCTRL-PHI-ACT	000075	AOUT2	010510	AND3
019521	FCODE-474/1	006000	DFRFG-OUT	000100	DFSET	010515	AND4
019522	FCODE-474/2	006220	CONV5-OUT	000200	DFIN	010520	AND5
020103	CAN-IN1.D1	019521	FCODE-475/1	000250	DFOUT	010550	OR1
020201	CAN-IN2.D1	019522	FCODE-475/2	005050	NSET	010555	OR2
020301	CAN-IN3.D1			005100	MPOT1	010560	OR3
025103	AIF-IN.D1			005150	PCTRL1	010565	OR4
				005250	NLIM1	010570	OR5
				005500	ARIT1	010600	NOT1
				005505	ARIT2	010605	NOT2
				005510	ARIT3	010610	NOT3
				005540	SQRT1	010615	NOT4
				005550	ADD1	010620	NOT5
				005555	ADD2	010650	CMP1
				005600	RFG1	010655	CMP2
				005610	SRFG1	010660	CMP3
				005650	ASW1	010700	DIGDEL1
				005655	ASW2	010705	DIGDEL2
				005660	ASW3	010750	TRANS1
				005700	ANEG1	010755	TRANS2
				005705	ANEG2	010900	FLIP1
				005750	FIXSET1	010905	FLIP2
				005800	LIM1	011000	DCALC1
				005850	ABS1	011050	PCTRL2
				005900	PT1-1	011100	INT1
				005905	PT1-2	011105	INT2
				005950	DT1-1	011150	FOLL1
				006000	DFRFG1	013000	FEV-AN1
				006100	MFAIL	013100	OSZ
				006150	DB1	015100	MLP1
				006200	CONV1	020000	CAN-OUT
				006205	CONV2	025000	AIF-OUT
				006210	CONV3		
				006215	CONV4		
				006220	CONV5		
				006230	CONVPHA1		
				006300	S&H1		
				006350	CURVE1		
				006400	FCNT1		

Configuration

Selection list 10: Error list		Selection list 10: Error list					
000000	No fail	000105	H05 trip	001030	LV message	002015	OC5 warning
000011	OC1 trip	000107	H07 trip	001091	EEr message	002020	OV warning
000012	OC2 trip	000110	H10 trip			002032	LP1 warning
000013	OC3 trip	000111	H11 trip			002054	OH4 warning
000022	LUQ trip	000140	Id1 trip			002057	OH7 warning
000032	LP1 trip	000141	Id2 trip			002058	OH8 warning
000050	OH trip	000200	NMAX trip			002061	CE0 warning
000053	OH3 trip					002062	CE1 warning
000057	OH7 trip					002063	CE2 warning
000058	OH8 trip					002064	CE3 warning
000061	CE0 trip					002065	CE4 warning
000062	CE1 trip					002083	Sd3 warning
000063	CE2 trip					002085	Sd5 warning
000064	CE3 trip					002086	Sd6 warning
000065	CE4 trip					002091	EER warning
000070	U15 trip						
000071	CCr trip						
000072	Pr1 trip						
000073	Pr2 trip						
000074	PEr trip						
000075	Pr0 trip						
000077	Pr3 trip						
000078	Pr4 trip						
000079	PI trip						
000083	Sd3 trip						
000085	Sd5 trip						
000086	Sd6 trip						
000091	EEr trip						

7.9 Table of attributes

If you want to write programs on your own, you need the specifications given in the table of attributes. It includes all information for the communication with the controller using parameters.

How to read the table of attributes:

Column		**Meaning**	**Entry**	
Code		Meaning 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	Is only required for control via InterBus-S, Profibus DP or system bus (CAN).
	hex		5FFFh - Lenze code	
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 byte bit-coded
			B32	4 byte bit-coded
			FIX32	32 bit value with sign; decimal with four decimal codes
			I32	4 byte with sign
			U32	4 byte without sign
			VS	ASCII string
	Format	LECOM format (see also Operating Instructions of the fieldbus module 2102)	VD	ASCII decimal format
			VH	ASCII hexadecimal format
			VS	String format
			VO	Octett string format for data blocks
	DL	Data length in byte		The column "Important" contains further information
Access	LCM-R/W	Access authorization for LECOM	Ra	Reading is always permitted
			Wa	Writing is always permitted
			W	Writing is restricted
	Condition	Condition for writing	CINH	Writing permitted only with controller inhibit

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	
C0010	24565	5FF5h	E	1	FIX32	VD	4	Ra/Wa	
C0011	24564	5FF4h	E	1	FIX32	VD	4	Ra/Wa	
C0012	24563	5FF3h	E	1	FIX32	VD	4	Ra/Wa	
C0013	24562	5FF2h	E	1	FIX32	VD	4	Ra/Wa	
C0014	24561	5FF1h	E	1	FIX32	VD	4	Ra/Wa	
C0015	24560	5FF0h	E	1	FIX32	VD	4	Ra/Wa	
C0016	24559	5FEFh	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	
C0020	24555	5FEBh	E	1	FIX32	VD	4	Ra/Wa	
C0021	24554	5FEAh	E	1	FIX32	VD	4	Ra/Wa	
C0022	24553	5FE9h	E	1	FIX32	VD	4	Ra/Wa	
C0023	24552	5FE8h	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	
C0033	24542	5FDEh	E	1	FIX32	VD	4	Ra/Wa	
C0034	24541	5FDDh	E	1	FIX32	VD	4	Ra/Wa	
C0036	24539	5FDBh	E	1	FIX32	VD	4	Ra/Wa	
C0037	24538	5FDAh	E	1	FIX32	VD	4	Ra/Wa	
C0038	24537	5FD9h	A	6	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	
C0059	24516	5FC4h	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	

Configuration

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0074	24501	5FB5h	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
C0082	24493	5FADh	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
C0092	24483	5FA3h	E	1	FIX32	VD	4	Ra/Wa	
C0093	24482	5FA2h	E	1	FIX32	VD	4	Ra	
C0094	24481	5FA1h	E	1	FIX32	VD	4	Ra/Wa	
C0096	24479	5F9Fh	A	2	FIX32	VD	4	Ra/W	CINH
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	
C0104	24471	5F97h	E	1	FIX32	VD	4	Ra/Wa	
C0105	24470	5F96h	E	1	FIX32	VD	4	Ra/Wa	
C0107	24478	5F94h	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	6	FIX32	VD	4	Ra/Wa	
C0116	24459	5F8Bh	A	32	FIX32	VD	4	Ra/W	CINH
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	
C0143	24432	5F70h	E	1	FIX32	VD	4	Ra/Wa	
C0144	24431	5F6Fh	E	1	FIX32	VD	4	Ra/Wa	
C0145	24430	5F6Eh	E	1	FIX32	VD	4	Ra/Wa	
C0146	24429	5F6Dh	E	1	FIX32	VD	4	Ra/Wa	
C0147	24428	5F6Ch	E	1	FIX32	VD	4	Ra/Wa	
C0148	24427	5F6Bh	E	1	FIX32	VD	4	Ra/Wa	
C0149	24426	5F6Ah	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

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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/W	CINH
C0178	24397	5F4Dh	E	1	U32	VH	4	Ra	
C0179	24396	5F4Ch	E	1	U32	VH	4	Ra	
C0182	24393	5F49h	E	1	FIX32	VD	4	Ra/Wa	
C0183	24392	5F48h	E	1	FIX32	VD	4	Ra	
C0190	24385	5F41h	E	1	FIX32	VD	4	Ra/Wa	
C0195	24380	5F3Ch	E	1	FIX32	VD	4	Ra/Wa	
C0196	24379	5F3Bh	E	1	FIX32	VD	4	Ra/Wa	
C0200	24375	5F37h	E	1	VS	VS	14	Ra	
C0201	24374	5F36h	E	1	VS	VS	20	Ra	
C0203	24372	5F34h	E	1	VS	VS	20	Ra	
C0204	24371	5F33h	E	1	VS	VS	20	Ra	
C0205	24370	5F32h	E	1	VS	VS	20	Ra	
C0206	24369	5F31h	E	1	VS	VS	20	Ra	
C0207	24368	5F30h	E	1	VS	VS	20	Ra	
C0208	24367	5F2Fh	E	1	VS	VS	20	Ra	
C0209	24366	5F2Eh	E	1	VS	VS	20	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	
C0234	24341	5F15h	E	1	FIX32	VD	4	Ra/Wa	
C0235	24340	5F14h	E	1	FIX32	VD	4	Ra/Wa	
C0236	24339	5F13h	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	
C0260	24315	5EFBh	E	1	FIX32	VD	4	Ra/Wa	
C0261	24314	5EFAh	E	1	FIX32	VD	4	Ra/Wa	
C0262	24313	5EF9h	E	1	FIX32	VD	4	Ra/Wa	
C0263	24312	5EF8h	E	1	FIX32	VD	4	Ra/Wa	
C0264	24311	5EF7h	E	1	FIX32	VD	4	Ra/Wa	
C0265	24310	5EF6h	E	1	FIX32	VD	4	Ra/Wa	
C0267	24308	5EF4h	A	2	FIX32	VD	4	Ra/W	CINH
C0268	24307	5EF3h	E	1	FIX32	VD	4	Ra/W	CINH
C0269	24306	5EF2h	A	3	FIX32	VD	4	Ra	
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	

Configuration

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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/W	CINH
C0351	24224	5EA0h	E	1	FIX32	VD	4	Ra/W	CINH
C0352	24223	5E9Fh	E	1	FIX32	VD	4	Ra/W	CINH
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/W	CINH
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	
C0364	24211	5E93h	E	1	FIX32	VD	4	Ra/Wa	
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	
C0420	24155	5E5Bh	E	1	FIX32	VD	4	Ra/W	CINH
C0421	24154	5E5Ah	E	1	FIX32	VD	4	Ra/W	CINH
C0425	24150	5E56h	E	1	FIX32	VD	4	Ra/Wa	
C0426	24149	5E55h	E	1	FIX32	VD	4	Ra	
C0427	24148	5E54h	E	1	FIX32	VD	4	Ra/Wa	
C0429	24146	5E52h	E	1	FIX32	VD	4	Ra/Wa	
C0431	24144	5E50h	E	1	FIX32	VD	4	Ra/W	CINH
C0432	24143	5E4Fh	E	1	FIX32	VD	4	Ra/W	CINH
C0433	24142	5E4Eh	E	1	FIX32	VD	4	Ra/W	CINH
C0434	24141	5E4Dh	A	3	FIX32	VD	4	Ra	
C0436	24139	5E4Bh	E	1	FIX32	VD	4	Ra/W	CINH
C0437	24138	5E4Ah	E	1	FIX32	VD	4	Ra/W	CINH
C0438	24137	5E49h	E	1	FIX32	VD	4	Ra/W	CINH
C0439	24136	5E48h	A	3	FIX32	VD	4	Ra	
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	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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	2	I32	VH	4	Ra/Wa	
C0475	24100	5E24h	A	2	FIX32	VD	4	Ra/Wa	
C0497	24078	5E0Eh	E	1	FIX32	VD	4	Ra/Wa	
C0510	24065	5E01h	E	1	FIX32	VD	4	Ra/Wa	
C0511	24064	5E00h	E	1	FIX32	VD	4	Ra/Wa	
C0517	24058	5DFAh	A	32	FIX32	VD	4	Ra/W	CINH
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	
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/W	CINH
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	

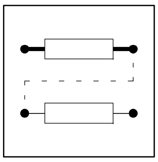
Configuration

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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	
C0587	23988	5DB4h	E	1	FIX32	VD	4	Ra/Wa	
C0588	23987	5DB3h	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	
C0603	23972	5DA4h	E	1	FIX32	VD	4	Ra/Wa	
C0604	23971	5DA3h	A	2	FIX32	VD	4	Ra/W	CINH
C0605	23970	5DA2h	A	2	FIX32	VD	4	Ra	
C0608	23967	5D9Fh	E	1	FIX32	VD	4	Ra/W	CINH
C0609	23966	5D9Eh	E	1	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	
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	
C0643	23932	5D7Ch	E	1	FIX32	VD	4	Ra/Wa	
C0644	23931	5D7Bh	E	1	FIX32	VD	4	Ra/W	CINH
C0645	23930	5D7Ah	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	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
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	
C0705	23870	5D3Eh	E	1	FIX32	VD	4	Ra/Wa	
C0706	23869	5D3Dh	E	1	FIX32	VD	4	Ra/Wa	
C0707	23868	5D3Ch	E	1	FIX32	VD	4	Ra/Wa	
C0708	23867	5D3Bh	A	2	FIX32	VD	4	Ra/W	CINH
C0709	23866	5D3Ah	A	2	FIX32	VD	4	Ra	
C0710	23865	5D39h	E	1	FIX32	VD	4	Ra/Wa	
C0711	23864	5D38h	E	1	FIX32	VD	4	Ra/Wa	
C0713	23862	5D36h	E	1	FIX32	VD	4	Ra/W	CINH
C0714	23861	5D35h	E	1	FIX32	VD	4	Ra	
C0715	23860	5D34h	E	1	FIX32	VD	4	Ra/Wa	
C0716	23859	5D33h	E	1	FIX32	VD	4	Ra/Wa	
C0718	23857	5D31h	E	1	FIX32	VD	4	Ra/W	CINH
C0719	23856	5D30h	E	1	FIX32	VD	4	Ra	
C0720	23855	5D2Fh	E	1	FIX32	VD	4	Ra/Wa	
C0721	23854	5D2Eh	E	1	FIX32	VD	4	Ra/Wa	
C0723	23852	5D2Ch	E	1	FIX32	VD	4	Ra/W	CINH
C0724	23851	5D2Bh	E	1	FIX32	VD	4	Ra	
C0725	23850	5D2Ah	E	1	FIX32	VD	4	Ra/Wa	
C0726	23849	5D29h	E	1	FIX32	VD	4	Ra/Wa	
C0728	23847	5D27h	E	1	FIX32	VD	4	Ra/W	CINH
C0729	23846	5D26h	E	1	FIX32	VD	4	Ra	
C0730	23845	5D25h	E	1	FIX32	VD	4	Ra/Wa	
C0731	23844	5D24h	E	1	FIX32	VD	4	Ra	
C0732	23843	5D23h	A	4	FIX32	VD	4	Ra/W	CINH
C0733	23842	5D22h	E	1	FIX32	VD	4	Ra/W	CINH
C0734	23841	5D21h	E	1	FIX32	VD	4	Ra/Wa	
C0735	23840	5D20h	E	1	FIX32	VD	4	Ra/Wa	

Configuration

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0736	23839	5D1Fh	E	1	FIX32	VD	4	Ra/Wa	
C0737	23838	5D1Eh	E	1	FIX32	VD	4	Ra/Wa	
C0738	23837	5D1Dh	E	1	FIX32	VD	4	Ra/Wa	
C0739	23836	5D1Ch	E	1	FIX32	VD	4	Ra/Wa	
C0740	23835	5D1Bh	A	2	FIX32	VD	4	Ra/Wa	
C0741	23834	5D1Ah	A	4	FIX32	VD	4	Ra	
C0742	23833	5D19h	E	1	FIX32	VD	4	Ra	
C0743	23832	5D18h	E	1	FIX32	VD	4	Ra	
C0744	23831	5D17h	E	1	FIX32	VD	4	Ra/Wa	
C0749	23826	5D12h	A	3	FIX32	VD	4	Ra	
C0750	23825	5D11h	E	1	FIX32	VD	4	Ra/Wa	
C0751	23824	5D10h	E	1	FIX32	VD	4	Ra/Wa	
C0752	23823	5D0Fh	E	1	FIX32	VD	4	Ra/Wa	
C0753	23822	5D0Eh	E	1	FIX32	VD	4	Ra/Wa	
C0754	23821	5D0Dh	E	1	U32	VH	4	Ra/Wa	
C0755	23820	5D0Ch	E	1	FIX32	VD	4	Ra/Wa	
C0756	23819	5D0Bh	E	1	U32	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	
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	



Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0809	23766	5CD6h	A	2	FIX32	VD	4	Ra	
C0810	23765	5CD5h	A	2	FIX32	VD	4	Ra/W	CINH
C0811	23764	5CD4h	E	1	FIX32	VD	4	Ra/W	CINH
C0812	23763	5CD3h	A	2	FIX32	VD	4	Ra	
C0813	23762	5CD2h	E	1	FIX32	VD	4	Ra	
C0815	23760	5CD0h	A	2	FIX32	VD	4	Ra/W	CINH
C0816	23759	5CCFh	E	1	FIX32	VD	4	Ra/W	CINH
C0817	23758	5CCEh	A	2	FIX32	VD	4	Ra	
C0818	23757	5CCDh	E	1	FIX32	VD	4	Ra	
C0820	23755	5CCBh	A	3	FIX32	VD	4	Ra/W	CINH
C0821	23754	5CCAh	A	3	FIX32	VD	4	Ra	
C0822	23753	5CC9h	A	3	FIX32	VD	4	Ra/W	CINH
C0823	23752	5CC8h	A	3	FIX32	VD	4	Ra	
C0824	23751	5CC7h	A	3	FIX32	VD	4	Ra/W	CINH
C0825	23750	5CC6h	A	3	FIX32	VD	4	Ra	
C0826	23749	5CC5h	A	3	FIX32	VD	4	Ra/W	CINH
C0827	23748	5CC4h	A	3	FIX32	VD	4	Ra	
C0828	23747	5CC3h	A	3	FIX32	VD	4	Ra/W	CINH
C0829	23746	5CC2h	A	3	FIX32	VD	4	Ra	
C0830	23745	5CC1h	A	3	FIX32	VD	4	Ra/W	CINH
C0831	23744	5CC0h	A	3	FIX32	VD	4	Ra	
C0832	23743	5CBFh	A	3	FIX32	VD	4	Ra/W	CINH
C0833	23742	5CBEh	A	3	FIX32	VD	4	Ra	
C0834	23741	5CBDh	A	3	FIX32	VD	4	Ra/W	CINH
C0835	23740	5CBCh	A	3	FIX32	VD	4	Ra	
C0836	23739	5CBBh	A	3	FIX32	VD	4	Ra/W	CINH
C0837	23738	5CBAh	A	3	FIX32	VD	4	Ra	
C0838	23737	5CB9h	A	3	FIX32	VD	4	Ra/W	CINH
C0839	23736	5CB8h	A	3	FIX32	VD	4	Ra	
C0840	23735	5CB7h	E	1	FIX32	VD	4	Ra/W	CINH
C0841	23734	5CB6h	E	1	FIX32	VD	4	Ra	
C0842	23733	5CB5h	E	1	FIX32	VD	4	Ra/W	CINH
C0843	23732	5CB4h	E	1	FIX32	VD	4	Ra	
C0844	23731	5CB3h	E	1	FIX32	VD	4	Ra/W	CINH
C0845	23730	5CB2h	E	1	FIX32	VD	4	Ra	
C0846	23729	5CB1h	E	1	FIX32	VD	4	Ra/W	CINH
C0847	23728	5CB0h	E	1	FIX32	VD	4	Ra	
C0848	23727	5CAFh	E	1	FIX32	VD	4	Ra/W	CINH
C0849	23726	5CAEh	E	1	FIX32	VD	4	Ra	
C0850	23725	5CADh	A	3	FIX32	VD	4	Ra/W	CINH
C0851	23724	5CACh	E	1	FIX32	VD	4	Ra/W	CINH
C0852	23723	5CABh	E	1	FIX32	VD	4	Ra/Wa	
C0853	23722	5CAAh	E	1	FIX32	VD	4	Ra/Wa	
C0855	23720	5CA8h	A	2	B16	VH	2	Ra	
C0856	23719	5CA7h	A	3	I32	VH	4	Ra	
C0857	23718	5CA6h	E	1	I32	VH	4	Ra	
C0858	23717	5CA5h	A	3	I32	VH	4	Ra	
C0859	23716	5CA4h	E	1	I32	VH	4	Ra	
C0860	23715	5CA3h	A	11	FIX32	VD	4	Ra/W	CINH
C0861	23714	5CA2h	A	3	FIX32	VD	4	Ra/W	CINH
C0863	23712	5CA0h	A	6	B32	VH	4	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	I32	VH	4	Ra	
C0867	23708	5C9Ch	A	3	I32	VH	4	Ra	
C0868	23707	5C9Bh	A	11	I32	VH	4	Ra	
C0869	23706	5C9Ah	A	3	I32	VH	4	Ra	
C0870	23705	5C99h	A	2	FIX32	VD	4	Ra/W	CINH
C0871	23704	5C98h	E	1	FIX32	VD	4	Ra/W	CINH
C0876	23699	5C93h	E	1	FIX32	VD	4	Ra/W	CINH
C0878	23697	5C91h	A	4	FIX32	VD	4	Ra	
C0879	23696	5C90h	A	3	FIX32	VD	4	Ra/Wa	
C0880	23695	5C8Fh	A	2	FIX32	VD	4	Ra/W	CINH
C0881	23694	5C8Eh	E	1	FIX32	VD	4	Ra/W	CINH
C0884	23691	5C8Bh	A	3	FIX32	VD	4	Ra	
C0885	23690	5C8Ah	E	1	FIX32	VD	4	Ra/W	CINH
C0886	23689	5C89h	E	1	FIX32	VD	4	Ra/W	CINH
C0889	23686	5C86h	A	2	FIX32	VD	4	Ra	
C0890	23685	5C85h	E	1	FIX32	VD	4	Ra/W	CINH
C0891	23684	5C84h	E	1	FIX32	VD	4	Ra/W	CINH
C0892	23683	5C83h	E	1	FIX32	VD	4	Ra/W	CINH
C0893	23682	5C82h	E	1	FIX32	VD	4	Ra/W	CINH
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
C0904	23671	5C77h	E	1	FIX32	VD	4	Ra/W	CINH
C0905	23670	5C76h	E	1	FIX32	VD	4	Ra	
C0906	23669	5C75h	A	6	FIX32	VD	4	Ra	
C0907	23668	5C74h	A	4	FIX32	VD	4	Ra	
C0909	23666	5C72h	E	1	FIX32	VD	4	Ra/Wa	
C0910	23665	5C71h	E	1	FIX32	VD	4	Ra/Wa	
C0911	23664	5C70h	E	1	FIX32	VD	4	Ra	
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	

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C0964	23611	5C3Bh	E	1	FIX32	VD	4	Ra/Wa	
C0965	23610	5C3Ah	E	1	FIX32	VD	4	Ra/Wa	
C0966	23609	5C39h	E	1	FIX32	VD	4	Ra/Wa	
C0967	23608	5C38h	E	1	FIX32	VD	4	Ra/W	CINH
C0968	23607	5C37h	E	1	FIX32	VD	4	Ra	
C0970	23605	5C35h	E	1	FIX32	VD	4	Ra/W	CINH
C0971	23604	5C34h	E	1	FIX32	VD	4	Ra/W	CINH
C0972	23603	5C33h	E	1	FIX32	VD	4	Ra/W	CINH
C0973	23602	5C32h	E	1	FIX32	VD	4	Ra/W	CINH
C0974	23601	5C31h	E	1	FIX32	VD	4	Ra/W	CINH
C0975	23600	5C30h	E	1	FIX32	VD	4	Ra/W	CINH
C0976	23599	5C2Fh	E	1	FIX32	VD	4	Ra/W	CINH
C0977	23598	5C2Eh	E	1	FIX32	VD	4	Ra/W	CINH
C0978	23597	5C2Dh	E	1	FIX32	VD	4	Ra/W	CINH
C0980	23595	5C2Bh	E	1	FIX32	VD	4	Ra/Wa	
C0981	23594	5C2Ah	E	1	FIX32	VD	4	Ra/Wa	
C0982	23593	5C29h	E	1	FIX32	VD	4	Ra/Wa	
C0983	23592	5C28h	E	1	FIX32	VD	4	Ra/Wa	
C0988	23587	5C23h	A	7	FIX32	VD	4	Ra	
C0989	23586	5C22h	A	2	FIX32	VD	4	Ra	
C1040	23535	5BEFh	E	1	FIX32	VD	4	Ra/Wa	
C1041	23534	5BEEh	E	1	FIX32	VD	4	Ra/Wa	
C1042	23533	5BEDh	E	1	FIX32	VD	4	Ra/W	CINH
C1043	23532	5BECh	E	1	FIX32	VD	4	Ra/W	CINH
C1044	23531	5BEBh	E	1	FIX32	VD	4	Ra/W	CINH
C1045	23530	5BEAh	A	2	FIX32	VD	4	Ra	
C1046	23529	5BE9h	E	1	FIX32	VD	4	Ra	
C1090	23485	5BBDh	E	1	I32	VH	4	Ra	
C1091	23484	5BBCh	E	1	FIX32	VD	4	Ra/Wa	
C1092	23483	5BBBh	E	1	FIX32	VD	4	Ra/Wa	
C1093	23482	5BBAh	E	1	FIX32	VD	4	Ra/Wa	
C1094	23481	5BB9h	E	1	FIX32	VD	4	Ra/Wa	
C1095	23480	5BB8h	E	1	FIX32	VD	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	E	1	FIX32	VD	4	Ra	
C1100	23475	5BB3h	E	1	FIX32	VD	4	Ra/Wa	
C1101	23474	5BB2h	A	2	FIX32	VD	4	Ra/W	CINH
C1102	23473	5BB1h	A	3	FIX32	VD	4	Ra/W	CINH
C1103	23472	5BB0h	A	2	FIX32	VD	4	Ra	
C1104	23471	5BAFh	A	3	FIX32	VD	4	Ra	
C1160	23418	5B7Ah	A	2	FIX32	VD	4	Ra/W	CINH
C1161	23417	5B79h	E	1	FIX32	VD	4	Ra/W	CINH
C1162	23416	5B78h	E	1	FIX32	VD	4	Ra	
C1163	23415	5B77h	E	1	FIX32	VD	4	Ra	
C1300	23278	5AEEh	E	1	FIX32	VD	4	Ra/Wa	
C1301	23277	5AEDh	E	1	FIX32	VD	4	Ra/Wa	
C1302	23276	5AECh	E	1	FIX32	VD	4	Ra/Wa	
C1303	23275	5AEBh	E	1	FIX32	VD	4	Ra/Wa	
C1304	23274	5AEAh	E	1	VS	VS	20	Ra	
C1305	23273	5AE9h	E	1	VS	VS	20	Ra	

Configuration

Code	Index		Data					Access	
	dec	hex	DS	DA	DT	Format	DL	LCM-R/W	Condition
C1306	23272	5AE8h	E	1	FIX32	VD	4	Ra/Wa	
C1307	23271	5AE7h	E	1	FIX32	VD	4	Ra/Wa	
C1308	23270	5AE6h	E	1	FIX32	VD	4	Ra/Wa	
C1309	23269	5AE5h	E	1	FIX32	VD	4	Ra/Wa	
C1310	23268	5AE4h	E	1	FIX32	VD	4	Ra/Wa	
C1311	23267	5AE3h	E	1	FIX32	VD	4	Ra/Wa	
C1320	23258	5ADAh	E	1	FIX32	VD	4	Ra/W	CINH
C1321	23257	5AD9h	A	2	FIX32	VD	4	Ra/W	CINH
C1322	23256	5AD8h	A	2	FIX32	VD	4	Ra	
C1325	23253	5AD5h	E	1	FIX32	VD	4	Ra	
C1326	23252	5AD4h	A	2	FIX32	VD	4	Ra	
C1327	23251	5AD3h	A	2	FIX32	VD	4	Ra/W	CINH
C1328	23250	5AD2h	E	1	FIX32	VD	4	Ra	
C1330	23248	5AD0h	E	1	FIX32	VD	4	Ra/Wa	
C1331	23247	5ACFh	E	1	FIX32	VD	4	Ra/Wa	
C1332	23246	5ACEh	E	1	FIX32	VD	4	Ra/Wa	
C1333	23245	5ACDh	E	1	FIX32	VD	4	Ra/Wa	
C1334	23244	5ACCh	E	1	FIX32	VD	4	Ra/Wa	
C1335	23243	5ACBh	E	1	FIX32	VD	4	Ra/Wa	
C1336	23242	5ACAh	E	1	FIX32	VD	4	Ra/Wa	
C1337	23241	5AC9h	E	1	FIX32	VD	4	Ra/Wa	
C1340	23238	5AC6h	A	4	FIX32	VD	4	Ra/W	CINH
C1341	23237	5AC5h	A	4	FIX32	VD	4	Ra/W	CINH
C1344	23234	5AC2h	A	4	FIX32	VD	4	Ra	
C1345	23233	5AC1h	A	4	FIX32	VD	4	Ra	
C1350	23228	5ABCh	E	1	FIX32	VD	4	Ra/Wa	
C1351	23227	5ABBh	E	1	FIX32	VD	4	Ra/Wa	
C1354	23224	5AB8h	E	1	FIX32	VD	4	Ra/W	CINH
C1355	23223	5AB7h	E	1	FIX32	VD	4	Ra/W	CINH
C1356	23222	5AB6h	E	1	FIX32	VD	4	Ra/W	CINH
C1357	23221	5AB5h	E	1	FIX32	VD	4	Ra	
C1358	23220	5AB4h	E	1	FIX32	VD	4	Ra	
C1359	23219	5AB3h	E	1	FIX32	VD	4	Ra	
C1360	23218	5AB2h	E	1	FIX32	VD	4	Ra/Wa	
C1361	23217	5AB1h	E	1	FIX32	VD	4	Ra/Wa	
C1364	23214	5AAEh	E	1	FIX32	VD	4	Ra/W	CINH
C1365	23213	5AADh	E	1	FIX32	VD	4	Ra/W	CINH
C1366	23212	5AACh	E	1	FIX32	VD	4	Ra/W	CINH
C1367	23211	5AABh	E	1	FIX32	VD	4	Ra	
C1368	23210	5AAAh	E	1	FIX32	VD	4	Ra	
C1369	23209	5AA9h	E	1	FIX32	VD	4	Ra	
C1370	23208	5AA8h	E	1	FIX32	VD	4	Ra/Wa	
C1371	23207	5AA7h	E	1	FIX32	VD	4	Ra/Wa	
C1372	23206	5AA6h	E	1	FIX32	VD	4	Ra/Wa	
C1373	23205	5AA5h	E	1	FIX32	VD	4	Ra/Wa	
C1375	23203	5AA3h	E	4	FIX32	VD	4	Ra/W	CINH
C1376	23202	5AA2h	A	1	FIX32	VD	4	Ra/W	CINH
C1377	23201	5AA1h	A	4	FIX32	VD	4	Ra	
C1378	23200	5AA0h	E	1	FIX32	VD	4	Ra	
C1810	22768	58F0h	E	1	FIX32	VD	4	Ra	
C1811	22767	58EFh	E	1	FIX32	VD	4	Ra	

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Lenze

Manual
Part E

Troubleshooting and fault elimination

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This documentation is valid for controller types 9300 vector control as from the version

33.93XX - EV 3x 2x (9321 - 9333)

Type	33.93XX
Design: E = Enclosure IP20	EV
Hardware level and index	3x
Software level and index	2x
Explanation	(9321 - 9333)

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Part E

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8 Troubleshooting and fault elimination

- If a fault occurs, it will be displayed immediately or indicated through the status information. (🕮 8-1, Chapter “Troubleshooting”)
- Analyse the fault
  – using the history buffer (🕮 8-2)
  – and the list “Fault messages”. (🕮 8-4)
- The list “Fault messages” helps you to eliminate the fault. (🕮 8-4)

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 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

Display via the LECOM status word C0150

Bit	Meaning	
0	FREE 0	freely linkable
1	IMP (pulse inhibit)	0 = enable pulses for power stage 1 = inhibit pulses for power stage
2	FREE 2	freely linkable
3	FREE 3	freely linkable
4	FREE 4	freely linkable
5	FREE 5	freely linkable
6	f_d = 0 (act. speed = 0)	0 = n <> 0 1 = n = 0
7	Ctrl. inhibit (controller inhibit)	0 = no controller inhibit 1 = controller inhibit
8-11	Controller status	0 = controller initialization 1 = switch-on inhibited 3 = operation inhibited (controller inhibit) 6 = operation enabled 7 = message active 8 = fault active 9 = power off A = fail-QSP
12	Warning	0 = no warning 1 = warning
13	Warning	0 = no message 1 = message
14	FREE 14	freely linkable
15	FREE 15	freely linkable

8.2 Fault analysis with the history buffer

- The history buffer is used to trace faults.
- Fault messages are stored in the history buffer in the order of their occurrence.

Tip!

The codes of the history buffer are contained in the Diagnostics menu.

8.2.1 Structure of the history buffer

- The history buffer has eight memory units which can be requested by subcodes.
- The first memory unit (subcode 1) contains information about the active fault.
  – The history buffer is written only after the fault has been eliminated or acknowledged. The last fault but six is eliminated from the history buffer and can no longer be read.
- The memory units 1 to 7 contain information on the last fault but six.
- For every fault that occurred, certain information is stored which can be retrieved by codes:

Codes and retrievable information				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 recognition and reaction

- C0168 contains the fault recognition for every memory unit and the reaction to the fault.
  – It is entered as a LECOM fault number. (🕮 7-197)

Please note:

- If there are several faults with different reactions:
  – Only the reaction with the highest priority (TRIP → Message → Warning) is entered.
- If there are faults with the same reaction (e.g. 2 messages) simultaneously:
  – Only the fault which occurred first is entered.

Time

- The times when the faults occurred are entered under C0169:
  – Reference time is the state of the mains switch-on elapsed-time meter (C0179).

Please note:

- If a fault is immediately and repeatedly followed by another, only the time of the last occurrence is stored.

Frequency

- The frequency of a fault immediately followed by the same fault is entered under C0170. The time of the last occurrence is stored.

Delete history buffer

Set C0167 = 1, to clear the history buffer.

8.3 Fault indications

Tip!

If the fault indication is requested by a fieldbus, the fault indication is represented by a fault number (C0168/x). See column 2 and the footnote at the end of this table.

Display	Fault No.[2)]	Error	Cause	Remedy
---	---	No fault	-	-
CCr	71	System error	Processor is overloaded or there is a fault in the program processing	Reduce processor load. Remove function blocks that are not needed from the processing table.
			Strong interference on control cables	Screen the control cables
			Ground or earth loops in the wiring	Ensure PE wiring complies with EMC requirements (📖 4-33)
CE0	61	Communication error	Interference during transmission of control commands via automation interface X1	Plug in automation module firmly, bolt down if necessary
CE1	62	Communication error at the system bus object CAN-IN1	CAN-IN1 object receives faulty data, or communication is interrupted	Check cable at X4 Check transmitter Increase monitoring time under C0357/1 if necessary
CE2	63	Communication error at the system bus object CAN-IN2	CAN-IN2 object receives faulty data, or communication is interrupted	Check cable at X4 Check transmitter Increase monitoring time under C0357/2 if necessary
CE3	64	Communication error at the system bus object CAN-IN3	CAN-IN3 object receives faulty data, or communication is interrupted	Check cable at X4 Check transmitter Increase monitoring time under C0357/3 if necessary
CE4	65	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	91	External fault (TRIP-Set)	A digital input assigned to the TRIP-Set function has been activated.	Check external encoder
H05	105	Internal fault		Contact Lenze The controller can only be reset by mains switching
H07	107	Incorrect power stage	During initialization of the controller, an incorrect power stage was detected	Contact Lenze The controller can only be reset by mains switching
H10	110	Sensor fault heat sink temperature	Sensor for heat sink temperature detection indicates indefinite values	Contact Lenze The controller can only be reset by mains switching
H11	111	Sensor fault indoor temperature	Sensor for indoor temperature detection indicates indefinite values	Contact Lenze The controller can only be reset by mains switching
ID1	140	Fault during motor identification	Measuring of the characteristic failed Motor clearly too small ($P_{motor} \ll P_{Controller}$)	Check motor cable Select larger motor
ID2	141	Fault during motor identification	No identification of the motor parameters	Enter data from the nameplate of the connected motor

Display	Fault No.[2)]	Error	Cause	Remedy
LP1	32	Motor phase failure	A current-carrying motor phase has failed	Check motor; Check supply module
			The current limit is set too high	Reduce current limit under C0599
			This monitoring is not suitable for: ● Synchronous servo motors ● for rotating-field frequencies > 480 Hz	Deactivate monitoring with C0597= 3
LU	30	Undervoltage	DC bus voltage is smaller than the value fixed under C0173	Check mains voltage Check supply cable
NMAX	200	Max. system speed exceeded (C0596)	Active load too high (e.g. for hoists)	Check drive dimensioning
			Drive is not speed-controlled, torque excessively limited	Increase torque limit if necessary
			The current speed has been detected incorrectly.	Check encoder selection (C0025) Check motor data
OC1	11	Short-circuit	Short-circuit	Find out cause of short-circuit; check cable
			Excessive capacitive charging current in the motor cable	Use motor cable which is shorter or has a lower capacitance
OC2	12	Earth fault	One of the motor phases has an earth contact	Check motor; check cable
OC2	12	Earth fault	Excessive capacitive charging current in the motor cable	Use motor cable which is shorter or has a lower capacitance
OC3	13	Trip due to overload	Acceleration and/or deceleration too short (C0012, C0013)	Increase acceleration and deceleration times
			Value for current parameter V_p (C0075) too low	Check setting
OC5	15	I x t overload	Frequent and too long acceleration with overcurrent Continuous overload with $I_{motor} > 1.5 \times I_{rx}$	Check drive dimensioning
OH	50	Heat sink 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
			Heat sink very dirty	Clean heat sink
			Incorrect mounting position	Change mounting position
OH3 [1)]	53	Motor temperature is higher than the value set in the controller	Motor too hot because of excessive current, or acceleration is too frequent and too long	Check drive dimensioning
			No PTC connected to X8	Connect PTC or switch off monitoring (C0583=3)
OH4	54	Heat sink 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
			Heat sink very dirty	Clean heat sink
			Incorrect mounting position	Change mounting position
			Value set under C0122 was too low	Enter higher value
OH7 [1)]	57	Motor temperature is higher than the value set under C0121	Motor too hot because of excessive current, or acceleration is too frequent and too long	Check drive dimensioning
			No PTC connected to X7 or X8	Connect PTC or switch off monitoring (C0584=3)
			Value set under C0121 was too low	Enter higher value
OH8	58	PTC at terminals T1, T2 indicates motor overheating	Motor too hot because of excessive current, or acceleration is too frequent and too long	Check drive dimensioning
			Terminals T1, T2 are not assigned	Connect PTC or thermostat or switch off monitoring (C0585=3)
OU	20	Overvoltage	Excessive braking energy (DC bus voltage higher than the value set under C0173)	Use brake unit or supply module and brake module or feedback module
PEr	74	Program fault	A fault in the program was detected	Send controller with data (on diskette) to Lenze
PI	79	Initializing error	● A fault was detected during transfer of parameter set between the controllers ● Parameter set does not match the controller	Correct parameter set Load Lenze default setting Contact Lenze
PR0 PR1 PR2 PR3 PR4	75 72 73 77 78	Parameter set error	Fault when reading a parameter set	Set the desired parameters and save under C0003 With PR0 mains switching is necessary to acknowledge the fault
			Transmission of parameter sets has been interrupted (e. g. by an early disconnection of the keypad).	
			CAUTION: The Lenze default setting is automatically loaded	

Troubleshooting and fault elimination

Display	Fault No.[2]	Error	Cause	Remedy
Sd3	83	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	85	Master current source defective	Master current at X6/1, X6/2 < 2 mA	Check cable for open circuit Check master current source
Sd6	86	Sensor fault	Encoder of the motor temperature detection at X8 indicates undefined values	Check supply cable for firm connection Switch off monitoring with C0594 = 3 if necessary

1) Temperature sensing through incremental encoder X8

2) Meaning of the displayed value:

{Fault No.} + 0 = TRIP

{Fault No.} + 1000 = Message

{Fault No.} + 2000 = Warning

8.4 Reset of fault indications

TRIP

- After eliminating the fault, the pulse inhibit is only reset after acknowledgement of TRIP.
- Acknowledge TRIP by:
  - Keypad 9371 BB:
    Press STOP key. Then press RUN key to enable the controller again.
  - Fieldbus module: Set C0043 = 0
  - Control word C0135
  - Terminal X5/E5
  - Control word AIF
  - Control word system bus (CAN)
  - Mains switching (necessary for some faults)

Tip!

If a TRIP source is still active, TRIP cannot be reset.

Warning

- After eliminating the fault, the pulse inhibit is reset automatically.

9 Maintenance

9.1 Maintenance services

- The controller is free of maintenance, if the prescribed conditions of operation are observed. (📖 3-2)
- If the ambient air is polluted, the air vents of the controller may be obstructed.
  - Check the air vents periodically (depending on the degree of pollution approx. every 4 weeks).
  - Free the obstructed air vents using a vacuum cleaner.

STOP

Stop!

Do not use sharp or pointed tools such as a knife or screwdriver to clean the air vents.

9.2 Service addresses

The addresses of your Lenze world-wide representatives are listed on the back cover of every Lenze publication.

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This documentation is valid for controller types 9300 vector control as from the version

33.93XX - EV 3x 2x (9321 - 9333)

- 33.93XX — Type
- E — Design: E = Enclosure IP20
- 3x — Hardware level and index
- 2x — Software level and index
- (9321 - 9333) — Explanation

We have thoroughly collected all specifications in this documentation and have checked it for compliance with the described hardware and software. However, differences cannot be excluded completely. We are not responsible or liable for possible consequential damage. We will include necessary corrections in subsequent editions.

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Contents

Part K

Contents

15 Application examples

The internal signal processing in the controller is saved in basic configurations for common applications.

- You can select and activate the basic configurations via C0005, and adapt them with only a few settings to your applications (short setup). (📖 7-1)
- In general, the setting of the motor data and the adaptation of the motor control is independent of the configuration and is described in the section "Commissioning". (📖 5-1)

Tip!

For the most important codes of the basic configurations, please refer to the "short setup" menus in **Global Drive Control (GDC)** and the operating module.

15.1 Acceleration and deceleration with constant time

This application is based on the basic configuration C0005 = 1000.

Example

A conveyor drive is always to accelerate and decelerate at the same time as other drives. The setpoint for the conveyor speed shall have no influence on the acceleration and deceleration time.

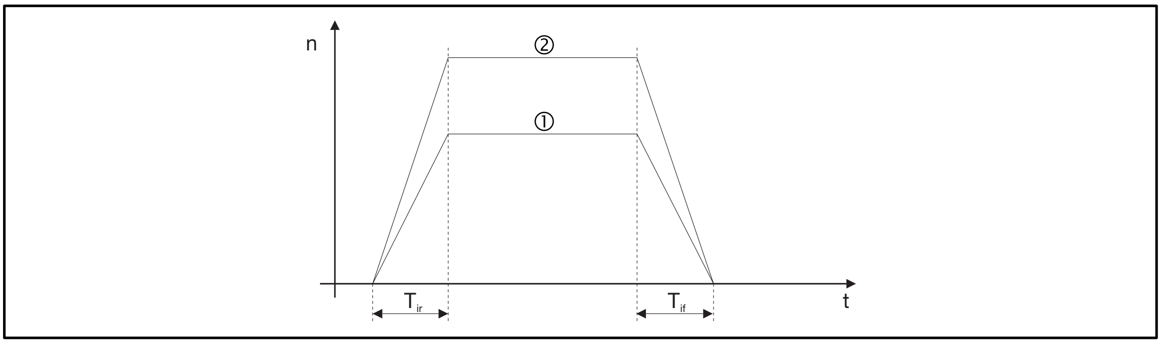

Fig. 15-1 Acceleration and deceleration with constant time (C0104 = 1)

① Setpoint 1
② Setpoint 2
r Speed
T_{ir} Acceleration time
T_{if} Deceleration time

Application examples

Solution

The drive is enabled and inhibited via the inputs of the direction of rotation. The function of the digital inputs remains unchanged. The internal signal processing for quick stop (QSP) is adapted according to the requirements.

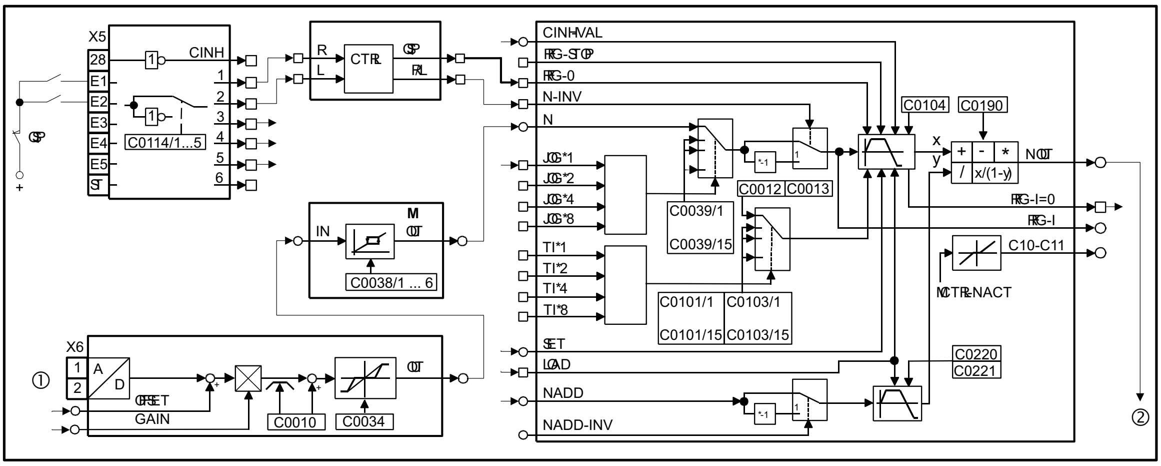

Fig. 15-2 Changes in configuration 1000, to accelerate and decelerate in constant time.

① Setpoint
② Setpoint to input MCTRL-N-SET

For the complete signal chart refer to Part L. (📖 16-2)

Parameterization

1. Remove the connection from output R/LQ-QSP to the input MCTRL-QSP of the FB MCTRL.
2. Set MCTRL-QSP to FIXED0 (C0900 = 1000).
3. Connect the output R/L/Q-QSP to the input NSET-RFG-0 (C0789 =10250).
4. Set C0104 = 1
   – The acceleration to the setpoint at X6/1,2 or the deceleration to zero speed is performed within a constant time.
5. Set the acceleration time (T_{ir}) under C0012 and the deceleration time (T_{if}) under C0013.

Note!

If you want to use other ramp times, select the desired Ti time before or simultaneously with the setpoint change at NSET-RFG-0.

15.2 Acceleration and deceleration with constant distance

Use the basic configuration C0005 = 1000 with the changes as shown in Fig. 15-2. Set C0104 = 2.

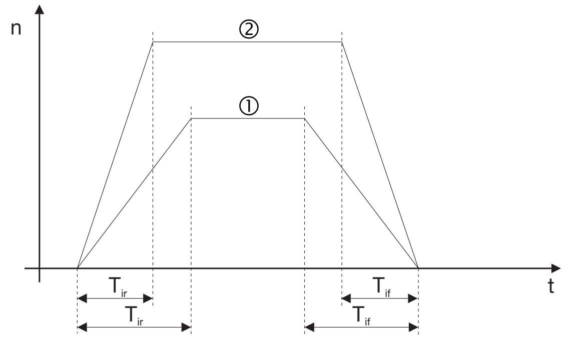

Fig. 15-3 Acceleration and deceleration with constant distance (C0104 = 2)

①	Setpoint 1	T_{ir}	Acceleration time
②	Setpoint 2	T_{if}	Deceleration time
n	speed		

The distance is proportional to the number of motor revolutions. Determine the distances by setting the Ti time (C0012, C0013).

- Calculate the number of motor revolutions during the acceleration or deceleration phases according to the following formula:

$$N = \frac{n_{max}}{60} \cdot \frac{T_i}{2}$$

r	Number of motor revolutions
n_{max}	Maximum speed (value in C0011)
T_i	Acceleration time T_{ir} (value in C0012) or deceleration time T_{if} (value in C0013)

15.3 Dosing drive for a filling station

This application is based on the basic configuration C0005 = 2000.

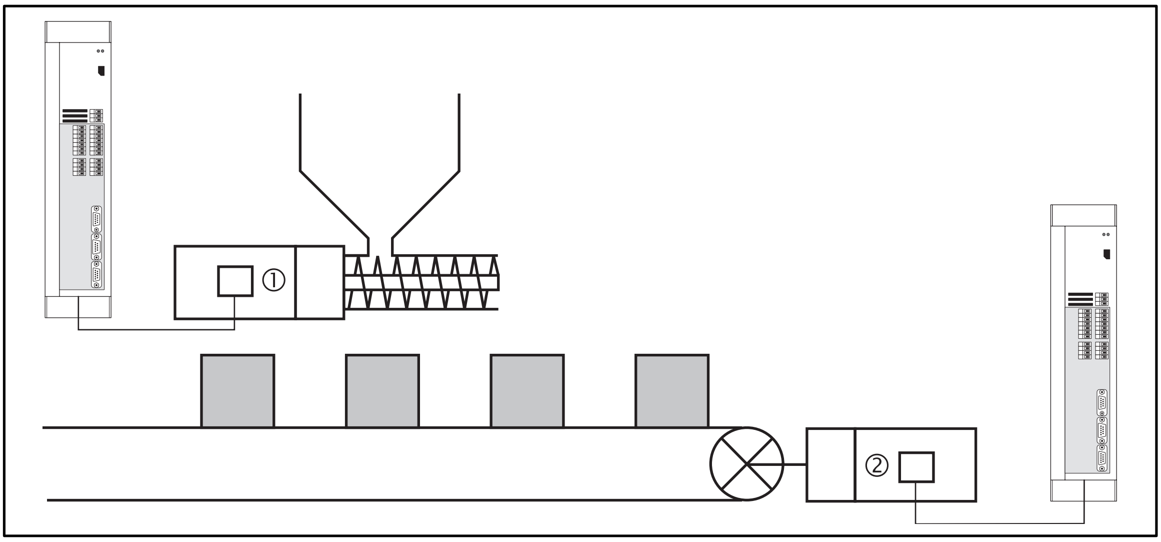

Fig. 15-4 Basic structure of a step control for a filling station of bulk material

① Dosing drive
② Conveyor drive

Assignment of the inputs and outputs		Dosing drive	Conveyor drive
Analog inputs	X6/1,2	• Dosing speed	• Step speed
	X6/3,4	• Dosing amount	• Step size
Digital inputs	X5/28	• Controller enable	• Controller enable
	X5/E1, X5/E2	• Direction of rotation/Quick stop	• Direction of steps/Quick stop
	X5/E3	• Fixed dosing amount	• Fixed step size
	X5/E4	• Start dosing	• Start step
	X5/E5	• TRIP reset	• TRIP reset
Digital outputs	X5/A1	• Fault (TRIP)	• Fault (TRIP)
	X5/A2	• Current speed > C0017 (Qmin)	• Current speed > C0017 (Q_{min})
	X5/A3	• Ready for operation (RDY)	• Ready for operation (RDY)
	X5/A4	• Dosing completed	• Step completed
Analog outputs	X6/62	• Act. speed	• Act. speed
	X6/63	• Motor current	• Motor current

Note!

If the required amount is not yet reached at the end of the dosing procedure, you can initiate an additional dosing via the setpoint for the dosing amount.

Note!

For a detailed signal chart of configuration C0005 = 2000 refer to Part L.

Calculate actual value

- The motor speed is integrated to a rotary phase using the FB INT1. The amount supplied is determined via the rotary phase.
  – A rotary phase of 360 ° (one revolution) corresponds to 65536 inc.
- C1351 is used to convert the rotary phase into an analog signal and adapted to the setpoint.

Example

The worm conveyor is to perform 50 revolutions with a setpoint of INT1-AOUT = 100 %. The geared motor used has a ratio of i = 20.

- The motor must perform 1,000 revolutions.
  – The rotary phase amounts to 65536 inc · 1000.
- In C1351, the value 65536000 must be set.
- The calculation is done according to the following formula:

$$\text{INT1-AOUT} = \frac{\text{Rotary phase [inc]}}{\text{C1351}} \cdot 100\ \%$$

See also: (📖 7-132)

Complete dosing

The FB CMP2 supplies the brake signal for the linear ramp function generator in the FB NSET. The ramp function generator is triggered via NSET-RFG-0 and the speed setpoint is led to zero.

Braking is started when the actual amount plus residual amount (is added during braking) to the setpoint.

Calculation of the residual amount

- Calculate the square of the current speed using FB ARIT1 (C0338 = 3).
- With the FB CONV1 the output signal of ARIT1 is adapted to the setpoint and actual value, taking the deceleration time T_{if} into consideration. Calculate the ratio C0940/C0941 according to the following formula:

$$\frac{C0940}{C0941} = \frac{n_{max}}{60} \cdot \frac{T_{if}}{2} \cdot \frac{65536}{C1351}$$

n_{max}	Value in C0011
T_{if}	Time during braking (value in C0013)

Example

- n_{max} = 3000 rpm
- T_{if} = 1 s
- C1351 = 65536000 (corresponds to 1,000 motor revolutions)

The ratio C0940/C0941 must be 0.025 (e.g. C0940 = 25; C0941 = 1000).

15.4 Traversing drive for a wire winder

This application is based on the basic configuration C0005 = 3000.

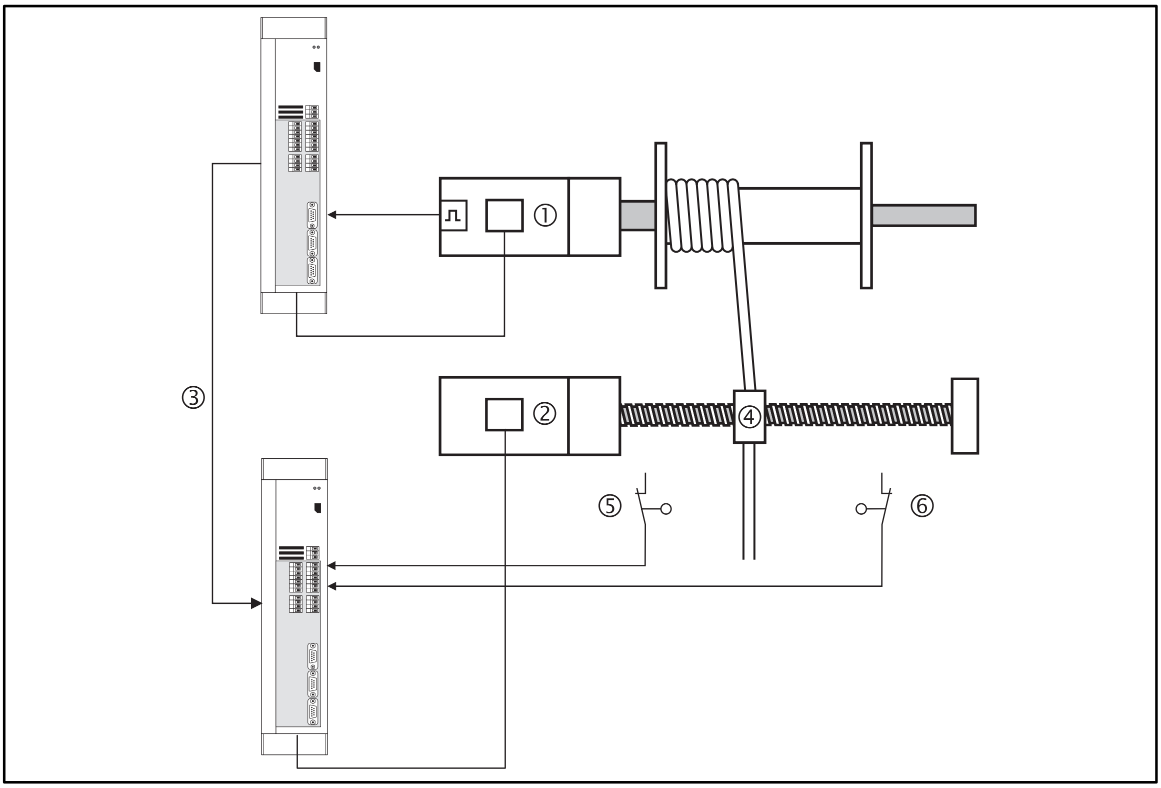

Fig. 15-5 Basic structure of a traversing drive

①	Winding drive	④	Traversing element
②	traversing drive	⑤	Limit switch for the change to CCW rotation
③	Master setpoint from winding drive	⑥	Limit switch for the change to CW rotation

Assignment of the inputs and outputs		**Traversing drive**
Analog input	X6/1,2	• Master setpoint
Digital inputs	X5/28	• Controller enable
	X5/E1, X5/E2	• Direction of rotation/Quick stop
	X5/E3	• Additional setpoint
	X5/E4	• Start traversing
	X5/E5	• TRIP reset
Digital outputs	X5/A1	• Fault (TRIP)
	X5/A2	• Current speed > C0017 (Q_{min})
	X5/A3	• Ready for operation (RDY)
	X5/A4	• Traversing break
Analog outputs	X6/62	• Act. speed
	X6/63	• Motor current

The traversing speed results from the precontrol signal proportional to the winding speed and the setting of the evaluation (traversing step). Limit switches detect the position of the traversing element at the winding ends. The traversing drive is accelerated and decelerated with constant distance and is independent of the winding speed.

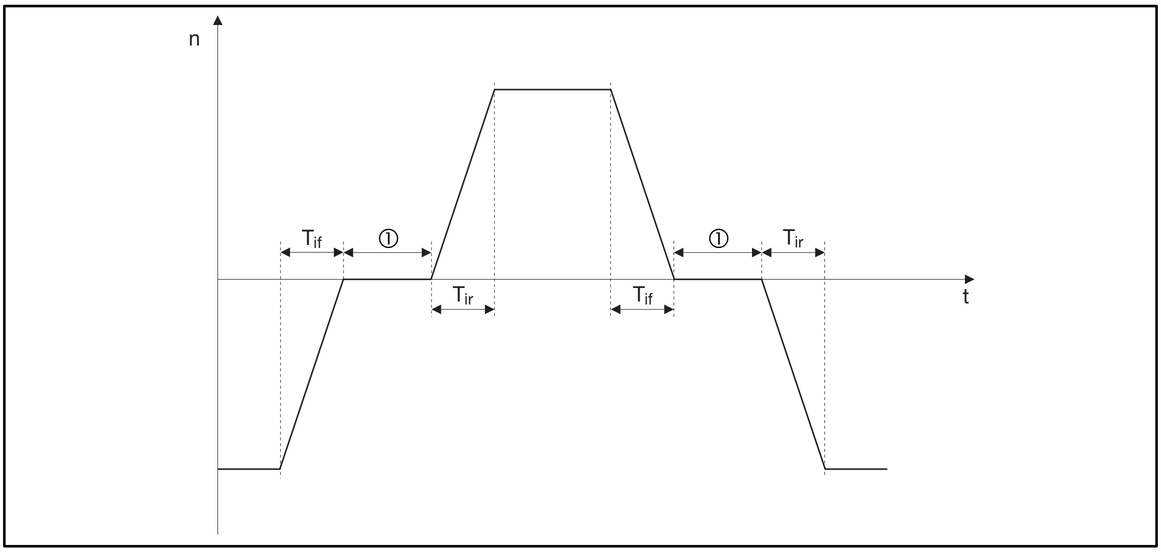

Fig. 15-6 Deceleration and acceleration of the traversing drive with stop

①	Traversing break	T_{ir}	Acceleration time
n	speed	T_{if}	Deceleration time

At the points of return, the traversing drive remains at standstill until the winding drive has covered a specified rotary phase.

Note!

For a detailed signal chart of configuration C0005 = 3000 refer to Part L.

Traversing step

The multiplication of the master setpoint (winding speed via X6/1,2) with C0472/1 is used to set the traversing speed or the traversing step.

The traversing drive reaches the speed set under C0011 (n_{max}) with a master setpoint of 10 V and an evaluation of C0472/1 = 100 %.

Additional setpoint

You can activate an internal additional setpoint (C0471) via X5/E3 which is added to the master setpoint via the FB ADD1. You can use it e.g. to align the traversing drive when the winding drive is at standstill.

Residual distance during acceleration and deceleration

The linear ramp function generator controls the acceleration and deceleration of the traversing drive in the FB NSET (controlled via NSET-RFG-0).

Function procedure

1. If the traversing element reaches a limit switch (normally-closed contact), a change of the direction of rotation is detected via the FB R/L/Q.
2. The D-flipflop FLIP1 is set via the FB TRANS1.
3. The input NSET-RFG-0 is activated via the FB OR1 and the braking starts.
4. If the ramp function generator has decelerated to zero (NSET-NOUT = 0), the calculation of the rotary phase for the traversing break is enabled via the FB CMP2.
5. If the traversing break is completed, the D-flipflop is reset via the FB INT1 (INT1-DOUT = HIGH).
6. The traversing drive starts with a changed direction of rotation.

Note!

If you load the basic configuration C0005 = 3000 for this application, the function of the ramp function generator is already set such that acceleration and deceleration of the traversing drive is performed with constant distance (C0104 = 2) and independent of the winding speed.

Determination of the distance during acceleration and deceleration phases

The distance during acceleration and deceleration corresponds to a specific number of motor revolutions (N). You determine this number N by setting the Ti times (C0012, C0013).

- You can calculate the number of motor revolutions during acceleration and deceleration according to the following formula:

$$N = \frac{n_{max}}{60} \cdot \frac{T_i}{2}$$

r	Number of motor revolutions
n_{max}	Maximum speed (value in C0011)
T_i	Acceleration time T_{ir}(value in C0012) or deceleration time T_{if} (value in C0013)

Traversing break

The controller of the traversing drive receives a scaled master setpoint from the controller of the winding drive via X6/1,2. To determine the rotary phase which the winding drive is to pass during the traversing break, the speed signal of the winding drive must be calculated via the FB CONV5. CONV5 is parameterized using C0655 and C0656.

- Calculate the ratio C0655/C0656 according to the following formula:

$$\frac{C0655}{C0656} = \frac{\text{max. winding speed [rpm]}}{\text{max. master setpoint [\%]}} \cdot \frac{100\ \%}{15000\ \text{rpm}}$$

Example

- Max. winding speed = 1000 rpm
- Max. master setpoint = 100 % (with max. winding speed)

The ratio C0655/C0656 must be 0.0666 (e.g. C0655 = 1000; C0656 = 15000).

Input of the rotary phase for the winding drive during the traversing break

A rotary phase of 360 ° (one revolution) corresponds to 65536 inc. Calculate the value for C0474/1 according to the following formula:

$$C0474/1 = 65536 \cdot \frac{\text{Rotary phase}}{360\ °}$$

If the traversing break is to be e.g. a half revolution, the value in C0474/1 must be 32768.

Note!

If you set C0474/1 = 0, the traversing drive is braked and started with constant acceleration.

15.5 Diameter detection with distance sensor

This application is based on the basic configuration C0005 = 8000.

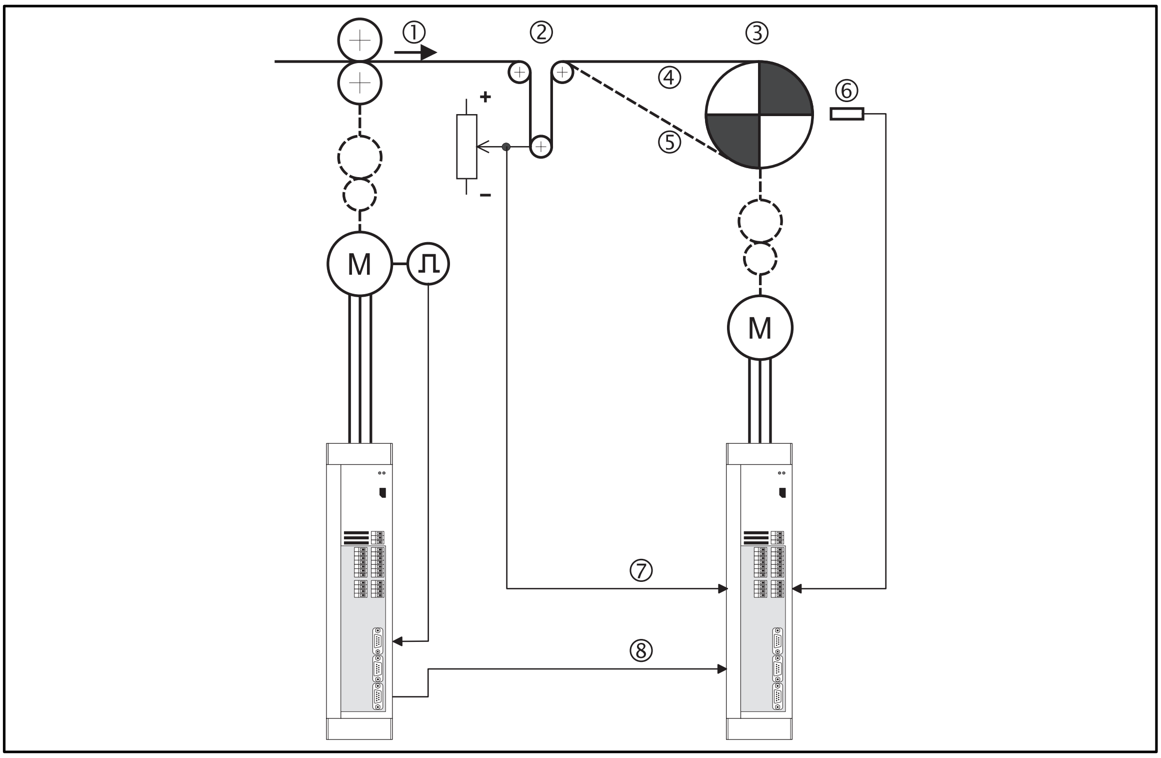

Fig. 15-7 Basic structure of a dancer position control with external diameter detection via a distance sensor

① Line speed (material speed)
② Dancer
③ Rewinder
④ Material flow for CW rotation of the rewinder
⑤ Material flow for CCW rotation of the rewinder
⑥ Distance sensor (detects the distance to the winding surface)
⑦ Actual value dancer position
⑧ Digital frequency of the material speed

Assignment of the inputs and outputs		Winding drive
Digital frequency input	X9	• Line speed (material speed)
Analog input	X6/1,2	• Actual value dancer position
	X6/3,4	• Signal from distance sensor
Digital inputs	X5/28	• Controller enable
	X5/E1, X5/E2	• Direction of rotation/Quick stop
	X5/E3	• Load actual value
	X5/E4	• Reset dancer position controller
	X5/E5	• TRIP reset
Digital outputs	X5/A1	• Fault (TRIP)
	X5/A2	• Actual dancer position = setpoint
	X5/A3	• Ready for operation (RDY)
	X5/A4	• D_{min}/D_{max} reached
Analog outputs	X6/62	• Act. speed
	X6/63	• Motor current

Note!

For a detailed signal chart of configuration C0005 = 8000 refer to Part L.

The analog input X6/3,4 (AIN2) is assigned with the signal of the diameter detection. If you use a distance sensor for the detection of the winding diameter, gain and offset of the FB AIN2 can be set such that the diameter signal is directly converted from the sensor signal .

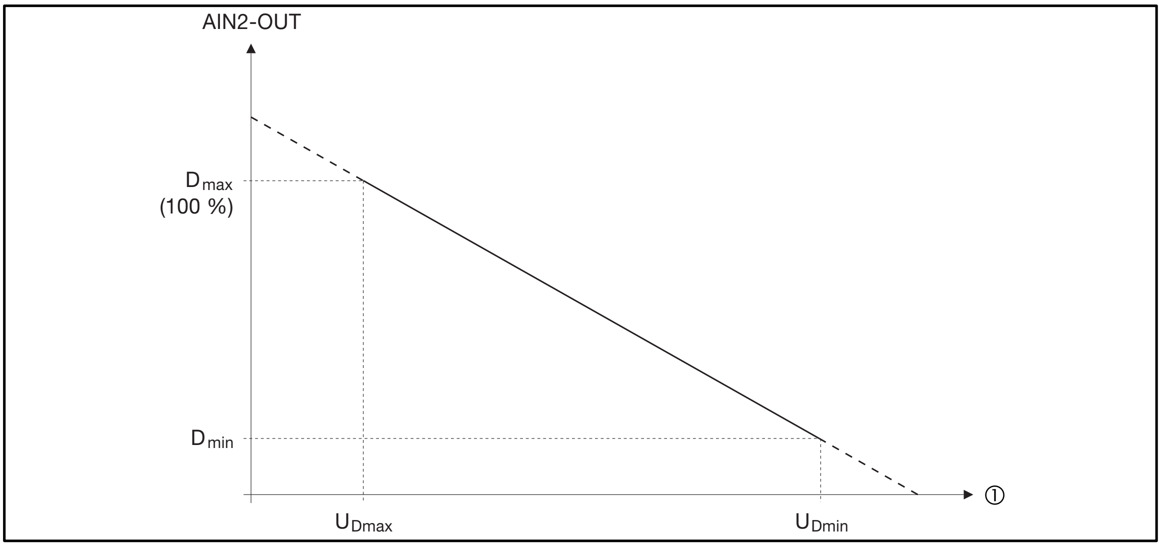

Fig. 15-8 Transmission characteristic of X6/3,4 when using a distance sensor

D_{max}	Maximum winding diameter	U_{Dmax}	Signal voltage of the sensor with maximum winding diameter
D_{min}	Minimum winding diameter	U_{Dmin}	Signal voltage of the sensor with minimum winding diameter
		①	Sensor signal

The signal at AIN2-OUT must be 100 % with maximum winding diameter. Therefore, the FB AIN2 must get the inverse transmission characteristic shown in Fig. 15-8.

Calculate the values for gain (C0027/2) and offset (C0026/2) according to the following formulae:

$$C0027/2 = \frac{10\ V}{D_{max}} \cdot \frac{D_{max} - D_{min}}{U_{Dmax} - U_{Dmin}}$$

$$C0026/2 = C0027/2 \cdot \frac{U_{Dmax}}{10\ V} - 100\ \%$$

Example

U_{Dmin} = 8 V, D_{min} = 100 mm

U_{Dmax} = 2 V, D_{max} = 500 mm

Enter the following values in C0027/2 and C0026/2:

$$C0027/2 = \frac{10\ V}{500\ mm} \cdot \frac{500\ mm - 100\ mm}{2\ V - 8\ V} = -133.33\ \%$$

$$C0026/2 = -133.33\ \% \cdot \frac{2\ V}{10\ V} - 100\ \% = -126.67\ \%$$

Note!

For further information on the parameterization refer to the application example of the basic configuration C0005 = 9000. (📖 15-12)

15.6 Core winder with internal diameter calculation

This application is based on the basic configuration C0005 = 9000.

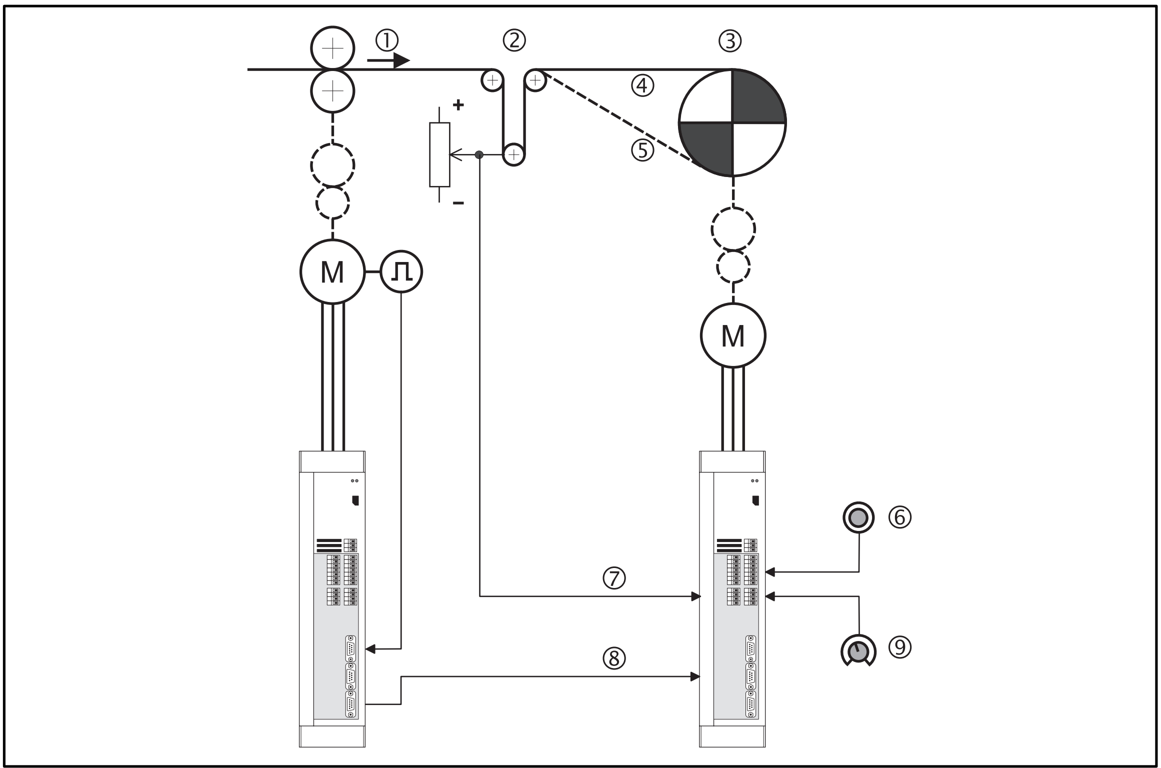

Fig. 15-9 Basic structure of a dancer position control with internal diameter detection

① Line speed
② Dancer
③ Rewinder
④ Material flow for CW rotation of the rewinder
⑤ Material flow for CCW rotation of the rewinder
⑥ Diameter preset
⑦ Actual value dancer position
⑧ Digital frequency proportional to the line speed
⑨ Initial diameter

Assignment of the inputs and outputs		**Winding drive**
Digital frequency input	X9	• Line speed
Analog input	X6/1,2	• Actual value dancer position
	X6/3,4	• Initial diameter
Digital inputs	X5/28	• Controller enable
	X5/E1, X5/E2	• Direction of rotation/Quick stop
	X5/E3	• Load actual value
	X5/E4	• Accept initial diameter
	X5/E5	• TRIP reset
Digital outputs	X5/A1	• Fault (TRIP)
	X5/A2	• Actual dancer position = setpoint
	X5/A3	• Ready for operation (RDY)
	X5/A4	• D_{min}/D_{max} reached
Analog outputs	X6/62	• Act. speed
	X6/63	• Motor current

Note!

For a detailed signal chart of configuration C0005 = 9000 refer to Part L.

Calculate the following value for the parameterization:

- Rated line speed (V_{LN}), which is entered via digital frequency input X9.
- Speed of the winding drive at rated line speed and minimum winding diameter (n_{Dmin}).
  – The speed of the winding drive results from the line speed V_L and the reciprocal value of the winding diameter

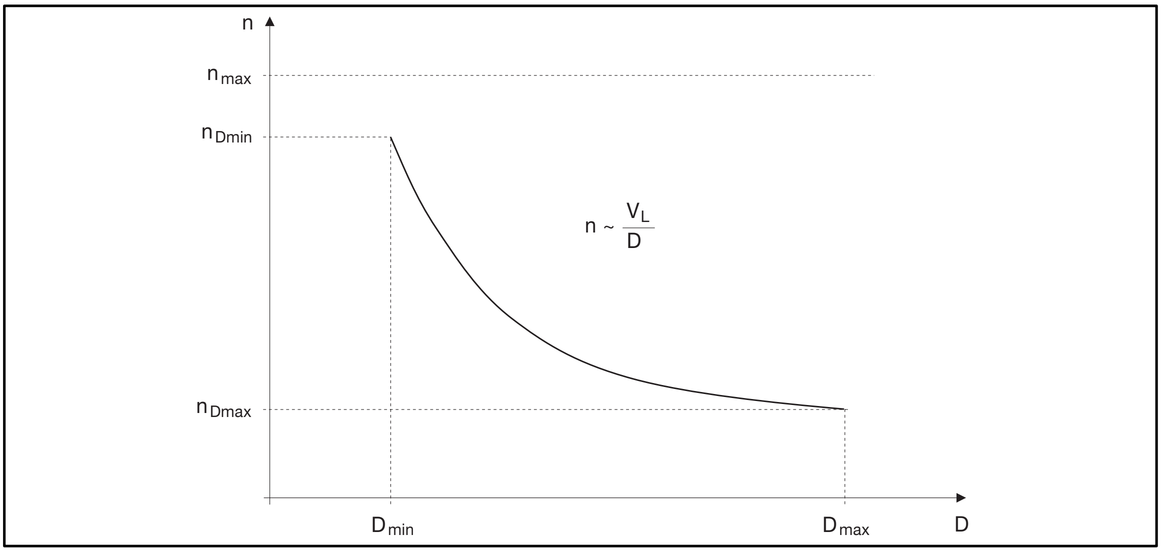

Fig. 15-10 Speed behaviour of the winding drive related to the winding diameter

D	Winding diameter	n	Speed of the winding drive
D_{max}	Maximum winding diameter	n_{Dmax}	Speed of the winding drive with maximum winding diameter
D_{min}	Minimum winding diameter	n_{Dmin}	Speed of the winding drive with minimum winding diameter
		V_L	Line speed

Example

For a better comprehension of the parameterization of this application example, the following values are assumed for the calculations:

- At rated line speed (V_{LN}), the winding drive receives a digital frequency signal from which the speed of 3000 rpm is calculated (DFIN-OUT).
- The speed of the winding drive with minimum winding speed and rated line speed V_{LN} (n_{DminN}) is 4000 rpm (MCTRL-PHI-ACT).

Application examples

Determination of the maximum speed n_{max} (C0011)

The dancer position control (C0472/1) can influence the drive such that it achieves a speed which is higher than n_{DminN} for a short term. This higher speed is required e.g. to achieve the setpoint dancer position after the start with D_{min}.

$$C0011 \geq n_{DminN} \cdot \left(\frac{100\ \%}{100\ \% - C0472/1} \right)$$

Example:

You can set C0011 to e.g. 4500 rpm using C0472/1 = 10 % (Lenze default setting) and n_{DminN} = 4000 rpm.

Adaptation of the precontrol signal

The FB CONV3 is used to convert the speed signal proportional to the line speed (signal to DFIN-OUT) into a scaled (analog) precontrol signal.

It is assumed that the speed setpoint in stationary operation is exclusively generated by the precontrol signal and passed on without changes to the motor control (diameter evaluation = 100 %). For stationary operation with rated line speed (speed value at DFIN-OUT) and minimum winding diameter the line is thus calculated according to the following formula:

$$\text{CONV3-OUT} = \frac{n_{DminN}}{C0011}$$

The following parameter setting of FB CONV3 results:

$$\frac{C0950}{C0951} = \frac{15000\ \text{rpm}}{\text{DFIN-OUT [rpm]}} \cdot \frac{n_{DminN}}{C0011}$$

Example:

$$\frac{C0950}{C0951} = \frac{15000\ \text{rpm}}{3000\ \text{rpm}} \cdot \frac{4000\ \text{rpm}}{4500\ \text{rpm}} = 4.444$$

e.g.: C0950 = 4444, C0951 = 1000

Diameter evaluation

The precontrol signal is multiplied with the reciprocal value of the winding diameter via the FB ARIT1.

The diameter calculator (DCALC1) first calculates the winding diameter from the line speed (speed value at DFIN-OUT) and motor speed and then generates the reciprocal value (C1308 = 1).

For a correct diameter calculation enter the following values:

- In C1300: Motor speed with maximum diameter
- In C1301: Assigned line speed (speed value at DFIN-OUT)
- In C1304: Maximum diameter
- In C1309: Reference diameter for the calculation of the reciprocal value

Example:

With a diameter ratio of q = 5 (e.g. D_{min} = 100 mm, D_{max}= 500 mm) this results in:

- C1300 = 3000 rpm
- $C1301 = \frac{n_{DminN}}{q} = 800$ rpm
- C1304 = 500 mm
- C1309 = 100 mm (enter the value on which you have based the calculation of n_{DminN})

Limit values for the winding diameter

To limit incorrectly calculated diameter values during the start and stop phases to permissible values, you can determine limit values under C1305 and C1306.

Example:

- C1305 = 100 mm
- C1306 = 500 mm

Application examples

Show/Hide Bookmarks

EDS9300U--VL
00416045

Manual
Part L

Signal-flow charts

Global Drive

Frequency inverter
9300 vector control

This documentation is valid for controller types 9300 vector control as from the version

33.93XX - EV 3x 2x (9321 - 9333)

- Type: 33.93XX
- Design: E = Enclosure IP20 (EV)
- Hardware level and index: 3x
- Software level and index: 2x
- Explanation: (9321 - 9333)

Version 2.0 07/00

Contents

Part L

Contents

16 Signal-flow charts

How to read the signal-flow charts

Symbol	Meaning
———▶	Signal connection in the Lenze setting
○———	Analog input, can be freely connected to any analog output
———○	Analog output
□———	Digital input, can be freely connected to any digital output
———□	Digital output
△———	Input for speed signals, can be freely connected to any output for speed signals
———△	Output for speed signals
▲———	Input for phase signals, can be freely connected to any output for phase signals
———▲	Output for phase signals

16.1 Speed control (C0005 = 1000)

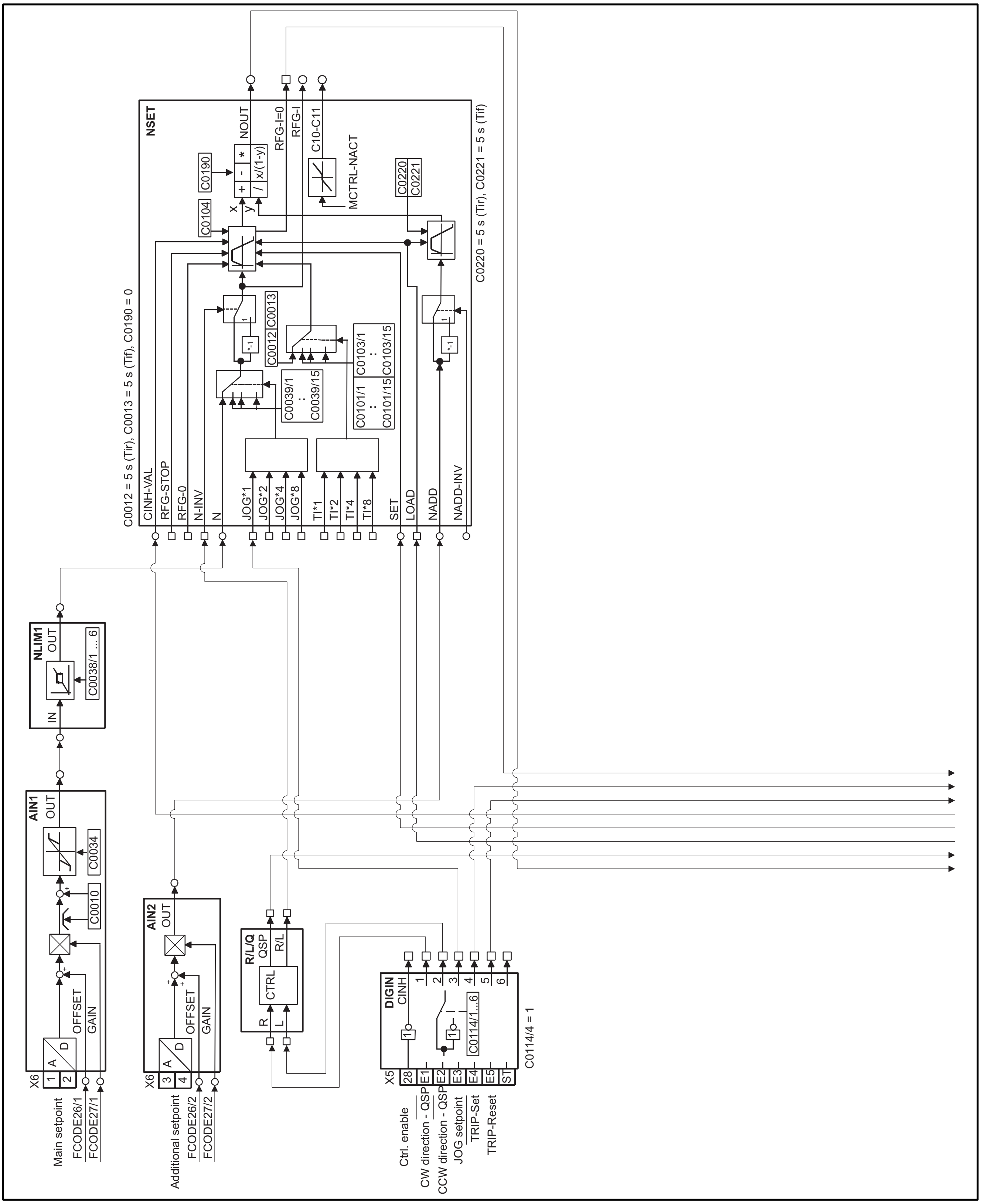

Fig. 16-1 Basic configuration 1000 - speed controll (sheet 1)

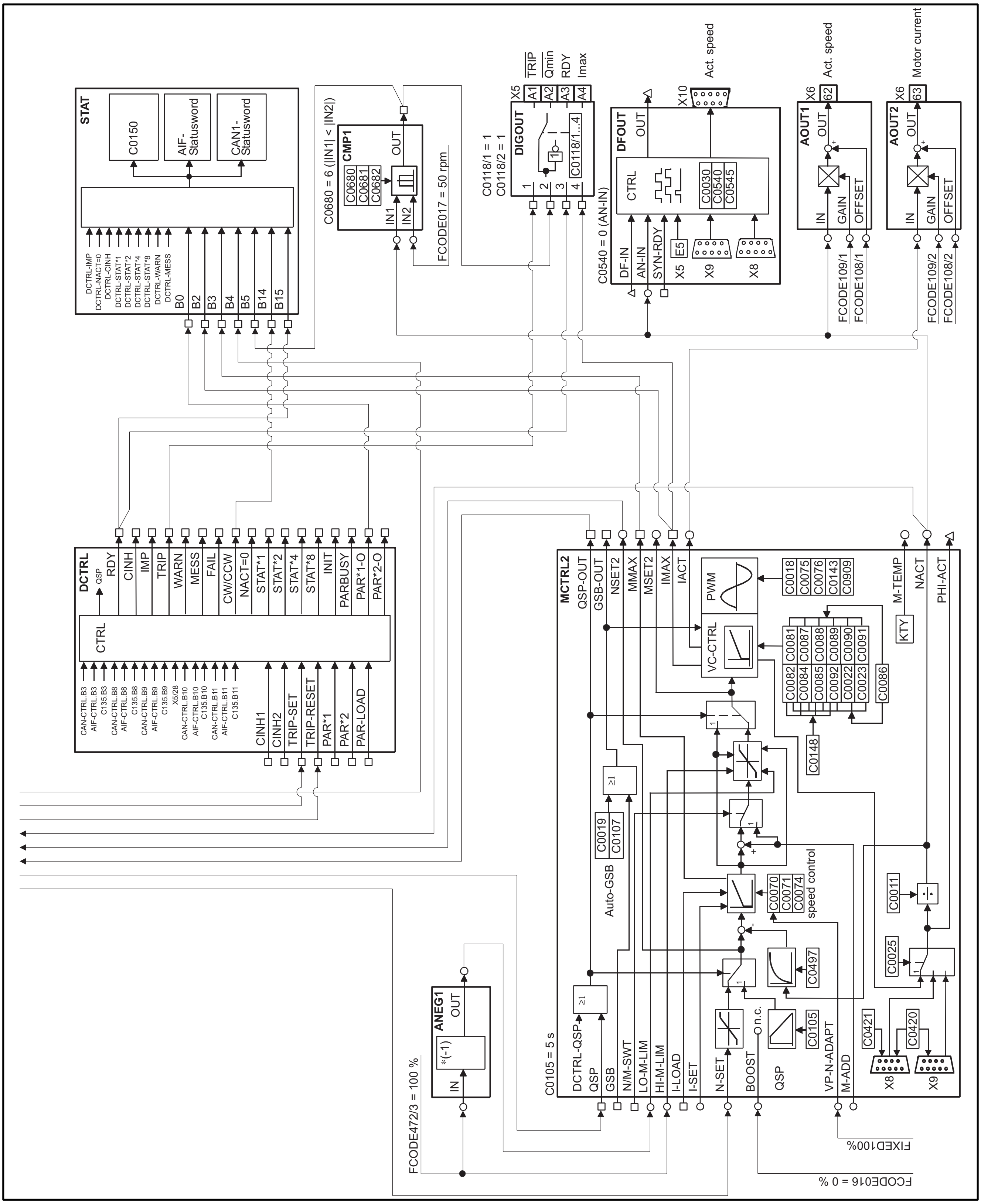

Fig. 16-2 Basic configuration 1000 - speed controll (sheet 2)

16.1.1 Speed control with brake output (C0005 = 1100)

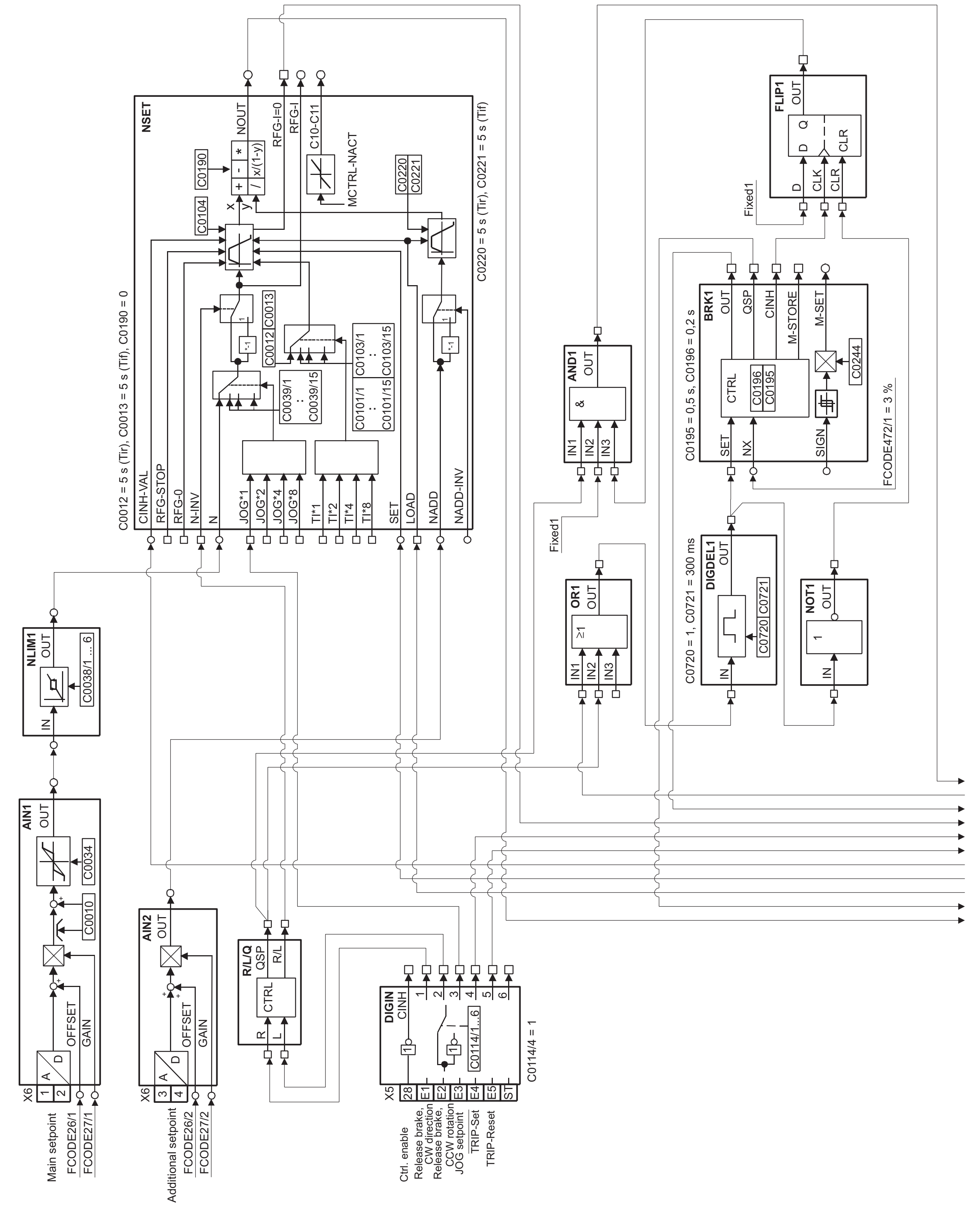

Fig. 16-3 Basic configuration 1100 - speed control with brake output (sheet 1)

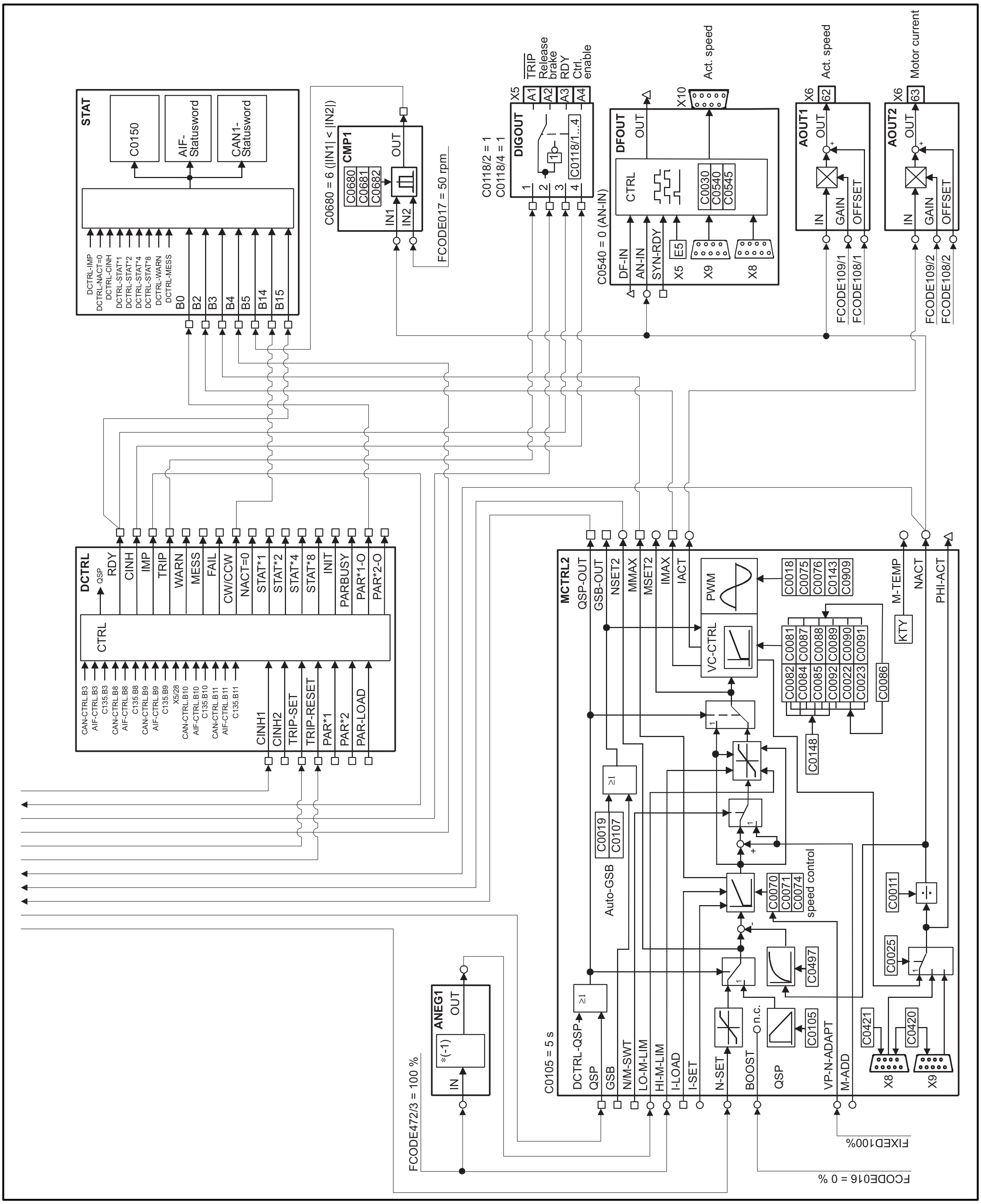

Fig. 16-4 Basic configuration 1100 - speed control with brake output (sheet 2)

16.1.2 Speed control with motor potentiometer (C0005 = 1200)

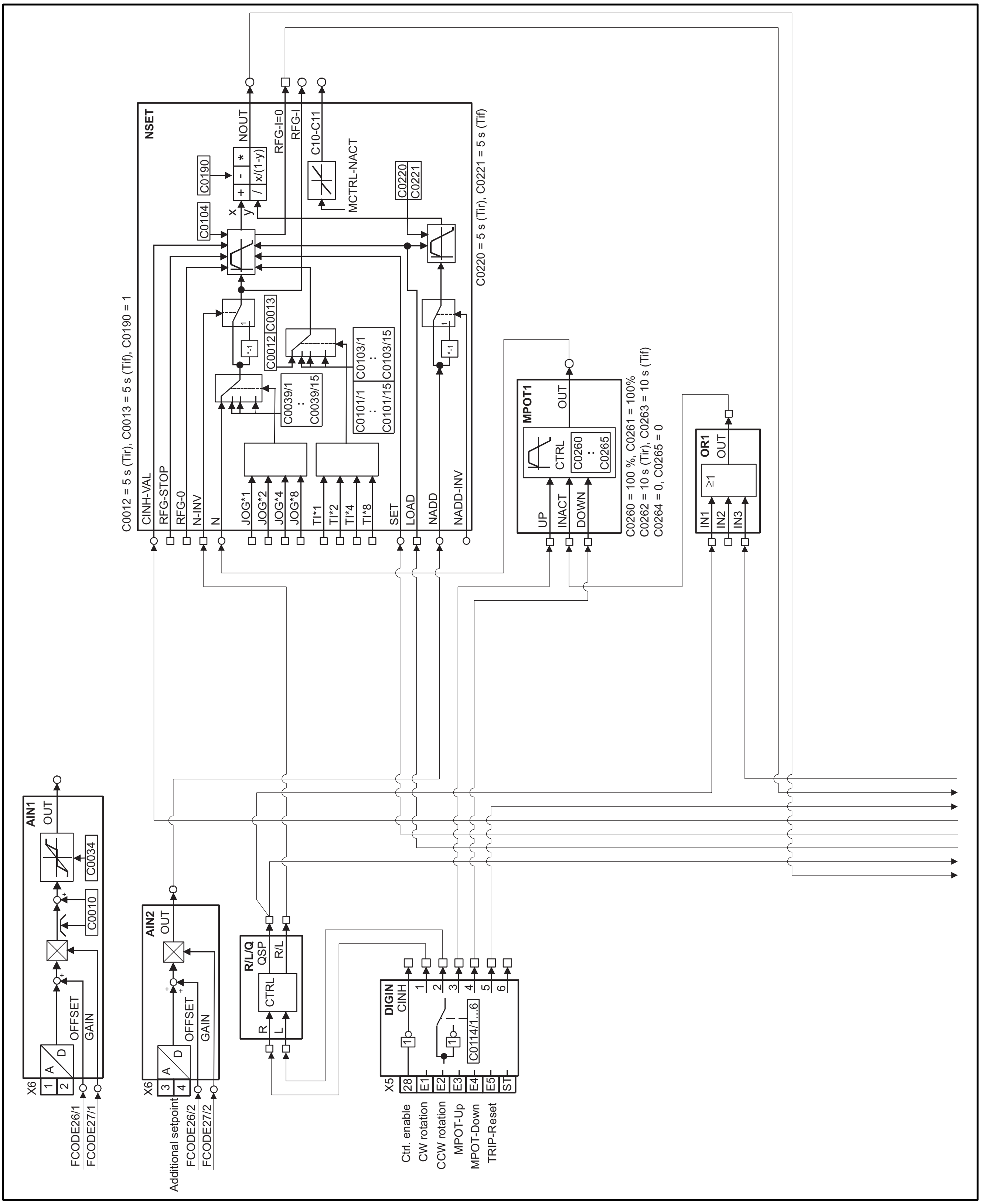

Fig. 16-5 Basic configuration 1200 - speed control with motor potentiometer (sheet 1)

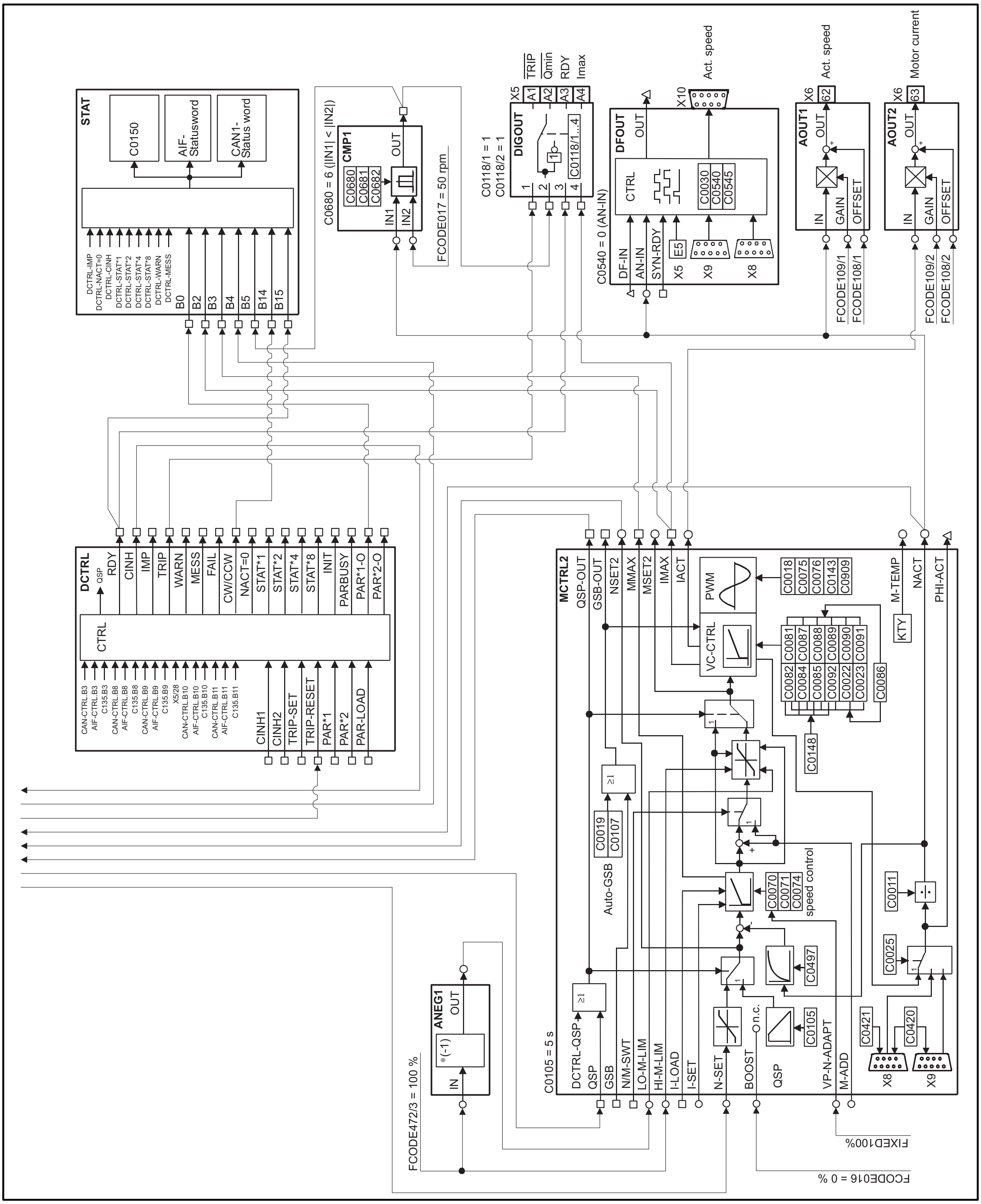

Fig. 16-6 Basic configuration 1200 - speed control with motor potentiometer (sheet 2)

16.1.3 Speed control with process controller (C0005 = 1300)

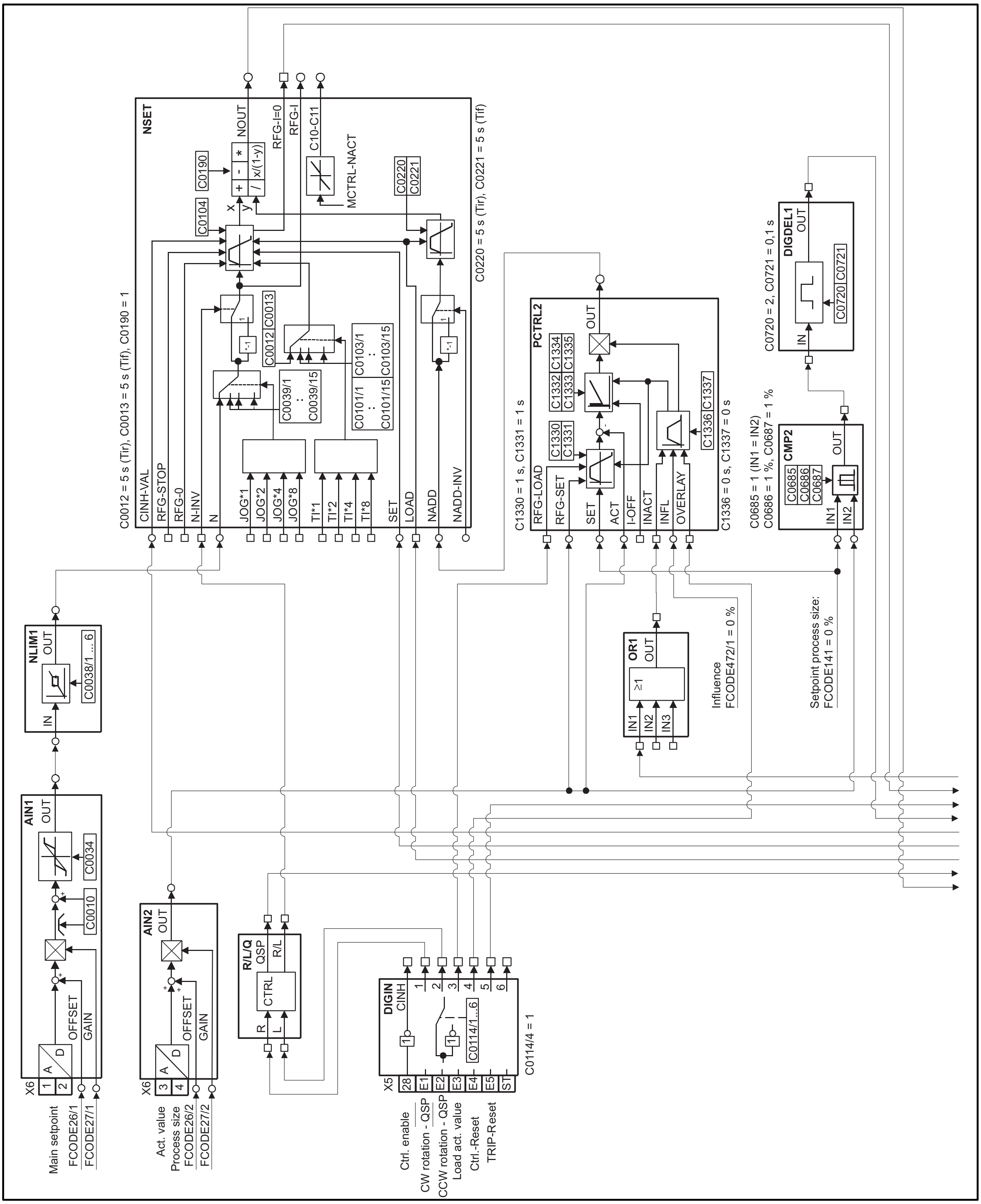

Fig. 16-7 Basic configuration 1300 - speed control with process controller (sheet 1)

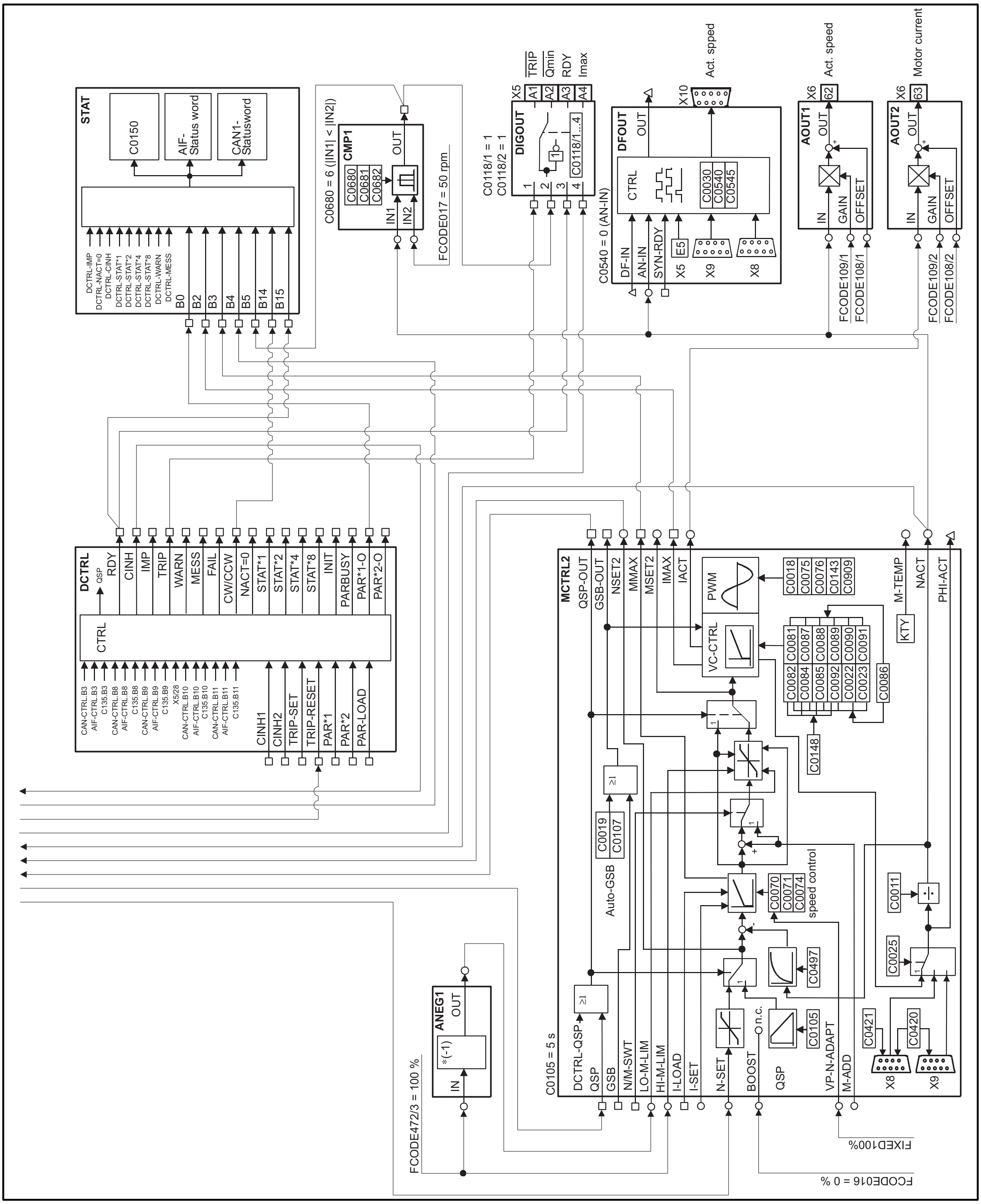

Fig. 16-8 Basic configuration 1300 - speed control with process controller (sheet 2)

16.1.4 Speed control with mains failure control (C0005 = 1400)

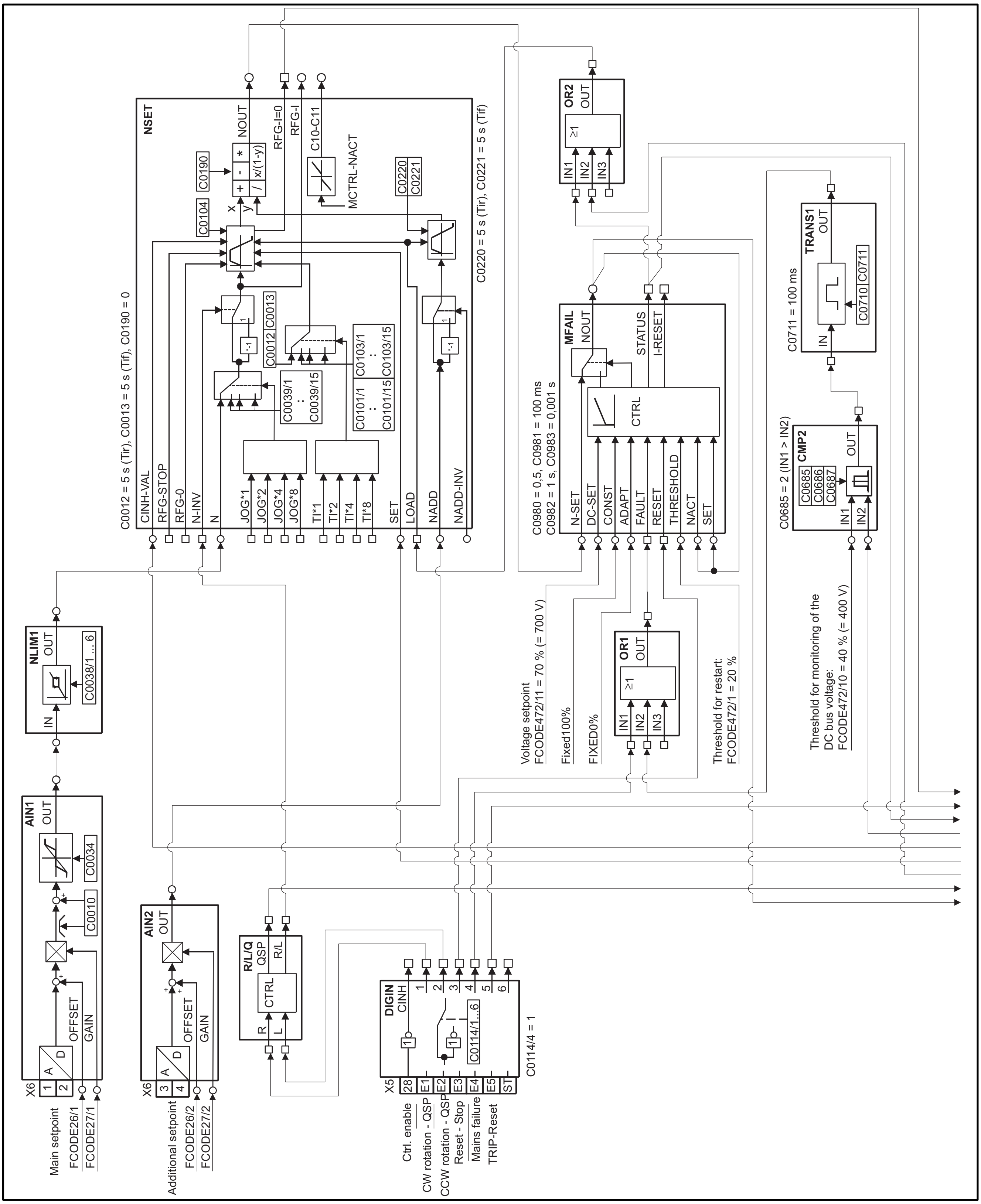

Fig. 16-9 Basic configuration 1400 - speed control with mains failure control (sheet 1)

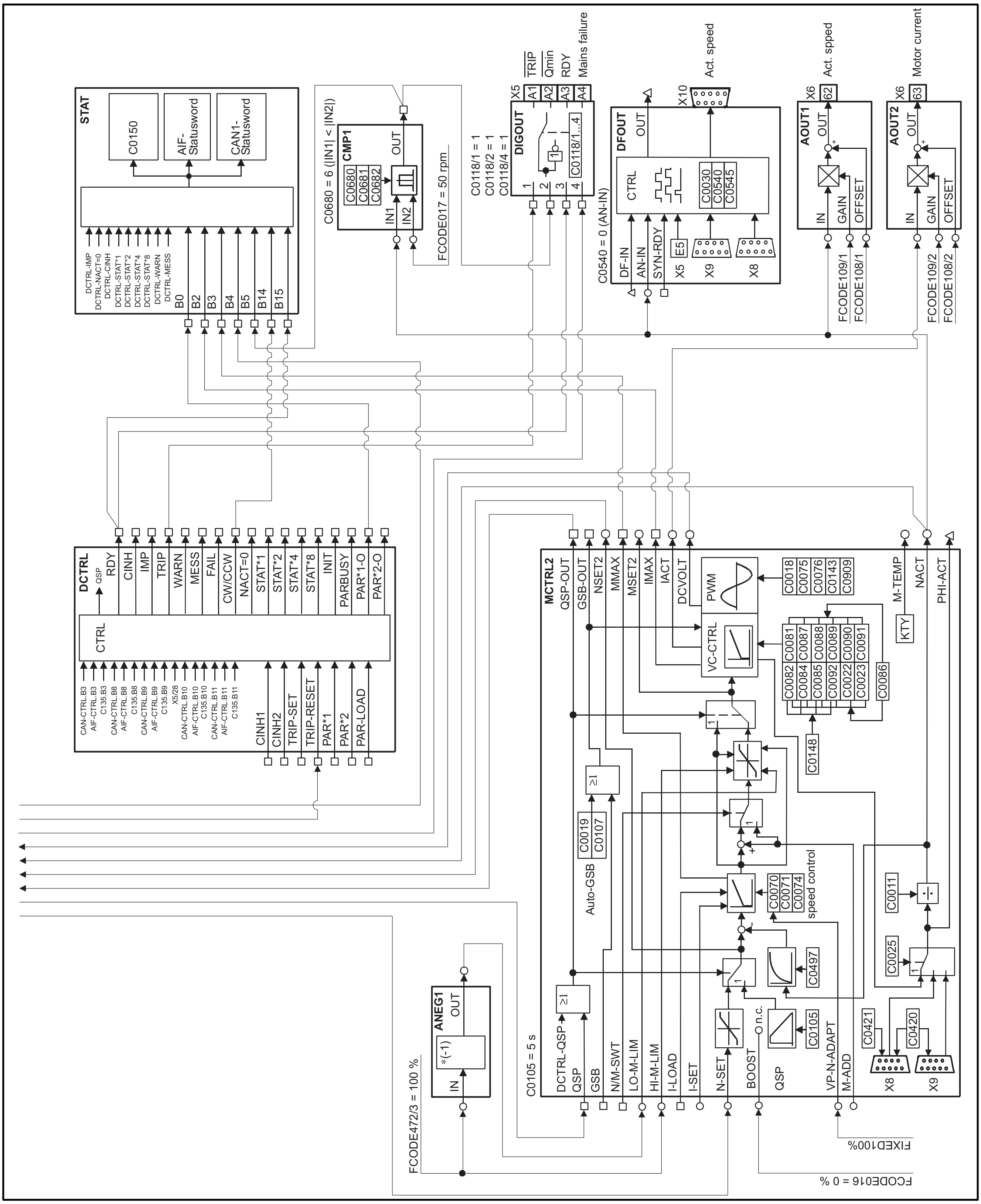

Fig. 16-10 Basic configuration 1400 - speed control with mains failure control (sheet 2)

16.1.5 Speed control with digigital frequency input (C0005 = 1500)

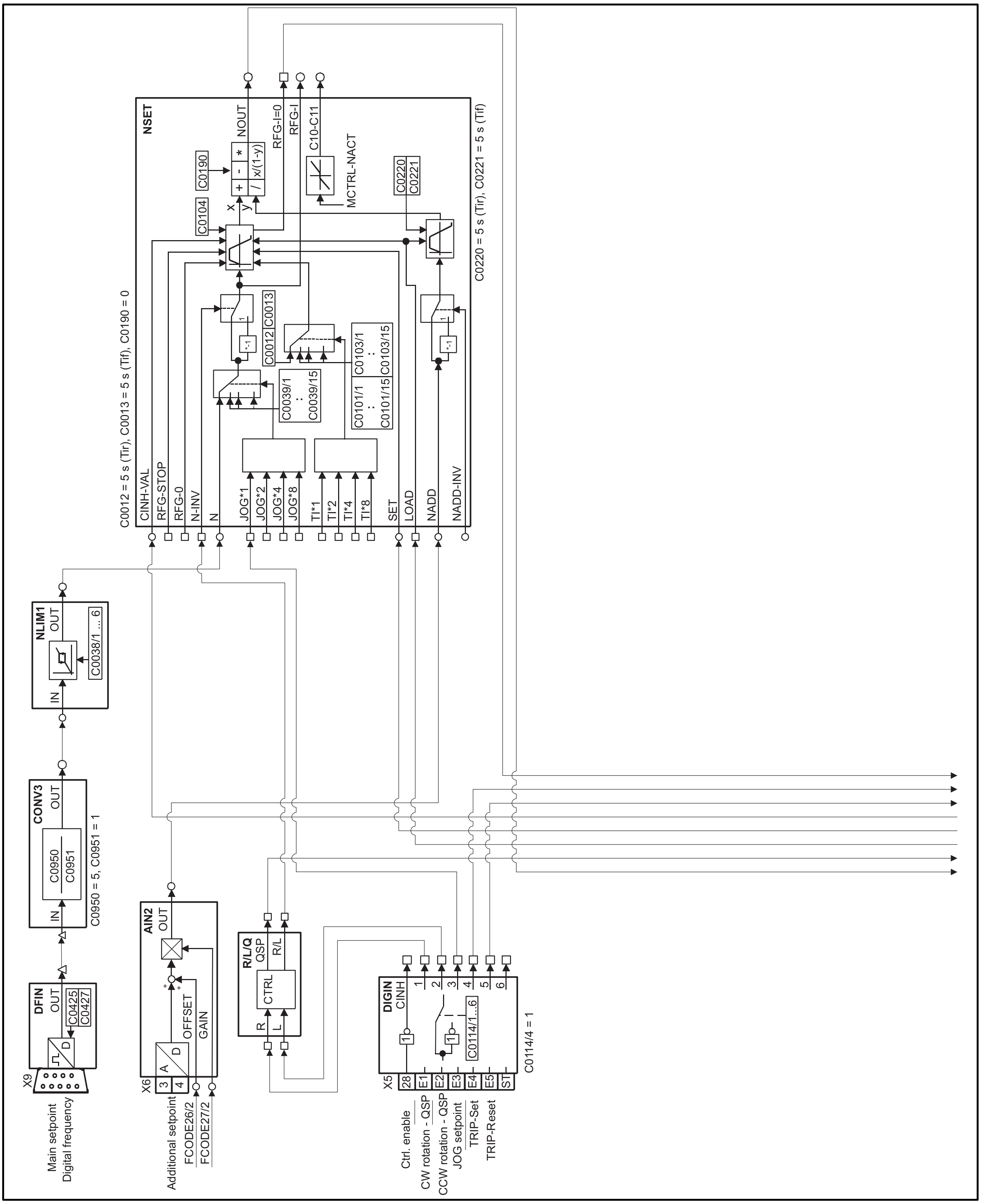

Fig. 16-11 Basic configuration 1000 - speed control with digital frequency input (sheet 1)

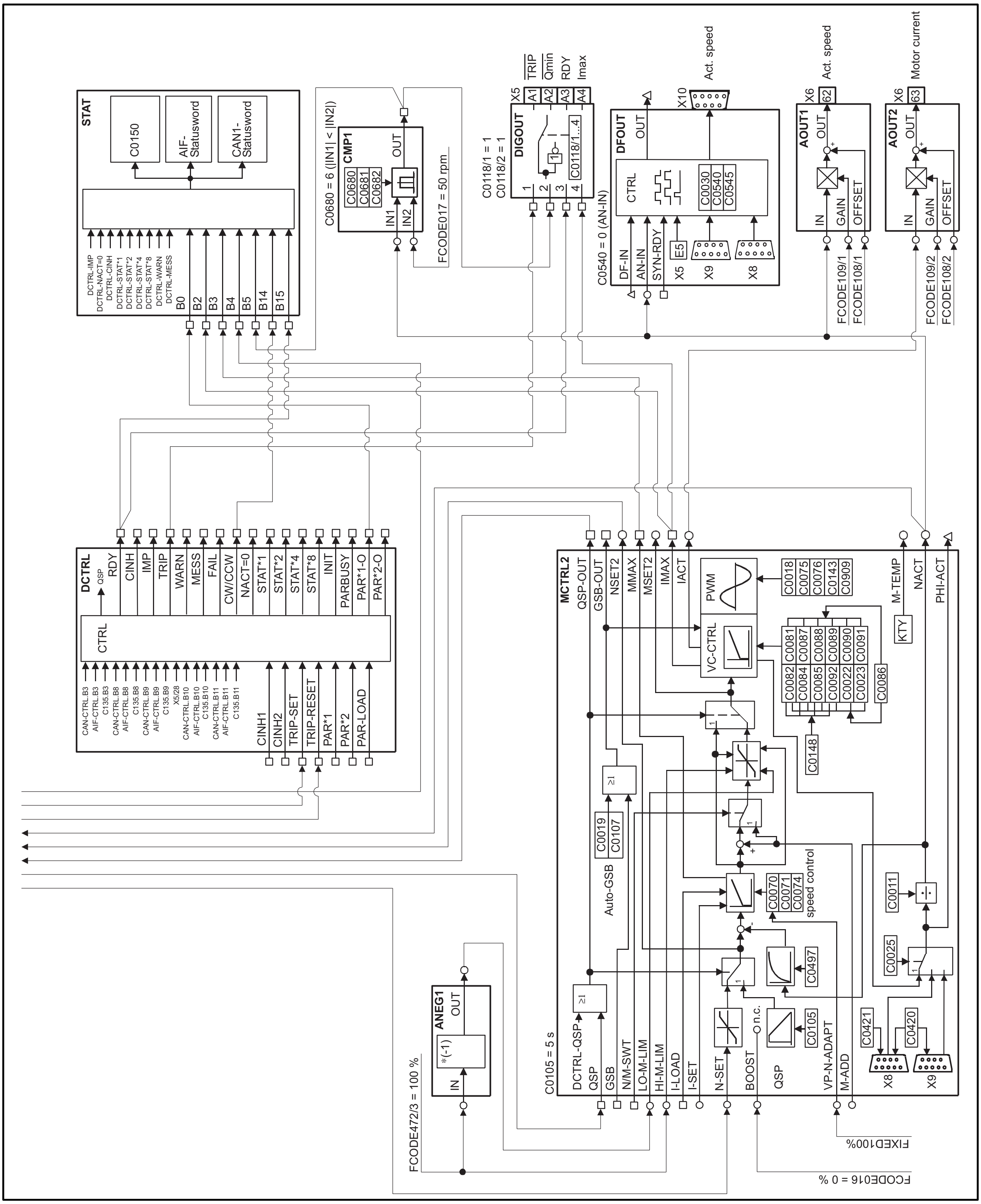

Fig. 16-12 Basic configuration 1000 - speed control with digital frequency input (sheet 2)

16.2 Step control (C0005 = 2000)

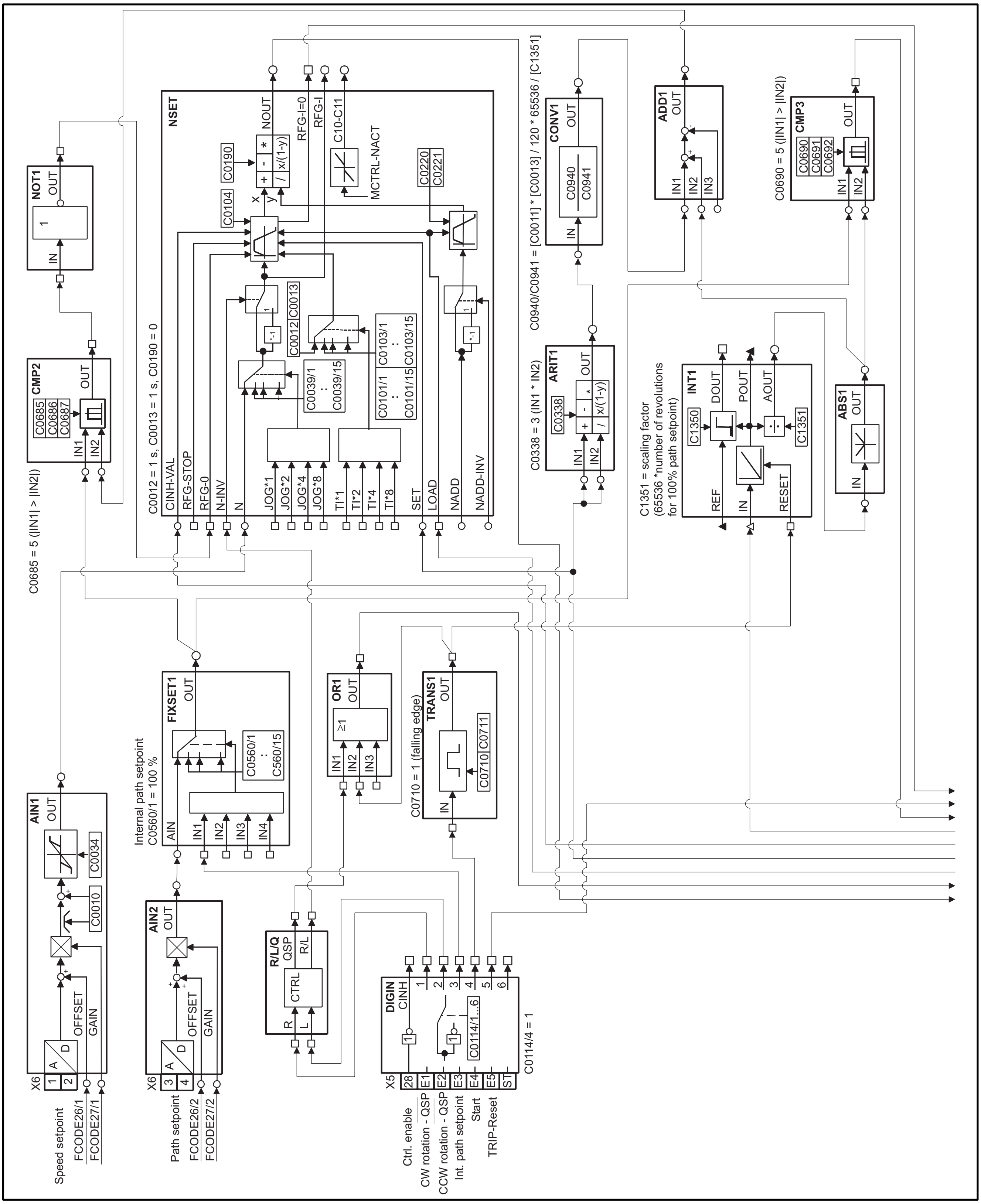

Fig. 16-13 Basic configuration 2000 - step control (sheet 1)

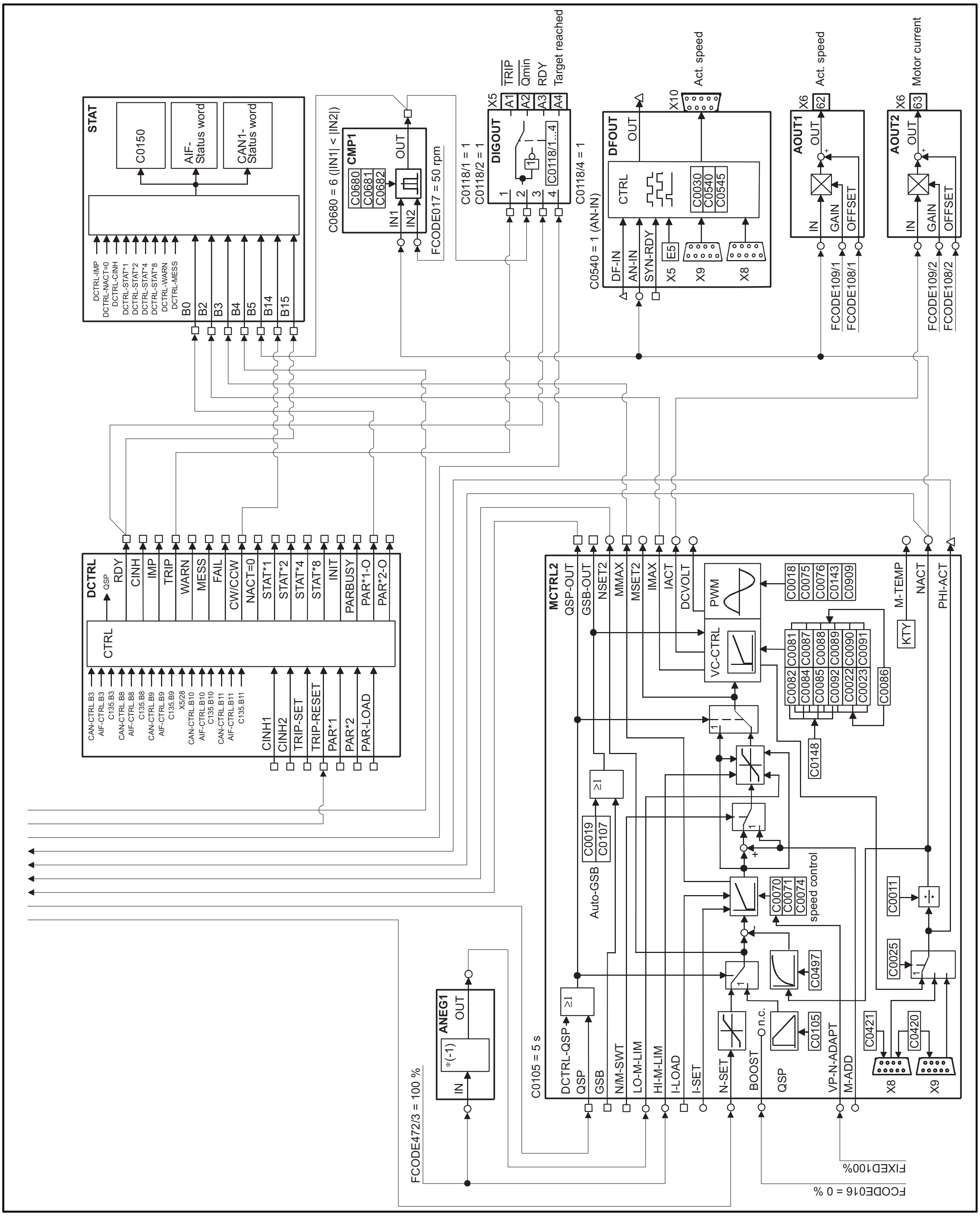

Fig. 16-14 Basic configuration 2000 - step control (sheet 2)

16.3 Traversing control (C0005 = 3000)

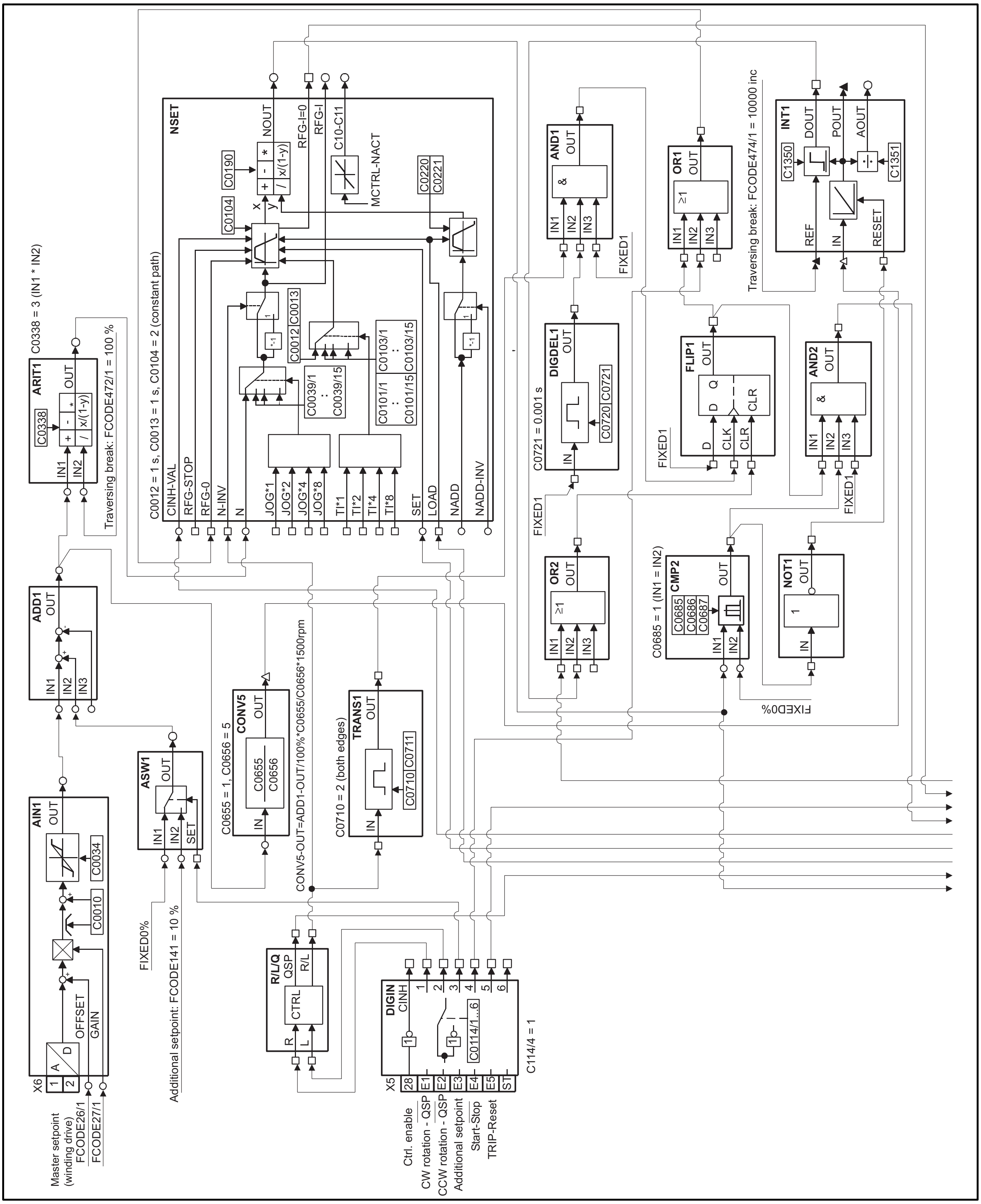

Fig. 16-15 Basic configuration 3000 - traversing control (sheet 1)

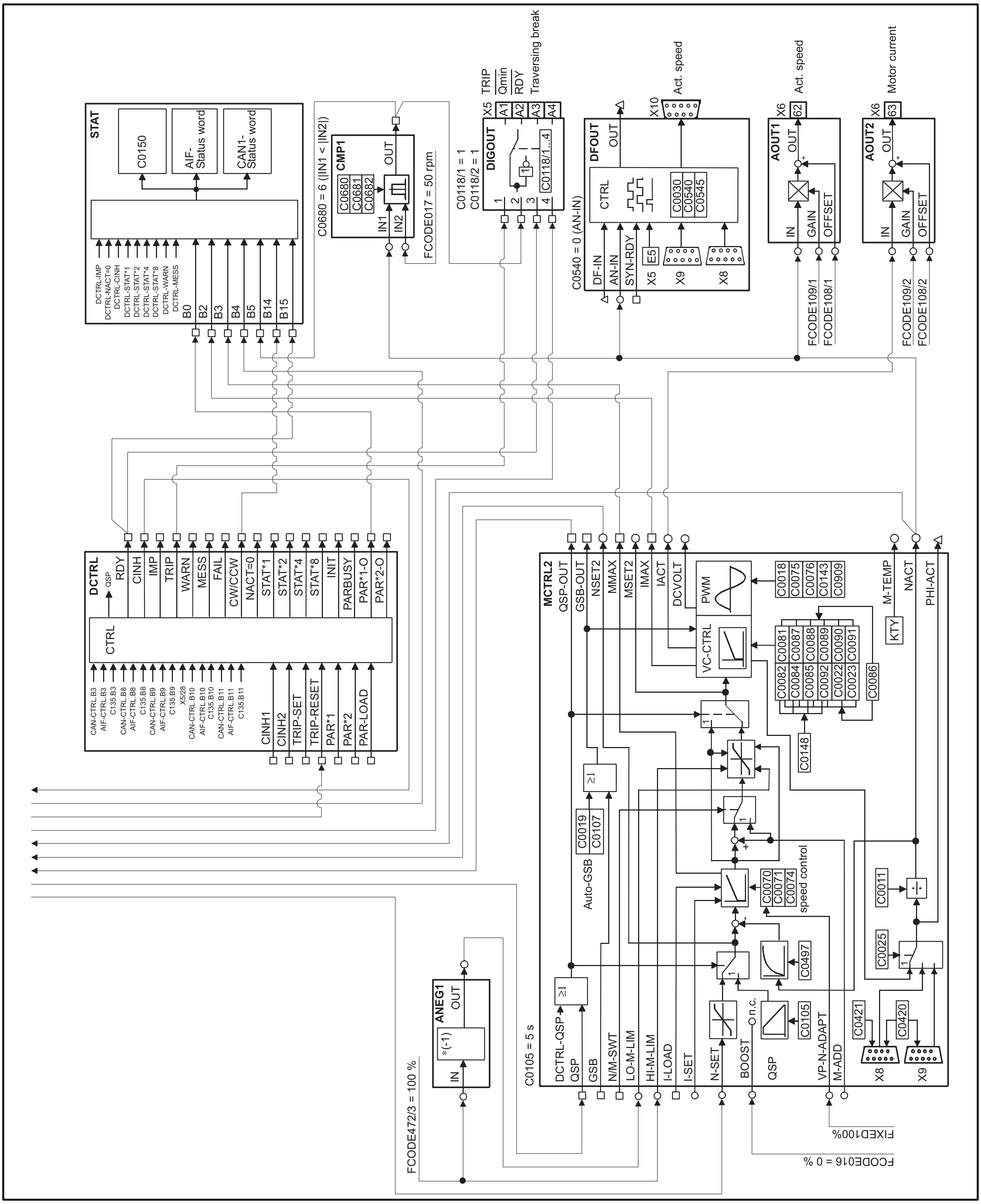

Fig. 16-16 Basic configuration 3000 - traversing control (sheet 2)

16.4 Torque control (C0005 = 4000)

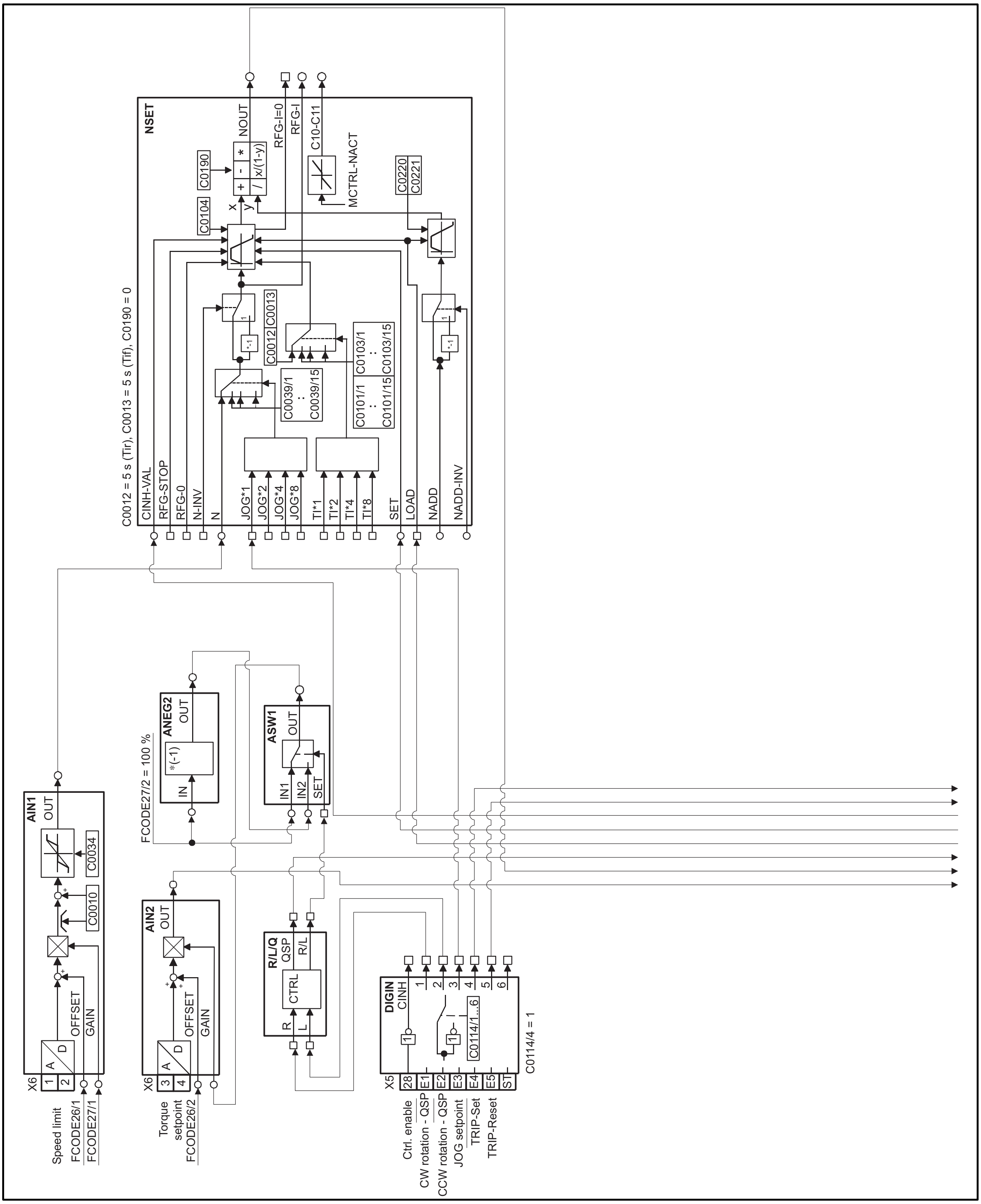

Fig. 16-17 Basic configuration 4000 - torque control (sheet 1)

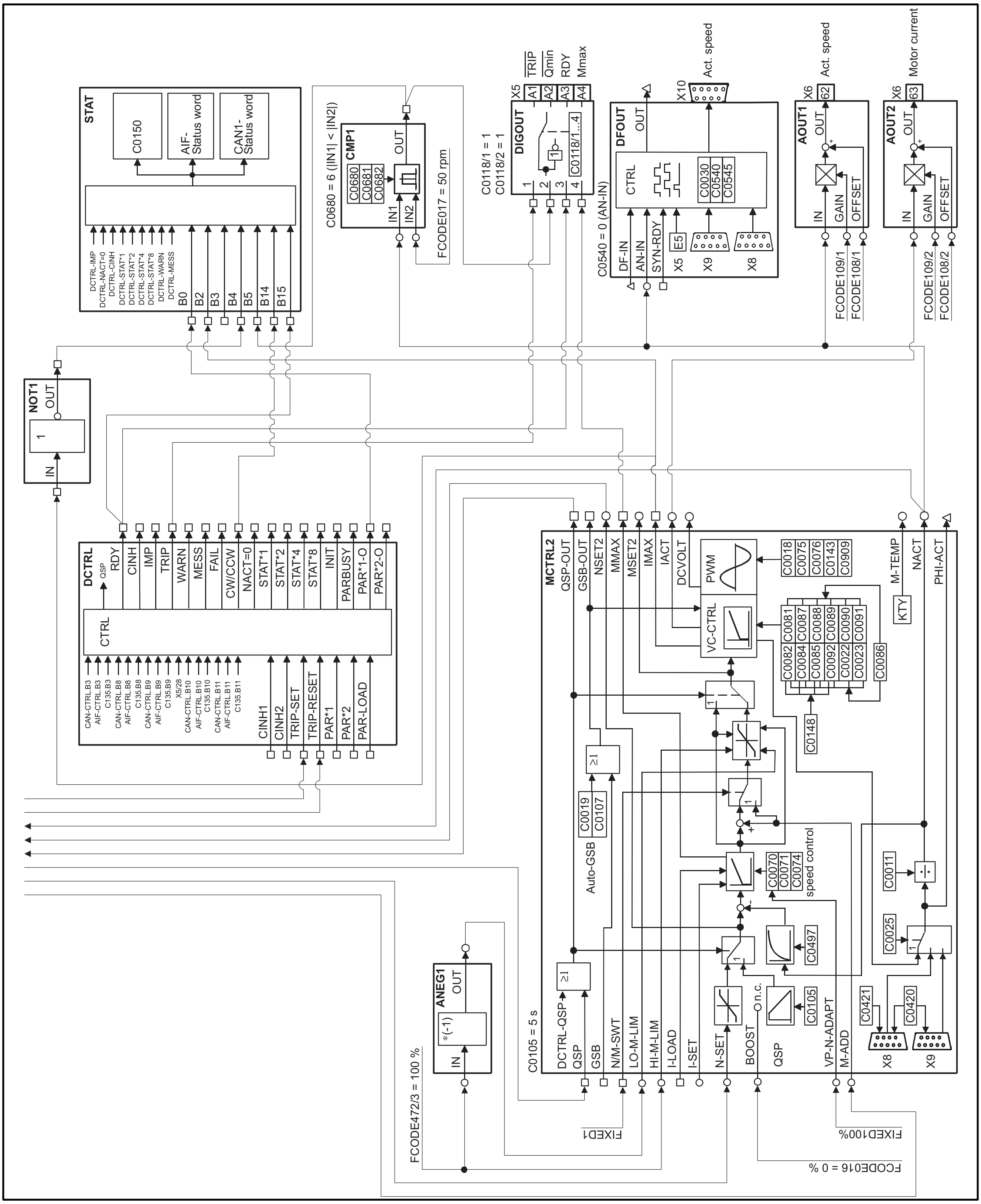

Fig. 16-18 Basic configuration 4000 - torque control (sheet 2)

16.5 Digital frequency - master (C0005 = 5000)

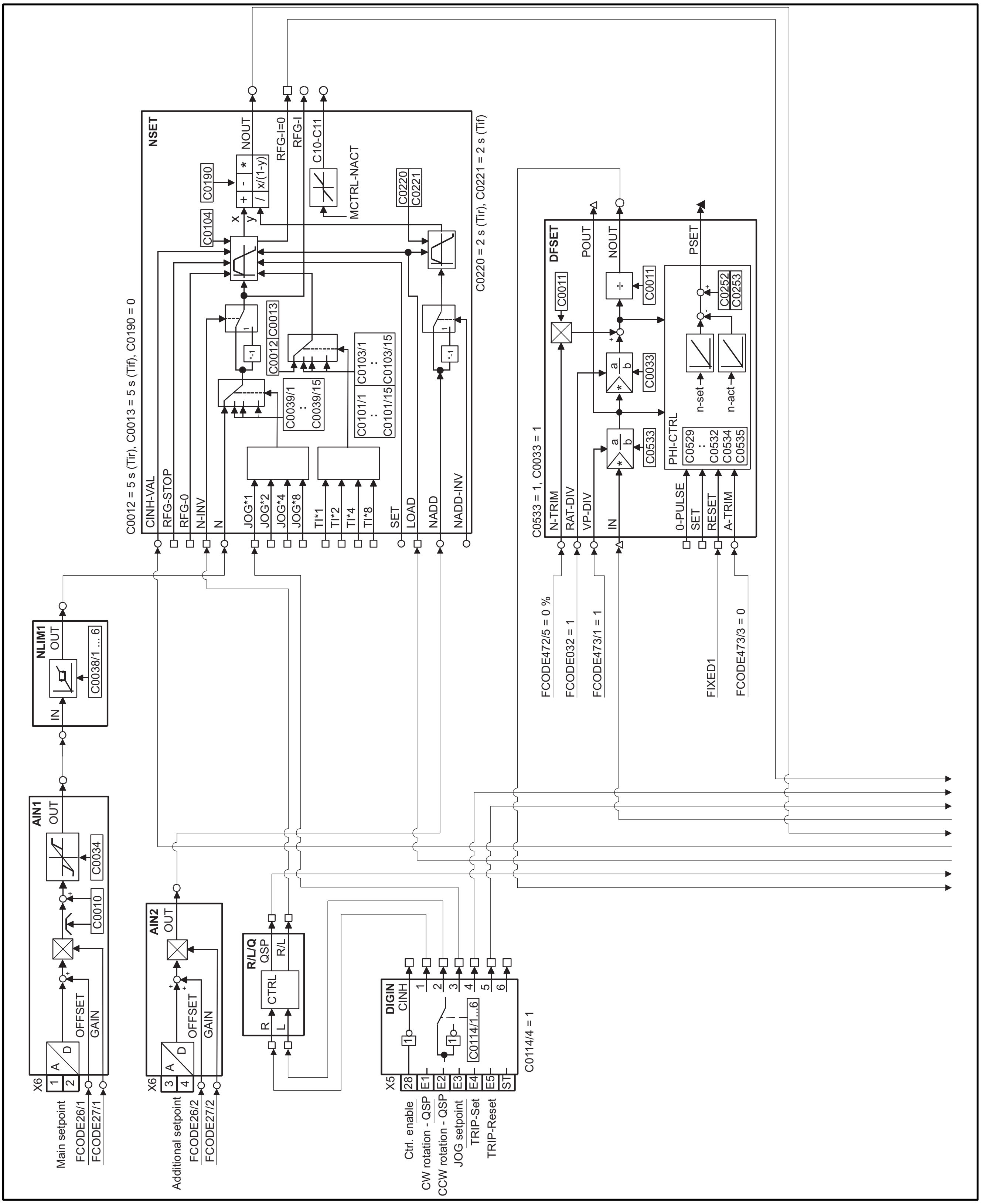

Fig. 16-19 Basic configuration 5000 - digital frequency - master (sheet 1)

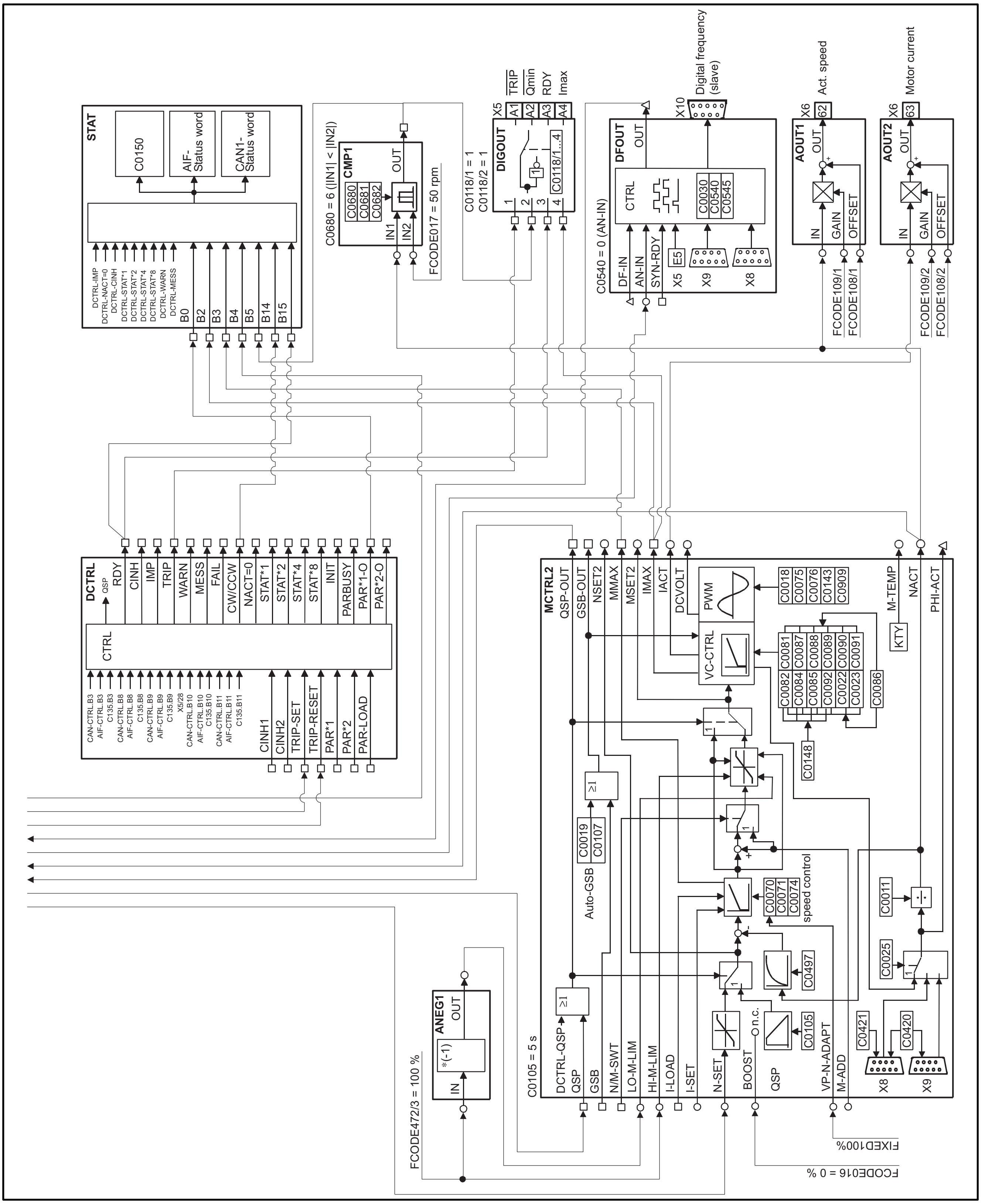

Fig. 16-20 Basic configuration 5000 - digital frequency - master (sheet 2)

16.6 Digital frequency bus (C0005 = 6000)

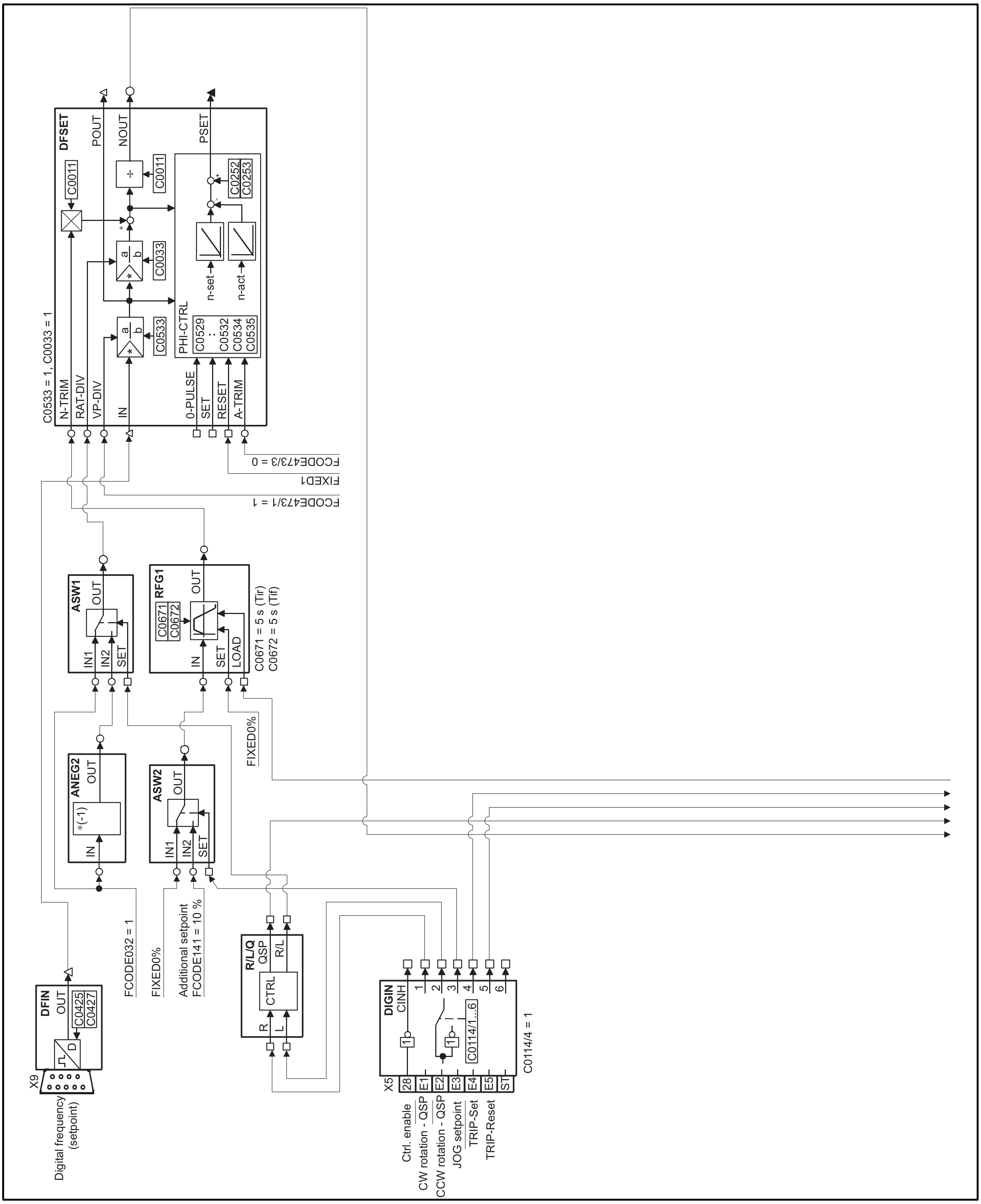

Fig. 16-21 Basic configuration 6000 - digital frequency bus (sheet 1)

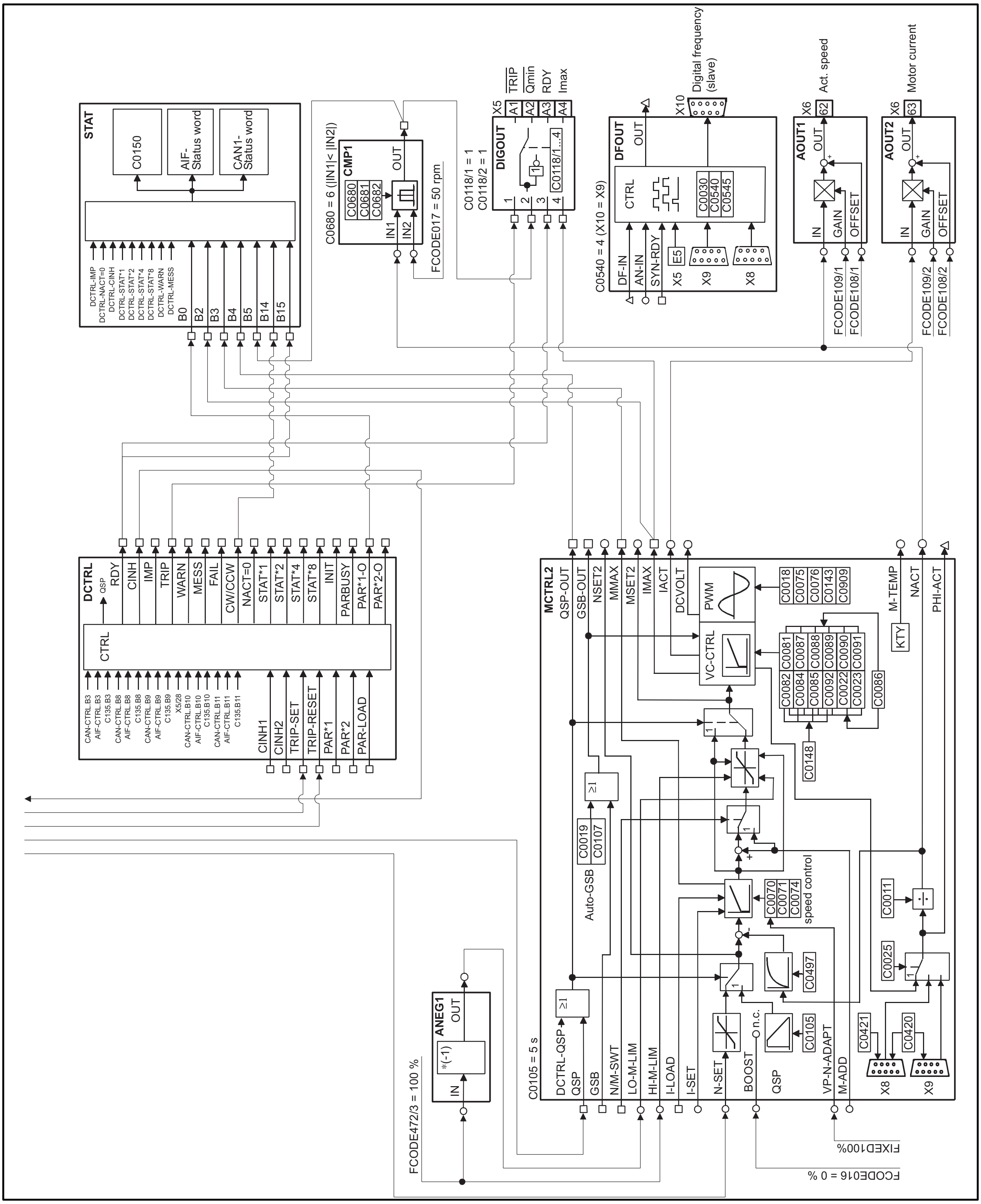

Fig. 16-22 Basic configuration 6000 - digital frequency bus (sheet 2)

16.7 Digital frequency cascade (C0005 = 7000)

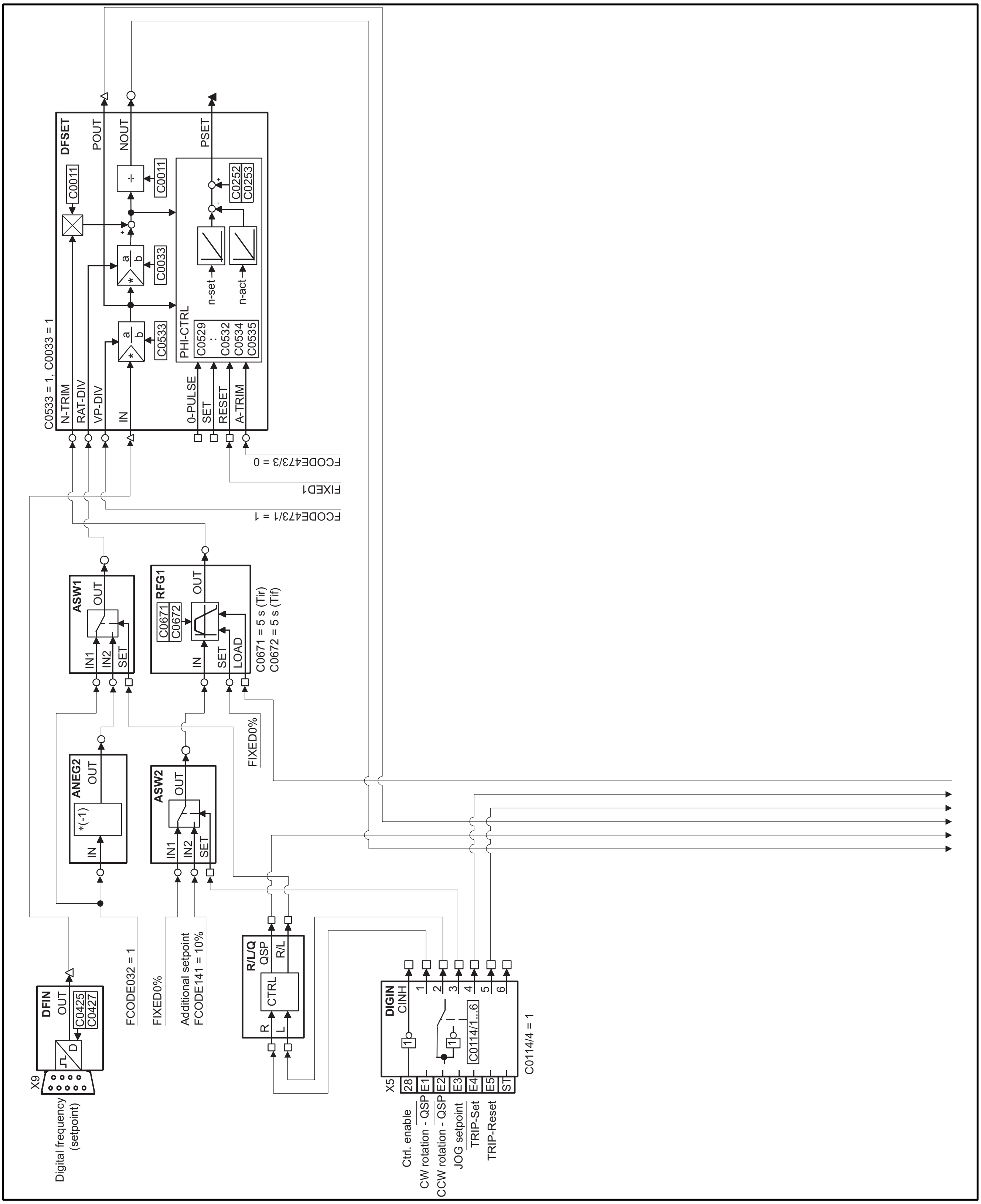

Fig. 16-23 Basic configuration 7000 - digital frequency cascade (sheet 1)

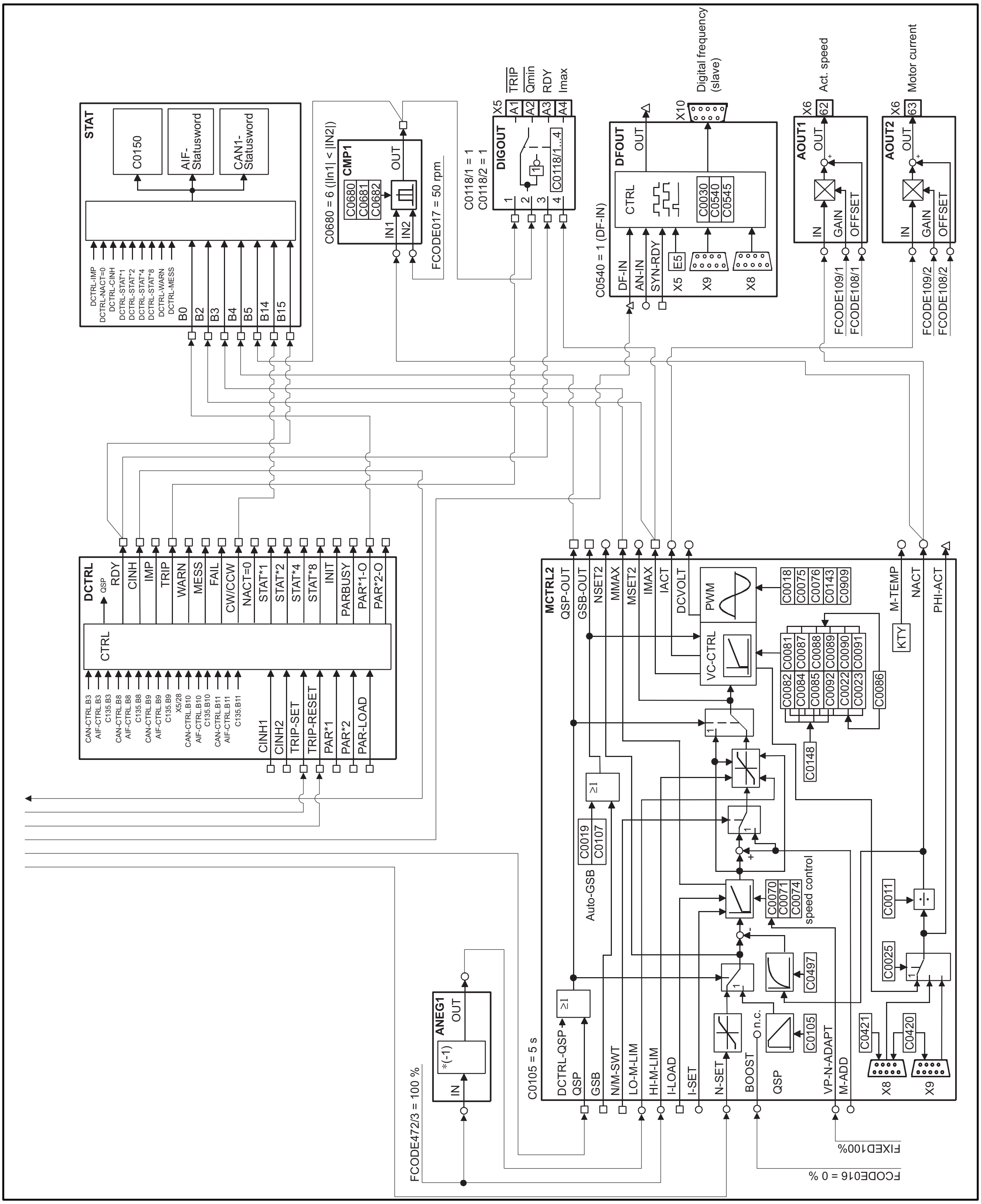

Fig. 16-24 Basic configuration 7000 - digital frequency cascade (sheet 2)

16.8 Dancer position control (external diameter calculator) (C0005 = 8000)

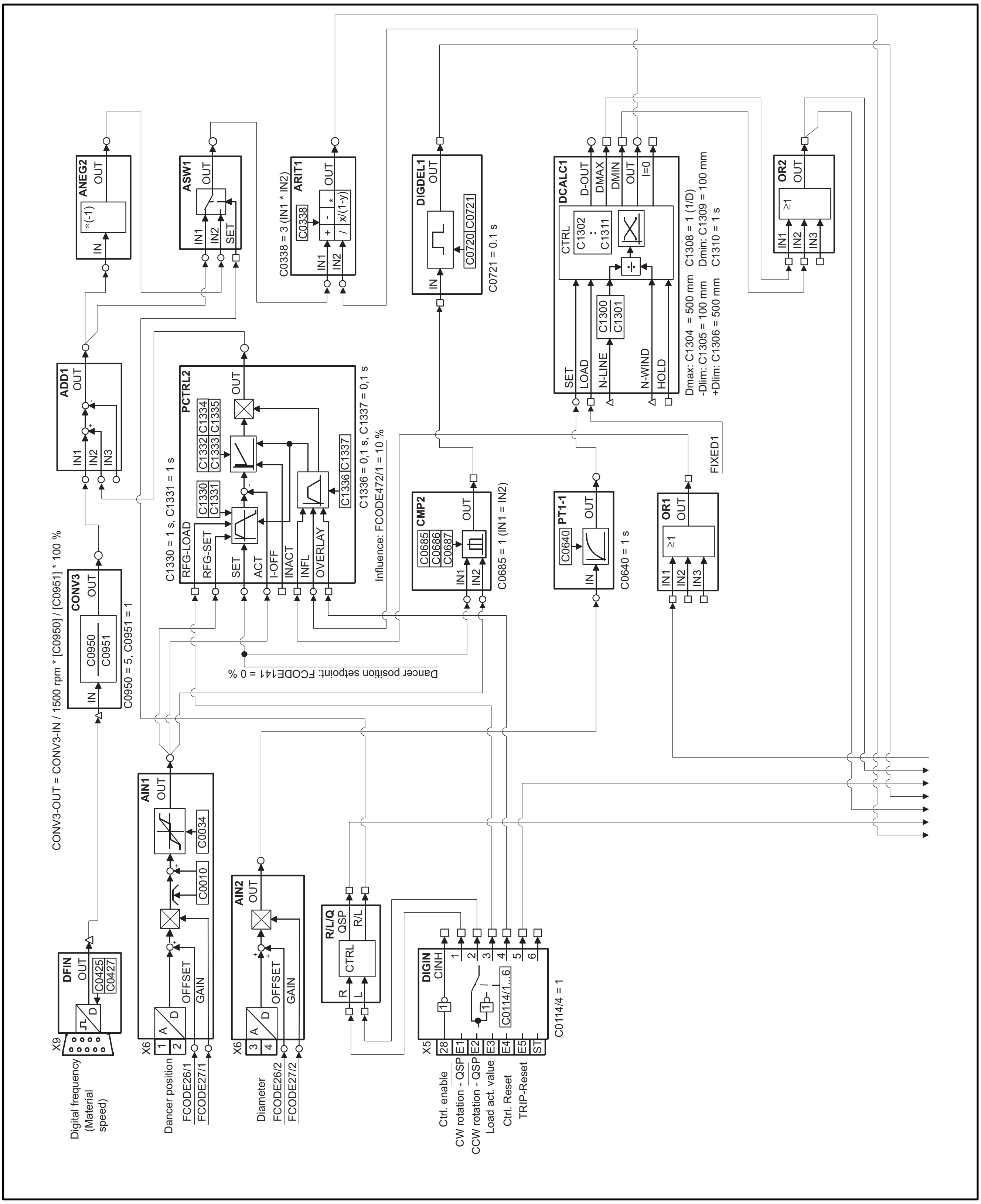

Fig. 16-25 Basic configuration 8000 - dancer position control with external diameter calculator (sheet 1)

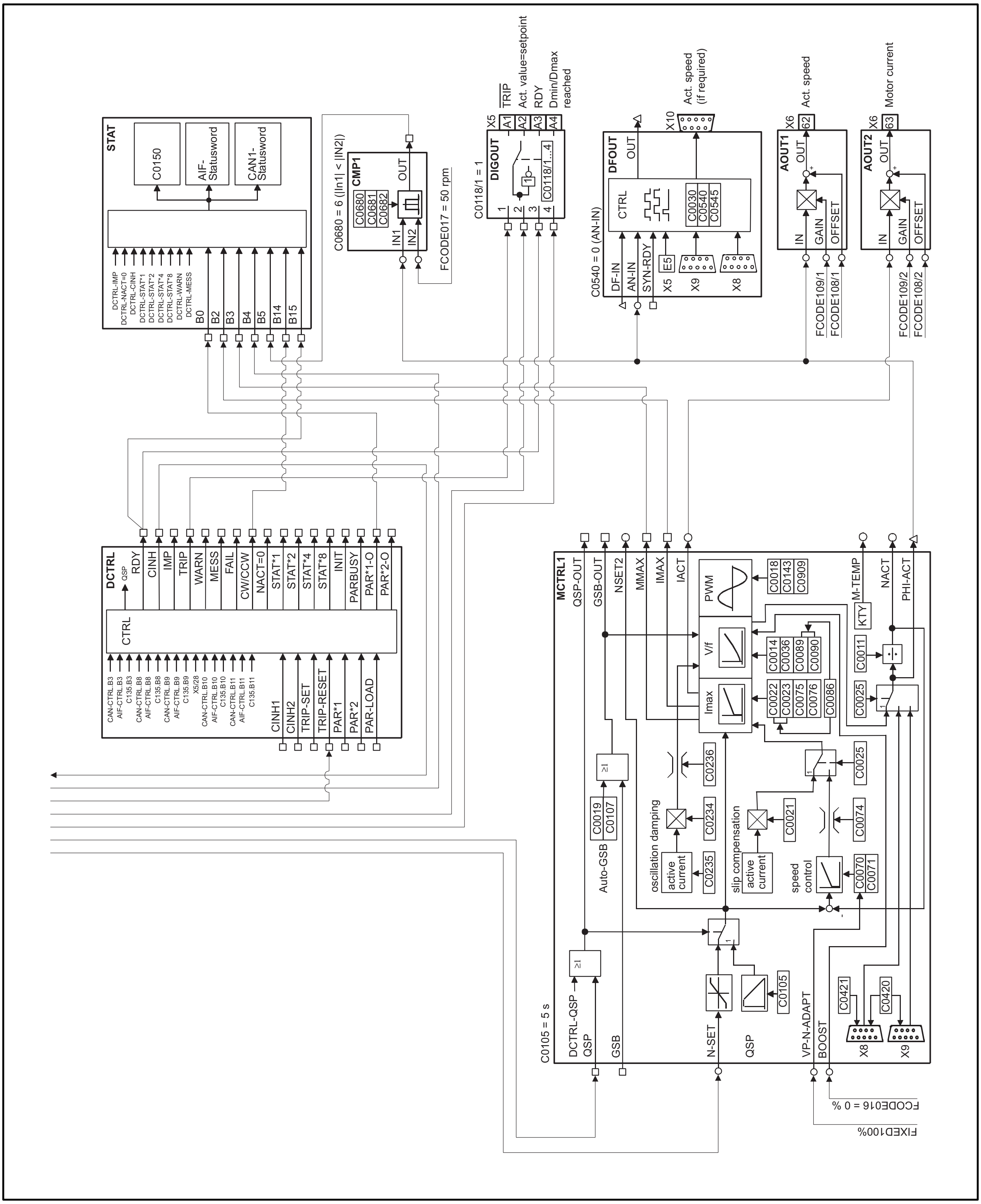

Fig. 16-26 Basic configuration 8000 - dancer position control with external diameter calculator (sheet 2)

16.9 Dancer position control (internal diameter calculator) (C0005 = 9000)

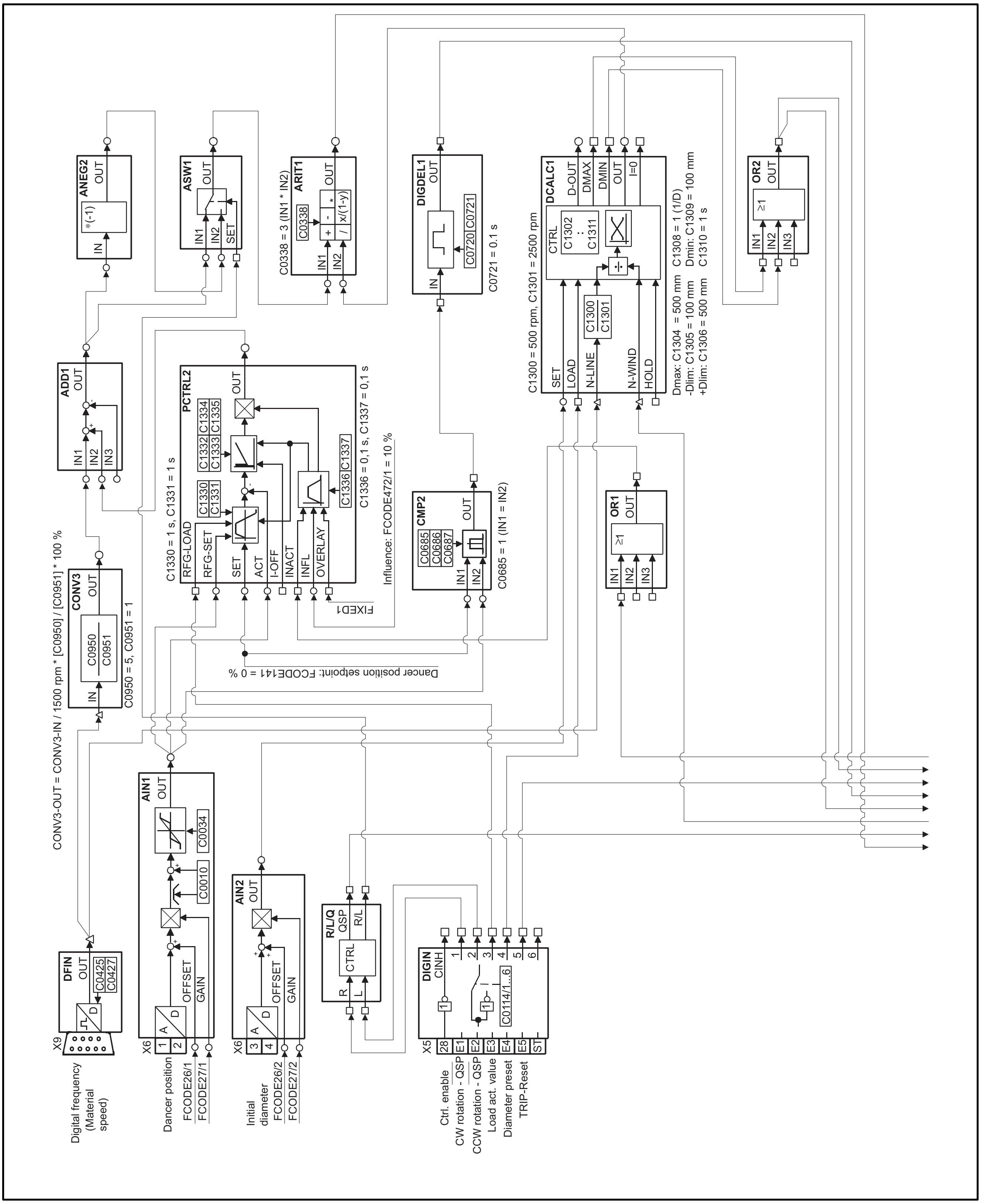

Fig. 16-27 Basic configuration 9000 - dancer position control with internal diameter calculator (sheet 1)

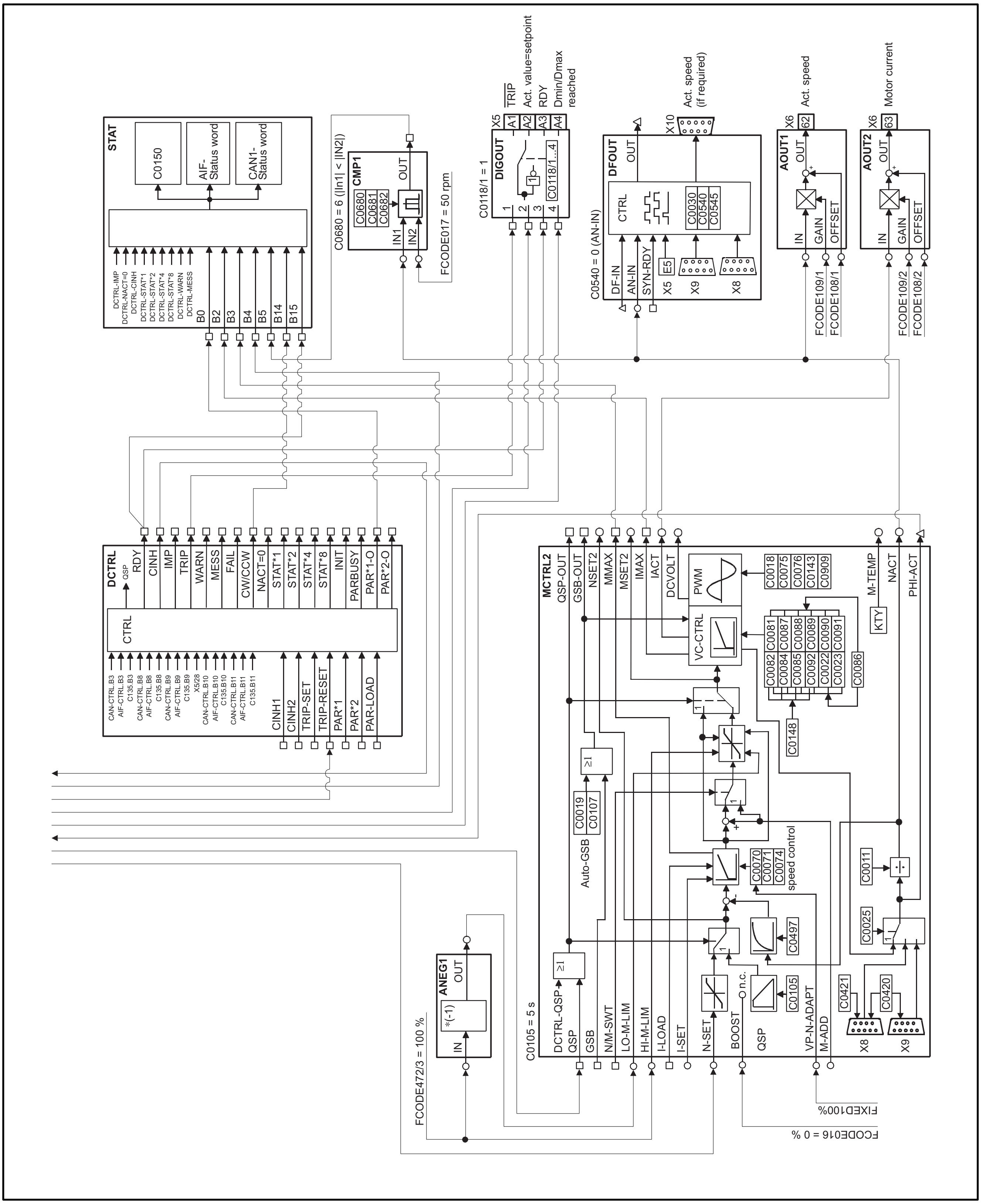

Fig. 16-28 Basic configuration 9000 - dancer position control with internal diameter calculator (sheet 2)

Signal-flow charts

EDS9300U--VM
00416047

Lenze

Manual
Part M

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Global Drive

Frequency inverter
9300 vector control

This documentation is valid for controller types 9300 vector control as from the version

33.93XX	-	EV	3x	2x	(9321 - 9333)

- Type: 33.93XX
- Design: E = Enclosure IP20
- Hardware level and index: 3x
- Software level and index: 2x
- Explanation: (9321 - 9333)

We have thoroughly collected all specifications in this documentation and have checked it for compliance with the described hardware and software. However, differences cannot be excluded completely. We are not responsible or liable for possible consequential damage. We will include necessary corrections in subsequent editions.

Version 2.0 07/00

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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.
Ctrl. enable	Controller enable
Ctrl. inhibit	Controller inhibit (= $\overline{\text{Controller enable}}$)
FB	Function block
Fieldbus	For data exchange between superimposed control and positioning control, e.g. InterBus-S or PROFIBUS-DP
FPDA	Freely programmable digital output
FPDE	Freely programmable digital input
GDC	Global Drive Control (PC-program (Windows) for Lenze controllers)
INTERBUS	Industrial communication standard to DIN E19258
JOG	Fixed speed or input for fixed speed
KTY	"Linear" thermal sensor of the motor winding
LECOM	Lenze Communication
LEMOC2	PC-program (DOS) for Lenze controllers
LU	Undervoltage
Master	Masters are host systems, e.g. PLC or PC.
OU	Overvoltage
PC	Personal Computer
PLC	Programmable logic controller
PM	Permanent magnet
Process data	For instance, setpoints and actual values of controllers which must be exchanged within a minimum of time. Process data are usually small amounts of data which are to be transmitted cyclically. For PROFIBUS-DP, these data are transmitted in the logic process data channel.
PROFIBUS-DP	Communication standard DIN 19245, consisting of part 1, part 2 and part 3
PTC	PTC thermistor with defined tripping temperature
QSP	Quick stop
RFG	Ramp generator
Slave	Bus device which may only send after the request of the master. Controllers are slaves.
SSC	Sensorless control
SSI	Synchronous serial interface
Target position	The target which is to be approached by means of a defined traversing profile.
TKO	Thermostat / normally-closed contact

Glossary

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