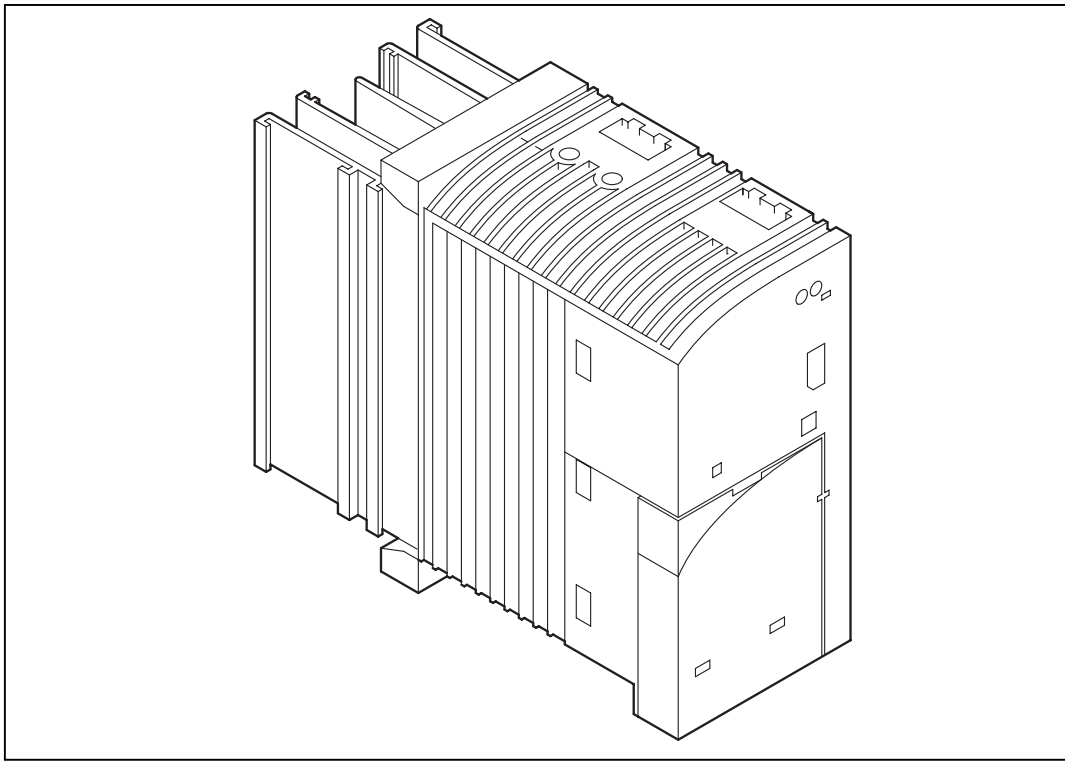
EDB82EVU
00408400

Lenze

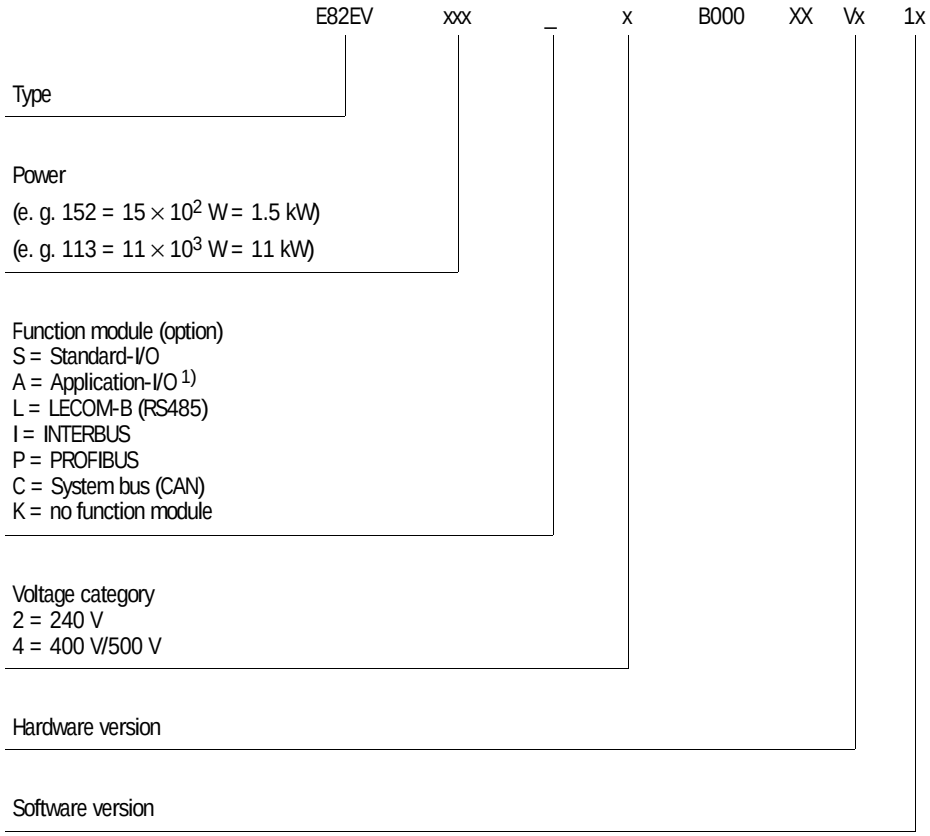
Operating Instructions



Global Drive

Frequency inverter
8200 vector series
0.25 kW ... 2.2 kW

This documentation is only valid for 8200 vector controllers as of version:



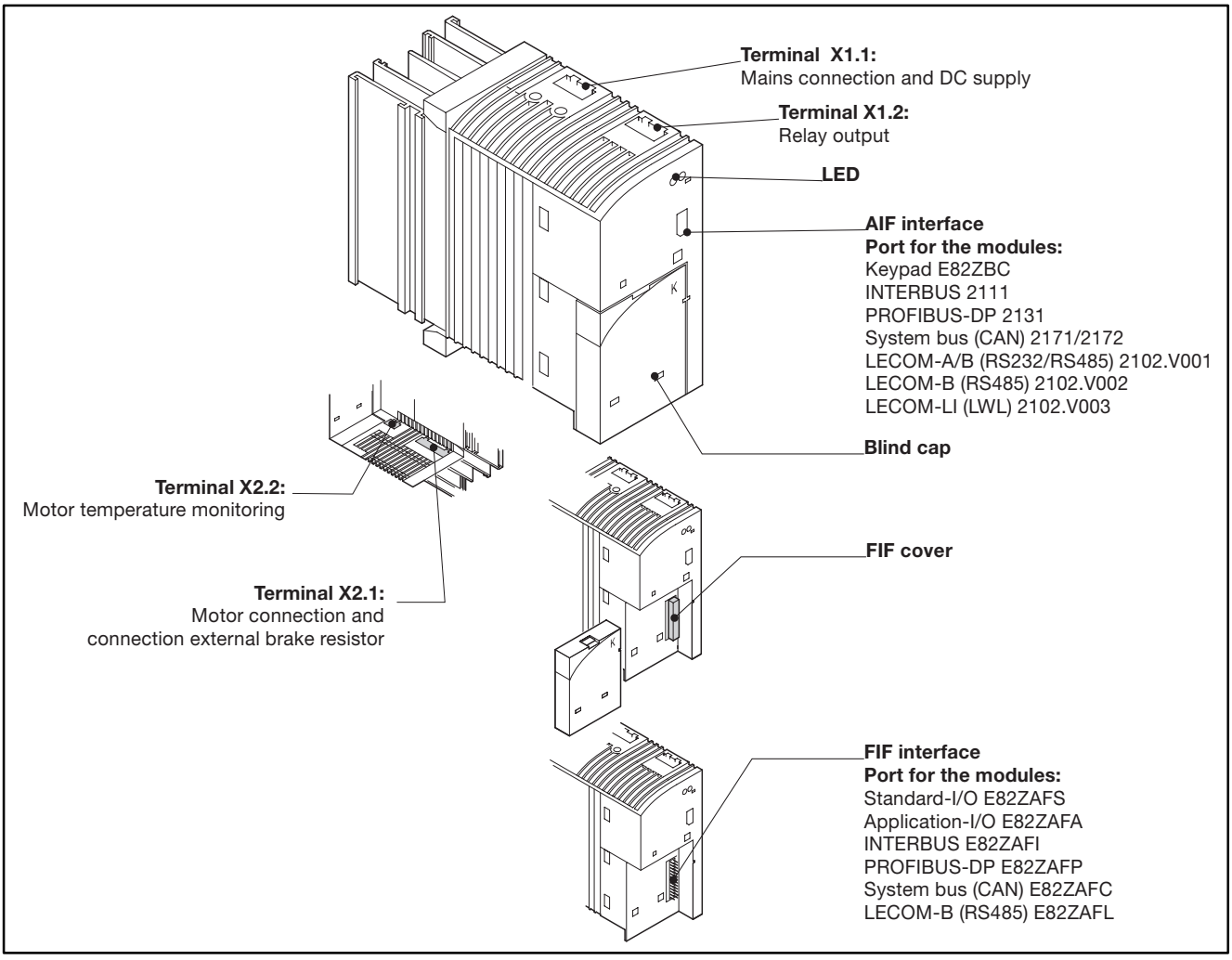
1) **Please observe:** The application-I/O is compatible with the following software version of the 8200 vector:	**Application-I/O**	**Frequency inverter 8200 vector**	
		up to E82EV ... Vx 04	**as of E82EV ... Vx 11**
	E82ZAFA ... XX VB 01	•	
	E82ZAFA ... XX VC 10		•

If the 8200 vector is used together with Lenze motors or Lenze geared motors, these Operating Instructions are only valid together with the Operating Instructions for the motors or geared motors.

In the event of service, please indicate the type. The function module used can be identified with the keypad or the PC. In addition, each function module is clearly labelled (e. g. “STANDARD” for standard-I/O).

Version 1.0 05/99

System survey - Frequency inverter 8200 vector



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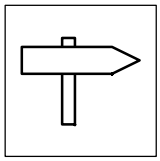

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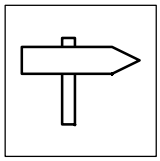

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1 Preface and general information

1.1 The frequency inverter 8200 vector

The main task of the frequency inverter 8200 vector is the speed adjustment of three-phase AC motors. Together with a Lenze geared motor or a Lenze three-phase AC motor, the inverter forms an electrical variable speed drive which provides excellent drive features. Different combination possibilities of frequency inverters and application-specific modules, which can be used at two interfaces at the same time, offer high flexibility for solving drive tasks.

Additional features, such as compact design and high functionality, make the frequency inverter 8200 vector the ideal solution for almost every application, e.g. in HVAC technology, material handling or automation.

1.2 About these Operating Instructions

- These Operating Instructions are intended for all persons who install, set-up and adjust the frequency inverter 8200 vector.
- Every chapter informs entirely about one topic:
  – Therefore, it is enough to read the chapter which provides the required information.
  – The index helps you to easily and quickly find information on a special keyword.
- These Instructions complement the Mounting Instruction delivered with the 8200 vector.
  – The features and funtions are described in detail.
  – The parameter setting for typical applications is explained by means of examples.
- They do not include any information about combinations with Lenze geared motors or Lenze motors. The most important data can be obtained from the nameplates. If necessary, ask your Lenze representative for the corresponding Operating Instructions.

1.2.1 Terminology used

Term	In the following text used for
Controller	Any frequency inverter, servo inverter or DC controller
vector	Frequency inverter 8200 vector
Drive	Lenze controller in combination with a geared motor, a three-phase AC motor or other Lenze drive components.
AIF	**A**utomation**I**nter**F**ace: Interface for a communcation module.
FIF	**F**unction**I**nter**F**ace: Interface for a function module.
Cxxxx/y	Subcode y of code Cxxxx (e.g. C0410/3 = subcode 3 of code C0410)
Xk/y	Terminal y on terminal strip Xk (e. g. X3/28 = terminal 28 on terminal strip X3)
🕮 xx-yyy	Cross reference to a page

1.2.2 What is new?/What has been changed?

Version	Id No.	Changes
1.0 05/99	00408400	First edition

1.3 Legal regulations

<table>
<tr><td>Labelling</td><td>Nameplate</td><td>CE identification</td><td>Manufacturer</td></tr>
<tr><td></td><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">Frequency inverters 8200 vector and accessories
● must only be operated under the conditions prescribed in these Operating Instructions.
● are components
– for open and closed loop control of variable speed drives with asynchronous standard motors, reluctance motors, PM synchronous motors with asynchronous damping cage.
– for installation into a machine
– used for assembly together with other components to form a machine.
● comply with the requirements of the EC Low-Voltage Directive.
● are not machines for the purpose of the EC Machinery Directive.
● are not to be used as domestic appliances, but only for industrial purposes.
Drives with frequency inverters 8200 vector
● meet the EC Electromagnetic Compatibility 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 Operating Instructions met the state of the art at the time of printing. Claims referring to drive systems which have already been supplied cannot be derived from the information, illustrations, and descriptions given in these Operating Instructions.
● The specifications, processes, and circuitry described in these Operating 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 indications given in these Operating Instructions describe the features of the product without warranting them.
● Lenze does not accept any liability for damage and operating interference caused by:
– Disregarding these 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">● Terms of warranty: see terms of sales and delivery of Lenze GmbH & Co KG.
● Warranty claims must be made immediately after detecting defects or faults.
● The warranty is void in all cases where liability claims cannot be made.</td></tr>
<tr><td>Disposal</td><td>Material</td><td>recycle</td><td>dispose</td></tr>
<tr><td></td><td>Metal</td><td>●</td><td>-</td></tr>
<tr><td></td><td>Plastic</td><td>●</td><td>-</td></tr>
<tr><td></td><td>Printed-board assemblies</td><td>-</td><td>●</td></tr>
</table>

2 Safety information

2.1 Safety and application notes for Lenze controllers

(according to: Low-Voltage Directive 73/23/EC)

1. General

During operation, drive controllers may have live, bare, in some cases also movable or rotating parts as well as hot surfaces, depending on their level of protection.

Non-authorized removal of the required cover, inappropriate use, incorrect installation or operation, creates the risk of severe injury to persons or damage to material assets.

Further information can be obtained from the documentation.

All operations concerning transport, installation, and commissioning as well as maintenance must be carried out by qualified, skilled personnel (IEC 60364 and CENELEC HD384 or VDE 0100 and IEC report 664 or VDE 0110 and national regulations for the prevention of accidents must be observed).

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

2. Application as directed

Drive controllers are components which are designed for installation in electrical systems or machinery.

When installing in machines, commissioning of the drive controllers (i.e. the starting of operation as directed) is prohibited until it is proven that the machine corresponds to the regulations of the EC Directive 98/37/EEC (Machinery Directive); EN 60204 (VDE 0113) must be observed.

Commissioning (i.e. starting of operation as directed) is only allowed when there is compliance with the EMC Directive (89/336/EEC).

The drive controllers meet the requirements of the Low Voltage Directive 73/23/EEC. The harmonized standards of the series Reihe EN 50178 (VDE 0160) together with EN 60439-1 (VDE 0660-500) and EN 60146 (VDE 0558) apply to the controllers

The technical data and information on the connection conditions must be obtained from the nameplate and the documentation and must be observed in all cases.

3. Transport, storage

Notes on transport, storage and appropriate handling must be observed.

The climatic conditions must be maintained as prescribed in EN 50178 (VDE 0160).

4. Erection

The devices must be erected and cooled according to the regulations of the corresponding documentation.

The drive controllers must be protected from inappropriate loads. Particularly during transport and handling, components must not be bent and/or isolating distances must not be changed. Touching of electronic components and contacts must be avoided.

Drive controllers contain electrostatically sensitive components which can easily be damaged by inappropriate handling. Electrical components must not be damaged or destroyed mechanically (health risks are possible!).

5. Electrical connection

When working on live drive controllers, the valid national regulations for the prevention of accidents (e.g. VBG 4) must be observed.

The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). More detailed information is included in the documentation.

Notes concerning the installation in compliance with EMC - such as screening, grounding, arrangement of filters and laying of cables - are included in the documentation of the drive controllers. These notes must also be observed in all cases for drive controllers with the CE mark. The compliance with the required limit values demanded by the EMC legislation is the responsibility of the manufacturer of the system or machine.

6. Operation

Systems where drive controllers are installed must be equipped, if necessary, with additional monitoring and protective devices according to the valid safety regulations, e.g. law on technical tools, regulations for the prevention of accidents, etc. Modifications of the drive controllers by the operating software are allowed.

After disconnecting the drive controllers from the supply voltage, live parts of the controller and power connections must not be touched immediately, because of possibly charged capacitors. For this, observe the corresponding labels on the drive controllers.

During operation, all covers and doors must be closed.

7. Maintenance and servicing

The manufacturer's documentation must be observed.

This safety information must be kept!
The product-specific safety and application notes in these Operating Instructions must also be observed!

2.2 Residual hazards

Protection of persons	• Before working on the controller, check that no voltage is applied to the power terminals and the relay output, – because the power terminals U, V, W and BR1 and BR2 remain live for at least 3 minutes after mains switch-off. – because the power terminals L1, L2, L3; U, V, W and BR1 and BR2 remain live when the motor is stopped. – because the relay outputs K11, K12, K14 remain live when the controller is separated from the mains. • If you use the function "Selection of the direction of rotation" via the digital signal NSET1-CW/CCW (C0007 = -0- ... -13-, C0410/3 ≠ 255): – The drive can reverse the direction of rotation in the event of a control-voltage failure or a cable break. • If you use the function "Flying-restart circuit" (C0142 = -2-, -3-) with machines with a low moment of inertia and a minimum friction: – The motor can start for a short time or reverse the direction of rotation for a short time after having enabled the controller when the motor is at standstill. • The heat sink of the controller has an operating temperature of >60 °C: – Direct skin contact results in burnings.
Controller protection	• All pluggable connection terminals must only be connected or disconnected when no voltage is applied! • **Cyclic** connection and disconnection of the controller supply voltage with L1, L2, L3 can exceed the input current limit: – Allow at least 3 minutes between disconnection and reconnection. • 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.
Overspeeds	• Drive can reach dangerous overspeeds (e.g. setting of inappropriately high field frequencies): – The controllers do not offer any protection against these operating conditions. For this, use additional components.

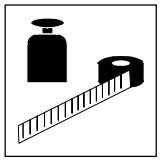
2.3 Layout of the safety information

All safety information given in these Operating Instructions has the same layout:

Signal word (characterises the severity of danger)

Note (describes the danger and informs how to avoid it)

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

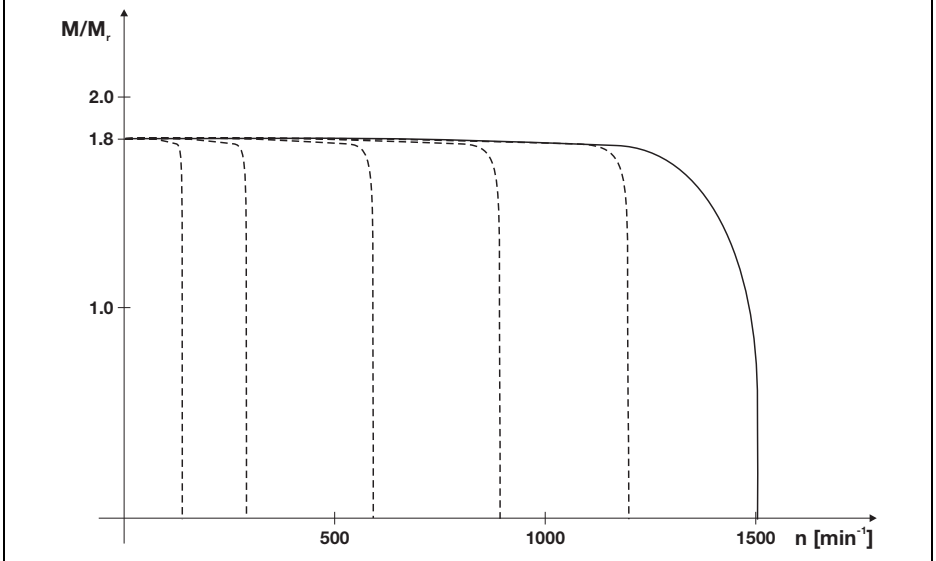


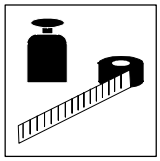
3 Technical data

3.1 General data / application conditions

Standards and application conditions			
Conformity	CE	Low-Voltage Directive (73/23/EEC)	
Approvals	UL 508 UL 508C	Industrial Control Equipment (in preparation) Power Conversion Equipment (in preparation)	
Vibration resistance	Acceleration resistant up to 2g (Germanischer Lloyd, general conditions)		
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)		
Degree of pollution	VDE 0110 part 2 pollution degree 2		
Packaging (DIN 4180)	Dust packaging		
Permissible temperature range	Transport	-25 °C...+70 °C	
	Storage	-25 °C...+60 °C	
	Operation	-10 °C...+40 °C +40 °C...+55 °C	Without power derating With power derating
Permissible installation height h	h ≤ 1000 m a.m.s.l. 1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l.		Without power derating With power derating
Power derating	Chopper frequency dependent derating:	📖 3-3 (rated data)	
	+40 °C < T_V ≤ +55 °C:	2.5 %/K (ref. to rated output current)	
	1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l.:	5 %/1000 m	
Mounting position	vertically hanging		
Free assembly space	above	100 mm	
	below	100 mm	
DC-group operation	possible, except E82EV251-2 and E82EV371-2		

General electrical data			
Noise emission	Requirements to EN 50081-1 Limit value class A to EN 55011 Limit value class B to EN 55022		
Noise immunity	Requirements to EN 61800-3		
	Requirements	**Standard**	**Severities**
	Running time	EN 61000-4-2	3, i.e. 8 kV with air discharge, 6 kV with contact discharge
	RF interference (enclosure)	EN 61000-4-3	3, i.e. 10 V/m; 27...1000 MHz
	Burst	EN 61000-4-4	3/4, i.e. 2 kV/5 kHz
	Surge (Surge on mains cable)	EN 61000-4-5	3, i. e. 1.2/50 µs, 1 kV phase-phase, 2 kV phase-PE
Insulation strength	Overvoltage category III to VDE 0110		
Discharge current to PE (to EN 50178)	> 3.5 mA		
Type of protection	IP20		
Protection measures against	Short circuit, earth fault, overvoltage, motor pull-out Motor overtemperature (input for PTC or thermal contact, I^2t monitoring)		
Insulation of control circuits	Safe mains disconnection:	Double basic insulation to EN 50178	

Open and closed loop control				
Control method		V/f-characteristic control (linear, square), vector control		
Chopper frequency		2 kHz, 4 kHz, 8 kHz, 16 kHz selectable		
Maximum torque		1.8 x M_r for 60 s, if rated motor power = rated inverter power		
Torque setting range		1 : 10 (3 ... 50 Hz, constant speed)		
Torque-speed characteristics				
Sensorless speed control		Min. output frequency	1.0 Hz (0 ... M_r)	
		Setting range	1 : 50	(ref. to 50 Hz)
		Accuracy	0.5 %	3 ... 50 Hz
		Smooth running	± 0.1 Hz	
Output frequency	Field		- 480 Hz ... + 480 Hz	
	Resolution	absolute	0.02 Hz	
		normalized	Parameter: 0.01 %, process data: 0.006 % (= 2^{14})	
	Digital setpoint selection	Accuracy	± 0.005 Hz (= ±100 ppm)	
	Analog setpoint selection	Linearity	± 0.5 %	Signal level: 5 V or 10 V
		Temperature sensitivity	+ 0.4 %	0 … 40 °C
		Offset	± 0 %	
Analog inputs/ outputs	with Standard-I/O	1 input, optionally bipolar 1 output		
	with Application-I/O	2 inputs, optionally bipolar 2 outputs		
Digital inputs/ outputs	with Standard-I/O	4 inputs, optionally 1 frequency input 0 ... 10 kHz; 1 input for controller inhibit 1 output		
	with Application-I/O	6 inputs, optionally 2 frequency inputs 0 ... 100 kHz; 1 input for controller inhibit 2 outputs, 1 frequency output 0 ... 10 kHz		
Cycle time	Digital inputs	1 ms		
	Digital outputs	4 ms		
	Analog inputs	2 ms		
	Analog outputs	4 ms (filter time: τ = 10 ms)		
Relay output		Changeover contact, AC 240 V/3 A, DC 24 V/2 A ... 200 V/0.18 A		
Operation in generator mode (internally monitored)		Brake transistor integrated external brake resistors: (📖 11-2)		



3.2 Rated data

3.2.1 Operation with 150 % overload (normal operation)

	Type	E82EV251_2B	E82EV371_2B	E82EV551_2B		E82EV751_2B		E82EV152_2B		E82EV222_2B	
Mains voltage	V_{mains} [V]	1/N/PE AC 100 V - 0 % ... 264 V + 0 % ; 48 Hz - 0 % … 62 Hz + 0 % 3/PE AC 100 V - 0 % ... 264 V + 0 % ; 48 Hz - 0 % … 62 Hz + 0 %									
alternative DC supply at $+U_{DC}$, $-U_{DC}$	V_{DC} [V]	not possible		DC 140 V - 0 % ... 360 V + 0 %							
Data for operation at 1/N/PE (3/PE) AC 240 V		1/N/PE	1/N/PE	1/N/PE	3/PE	1/N/PE	3/PE	1/N/PE	3/PE	1/N/PE 3)	3/PE
Rated mains current	I_{mains} [A]	3.4	5.0	6.0	3.9	9.0	5.2	15.0	9.1	18.0	12.4
Motor power (4pole ASM)	**P_r [kW]**	**0.25**	**0.37**	**0.55**		**0.75**		**1.5**		**2.2**	
	P_r [hp]	0.34	0.5	0.75		1.0		2.0		3.0	
Output power U, V, W	**S_{rated8} [kVA]**	**0.68**	**1.0**	**1.2**		**1.6**		**2.8**		**3.8**	
Output power $+U_{DC}$, $-U_{DC}$ 2)	P_{DC} [kW]	DC-group operation not possible		0.2		0		0.7		0	
Rated output current 2/4 kHz*	I_{r24} [A]	1.7	2.4	3.0		4.0		7.0		9.5	
Rated output current 8 kHz*	**I_{rated8} [A]**	**1.7**	**2.4**	**3.0**		**4.0**		**7.0**		**9.5**	
Rated output current 16 kHz*	Ir_{16} [A]	1.1	1.6	2.0		2.6		4.6		6.2	
Max. permissible output current for 60s 1) 2/4 kHz*	I_{max24} [A]	2.5	3.6	4.5		6.0		10.5		14.2	
Max. permissible output current for 60s 1) 8 kHz*	**I_{max8} [A]**	**2.5**	**3.6**	**4.5**		**6.0**		**10.5**		**14.2**	
Max. permissible output current for 60s 1) 16 kHz*	I_{max16} [A]	1.7	2.3	2.9		3.9		6.9		9.3	
Motor voltage	V_M [V]	0 ... 3 × V_{mains} / 0 Hz … 50 Hz, selectable up to 480 Hz									
Power loss (operation with I_{rated8})	P_{loss} [W]	30	40	50		60		100		130	
Weight	m [kg]	0.65	0.65	0.95		0.95		1.4		1.4	

	Type	E82EV551_4B		E82EV751_4B		E82EV152_4B		E82EV222_4B	
Mains voltage	V_{mains} [V]	3/PE AC 320 V - 0 % ... 550 V + 0 % ; 48 Hz - 0 % … 62 Hz + 0 %							
alternative DC supply at $+U_{DC}$, $-U_{DC}$	V_{DC} [V]	DC 450 V - 0 % ... 770 V + 0 %							
Data for operation at 3/PE AC		400 V	500 V	400 V	500 V	400 V	500 V	400 V	500 V
Rated mains current 4)	I_{mains} [A]	2.5	2.0	3.3	2.6	5.5	4.4	7.3	5.8
Motor power (4pole ASM)	**P_r [kW]**	**0.55**		**0.75**		**1.5**		**2.2**	
	P_r [hp]	0.75		1.0		2.0		3.0	
Output power U, V, W	**S_{rated8} [kVA]**	**1.3**		**1.7**		**2.7**		**3.9**	
Output power $+U_{DC}$, $-U_{DC}$ 2)	P_{DC} [kW]	0.2		0		1.5		0.8	
Rated output current 2/4 kHz*	I_{r24} [A]	1.8	1.4	2.4	1.9	3.9	3.1	5.6	4.5
Rated output current 8 kHz*	**I_{rated8} [A]**	**1.8**	**1.4**	**2.4**	**1.9**	**3.9**	**3.1**	**5.6**	**4.5**
Rated output current 16 kHz*	I_{r16} [A]	1.2	1.1 5)	1.6	1.4 5)	2.5	2.3	3.6	3.4
Max. permissible output current for 60s 1) 2/4 kHz*	I_{max24} [A]	2.7	2.7	3.6	3.6	5.9	5.9	8.4	8.4
Max. permissible output current for 60s 1) 8 kHz*	**I_{max8} [A]**	**2.7**	**2.7**	**3.6**	**3.6**	**5.9**	**5.9**	**8.4**	**8.4**
Max. permissible output current for 60s 1) 16 kHz*	I_{max16} [A]	1.8	1.6	2.4	2.2	3.9	3.5	5.6	5.0
Motor voltage	V_M [V]	0 ... 3 × V_{mains} / 0 Hz … 50 Hz, selectable up to 480 Hz							
Power loss (operation with I_{rated8})	P_{loss} [W]	50		60		100		130	
Weight	m [kg]	0.95		0.95		1.4		1.4	

Printed in bold = Data for operation at a chopper frequency of 8 kHz (Lenze setting)

1) Currents for periodic load changes with an overcurrent capacity of 1 min I_{maxx} and 2 min basic load capacity with 75% I_{ratedx}

2) When operating power-adapted motors this power can be additionally obtained from the DC bus

3) Operation only with assigned mains choke/mains filter

4) During operation with mains filter, the mains current is reduced by approx. 30 %

5) Max. permissible motor cable length: 10 m shielded

* Chopper frequency of the inverter

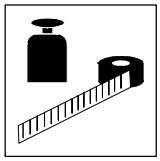
3.2.2 Operation with 120 % overload

- When regarding the here stated restrictions, the controller load can be increased in continuous operation. The overload capacity is reduced to 120 %
- Applications:
  – Pumps with square-law load characteristic
  – Fans
- Operation only allowed with
  – a mains voltage of 1/N/PE (3/PE) AC 240 V / 50 Hz/60 Hz or 3/PE AC 400 V / 50 Hz/60 Hz.
  – a chopper frequency of ≤ 4 kHz (C0018).

	Type	E82EV251_2B	E82EV371_2B	E82EV551_2B		E82EV751_2B 3)		E82EV152_2B		E82EV222_2B	
Mains voltage	V_{mains} [V]	1/N/PE AC 100 V - 0 % ... 264 V + 0 % ; 48 Hz - 0 % … 62 Hz + 0 % 3/PE AC 100 V - 0 % ... 264 V + 0 % ; 48 Hz - 0 % … 62 Hz + 0 %									
alternative DC supply at $+U_G$, $-U_G$	V_{DC} [V]	not possible		DC 140 V - 0 % ... 360 V + 0 %							
Data for operation at 1/N/PE (3/PE) AC 240 V		1/N/PE	1/N/PE	1/N/PE	3/PE	1/N/PE	3/PE	1/N/PE	3/PE	1/N/PE	3/PE
Rated mains current	I_{mains} [A]	4.1	Operation with 120 % overload not allowed	7.2	4.2	9.0	5.2	18.0	10.4	Operation with 120 % overload not allowed	
Motor power (4pole ASM)	P_r [kW]	0.37		0.75		1.1		2.2			
	P_r [hp]	0.5		1.0		1.5		3.0			
Output power U, V, W	S_{rated4} [kVA]	0.8		1.4		1.6		2.8			
Output power $+U_G$, $-U_G$ 2)	P_{DC} [kW]	DC-group operation not possible		0.75		0.75		2.2			
Rated output current 2/4 kHz*	I_{r24} [A]	2.0		3.6		4.8		8.4			
Max. permissible output current for 60s 1) 2/4 kHz*	I_{max24} [A]	2.5		4.5		6.0		10.5			
Motor voltage	V_M [V]	0 ... 3 × V_{mains} / 0 Hz … 50 Hz, optionally up to 480 Hz									
Power loss (operation with I_{ratedx})	P_{loss} [W]	30		50		60		100			130
Weight	m [kg]	0.65		0.95		0.95		1.4			1.4

	Type	E82EV551_4B	E82EV751_4B 3)	E82EV152_4B	E82EV222_4B 3)
Mains voltage	V_{mains} [V]	3/PE AC 320 V - 0 % ... 440 V + 0 % ; 48 Hz -0 % … 62 Hz + 0 %			
alternative DC supply at $+U_G$, $-U_G$	V_{DC} [V]	DC 450 V - 0 % ... 620 V + 0 %			
Data for operation at 3/PE AC		400 V	400 V	400 V	400 V
Rated mains current	I_{mains} [A]	2.2	2.9	Operation with 120 % overload not allowed	6.6
Motor power (4pole ASM)	P_r [kW]	0.75	1.5		3.0
	P_r [hp]	1.0	2.0		4.0
Output power U, V, W	S_{rated4} [kVA]	1.5	2.0		4.7
Output power $+U_G$, $-U_G$ 2)	P_{DC} [kW]	0.75	0.75		3.0
Rated output current 2/4 kHz*	I_{r24} [A]	2.2	2.9		6.7
Max. permissible output current for 60s 1) 2/4 kHz*	I_{max24} [A]	2.7	3.6		8.4
Motor voltage	V_M [V]	0 ... 3 × V_{mains} / 0 Hz … 50 Hz, optionally up to 480 Hz			
Power loss (operation with I_{ratedx})	P_{loss} [W]	50	60		130
Weight	m [kg]	0.95	0.95		1.4

1) Currents for periodic load changes with an overcurrent capacity of 1 min I_{maxx} and 2 min basic load capacity with 75% I_{ratedx}
2) When operating power-adapted motors this power can be additionally obtained from the DC bus
3) Operation only with assigned mains choke/mains filter
* Chopper frequency of the inverter



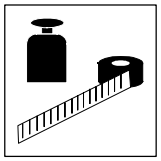
3.3 Fuses and cable cross sections

		L1, L2, L3, N, U, V, W, PE									
		Operation with 150 % overload					Operation with 120 % overload				
Type	Mains	Fuse		E.I.c.b.	Cable cross-section		Fuse		E.I.c.b.	Cable cross-section	
		VDE	UL	VDE	mm²	AWG	VDE	UL	VDE	mm²	AWG
E82EV251_2B	1/N/PE AC 240 V 2/PE AC 240 V	M6 A	5 A	B6 A	1	17	M6 A	5 A	B6 A	1	17
E82EV371_2B		M10 A	10 A	B10 A	1.5	15	-	-	-	-	-
E82EV551_2B		M10 A	10 A	B10 A	1.5	15	M10 A	10 A	B10 A	1.5	15
E82EV751_2B		M16 A	15 A	B16 A	2.5	14	M16 A	15 A	B16 A	2.5	14
E82EV152_2B		M20 A	20 A	B20 A	2 x 1.5	2 x 15	M20 A	20 A	B20 A	2 x 1.5	2 x 15
E82EV222_2B		M20 A	20 A	B20 A	2 x 1.5	2 x 15	-	-	-	-	-
E82EV551_2B	3/PE AC 240 V	M6 A	5 A	B6 A	1	17	M6 A	5 A	B6 A	1	17
E82EV751_2B		M10 A	10 A	B10 A	1.5	15	M10 A	10 A	B10 A	1.5	15
E82EV152_2B		M16 A	15 A	B16 A	2.5	14	M16 A	15 A	B16 A	2.5	14
E82EV222_2B		M16 A	15 A	B16 A	2.5	14	M16 A	15 A	B16 A	2.5	14
E82EV551_4B	3/PE AC 400 V	M6 A	5 A	B6 A	1	17	M6 A	5 A	B6 A	1	17
E82EV751_4B		M6 A	5 A	B6 A	1	17	M6 A	5 A	B6 A	1	17
E82EV152_4B		M10 A	10 A	B10 A	1.5	15	M10 A	10 A	B10 A	1.5	15
E82EV222_4B		M10 A	10 A	B10 A	1.5	15	M10 A	10 A	B10 A	1.5	15

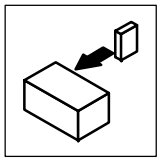
Observe national and regional regulations (e. g. VDE 0113, EN 60204)

For operation in UL approved systems:

- Use UL-approved fuses and fuse holders:
  – 500 V to 600 V in the mains input (AC, F1 ... F3).
  – Activation characteristic ”H” or ”K5”
- Only use UL-approved cables



Technical data



4 Installation

Stop!

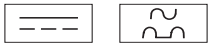
The controller contains electrostatically endangered components!

Prior to assembly and service operations, the personnel must be free of electrostatic charge.

4.1 Important notes

4.1.1 Protection of persons

4.1.1.1 Operators' safety with RCCBs

	Symbol of the RCCB		
			
RCCB types	AC sensitive residual current circuit breaker (RCCB, type AC)	pulse current sensitive (RCCB, type A)	all current sensitive (RCCB, type B)

Definition

In the following text "RCCB" is used for "residual current circuit breaker".

Protection of persons and animals

DIN VDE 0100 with residual current circuit breakers (RCCB):

- The controllers are equipped with a mains rectifier. If a short-circuit to frame occurs, a smooth DC residual current can block the activation of the DC sensitive or pulse-current sensitive RCCBs and thus destroy the protective function for all units connected.
- We therefore recommend:
  - "pulse current sensitive RCCB" in systems equipped with controllers on a single-phase AC mains (l1/N).
  - "universal-current sensitive RCCB" in systems equipped with controllers with three-phase mains connection (L1/L2/L3).

Note about the use of all-current sensitive RCCBs

- Universal-current sensitive RCCBs are described for the first time in the EN 50178. The EN 50178 has been harmonized and has been effective since October 1997. It replaces the national standard VDE 0160.
- All-current sensitive RCCB are also described in the IEC 755.

Rated residual current

- Use RCCBs with a rated fault current of
  - ≥ 30 mA: E82EV251_2B ... E82EV222_2B
  - ≥ 300 mA: all other types
- The RCCB may cause false tripping because of
  - capacitive leakage currents between the cable screens (especially with long screened motor cables),
  - simultaneous connection of several controllers to the mains,
  - use of additional RFI filters.

Installation

The RCCB must only be installed between mains supply and controller.

4.1.1.2 Other measures to protect persons

Potential isolation / protection against contact

The control inputs and outputs of all controllers are electrically isolated. Please observe the terminal description of the different controllers.

Pluggable terminal strips

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

Replace defective fuses

Replace defective fuses with the prescribed type only when no voltage is applied.

- 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 through a contactor on the input side.

4.1.2 Motor protection

- Further overload protection:
  – By overcurrent relays or temperature monitoring.
  – We recommend the use of PTC thermistors or thermostats with PTC characteristic for monitoring the motor temperature. (Lenze three-phase AC motors are equipped with thermostats as standard.)
  – PTCs or thermostats can be connected to the controller.
- Do only use motors with an isolation which is designed for inverter operation:
  – Insulation resistance: max. v = 1.5 kV, max. dv/dt = 5 kV/µs
  – Lenze-three-phase AC motors are designed for inverter operation.
  – When using a motor with an insulation which is not suitable for inverter operation, please contact your motor supplier.

4.1.3 Mains types/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 supplying mains. • by suitable equipment for detecting an earth fault and • the controller is directly disconnected from the mains	Safe operation cannot be guaranteed in the event of an earth fault at the inverter output.

4.1.4 Interactions with compensation equipment

- Controllers take up only very little fundamental reactive power from the supplying AC mains. 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 compensation equipment.

4.1.5 Specification of the cables used

- The cables used must comply with the required approvals of the application (eg. UL).
- Use low-capacity cables. Capacitance per unit length:
  – Core/core ≤ 75 pF/m
  – Core/screen ≤ 150 pF/m
- Max. permissible motor cable length without external measures:
  – screened: 50 m
  – unscreened: 100 m
- 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.
  – for the overlapping degree of the screen braid:
    At least 70% to 80% with an overlay angle of 90°.

4.2 Mechanical installation

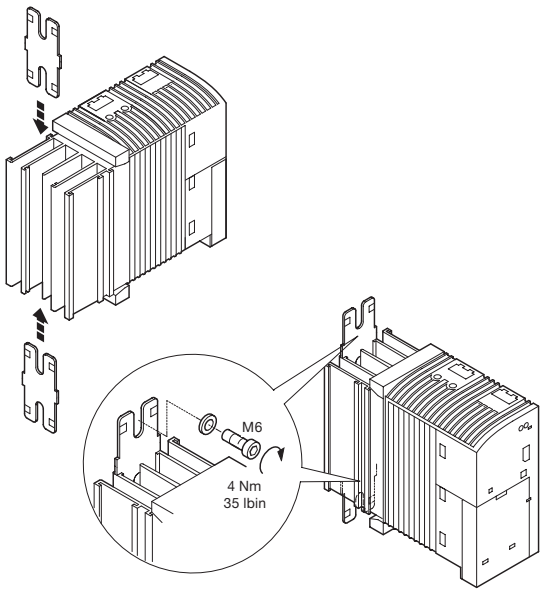
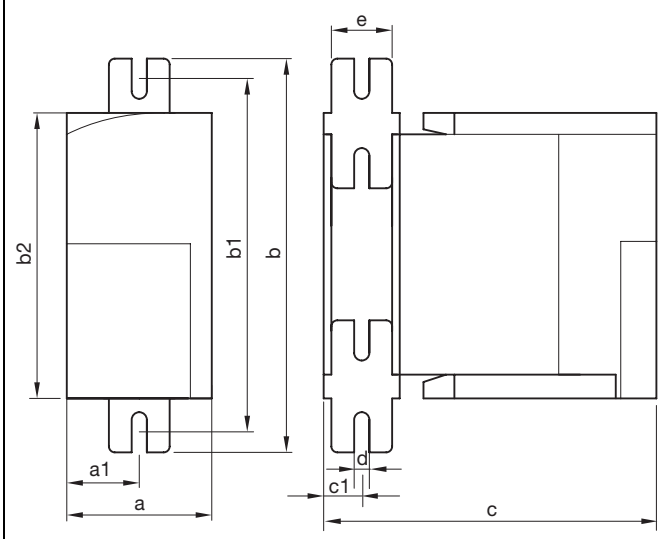
Fixing	Dimensions
	

Fig. 4-1 Mechanical installation

	a [mm]	**a1** [mm]	**b** [mm]	**b1** [mm]	**b2** [mm]	**c** [mm]	**c1** [mm]	**d** [mm]	**e** [mm]
E82EV251_2B **E82EV371_2B**	60	30	170	140 - 160	120	140	16	6.5	27.5
E82EV551_2B **E82EV751_2B**			230	200 - 220	180				
E82EV152_2B **E82EV222_2B**			290	260 - 280	240				
E82EV551_4B **E82EV751_4B**			230	200 - 220	180				
E82EV152_4B **E82EV222_4B**			290	260 - 280	240				

4.3 Electrical installation

4.3.1 Wiring of terminal strips

Stop!

- Wire the terminal strips before connecting them!
- Connect or disconnect the terminal strips only when the controller is enabled!
- Do also connect terminal strips that are not used to protect the connections.

It is as simple as shown here:

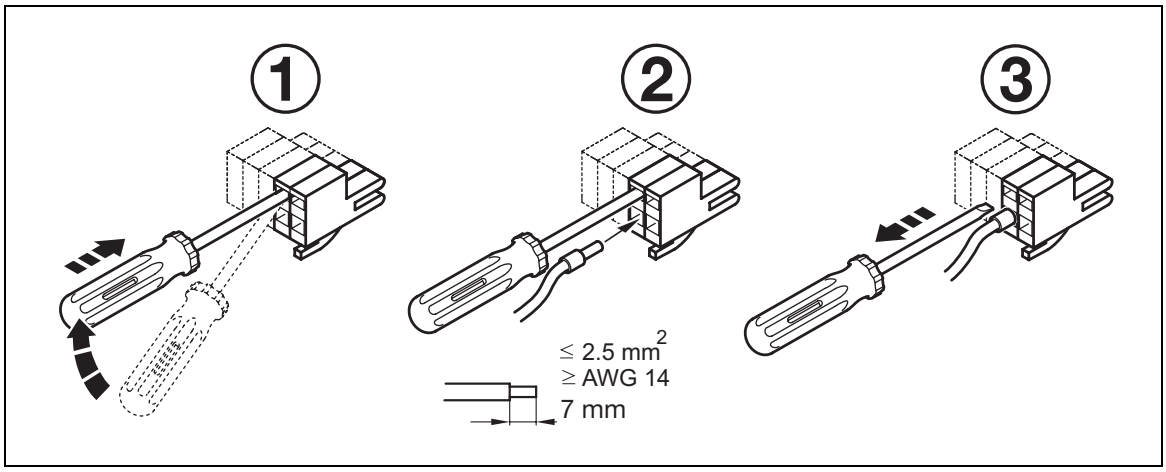


Fig. 4-2 Wiring of the terminal strips

4.3.2 Power connections

Stop!

Controller type E82EVxxx_**2B** must only be connected to a 240 V mains!

Higher mains voltages damage the controller!

4.3.2.1 Mains connection 240 V controller

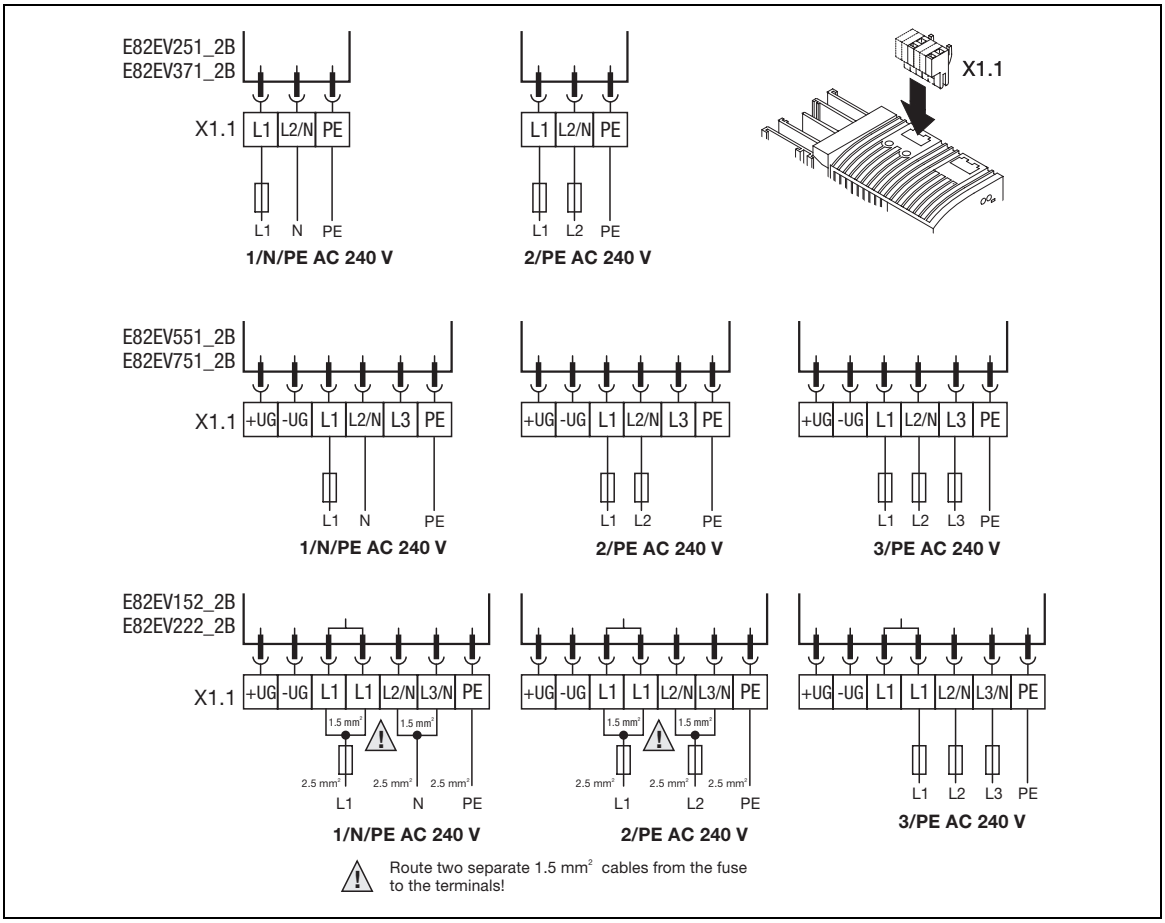


Fig. 4-3 Mains connection 240 V controller

+UG, -UG DC supply

4.3.2.2 Mains connection 400 V controller

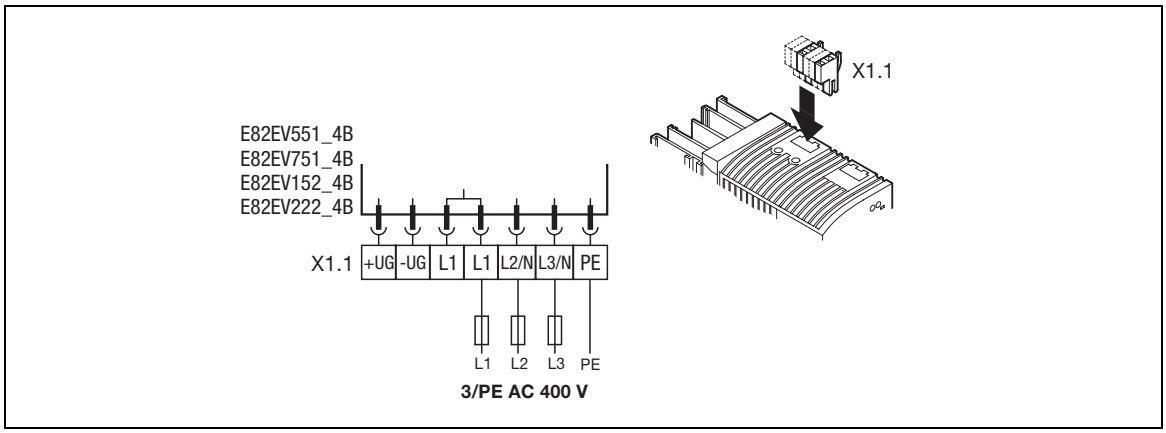


Fig. 4-4 Mains connection 400 V controller

+UG, -UG DC supply

4.3.2.3 Connection of motor/external brake resistor

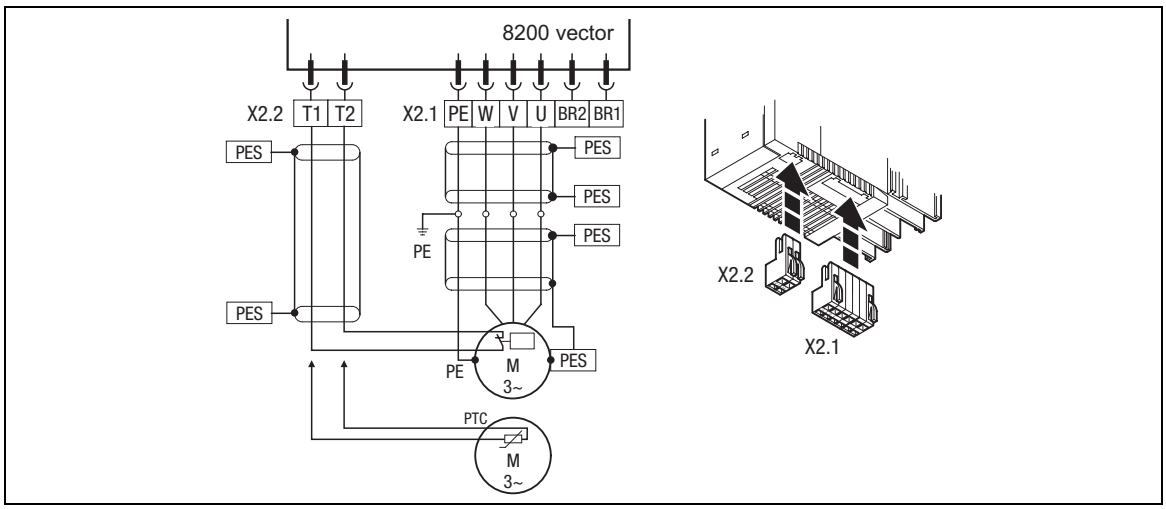


Fig. 4-5 Motor connection

BR1, BR2 External brake resistor
T1, T2 Motor temperature monitoring (PTC thermistor or thermostat)

Note!

The shorter the motor cables, the better the drive behaviour.

4.3.3 Installation according to EMC requirements

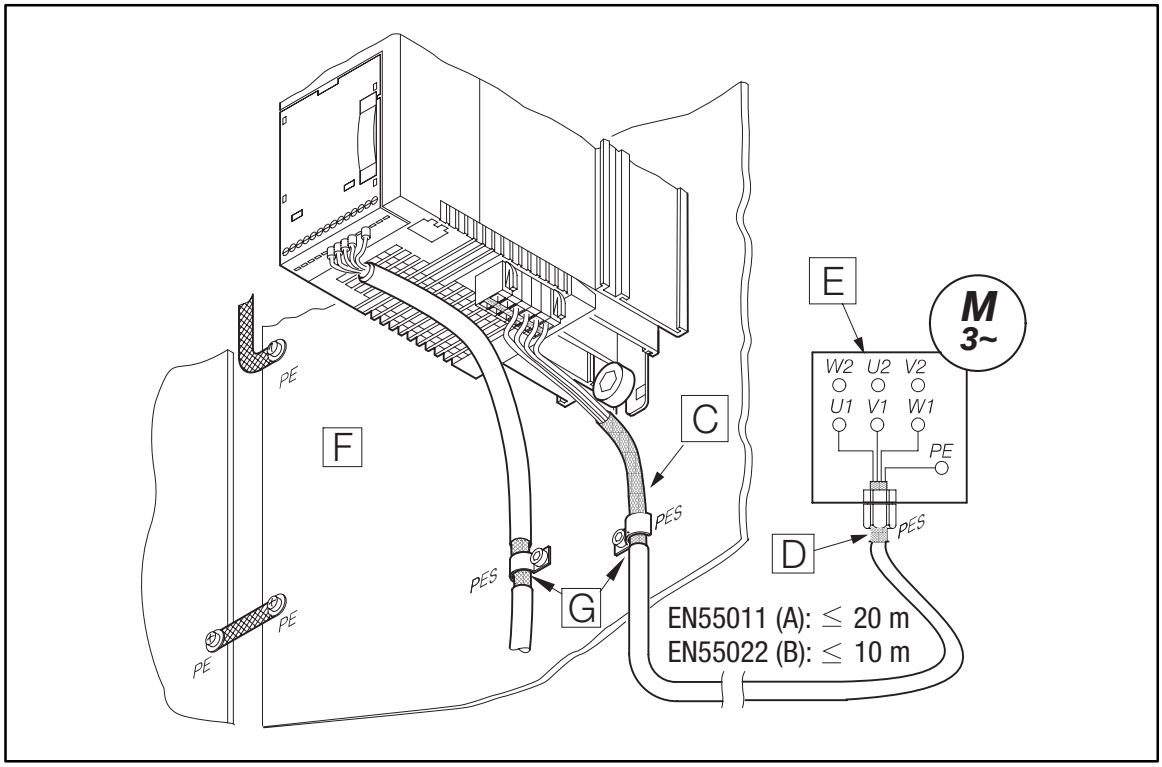


Fig. 4-6 Installation according to EMC requirements

Separate the control and mains cables from the motor cable!

Use low-capacity cables. Capacitance per unit length:

C
- Core/core ≤ 75 pF/m
- Core/screen ≤ 150 pF/m

D EMC-cable gland

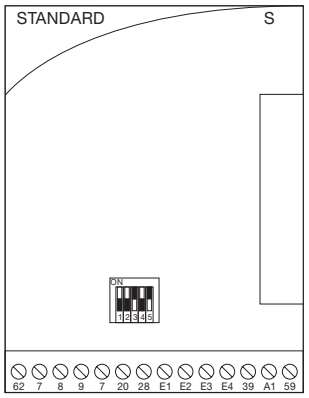
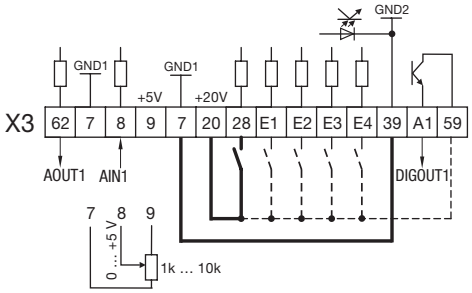
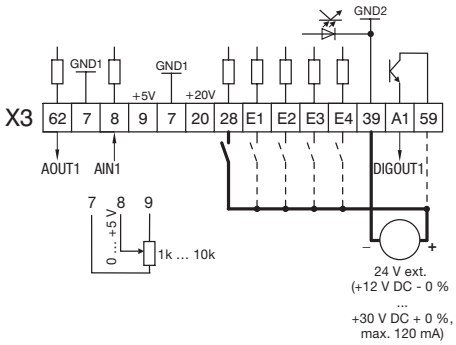
I Motor connection according to nameplate

F Mounting board with electrically conductive surface

G Connect the cable screen to PE with a surface as large as possible. Use the enclosed fixing brackets.

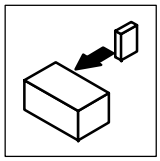
4.3.4 Control connections

4.3.4.1 Terminal assignment, standard-I/O (X3)

	Supply via internal voltage source X3/20 (+20 V DC, max. 40 mA)	Supply via external voltage source + 24 V DC (+12 V DC - 0 % ... +30 V DC + 0 %, max. 120 mA)
		
	Min. wiring requirements for operation	

X3/	Signal type	Function (Printed in bold = **Lenze setting**)	Level			Technical data
8	Analog input	Act. value or setpoint input Change range uing the DIP switch and C0034	0 ... +5 V **0 ... +10 V** -10 V ... +10 V 0 ... +20 mA +4 ... +20 mA +4 ... +20 mA (open-circuit monitored)			Resolution: 10 bit Linearity fault: ±0.5 % Temperature fault: 0.3 % (0 ... +60°C) Input resistance • Voltage signal: > 50 kΩ • Current signal: 250 Ω
62	Analog output	**Output frequency**	0 ... +10V			Resolution: 10 bit Linearity fault: ±0.5 % Temperature fault: 0.3 % (0 ... +60°C) Load capacity: max. 2 mA
28	Digital inputs	Controller inhibit (CINH)	1 = START			Input resistance: 3.3 kΩ 1 = HIGH (+12 ... +30 V) 0 = LOW (0 ... +3 V) (PLC level, HTL)
E1[1]		**Activation of JOG frequencies** **JOG1 = 20 Hz** **JOG2 = 30 Hz** **JOG3 = 40 Hz**		E1	E2	
E2			JOG1	1	0	
			JOG2	0	1	
			JOG3	1	1	
E3		**DC injection brake (DCB)**	1 = DCB active			
E4		**Change of direction of rotation** **CW/CCW rotation**		E4		
			CW	0		
			CCW	1		
A1	Digital output	**Ready for operation**	0/+20 V at DC internal 0/+24 V at DC external			Load capacity: 10 mA 50 mA
9	-	Internal, stabilized Dc voltage source for setpoint potentiometer	+5.2 V (ref.: X3/7)			Load capacity: max. 10 mA
20	-	Internal DC voltage source to control digital inputs and outputs	+20 V (ref.: X3/7)			Load capacity: max. 40 mA (Sum of all output currents!)
59	-	DC supply for A1	+20 V (internal, bridge to X3/20)			
			+24 V (external)			
7	-	GND1, reference potential for analog signals	-			isolated to GND2
39	-	GND2, reference potential for digital signals	-			isolated to GND1

[1] or frequency input 0 ... 10 kHz, configuration via C0425

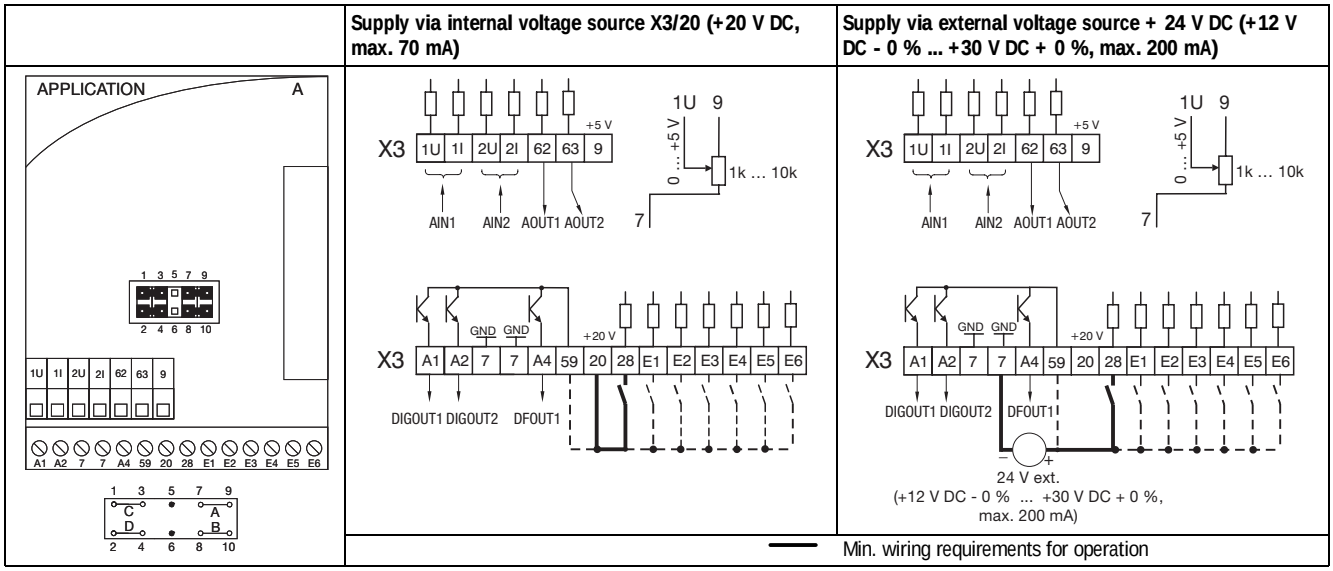


Signal at X3/8	Switch position					C0034
	1	2	3	4	5	
0 ... 5 V	OFF	OFF	ON	OFF	OFF	0
0 ... 10 V (Lenze setting)	**OFF**	**OFF**	**ON**	**OFF**	**ON**	**0**
0 ... 20 mA	OFF	OFF	ON	ON	OFF	0
4 ... 20 mA	OFF	OFF	ON	ON	OFF	1
4 ... 20 mA Open-circuit monitoring	OFF	OFF	ON	ON	OFF	3
-10 V ... +10 V	ON	ON	OFF	OFF	OFF	2

Note!

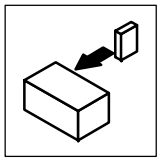
- DIP-switch and C0034 must be set to the same range, otherwise the controller will not be able to correctly read the analog signal at X3/8.
- If a setpoint potentiometer is internally supplied via X3/9, the DIP switch must be set to a voltage range of 0 ... 5 V. Otherwise, it is not possible to use the whole speed range.

4.3.4.2 Terminal assignment, application-I/O (X3)



X3/	Signal type	Function (Printed in bold = **Lenze setting**)	Level			Technical data
1U/2U	Analog inputs	Actual value or setpoint inputs (master voltage) Change range using the jumper and C0034	0 ... +5 V **0 ... +10 V** -10 V ... +10 V			Resolution: 10 bit Linearity fault: ±0.5 % Temperature fault: 0.3 % (0 ... +60°C) Input resistance • Voltage signal: > 50 kΩ • Current signal: 250 Ω
1I/2I		Actual value or setpoint inputs (master current) Change range using the jumper and C0034	0 ... +20 mA +4 ... +20 mA +4 ... +20 mA (open-circuit monitored)			
62	Analog outputs	**Output frequency**	**0 ... +10V** 0 ... +20 mA			Resolution: 10 bit Linearity fault: ±0.5 % Temperature fault: 0.3 % (0 ... +60°C) Load capacity (0 ... +10 V): max. 2 mA CW_{CCW} (0 ... 20 mA) ≤ 500 Ω
63		**Motor current**				
28	Digital inputs	Controller inhibit (CINH)	1 = START			Input resistance: 3 kΩ 1 = HIGH (+12 ... +30 V) 0 = LOW (0 ... +3 V) (PLC level, HTL)
E1[1)]		**Activation of JOG frequencies** **JOG1 = 20 Hz** **JOG2 = 30 Hz** **JOG3 = 40 Hz**		E1	E2	
E2[1)]			JOG1	1	0	
			JOG2	0	1	
			JOG3	1	1	
E3		**DC injection brake (DCB)**	1 = DCB			
E4		**Change of direction of rotation** **CW/CCW rotation**		E4		
			CW	0		
			CCW	1		
E5		**not preconfigured**	-			
E6		**not preconfigured**	**-**			
A1	Digital outputs	**Ready for operation**	0/+20 V at DC internal 0/+24 V at DC external			Load capacity: 10 mA 50 mA
A2		**not preconfigured**				
A4	Frequency output	**DC-bus voltage**	HIGH: +18 V ... +24 V (HTL) LOW: 0 V			0 ...10 kHz Load capacity: max. 5 mA
9	-	Internal, stabilized Dc voltage source for setpoint potentiometer	+5.2 V (ref.: X3/7)			Load capacity: max. 10 mA
20	-	Internal DC voltage source to control digital inputs and outputs	+20 V (ref.: X3/7)			Load capacity: max. 70 mA (Sum of all output currents!)
59	-	DC supply for A1	+20 V (internal, bridge to X3/20)			-
			+24 V (external)			
7	-	GND1, reference potential for analog signals	-			isolated to GND2

[1)] or frequency input 0 ... 100 kHz, single or two track, configuration via C0425



Signal	AINx	X3/	Jumper A	Jumper B	C0034
0 ... 5 V	1 2	1U 2U	remove	remove	
0 ... 10 V (Lenze setting)	1 2	1U 2U	**7 - 9**	**8 - 10**	
-10 V ... +10 V	1 2	1U 2U	7 - 9	8 - 10	
0 ... 20 mA	1 2	1I 2I			📖 7-20
4 ... 20 mA	1 2	1I 2I			
4 ... 20 mA Open-circuit monitoring	1 2	1I 2I			

Signal	AOUTx	X3/	Jumper C	Jumper D	
0 ... 10 V (Lenze setting)	1 2	62 63	**1 - 3**	**2 - 4**	
0 ... 20 mA	1 2	62 63	3 - 5	4 - 6	

Note!

- Jumper and C0034 for each analog input must be set to the same range, otherwise the controller will not be able to detect the analog input signals at AIN1 and AIN2 correctly.
- If a setpoint potentiometer is internally supplied via X3/9, the jumper must be set to a voltage range of 0 ... 5 V. Otherwise, it is not possible to use the whole speed range.

4.3.5 Relay output connection

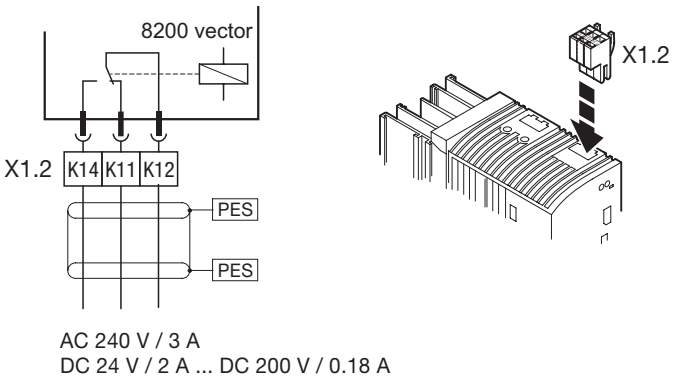


Fig. 4-7 Relay output connection K1

PES HF-screen end by PE connection through screen bracket.

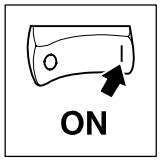
X1.2/	Signal type	Function (Printed in bold = **Lenze setting**)	Relay setting switched	Technical data
K11	Relay output	Relay output normally-closed contact **TRIP**	opened	AC 240 V/3 A DC 24 V/2 A ... DC 200 V/0.18 A single basic isolation
K12		Relay mid-position contact		
K14		Relay output normally-open contact **TRIP**	closed	

Danger!

- The terminals and the relay output have a single basic isolation (single insulating distance).
- Protection against contact in the event of fault can only be ensured by additional measures.

Note!

Relay output configuration: (📖 7-43)



5 Commissioning

5.1 Before switching on

Note!

- The controller is factory-set to drive the following four-pole standard asynchronous motors:
  – 230/400 V, 50 Hz
  – 280/480 V, 60 Hz
  – 400 V, 50 Hz
- Keep to the switch-on sequence. (📖 5-5)
- In the event of faults or errors during commissioning, see chapter ”Trouble shooting and fault elimination”: (📖 8-1)

5.1.1 Check ...

... before connecting the controller to the voltage supply

- Check the wiring for completeness, short circuit and earth fault
- Without function module (as delivered):
  – Check whether the cover is mounted properly.
- With the internal voltage source X3/20 of the standard-I/O:
  – Are the terminals X3/7 and X3/39 bridged?

... the setting of the main drive parameters before enabling the controller

- Is the V/F-rated frequency adapted to the motor connection? (📖 7-4)
- Is the configuration of the analog inputs and outputs adapted to the wiring? (📖 7-35)
- Is the configuration of the digital inputs and outputs adapted to wiring? (📖 7-41)
- Are the drive parameters relevant for your application set correctly?

If necessary, adapt them using the PC or keypad. (📖 6-1 ff)

5.1.2 The user menu - The most important drive parameters for a fast set-up

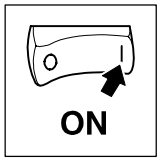
The user menu lists all parameters required for a standard application with linear V/f-characteristic control. The user menu is active after mains switching.

Note!

- Use C0002 "Parameter set transfer" to easily transfer configurations from one controller to the other or to reset the controller to Lenze settings.
- Detailed information on the user menu: (📖 7-54)

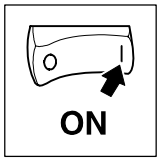
How to change parameters in the user menu

Action		Keys	Result	Note	Example	
1.	Plug-in the keypad		Disp *XX.XX* Hz	The function Disp is activated. The first code in the user menu is displayed (C0517/1, Lenze setting: C0050 = output frequency).		
2.	Inhibit controller	STOP	RDY IMP	Only necessary if you want to transfer parameter sets (C0002).		
3.	Set parameters	← →	Code			Reduce C0012 (acceleration time) from 5.00 s to 1.00 s.
4.		↑	*XXXX*	Select code	*0012*	
5.		→	SubCode *001*	For codes without subcodes: Jump immediately to Para		
6.		↓ ↑	*XXX*	Select subcode		
7.		→	Para		*5.00* s	
8.		↓ ↑	*XXXXX*	Set parameters	*1.00* s	
9.	Set parameters	ENTER	*STOrE*	Acknowledge entry if → blinking		
		←		Acknowledge entry if → not blinking; ENTER is not active		
10.				Start "loop" again at 3. for further parameter setting		



Lenze settings in the user menu:

Drive parameters		Code	Lenze setting						Detailed description
Display values									
Output frequency		C0050		Only display					
Analog input signals									
Setpoint selection range									🕮 7-20
with function module standard-I/O		C0034	-0-	0 ... +5 V / 0 ... +10 V / 0 ... +20 mA			Analog input 1 (X3/8)		
with function module, application-I/O		C0034/1	-0-	0 ... +5 V / 0 ... +10 V			Analog input 1 (X3/1U)		
		C0034/2	-0-	0 ... +5 V / 0 ... +10 V			Analog input 2 (X3/2U)		
Digital input signals									
Fixed configuration - digital input signals (Determines, which functions of the controller can be activated via the digital inputs)		C0007	-0-	E4	E3	E2	E1		🕮 7-41
				CW/CCW	DCB	JOG2/3	JOG1/3		
				CW/CCW rotation	DC-injection brake	LOW	HIGH	JOG1 (20 Hz)	
						HIGH	LOW	JOG2 (30 Hz)	
						HIGH	HIGH	JOG3 (40 Hz)	
						JOG frequencies			
Machine data									
Speed range	Min. output frequency	C0010	0.00 Hz						🕮 7-13
	max. output frequency	C0011	50.00 Hz						
Acceleration and deceleration times	Acceleration time	C0012	5.00 s						🕮 7-15
	Deceleration time	C0013	5.00 s						
Drive performance									
Current, torque, power performance	V/f rated frequency	C0015	50.00 Hz						🕮 7-4
	V_{min} boost	C0016	0.00 %						
Parameter set transfer									
		C0002	-0-	Function executed					🕮 7-52
Overwrite the selected parameter set of the controller with the default setting.				-1-	Lenze setting ⇨ PAR1				
				-2-	Lenze setting ⇨ PAR2				
				-3-	Lenze setting ⇨ PAR3				
				-4-	Lenze setting ⇨ PAR4				
Overwrite all parameter sets of the controller with the keypad data				-10-	Keypad ⇨ PAR1 ... PAR4				
Overwrite a single parameter set with the keypad data.				-11-	Keypad ⇨ PAR1				
				-12-	Keypad ⇨ PAR2				
				-13-	Keypad ⇨ PAR3				
				-14-	Keypad ⇨ PAR4				
Copy all parameter sets of the controller to the keypad.				-20-	PAR1 ... PAR4 ⇨ Keypad				
Extended parameter set transfer				-31- ... -80-					🕮 7-52



5.1.3 The menu ”ALL” - access to all drive parameters

The menu ”ALL” lists **all** drive parameters. They can be used to optimize the drive performance or to set the parameters for special applications.

Note!

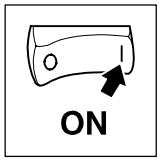
The code table is in the same order as the menu ”ALL”. (📖 14-9)

How to change parameters in the menu ”ALL”:

Action		Keys	Result	Note	Example	
1.	Plug-in the keypad		Disp *XX.XX* Hz	The function Disp is activated. The first code in the user menu is displayed (C0517/1, Lenze setting: C0050 = output frequency).		
2.	Change to the menu ”ALL”	❶↔❷	❷	Change to function bar 2		
3.		⬅➡	Menu			
4.		▼▲	*ALL*	Select menu ”ALL” (list of all codes)		
5.		❶↔❷	❶	Acknowledge selection and change to function bar 1		
6.	Inhibit controller	STOP	RDY IMP	Only required if you want to change C0002, C0148, C0174 and/or C0469		C0412, assign 3 to subcode 3.
7.	Set parameters	⬅➡	Code			
8.		▼▲	*XXXX*	Select code	*0412*	
9.		➡	SubCode *001*	For codes without subcodes: Jump automatically to Para.		
10.		▼▲	*XXX*	Select subcode	*003*	
11.		➡	Para			
12.		▼▲	*XXXXX*	Set parameters	*3*	
13.		ENTER	*STOrE*	Acknowledge entry if ➔ is displayed		
		⬅		Acknowledge entry if ➔ is not displayed. ENTER is not active		
14.				Start ”loop” again at 7. for further parameter setting		

Important Lenze settings in the menu ”ALL”

Drive parameters		Code	Lenze setting		Description
Analog / digital input signals					
Free configuration of analog input signals		C0412			📖 7-35
		C0412/1	-1-	Source setpoint 1 (NSET1-N1): X3/8 or X3/1U or X3/1I	
		C0412/2	-1-	Source setpoint 2 (NSET1-N2): X3/8 or X3/1U or X3/1I	
Machine data					
Current limit values	Motor mode	C0022	150 %		📖 7-14
	Generator mode	C0023	150 %		
Drive performance					
Current Torque Power characteristic	Control mode	C0014	-2-	Linear V/f-characteristic V ~ f with constant V_{min} boost	📖 7-2
	Slip compensation	C0021	0.0 %		📖 7-6



5.2 Commissioning without function module

Note!

- The controller can only be used when the FIF cover is mounted!
  - If the FIF cover is missing, the green LED is blinking (keypad: RDY IMP). The controller is inhibited.
  - The FIF is mounted when the controller is delivered. It is under the blind cap (see front flip-out page).
- Since the controller does not provide any control terminals when the function module is not attached, starting and stopping during operation is possible by switching the mains.
  - For cyclic switching: Observe break times of 3 minutes!
- The function Set stores the setpoint at the time when operation is interrupted by switching the mains or mains failures. The drive restarts automatically as soon as the mains connection is built up again.
- If the drive does not start in step 3. (IMP is not off), RUN is to be pressed to enable the controller.

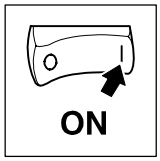
Step			Drive reaction
1. Attach the keypad to the AIF interface (📖 6-2)			
2. Switch on the main.	The controller is ready for operation after approx. 1 second.		The green LED is on. Keypad: RDY IMP
3. Select the setpoint via the function Set .	Set Activate	Disp ⬅ Set	
	CW rotation	▲	IMP is off The drive is now running. The output frequency is displayed.
	CCW rotation	▼	
4. If necessary, optimize the drive performance.	📖 7-1 ff.		

5.3 Commissioning with function module standard-I/O

Note!

- Commissioning of the drive with Lenze settings is possible without keypad, if step 6. is not required.
- If the configuration deviates from the Lenze settings, read the instrucion under ”with individual settings”
- Ensure
  – that the setpoint range is set correctly using the Dip switch at the function module.
  – that C0034 matches the setting of the Dip switch.
  – Example: Setpoint selection (0 ... 5 V) via potentiometer at X3/7, X3/8 and X3/9
  ⇨ C0034 = 0, Dip switch 1 = OFF, 2 = OFF, 3 = ON, 4 = OFF, 5 = OFF
- The controller is only ready for operation if a HIGh signal is applied to X3/28 (controller enable via terminal).
  – Please observe, that the controller can be inhibited through various sources. The sources have the same effect as a line connection of switches.
  – If the controller does not start after having enabled it via X3/28, check whether it is inhibited via another source. (📖 7-12) .

Step	with Lenze setting					Individual setting	Drive reaction
1. Attach the keypad to the AIF interface. (📖 6-2)							
2. Switch on the main.	The controller is ready for operation after approx. 1 second. The controller inhibit is active.						The green LEd is blinking. Keypad: RDY IMP
3. Control of digital inputs		E4	E3	E2	E1	• Use C0410 to adapt the digital inputs to your application . • Digital input must be controlled so that the drive can restart via terminal after controller enable.	
	CW rotation	LOW	LOW	LOW	LOW		
	CCW rotation	HIGH					
4. Select the setpoint.	Apply a voltage of 0 ... +10 V to X3/8.					• Depending on the position of the Dip switch at the module: – Apply voltage or current to X3/8. – Check C0034. • Further possibilities for setpoint selection: (📖 7-19)	
5. Enable the controller via terminal.	X3/28 = HIGH (+12 ... +30 V)						The green LED is on. IMP is off The drive is now running.
6. If necessary, optimize the drive behaviour.	📖 7-1 ff.						



5.4 Commissioning with function module application-I/O

Note!

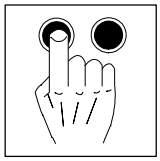
- Commissioning of the drive with Lenze settings is possible without keypad, if step 6. is not required.
- If the configuration deviates from the Lenze settings, read the instrucion under ”with individual settings”
- Ensure
  – that the setpoint range is set correctly using the jumpers A and B at the function module
  – that C0034 matches the jumper setting.
  – Example: Bipolar setpoint selection (-10 V ... +10 V) via X3/1U
  ⇨ C0034/1 = 1, jumper A in position “7 - 9“
- The controller is only ready for operation if a HIGh signal is applied to X3/28 (controller enable via terminal).
  – Please observe, that the controller can be inhibited through various sources. The sources have the same effect as a line connection of switches.
  – If the controller does not start after having enabled it via X3/28, check whether it is inhibited via another source. (📖 7-12) .

Step	with Lenze setting					Individual setting	Drive reaction
1. Attach the keypad to the AIF interface. (📖 6-2)							
2. Switch on the main.	The controller is ready for operation after approx. 1 second. The controller inhibit is active.						The green LEd is blinking. Keypad: RDY IMP
3. Control of digital inputs		E4	E3	E2	E1	• Use C0410 to adapt the digital inputs to your application . • Digital input must be controlled so that the drive can restart via terminal after controller enable.	
	CW rotation	LOW	LOW	LOW	LOW		
	CCW rotation	HIGH					
4. Select the setpoint.	Apply a voltage of 0 ... +10 V to X3/8.					• Depending on the jumper position at the module: – Apply a current to X3/1I or X3/2I – or a voltage to X3/1U or X3/2U – Check C0034. • Further possibilities for setpoint selection: (📖 7-19)	
5. Enable the controller via terminal.	X3/28 = HIGH (+12 ... +30 V)						The green LED is on. IMP is off The drive is now running.
6. If necessary, optimize the drive behaviour.	📖 7-1 ff.						

5.5 Commissioning using the bus function modules

The commissioning steps are described in:

Combination controller + function module	Description
System bus (CAN)	🕮 9-1 ff.
PROFIBUS-DP	See Operating Instructions for the bus function modules
INTERBUS	
LECOM-B (RS485)	



6 Parameter setting

6.1 General

- The controller can be adapted to your application by setting parameters. The functions are described in detail in the function library. (📖 7-1 ff.)
- The possible function settings are organized in codes:
  – Codes have numbers and start with a ”C”.
  – The code table gives a fast survey over all codes. The codes are listed in an ascending order. (📖 14-9)
  – Each code contains parameters which can be used to adjust and optimize the drive.
  – For easier parameter setting, some codes have subcodes which contain the parameters (example: C0410).
- The parameters are set via a communication module - keypad/LECOM-A (RS232) - or a fieldbus function module, which can be supplied as accessory

Note!

- The signal flow charts give a survey over all configurable signals. (📖 14-1)
- In case you lose the ”red thread”, load the Lenze setting under C002 and start again from the beginning.

6.2 Parameter setting with the communication modules

With the communication module it is possible

- to set the parameters for your controller
- to control your controller (e.g. inhibit and enable)
- to select setpoints
- to display operating data
- to transfer parameter sets to other controllers

Note!

The communication module can be inserted or removed and parameters can be set during operation.

6.2.1 Parameter setting with the keypad

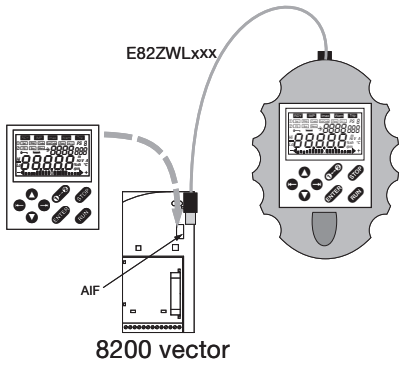
The parameters for the controller are set using the keypad.

Without hand terminal, the keypad can be directly attached to the AIF interface. With a hand terminal, it can be connected to the AIF interface with cables of different lengths.

6.2.1.1 General data/application conditions

Insulation voltage to PE	50 V AC
Type of protection	IP55
Ambient temperature	During operation: -10 ... +60 °C During transport: -25 ... +60 °C During storage: -25 ... +60 °C
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)
Dimensions (L x W x H)	75 mm x 62 mm x 23 mm

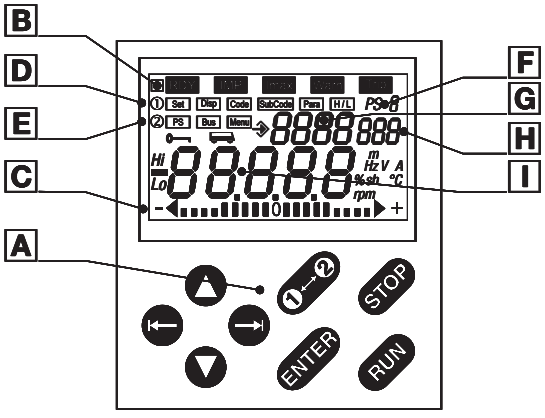
6.2.1.2 Installation/commissioning

With hand terminal	**Without hand terminal**	**Principle**
1. If necessary, plug the keypad into the hand terminal and tighten the screws. 2. Use the connection cable to connect the hand terminal with the AIF interface.	1. Attach the keypad to the AIF interface.	
The communication module is ready for operation when the mains voltage is switched on. It is now possible to communicate with the drive.		

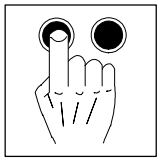
Note!

- The keypad is screwed to the backside of the hand terminal (remove rubber protection).
- The keypad can be mounted to a control cabinet wall with the assembly kit (door) (cut-out 45.3 x 45.3 mm).

6.2.1.3 Displays and functions



A	Function keys	
B	Status display	
C	Bar-graph display	
D	Function bar 1	
E	Function bar 2	
F	Active parameter set for change	The value can be changed when it is blinking.
G	Code number	
H	Subcode number	
I	Parameter value with unit	



A	**Function keys**		
	Key	**Function**	**Explanation**
	RUN	Enable controller	X3/28 must be on HIGH level.
	STOP	Inhibit the controller (CINH) or set quick stop (QSP)	Configuration in C0469.
	①↔②	Change between function bar 1 ↔ function bar 2	
	→←	To right/left on the active function bar.	The current function is outlined.
	▲▼	Increase/decrease value. Fast change: Press key	Only blinking values can be changed.
	ENTER	Save parameters if → is blinking. Acknowledgement by *STOrE* in the display.	
B	**Status display** (Description of the fault messages: (📖 8-1 ff)		
	Display	**Meaning**	**Explanation**
	RDY	Ready for operation	
	IMP	Pulse inhibit	Power outputs inhibited
	Imax	Set current limit exceeded	C0022 (motor mode) or C0023 (generator mode)
	Warn	Warning active	
	Trip	Fault active	
C	**Bar-graph display**		
		Value set under C0004 in %. (Lenze setting: load C0056).	Display range: - 180 % ... + 180 % (every bar = 20 %)
D	**Function bar 1**		
	Function	**Meaning**	**Explanation**
	Set	Setpoint selection via ▼▲	Not possible with active password protection (display = *"LOC"*)
	Disp	Display function: • Display of user menu, memory loaction 1 (C0517/1) • Display of active parameter set	Active after every main connection
	Code	Select codes	4 digit display of the active code number G
	SubCode	Select subcodes	3 digit display of the active subcode number H
	Para	Change the parameter value of a (sub) code	5 digit display of the actual value I
	H / L	Disply of values with more than 5 digits	
		H: high value digits	Display *"HI"*
		L: low value digits	Display *"LO"*
E	**Function bar 2**		
	Function	**Meaning**	**Explanation**
	PS	Select parameter set 1 ... parameter set 4 for a change	• Display e.g. PS *2* (F) • The parameter sets can only be activated through digital signals configuration under C0410).
	Bus	Select participants of the system bus (CAN)	The participants selected can be parameterized via the actual drive. 🚗 = function active
	Menu	Select menu **The user menu is active after mains switching. If necessary, change to** *ALL*	*uSEr* List of the codes in the user menu (C0517) *ALL* List of all codes *FunCI* Only specific codes for the function modules INTERBUS, PROFIBUS-DP and LECOM-B

6.2.1.4 How to change and store parameters with the keypad

Note!

The user menu is active after mains switching. Change to the menu *ALL*

Action		Keys	Result	Note	Example	
1.	Plug-in the keypad		Disp *XX.XX* Hz	The function Disp is activated. The first code in the user menu is displayed (C0517/1, Lenze setting: C0050 = output frequency).		
2.	Change to the menu "ALL"	1↔2	❷	Change to function bar 2		
3.		←→	Menu			
4.		▼▲	*ALL*	Select menu "ALL" (list of all codes)		
5.		1↔2	❶	Acknowledge selection and change to function bar 1		
6.	Inhibit controller	STOP	RDY IMP	Only required if you want to change C0002, C0148, C0174 and/or C0469		
7.	Set parameters	←→	Code			C0412, assign 3 to subcode 3.
8.		▼▲	*XXXX*	Select code	*0412*	
9.		→	SubCode *001*	For codes without subcodes: Jump automatically to Para		
10.		▼▲	*XXX*	Select subcode	*003*	
11.		→	Para			
12.		▼▲	*XXXXX*	Set parameters	*3*	
13.		ENTER	*STOrE*	Acknowledge entry if ↵ blinking		
		←		Acknowledge entry if ↵ not blinking; ENTER is not active		
14.	Set parameters			Start "loop" again at 7. for further parameter setting		

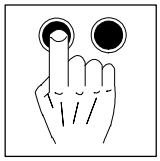
6.2.1.5 Change parameter set

Note!

Use the keypad to change the parameter set for changing parameter. Use digital signals to activate a parameter set for operation (configuration under C0410)!

The parameter set active during operation can be displayed using the function Disp

Action		Keys	Result	Note	Example	
1.	Select function	1↔2	❷	Change to function bar 2		Select parameter set 2
2.		←→	PS			
3.	Select parameter set	▼▲	*1 ... 4*	Select parameter set to be changed	*2*	
4.		1↔2	❶	Acknowledge selection and change to function bar 1		
5.	Set parameters			As described in chapter 6.2.1.4		



6.2.1.6 Remote parameter setting of system bus participants

Note!

Instead of using the function [Bus] the system bus participants can also be selected under C0370.

Action		Keys	Result	Note	Example	
1.	Select function	①↔②	❷	Change to function bar 2		Remote parameter setting for system bus participant 32.
2.		←→	[Bus]			
3.	Select address of the participant	▼▲	*1 ... 63*	Select participant address. (📖 9-5 ff)	*32*	
4.		①↔②	❶	Acknowledge address and change to function bar 1 Remote parameter setting is now possible.		
5.	Set parameters			As described in chapter 6.2.1.4 All settings are transferred to the selected participant.		

6.2.1.7 How to change user menu entries

Note!

Detailed information on the user menu: (📖 7-54)

Action		Keys	Result	Note	Example	
1.	Change to the menu "ALL"	①↔②	❷	Change to function bar 2		
2.		←→	[Menu]			
3.		▼▲	*ALL*	Select menu "ALL" (list of all codes)		
4.		①↔②	❶	Acknowledge selection and change to function bar 1		
5.	Select user menu	→	[Code]			Enter C0014 (control mode) in location 2 of the user menu. The exisiting setting will be overwritten.
6.		▲	*0517*	Code for user menu	*0517*	
7.	Select memory location	←→	[SubCode] *001*	Code stored in C0517/1 is displayed (Lenze setting: output frequency C0050)		
8.		▲	*001 ... 010*	Select subcode	*002*	
9.	Change entry	→	[Para]			
10.		▼▲	*XXXXX*	Enter code number It is not checked whether the entered code number exists! *"0"* to delete entry.	*14*	
11.		ENTER	*StOrE*	Acknowledge entry		
12.				Start "loop" again at 7. to change further memory locations		

6.2.1.8 Activate password protection

(Available as of version E82 ... Vx11 in combination with keypad, version E82ZB ... Vx10)

Note!

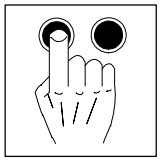
- If the password protection is activated (C0094 = 1 ... 9999) only the user menu can be accessed freely.
- For free access to all functions, enter the password.
- Do not forget the password! If you have forgotten the password, contact the Lenze Service!

How to activate the password protection

Action		Keys	Result	Note	Example	
1.	Change to the menu "ALL"	①↔②	❷	Change to function bar 2		
2.		←→	Menu			
3.		▼▲	ALL	Select menu "ALL" (list of all codes)		
4.		①↔②	❶	Acknowledge selection and change to function bar 1		
5.	Enter password	→	Code			Enter and activate password 123
6.		▲	0094	Code for password	0094	
7.		→	Para			
8.		▲	XXXX	Password setting	123	
9.		ENTER	StOrE	Password acknowledgement		
10.	Activate the password by changing to the user menu	①↔②	❷	Change to function bar 2		
11.		←→	Menu			
12.		▼▲	uSEr	Select user menu		
13.		①↔②	❶ 🔑	Acknowledge selection and change to function bar 1 The key symbol indicates that the password has been activated		

How to activate a password-protected function

Action		Keys	Result	Note	Example	
1.	Activation of password protected function	various	PASS 0 🔑	Try to activate a password-protected function 0 blinking		Deactivate password 123 temporarily
2.	Deactivate the password protection temporarily	▲	PASS XXXX 🔑	Password setting	123	
3.		ENTER	StOrE	Password acknowledgement 🔑 is off		
4.	Free access to all functions	various		It is now possible to freely access all functions		
5.	Activate the password protection again by changing to the user menu.	①↔②	❷	Change to function bar 2		
6.		←→	Menu			
7.		▼▲	uSEr	Select user menu		
8.		①↔②	❶ 🔑	Acknowledge selection and change to function bar 1 The password protection is active again.		



Permanent deactivation of the password protection

Action		Keys	Result	Note	Example	
1.	Change to the menu "ALL"	1↔2	PASS 0 🔑	0 blinking		Deactivate password 123 permanently
2.		▲	PASS XXXX 🔑	Password setting	123	
3.		ENTER	STOrE	Password acknowledgement 🔑 is off		
4.		1↔2	❷	Change to function bar 2		
5.		←→	Menu			
6.		▼▲	ALL	Select menu "ALL" (list of all codes)		
7.		1↔2	❶	Acknowledge selection and change to function bar 1		
8.	Permanent deactivation of the password protection	→	Code			
9.		▲	0094	Code for password	0094	
10.		→	Para			
11.		▲	0	Delete password	0	
12.		ENTER	STOrE	Acknowledge entry All functions can be accessed freely again.		

6.2.2 Parameter setting with the communication module LECOM-A (RS232)

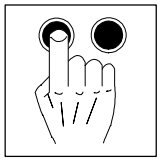
The communication module LECOM-A (RS232) connects the controller to a superimposed host (e. g. PC) using a RS232 interface.

Additional components are required to work with the communication module:

- Parameter setting software “Global Drive Control (GDC)”, version 3.2 or higher
- PC system cable

6.2.2.1 General data/application conditions

Communication module type	EMF2102IB-V001 (LECOM-A/B)
Communication medium	RS232 (LECOM-A)
Communication protocol	LECOM-A/B V2.0
Character format	7E1: 7 bit ASCII, 1 stop bit, 1 start bit, 1 parity bit (even)
Baud rate [bit/s]	1200, 2400, 4800, 9600, 19200
LECOM-A participant	Slave
Network topology	Point-to-point
Max. number of participants	1
Max. cable length	15 m
Communication time	See table
PC connection	9 pole Sub-D socket
DC supply voltage	Internal
Insulation voltage to PE	50 V AC
Type of protection	IP20
Ambient temperature	During operation: 0 ... +50 °C During transport: -25 ... +70 °C During storage: -25 ... +55 °C
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)
Dimensions (L x W x H)	75 mm x 62 mm x 23 mm



6.2.2.2 Communication times

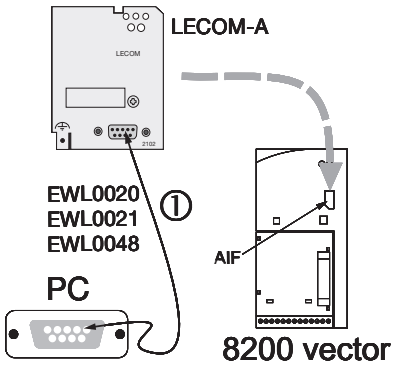
The time required for the communication with the drive can be subdivided into successive time sections:

Section	Active component	Action
t0	User program in host	Starts inquiry to the controller
t1	Software driver in host	Converts inquiry data into the LECOM-A/B protocol and starts the transmission
t2		Communication (= serial transmission) to the controller (telegram time)
t3	Controller	Processes the inquiry and starts the response
t4		Communication response is transmitted (telegram time)
t5	Software driver in host	Evaluates response and converts it into the user program's format
t6	User program in host	Gets results

Telegram time (t2, t4) [ms]		**Baud rate [bits/s]**				
		1200	**2400**	**4800**	**9600**	**19200**
Telegram type SEND (Send data to drive)	$t2_{Standard}$ (Parameter value = 9 digits)	150	75	37.5	18.8	9.4
	In addition for extended addressing	41.6	20.8	10.4	5.2	2.6
Telegram type RECEIVE (Read data from drive)	$t4_{Standard}$ (Parameter value = 9 digits)	166.7	83.3	41.7	20.8	10.4
	In addition to extended addressing	83.3	41.7	20.8	10.4	5.2
Time required for single digit [1]	per digit [ms]	8.4	4.2	2.1	1	0.52
Processing time in the controller (t3)		**t3 [ms]**				
	Write codes	20				
	Read codes	20				

1) If a telegram has less than 9 characters, the transmission time will change accordingly.

6.2.2.3 Wiring to a host (PC or PLC)

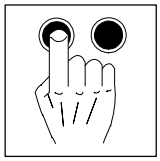
Pin assignment 9-pole SubD socket				Installation/commissioning
Pin	**Name**	**Input (I) / output (O)**	**Explanation**	
1	-	-	not assigned	
2	RxD	I	Cable “Receive data”	
3	TxD	O	Cable “Send data”	
4	DTR	OA	Sending control	
5	GND	-	Reference potential	
6	DSR	I	not assigned	
7	-	-	not assigned	
8	-	-	not assigned	
9	GND		Reference potential for T/R (A), T/R (B) and +5 V	
			① = PC system cable	The parameter setting software Global Drive Control must be installed on your PC. 1. Attach the communication module to the AIF interface 2. Connect the communication module to the PC using a PC system cable. The communication module is ready for operation when the mains voltage is switched on. It is now possible to communicate with the drive, i. e. all codes can be read and the writeable code can be changed.

Note!

- The controller has a double basic insulation to VDE 0160. An additional mains isolation is not required.
- Use Lenze accessories for wiring.

Notes for ready-cut PC system cables

Specification for RS232 interface cables	Cable type	LIYCY 4 x 0.25 mm² shielded		
	Cable resistance	≤ 100 Ω/km		
	Capacitance per unit length	≤ 140 nF/km		
Specification for SubD connector	Do not use other than metal SubD housings. Connect the shield on both sides with the housing.			
Pin assignment			**Connection to PC or similar**	
	Connection to communication module		9 pole SubD socket pin	25 pole SubD socket pin
	9 pole SubD plug pin	2 (RxD)	3 (TxD)	2 (TxD)
		3 (TxD)	2 (RxD)	3 (RxD)
		5 (GND)	5 (GND)	7 (GND)



Accessories

Host accessories	Name	Order no.	Explanation
Software	Global Drive Control (GDC)	ESP-GDC2	PC program for drive programming (version 3.2 and higher) System requirements: IBM AT compatible PC
	LECOM-PC	-	LECOM-A/B communication driver for PC systems in C/C++ (source code). Easy modification for other target systems.
Hardware	PC system cable 0.5 m	EWL0048	System cable between PC (9 pole socket) and communication module
	PC system cable 5 m	EWL0020	
	PC system cable 10 m	EWL0021	

6.2.2.4 Parameter setting with LECOM-A (RS232)

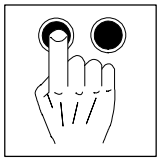
All codes can be accessed when using LECOM-A:

- Controller codes (code table: 📖 14-9 ff.).
  – These codes are automatically stored as non-volatile data.
  – Exception: Process data, such as control words or setpoints.
- Module-specific codes (access only via communication module): 📖 6-11).
- The online help of Global Drive Control gives all information required for parameter setting with LECOM-A.

6.2.2.5 Additional codes for LECOM-A (RS232)

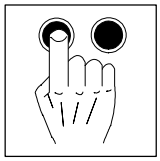
How to read the code table:

Column	Entry	Meaning
Code	No.	Code number. (Codes marked with "*" are similar in all parameter sets).
	Name	Name of the code
	LECOM format	Interpretation response telegram: VH = hexadecimal; VD = decimal; VS = ASCII string; VO = octet
Parameter	Settings/selection possibilites	Contents and meaning of the parameter values (bold printing = Lenze setting)
Important		Important additional information

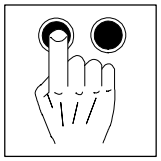


Parameter setting

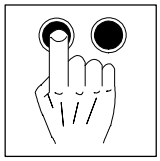
Code			Parameter		IMPORTANT
No.	**Name**	**LECOM format**	**Settings/selection possibilites**		
C0068*	Operating status	VH	Bit	Assignment	
			3|2|1|0	TRIP fault number	Submission of the 10th digit of the LECOM fault number. Example: TRIP OH (LECOM-No. 50) = 0110 (5)
			7|6|5|4	Last communication error 0000 No error 0001 Check sum error 0010 Protocol frame error 0011 Reserved 0100 Invalid code number 0101 Invalid variable 0110 No access permission 0111 Telegram processing interrupted by new telegram 1111 General fault	
			8	Controller inhibit (DCTRL1-CINH) 0 Controller inhibited 1 Controller enabled	
			9	Q_{min} threshold reached (PCTRL1-QMIN) 0 not reached 1 reached	
			10	Direction of rotation (NSET1/CW/CCW) 0 CW rotation 1 CCW rotation	
			11	Pulse inhibit (DCTRL1-IMP) 0 Power outputs inhibited 1 Power outputs enabled	
			12	Quick stop (NSET1-QSP) 0 not active 1 active	
			13	I_{max} limit reached (MCTRL1-IMAX) (C0014 = -5-: Torque setpoint) 0 not reached 1 reached	
			14	Frequency setpoint reached (MCTRL1-RFG1=NOUT) 0 wrong 1 correct	
			15	TRIP fault message (DCTRL1-TRIP) 0 not active 1 active	
C0248*	LECOM input selection	VD	**0**	**0000 ... 0255**	• For the compatibility to LECOM-A/B drivers V1.0, which do not support the direct addressing of subcodes (array parameters). • C0248 determines the subcode (array element) to be accessed. • The access of codes without subcodes when C0248 > 0 leads to trip because the address does not exist. • LECOM-A/B drivers as of V2.0 support direct addressing of subcodes. Do not use C0248 together with these drivers! • C0248 is set to 0 when switching on the unit.



Code			Parameter			IMPORTANT
No.	**Name**	**LECOM format**	**Settings/selection possibilites**			
C0249*	LECOM code bank	VD	Code bank	Addressable codes		• For compatibility to LECOM-A/B drivers V1.0 (highest possible code number 255). • With the code bank, an offset of 250 is added to the code number. • C0249 is not effective together with LECOM-A/B drivers as of V2.0. • C0249 is set to 0 when switching on the unit.
			0	**0000 ... 0255**		
			1	0250 ... 0505		
			2	0500 ... 0755		
			3	0750 ... 1005		
			4	1000 ... 1255		
			5	1250 ... 1505		
			6	1500 ... 1755		
			7	1750 ... 2005		
			8	2000 ... 2255		
			9	2250 ... 2505		
			10	2500 ... 2755		
			11	2750 ... 3005		
			12	3000 ... 3255		
			13	3250 ... 3505		
			14	3500 ... 3755		
			15	3750 ... 4005		
C1810*	SW labelling	VS	Structure: 33S2102I_xy000			Software version (x = main version, y = subversion)
C1811*	SW generation	VS				Date of software generation
C1920	Start status	VD	**0**	**QSP (quick stop)**		The drive is set to “QSP” after mains switching.
			1	CINH (controller inhibit)		The drive is set to “CINH” after mains switching. Write C0040 = 1 ⇒ Enable
C1921	Shortened response time	VD	**0**	**Not active**		C1921 = 1: • A write telegram (send) is checked for transmission errors only: – A faultless telegram is acknowledged positively (ACK), otherwise it is acknowledged negatively (NAK). – Only then the value is transmitted to the controller. • The controller might not have accepted the value correctly. • Address the communication module again after 50 ms.
			1	active		
C1922	Reaction communication monitoring	VD	**0**	**Not active**		• With C1922 and C1923 it is possible to monitor the communication with the host. • If the host does not send a telegram to the communication module within the time set under C1923, the action set under C1922 will be carried out.
			1	CINH (controller inhibit)		
			2	QSP (quick stop)		
C1923	Monitoring time		50	{ms}	65535	



Code			Parameter	IMPORTANT
No.	**Name**	**LECOM format**	**Settings/selection possibilites**	
C1962	Extended code No.		0 No error	
			1 Invalid service designation 2 Invalid call recognition	Internal fault
			3 Invalid data type 4 Invalid subcode number 5 Invalid code number 6 Invalid general parameter	Application error in the host
			7 Operating status, e. g. controller inhibit 8 Operating mode C0001 is wrong 9 Parameter can only be read 10 General	Access error
			11 Data block too long 12 Collision with other parameter values 13 Leave value range 14 General limit value exceeding	Limit value exceeded
			17 General internal fault	Internal fault
			32 General 33 Time limit exceeded 34 Frame error 35 Parity error 36 Overflow 37 Handshake 38 Block memory overflow	Communication error communication module ↔ controller
			208 Frame error 209 Overflow error 210 Check sum error in the communication module 211 Telegram interruption 212 Invalid data 213 Invalid service 214 Parity error	Communication error controller ↔ communication module



6.2.2.6 Troubleshooting and fault elimination LECOM-A (RS232)

Three LEDs at the communication module LECOM-A (RS232) indicate the status:

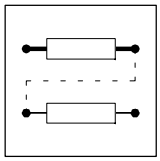
	LED green (Vcc)	**LED yellow (RxD)**	**LED yellow (TxD)**
Blinking	Communication module not initialized yet.	Telegram is being received.	Response is being sent.
On	Communication module is connected to voltage supply, no fault.	-	-
Off	Communication module is not connected to voltage supply.	No telegrams are being received.	No responses are being sent.

Fault	**Cause**	**Remedy**
No communication with the controller.	Antriebsregler is switched off: • No operating status display at the controller is on. • The green LED Vcc is not on.	Controller is connected to voltage supply.
	Communication module is not live: • The green LED Vcc is not on.	Check the connection to the controller.
	Communication module has not been initialised with the controller.	
	Controller does not receive telegrams. Test: Let the host send telegrams cyclically. This happens, e.g. if GDC is in online operation.	If yellows LED RxD is not blinking: • Check wiring to host. • Check whether host sends telegrams and uses the appropriate interface.
	Controller does not send telegrams. Test: Let the host send telegrams cyclically. This happens, e.g. if GDC is in online operation.	If yellows LED TxD is not blinking: • Check LECOM baud rate (C0125) of both participants and if necessary adjust the rate. • Do not use controller addresses 00, 10, …, 90. Yellow LED TxD is blinking: • Check wiring to host.
Controller does not execute write order	• Controller sends negative acknowledgement (NAK response): – No write access to C0044, C0046, because C0412 is not set correctly. – Attempt to write in a code type “read only”.	Set C0412/1, C0412/2 = 0. In general, write order not possible.
	• Controller sends positive acknowledgement (ACK response): – Controller uses a different parameter set	Change parameter set.

6.3 Parameter setting with bus function modules

Notes on parameter setting can be obtained from:

Combination controller + function module	**Description**
System bus (CAN)	🕮 9-1 ff.
PROFIBUS	See Operating Instructions for Bus Function Modules
INTERBUS	
LECOM-B (RS485)	



7 Function library

The function library provides detailed information on how to adapt the controller to your application. The chapter comprises the following:

- Selection of the control mode and optimization of the operating behaviour
- Setting of the limit values
- Acceleration, deceleration, braking, stopping
- Configuration of the analog and digital setpoints
- Entry/automatic detection of the motor data
- Process controller I_{max}controller
- Free connection of analog signals
- Free connection of digital signals, message output
- Thermal motor monitoring, fault detection
- Display of operating data, diagnostics
- Parameter set management
- Individual selection of drive parameters - The user menu

Note!

- The signal-flow charts show how the codes are integrated into the signal processing. (📖 14-1 ff.)
- The code table lists all functions in a numerical order and gives short explanations. (📖 14-9 ff.)
- For free configuration of signals:
  – Select the source from the target position.
  – Answer the question “Where does the signal come from?” It is thus easy to find the correct entry for the corresponding code.
  – A source can have several targets, but a target can only have one source.

7.1 Selection of the control mode and optimization of the operating behaviour

7.1.1 Control mode

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0014↵	Control mode	-2-	-2-	V/f-characteristic control V ~ f	Linear characteristic with constant V_{min} boost
			-3-	V/f-characteristic control V ~ f^2	Square-law characteristic with constant V_{min} boost
			-4-	Vector control	For initial selection with C0148, identify the motor parameters. Otherwise, commissioning is not possible.
			-5-	Sensorless torque control with speed limitation • Torque setpoint via C0412/6 • Speed limitation via setpoint 1 (NSET1-N1), if C0412/1 is assigned, if not via max. frequency (C0011)	

Function

Under C0014 you can set the control mode and the voltage characteristic. It is also possible to adapt your drive to different load characteristics:

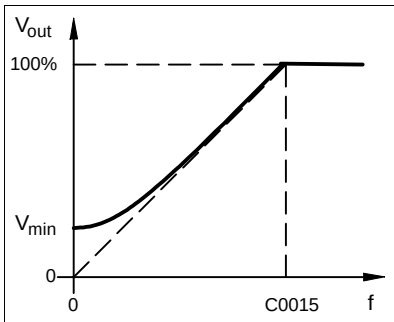
- Linear characteristic for drives with constant load torque over the speed.
- Square-law characteristic for drives with a load torque squared in relation to the speed.
  - Square-law V/f characteristics are mainly used for centrifugal pump and fan drives. It is however necessary to check whether your individual pump or fan application can be driven with this control mode.
  - If your pump or fan drive cannot be operated with a square-law V/f characteristic, select the control mode C0014 = -2- or -4-.

V/f-characteristic control with V_{min}boost

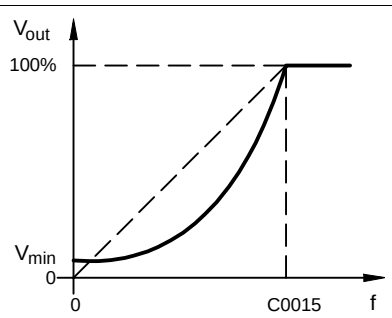
Select the classical V/f-control with constant V_{min}boost (C0016) for operation of the following drives:

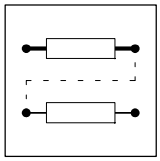
- Multi-motor applications (several motors connected to one controller)
- Three-phase AC reluctance motors
- Three-phase sliding rotor motors
- Operation with special motors with assigned frequency-voltage characteristic
- Positioning and infeed drives with high dynamic response
- Hoists

C0014 = -2-
Linear characteristic



C0014 = -3-
Square-law characteristic (e. g. for pumps, fans)





Vector control
Compared with the V/f-characteristic control, the vector control offers a considerably higher torque and a reduced current consumption during idling. The vector control is the improved motor-current control according to the Lenze FTC method.
Select the vector control for operation of the following drives:

- Single drives with changing loads
- Single drives with heavy start conditions
- Multi-motor applications with the same motors and the same load distribution
- Sensorless speed control of three-phase AC standard motors in connection with the slip compensation (C0021)

Sensorless torque control with speed limitation
The setpoint (C0412/6) is interpreted as torque setpoint. An actual value is not necessary.
Application, e.g. with winding drives.

Adjustment

V/f-characteristic control (C0014 = -2- or C0014 = -3-):

1. Select V/f-rated frequency C0015.
2. V_{min} boost (C0016).

Vector-control (C0014 = -4-):

- The parameter identification is absolutely necessary.(📖 7-28)
- The control mode C0014 = -4- should only be used with slip compensation (C0021). The "sensorless speed control" is thus optimized for the process.
- The idle current of the motor (magnetizing current) must not exceed the rated current of the controller.
- The power code of the connected motor should not be more than two classes lower than the one of the motor assigned to the controller.

Important

- The change from V/f-characteristic control to vector control must only be carried out when the controller is inhibited.
- Applications with power control must not be used with control mode "Torque control" (C0014 = 5)! 📖 13-15
- Optimum drive performance for application with process controller, e. g. speed control or dancer position control, when selecting the control modes C0014 = 2 or C0014 = 4.
  - For high torques at low speeds we recommend the control mode "Vector control" (C0014 = 4)

Special features

C0014 = -3-

- High moments of inertia result in a reduced drive acceleration.
  - This can only be avoided with a parameter set changeover (e. g. acceleration with C0014 = -2-).

C0014 = -4-

- **Not** possible if
  - drives with different loads are connected to an inverter.
  - drives with different rated powers are connected to an inverter.

7.1.2 V/f-characteristic

7.1.2.1 V/f rated frequency

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0015	V/f-rated frequency	50.00	7.50	{0.02 Hz}	960.00	Setting applies to all mains voltages permitted

Function when C0014 = -2-, -3- The V/f-rated frequency determines the slope of the V/f characteristic and has considerable influence on the current, torque and power performance of the motor.

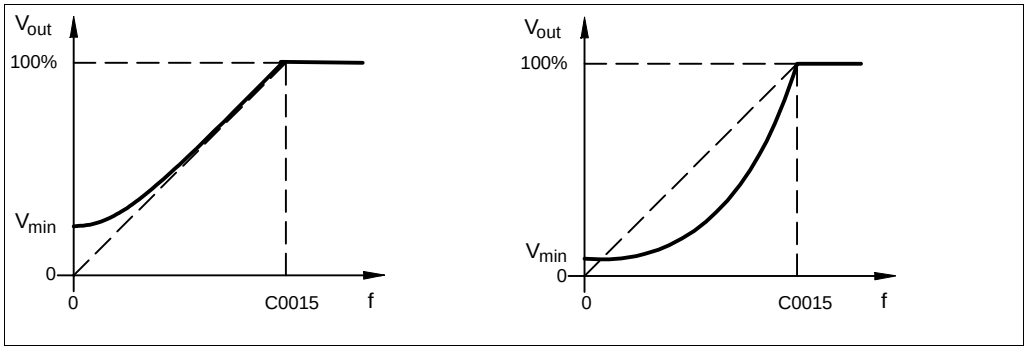
Function when C0014 = -4- The V/f-rated frequency influences the internal parameter of the motor model when using the control mode "vector control".

Adjustment

$$C0015[Hz] = \frac{400V}{U_{rmotor}[V]} \cdot \text{Rated motor frequency[Hz]}$$

C0014 = -2-
Linear characteristic

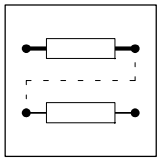
C0014 = -3-
Square-law characteristic (e. g. for pumps, fans)



Motor			Setting of C0015	
Voltage	Frequency	Connection		
230/400 V	50 Hz	Y	50 Hz	**Tip:** • 4-pole asynchronoua motors, which are designed for a rated frequency of 50 Hz in star connection, can be operated in delta connection when being constantly excited up to 87 Hz. – The motor current and the motor power are then increased by the factor √3 = 1.73. – The field-weakening range starts above 87 Hz. • Advantages: – Higher speed-setting range – 73 % higher power output with standard motors. • In principle, this method can also be used with higher-pole motors (6,8,...). – Observe the mechanical limit speed when using 2-pole asynchronous motors.
220/380 V	50 Hz	Y	52.6 Hz	
280/480 V	60 Hz	Y	50 Hz	
400/690 V 400 V	50 Hz 50 Hz	Δ	50 Hz	
230/400 V 280/480 V	50 Hz 60 Hz	Δ	87 Hz	
220/380 V	50 Hz	Δ	90.9 Hz	

Important

- An internal mains voltage compensation compensates mains fluctuations during operation, so that they do not have to be considered for the setting of C0015.
- The identification of the motor parameter automatically assigns C0015.



7.1.2.2 V_{min} boost

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0016	V_{min} boost	→	0.00	{0.2 %}	40.0	→ depends on the unit Setting applies to all mains voltages permitted

Function with V/f-characteristic control
C0014 = -2-, -3-

Load-independent boost of the motor voltage in the output frequency range below the V/f-rated frequency. You can thus optimize the torque performance of the inverter drive.

Adjustment

It is absolutely necessary to adapt C0016 to the asynchronous motor. Otherwise, the motor might be destroyed by overtemperature or the inverter might be driven with overcurrent.

1. In idle running motor should be operated at slip frequency ($f \approx 5$ Hz)

Slip frequency calculation

$$f_s = f_r \cdot \frac{n_{rsyn} - n_r}{n_{rsyn}}$$

$$n_{rsyn} = \frac{f_r \cdot 60}{p}$$

f_s	Slip frequency
f_r	Rated frequency to motor nameplate [Hz]
$n_{ratedsyn}$	Synchronous motor speed [min^{-1}]
n_r	Rated speed as per motor nameplate [min^{-1}]
p	Number of pole pairs

2. Increase V_{min} until the following motor current is reached
   - Motor in short-term operation at 0 Hz ≤ f ≤ 25 Hz:
     With self-ventilated motors: $I_{motor} \leq I_{r\ motor}$
     With forced ventilated motors: $I_{motor} \leq I_{r\ motor}$
   - Motor in continuous operation at 0 Hz ≤ f ≤ 25 Hz:
     With self-ventilated motors: $I_{motor} \leq 0.8 \cdot I_{r\ motor}$
     With forced ventilated motors: $I_{motor} \leq I_{r\ motor}$

Important

For adjustment, observe the thermal performance of the connected asynchronous motor at low output frequencies:

- Experience shows, that it is possible to drive standard asynchronous motors with the insulation class B at rated current for a short time in the frequency range 0 Hz ≤ f ≤ 25 Hz.
- Contact the motor manufacturer for exact setting values for the max. permissible motor current in the lower frequency range of self-ventilated motors.

Function for vector control or torque control
C0014 = -4-, -5-

V_{min} ist not effective.

7.1.3 Running optimization

7.1.3.1 Slip compensation

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0021	Slip compensation	0.0	-50.0	{0.1 %}	50.0	

Function

Under load, the speed of an asynchronous machine is reduced. This load-dependent speed drop is called slip. The slip can be partially compensated by setting C0021 accordingly. The slip compensation is effective with all control modes (C0014).

- Increase the slip under C0021 < 0 (if C0014 = -2-, -3-)
  - "Smoother" drive behaviour with high load impacts or multi-motor applciations.
- In the frequency range between 5 Hz ... 50 Hz (87 Hz) the deviation of the rated speed is ≤ 0.5 % (guide value). The error increases in field-weakening operation.

Adjustment

1. Rough setting by means of the motor data:

$$s = \frac{n_{rsyn} - n_r}{n_{rsyn}} \cdot 100\,\%$$

$$n_{rsyn} = \frac{f_r \cdot 60}{p}$$

s	Slip constant (C0021) [%]
$n_{ratedsyn}$	Synchronous motor speed [min^{-1}]
n_r	Rated speed as per motor nameplate [min^{-1}]
f_r	Rated frequency to motor nameplate [Hz]
p	No. of pole pairs (1, 2, 3, ...)

2. Empirical precise setting of the slip compensation:
   - Correct C0021 until no load-dependent speed drop occurs in the required speed range between idle running and max. motor load.

Example with motor data: 4 kW / 1435 min^{-1} / 50 Hz

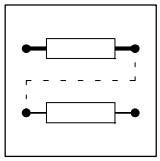
$$n_{rsyn} = \frac{50Hz \cdot 60}{2} = 1500\,min^{-1}$$

$$s = \frac{1500\,min^{-1} - 1435\,min^{-1}}{1500\,min^{-1}} \cdot 100\% = 4.33\,\%$$

C0021 = 4.3 % preselection

Important

- If the value under C0021 is too high, overcompensation occurs and the drive becomes instable.
- Set C0021 = 0.0 for speed control with the internal process controller.
- The motor parameter identification under C0148 automatically assigns C0021.



7.1.3.2 Chopper frequency

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0018↲	Chopper frequency	-2-	-0-	2 kHz	
			-1-	4 kHz	
			-2-	8 kHz	
			-3-	16 kHz	
C0144↲	Chopper frequency derating	-1-	-0-	No chopper frequency derating	
			-1-		

Function C0018

Set the chopper frequency of the inverter with this function. In Lenze setting, the chopper frequency is set to 8 kHz. Reasons for other parameter settings may be:

- 2 kHz, 4 kHz:
  - – improved smooth running at low output frequencies.
- 16 kHz:
  - – reduced noise emission in the connected motor
  - – good sine wave of the motor current for applications with output frequencies > 150 Hz, e. g. medium frequecy drives

Important

With a chopper frequency of 16 kHz, the system suffers high power losses which must be compensated by derating the output current. (📖 3-3)

Function C0144

- C0144 = -0-
  - – With a chopper frequency of 8 kHz or 16 kHz and if the max. permissible heat sink temperature is exceeded (ϑ_{max}) the inverter will be inhibited, a TRIP message will be set and the motor will coast to standstill.
- C0144 = -1- (automatic chopper frequency derating):
  - – With a choppper frequency of 8 kHz or 16 kHz and if the heat sink temperature is exceeded ϑ_{max} - 5 °C the chopper frequency is automatically reduced to 4 kHz and thus maintains operation.
  - – After the heat sink temperature has cooled down, the controller will increase the chopper frequency again.

Important

- The current limitation C0022/C0023 is not automatically influenced by the selected chopper frequency.
- Depending on the apparent motor current and the output frequency, the chopper frequency is automatically set to its optimum value to ensure troublefree operation.
  - – The noise emissions will change.
  - – The function cannot be influenced by the user.

7.1.3.3 Level damping

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0079	Oscillation damping	→	0	{1}	80	→ depends on the unit

Function

Suppression of idling oscillations when:

- A drive does not match, i.e. rated controller power - motor
  e. g. operation with high chopper frequency and the related power derating
- Operation of higher pole motors
- Operation of special motors

Compensation of resonances in the drive

- Some asynchronous motors can sometimes show this characteristic at an output frequency of approx. 20 Hz ... 40 Hz. The drive can become instable (current and speed fluctuations).

Adjustment

1. Approach the area with speed oscillations.
2. Reduce the oscillation by changing C0079 step by step.
   - – Indicators for smooth running can be a uniform motor current or the reduction of mechanical vibrations in the bearing seat.

Important

Compensate the resonances in speed controlled operation via the appropriate parameters of the speed controller.

7.1.3.4 Skip frequencies

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0625*	Skip frequency 1	480.00	0.00	{0.02 Hz}	480.00	
C0626*	Skip frequency 2	480.00	0.00	{0.02 Hz}	480.00	
C0627*	Skip frequency 3	480.00	0.00	{0.02 Hz}	480.00	
C0628*	Bandwidth of skip frequencies	0.00	0.00	{0.01 %}	100.00	Applies to C0625, C0626, C0627

Function

With certain output frequencies, mechanical resonances might occur (e. g. fan).Skip frequencies suppress these unwanted output frequencies. The bandwidth (Δf) determines the range of frequency suppression.
With a skip frequency = 480.00 Hz the function is not active.
The function is in the block NSET1 before the ramp function generator.

Adjustment

- Set the required skip frequencies under C0625, C0626, C0627.
- C0628 defines the bandwidth for skip frequencies.
  – Calculate the bandwidth (Δf) for the corresponding skip frequency.

$$\Delta f\,[Hz] = f_s\,[Hz] \cdot \frac{C0628\,[\%]}{100\,\%}$$

f_s Skip frequency

Important

- Skip frequencies only influence the main setpoint.
- C0625, C0626, C0627, C0628 are the same in all parameter sets.

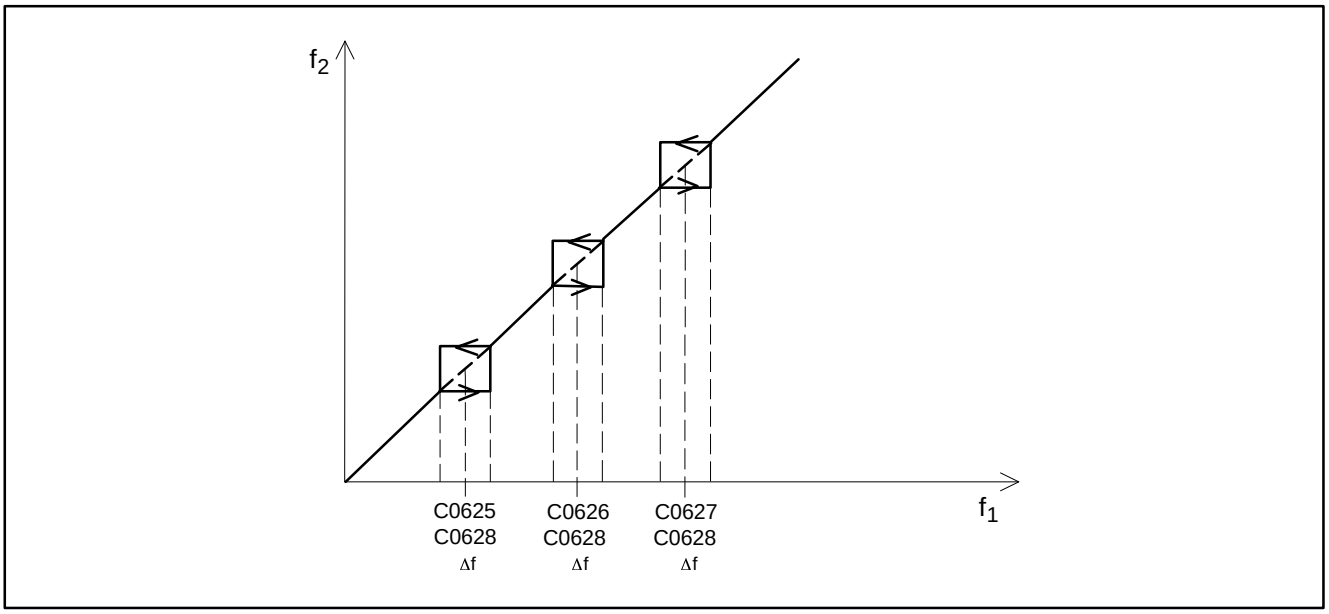
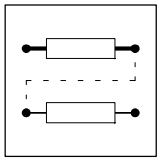


Fig. 7-1 Skip frequencies and their bandwidths (Δf)



7.1.4 Behaviour in the event of mains switching, mains failure or controller inhibit

7.1.4.1 Start conditions/flying-restart circuit

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0142↲	Start condition	-1-	-0-	Automatic start inhibited Flying restart not active	Start after LOW-HIGH level change at X3/28
			-1-	Automatic start, if X3/28 = HIGH Flying restart not active	
			-2-	Automatic start inhibited Flying-restart circuit active	Start after LOW-HIGH level change at X3/28
			-3-	Automatic start, if X3/28 = HIGH Flying-restart circuit active	
C0143*↲	Selection of flying-restart	-0-	-0-	Max. output frequency (C0011) ... 0 Hz	Motor speed is searched. The selection range is indicated.
			-1-	Last output frequency ... 0 Hz	
			-2-	Frequency setpoint addition (NSET1-NOUT)	The corresponding value is added after controller enable.
			-3-	Act. process controller value (C0412/5) addition (PCTRL1-ACT)	

Function

Determines the controller performance after mains connection, mains reconnection after failure or restart after controller inhibit (CINH). With activated flying-restart circuit, the controller automatically synchronizes to a coasting motor after mains disconnection or adds a setpoint signal.

- C0143 = -0-, -1- (Search motor speed)
  - For this, the controller calculates the output frequency required for the current speed of the coasting motor, the controller is then connected and accelerates the motor to the selected setpoint.
  - Advantage: Continuous and smooth acceleration and deceleration
  - Disadvantage: "Start" only after the current motor speed has been found. Faster "start" is possible by using the function "controlled deceleration after mains failure/mains disconnection". (📖 7-10)
- C0143 = -2-, -3- (signal addition)
  - The controller adds the output frequency required for the frequency setpoint or the act. process controller value.

Drive performance

Start options with flying-restart circuit

- C0142 = -0-
  - After mains interruption, the drive does not start before a LOW/HIGH level change at input CINH (X3/28).
- C0142 = -1-
  - After mains interrruption the drive starts automatically, if a HIGH signal is assigned to the input CINH (X3/28). At the same time, the controller sets all integrators to zero and enables them again.

Start options with flying-restart circuit

- C0142 = -2-
  - Start with flying-restart circuit after a LOW/HIGH level change at the input CINH (X3/28).
- C0142 = -3-
  - Automatic start with flying-restart circuit, if a HIGH level is assigned to the input CINH (X3/28).
- C0143 determines whether the motor speed is searched or a signal is added.

Important

C0143 = -0-, -1-

- The flying-restart circuit must not be used, if several motors with different inertias are connected to a controller.
- The flying-restart circuit only searches the selected direction of rotation for the synchronization.
- The flying restart works properly for drives with high moments of inertia.
- Machines with low moments of inertia and friction: After the controller has been enabled the motor can start or reverse for a short time.

C0143 = --3-

- Add the actual process controller value only if a speed proportional signal is available under C0412/5.

Note

If the flying-restart circuit **is not required** for every drive start, but only after mains reconnection:

- Bridge X3/28 with HIGH level and start the controller with the function "QSP" (C0142 = -3- and C0106 = 0 s).
- The flying-restart circuit is now only **activated** for the first mains connection.

7.1.4.2 Controlled deceleration after mains failure/mains disconnection

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0988*	DC-bus voltage threshold for DC-bus voltage control	0	0	{1 %}	200	• C988 = 0 % – Parameter set changeover via DC-bus voltage is deactivated • Changeover always between PAR1 and PAR2 • Parameter set changeover via terminal, bus or PC is not possible if C988 > 0!

Function

- Controlled motor deceleration to standstill (f = 0) when switching off the mains or in the event of mains failure.
- If the motor is not in standstill when being reconnected to the mains, it is accelerated along the acceleration ramp (C0012) to the preselected setpoint. There is no delay time as in an active flying-restart circuit.
  – Advantage: Immediate "start", no delay time as in active flying-restart circuits. (📖 7-9)
  – Disadvantage: "Harder" transition when restarting the drive

This function can be implemented with or without external brake resistor:

Without external brake resistor

- Controlled motor deceleration to standstill (f = 0) when the controller is active.
- The braking energy is generated through the system losses (controller and motor).

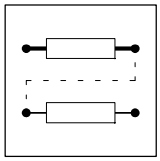
With external brake resistor

- Automatic, fast motor deceleration to standstill (f = 0).
- The deceleration time is shorter than without an external brake resistor.

Procedure

1. Mains voltage is interrupted.
2. The DC-bus voltage (V_{DC}) becomes lower than the value set under C0988 ⇒ PAR1 is activated.
3. QSP in PAR1 starts operation in generator mode.
4. V_{DC} becomes higher than the value set under C0988.
5. PAR2 is activated ⇒ The motor accelerates with Tir (C0012 in PAR2).
6. "Loop" starts again at 2.

Repeat the "loop" 2. to 6. until the motor speed reaches approx. 0, since the rotation energy in the motor maintains V_{DC} .



Adjustment	Code	PAR1 setting (active in the event of mains failure)	PAR2 setting (active in normal operation)	Note
Changeover threshold	C0988	C0988 = 100 % corresponds exactly to the mains voltage AC 230V or 400 V. Adapt C0988 to the mains-side undervoltage		
		AC 230 V or AC 400 V 10 % undervoltage ⇨ C0988 = 75 % ... 85 %	AC 460 V 10 % undervoltage ⇨ C0988 = 75 % ... 98 %	Most uniform deceleration can be achieved by setting the upper limit of the bandwidth.
Terminal configuration	C0410	Assign a digital input (X3/E1 ... X3/E6) to C0410/4 (QSP).	Select terminal configuration for normal operation.	With Lenze settings, QSP is LOW active.
With QSP In normal operation		• Invert this input via C0411.	• The digital input assigned to QSP in PAR1 must be assigned to QSP (not inverted).	
Without QSP In normal operation		• Do not assign this input.	• The digital input assigned to QSP in PAR1 must not be used.	
Quick stop in the event of mains failure without brake resistor.	C0105	The setting must ensure that the motor decelerates to standstill in a controlled mode after mains switch off: 1. Set the same value as in PAR2. 2. Switch-off the mains voltage. – PAR1 is activated. – Observe whether the controller indicates “Overvoltage OU” during controlled deceleration. 3. Reduce the value and switch the mains until the controller indicates OU during deceleration. 4. Increase this value by approx. 20 % as final setting.	Set the deceleration time for QSP required for the application.	
Quick stop in the event of mains failure with external brake resistor.	C0105	1. Set the same value as in PAR2. 2. Reduce the value until the deceleration time required after mains switch-off is reached.	Set the deceleration time for QSP required for the application.	• The current limit in generator mode must not be exceeded during controlled deceleration. • Select a sufficiently high external brake resistance.

Important

- Parameter set changeover via terminal, bus or PC is not possible if C0988 > 0!
- C0988 is the same in all parameter sets.

Note!

In the event of emergency off (controller is disconnected from the mains), the function “Controlled deceleration after mains failure/mains disconnection” can prevent the drive from coasting.

7.1.4.3 Controller inhibit (CINH)

Caution!

Do not use the controller inhibit (CINH) for emergency-off purposes. CINH inhibits the power output but does **not** diconnect the controller from the mains.

Function

- Power output inhibit.
  - The drive idles without torque.
  - Status display keypad: IMP (pulse inhibit)
  - The green LED at the controller is blinking.

Activation

- LOW level at X3/28 (cannot be inverted)
- C0410/10 ≠ 0: LOW level at the signal source for CINH (Level inversion under C0411)
- C0469 = 1: STOP
  - Restart with RUN

Important

- X3/28, C0410/10 and RUN act like an AND logic.
- A restart starts at an output frequency = 0 Hz.
  - If the drive is still rotating, generative overload can occur, if the flying restart is not activated (C0142).

Note!

The controller can also be inhibited and enabled under C0040 or the controller status can be read.

7.2 Setting of the limit values

7.2.1 Speed range

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0010	Minimum output frequency	0.00	0.00 → **14.5 Hz**	{0.02 Hz}	480.00	• C0010 is not effective for bipolar setpoint selection. • C0010 has no effect on AIN2. → **Speed setting range 1 : 6: Absolutely necessary for operation with Lenze geared motors.**
C0011	Maximum output frequency	50.00	7.50 → **87 Hz**	{0.02 Hz}	480.00	
C0239↵	Lowest frequency limit	-480.00	-480.00	{0.02 Hz}	480.00	Will not be exceeded independently of the setpoint.

Function

The speed range required for the application can be set by selecting output frequencies:
- C0010 corresponds to the speed at 0 % speed setpoint selection.
- C0011 corresponds to the speed at 100 % speed setpoint selection.
- C0239 selects the speed below which the value must not fall - independently of the setpoint - (e.g. for fans, dancer position control or dry-running protection for pumps).

Adjustment

Relation between output frequency and synchronous speed of the motor:

$$n_{rsyn} = \frac{C0011 \cdot 60}{p}$$

$n_{ratedsyn}$ Synchronous motor speed [min^{-1}]
C0011 Max. output frequency [Hz]
p No. of pole pairs (1, 2, 3, ...)

Example: 4-pole asynchronous motor:
p = 2, C0011 = 50 Hz

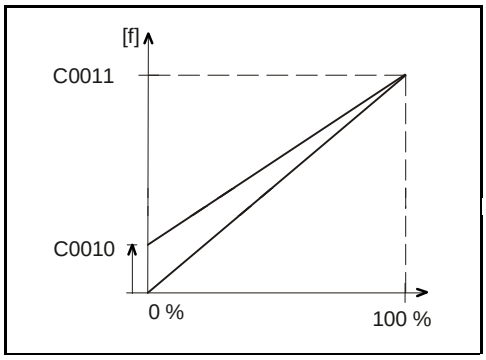
$$n_{rsyn} = \frac{50 \cdot 60}{2} = 1500\,min^{-1}$$

Important

- With the setting C0010 > C0011 limited to C0011.
- With setpoint selection via JOG values, C0011 acts as limitation.
- C0011 is an internal normalization value:
  – Inhibit the controller for complex changes.
- C0010 has no effect on AIN2 of the application-I/O.
- Observe the maximum speed of the motor!

Special features

- For output frequencies > 300 Hz:
  – Avoid chopper frequencies < 8 kHz.
- The display values of C0010 and C0011 can be related to an application datum via C0500 and C0501.
- C0239 = 0.00 Hz allows only one direction of rotation.



7.2.2 Current limit values (I_{max} limit values)

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0022	I_{max} limit (motor mode)	150	30	{1 %}	150	
C0023	I_{max} limit (generator mode)	150	30	{1 %}	150	C0023 = 30 %: Function not active if C0014 = -2-, -3-:

Function

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

- C0023 = 30 %
  - Current-limit controller not active in generator mode (only in control mode V/f-characteristic control C0014 = -2-, -3-) (📖 7-2).
  - Possibly reasonable in applications with medium frequency asynchronous motors if motor and generator mode cannot be detected as fault-free.

Adjustment

- Set the acceleration and deceleration times so that the drive can follow the speed profile without reaching I_{max} of the controller.
- Observe the current derating at a chopper frequency of 16 kHz. (📖 3-3)

Drive characteristic when reaching the limit value

- During acceleration:
  - Increase of the acceleration ramp
- During deceleration:
  - Increase of the deceleration ramp:
- With increasing load and constant speed:
  - When reaching the motor-current limit value:
    Derating of the output frequency to 0 Hz.
  - When reaching the generator current limit:
    Increase of the output frequency to maximum frequency (C0011).
  - Stop the output frequency change if the load falls below the limit value.
  - If a sudden load is generated at the motor shaft (e.g. drive is blocked), the overcurrent switch-off can be activated (fault message OCX).
- C0023 = 30 % and C0014 = -2-, -3-:
  - For motor and generator overload (C0054 > C0022):
    Derating of the output frequency to 0 Hz.
  - Stop the output frequency change if the load falls below the limit value.

Important

- In generator mode, the current can only be controlled correctly if a brake resistor is connected.
- C0022 and C0023 refer to the rated output current at a chopper frequency of 8 kHz. (📖 3-3)

7.3 Acceleration, deceleration, braking, stopping

7.3.1 Acceleration and deceleration times, S-ramps

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0012	Acceleration time main setpoint	5.00	0.00	{0.02 s}	1300.00	Additional setpoint ⇨ C0220
C0013	Deceleration time main setpoint	5.00	0.00	{0.02 s}	1300.00	Additional setpoint ⇨ C0221
C0182*	Integration time S–ramps	0.00	0.00	{0.01 s}	50.00	• C0182 = 0.00: Linear ramp function generator operation • C0182 > 0.00: S-shaped ramp function generator (smooth)
C0220	Acceleration time additional setpoint	5.00	0.00	{0.02 s}	1300.00	Main setpoint ⇨ C0012
C0221	Deceleration time additional setpoint	5.00	0.00	{0.02 s}	1300.00	Main setpoint ⇨ C0013

Function

The acceleration and deceleration times determine the time required by the drive to follow a setpoint change.
An adjustable transmission element (PT1) is connected behind the ramp function generator of the main setpoint (NSET1-RFG1). Thus it is possible to adjust a S-shaped acceleration or deceleration of the frequency setpoint. This function enables an absolutely smooth start or stop of the drive:

- C0182 = 0.00: Linear ramp function generator operation
- C0182 > 0.00: S-shaped ramp function generator (smooth).

Adjustment

- The acceleration and deceleration times refer to the change of the output frequency from 0 Hz to the maximum output frequency set under C0011.
- Calculate the times T_{ir} and T_{if}, which are to be set under C0012 and C0013.
  – t_{ir} and t_{if} are the times required for the change between f_1 and f_2:

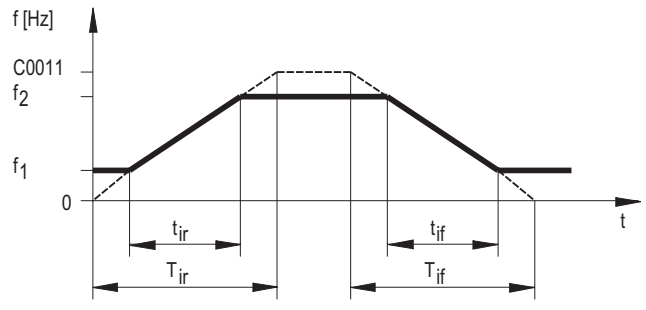
$$T_{ir} = t_{ir} \cdot \frac{C0011}{f_2 - f_1} \qquad T_{if} = t_{if} \cdot \frac{C0011}{f_2 - f_1}$$

Important

- Under unfavourable operating conditions, too short acceleration and deceleration times can lead to the deactivation of the controller with the indication of TRIP OC5. In these cases, the acceleration and deceleration times should be set short enough so that the drive can follow the speed profile without reaching I_{max} of the controller.
- C0182 is the same in all parameter sets.
- C0182 has no effect on the additional setpoint (PCTRL1-NADD)
- Application example for S-ramps: 📖 13-14, setpoint summation (basic and additional load operation)

Special features

- The ramp function generator input of the main setpoint can be set to 0 under C0410/6 (NSET1-RFG1-0). As long as the function is active, the main setpoint decreases to 0 Hz following the deceleration time set under C0013.
  – The drive can continue operation with setpoint summation or in controlled operation.
- The ramp function generator of the main setpoint can be stopped under C0410/5 (NSET1-RFG1-STOP). The ramp function generator output value remains the same as long as the function is active.



7.3.2 Quick stop (QSP)

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0105	Deceleration time QSP	5.00	0.00	{0.02 s}	1300.00	QSP = Quick stop

Function

Quick stop decelerates the drive to standstill according to the deceleration time set under C0105.
If f falls below the threshold C0019, the DC-injection brake (DCB) will be activated. After the holding time (C0106) is over, the controller sets pulse inhibit (display keypad. IMP). (📖 7-17)

Activation

- C0410/4 ≠ 0:
  - LOW-Pegel at signal source for QSP (invert level with C0411)
- C0469 = -2-: STOP .
  - Restart with RUN
- C0007 = -14- ... -22-, -34-, -47-:
  - LOW level at X3/E3 and X3/E4
  - HIGH level at X3/E3 and X3/E4 when switching on the mains
- C0007 = -46-, -49-:
  - LOW level at X3/E2
- C007 = -2-, -4-, -8-, -9-, -13-,-30-, -31-, -32-, -36-, -37-,-40-,-43-, -45-:
  - LOW level at X3/E3
- C0007 = -33-, -42-:
  - LOW level at X3/E4

Important

- Quick stop has an effect on the main setpoint and the additional setpoint.
- Quick stop does not have an influence on the process controller.

7.3.3 Change of the direction of rotation (CW/CCW)

Function

change of the motor direction of rotation via digital control signals. The time required for changeover depends on the ramp times set for the main setpoint (deceleration time C0013, acceleration time C0012, acceleration time S ramps C0182).

Not failsafe change of the direction of rotation

Activation

- C0007 = -0- ... -13-, -23-, -43-, -45-: Change over via X3/E4.
- C0410/3 ≠ 0: Changeover via freely configurable signal source.

If the controller is connected in correct phase sequence and if the inputs are HIGH active

- a CW rotary field is generated when a LOW signal is applied, and a CCW rotary field when a HIGH signal is applied.

Important

- The drive can reverse the direction of rotation in the event of a control-voltage failure or an open circuit.
- CW/CCW changeover only in the main setpoint.

Failsafe change of the direction of rotation

Activation

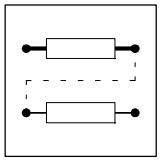
- C0007 = -14- ... -22-, -34-, -47-: Failsafe changeover of the direction of rotation via X3/E3, X3/E4.
- C0410/22 ≠ 0 and C0410/23 ≠ 0: Failsafe changeover via free configurable signal source.

If the controller is connected in correct phase sequence and if the inputs are HIGH active

Function	Signal source	
	Level for CW/QSP	Level for CCW/QSP
CCW rotation	LOW	HIGH
CW rotation	HIGH	LOW
Quick stop	LOW	LOW
unchanged	HIGH	HIGH

Important

- HIGH signal at CW/QSP and CCW/QSP: The direction of rotation results from the first active signal.
- HIGH signal when switching on the mains at CW/QSP and CCW/QSP: The controller activates quick stop (QSP).
- CW/CCW changeover only in the main setpoint.



7.3.4 Braking without brake resistor

7.3.4.1 DC-injection brake (DCB)

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0035*↲	Selection DCB	-0-	-0-	Brake voltage selection under C0036		
			-1-	Brake current selection under C0036		
C0036	Voltage/current DCB	→	0	{0.02 %}	150 %	→ depends on the unit ● Reference M_r, I_r
C0107	Holding time DCB	999.00	1.00	{0.01 s}	999.00	Holding time, if DCB is activated via an external terminal or control word. 999.00 s = ∞
C0196*↲	Activation of auto–DCB	-0-	-0-	Auto DCB active if PCTRL1-SET3 < C0019		
			-1-	Auto DCB active if PCTRL1-SET3 < C0019 **and** NSET1-RFG1-IN < C0019		
C0019	Threshold for auto DCB	0.10	0.00	{0.02 Hz}	480.00	DCB=DC-injection brake 0.00 s = Auto DCB not active
C0106	Holding time auto DCB	0.50	0.00	{0.01 s}	999.00	Holding time, if DCB is activated because the value falls below the setting in C0019. 0.00 s = Auto DCB not active 999.00 s = ∞

Function

DC-injection braking enables fast deceleration of the drive to standstill without using an external brake resistor.

- The brake torque is lower than in generator mode braking with external brake resistor.
  - Max. brake torque: approx. 20 % ... 30 % of the rated motor torque.
- A brake voltage or a brake current can be selected.
- C0196 improves the starting characteristic of the motor when the automatic DC-injection brake is activated (e. g. for hoist operation).

Adjustment

1. Determine under C0035 whether a brake voltage or brake current is to be preselected.
2. Indicate under C0036 a percentage for the brake voltage or the brake current.
   - If C0035 = -0- the selection refers to the rated controller voltage [V_r].
   - If C0035 = -1- the selection refers to the rated controller current [I_r].
3. Select how to activate the DC-injection brake:
   - Via digital input signal (configuration under C0410/15)
   - Automatically when the value falls below the threshold C0019 (condition: C0106 > 0.00 s)

Activation via input signal

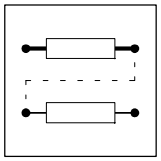
With HIGH active inputs:

Code		HIGH signal to	Function
C0007	-17-	X3/E1	DCB is active until X3/E1 = LOW.
	-3-, -7-, -14-, 19	X3/E2	DCB is active until X3/E2 = LOW.
	-0-, -5-, -11-, -25-, -29-, -41-, -42-, -48-	X3/E3	DCB is active until X3/E3 = LOW.
	-31-, -36-, -51-	X3/E4	DCB is active until X3/E4 = LOW.
C0410/15	≠ 0	Signal source	DCB is active until signal source = LOW.

After the holding time (C0106) is over, the controller sets pulse inhibit (display keypad. IMP).

Automatic activation

1. Select a holding time >0.00 s under C0106:
   - The automatic DC-injection brake remains active for the time set. Afterwards, the controller is inhibited (CINH).
2. The input conditions for the automatic DC-injection braking can be selected under C0196.
   - C0196 = -0-: DCB active if C0050 < C0019
   - C0196 = -1-: DCB active if C0050 < C0019 **and** setpoint < C0019
3. Set the threshold under C0019:
   - The threshold indicates when the DC-injection brake is activated.



Important

- C0035 = -1-
  - The DC motor current is directly set under C0036 (ref. to rated controller current).
- C0035 = -0-
  - The DC motor current is indirectly set under C0036 (ref. to rated controller voltage).
- Overlong operation and excessive DC motor current can overheat the connected motor!

Special features

- With C0019 it is possible to set a dead band for the setpoint. If the DC-injection brake is not to be active, set C0106 = 0.00 s.
- C0019 can be related to an application datum (📖 7-50).

7.3.4.2 AC motor braking

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0988*	DC-bus voltage threshold for DC-bus voltage control	0	0 {1 %} 200	• C988 = 0 % – Parameter set changeover via DC-bus voltage is deactivated • Changeover always between PAR1 and PAR2 • Parameter set changeover via terminal, bus or PC is not possible if C988 > 0!

Function

With the parameter set changeover depending on the DC-bus voltage, the AC motor braking can be used alternatively to DC braking (DCB):

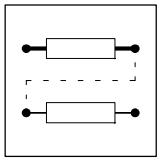
- AC-motor braking is a method without external brake resistor for the control mode “V/f-characteristic control with linear characteristic (C0014 = -2-)”.
- With a mains voltage up to approx. 400 V AC it is possible to reach braking times shorter than with DC braking (DCB).
- The times for generator braking with an external brake resistor are approx. 33 % shorter than for AC motor braking.

Configuration of the parameter sets

Code	PAR1 setting (active in normal operation)	PAR2 setting (active in brake operation)	Note
C0013/ C0105	Braking time required for AC braking	Deceleration time of the drive with max. inertia load without getting the message OU (overvoltage) during deceleration.	• C0013 for braking along the main setpoint ramp • C0105 for braking along the QSP ramp
C0015	Value adapted to the drive, e.g. V/f vertex = 50 Hz	Depending on the drive power up to min. 25 % of the value under C0015 in PAR1: • Rule of thumb: 2.2 kW ⇨ 50 % • Reduce the value for lower drive power and increase the value for higher drive power.	Thus, the motor energy is reduced by overexcitation in PAR 2.
C0016	Value adapted to the drive, e. g. V_{min} = 5 %	Depending on the drive power up to 500 % of the value under C0016 in PAR1: • Rule of thumb: 2.2 kW ⇨ factor 3 • Increase the factor for lower drive power, decrease the factor for higher drive power.	Thus also in the lower speed range, the energy in the motor is decreased by overexcitation in PAR2.
C0988	Changeover threshold Setting according to the mains voltage:		
	230 V, 400 V 440 V 460 V 480 V 500 V	⇨ 112 % ⇨ 123 % ⇨ 129 % ⇨ 134 % ⇨ 140 %	

Important

- The AC motor brake can only be used with the control mode “V/f-characteristic control with linear characteristic” (C0014 = -2-).
- Parameter set changeover via terminal, bus or PC is not possible if C988 > 0!
- To comply with the requirements above, the deceleration time of the AC brake in PAR1 must be longer when the mains voltage is higher. With a high mains voltage it is therefore possible to achieve shorter deceleration times with the DCB.
- C0988 is the same in all parameter sets.



7.4 Configuration of analog and digital setpoints and actual values

7.4.1 Setpoint selection

Analog signals					
Code		**Possible settings**			**IMPORTANT**
No.	**Name**	**Lenze**	**Selection**		
C0001↵	Setpoint selection (operating mode)	-0-	-0-	Setpoint selection via AIN1 (X3/8 or X3/1U, X3/1I)	• Valid for C0001 = 0 ... 3: Control is alway possible via terminals or PC/keypad at the same time. • **The change of C0001 will be copied to the corresponding subcode of C0412. A free configuration of C0412 does not change C0001!** • If C0412 is freely configured (check C0005 = 255), C0001 has no influence on C0412. • C0001 = 3 must be set for the setpoint selection via a process data channel of an AIF bus module! Otherwise the process data will not be evaluated • AIF bus modules are INTERBUS 2111, PROFIBUS-DP 2131, system bus (CAN) 2171/2172, LECOM A/B/LI 2102
			-1-	Setpoint selection via keypad or parameter channel of an AIF bus module	
			-2-	Setpoint selection via AIN1 (X3/8 or X3/1U, X3/1I)	
			-3-	Setpoint selection via a process data channel of an AIF bus module	

Function

- C0001 = -1-: Setpoint source is the parameter channel of AIF (Automation Interface).
- C0001 = -3-: Setpoint source is the process data channel of AIF.
- C0001 = -0-, -2-: Setpoint source is the terminal AIN1.

Important

- When changing the setting under C0001 = -0-, -1- or -2-, the drive can start after the controller has been enabled.
- C0001 = 3 must be set for the setpoint selection via a process data channel of an AIF bus module! Otherwise the process data will not be evaluated.
- If C0001 = -3- QSP will be set after mains connection!
  - With PC: QSP can be reset with the control word C0135, bit 3 = 0.
  - With keypad: C0469 = -2-. RUN

7.4.2 Analog setpoints via terminal

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0034*↲	Setpoint selection range Standard–I/O (X3/8)	-0-	-0-	0 ... 5 V / 0 ... 10 V / 0 ... 20 mA		• Observe the switch position of the function module! • C0034 = -2-: – C0010 not effective
			-1-	4 ... 20 mA		
			-2-	-10 V ... +10 V		
			-3-	4 ... 20 mA Open-circuit monitoring (TRIP Sd5, if I < 4 mA)		
			-4- ... -13-	Reserved		
C0034*↲ (A)	Setpoint selection range Application-I/O					Observe the jumper setting of the function module!
1	X3/1U, X3/1I	-0-	-0-	Voltage unipolar 0 ... 5 V / 0 ... 10 V		
2	X3/2U, X3/2I		-1-	Voltage bipolar -10 V ... +10 V		Minimum output frequency (C0010) not effective
			-2-	Current 0 ... 20 mA		
			-3-	Current 4 ... 20 mA		
			-4-	Current 4 ... 20 mA open-circuit monitored		TRIP Sd5 if I < 4 mA
C0026*	Offset analog input 1 (AIN1–OFFSET)	0.0	-200.0	{0.1 %}	200.0	• Setting for X3/8 or X3/1U, X3/1I • The upper limit of the setpoint range in C0034 corresponds to 100% • C0026 and C0413/1 are the same
C0027*	Gain analog input 1 (AIN1-GAIN)	100.0	-1500.0	{0.1 %}	1500.0	• Setting for X3/8 or X3/1U, X3/1I • 100.0 % = Gain 1 • Inverse setpoint selection through negative gain and negative offset • C0027 and C0414/1 are the same
C0413*	Offset analog inputs					The upper limit of the setpoint range in C0034 corresponds to 100%
1	AIN1-OFFSET	0.0	-200.0	{0.1 %}	200.0	Setting for X3/8 or X3/1U, X3/1I C0413/1 and C0026 are the same
2	AIN2-OFFSET	0.0				Setting for X3/2U, X3/2I (only application-I/O)
C0414*	Gain analog inputs					• 100.0 % = Gain 1 • Inverse setpoint selection through negative gain and negative offset
1	AIN1-GAIN	100.0	-1500.0	{0.1 %}	1500.0	Setting for X3/8 or X3/1U, X3/1I C0414/1 and C0027 are the same
2	AIN2-GAIN	100.0				Setting for X3/2U, X3/2I (only application-I/O)

Function

Selection and adjustment of analog signals via terminal as setpoint or as actual value.

Permanently configured activation

Select a configuration suitable for the application under C0005.

Freely configured activation

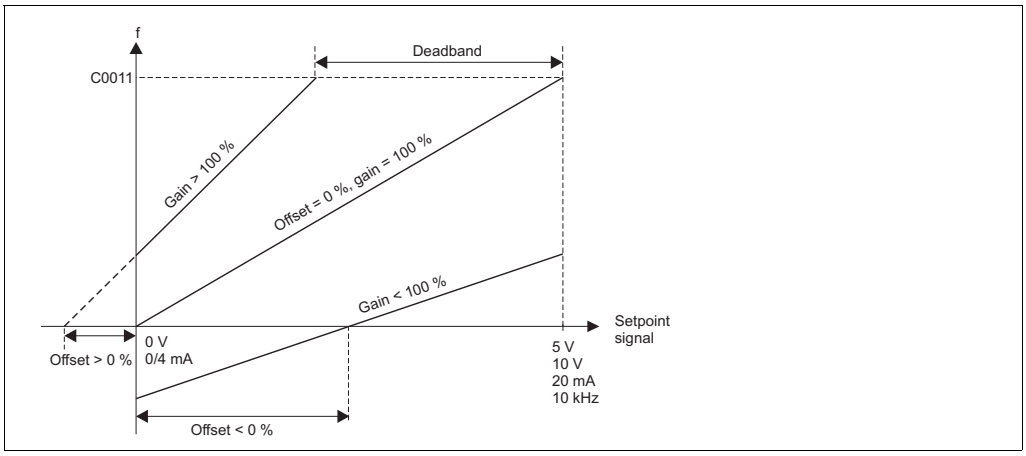
Assign an analog input terminal to the required setpoint or actual value under C0412 (C0412/x = 1 oder 4).

Adjustment

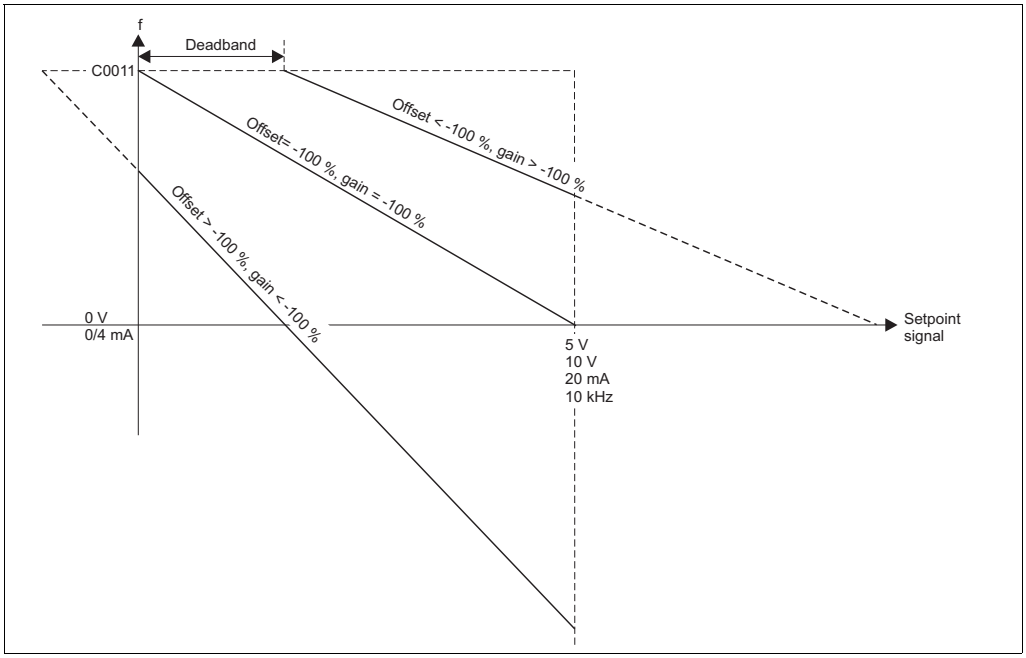
1. Select the setpoint range under C0034.
2. Set the same range for the switch and the jumper position (function module)! Otherwise the setpoint signal will not be interpreted correctly.
   – The setpoint signal is only evaluated with the setpoint range (C0034) set, independently of the gain set.
   – The min. output frequency (C0010) corresponds to 0 % setpoint signal.
   – With offset ≠ 0 % and/or inverse setpoint selection, the value set under C0010 may not be reached.
3. If necessary, adjust the gain (C0414)
   – The gain always acts on the setpoint signal and the offset at the same time.
   – 100 % corresponds to gain factor = 1.
4. If necessary, adjust the offset (C0413).
   – An offset shifts the characteristic (📖 7-21).
   – A dead band can be set through the offset and if necessary via C0239 (lower frequency limit).

Adjustment

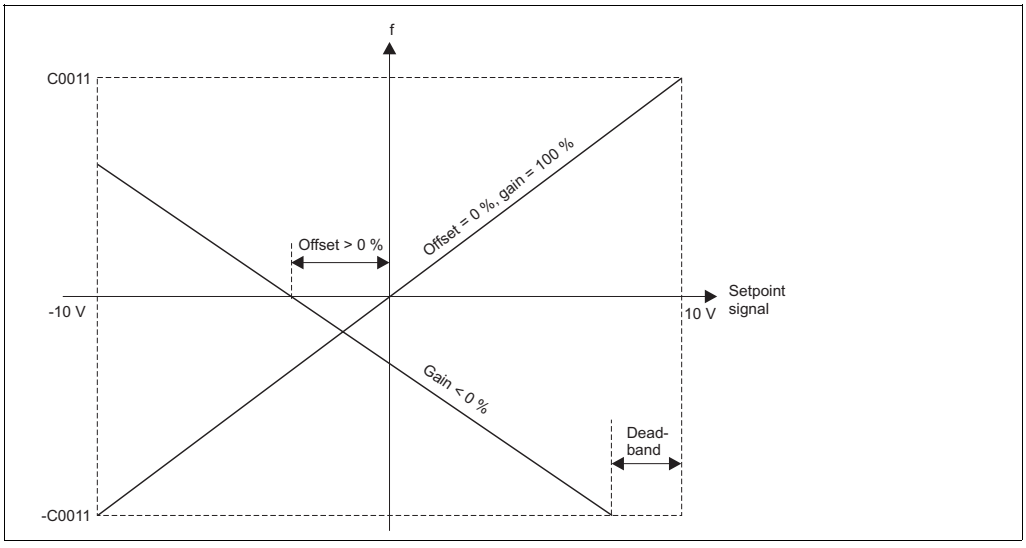
Unipolar setpoint selection



Inverse setpoint selection



Bipolar setpoint selection



Example

A deadband of + 2 V (= 20 %) is to be set for an inverse setpoint selection (0 ... +10 V). With an increasing setpoint signal the output frequency is to be inversed and reach - 30 % at a setpoint of + 10 V.

Tip:

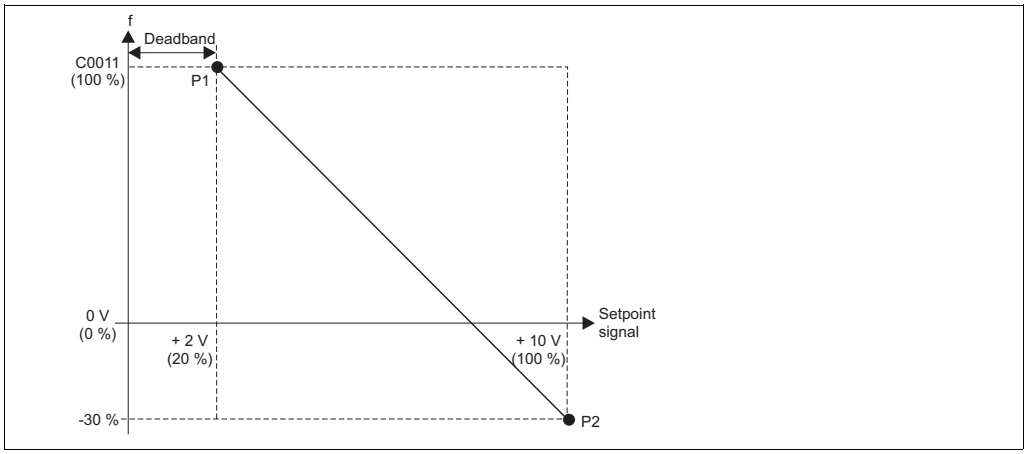
- P1 and P2 can be any point on a line.
- Consider the sign of the number.

Calculate the gain

$$\text{Gain [\%]} = \frac{f(P_2) - f(P_1)}{V(P_2) - V(P_1)} \cdot 100\,\% = \frac{-30\,\% - 100\,\%}{100\,\% - 20\,\%} \cdot 100\,\% = -162.5\,\%$$

Calculate the offset

$$\text{Offset}(P_2)\,[\%] = \frac{f(P_2)\,[\%]}{\text{Gain [\%]}} \cdot 100\,\% - V(P_2)\,[\%] = \frac{-30\,\%}{-162.5\,\%} \cdot 100\,\% - 100\,\% = -81.5\,\%$$



Calibration during operation with a process controller

If, for instance, in a pressure control the control range is to be limited to a value lower than the rated sensor value P_r, the pressure setpoint can be proportionally reduced through the gain of the analog input (C0027, C0414).

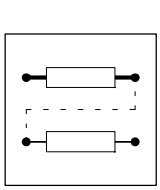
Example:

- Act. pressure via pressure sensor (P_r = 0 - 200 mbar) at X3/2U (C0412/5 = 4).
- Analog pressure setpoint via X3/1U (C0412/4 = 1).
- The max. pressure is to be limited to 120 mbar. Reduce the effective pressure setpoint via the gain of the analog input.

$$C0414/1 = \frac{P_1}{P_r} \cdot 100\,\% = \frac{120\ \text{mbar}}{200\ \text{mbar}} \cdot 100\,\% = 60\,\%$$

Important

C0026, C0027, C0413 and C0414 are the same in all parameter sets.



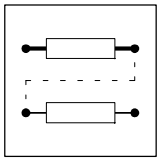
7.4.3 Digital setpoints via frequency input

Code		Possible settings						IMPORTANT
No.	Name	Lenze	Selection					
C0425↲*	Configuration frequency input single track X3/E1 (DFIN1)	-2-		Frequency	Resolution	Scanning rate	Max. frequency	• "Frequency" refers to the internal normalization (e. g. C0011 etc.) • "Max. frequency" is the max. frequency which can be processed depending on C0425. If the value for a setting is exceeded, it can be porportionally adjusted under C0426: – Example: C0425 = -0-, (300 Hz) – C0426 = 33.3 % enables the correct evaluation with C0425 = -0- • Reference: C0011
			-0-	100 Hz	1/200	1 s	300 Hz	
			-1-	1 kHz	1/200	100 ms	3 kHz	
			-2-	10 kHz	1/200	10 ms	10 kHz	
			-3-	10 kHz	1/1000	50 ms	10 kHz	
			-4-	10 kHz	1/10000	500 ms	10 kHz	
			-5- (A)	100 kHz	1/400	2 ms	100 kHz	
			-6- (A)	100 kHz	1/1000	5 ms	100 kHz	
			-7- (A)	100 kHz	1/2000	10 ms	100 kHz	
	Configuration frequency input two track X3/E1, X3/E2 (DFIN1)		-10- (A)	100 Hz	1/200	1 s	300 Hz	
			-11- (A)	1 kHz	1/200	100 ms	3 kHz	
			-12- (A)	10 kHz	1/200	10 ms	10 kHz	
			-13- (A)	10 kHz	1/1000	50 ms	10 kHz	
			-14- (A)	10 kHz	1/10000	500 ms	10 kHz	
			-15- (A)	100 kHz	1/400	2 ms	100 kHz	
			-16- (A)	100 kHz	1/1000	5 ms	100 kHz	
			-17- (A)	100 kHz	1/2000	10 ms	100 kHz	
C0426*	Gain frequency input X3/E1, X3/E2 (A) (DFIN1-GAIN)	100	-1500.0		{0.1 %}		1500.0	
C0427*	Offset frequency input X3/E1, X3/E2 (A) (DFIN1-OFFSET)	0.0	-100.0		{0.1 %}		100.0	
C0428* (A)	Gain frequency output (DFOUT1-OUT)	100	0.0		{0.1 %}		1500.0	
C0435*↲ (A)	Automatic adjustment frequency input	0	0 = not active		{1}		4096	• Only required for speed control with digital feedback via HTL encoder • Calculates the gain C0426, depending on C0425 and C0011 • C0426 must be calculated again after every change of C0011 or C0425 • **Enter the increment divided by the number of pole pairs of the motor.** – Example: Increment encoder = 4096, motor 4-pole – C0435 = 2048

Function

Selection and adjustment of a digital frequency as setpoint or as actual value.

- 0 Hz ... 10 kHz at X3/E1 for operation with standard-I/O
- 0 Hz ... 100 kHz at X3/E1 (single track) or at X3/E1 and X3/E2 (two track) for operation with application-I/O



Permanently configured activation

1. C0007 = -28- ... -45-, -48-, -49-, -50-, -51- configures X3/E1 as frequency input.
2. Select the configuration which evaluates the frequency input (C0005 = -2-, -3-, -5-, -6-, -7-).

Freely configured activation

Assign the signal source "frequency input" to the required setpoint or actual value under C0412 (C0412/x = 2).

Adjustment

1. Enter the frequency, resolution scanning time and type (single track or two track) of the setpoint signal (C0425).
2. If necessary, adjust the gain (C0426)
   – The gain always acts on the setpoint signal and the offset at the same time.
   – 100 % corresponds to gain factor = 1(📖 7-21).
3. If necessary, adjust the offset (C0427).
   – An offset shifts the characteristic (📖 7-21).

Note

- For higher accuracy requirements select a higher resolution under C0425 under consideration of the scanning time.
- The direction of rotation of the motor can be evaluated over the two track frequency signal.

Important

If X3/E1 or X3/E1 and X3/E2 are used as frequency inputs, it must be ensured that the inputs are not linked to other digital signals. These links must be disconnected under C0410, otherwise the controller will not interprete the digital setpoint signal correctly. (📖 14-1 ff)

7.4.4 Setpoints via function ”Motor potentiometer”

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0265*↲	Configuration motor potentiomenter	-3-	-0- Start value = power off	• Start value: output frequency which is approached with Tir (C0012) when the mains is switched on and the motor potentiometer is activated: – ”Power off” = act. value if mains is off – ”C0010”: min. output frequency from C0010 – ”0” = output frequency 0 Hz • C0265 = -3-, -4-, -5-: – QSP reduces the motor potentiometer along the QSP ramp (C0105)
			-1- Start value = C0010	
			-2- Start value = 0	
			-3- Start value = power off QSP, if UP/DOWN = LOW	
			-4- Start value = C0010 QSP, if UP/DOWN = LOW	
			-5- Start value = 0 QSP, if UP/DOWN = LOW	

Function

Setpoint selection via two digital signals UP/DOWN, which, for instance, can be controlled via contact keys.
The output frequency is changed via the acceleration and deceleration times set for the main setpoint (C0012/C0013) or for the additional setpoint (C0220/C0221).

Permanently configured activation

C0007 = -10-, -11-, -12-, -13-, -21-, -23-, -24-, -25-, -26-, -27-, -44-

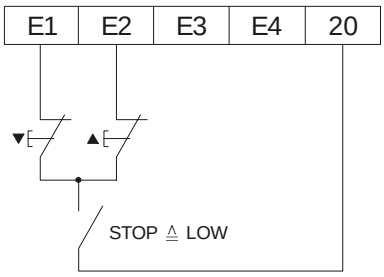
Permanently configured activation

1. Connect UP and DOWN to external signal sources: C0410/7 (UP) ≠ 0 and C0410/8 (DOWN) ≠ 0
2. Assign the signal source ”motor potentiometer” to the required setpoint under C0412 (C0412/x = 3). (📖 7-35)

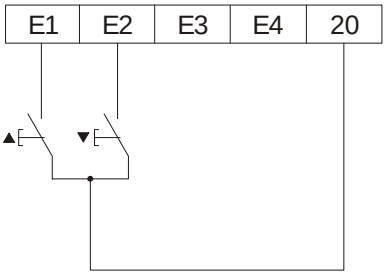
Function	UP	DOWN
Setpoint deceleration to 0 Hz along the QSP ramp (C0105).	LOW	LOW
Setpoint deceleration to the minimum output frequency (C0010) along the main setpoint deceleration ramp (Setpoint must have exceeded C0010 before)	LOW	HIGH
Accelerate the setpoint to the max. output frequency (C0011) along the main setpoint acceleration ramp (C0012)	HIGH	LOW
Setpoint remains constant	HIGH	HIGH

Examples

Open-circuit protected activation of the function “Motor potentiometer” via normally closed contacts
E1 = ”DOWN”: Configuration under C0410/8 = 1
E2 = ”UP”: Configuration under C0410/7 = 2



Open-circuit unprotected activation of the function “Motor potentiometer” via normally-open contacts
E1 = ”DOWN”: Configuration under C0410/8 = 1
E2 = ”UP”: Configuration under C0410/7 = 2



Important

- Usually, the function ”Motor potentiometer” requires the application of an I/O-module. It can however be implemented using digital bus signals.
- If the setpoint selection via motor potentiometer is used together with the function module standard I/O:
  - In C0412 the output signal MPOT1-OUT must only be linked to the signals NSET1-N1, NSET1-N2 or PCTRL1-NADD!
  - If it is linked to other signals, a setpoint jump will occur.
- JOG frequencies have priority over the function “Motor potentiometer”.
- The setpoint is saved
  - when switching the mains (see C0265),
  - when the controller is inhibited (CINH),
  - when having fault messages
- C0265 = -3-, -4-, -5-:
  - If the QSP function is activated with C0410/4, the motor potentiometer is reset to 0 Hz along the QSP ramp (C0105).
- The additional setpoint is added to the motor potentiometer function.

7.4.5 Setpoints via JOG frequencies

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0037	JOG1	20.00	-480.00	{0.02 Hz}	480.00	JOG = JOG frequency
C0038	JOG2	30.00	-480.00	{0.02 Hz}	480.00	
C0039	JOG3	40.00	-480.00	{0.02 Hz}	480.00	

Function

Up to three JOG setpoints can be stored and retrieved.

Activation

- C007 = -10-, -11-, -12-, -13-, -21-:
- C0410/1 ≠ 0 and/or C0410/2 ≠ 0

With HIGH active inputs:

Setpoint input via	signal to	
	JOG1/3	JOG2/3
other setpoint source	LOW	LOW
JOG 1	HIGH	LOW
JOG 2	LOW	HIGH
JOG 3	HIGH	HIGH

Important

- The setting of C0011 limits the output frequency with JOG values.
- The setting of C0010 is not effective when selecting the setpoint by means of JOG values.
- JOG values have priority over NSET1-N1 and NSET1-N2.

Special features

- You can relate the display value of the parameter to a process value. (📖 7-50)
- The additional setpoint is added to the JOG frequencies.

7.4.6 Setpoints via the keypad

Function

The setpoint can be selected via the keypad.

Adjustment

1. With ⬅ or ➡ to Set
2. Adjust the setpoint with ▼ or ▲
   – If the controller is enabled, the changed setpoint has a direct effect on the drive.
   – The setpoint is saved when the controller is inhibited. After the controller has been enabled, the drive accelerates or decelerates to the last setpoint.
   – Under C0140 it is possible to read and alternatively set the keypad setpoint.

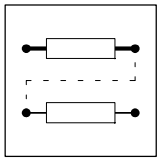
Important

- Setpoints selected by means of the keypad are saved when separating the controller from the mains or interrupting the operation.
- The keypad setpoint is added to the main setpoint.
- Setpoint selection via Set has an effect on NSET1-N1 and NSET1-N2.
  – Separate setpoint selection for NSET1-N1 and NSET-N2 is possible via C0046 and C0044. Set C0412/1 = 0 and C0412/2 = 0.
- Set C0140 = 0, if the setpoint is not selected via Set .
- The drive can start again after controller enable!
- Observe the start conditions under C0142 (📖 7-9).

7.4.7 Setpoints via a bus system

Function

Setpoints or actual values can be selected via a bus function module in FIF or a bus module in AIF.
A more detailed description can be obtained from the corresponding Operating Instructions. (📖 12-2) .



7.4.8 Setpoint changeover (manual/remote changeover)

Function

- Changeover between the setpoints NSET1-N1 and NSET1-N2 (signal flow charts: 📖 14-1 ff).
- With manual/remote changeover (M/Re) it is for instance possible to change between remote operation used during setting-up or service and local operation (manual operation).
  - For manual operation, the remote source must not be influenced.
  - In manual operation, the setpoint is selected via potentiometer, motor potentiometer or keypad/PC.
- The following changeovers are possible:
  - Bus operation ⇔ Keypad or PC
  - Bus operation ⇔ Setpoint X3/8, X3/1U, X3/2U, X3/1I, X3/2I oder X3/E1 (only 8200 vector)
  - Bus operation ⇔ Function “Motor potentiometer” (only 8200 vector)
  - Keypad or PC ⇔ Setpoint X3/8, X3/1U, X3/2U, X3/1I, X3/2I or X3/E1
  - Function “Motor potentiometer” ⇔ Setpoint X3/8, X3/1U, X3/2U, X3/1I, X3/2I or X3/E1
  - Setpoint X3/8, X3/1U, X3/2U, X3/1I or X3/2I ⇔ Setpoint X3/E1
  - Setpoint X3/1U, X3/1I ⇔ Setpoint X3/2U, X3/2I

Activation

- Assign C0410/17 (M/Re) to a signal source.
- With HIGH active inputs:
  - Signal source for M/Re = HIGH activates manual operation.

Activation of the changeover ”Bus operation ⇔ keypad or PC”

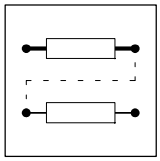
- Internal inversion a digital input under C0411.
- Assign this input to C0410/17 (M/Re).
- Example:
  - Invert X3/E3 (e.g. with C0411 = -4-).
  - Assign X3/E3 to the subcode C0410/17 (C0410/17 = 3).

Important

- Assign setpoint for remote operation C0412/1.
- Assign setpoint for manual operation C0412/2.
- The safety function CINH and QSP activated in remote operation are reset when changing to manual operation. Check whether the host activates these safety functions again when changing back from manual to remote operation.
- JOG frequencies are effective independently of the manual/remote changeover.
- Set act on NSET1-N1 **and** NSET-N2.
  - Use C0046 or C0044 for separated setpoint selection.
- The key STOP of the keypad is not active in manual operation!

7.5 Entry/automatic detection of the motor data

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0087↵	Rated motor speed	1390	300	{1 rpm}	16000	
C0088	Rated motor current	→	0.0	{0.1 A}	480.0	→ depends on the unit 0.0 ... 2.0 x rated controller output current
C0089	Rated motor frequency	50	10	{1 Hz}	960	
C0090	Rated motor voltage	→	50	{1 V}	500	→ depends on the unit
C0091	Motor cos φ	→	0.40	{0.1}	1.0	→ depends on the unit
C0084	Motor stator resistance	0.000	0.000	{0.001 Ω}	64.000	
C0092	Motor stator inductance	0.0	0.0	{0.1 mH}	2000.0	
[C0148]*	Motor parameter identification	-0-	-0-	Identification not active		• C0087, C0088, C0089, C0090, C0091 must be entered correctly • The motor stator resistance (C0084) is measured • V/f-rated frequency (C0015), slip (C0021) and the motor stator inductivity are calculated • The identification takes approx. 30 s • After the identification is over, – the green LED at the controller is blinking. – the segment IMP at the keypad or in the GDC is active
			-1-	Start identification		



Function

Complete detection of the motor data and the influences of the motor cable.
For first selection set C0014 = -4- (vector control) or C0014 = -5- (torque selection).
Otherwise, commissioning is not possible.

Adjustment

1. Inhibit the controller. If necessary, wait until the drive comes to standstill.
2. Enter C0087, C0088, C0089, C0090 and C0091 of your motor (see nameplate):
   – It is absolutely necessary to enter correct values because all important parameters, such as slip compensation, idling current and I^2t depend on them.
   – Enter the values for the rated motor current (C0088) and the rated motor voltage (C0090) depending on the type of connection (star or delta).
3. Select C0148 = -1-, acknowledge with ENTER .
4. Enable the controller. The identification starts (green LED at the controller is blinking very quickly).
   – The motor stator resistance is measured and the motor stator inductivity is calculated from the entered data . C0015 and C0021 are assigned automatically.
   – The identification takes approx. 30 s.
   – The identification is completed when the green LED at the controller is on (keypad, GDC: IMP is active).
5. Inhibit the controller.

Important

- Ensure that the motor is cold when the identification is started!
  – During the identification, the current flows via the outputs U, V of the controller.
  – It is not necessary to disconnect the load machine. Holding brakes can remain in their brake position.
  – With idling motors the motor shaft can be shifted a little bit.
- The motor data adjustment (max. ±25 %) required for the compensation of temperature-depending changes is set automatically during operation.
  – After mains switching, the values for C0084 and C0092 calculated under C0148 are effective.
- C0084 and C0092 can be entered or corrected manually.
- The identification is only made for the parameter set activated via the digital input signals.
  – If you want to enter motor data for another parameter set, it is necessary to change to this parameter set (via digital input signals) and to start the identification again.
  – The motor parameters can be manually transferred to other parameter sets under C0002. The corresponding parameter set does not have to be active.

Note

The identification of the motor parameters also influences the smooth running characteristic. Therefore it is possible to optimize the smooth running features for low speed using the contol mode "V/f-characteristic control with linear characteristic" (C0014 = -2-.

7.6 Process controller, current limitation controller

7.6.1 PID controller as process controller

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0070	Process controller gain	1.00	0.00	{0.01}	300.00	0.00 = P component not active
C0071	Integral action time of process controller	100	10	{1}	9999	9999 = I-component not active
C0072	Differential component process controller	0.0	0.0	{0.1}	5.0	0.0 = D-component not active
C0074	Influence of process controller	0.0	0.0	{0.1 %}	100.0	
C0238↵	Frequency precontrol	-2-	-0-	No precontrol (only process controller)		Full influence of process controller
			-1-	Precontrol (total setpoint + process controller)		Limited influence of process controller
			-2-	No precontrol (only total setpoint)		No influence of process controller (not active)
						Total setpoint (PCTRL1-SET3) = main setpoint + additional setpoint

Function

Control of pressure, temperature, flow rate, humidity, level, dancer position, speed, ...
The process controller requires a setpoint and an actual value (e.g. from a sensor). If the setpoint and the actual value are selected as analog values (potentiometer, PLC), the controller must be equipped with an application-I/O to build up a control circuit.

Adjustment

C0071	Resulting integral action time T_r
10 ... 5000	10 ms ... 5000 ms
5000 ... 6000	5 s ... 10 s
6000 ... 7000	10 s ... 100 s
7000 ... 8000	100 s ... 1000 s
8000 ... 9998	1000 s ... 9998 s

The values in the following table are for orientation only. Fine adjustments will always be required.
Set C0070, C0071 and C0072 so that in the event of setpoint and actual value changes, the target value will be

- reached quickly
- with minimum overshooting

.

Guide values for pressure control and flow rate

- The differential component K_D (C0072) is usually not required for pressure and flow rate controls (C0072 = 0).
- Set the influence (C0074) to 100 %.
- Deactivate the frequency precontrol (C0238 = -0-)

Code	Gases	Liquids
C0070 (K_P)	0.1	0.02 ... 0.1
C0071 (T_r)	5000 (T_r = 5 s)	200 ... 1000 (T_r = 0.2 s ... 1 s)
C0072 (K_D)	0	0

Guide values for speed control

See application example “speed control” (📖 13-8).

Code		
C0070 (K_P)	5	
C0071 (T_r)	100 (T_r = 0.1 s)	
C0072 (K_D)	0	

PID controller influence (C0074)

The control factor is important for a process control with frequency precontrol (C0238 = -1-), e. g. speed control.

- The control factor is calculated from the difference of the values under C0050 (output frequency) and C0051 (actual process controller value).
- The control factor determines the influence C0074 of the process controller.
- The influence (C0074) refers to the maximum output frequency C0011.
- C0074 influences the stability of the control circuit. C0074 should be as low as possible.

Calculation of the influence C0074 [%]:

$$\text{Influence}[\%] = \frac{\text{C0050} - \text{C0051}}{\text{C0011}} \cdot 100\%$$

Example:
The influence is to be calculated for the following values:
C0011 = 50 Hz, C0050 = 53 Hz, C0051 = 50 Hz

$$6\% = \frac{53\text{Hz} - 50\text{Hz}}{50\text{Hz}} \cdot 100\%$$

- Set the influence so that the output of the process control covers the value calculated for every operating point.
  - For the example (influence = 6 %) set e.g. C0074 = 10 %. This is a guide value and includes tolerances which must always be considered.
- If the influence is too high (C0074) the control circuit may become instable.

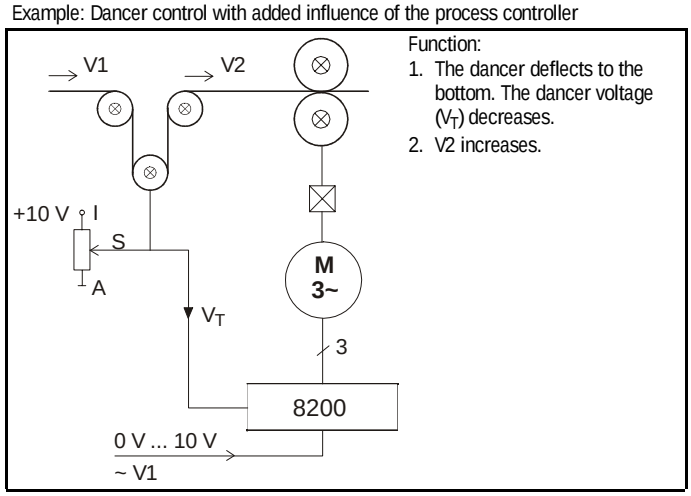
Added process controller influence

Conditions:

- C0051 = positive act. value
- C0181 = input positive setpoint
- C0238 = -1- (with frequency precontrol)
- Potentiometer connections of the dancer
  - Stop (E) = +10 V
  - Start (A) = GND

The direction of control action of the process controller is added to the main setpoint.

Example: Dancer control with added influence of the process controller



Function:
1. The dancer deflects to the bottom. The dancer voltage (V_T) decreases.
2. V2 increases.

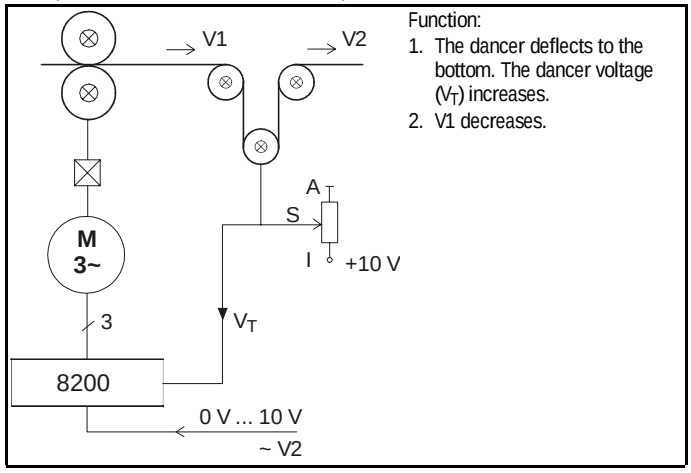
Subtracted process controller influence

Conditions:

- C0051 = positive act. value
- C0181 = input positive setpoint
- C0238 = -1- (with frequency precontrol)
- Potentiometer connections of the dancer
  - Start (A) = +10 V
  - Stop (E) = GND

The direction of the control action of the process controller output is substracted from the main setpoint.

Example: Dancer control with subtracted process controller influence



Function:
1. The dancer deflects to the bottom. The dancer voltage (V_T) increases.
2. V1 decreases.

7.6.1.1 Setpoint selection for the process controller

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0145*↲	Source process controller setpoint	-0-	-0-	Total setpoint (PCTRL1-SET3)		Main setpoint + additional setpoint
			-1-	C0181 (PCTRL1-SET2)		
			-2-	C0412/4 (PCTRL1-SET1)		
C0138*	Process controller setpoint 1 (PCTRL1-SET1)		-480.00	{0.02 Hz}	480.00	• Selection if C0412/4 = FIXED-FREE • Display, if C0412/4 ≠ FIXED-FREE
C0181*	Process controller setpoint 2 (PCTRL1-SET2)	0.00	-480.00	{0.02 Hz}	480.00	

Function

Selection of a frequency setpoint, e.g. for
- the dancer position for a dancer control in a line drive,
- the pressure setpoint in a pressure control.

Activation

C0145 = -0-
- 🕮 7-19 ff., Possible setpoint selections
  - – Process controller setpoint = precontrol value PCTRL1-SET3

C0145 = -1-
- Setpoint for process controller = value under C0181.
  - – Applications: e.g. dancer controls, pressure and flow rate controls

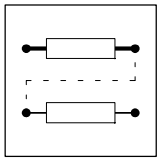
C0145 = -2-
- Setpoint for process controller = freely configured signal via C0412/4.
  - – The setpoint acts directly on the process controller
  - – Selection is also possible under C0138 (the same as C0181)

Note

Select C0145 = 0, if the setpoint is to be selected via:
- JOG values
- Set function of the keypad
- In connection with the manual/remote changeover, skip frequencies, ramp function generator, additional setpoint,
- C0044, C0046 and C0049.

Important

C0181 is the same in all parameter sets.



7.6.1.2 Actual value selection for the process controller

Function

The actual value is the signal feedback from the process (e.g. from a pressure or speed encoder).

Activation

C0412/5 ≠ 0 Freely configured signal = act. process controller value	C0051 Display of the actual process controller value (PCTRL1-ACT)

7.6.1.3 Switch-off the integral action component (PCTRL1-I-OFF)

Function

The process controller output provides the difference between setpoint and actual value, if necessary with the gain $_P$

- Thus, excessive control while the drive is starting, can be avoided. The integral action component K_I can be connected when the drive is running.
- Application: e.g. dancer position control

Activation via terminal

C0007 = -28- ... -34-, -48-, -50-, -51-: HIGH level at X3/E2	C0410/18 ≠ 0: HIGH signal at C0410/18.
The signal levels are indicated for non-inverted input signals.	

Activation via frequency threshold

C0184 > 0.0 Hz

7.6.1.4 Switch-off the process controller (PCTRL1-OFF)

Function

The process controller output does not send signals as long as this function is activated.

Activation

C0007 = -48-, -49-, -50-: HIGH level at X3/E4	C0410/19 ≠ 0: HIGH signal at C0410/19.
The signal levels are indicated for non-inverted input signals.	

7.6.1.5 Stop the process controller (PCTRL1-STOP)

Function

The process controller output remains at the value which is actual at the time of function activation. The value remains the same until the function is deactivated.

Activation

C0410/21 ≠ 0:
HIGH level at C0410/21.
The signal levels are indicated for non-inverted input signals.

7.6.2 Current limitation controller (I_{max} controller)

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0077*	Gain I_{max} controller	0.25	0.00	{0.01}	16.00	0.00 = P component not active
C0078*	Integral action time I_{max} controller	65	12	{1 ms}	9990	9990 = I-component not active

Function

For the control of high moments of inertia the I_{max} controller can be adjusted.

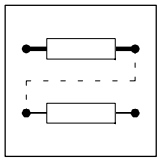
Adjustment

The Imax controller is factory set to stability.
Settings for the control of high moments of inertia:

- C0014 = -2- oder C0014 = -3- (V/f-characteritic control)
- V_P (C0077): $\approx$ 0.06
- T_i (C0078):: $\approx$ 750 ms

Important

C0077 and C0078 are the same in all parameter sets.



7.7 Free connection of analog signals

7.7.1 Free configuration of analog input signals

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0412↲	Free configuration of analog input signals			Connection between external analog signal sources and internal analog signals Analog signal source	**A selection of C0001, C0005, C0007 is copied to the corresponding subcode of C0412. A change of C0412 does not change C0001, C0005, C0007!**
1	Setpoint 1 (NSET1–N1)	1	0 255	not assigned (FIXED-FREE)	Either NSET1-N1 or NSET1-N2 active Changeover under C0410/17
2	Setpoint 2 (NSET1-N2)	1	1	X3/8 or X3/1U, X3/1I (AIN1-OUT)	
3	Additional setpoint (PCTRL1-NADD)	255	2	Frequency input (DFIN1-OUT) (observe C0410/24, C0425, C0426, C0427)	Is added to NSET1-N1, NSET1-N2, JOG values and the function Set of the keypad
4	Process controller setpoint 1 (PCTRL1-SET1)	255	3 4	Motor potentiometer (MPOT1-OUT) X3/2U, X3/2I (AIN2-OUT, application-I/O only)	
5	Act. process controller value (PCTRL1-ACT)	255	5 ... 9	Input signal = constant 0 (FIXED0)	
6	Torque setpoint or torque limit value (MCTRL1-MSET)	255	10 11	AIF input word 1 (AIF-IN.W1) AIF input word 2 (AIF-IN.W2) (Only evaluated if C0001 = 3!)	Observe C0014! An actual torque value is not necessary. 16384 ≡ 100 % torque setpoint Condition for selection via terminal (C0412/6 = 1, 2 or 4): The gain of the analog input is set to: C0414/x, C0426 = 32768/C0011 [%]
7	Reserved	255	20 ... 23	CAN-IN1.W1 ... W4 Word 1 (20) ... word 4 (23)	
8	MCTRL1-VOLT-ADD	255	30 ... 33	CAN-IN2.W1 ... W4 Word 1 (24) ... word 4 (27)	Only for special applications. Modifications only when agreed on by Lenze!
9	MCTRL1-PHI-ADD	255	200	Word-by-word assignment of the signals from the function module INTERBUS or PROFIBUS (see C0005)	

Function

- Internal analog signals can be freely assigned to external analog signal sources.
  - Analog inputs (X3/8, X3/1U, X3/2U, X3/1I, X3/2I)
  - Frequency input
  - Function “Motor potentiometer”
  - Analog process data input words
- Examples:
  - C0412/1 = 2: Signal source for setpoint 1 (NSET1-N1) is the frequency input
  - C0412/5 = 23: Signal source for the actual process controller value (PCTRL1-ACT) is CAN-IN1/word 4
- A signal source can be assigned to several targets.

Important

- **The process data input words CAN-IN1.W1, CAN-IN1.W2, CAN-IN2.W1 and CAN-IN2.W2 can be defined as analog word or as digital word (16 bit). When they are linked to internal analog signals (C0412/x = 20, 21 or 30, 31), they must be defined as analog input words. Otherwise, the controller would not interprete the signal correctly.**
- C0412 can be different in the parameter sets.

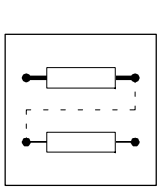
Special features

With C0005 it is possible to assign some signal sources to analog inputs. The corresponding subcodes of C0412 are adjusted automatically.

7.7.2 Free configuration of analog output signals

7.7.2.1 Configuration of analog outputs

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0419*↲	Free configuration of analog outputs			Analog signal output to terminal Analog signal source	• **A selection made under C0111 is copied to C0419/1. A change of C0419/1 does not change C0111!** • C0419/2, C0419/3 is only active when using an application–I/O • DFOUT1: 0 ... 10 kHz
1	X3/62 (AOUT1-IN)	0	0	Output frequency (MCTRL1-NOUT+ SLIP)	6 V/12 mA/5.85 kHz ≡ C0011
2	X3/63 (AOUT2-IN)	2	1	Controller load (MCTRL1-MOUT)	3 V/6 mA/2.925 kHz ≡ Rated motor torque for vector control (C0014 = 4), otherwise rated effective current (effective current / C0091)
3	X3/A4 (DFOUT1-IN)	3	2	Apparent motor current (MCTRL1-IMOT)	3 V/6 mA/2.925 kHz ≡ Rated inverter current
			3	DC-bus voltage (MCTRL1-DCVOLT)	6 V/12 mA/5.85 kHz ≡ DC 1000 V (400 V-mains) 6 V/12 mA/5.85 kHz ≡ DC 380 V (240 V mains)
			4	Motor power	3 V/6 mA/2.925 kHz ≡ Rated motor power
			5	Motor voltage (MCTRL1-VOLT)	4.8 V/9.6 mA/4.68 kHz ≡ Rated motor voltage
			6	1/output frequency (1/C0050) (MCTRL1-1/NOUT)	2 V/4 mA/1.95 kHz ≡ C0050 = 0.4 × C0011
			7	Output frequency withing limits sets (NSET1-C0010...C0011)	0 V/0 mA/0 kHz ≡ f = f_{min} (C0010) 6 V/12 mA/5.85 kHz ≡ f = f_{max} (C0011)
			8	Operation with process controller (C0238 = 0, 1): Act. process controller value (PCTRL1-ACT) Operation without process controller (C0238 = 2): Output frequency without slip (MCTRL1-NOUT)	6 V/12 mA/5.85 kHz ≡ C0011
			9	Ready for operation (DCTRL1-RDY)	Selection -9- ... -25- corresponds to the digital functions of the relay output K1 (C0008) or the digital output A1 (C0117): LOW = 0 V (or 0 mA with application–I/O) HIGH = 10 V (or 20 mA with application–I/O)
			10	TRIP fault message (DCTRL1-TRIP)	
			11	Motor is running (DCTRL1-RUN)	
			12	Motor is running / CW rotation (DCTRL1-RUN-CW)	
			13	Motor is running / CCW rotation (DCTRL1-RUN-CCW)	
			14	Output frequency = 0 (DCTRL1-NOUT=0)	
			15	Frequency setpoint reached (MCTRL1-RFG1=NOUT)	
			16	Q_{min} threshold reached (PCTRL1-QMIN)	
			17	I_{max} limit reached (MCTRL1-IMAX) C0014 = -5-: Torque setpoint reached	
			18	Overtemperature (ϑ_{max} - 5 °C) (DCTRL1-OH-WARN)	
			19	TRIP or Q_{min} or pulse inhibit (IMP) active (DCTRL1-TRIP-QMIN-IMP)	
			20	PTC warning (DCTRL1-PTC-WARN)	
			21	Apparent motor current < current threshold (DCTRL1-IMOT< ILIM)	Belt monitoring Apparent motor current = C0054 Current threshold = C0156
			22	Apparent motor current < current threshold and Q_{min} threshold reached (DCTRL1-(IMOT< ILIM)-QMIN)	
			23	Apparent motor current < current threshold and ramp function generator 1: input = output (DCTRL1-(IMOT< ILIM)-RFG-I=0)	
			24	Warning motor phase failure (DCTRL1-LP1-WARN)	
			25	Min. output frequency reached (PCTRL1-NMIN)	



Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0419*↲ (cont.)	Free configuration of analog outputs			Analog signal output to terminal Analog signal source		
			27	Output frequency without slip (MCTRL1-NOUT)		6 V/12 mA/5.85 kHz ≡ C0011
			28	Act. process controller value (PCTRL1-ACT)		
			29	Process controller setpoint (PCTRL1-SET1)		6 V/12 mA/5.85 kHz ≡ C0011
			30	Process controller output (PCTRL1-OUT)		
			31	Ramp function generator input (NSET1-RFG1-IN)		
			32	Ramp function generator output (NSET1-NOUT)		
			35	Input signal at X3/8 or X3/1U, X3/1I, evaluated with gain (C0414/1 or C0027) and offset (C0413/1 or C0026) (AIN1-OUT)		10 V/20 mA/9.75 kHz ≡ Max. value of analog input signal (5 V, 10 V, 20 mA, 10 kHz) Precondition: The gain of the analog input or the frequendy input is set to: C0414/x, C0426 = 20/C0011 [%]
			36	Input signal at frequency input X3/E1, evaluated with gain (C0426) and offset (C0427) (DFIN1-OUT)		
			37	Motor potentiometer output (MPOT1-OUT)		
			38	Input signal at X3/2U, X3/2I, evaluated with gain (C0414/2) and offset (C0413/2) (AIN2-OUT)		
			40 41	AIF input word 1 (AIF-IN.W1) AIF input word 2 (AIF-IN.W2)		Setpoints to the controller from the communication module in AIF 10 V/20 mA/10 kHz ≡ 1000
			50 ... 53 60 ... 63	CAN-IN1.W1 ... 4 or FIF-IN.W1 ... FIF-IN.W4 Word 1 (50) ... word 4 (53) CAN-IN2.W1 ... 4 Word 1 (60) ... word 4 (63)		Setpoints to the controller from the function module in FIF 10 V/20 mA/10 kHz ≡ 1000
			255	Not assigned (FIXED-FREE)		
C0108*	Gain - analog output X3/62 (AOUT1-GAIN)	128	0	{1}	255	Standard-I/O: C0108 and C0420 are the same Application-I/O: C0108 and C0420/1 are the same
C0109*	Offset - analog output X3/62 (AOUT1-OFFSET)	0.00	-10.00	{0.01 V}	10.00	Standard-I/O: C0109 and C0422 are the same Application-I/O: C0109 und C0422/1 sind gleich
C0420*	Gain analog output X3/62 (AOUT1-GAIN) Standard-I/O	128	0	{1}	255	128 ≡ Gain 1 C0420 and C0108 are the same
C0420* (A)	Gain - analog outputs Application-I/O					128 ≡ Gain 1
1	X3/62 (AOUT1-GAIN)	128	0	{1}	255	C0420/1 and C0108 are the same
2	X3/63 (AOUT2-GAIN)					
C0422*	Offset analog output X3/62 (AOUT1-OFFSET) Standard-I/O	0.00	-10.00	{0.01 V}	10.00	C0422 and C0109 are the same
C0422* (A)	Offset - analog outputs Application-I/O					
1	X3/62 (AOUT1-OFFSET)	0.00	-10.00	{0.01 V}	10.00	C0422/1 and C0109 are the same
2	X3/63 (AOUT2-OFFSET)					
C0424*↲ (A)	Output signal range - analog outputs Application–I/O					Observe the jumper setting of the function module! (as of verion Application-I/O E82ZAFA ... Vx11)
1	X3/62 (AOUT1)	-0-	-0-	0 ... 10 V / 0 ... 20 mA		
2	X3/63 (AOUT2)	-0-	-1-	4 ... 20 mA		

Function

- Analog process or monitoring signals can be freely assigned to the analog outputs (X3/62, X3/63) and the frequency input (X3/A4).
- Examples:
  - C0419/1 = 51: Assigns the process data word CAN-IN2/word 2 to X3/62.
  - C0419/3 = 14: Assigns the monitoring message “output frequency = 0” to X3/A4.
- A signal source can be assigned to several targets.

Adjustment

C0108 or C0420:

- 128 corresponds to an output signal of 6 V or 12 mA (Lenze setting) at X3/62 or X3/63.

Level for Lenze setting

Selection	Signal	Level
0	Output frequency	6 V, if output frequency = C0011
1	Unit load	3 V, if C0056 = 100 %
2	Apparent motor current	3 V, if C0054 = rated controller current
3	DC-bus voltage	6 V at 1000 V DC (controller with 3 AC/400 V)
4	Motor power	3 V at rated power, P_r = C0052 * C0056
5	Motor voltage	4.8 V at C0052 = 400 V (controller with 3 AC/400 V)
6	1/output frequency	2.5 V, if C0011 = 50 Hz, C0050 = 20 Hz
7	C0010 ... C0011	Output voltage [V] = 6.00 V · $\frac{f - C0011}{C0011 - C0010}$
8	Act. process controller value	6 V, if C0051 = max. output frequency

Important

- **The process data input words CAN-IN1.W1/FIF-IN.W1, CAN-IN1.W2/FIF-IN.W2, CAN-IN2.W1 and CAN-IN2.W2 can be defined as analog word or as digital word (16 bit). When they are linked to the analog outputs (C0419/x = 50, 51 or 60, 61), they must be defined as analog input words. Otherwise, the output signal would be wrong.**
- Selection 0 and 7: Output with slip compensation
- Selection 8:
  - Output frequency without slip compensation (C0412/5 = 0), e. g. with setpoint cascades
  - Act. process controller value (C0412/5 ≠ 0)
- 0/4 mA ... 20 mA at X3/62 and X3/63 only with application-I/O
- C0419 can be different in the parmater sets.

Special features

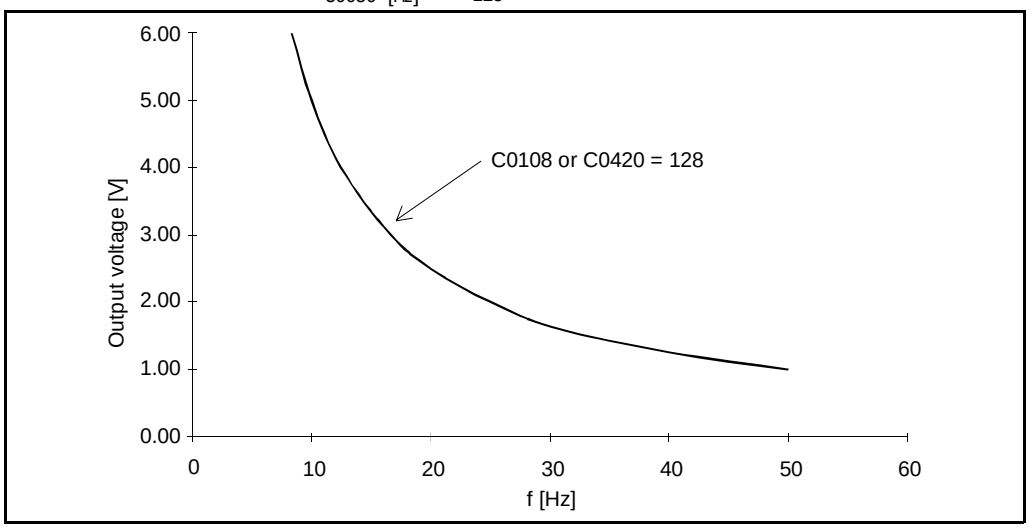
- Monitoring messages can be assigned to the analog output X3/62 via C0111. C0419/1 is adjusted automatically.
- Selection 9 ... 25 corresponds to the relay output functions of C0008:
  - LOW = 0 V or 0/4 mA
  - HIGH = 10 V or 20 mA

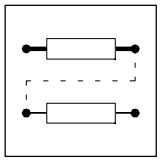
Tip for selection 6

The analog signal is reciprocal to the output frequency. This signal can be used to display the time used, for instance, to process a product (e.g. product processing in a continuous furnace).

Example: Output signal = 0 ... 10 V

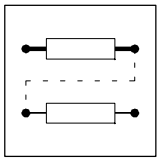
$$\text{Output voltage [V]} = 1.00\ \text{V} \cdot \frac{C0011\ [\text{Hz}]}{C0050\ [\text{Hz}]} \cdot \frac{C0108}{128}$$





7.7.2.2 Free configuration of analog process data output words

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0421*↲	Free configuration of analog process data output words			Analog signal output to bus Analog signal source	• **With the Lenze setting, CAN-OUT1.W1 and FIF-OUT.W1 are defined as being digital and assigned to the 16 bit of the controller status word 1 (C0417)** • **If you want to output analog values (C0421/3 ≠ 255), the digital assignment must be deleted (C0417/x = 255)! Otherwise, the output signal would be wrong.**
1	AIF-OUT.W1	8	0	Output frequency (MCTRL1-NOUT+SLIP)	24000 ≡ 480 Hz
2	AIF-OUT.W2	0	1	Controller load (MCTRL1-MOUT)	16383 ≡ Rated motor torque for vector control (C0014 = 4), otherwise rated effective current (effective current / C0091)
3	CAN-OUT1.W1 / FIF-OUT.W1	255	2	Apparent motor current (MCTRL1-IMOT)	16383 ≡ Rated inverter current
4	CAN-OUT1.W2 / FIF-OUT.W2	255	3	DC-bus voltage (MCTRL1-DCVOLT)	16383 ≡ 1000 VDC at 400 V mains 16383 ≡ 380 VDC at 240 V mains
5	CAN-OUT1.W3 / FIF-OUT.W3	255	4	Motor power	285 ≡ Rated motor power
6	CAN-OUT1.W4 / FIF-OUT.W4	255	5	Motor voltage (MCTRL1-VOLT)	16383 ≡ Rated motor voltage
7	CAN-OUT2.W1	255	6	1/output frequency (1/C0050) (MCTRL1-1/NOUT)	195 ≡ C0050 = 0.4 × C0011
8	CAN-OUT2.W2	255	7	Output frequency withing limits sets (NSET1-C0010...C0011)	24000 - C0010 ≡ 480 Hz - C0010
9	CAN-OUT2.W3	255	8	Operation with process controller (C0238 = 0, 1): Act. process controller value (PCTRL1-ACT)	24000 ≡ 480 Hz
10	CAN-OUT2.W4	255		Operation without process controller (C0238 = 2): Output frequency without slip (MCTRL1-NOUT)	
			9	Ready for operation (DCTRL1-RDY)	Selection -9- ... -25- corresponds to the digital functions of the relay output K1 (C0008) or the digital output A1 (C0117): LOW = 0 V (or 0/4 mA with application–I/O) HIGH = 10 V (or 20 mA with application–I/O)
			10	TRIP fault message (DCTRL1-TRIP)	
			11	Motor is running (DCTRL1-RUN)	
			12	Motor is running / CW rotation (DCTRL1-RUN-CW)	
			13	Motor is running / CCW rotation (DCTRL1-RUN-CCW)	
			14	Output frequency = 0 (DCTRL1-NOUT=0)	
			15	Frequency setpoint reached (MCTRL1-RFG1=NOUT)	
			16	Q_{min} threshold reached (PCTRL1-QMIN)	
			17	I_{max} limit reached (MCTRL1-IMAX) C0014 = -5-: Torque setpoint reached	
			18	Overtemperature (ϑ_{max} -5 °C) (DCTRL1-OH-WARN)	
			19	TRIP or Q_{min} or pulse inhibit (IMP) (DCTRL1-IMP)	
			20	PTC warning (DCTRL1-PTC-WARN)	
			21	Apparent motor current < current threshold (DCTRL1-IMOT<ILIM)	Belt monitoring Apparent motor current = C0054 Current threshold = C0156
			22	Apparent motor current < current threshold and Q_{min} threshold reached (DCTRL1-(IMOT<ILIM)-QMIN)	
			23	Apparent motor current < current threshold and ramp function generator 1: input = output (DCTRL1-(IMOT<ILIM)-RFG-I=0)	
			24	Warning motor phase failure (DCTRL1-LP1-WARN)	
			25	Min. output frequency reached (PCTRL1-NMIN)	



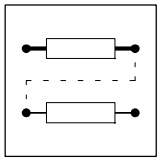
Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0421 (cont.)	Free configuration of analog process data output words		Analog signal output to bus Analog signal source	
			27 Output frequency without slip (MCTRL1-NOUT)	24000 ≡ 480 Hz
			28 Act. process controller value (PCTRL1-ACT)	
			29 Process controller setpoint (PCTRL1-SET1)	
			30 Process controller output (PCTRL1-OUT)	
			31 Ramp function generator input (NSET1-RFG1-IN)	
			32 Ramp function generator output (NSET1-NOUT)	
			35 Input signal at X3/8 or X3/1U, X3/1I, evaluated with gain (C0414/1 or C0027) and offset (C0413/1 or C0026) (AIN1-OUT)	10 V ≡ Max. value of analog input signal (5 V, 10 V, 20 mA, 10 kHz) Precondition: The gain of the analog input or the frequendy input is set to: C0414/x, C0426 = 20/C0011 [%]
			36 Input signal at frequency input X3/E1, evaluated with gain (C0426) and offset (C0427) (DFIN1-OUT)	
			37 Motor potentiometer output (MPOT1-OUT)	
			38 Input signal at X3/2U, X3/2I, evaluated with gain (C0414/2) and offset (C0413/2) (AIN2-OUT)	
			40 AIF input word 1 (AIF-IN.W1) 41 AIF input word 2 (AIF-IN.W2)	Setpoints to the controller from the communication module in AIF Normalization via AIF
			50 ... 53 CAN-IN1.W1 ... 4 or FIF-IN.W1 ... FIF-IN.W4 Word 1 (50) ... word 4 (53) 60 ... 63 CAN-IN2.W1 ... 4 Word 1 (60) ... word 4 (63)	Setpoints to the controller from CAN or function module in FIF Normalization via CAN or FIF
			255 Not assigned (FIXED-FREE)	

Function

- Analog process or monitoring signals can be freely assigned to the analog process data output words.
- Examples:
  - C0421/3 = 5: Assigns the monitoring signal “Motor voltage” to the CAN-OUT1/word1.
  - C0421/8 = 61: Assigns the process data input word CAN-IN2/word2 to the CAN-OUT2/word2.
- A signal source can be assigned to several targets.

Important

- **The process data output words CAN-OUT1.W1/FIF-OUT.W1, CAN-OUT2.W1 and FIF-OUT.W2 can also be assigned via C0417 and C0418 with 16 bit status information each:**
  - **With digital configuration through C0417 or C0418 it is not possible to assign them to C0421 (analog) at the same time (C0421/x = 255)!**
  - **With analog configuration through C0421, it is not possible to assign them to C0417 and C0418 (digital) at the same time (C0417/x = 255, C0418/x = 255)!**
  - **Otherwise, the output signal would be wrong.**
- **The process data input words CAN-IN1.W1/FIF-IN.W1, CAN-IN1.W2/FIF-IN.W2, CAN-IN2.W1 and CAN-IN2.W2 can be defined as analog word or as digital word (16 bit). When they are linked to analog process data output words (C0421/x = 50, 51 or 60, 61), they musst be defined as analog input words. Otherwise, the output signal would be wrong.**
- C0421 can be different in the parameter sets.



7.8 Free connection of digital signals, message output

7.8.1 Free configuration of digital input signals

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0410↲	Free configuration of digital input signals			Linkage of external signal sources to internal digital signals Digital signal source	• **A selection made under C0007 is copied to the corresponding subcode of C0410. A change of C0410 does not change C0007!**
1	NSET1-JOG1/3	1	0 255	Not assigned (FIXED-FREE)	Selection of fixed setpoints C0410/1 C0410/2 active LOW LOW C0046 HIGH LOW JOG1 LOW HIGH JOG2 HIGH HIGH JOG3
2	NSET1-JOG2/3	2	1 ... 6	Digital inputs X3/E1 ... X3/E6 (DIGIN1 ... 6) X3/E1 (1) ... X3/E6 (6) E5, E6 only application-I/O	
3	DCTRL1-CW/CCW	4			CW = CW rotation LOW CCW = CCW rotation HIGH
4	DCTRL1-QSP	255	10 ... 25	AIF control word (AIF-CTRL) Bit 0 (10) ... bit 15 (25)	Quick stop
5	NSET1-RFG1-STOP	255			Stop ramp function generator main setpoint
6	NSET1-RFG1-0	255	30 ... 45	CAN-IN1.W1 Bit 0 (30) ... bit 15 (45)	Set ramp function generator input for main setpoint to "0"
7	MPOT1-UP	255			Motor potentiometer functions
8	MPOT1-DOWN	255	50 ... 65	CAN-IN1.W2 Bit 0 (50) ... bit 15 (65)	
9	Reserved	255			
10	DCTRL1-CINH	255			Controller inhibit (LOW active)
11	DCTRL1-TRIP-SET	255	70 ... 85	CAN-IN2.W1 Bit 0 (70) ... bit 15 (85)	External fault
12	DCTRL1-TRIP-RESET	255			Reset fault
13	DCTRL1-PAR2/4	255	90 ... 105	CAN-IN2.W2 Bit 0 (90) ... bit 15 (105)	Parameter set changeover (only with C0988 = 0)
14	DCTRL1-PAR3/4	255			C0410/13 C0410/14 active LOW LOW PAR1 HIGH LOW PAR2 LOW HIGH PAR3 HIGH HIGH PAR4
15	MCTRL1-DCB	3	200	Bit-by-bit assignment of FIF control words (FIF-CTRL1, FIF-CTRL2) from the function module INTERBUS or PROFIBUS-DP (see also C0005)	DC-injection brake
16 (A)	PCTRL1-RFG2-LOADI	255			Add the actual process controller value (PCTRL1-ACT) to the process controller ramp function generator (PCTRL1-RFG2)
17	DCTRL1-M/Re	255			Manual/remote changeover
18	PCTRL1-I-OFF	255			Switch-off the I-component of the controller
19	PCTRL1-OFF	255			Switch-off the controller
20	Reserved	255			
21	PCTRL1-STOP	255			Stop the process controller ("freeze" the value)
22	DCTRL1-CW/QSP	255			Failsafe change of the direction of rotation
23	DCTRL1-CCW/QSP	255			
24	DFIN1-ON	255			Digital frequency 0 ... 10 kHz/ 0 ... 100 kHz (only selection 0 or 1)
25 (A)	PCTRL1-FOLL1-0	255			Set the sensor compensation to "0" under C0193 reset ramp
26 (A)	Reserved	255			
27 (A)	NSET1-TI1/3	255			Add acceleration times
28 (A)	NSET1-TI2/3	255			C0410/27 C0410/28 active LOW LOW C0012; C0013 HIGH LOW T_{ir} 1; T_{if} 1 LOW HIGH T_{ir} 2; T_{if} 2 HIGH HIGH T_{ir} 3; T_{if} 3
29 (A)	PCTRL1-FADING	255			Activate (LOW) / deactivate (HIGH) process controller output

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
30 (A)	PCTRL1-INV-ON	255		Inversion of process controller output
31 (A)	PCTRL1-NADD-OFF	255		Switch-off addition setpoint
32 (A)	PCTRL1-RFG2-0	255		Set the ramp function generator input process controller to ”0” under C0226

Function

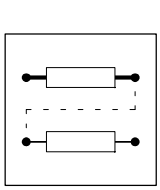
- Digital functions can be freely assigned to the digital inputs (X3/E1 ... X3/E6) and the software inputs (process data input words). It is thus possible to adjust a freely configurable control.
- Example:
  - C0410/10 = 2: Signal source for “CINH (controller inhibit)” is X3/E2.
  - C0410/15 = 32: Signal source for “DCB (DC-injection brake)” is CAN-IN1 word1, bit 3.
- A signal source can be assigned to several targets. Ensure to assign them reasonably, otherwise functions, which exclude each other, can be activated (e.g. QSP and DCB assigned to X3/E3 at the same time).

Important

- **The process data input words CAN-IN1.W1, CAN-IN1.W2, CAN-IN2.W1 and CAN-IN2.W2 can be defined as analog word or as digital word (16 bit). When being linked to internal digital signals (C0410/x = 30 ... 105) they must be defined as digital input words. Otherwise the bit control information would not be interpreted correctly.**
- Signal:
  - Hardware inputs (X3/E1 ... X3/E6): HIGH = +12 V ... +30 V; LOW = 0 V ... +3 V
  - Software inputs (process data input words): HIGH = bit logic 1; LOW = bit logic 0
  - For level inversion see code table C0114/C0411.
- Response times: 1.5 ... 2.5 ms
- C0410 can be different in the parameter sets.

Special features

With C0007 it is possible to configure X3/E1 ... X3/E4 as blocks. The corresponding subcodes of C0410 are automatically adjusted.



7.8.2 Free configuration of digital output signals

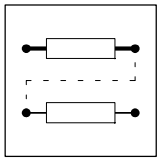
7.8.2.1 Configuration of digital outputs

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0415↲	Free configuration of digital outputs			Output of digital signals to terminals	• **A selection made under C0008 is copied to C0415/1. A change of C0415/1 does not change C0008!** • **A selection made under C0117 is copied to C0415/2. A change of C0415/2 does not change C0117!** • **C0415/3 only application–I/O**
1	Relay output K1 (RELAY)	25	0 255	Not assigned (FIXED-FREE)	
			1	PAR-B0 active (DCTRL1-PAR-B0)	
			2	Pulse inhibit active (DCTRL1-IMP)	
2	Digital output X3/A1 (DIGOUT1)	16	3	I_{max} limit reached (MCTRL1-IMAX) (C0014 = -5-: Torque setpoint reached)	
			4	Frequency setpoint reached (MCTRL1-RFG1=NOUT)	
3	Digital output X3/A2 (DIGOUT2)	255	5	Ramp function generator 1: input = output (NSET1-RFG1-I=0)	RFG1 = Ramp function generator main setpoint
			6	Q_{min} threshold reached (PCTRL1-QMIN)	active PAR-B1 PAR-B0 PAR1 LOW LOW PAR2 LOW HIGH PAR3 HIGH LOW PAR4 HIGH HIGH
			7	Output frequency = 0 (DCTRL1-NOUT=0)	
			8	Controller inhibit active (DCTRL1-CINH)	
			9...12	Reserved	
			13	Overtemperature (ϑ_{max} - 5 °C) (DCTRL1-OH-WARN)	
			14	DC-bus overvoltage (DCTRL1-OV)	
			15	CCW rotation (DCTRL1-CCW)	
			16	Ready for operation (DCTRL1-RDY)	
			17	PAR-B1 active (DCTRL1-PAR-B1)	
			18	TRIP or Q_{min} or pulse inhibit (IMP) active (DCTRL1-TRIP-QMIN-IMP)	
			19	PTC warning (DCTRL1-PTC-WARN)	
			20	Apparent motor current < current threshold (DCTRL1-IMOT<ILIM)	Belt monitoring Apparent motor current = C0054 Current threshold = C0156
			21	Apparent motor current < current threshold and Q_{min} threshold reached (DCTRL1-(IMOT<ILIM)-QMIN	
			22	Apparent motor current < current threshold and ramp function generator 1: input = output (DCTRL1-(IMOT<ILIM)-RFG-I=0)	
			23	Warning motor phase failure (DCTRL1-LP1-WARN)	
			24	Min. output frequency reached (PCTRL1-NMIN)	
			25	TRIP fault message (DCTRL1-TRIP)	
			26	Motor is running (DCTRL1-RUN)	
			27	Motor is running/CW rotation (DCTRL1-RUN-CW)	
			28	Motor is running/CCW rotation (DCTRL1-RUN-CCW)	
			29	Process controller input = process controller output (PCTRL1-SET=ACT)	
			30	Reserved	
			31	Apparent motor current> current threshold and ramp function generator 1: input = output (DCTRL1-(IMOT>ILIM)-RFG-I=0)	Overload monitoring Apparent motor current = C0054 Current threshold = C0156
			32 ... 37	X3/E1 ... X3/E6, X3/E1 (32) ... X3/E6 (37)	Digital input terminals

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0415↵ (cont.)	Free configuration of digital outputs			Output of digital signals to terminals		
			40...55	AIF control word (AIF-CTRL) Bit 0 (40) ... bit 15 (55)		Bits of fieldbus input words Permanently assigned bits - AIF-CTRL: Bit 3: QSP Bit 7: CINH Bit 10: TRIP-SET Bit 11: TRIP-RESET
			60...75	CAN-IN1.W1 or FIF-IN.W1 Bit 0 (60) ... bit 15 (75)		
			80...95	CAN-IN1.W2 or FIF-IN.W2 Bit 0 (80) ... bit 15 (95)		
			100...115	CAN-IN2.W1, bit 0 (100) ... bit 15 (115)		
			120...135	CAN-IN2.W2, bit 0 (120) ... bit 15 (135)		
			140...172	Status application-I/O		Only active in operation with application-I/O
				140	Torque threshold 1 reached (MSET1=MACT)	
				141	Torque threshold 2 reached (MSET2=MACT)	
				142	Limitation process controller output reached (PCTRL1-LIM)	
				143 ... 172	Reserved	
C0416↵	Level inverted digital outputs	0		X3/A2	X3/A1	Relay K1	• 0: output not inverted (HIGH active) • 1: output inverted (LOW active) • X3/A2 only application-I/O
			-0-	0	0	0	
			-1-	0	0	1	
			-2-	0	1	0	
			-3-	0	1	1	
			-4-	1	0	0	
			-5-	1	0	1	
			-6-	1	1	0	
			-7-	1	1	1	
C0423* (A)	Delay digital outputs		0.000	{0.001 s}		65.000	"Debouncing" of the digital outputs (as of version application-I/O E82ZAFA ... Vx11) • Switches the digital output, if the linked signal is still active after the time set. • The digital output is reset without delay
1	Relay output K1 (RELAY)	0.000					
2	Digital output X3/A1 (DIGOUT1)	0.000					
3	Digital output X3/A2 (DIGOUT2)	0.000					

Function

- Digital signal can be freely assigned to the digital outputs (X3/A1, X3/A2, K1).
- Examples:
  - C0415/2 = 15: The monitoring message "CCW rotation" is output at A1.
  - C0415/1 = 60: bit 1 of the process data word CAN-IN1/word 1 is output to K1.
- A signal source can be assigned to several targets.



Switching conditions

Selection in C0415	Relay/digital output (not inverted)
1	is activated/HIGH, if PAR2 or PAR4 active
2	is activated/HIGH if STOP, controller inhibit (CINH), overvoltage or undervoltage
3	is activated/HIGH if motor current = C0022 or C0023
4	is activated/HIGH if output frequency = frequency setpoint
5	is activated/HIGH if condition fulfilled
6	is activated/HIGH if output frequency > C0017 (ref. to setpoint)
7	is activated/HIGH, because • frequency setpoint = 0 Hz, t_{if} over • DCB active • Controller inhibited (CINH)
8	is activated/HIGH, if the controller is inhibited by • X3/28 = LOW • C0410/10 = active • STOP
13	is activated/HIGH if heat sink temperature $\geq \vartheta_{max}$ -10 °C
14	is activated/HIGH, if permissible voltage threshold is reached
15	is activated/HIGH in CCW rotation
16	is activated/HIGH, if the controller is ready for operation. is decactivated/LOW if • TRIP fault message • Undervoltage/overvoltage
17	is activated/HIGH if PAR3 or PAR4 active
18	is deactivated/LOW, if at least one of the three conditions (selection 25 or 6 or 2) is fulfilled.
19	is deactivated/LOW, because • the connected temperature switch or PTC thermistor has detected a motor overtemperature
C1318/1 ... 32	is activated/HIGH if condition fulfilled
24	is activated/HIGH if the output frequency > C0010
25	is activated/HIGH, if TRIP fault message is set
26	is activated/HIGH, if output frequency $\neq$ 0 Hz
27	is activated/HIGH, if output frequency > 0 Hz
28	is activated/HIGH, if output frequency < 0 Hz
29	is activated/HIGH, if relay output K1 active
30	is activated/HIGH if digital output X3/A1 active
31	is activated/HIGH if condition fulfilled
40 ... 135	is activated/HIGH, if a HIGH signal is assigned to the correspondin bit

Important

- **The process data input words CAN-IN1.W1/FIF-IN.W1, CAN-IN1.W2/FIF-IN.W2, CAN-IN2.W1 and CAN-IN2.W2 can be defined as analog word or as digital word (16 bit). When being linked to the digital outputs (C0415/x = 60 ... 135) they must be defined as digital input words. Otherwise, the output signal would be wrong.**
- C0415 can be different in the parameter sets.
- With C0416 it is possible to invert digital outputs.
- Monitoring signals 20, 21, 22
  - The display value (C0054) is smoothed with a ring memory with 500 ms.
  - The value set under C0156 corresponds to a percentage of the rated controller current I_r.
  - With the control mode “Square-law characteristic” (C0014 = -3-) C0156 is internally adapted to the output frequency:

$$C0156_{internal}\,[\%] = C0156\,[\%] \cdot \frac{f^2\,[Hz^2]}{C0011^2\,[Hz^2]}$$

  - With this function it is, for instance, possible to monitor belts.

Special features

- Monitoring messages can be assigned to the analog output K1 via C0008. C0415/1 is automatically adjusted.
- Monitoring messages can be assinged to the digital output X3/A1 via C0117. C0415/2 is then automatically adjusted.

7.8.2.2 Free configuration of digital process data output words

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0417*↲	Free configuration of controller status (1)		Output of digital signals to bus	• The assignment is mapped to the – controller status word 1 (C0150) – AIF status word (AIF-STAT) – FIF output word 1 (FIF-OUT.W1) – Output word 1 in the CAN object 1 (CAN-OUT1.W1) → **Permanently assigned to AIF for operation with communication modules INTERBUS 2111, PROFIBUS-DP 2131 or LECOM-A/B/LI 2102. Changes not possible!:** All bits are freely configured in operation with function modules system bus (CAN), INTERBUS, PROFIBUS-DP in FIF.
1	Bit 0	1	Digital signal sources as in C0415	
2	Bit 1	2 →		
3	Bit 2	3		
4	Bit 3	4		
5	Bit 4	5		
6	Bit 5	6		
7	bit 6	7 →		
8	Bit 7	8 →		
9	Bit 8	9 →	11|10|9|8 Controller status 0000 Controller initialization 0001 Switch-on inhibit 0011 Operation inhibited 0100 Flying-restart circuit active 0101 DC-injection brake active 0110 Operation enabled 0111 Message active 1000 Active fault	
10	Bit 9	10 →		
11	Bit 10	11 →		
12	Bit 11	12 →		
13	Bit 12	13 →		
14	Bit 13	14 →		
15	Bit 14	15		
16	Bit 15	16		
C0418*↲	Free configuration of controller status (2)		Output of digital signals to bus	• The assignment is mapped to the – Controller status word 2 (C0151) – FIF output word 2 (FIF-OUT.W2) – Output word 1 in the CAN object 2 (CAN-OUT2.W1) • All bits are free configurable
1	Bit 0	255	Digital signal sources as in C0415	
...	...			
16	Bit 15	255		

Function

- Digital signals can be assigned to the controller status words 1 and 2.
- Examples:
  - C0417/4 = 16: Assigns bit 3 of the controller status word 1 to the monitoring message “Ready for operation”.
  - C0418/15 = 101: Assigns bit 14 of the controller status words 2 to bit 2 of CAN-IN2.W1.
- A signal source can be assigned to several targets.

Important

- **The process data output words CAN-OUT1.W1/FIF-OUT.W1, CAN-OUT2.W1 and FIF-OUT.W2 can also be assigned as analog word under C0421:**
  - **With digital configuration through C0417 or C0418 it is not possible to assign them to C0421 (analog) at the same time (C0421/x = 255)!**
  - **With analog configuration through C0421, it is not possible to assign them to C0417 and C0418 (digital) at the same time (C0417/x = 255, C0418/x = 255)!**
  - **Otherwise, the status information would be wrong.**
- The configuration in C0417 is mapped to the AIF status word 1 (C0150), the FIF output word 1 (FIF-OUT.W1) and the word 1 of the CAN object 1 (CAN-OUT1.W1).
- The configuration in C0418 is mapped to the AIF status word 2 (C0151), the FIF output word 2 (FIF-OUT.W2) and the word 1 of the CAN object 2 (CAN-OUT2.W1).
- C0417 and C0418 can be different in the parameter sets.

7.9 Thermal motor monitoring, fault detection

7.9.1 Thermal motor monitoring

7.9.1.1 I^2 x t monitoring

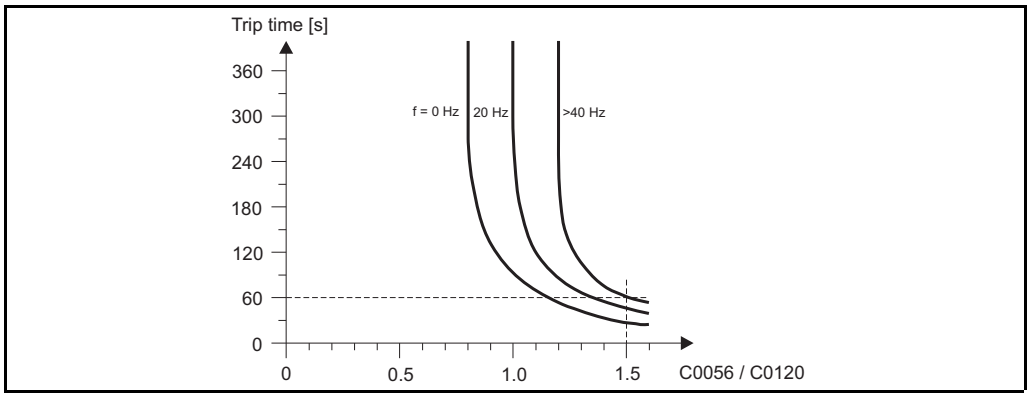
Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0120	I^2t switch off	0	0	{1 %}	200	C0120 = 0: I^2t switch-off not active

Function

With the $I^2 \cdot t$ monitoring, self-ventilated three-phase AC motors can be thermally monitored without sensors.

Adjustment

- Enter an individual load limit for the motor connected.
  - If this values is exceeded for a longer period of time, the controller will set the fault OC6 and switch-off (see chart).
- The current limits C0022 and C0023 only have an indirect influence on the $I^2 \cdot t$ calculation:
  - The settings of C0022 and C0023 can make operation with maximum controller load (C0056) impossible.
- When selecting a drive which does not match (output current much higher than rated motor current):
  - Reduce C0120 by the factor of the mismatch.



Example:
If C0120 = 100 % and with a load of C0056 = 150 %, the controller switches off at f > 40 Hz after 60 s or ealier when reaching f < 40 Hz.

Important

- The setting 0 % deactivates the function.
- This monitoring does not provide full motor protection since the calculated motor temperature is set to ”0” after every mains connection or disconnection. The connected motor can be overheated if
  - it is already hot and is still overloaded.
  - the cooling-air stream is interrupted or the air is too hot.
- Full motor protection can be achieved with a PTC thermistor or a thermostat in the motor.
- To prevent motors with forced ventilation from starting too early, this function can be deactivated.
- If you want to monitor load-adapted motors with loads < 100 %, C0120 must also be reduced accordingly.
- Controller operation with 120 % overload can cause a $I^2 \cdot t$ switch-off, if C0120 $\leq$ 100 % is set.

7.9.1.2 PTC motor monitoring/earth fault detection

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0119↵	Configuration PTC input / earth fault detection	-0-	-0-	PTC input not active	Earth fault detection active	Deactivate the earth fault detection if it is activated unintentionally
			-1-	PTC input active TRIP set		
			-2-	PTC input active Warning set		
			-3-	PTC input not active	Earth fault detection	
			-4-	PTC input active TRIP set		
			-5-	PTC input active Warning set		

Function

Input for the connection of PTC resistors to DIN44081 and DIN44082. The motor temperature can be detected and integrated in the drive monitoring.
This input can also be used for the connection of a thermostat (normally-closed).

Activation

1. Connect the monitoring circuit of the motor to X2/T1 and X2/T2.
2. Parameter setting for the evaluation of the PTC signal:
   If the PTC evaluation detects an overtemperature, this can be evaluated in three ways:
   – C0119 = -0-, -3-: PTC not active
   – C0119 = -1-, -4-: TRIP message (keypad display = OH3, LECOM fault number = 53)
   – C0119 = -2-, -5-: Warning message (keypad display = OH51, LECOM fault number = 203)

Important

- The controller can only evaluate a motor-PTC system.
  – It is not allowed to connect several motor PTC systems in parallel or in series.
- If you connect several motors to an inverter, use thermistors (normally close) to monitor the motor temperature.
  – For evaluation, thermostats must be connected in series.
- With approx. R ≥ 1.6 kΩ the fault or warning message is set.
- For operational tests, connect a non-variable resistor to the PTC input:
  – A fault or warning message will be set if R > 2 kΩ.
  – R < 250 Ω does not activate a message.
- Lenze three-phase AC motors are equipped with thermostats as standard.

7.9.2 Fault detection (DCTRL1-TRIP-SET/DCTRL1-TRIP-RESET)

Function

If the function DCTRL1-TRIP-SET is activated, the unit detects and external fault and can thus be monitored. The controller indicates the fault EEr and sets controller inhibit.

Activation of fixed configurations

With HIGH active inputs:

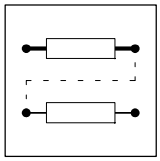
C0007	X3/E1	X3/E2	X3/E3	X3/E4
-7-, -8-, -18-, -19-	LOW			
-5-, -6-, -9-, -20-, -38- ... -43-		LOW		
10-, -27-			LOW	
-32-				LOW

Freely configured activation

- Assign a signal source to C0410/11 (DCTRL1-TRIP-SET).
- With HIGH active inputs:
  – Signal source for DCTRL1-TRIP-SET = LOW activates the function.

Important

Reset fault messages: 📖 8-5 .



7.10 Display of operating data, diagnostics

7.10.1 Display of operating data

7.10.1.1 Display values

Code		Possible settings				IMPORTANT
No.	Name	Lenze	Selection			
C0004*↲	Bar-graph display	56	All codes possible 56 = controller load (C0056)			• The bar-graph display indicates the selected value in % after mains switch-on • Range -180 % ... +180 % • Display indicates C0517/1
C0044*	Setpoint 2 (NSET1-N2)		-480.00	{0.02 Hz}	480.00	• Selection if C0412/2 = FIXED-FREE • Display if C0412/2 ≠ FIXED-FREE
C0046*	Setpoint 1 (NSET1-N1)		-480.00	{0.02 Hz}	480.00	• Selection if C0412/1 = FIXED-FREE • Display if C0412/1 ≠ FIXED-FREE
C0047*	Torque setpoint or torque limit value (MCTRL1-MSET)		0 Reference: Rated motor torque detected by motor parameter identification	{%}	400	With control mode "Sensorless torque control" (C0014 = 5): • Selection of torque setpoint if C0412/6 = FIXED-FREE • Display of torque setpoint if C0412/6 ≠ FIXED-FREE With control mode "V/f-characteristic control" or "Vector control" (C0014 = 2, 3, 4): • Display of torque limit value if C0412/6 ≠ FIXED-FREE • Function not active (C0047 = 400) if C0412/6 = FIXED-FREE
C0049*	Additional setpoint (PCTRL1-NADD)		-480.00	{Hz}	480.00	• Selection, if C0412/3 = 0 • Display if C0412/3 ≠ 0
C0050*	Output frequency (MCTRL1-NOUT)		-480.00	{Hz}	480.00	Only display: Output frequency without slip compensation
C0051*	Output frequency with slip compensation (MCTRL1-NOUT +SLIP) or Act. process controller value (PCTRL1-ACT)		-480.00	{Hz}	480.00	For operation without process controller (C0238 = 2): • Only display: output frequency with slip compensation (MCTRL1-NOUT+SLIP) For operation with process controller (C0238 = 0, 1): • Selection if C0412/5 = FIXED-FREE • Display if C0412/5 ≠ FIXED-FREE
C0052*	Motor voltage (MCTRL1-VOLT)		0	{V}	1000	Only display
C0053*	DC-bus voltage (MCTRL1-DCVOLT)		0	{V}	1000	Only display
C0054*	Apparent motor current (MCTRL1-IMOT)		0	{A}	400	Only display
C0056*	Controller load (MCTRL1-MOUT)		-255	{%}	255	Only display
C0061*	Heat sink temperature		0	{°C}	255	Only display The controller sets TRIP "OH" if the heat sink temperature is > +85 °C
C0138*	Process controller setpoint 1 (PCTRL1-SET1)		-480.00	{0.02 Hz}	480.00	• Selection if C0412/4 = FIXED-FREE • Display if C0412/4 ≠ FIXED-FREE

Function Some parameters, measured by the controller during operation, can be displayed on the keypad or PC.

7.10.1.2 Calibration of display values

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0500*	Cablibration of application datum numerator	2000	1 {1} 25000	• The codes C0010, C0011, C0017, C0019, C0037, C0038, C0039, C0044, C0046, C0049, C0050, C0051, C0138, C0139, C0140, C0181, C0239, C0625, C0626, C0627 can be calibrated to indicate an application datum on the keypad or PC. • If C0500/C0501 are changed, the unit "Hz" will not be displayed any longer
C0501*	Calibration of application datum denominator	10	1 {1} 25000	
C0500* (A)	Calibration of application datum numerator	2000	1 {1} 25000	• The codes C0037, C0038, C0039, C0044, C0046, C0049, C0051, C0138, C0139, C0140, C0181 can be calibrated to indicate an application datum on the keypad in a unit selected under C0502 • The frequency related codes C0010, C0011, C0017, C0019, C0050, C0239, C0625, C0626, C0627 are always displayed in "Hz"
C0501* (A)	Calibration of application datum denominator	10	1 {1} 25000	
C0502* (A)	Unit of application datum	0	0: — 6: rpm 13: % 18: Ω 1: ms 9: °C 14: kW 19: hex 2: s 10: Hz 15: N 34: m 4: A 11: kVA 16: mV 35: h 5: V 12: Nm 17: mΩ 42: mH	

Function

Absolute or relative selection or display of an application datum (e. g. pressure, temperature, flow rate, humidity, speed)

Calibration

The calibrated value is calculated as follows:

$$C0xxx = \frac{C0011}{200} \cdot \frac{C0500}{C0501}$$

Example:
Preselect a pressure setpoint as absolute and relative value:
Values: P_{set} = 5 bar if C0011 = 50 Hz

a) Relative calibration in %

$$100\ \% = \frac{50}{200} \cdot \frac{C0500}{C0501} = \frac{50}{200} \cdot \frac{4000}{10}$$

Solution with e.g. C0500 = 4000, C0501 = 10

b) Absolute calibration in bar

$$5.00\ \text{bar} = \frac{50}{200} \cdot \frac{C0500}{C0501} = \frac{50}{200} \cdot \frac{200}{10}$$

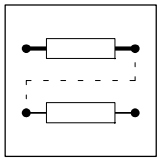
Solution with e.g. C0500 = 200, C0501 = 10

Important

- The calibration always applies to all codes selected at the same time.

Only for operation with standard-I/O

- After a calibration, the output frequency [Hz] (C0050) can only be calculated by means of display factors.



7.10.2 Diagnostics

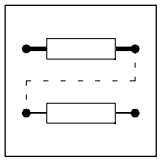
Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0093*	Type		xxxy		Only display • xxx = Power data on the nameplate (e. g. 551 = 550 W) • y = Voltage class (2 = 240 V, 4 = 400 V)
C0099*	Software version		x.y		Only display x = Version, y = Index
C0161*	Current fault				Display history buffer contents • Keypad: three-digit, alpha numerical fault detection • 9371BB keypad: LECOM fault number
C0162*	Last fault				
C0163*	Last but one fault				
C0164*	Last but two fault				
C0168*	Current fault				
C0178*	Operating time		Total time CINH = HIGH {h}		Only display
C0179*	Mains switch-on time		Total mains-on time-Ein {h}		Only display
C0183*	Diagnostics		0	No fault	Only display
			102	TRIP active	
			104	Message "Overvoltage (*OU*)" or "Undervoltage (*LU*)" active	
			142	Pulse inhibit	
			151	Quick stop active	
			161	DC-injection brake active	
			250	Warning active	
C0200*	Software identification				Only display
C0201*	Software generation date				Only display
C0202*	Software identification				Only display
1 ... 4					**Only for Lenze service**
C0304 ... C0309	Service codes				**Modifications only by Lenze service!**
C0518	Service codes				**Modifications only by Lenze service!**
C0519					
C0520					
C1502 (A)	Software identification application-I/O				Output to keypad as string in 4 parts à 4 characters
1	Part 1				
...	...				
4	Part 4				

Function Display codes for diagnostics

7.11 Parameter set management

7.11.1 Parameter set transfer

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
[C0002]*	Parameter set transfer	-0-	-0-	Function executed	
			Parameter set of the controller		
			-1-	Lenze setting ⇨ PAR1	Overwrite the selected parameter set of the controller with the default setting.
			-2-	Lenze setting ⇨ PAR2	
			-3-	Lenze setting ⇨ PAR3	
			-4-	Lenze setting ⇨ PAR4	
			-10-	Keypad ⇨ PAR1 ... PAR4	Overwrite all parameter sets of the controller with the keypad data
			-11-	Keypad ⇨ PAR1	Overwrite a single parameter set with the keypad data.
			-12-	Keypad ⇨ PAR2	
			-13-	Keypad ⇨ PAR3	
			-14-	Keypad ⇨ PAR4	
			-20-	PAR1 ... PAR4 ⇨ Keypad	Copy all parameter sets of the controller to the keypad.
			Parameter set of a function module in FIF		Not for standard-I/O or system bus (CAN)
			-31-	Lenze setting ⇨ FPAR1	Overwrite the selected parameter set of the function module with the default setting.
			-32-	Lenze setting ⇨ FPAR2	
			-33-	Lenze setting ⇨ FPAR3	
			-34-	Lenze setting ⇨ FPAR4	
			-40-	Keypad ⇨ FPAR1 ... FPAR4	Overwrite all parameter sets of the function module with the data of the keypad.
			-41-	Keypad ⇨ FPAR1	Overwrite a single parameter set of the function module with the data of the keypad.
			-42-	Keypad ⇨ FPAR2	
			-43-	Keypad ⇨ FPAR3	
			-44-	Keypad ⇨ FPAR4	
			-50-	FPAR1 ... FPAR4 ⇨ Keypad	Copy all parameter sets of the function module to the keypad.
			Parameter sets controller + function module in FIF		Not for standard-I/O or system bus (CAN) **For operation with application-I/O: The parameter sets of the controller and the application-I/O must be transmitted at the same time!**
			-61-	Lenze setting ⇨ PAR1 + FPAR1	Overwrite single parameter sets with the default setting
			-62-	Lenze setting ⇨ PAR2 + FPAR2	
			-63-	Lenze setting ⇨ PAR3 + FPAR3	
			-64-	Lenze setting ⇨ PAR4 + FPAR4	
			-70-	Keypad ⇨ PAR1 ... PAR4 + FPAR1 ... FPAR4	Overwrite all parameter sets with the keypad data
			-71-	Keypad ⇨ PAR1 + FPAR1	Overwrite single parameter sets with the keypad data
			-72-	Keypad ⇨ PAR2 + FPAR2	
			-73-	Keypad ⇨ PAR3 + FPAR3	
			-74-	Keypad ⇨ PAR4 + FPAR4	
			-80-	PAR1 ... PAR4 + FPAR1 ... FPAR4 ⇨ Keypad	Copy all parameter sets to the keypad



Function

Handling of parameter sets using the keypad:
- It is possible to set the Lenze setting again.
- Transfer of parameter sets from the keypad to the controller or vice versa. It is thus possible to copy the settings from one controller to the other.

Load Lenze setting

1. Plug in the keypad
2. Inhibit the controller with STOP or terminal (X3/28 = LOW)
3. Set the selection number under C0002 and acknowledge it with ENTER
   – E.g. C0002 = 1: Parameter set 1 of the controller will be overwritten with the Lenze setting
4. If *StorE* is off, the Lenze setting is loaded again.

Tranfer of parameter sets from the controller to the keypad

1. Plug in the keypad
2. Inhibit the controller with STOP or terminal (X3/28 = LOW)
3. Set C0002 = 20 or 50 or 80 and acknowledge with ENTER
4. If *SAvE* is off, all parameter sets are transferred to the keypad.

Transfer of parameter sets from the keypad to the controller

1. Plug in the keypad
2. Inhibit the controller with STOP or terminal (X3/28 = LOW)
3. Set the selection number under C0002 and acknowledge it with ENTER
   – E.g. C0002 = 10: All parameter sets of the controller will be overwritten with the settings of the keypad.
   – E.g. C0002 = 11: Parameter set 1 of the controller will be overwritten with the settings of the keypad.
4. If *LOAd* is off, all parameter sets are transferred to the controller.

Important

Do not disconnect the keypad while transmitting parameter sets (*StorE*, *SAVE* or *LOAd* will be displayed)!
If the keypad is disconnected during transmission, the fault "Prx" or "PT5" will be indicated. (📖 8-3)

7.11.2 Parameter set changeover (PAR, PAR2/4, PAR3/4)

Function

- Changes between the four parameter sets of the controller during operation (ONLINE). Thus, 9 additional JOG values or additional acceleration and deceleration times are available.
- The function PAR changes between the parameter sets 1 and 2.
- The functions PAR-B0 and PAR-B1 enable the changeover between all 4 parameter sets of the controller.

PAR activation

With HIGH active inputs:

C0007	Active parameter set	X3/E2	X3/E3
C007 = -10-, -11-, -12-, -13-, -21-:	PAR1	LOW	
	PAR2	HIGH	
-1-, -3-, -6-, -7-, -12-, -24-, -33-, -38-, -46-, -51-	PAR1		LOW
	PAR2		HIGH

Activation PAR-B0, PAR-B1

Assign C0410/13 (PAR-B0) and C0410/14 (PAR-B1) to signal sources.
With HIGH active inputs:

Signal source		Active parameter set
Level for PAR-B0	Level for PAR-B1	
LOW	LOW	PAR1
HIGH	LOW	PAR2
LOW	HIGH	PAR3
HIGH	HIGH	PAR4

Important

- **The parameter set changeover via terminals is not possible when the automatic changeover is activated through the DC-bus voltage (C0988 ≠ 0)!**
- The controller is default set to PAR1.
- When changing the parameter sets via terminals, the same terminals of all parameter sets must be assigned to PAR or PAR-B0 and PAR-B1.
- The codes in the code table marked with * are the same in all parameter sets.
- The active parameter set is indicated on the display of the keypad Disp (e. g. PS *2*).

Special features

If the control mode (C0014) is set differently in the parameter sets, the parameter sets should only be changed when the controller is inhibited (CINH).

7.12 Individual selection of drive parameters - The user menu

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0094*	User password		0 {1} 9999		0 = No pasword protection 1 ... 9999 = Free access only to user menu
C0517*↲	User menu				• After mains switching or when using the function Disp the code from C0517/1 will be displayed. • The Lenze setting of the user menu comprises the most important codes for commissioning the control mode "V/f characteristic control with linear characteristic" • When the password protection is activated, only the codes entered under C0517 are freely accessible. • Enter the required code numbers in the subcodes. • If codes are entered which are not available, C0050 will be copied to the memory.
1	Memory 1	50	C0050	Output frequency (MCTRL1-NOUT)	
2	Memory 2	34	C0034	Analog setpoint selection range	
3	Memory 3	7	C0007	Fixed configuration - digital input signals	
4	Memory 4	10	C0010	Minimum output frequency	
5	Memory 5	11	C0011	Maximum output frequency	
6	Memory 6	12	C0012	Acceleration time main setpoint	
7	Memory 7	13	C0013	Deceleration time main setpoint	
8	Memory 8	15	C0015	V/f rated frequency	
9	Memory 9	16	C0016	V_{min} boost	
10	Memory 10	2	C0002	Parameter set transfer	

Function

- Fast access to 10 selected codes
- Individual selection of 10 codes most important for an application

Important

- The user menu is active after mains switching or keypad attachment.
- Adaptation of the user menu using the keypad: (📖 6-5)
- Password protection: (📖 6-6)

Note!

- If the password protection is activated, the user menu can be used to provide your operating personnel with a "tailor made" code selection. The operating person can thus only change the codes in the user menu.
- Example: The operating peronnel for a transportation belt may not change any other but the speed of the belt via the keypad (▼▲). The actual speed is to be indicated in "rpm".
  - Assign C0140 to the memory 1 of the user menu (C0517/1 = 140)
  - Delete all other entries in the user menu (C0517/2 ... C0517/10 = 0)
  - Convert the display value of C014 in "rpm" via C0500/C0501 (📖 7-50)
  - Activate the password protection
  - After the keypad has been attached or after mains switching, the actual speed of the transportation belt is displayed. The speed can be changed during operation by using the keys ▼▲. The setpoint will be stored when switching-off the mains.

8 Troubleshooting and fault elimination

An operating fault is immediately indicated via the controller LED or the keypad status information. (📖 8-1)

The fault can be analysed with the history buffer. The list "Fault messages" gives information on how to eliminate the fault. (📖 8-3)

8.1 Troubleshooting

8.1.1 Operating status display

During operation, the status of the controller is indicated by means of two LEDs.

LED		Operating status
green	**red**	
on	off	Controller enabled
on	on	Mains switched on and automatic start inhibited
blinking	off	Controller inhibited
off	blinking every second	Fault active, check under C0161
off	blinking every 0.4 seconds	Undervoltage switch-off
fast blinking	off	Motor parameter identification

8.1.2 Faulty drive operation

Maloperation	Cause	Remedy	
Motor does not rotate	DC-bus voltage too low (Red LED is blinking every 0.4 s, keypad display: *LU*)	Check mains voltage	
	Controller inhibited (Green LED is blinking, keypad display: IMP)	Remove the controller inhibit, controller inhibit can be set through several sources	📖 7-12
	Automatic start inhibited (C0142 = 0 or 2)	LOW-HIGH signal at X3/28 If necessary, correct start condition (C0142)	
	DC-injection brake (DCB) active (keypad display: IMP)	Deactivate DC-injection brake	📖 7-17
	Mechanical motor brake is not released	Manual or electrical release of mechanical motor brake	
	Quick stop (QSP) active (keypad display: IMP)	Remove quick stop	📖 7-16
	Setpoint = 0	Setpoint selection	📖 7-19 ff
	JOG setpoint activated and JOG frequency = 0	JOG setpoint selection	📖 7-26
	Active fault	Eliminate fault	📖 8-3
	Wrong parameter set active	Change to correct parameter set via terminal	📖 7-17
	Control mode C0014 = -4-, -5-, but no motor parameter identification	Motor parameter identification	📖 7-28 📖 7-2
	Under C0410 several functions, which exclude each other, are assigned to the same signal source.	Correct configuration in C0410	📖 7-41
	When using the internal voltage source X3/20 with the function modules standard-I/O, INTERBUS, PROFIBUS-DP or LECOM-B (RS485): Bridge between X3/7 and X3/39 is missing	Bridge terminals	
Motor does not rotate smoothly	Defective motor cable	Check motor cable	
	Maximum current C0022 and C0023 is set too low	Adaptation to the application	📖 7-14
	Motor underexcited or overexcited	Check parameter setting (C0015, C0016, C0014)	📖 7-2 ff
	C0084, C0087, C0088, C0089, C0090, C0091 and/or C0092 are not adapted to the motor data	Manual adaptation or identification of motor parameters	📖 7-28
Current consumption of motor too high	Setting of C0016 too high	Correct setting	📖 7-5
	Setting of C0015 too low	Correct setting	📖 7-4
	C0084, C0087, C0088, C0089, C0090, C0091 and/or C0092 are not adapted to the motor data	Manual adaptation or identification of motor parameters	📖 7-28
Motor rotates, setpoints are "0"	With the funtion Set of the keypad a setpoint has been selected.	Set the setpoint to "0" by C0140 = 0	📖 7-26

8.2 Fault analysis with the history buffer

The history buffer is used to trace faults. The fault messages are stored in the history buffer in the order of their occurrence.

The memory locations can be retrieved via the codes.

Structure of the history buffer			
Code	**Memory location**	**Entry**	**Note**
C0161	Memory location 1	Active fault	If the fault is no longer active or has been acknowledged: • The contents of the memory locations 1-3 will be saved in a "higher" location. • The contents of the memory location 4 will be eliminated from the history buffer and cannot be read any longer. • Memory location 1 will be deleted (= no active fault).
C0162	Memory location 2	Last fault	
C0163	Memory location 3	Last but one fault	
C0164	Memory location 4	Last but two fault	

8.3 Fault messages

Display Keypad	PC [1]	Fault	Cause	Remedy
nOEr	0	No fault	-	-
CCr	71	System fault	Strong interference on control cables	Shield control cables
			Ground or earth loops in the wiring	
CE0	61	Communication error to AIF	Faulty transmission of control commands via AIF	Insert the communication module into the hand terminal
CE1	62	Communication error to CAN-IN1 with sync control	CAN-IN1-object receives faulty data or communication is interrupted	• Plug-in connection - bus module ⇔ check FIF • Check transmitter • Increase monitoring time under C0357/1 if necessary
CE2	63	Communication error to CAN-IN2	CAN-IN2-object receives faulty data or communication is interrupted	• Plug-in connection - bus module ⇔ check FIF • Check transmitter • Increase monitoring time under C0357/2 if necessary
CE3	64	Communication error to CAN-IN1 with event or time control	CAN-IN1-object receives faulty data or communication is interrupted	• Plug-in connection - bus module ⇔ check FIF • Check transmitter • Increase monitoring time under C0357/3 if necessary
CE4	65	BUS-OFF (many communication errors occured)	Controller has received too many incorrect telegrams via the system bus and has been disconnected	• Check whether bus terminator available • Shield control of the cables • Check PE connection • Check bus load, if necessary, reduce the baud rate
CE5	66	CAN Time-Out	For remote parameter setting via system bus (C0370): Slave does not answer. Communication monitoring time exceeded.	• Check system bus wiring • Check system bus configuration
			For operation with module in FIF: Internal fault	Contact Lenze
EEr	91	External fault (TRIP-Set)	A digital signal assigned to TRIP set has been activated	Check external encoder
H05	105	Internal fault		Contact Lenze
Id1	140	Faulty parameter identification	Motor not connected	Connect motor
LP1	32	Fault in motor phase (TRIP)	• Failure of one/several motor phase(s) • Motor current too low	• Check motor cables, • check V_{min} boost, • connect motor to corresponding power or adapt the motor under C0599.
	182	Fault in motor phase (warning)		
LU	1030	DC-bus undervoltage (only message without TRIP)	Mains voltage too low	Check mains voltage
			DC-bus voltage too low	Check supply module
			400 V controller connected to 240 V mains	Connect controller to the appropriate mains voltage
OC1	11	Short-circuit	Short-circuit	Find reason for short-circuit; check motor cable
			Excessive capacitive charging current of the motor cable	Use shorter motor cables with lower charging current
OC2	12	Earth fault	Grounded motor phase	Check motor, check motor cable
			Excessive capacitive charging current of the motor cable	Use shorter motor cables with lower charging current
				For testing purposes the earth fault detection can be deactivated (📖 7-48)
OC3	13	Overload inverter during acceleration or short circuit	Acceleration time too short (C0012)	• Increase acceleration time • Check drive selection
			Defective motor cable	Check wiring
			Interturn fault in the motor	Check motor
OC4	14	Overload controller during deceleration	Deceleration time set too short (C0013)	• Increase deceleration time • Check size of external brake resistor
OC5	15	Controller overload in stationary operation	Frequent and long overload	Check drive selection
OC6	16	Motor overload (I^2 x t overload)	Motor is thermally overloaded, for instance, because of • impermissible continuous current • frequent or too long acceleration processes	 • Check drive selection • Check setting of C0120

Troubleshooting and fault elimination

Display Keypad	PC [1]	Fault	Cause	Remedy
OH	50	Heat sink temperature is > +85 °C	Ambient temperature T_{amb} > +60 °C	• Allow controller to cool and ensure better ventilation • Check ambient temperature
			Heat sink very dirty	Clean heat sink
			Impermissibly high currents or too frequent and too long acceleration	• Check drive selection • Check load, if necessary, replace defective bearings
OH3	53	PTC monitoring (TRIP)	Motor too hot because of excessive currents or frequent and too long accelerations	Check drive selection
OH4	54	Controller overtemperature	Controller inside too hot	• Reduce controller load • Improve cooling • Check fan in the controller
OH51	203	PTC monitoring (warning)	PTC not connected	Connect PTC or switch off monitoring
OU	1020	DC-bus overvoltage (only message without TRIP)	Mains voltage too high	Check voltage supply
			Braking operation	• Prolong deceleration times. • For operation with brake transistor: – Check the selection and connection of the brake resistor – Increase the deceleration times – If necessary, adapt the threshold to the mains voltage under C0174
			Earth leakage on the motor side	Check motor cable and motor for earth fault (disconnect motor from inverter)
Pr	75	Faulty parameter transfer when using the keypad	All parameter sets are defective	It is absolutely necessary to repeat the data transfer or load the Lenze setting before enabling the controller.
Pr1	72	Wrong PAR1 transfer when using the keypad.	PAR1 is defective.	
Pr2	73	Wrong PAR2 transfer when using the keypad.	PAR2 is defective.	
Pr3	77	Wrong PAR3 transfer when using the keypad.	PAR3 is defective	
Pr4	78	Wrong PAR4 transfer when using the keypad.	PAR4 is defective	
Pr5	79	Internal fault		Contact Lenze
PTS	81	Time error during parameter set transfer	Data flow from keypad or PC interrupted, e. g. keypad was disconnected during transmission	It is absolutely necessary to repeat the data transfer or load the Lenze setting before enabling the controller.
rST	76	Faulty auto-TRIP reset	More than 8 fault messages in 10 minutes	Depends on the fault message
Sd5	85	Open circuit in analog input (setpoint range 4 ... 20 mA)	Current at analog input < 4 mA	Close circuit at analog input

[1] LECOM fault number

8.4 Reset of fault messages

TRIP

After the fault has been eliminated, pulse inhibit will only be reset if TRIP is acknowledged.

Note!

A TRIP can have several reasons. The fault message can only be acknowledged if all reasons for the TRIP have been eliminated.

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0043	TRIP reset		-0-	No current fault	Reset active fault with C0043 = 0
			-1-	Active fault	
C0170↲	Configuration TRIP reset	-0-	-0-	TRIP reset by mains switching, STOP, LOW–signal at X3/28, via function module (exception: LECOM-B) or communication module	• TRIP reset via function module or communication module with C0043, C0410/12 or C0135 bit 11. • Auto TRIP reset after the time set under C0171.
			-1-	like -0- and additional auto TRIP reset	
			-2-	TRIP reset by mains switching, LOW–signal at X3/28 or via function module (not with LECOM–B)	
			-3-	TRIP reset by mains switching	
C0171	Delay for auto-TRIP reset	0.00	0.00	{0.01 s} 60.00	

Function

You can select whether the active fault is to be reset automatically or manually.

Important

- TRIP reset is always carried out when switching the mains.
- With more than 8 Auto-TRIP resets within 10 minutes, the controller sets TRIP and indicates rST.
- TRIP reset also resets the auto-TRIP counter.

9 Automation

9.1 Function module system bus (CAN)

9.1.1 Description

The function module system bus (CAN) is a component for the frequency inverters 8200 motec and 8200 vector, which connects the controllers to the serial communication system CAN (Controller Area Network).

The controllers can also be retrofitted.

The function module extends the controller functionality:

- Parameter selection/remote parameter setting
- Decentral terminal expansion
- Data exchange between controllers
- Keypad and operating units
- Connection to external control systems and hosts

9.1.2 Technical data

9.1.2.1 General data and application conditions

Protocol	CANopen (CAL based communication profile DS301)				
Communication medium	DIN ISO 11898				
Network topology	Line (terminated at both ends with 120 Ω)				
System bus participants	Master or slave				
Max. number of participants	63				
Baud rate [kBit/s]	20	50	125	250	500
Max. bus length [m]	2500	1000	500	250	80
Electrical connection	Screw terminals Terminal for controller inhibit (CINH) available				
DC supply voltage	Internal (In the event of failure of the controller, the bus system continues operation)				
Insulation voltage to PE	50 V AC				
Type of protection	IP55				
Ambient temperature	During operation: -10 ... +60 °C During transport: -25 ... +60 °C During storage: -25 ... +60 °C				
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)				
Dimensions (L x W x H)	75 mm x 62 mm x 23 mm				

9.1.2.2 Communication times

The system bus communication times depend on

- the priority of the data
- the bus load
- the data transmission rate
- the processing time in the controller

Teletram times						Processing times in the controller	
	Baud rate [kBits/s]					Parameter channel	Process data
	20	50	125	250	500		
Running time/processing time [ms]	6.5	2.6	1.04	0.52	0.26	< 20	1 ... 2

9.1.3 Installation

9.1.3.1 Mechanical installation

See Mounting Instructions

9.1.3.2 Electrical installation

Terminal assignment

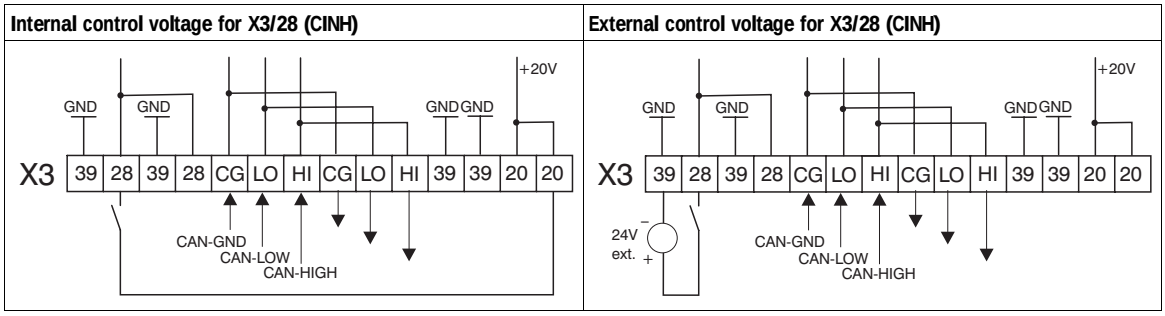


Fig. 9-1 Terminal assignment of the function module

Terminal	Name	Explanation	
X3/39	GND	Reference potential	
X3/28	CINH	Controller inhibit • Start = HIGH (+12 V ... +30 V) • Stop = LOW (0 V ... +3 V)	
X3/CG	CAN-GND	System bus reference potential	with internal series resistance 100 Ω, max. current capacity 30 mA
X3/LO	CAN-LOW	System bus LOW (data line)	
X3/HI	CAN-HIGH	System bus HIGH (data line)	
X3/20		+ 20 V internal for CINH	

Wiring of the system bus network

Principle structure

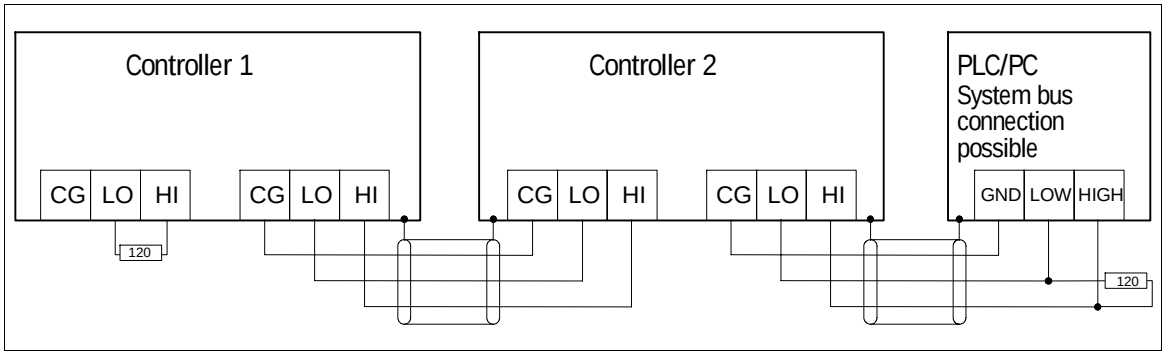


Fig. 9-2 Principle structure of a system bus network

Wiring notes

We recommend the following signal cable for wiring:

System bus cable specification	Total length up to 300 m	Total length up to 1000 m
Cable type	LIYCY 2 x 2 x 0.5 mm^2 (paired and shielded cable)	CYPIMF 2 x 2 x 0.5 mm^2 (paired and shielded cable)
Cable resistance	≤ 40 Ω/km	≤ 40 Ω/km
Capacitance per unit length	≤ 130 nF/km	≤ 60 nF/km
Connection	Pair 1 (white/brown): LO and HI Pair 2 (green/yellow): GND	

Note!

The controller has a double basic insulation to EN 50178. An additional mains isolation is not required.

9.1.4 Commissioning with the function module system bus (CAN)

Stop!

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

Initial switch on of a system bus network with a higher level master (e.g. PLC)

1. Switch on the mains. The green LED at the controller is blinking.
2. If necessary, change the system baud rate (C0351) via the keypad or PC.
   – Lenze setting: 500 kBaud
   – Changes will not be accepted before the command “Reset node” (C0358 = 1).
3. For several networked controllers:
   – System bus controller address (C0350) is to be set for every controller via the keypad or PC. Every address in the network must only be used once.
   – Lenze setting: 1
   – Changes will not be accepted before the command “Reset node” (C0358 = 1).
4. It is now possible to communicate with the controller, i.e. all codes can be read and all writeable codes can be changed.
   – If necessary, adapt the codes to your application. (📖 5-2 “Lenze setting of the most important drive parameters”)
5. Setpoint source configuration:
   – C0412/1 = 20 ... 23: Setpoint source is a word of the Sync-controlled process data channel 1 (CAN1)
   – E. g. C0412/1 = 21: Setpoint source is CAN-IN1.W2.
6. Master sets the system bus (CAN) to the status ”OPERATIONAL”.
7. Setpoint selection:
   – Send setpoint via the selected CAN word (e. g. CAN-IN1.W2).
8. Send sync telegram.
   – Sync telegram is only received by system bus participant if C0360 = 1 (Sync control) is set.
9. Enable the controller via terminal (HIGH signal at X3/28).

The drive is now running.

Note!

An example for the communication between controllers in a system bus network is given in the next chapter. (📖 9-22)

9.1.5 Parameter setting

If the parameters for the controller are set via the function module system bus (CAN), the data are entered using a PC, the PLC or other operating units. For more detailed information see the corresponding software documentation.

9.1.5.1 Parameter channels

Paremeters are values, which are stored as codes in Lenze controllers. Parameters are changed, for instance, for individual system settings or a change of the material used in the machine.

The two parameter channels (SDO = Service Data Object) in the function module system bus (CAN) enable the connection of two different parameter setting units at the same time, e.g. connection of a PC and an operating unit.

Parameters are transferred with low priority

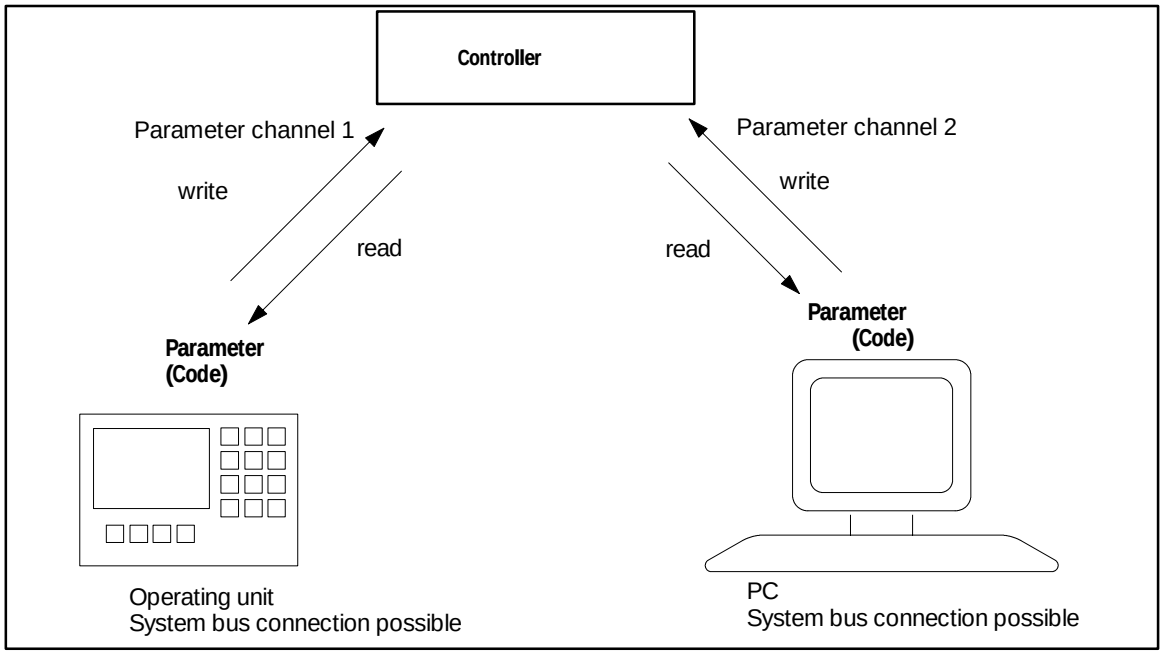


Fig. 9-3 Connection of parameter setting units via two parameter channels

9.1.5.2 Process data channels

Process data (e.g. setpoints and actual values) are transmitted and processed at high speed and priority. The function module system bus (CAN) provides:

A cyclic, synchronized process data channel (CAN1) for the communication to the host (process data objects CAN-IN1 and CAN-OUT1)

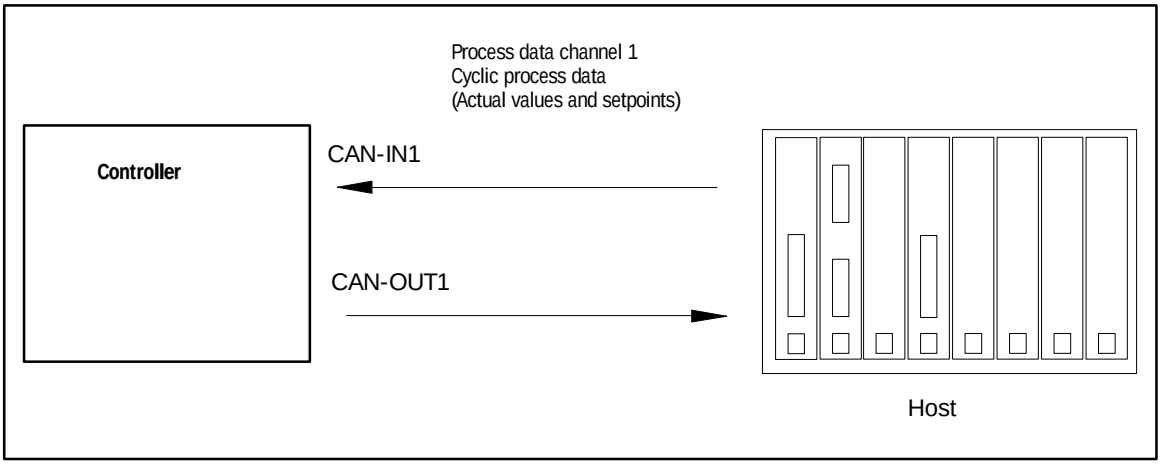


Fig. 9-4 Process data objects CAN-IN1 and CAN-OUT1 for host communication

An event-controlled process data channel (CAN2) for communication between the controllers (process data objects CAN-IN2 and CAN-OUT2)

Decentralized input and output terminal and higher level host systems can also use CAN2.

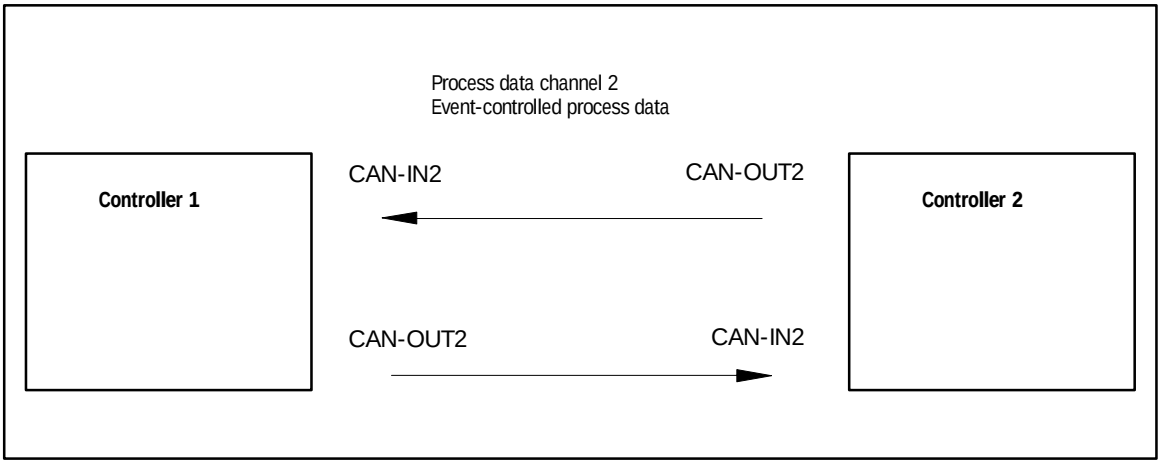


Fig. 9-5 Event-controlled process data channel for communication between controllers

Note!

- CAN1 can also be used in event-controlled or time-controlled operation like CAN2 (selection under C0360).
- The output data of the event-controlled process data channels can also be transferred cyclically with an adjustable time (setting under C0356)

9.1.5.3 Parameter addressing (code number/index)

The controller parameters are addressed through the index. The index for Lenze code numbers is between 16567 ($40C0_{hex}$) and 24575 ($5FFF_{hex}$)

Conversion formula: Index = 24575 - Lenze code number

9.1.5.4 Configuration of the system bus network

Determination of a master in the drive network C0352

C0352	Value	Note
0	Slave (Lenze setting)	• It is absolutely necessary to select one controller as master, if the data is to be exchanged between the controllers connected to a system bus network without superimposed host as master. • The master functionality is only required during the initialization phase of the drive system. • The master changes the status from pre-operation to operational. • Data exchange via the process data object is only possible in the operational status. • For the initialization phase, a master boot-up time is adjustable (📖 9-8) .
1	Master	

General addressing C0350

C0350	Value	Note
	1 (Lenze setting) ... 63	• C0350 enables the addressing of all data objects (parameter and process data channels). • Communication between system bus participants via event-controlled process data channels: – If the controllers get complete addresses in rising order, the event-controlled data objects are connected to enable the communication between the controllers. Example: – Controller 1: C0350 = 1 Controller 2: C0350 = 2 Controller 3: C0350 = 3 – The data channels are assigned as follows: CAN-OUT2 controller 1 → CAN-IN2 controller 2 CAN-OUT2 controller 2 → CAN-IN2 controller 3 • Communication between system bus participants via cyclic, synchronized process data channels: – The exchange of synchronized process data CAN-IN1 and CAN-OUT1 (C0360 = 1) from one controller to the other is possible, if a system bus participant can send the sync telegram (e.g. Lenze 9300 servo inverter). • Changes will only be accepted after the following actions: – Mains switching – Command "Reset node" via the bus system – Reset node via C0358

Selective addressing of individual process data objects C0353

C0353	Value		Note
C0353/1 (Address preselection CAN1 with sync control)	0	Addresses from C0350 (Lenze setting)	If C0350 does not provide the data exchange as required, each process data object can get its own address from C0354. The data input objects to be addressed must correspond to the identifier of the data output object. The identifier is a CAN specific assignment criterium for a message. Observe the resulting identifiers for the use of separate units, such as decentralized digital inputs and outputs. • Changes will only be accepted after the following actions: – Mains switching – Command "Reset node" via the bus system – Reset node via C0358 • The resulting identifiers can be retrieved under C0355.
	1	Address for CAN-IN1 from C0354/1 Address for CAN-OUT1 from C0354/2	
C0353/2 (Address preselection CAN2)	0	Addresses from C0350 (Lenze setting)	
	1	Address for CAN-IN2 from C0354/3 Adresse for CAN-OUT2 from C0354/4	
C0353/1 (Address preselection CAN1 with event or time control)	0	Addresses from C0350 (Lenze setting)	
	1	Address for CAN-IN1 from C0354/5 Address for CAN-OUT1 from C0354/6	

Time settings for the system bus C0356

C0356	Value		Note
C0356/1 (boot-up)	3000 ms (Lenze setting)		Time setting for the boot-up of the master (only valid if C0352 = 1) In general, the Lenze setting is high enough. If several controllers are connected to a network without a master system initialising the CAN network, one of the controllers must carry out the initialization as master. For this, the master activates the whole CAN network at a certain time and starts the process data transmission. (Status change from pre-operational to operational). C0356 determines when after mains connection the CAN network is going to be initialised.
C0356/2 (Cycle time CAN-OUT2)	0	event controlled	• Event-controlled process data transmission – The process data output object will only be sent, if a value of the output object is changed. • Cyclic process data transmission – The process data output object is sent with the cycle time set here. • C0356/3 is only active if C0360 = 0
	> 0	Cyclic	
C0356/3 (Cycle time CAN-OUT1)	0	event controlled	
	> 0	Cyclic	
C0356/4 (CAN delay)		Delay time	The cyclic sending starts after the boot up, after the delay time is over.

Monitoring times C0357

C0357	Display	Note
C0357/1 C0357/3	Monitoring time CAN-IN1	Monitoring of the process data input objects whether a telegram has been received in the time defined here. • If a telegram has been received in the time set, the corresponding monitoring time will be reset and restarted. • If no telegram has been received in the time set, the controller sets trip CE1/CE3 (CAN-IN1) or CE2 (CAN-IN2). • If the controller receives too many faulty telegrams, it is disconnected from the bus and sets TRIP CE4 (bus off).
C0357/2	Monitorin time CAN-IN2	

Reset-Node C358

C0358	Value	Note
0	Not active/reset node carried out	• Baud rate changes or changes of the addresses for the process data objects or the controller will only be valid after a reset node. • A reset node can also be made by – mains reconnection – Reset-node via the bus system
1	Start reset node	

9.1.6 Communication profile of the system bus

The following pages describe the CAL based communication profile DS 301 (CANopen) for the function module system bus (CAN).

9.1.6.1 Data description

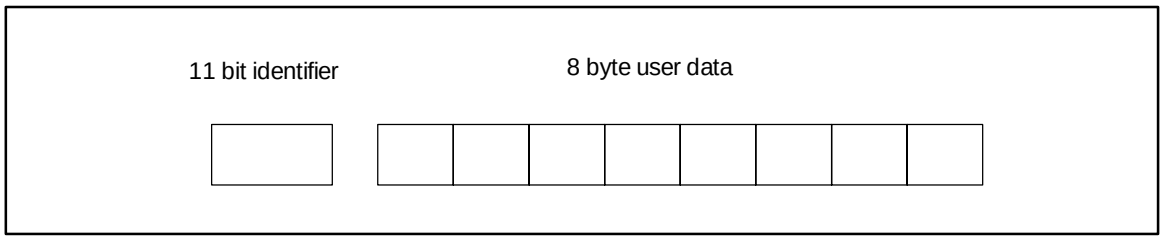


Fig. 9-6 Simplified structure of a CAN telegram

Identifier	The identifier determines the priority of the message. Furthermore, the CANopen codes: • Controller address • Determination which user data object will be transmitted.
User data	User data can be used for: • Initialization (communication via the system bus) • Parameter setting for the controller (with Lenze controllers reading and writing of codes.) • Process data (for fast, often cyclic processes (e. g. transmission of setpoint/act. value)

9.1.6.2 Drive addressing

The CAN bus system is message and not participant-oriented. Each message has a unique identifier. With CANopen the participant orientation is clear because there is only one sender per message. The identifiers are automatically calculated from the address entered in the controller. Exception: The identifier of the network management.

Message			**Identifier = Basic identifier + address**
Network management Sync-telegram			0 128
Parameter channel 1 to drive Parameter channel 2 to drive			1536 + address in C0350 1600 + address in C0350
Parameter channel 1 from drive Parameter channel 2 from drive			1408 + address in C0350 1472 + address in C0350
Process data channel to drive (CAN-IN1)	sync controlled time controlled	(C0360 = 1) (C0360 = 0)	512 + address in C0350 or C0354/1 768 + address in C0350 or C0354/5
Process data channel from drive (CAN-OUT1)	sync controlled time controlled	(C0360 = 1) (C0360 = 0)	384 + address in C0350 or C0354/2 769 + address in C0350 or C0354/6
Process data channel to drive (CAN-IN2) Process data channel from drive (CAN-OUT2)			640 + address in C0350 or C0354/3 641 + address in C0350 or C0354/4

Note!

The identifiers can be retrieved via C0355.

9.1.6.3 The three communication phases of the CAN network

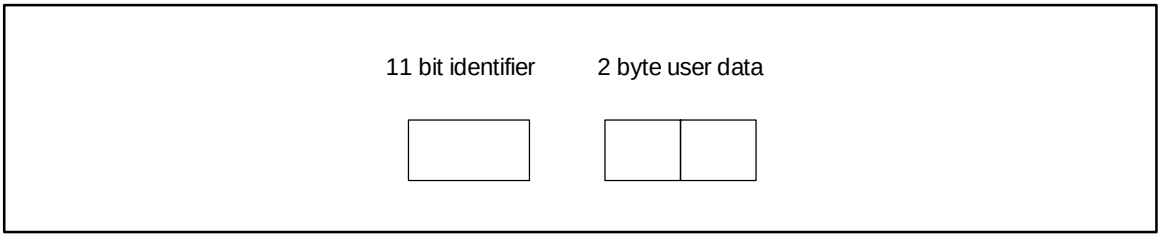


Fig. 9-7 Telegram to change the communication phase

Telegrams with the identifier 0 and 2 byte user data are used to change between the different communication phases.

State	Explanation
a	**"Initialization"** The drive does not take part in the data transfer on the bus. This status is reached after the controller has been switched on. Furthermore it is possible to restart the entire initilization phase or parts of it by transmitting different telegrams. All parameters already set are overwritten with their standard values. After initialisation, the drive is automatically set to the status "pre-operational".
b	**"Pre-operational" (before being ready for operation)** The drive can receive parameter setting data. The process data are ignored.
c	**"Operational" (ready for operation)** The drive can receive parameter setting and process data.

The network master changes the communication phases for the whole network. This could also be done by a controller, if it is defined as master under C0352.

With a delay after mains connection (time adjustable under C0356/1) the master sends a telegram that set the whole network to the status "pre-operational".

Telegrams to change between the communication phases				
From	**To**	**Data (hex)**	**Note**	
Pre-operational	Operational	01xx	Process and parameter setting data active	• xx = 00_{hex}: – The telegram is addressed to all bus participants. – The status is changed for all bus participants at the same time. • xx = controller address: – The status is only changed for the bus participant with the address indicated.
Operational	Pre-operational	80xx	Only parameter setting data active	
Operational	Initialization	81xx	Resets the drive, all parameters are overwritten with standard values.	
Pre-operational	Initialization	81xx		
Operational	Initialization	82xx	Resets the drive, only communication-relevant parameters are reset	
Pre-operational	Initialization	82xx		

Note!

Communication via process data is only possible when the drive is set to the status "Operational"!

9.1.6.4 Parameter data structure

The parameters can be set through two separate software channels, which have to be selected via the controller address.

The telegram structure for parameter setting is as follows:

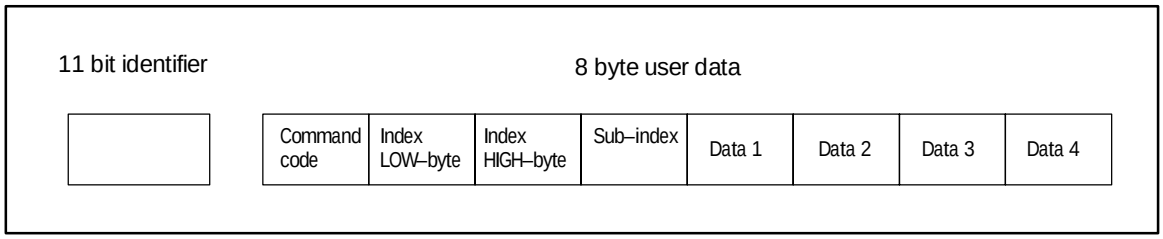


Fig. 9-8 Structure of the telegram for parameter setting

Command code

The command code contains the information required to write and read parameters and about the user data length:

Command code structure:

	bit 7 (MSB)	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0 (LSB)	Note
Job	Command Specifier (cs)			0	Length		e	s	User data length coded in bis 2 and bit 3: • 00 = 4 byte • 01 = 3 byte • 10 = 2 byte • 11 = 1 byte
Write request	0	0	1	0	x	x	1	1	
Write response	0	1	1	0	x	x	0	0	
Read request	0	1	0	0	x	x	0	0	
Read response	0	1	0	0	x	x	1	1	
Error response	1	0	0	0	0	0	0	0	

Example:

The most frequently used parameters are data with 4 bytes (32 bit) and 2 bytes (16 bit) data length:

Jobs	4 byte (32 bit) data		2 byte (16 bit) data		Meaning
	hex	dez	hex	dez	
Write request	23_{hex}	35	$2B_{hex}$	43	Send parameter to drive
Write response	60_{hex}	96	60_{hex}	64	Controller response to the write request (acknowledgement)
Read request	40_{hex}	64	40_{hex}	64	Request to read a parameter from the drive
Read response	43_{hex}	67	$4B_{hex}$	75	Response to the read request with actual value
Error response	80_{hex}	128	80_{hex}	128	The controller indicates a communication error

Index LOW byte, index HIGH byte

The Lenze code is selected with these two bytes according to the formula:

Index = 24575 - Lenze code number - 2000 · (parameter set - 1)

Example:

Index of C0012 (acceleration time) in parameter set 1= 24575 - 12 -0 = 24563 = $5FF3_{hex}$

Left-margin Intel data format, the entries are:
Index LOW byte = $F3_{hex}$
Index HIGH byte = $5F_{hex}$

Subindex

The subindex addresses a subcode. Codes without subcodes must have a subindex 0.

Example:

Subindex of C0417/4 = 4_{hex}

Data 1 to data 4

The value to be transmitted with a length of up to 4 bytes.

The controller parameters are stored in different formats.The most frequently used format is Fixed-32. This is a fixed comma format with 4 decimal codes. These parameters must be multiplied by 10.000.

Fault message (command code = 128 = 80_{hex})

In the event of an error, the drive generates an error response. In data 4 of the user data part a 6, and in data 3 an error code is transmitted.

Possible error codes:

Command code	Data 3	Data 4	Meaning
80_{hex}	6	6	Wrong index
80_{hex}	5	6	Wrong subindex
80_{hex}	3	6	Access denied

Example: Write parameter

The acceleration time C0012 of the controller with the address 1 is to be changed to 20 s via parameter channel 1.

- Identifier calculation:
  – Identifier parameter channel 1 to controller = 1536 + controller address = 1536 + 1 = 1537
- Command code = write request (Send parameter to drive) = 23_{hex}
- Index calculation:
  – Index = 24575 - code number = 24575 - 12 = 24563 = $5FF3_{hex}$
  Subindex: C0012 = 0
- Calculation of the acceleration time value:
  – 20 s * 10.000 = 200.000 = $00030D40_{hex}$
- Telegram to drive:

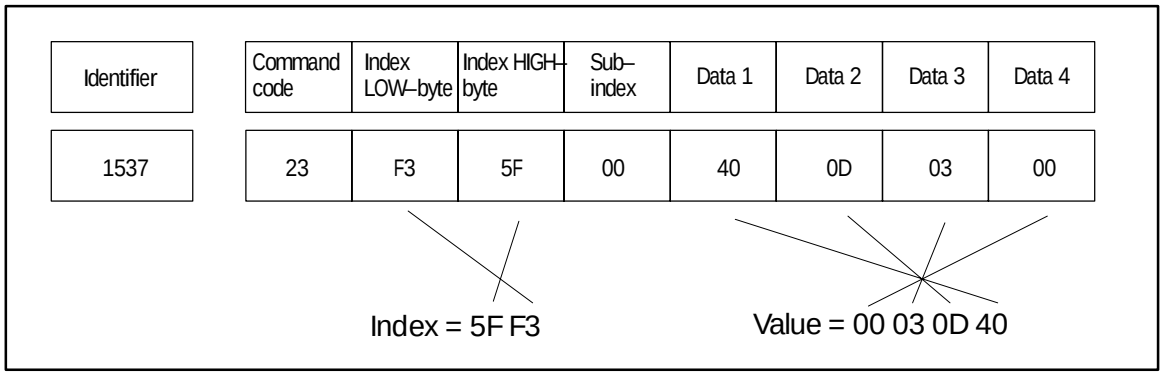


Fig. 9-9 Telegram to drive (write parameter)

- Telegram from drive if transmission is fault free:

Identifier	Command code	Index LOW–byte	Index HIGH–byte	Sub–index	Data 1	Data 2	Data 3	Data 4
1409	60	F3	5F	00	00	00	00	00

Fig. 9-10 Controller response in the event of faulty transmission

Identifier parameter channel 1 from controller: 1408 + controller address = 1409
Command code = write response (controller response (acknowledgement)) = 60_{hex}

Example: Read parameter

Read the heat sink temperature C0061 (43 °C) of the controller with address 5 via the parameter channel 1.

- Identifier calculation:
  – Identifier parameter channel 1 to controller = 1536 + controller address = 1536 + 5 = 1541
- Command code = read request (read controller parameter)$_{hex}$
- Index calculation:
  – Index = 24575 - code number = 24575 - 61 = 24514 = 5FC2$_{hex}$
- Telegram to drive:

Identifier	Command code	Index LOW–byte	Index HIGH–byte	Sub–index	Data 1	Data 2	Data 3	Data 4
1541	40	C2	5F	00	00	00	00	00

Fig. 9-11 Telegram to drive (read parameter)

- Telegram from drive:

Identifier	Command code	Index LOW–byte	Index HIGH–byte	Sub–index	Data 1	Data 2	Data 3	Data 4
1413	43	C2	5F	00	B0	8F	06	00

Fig. 9-12 Telegram from drive

Identifier parameter channel 1 from controller = 1408 + controller address = 1413

Command code = read response to the read request, actual value = 43$_{hex}$

Read request index = 5FC2$_{hex}$
Subindex = 0 (no subindex for C0061)

Data 1 to data 4 = 43 °C * 10.000 = 430.000 = 00068FB0$_{hex}$

9.1.6.5 Process data structure

There are two process data objects for input information (CAN-IN1, CAN-IN2) and two process data objects for output information (CAN-OUT1, CAN-OUT 2) to ensure fast data transmission between the controllers or between controller and superimposed host.

It is possible to transfer binary signals, for instance, the states of digital input terminals, data in 16 bit, such as analog signals.

- Cyclic, synchronized process data (process data channel CAN1)
  - There is a process data object for input signals and a process data object for output signals each providing 8 bytes user data to ensure fast cyclic data transmission.
  - These data are for the communication with the superimposed host, for instance, a PLC.
  - CAN1 can also be used for event-controlled operation (setting under C0360).
- Event-controlled process data (process data channel CAN2)
  - There is a process data object for input signals and a process data object for output signals each providing 8 bytes user data to ensure event-controlled data transmission.
  - These output data will be transferred if a value of the user data changes.
  - These process data objects are mainly for the data exchange between controllers and for decentralized terminal extension. They can also be used by a host.

Cyclic process data

The sync-telegram ensures that the controller can read and accept the cyclic process data.

The sync-telegram is the trigger point for data acceptance in the controller and starts sending from the controller. For cyclic process data processing, the sync-telegram must be generated accordingly from the master system.

Synchronization of cyclic process data

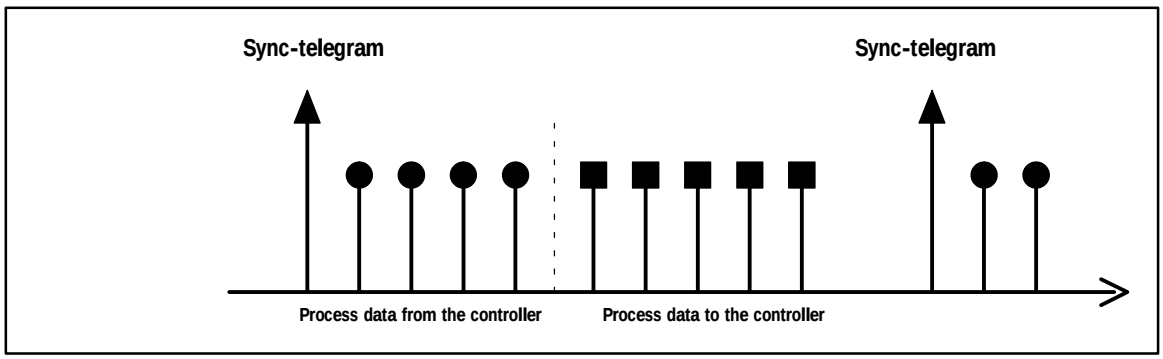


Fig. 9-13 Sync-telegram (asynchronous data not considered)

The controllers send cyclic process data after having received a sync-telegram. Then the data are transferred to the controllers where they are accepted through another sync-telegram.

All other telegram, e. g. parameters or the event-controlled process data, are accepted by the controllers after transmission.

Structure of process data telegrams in the cyclic process data channel (C0360 = 1)

Identifier	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

	User data assignment		
	Byte	**Word assignment (16 bit)**	**Individual bit assignment**
Cyclic process data telegram to the drive CAN-IN1	1	CAN-IN1.W1 (LOW-byte)	CAN-IN1.B0 …
	2	CAN-IN1.W1 (HIGH-byte)	CAN-IN1.B15
	3	CAN-IN1.W2 (LOW-byte)	CAN-IN1.B16 …
	4	CAN-IN1.W2 (HIGH-byte)	CAN-IN1.B31
	5	CAN-IN1.W3 (LOW-byte)	
	6	CAN-IN1.W3 (HIGH-byte)	
	7	CAN-IN1.W4 (LOW byte)	
	8	CAN-IN1.W4 (HIGH byte)	
Cyclic process data telegram from the drive CAN–OUT1	1	CAN-OUT1.W1 (LOW byte)	CAN-OUT1.B0 …
	2	CAN-OUT1.W1 (HIGH byte)	CAN-OUT1.B15
	3	CAN-OUT1.W2 (LOW byte)	CAN-OUT1.B16 …
	4	CAN-OUT1.W2 (HIGH byte)	CAN-OUT1.B31
	5	CAN-OUT1.W3 (LOW byte)	
	6	CAN-OUT1.W3 (HIGH byte)	
	7	CAN-OUT1.W4 (LOW byte)	
	8	CAN-OUT1.W4 (HIGH byte)	

Event-controlled process data optionally with adjustable cycle time

8 bytes are available for a data object.

The output data are transmitted if a value within the 8 byte user data changes with the cycle time for CAN-OUT2 set under C0356/2 or for CAN-OUT1 set under C0356/3.

Structure of process data telegrams in the event-controlled process data channel

Identifier	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

	User data assignment		
	Byte	**Word assignment (16 bit)**	**Individual bit assignment**
Process data telegram to drive CAN-IN2 (accepts system bus participant immediately)	1	CAN-IN2.W1 (LOW byte)	CAN-IN2.B0 …
	2	CAN-IN2.W1 (HIGH byte)	CAN-IN2.B15
	3	CAN-IN2.W2 (LOW byte)	CAN-IN2.B16 …
	4	CAN-IN2.W2 (HIGH byte)	CAN-IN2.B31
	5	CAN-IN2.W3 (LOW byte)	
	6	CAN-IN2.W3 (HIGH byte)	
	7	CAN-IN2.W4 (LOW byte)	
	8	CAN-IN2.W4 (HIGH byte)	
Event-controlled process data telegram from the drive CAN-OUT2	1	CAN-OUT2.W1 (LOW byte)	
	2	CAN-OUT2.W1 (HIGH byte)	
	3	CAN-OUT2.W2 (LOW byte)	
	4	CAN-OUT2.W2 (HIGH byte)	
	5	CAN-OUT2.W3 (LOW byte)	
	6	CAN-OUT2.W3 (HIGH byte)	
	7	CAN-OUT2.W4 (LOW byte)	
	8	CAN-OUT2.W4 (HIGH byte)	

Note!

The structure of the process data telegrams must correspond to the process data channel CAN1, if this is to be used for event-controlled operation (C0360 = 0).

9.2 Automation with the function modules INTERBUS, PROFIBUS-DP, LECOM-B (RS485)

The automation with the function modules INTERBUS, PROFIBUS-DP, LECOM-B (RS485) is described in the Operating Intructions “Fieldbus function modules for 8200 motec /8200 vector frequency inverters”.

9.3 Parallel operation of the interfaces AIF and FIF

9.3.1 Possible combinations

The two interfaces of the controllers - the automation interface (AIF) and the function interface (FIF) - can be used at the same time in parallel. It is thus possible, for instance, to parameterize distant system bus participants via keypad or PC.

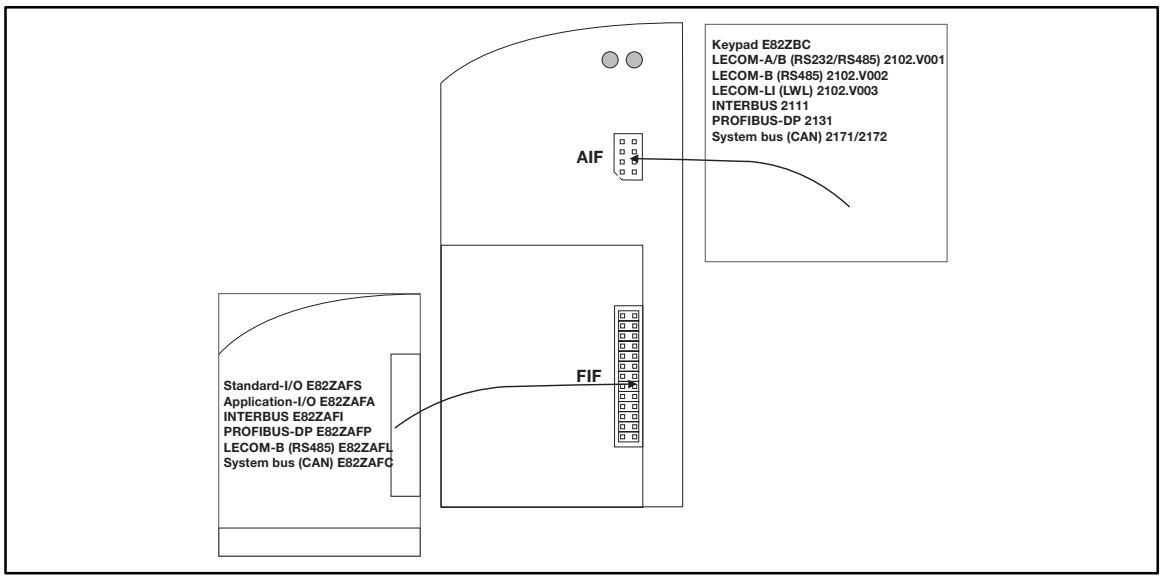


Fig. 9-14 Modules for the interfaces AIF and FIF

Possible combinations		Communication module in AIF						
		Keypad	LECOM-A/B (RS232/RS485)	LECOM-B (RS485)	LECOM-LI (optical fibre)	INTERBUS	PROFIBUS-DP	System bus (CAN)
Function module in FIF		E82ZBC	2102.V001	2102.V002	2102.V003	2111	2131	2171/2172
Standard-I/O	E82ZAFS	✓	✓	✓	✓	✓	✓	✓
Application-I/O	E82ZAFA	✓	(✓)	(✓)	(✓)	(✓)	(✓)	(✓)
INTERBUS	E82ZAFI	✓	☒	☒	☒	☒	☒	☒
PROFIBUS-DP	E82ZAFP	✓	☒	☒	☒	☒	☒	☒
LECOM-B (RS485)	E82ZAFL	✓	☒	☒	☒	☒	☒	☒
System bus (CAN)	E82ZAFC	✓	✓	✓	✓	✓	✓	✓

✓ Combination possible
(✓) Combination only possible if the communication module in AIf is supplied externally!
☒ Combination not possible

Note!

- Depending on the hardware level of the controllers, the communication modules can be internally supplied via the AIF interface. The Operating Instructions for the communication modules give detailed information.
- The Operating Instructions for the fieldbus modules give detailed information on commissioning and parameter setting of fieldbus modules. (📖 12-2)

9.3.1.1 Example ”Setpoint summation in a conveyor system”

A conveyor system is controlled via the fieldbus INTERBUS. The setpoint can be corrected manually when loads are additionally applied to the individual components.

- Accessories required for the controller
  – Function module INTERBUS
  – Keypad

Task

- Selection of the main setpoint for basic load via the fieldbus function module ”INTERBUS”.
- Selection of the additional setpoint for the additional load via the communication module ”Keypad”, e. g. via the function Set. (📖 7-26)

Configuration

Configuration	Code	Setting	Note
Basic configuration of the controller			Drive performance, acceleration and deceleration times, etc. must be set for every controller (📖 5-2 ff)
Configuration of main setpoint source (NSET1-N1)	C0412/1	200	Setpoint source is the function module INTERBUS
	C1511/2	3	Process data output word 2 of the master (PAW2) must be assigned to the signal NSET1-N1. (Lenze setting) Observe the master’s normalization.

9.3.1.2 Example ”Processing of external signals via a fieldbus”

A 8200 vector is used in a pump chamber to control a water pump. The setpoint is selected via INTERBUS. Analog and digital signals at the terminals of the controller are transferred to the INTERBUS.

- Accessories required for the controller
  – Communication module INTERBUS 2111
  – Function module Standard-I/O

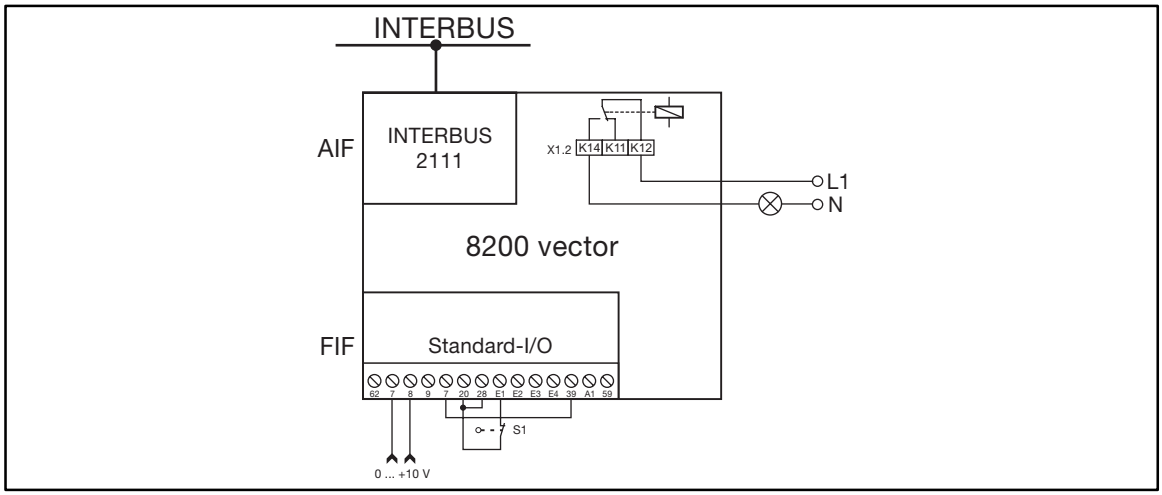


Fig. 9-15 Prinicple block diagram for the example “Processing of external signals via INTERBUS”

Task

- The water level of a water tank (encoder signal 0 ... 10 V) is transmitted from the controller to the drive. If the water level reaches 90 %, the host activates the relay K1 of the controller to switch on a warning light in the pump chamber.
- The digital signal of a float (S1, “tank too full”) is also transmitted from the controller to the INTERBUS so that the host can activate the switch-off mechanism.

Configuration

Configuration	Code	Setting	Note
Basic configuration of the controller			Drive performance, acceleration and deceleration times, etc. must be set for every controller (📖 5-2 ff)
Controller configuration for process data communication via AIF	C0001	3	Setting required for the evaluation of the process data via AIF
Configuration of main setpoint source (NSET1-N1)	C0412/1	11	Setpoint source is the process data input word AIF-IN.W2. The master must be configured such that a process data output word (POW) of the master AIF-IN.W2 writes the setpoint to the controller. Observe the master’s normalization.
Control of the water level via the communication module to INTERBUS	C0421/1	35	Signal source for the process data output word AIF-OUT.W1 is the evaluated signal at the analog input X3/8 (0 ... 10 V). Observe the signal’s normalization.
Send the message “Too full” via the communication module to INTERBUS	C0417/1	32	Signal source for the first bit of the AIF status word is the digital signal “Too full” at the digital input X3/E1.
Configure the warning signal for the relay output K1	C0415/1	40	The master must be configured such that a process data output word (POW) of the master sets bit 0 of the AIF control word (AIF-CTRL) and thus activates the relay K1.

9.3.2 Divert the process data or the parameter data to the system bus (CAN)

If you use the function module "System bus (CAN)" in FIF, process data and parameter data can be exchanged with the fieldbus module in AIF.

- Process data
  - Max. two analog signals (e.g. setpoints) can be diverted or send to the system bus network using two analog input words (AIF-IN.W1, AIF-IN.W2) and two analog output words (AIF-OUT.W1, AIF-OUT.W2). The data is configured under C0421.
  - The control information can be diverted to the system bus network using the digital input word (AIF-CTRL). Status information are retrieved with the digital output word (AIF-STAT).
- Parameter data
  - C0370 determines the address of the system bus participant to which the parameter data are to be sent.

9.3.2.1 Example "Exchange of process data between PROFIBUS-DP and system bus (CAN)"

Two controllers are networked via the system bus (CAN). They communicate with the higher-level host via the fieldbus PROFIBUS-DP. The PROFIBUS master controls the two controllers independently of each other. Controller 1 connects the system bus to the PROFIBUS:

- Accessories required for the controller
  - Communication module PROFIBUS-DP 2131 for controller 1
  - Onle function module system bus (CAN) for each controller (1 and 2)

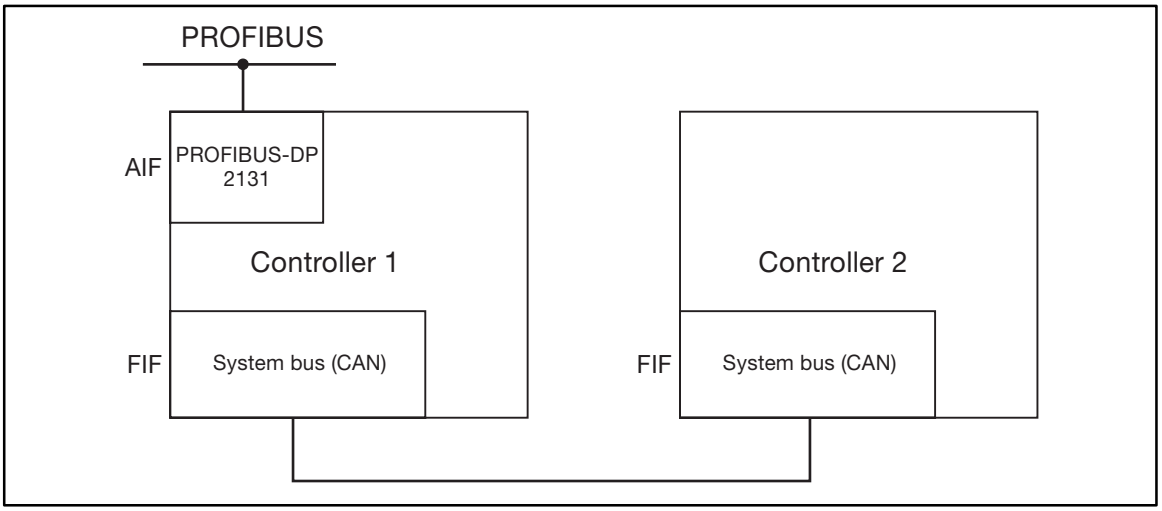
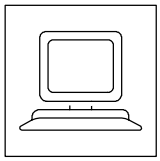


Fig. 9-16 Example for parallel operation of communication module PROFIBUS-DP and function module system bus (CAN)

Note!

Controller 2 can also be a Lenze 9300 or 8200 motec.



Task

- Setpoints and control commands from the PROFIBUS master:
  - Setpoint for controller 1 via AIF input word 1 (AIF-IN.W1)
  - Setpoint for controller 2 via AIF input word 2 (AIF-IN.W2)
  - Control commands CINH, TRIP-RESET and QSP for controller 1 and controller 2 via AIF control word (AIF-CTRL). Controller 2 must be controlled independently of controller 1.
- Actual values and status information to PROFIBUS master:
  - Actual value from controller 1 via AIF output word 1 (AIF-OUT.W1)
  - Actual value of controller 2 via AIF output word 2 (AIF-OUT.W2)
  - Controller status "CINH" and "controller status" of controller1 and controller 2 via AIF status word (AIF-STAT)

Configuration

Configuration		Code	Setting		Note
			A1	A2	
Basic configuration controller A1 and A2					Drive performance, acceleration and deceleration times, etc. must be set for every controller (📖 5-2)
Configure A1 for process data communication via AIF		C0001	3	-	Setting required for the evaluation of the process data via AIF
System bus configuration					
	System bus address	C0350	1	2	Different addresses to ensure unique controller addressing
	Source system bus address	C0353/1	0		Source for address of object CAN1 of A1 is C0350
				1	Source for address of object CAN1 of A2 is C0354
	Address CAN-object 1 of A1		-	-	Determined by source C0350: Address CAN-OUT1 = 386 Address CAN-IN1 = 385
	Address CAN-Objekt 1 of A2	C0354/5	-	386	Address CAN-IN1 (links CAN-IN1 to CAN-OUT1 of A1)
		C0354/6	-	385	Address CAN-OUT1 (links CAN-OUT1 to CAN-IN1 of A1)
	Determine master	C0352	1	-	Controller 1 is system bus master
	Select control	C0360	0	0	Time control
	Cycle time for time control	C0356/2	10	10	Each controller sends object CAN-OUT1 every 10 ms
Configure data flow for A1					
Setpoint	Assign NSET1-N1 to source	C0412/1	10	-	Setpoint source for A1 is AIF-IN.W1
Actual value	Assign output word AIF-OUT.W1 to actual value	C0421/1	0	-	AIF-OUT.W1 ⇦ MCTRL1-NOUT+SLIP (output frequency)
Control commands	QSP, CINH and TRIP-RESET		-	-	Master sends control commands for A1 via the permanently assigned bits of the AIF control word (AIF-CTRL): B3 = QSP, B9 = CINH, B11 = TRIP-RESET
Status information	"Controller status" and CINH		-	-	Master reads the permanently assigned bits of the status word 1 (AIF-STAT) of A1: B8 ... B11 = Controller status, B7 = CINH

Configuration		Code	Setting		Note
			A1	A2	
Configure data flow for A2					
Setpoint	A1 transfers the setpoint for A2 to the system bus	C0421/5	41	-	Assign the setpoint for A2 in A1 CAN object 1, word 3 CAN-OUT1.W3 ⇦ AIF-IN.W2
	Assign NSET1-N1 to source	C0412/1	-	22	Setpoint source for A2 is CAN-IN1.W3 NSET1-N1 ⇦ CAN-IN1.W3
Actual value	Assign output word CAN-OUT1.W3 to actual value	C0421/5	-	0	CAN-OUT1.W3 ⇦ MCTRL1-NOUT+SLIP (output frequency)
	A1 transfers the actual value of A2 to the PROFIBUS master	C0421/2	52	-	AIF-OUT.W2 ⇦ CAN-IN1.W3
Control commands	QSP, CINH and TRIP-RESET				Master sends control commands for A2 via freely linkable bits of the AIF control word (AIF-CTRL) of A1, z. B.: B4 = QSP, B5 = CINH, B6 = TRIP-RESET
	A1 transfers the control commands for A2 to the system bus	C0418/1	44	-	QSP: CAN-OUT2.W1, Bit 0 ⇦ AIF-CTRL, Bit 4
		C0418/2	45	-	CINH: CAN-OUT2.W1, Bit 1 ⇦ AIF-CTRL, Bit 5
		C0418/3	46	-	TRIP-RESET: CAN-OUT2.W1, Bit 2 ⇦ AIF-CTRL, Bit 6
	Assign QSP, CINH and TRIP-RESET to the source	C0410/4	-	70	NSET1-QSP: ⇦ CAN-IN2.W1, Bit 0
		C0410/10	-	71	DCTRL1-CINH: ⇦ CAN-IN2.W1, Bit 1
		C0410/12	-	72	DCTRL1-TRIP-RESET: ⇦ CAN-IN2.W1, Bit 2
Status information	"Controller status" and CINH				Map the bits of the controller status word 1 of A2 to the output word CAN-OUT1.W1: B8 ... B11 = Controller status, B7 = CINH
	Assign the status information to the output word CAN-OUT1.W1	C0417/8	-	8	CAN-OUT1.W1, Bit 7 ⇦ CINH
		C0417/9 ... C0417/12	-	9 ... 12	CAN-OUT1.W1, Bit 8 ... 11 ⇦ Controller status
	A1 provides the master with status information from A2				Map the status information of A2 to the freely assignable bits of the AIF status word (AIF-STAT) of A1
		C0417/15	74	-	AIF-STAT, Bit 14: ⇦ CAN-IN1.W1, Bit 7 (CINH)
		C0417/3 ... C0417/6	62 ... 65	- 	AIF-STAT, Bit 2: ⇦ CAN-IN1.W1, Bit 8 ... AIF-STAT, Bit 5: ⇦ CAN-IN1.W1, Bit 11

9.3.2.2 Example ”Transfer of parameter data from LECOM-B (RS485) to the system bus (CAN) (remote parameter setting)”

10 controllers are networked via the system bus (CAN). They communicate with the higher-level host via the Lenze fieldbus LECOM-B (RS485).

- Accessories required for the controller
  – Communication module LECOM-B 2102IB.V002 for controller 1
  – One function module system bus (CAN) for each controller (1 to 10)

Note!

- The parameter processing time in the controller is usually < 40 ms if the interfaces are operating in parallel. Therefore, this example only applies to time-uncritical applications.
- System bus participants can also be Lenze 9300 or 8200 motec controllers.
- Controller 1 must be a 8200 vector.

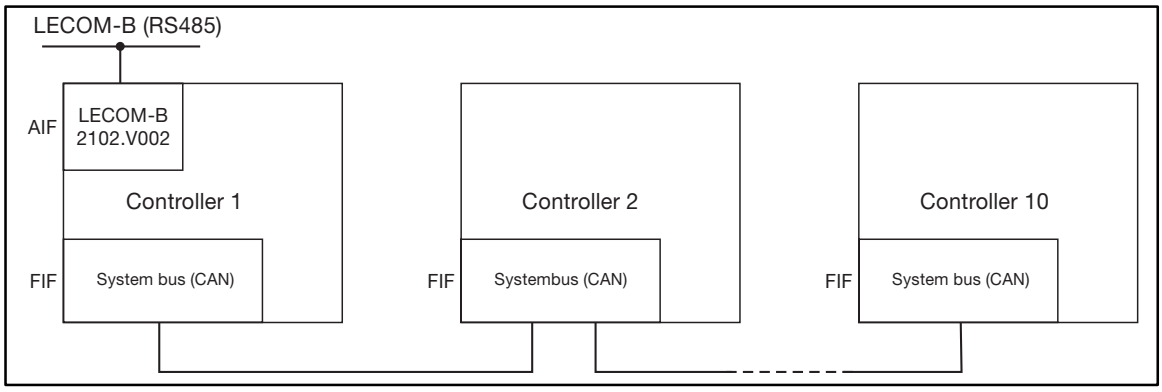


Fig. 9-17 Principle structure for the transfer of parameter data from the Lenze fieldbus LECOM-B to a system bus network

Task

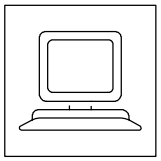
- LECOM-B preselects the setpoints for the controllers in C0046.
  – LECOM-B must transfer the address for the remote parameter setting before the setpoint (C0370). C0370 determines the address of the system bus participant to which the controller 1 transfers the setpoint.

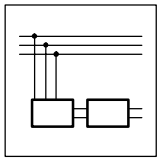
Configuration

Configuration	Code	Setting	Note
Basic configuration of the controller			Drive performance, acceleration and deceleration times, etc. must be set for every controller (📖LEERER MERKER)
System bus addresses must be set for every controller	C0350	1 (A1) ... 10 (A10)	Every system bus participant must have a unique address.
Configure a setpoint source for every controller.	C0412/1	0	Setpoint source for every controller is C0046.

Stop!

For cyclic writing of parameter data it is absolutely necessary to set C0003 = 0 after every mains switching (do not save data in EEPROM), otherwise the EEPROM will be damaged!





10 Network of several drives

This chapter describes the selection of group systems with frequency inverters of the series 8200 vector, 8220 and servo inverter of the series 9300 (including all technology variants: “Positioning controller”, “Register controller”, “Cam profiler”, “vector”).

10.1 Function

- DC-bus network of controllers enables the energy exchange between the connected controllers on the DC-voltage level.
- If one or more controllers operate in generator mode (braking), the recovered energy will be fed into the shared DC-voltage bus or the DC source. The energy will then be available in the network of controllers which operate in motor mode.
- The energy from the three-phase AC mains can be supplied as follows:
  – A 934X regenerative power supply module in a network of several drives.
  – One or more controller in a network
  – A combination of regenerative power supply modules and controllers.
- The use of brake units, supply units and the energy consumption from the three-phase AC mains can be reduced.
- The number of mains supplies and the resulting expenses (e.g. for wiring) can be perfectly adapted to your application.

10.2 Conditions for trouble free network operation

Stop!

- Connect controllers only when they have similar DC-bus/mains-voltage ranges (see the following table).
- Adapt the thresholds of brake unit and brake transistor.
- All supplies should only be operated with the prescribed mains chokes/mains filters! (📖 10-9)

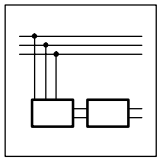
10.2.1 Possible combinations of Lenze controller in a network of several drives

Type	Data	E82EVXXX_2B	E82EVXXX_4B	822X	93XX
E82EVXXX_2B	①	1 / N / PE / AC / 100 V - 0 % ... 264 V + 0% 48 Hz - 0 % ... 62 Hz + 0 %			
	②	DC 140 V ... 360 V			
	③	DC 380 V			
E82EVXXX_4B	①		3 / PE / AC / 320 V - 0 % ... 550 V + 0 % 48 Hz - 0 % ... 62 Hz + 0 %		
	②		DC 450 V ... 770 V		
	③		DC 725 V/765 V		
822X	①		3 / PE / AC / 320 V - 0 % ... 528 V + 0 % 48 Hz - 0 % ... 62 Hz + 0 %		
	②		DC 460 V ... 740 V		
	③		DC 725 V/765 V		
93XX	①		3 / PE / AC / 320 V - 0 % ... 528 V + 0 % 48 Hz - 0 % ... 62 Hz + 0 %		
	②		DC 460 V ... 740 V		
	③		DC 725 V/765 V		

① Max. permissible mains-voltage range
② Permissible DC-bus voltage range
③ Threshold of the external brake unit (option)

Note!

If all the requirements stated above are met, it is also possible to use 821X and 824X Lenze controllers in the network.



10.2.2 Mains connection

10.2.2.1 Cable protection/cable cross-section

- Mains fuses and cable cross-section of the mains cables must be selected according to the mains current which results from the input power $P_{DC100\%}$. Observe national standards, temperatures and other conditions. (📖 10-6)
- Asymmetries in the network can require 135 to 150 % larger dimensioning.
- Formula for the mains current in networks:

$$I_{mains}\ [A] \approx \frac{P_{DC100\%}\ [W]}{1.5 \cdot V_{mains}\ [V]}$$

10.2.2.2 Mains choke/mains filter/EMC

- Use the mains chokes/mains filters assigned to the network operation. (📖 10-9)
- Function:
  - Mains-current limitation
  - Current/power symmetry of the mains input circuits of the controllers in decentral network operation.
- Main choke/mains filter must match the mains current.

Note!

- Observe, that network operation sometimes requires other mains chokes/mains filters than stand-alone operation.
- The compliance with the EMC guideline cannot be guaranteed. Check whether a central interference suppression in the AC supply should be used!

10.2.2.3 Controller protection

Switch-on conditions

- **Ensure simultaneous mains connection of all controllers connected to the network.**
  - Use of a central mains contactor (📖 10-20)
  - Decentral mains switching is possible if the activation of every single contactor is monitored (feedback to PLC) and the switching follows the same cycle.

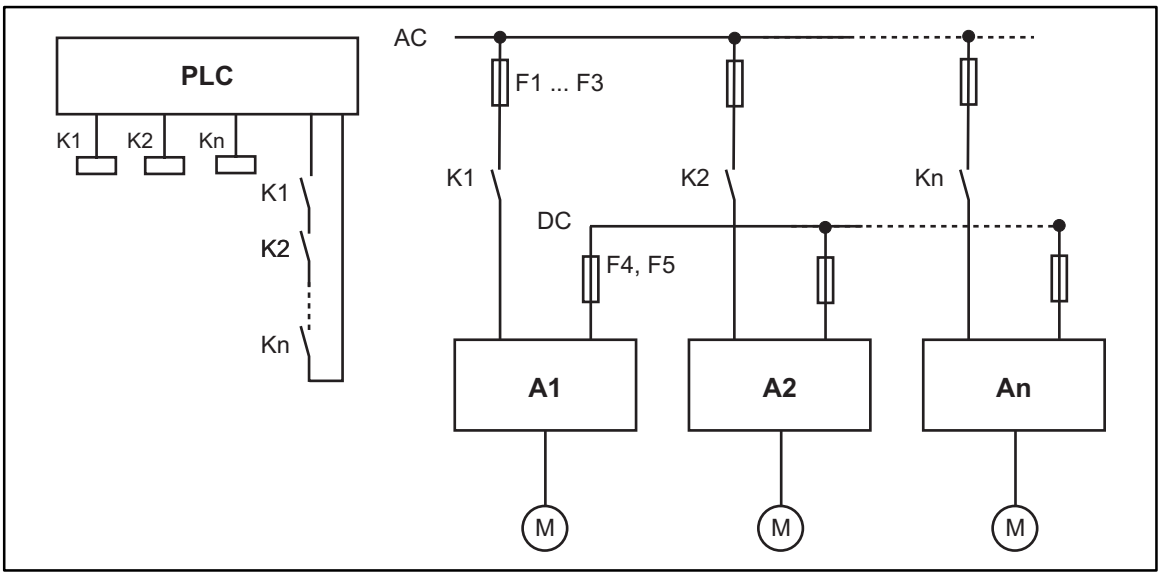


Fig. 10-1 Decentral switching of the mains supply for a network of drives

A1 ... An	Controller 1 ... controller n
F1 ... F3	Mains fuses
F4 ... F5	Fuses on the DC level
K1 ... Kn	Mains contactors

Adaptation to the mains voltage

- The value under C0173 must be the same for all 93XX controllers in the network.

Mains phase failure detection for decentral supply

Monitor the mains supply of each controller, otherwise all mains input connections, which are active when the failure occurs, can be overloaded. Therefore:

- Switch off the whole network in the event of a mains or a phase failure. (📖 10-20)
- Use switching elements for the mains failure detection and indication.
  - Thermal overcurrent release (bimetal relay) connected after the mains fuses.
  - Cable protection by power switches with thermal and magnetic release and integrated alarm contact.

Additional capacities in the DC bus

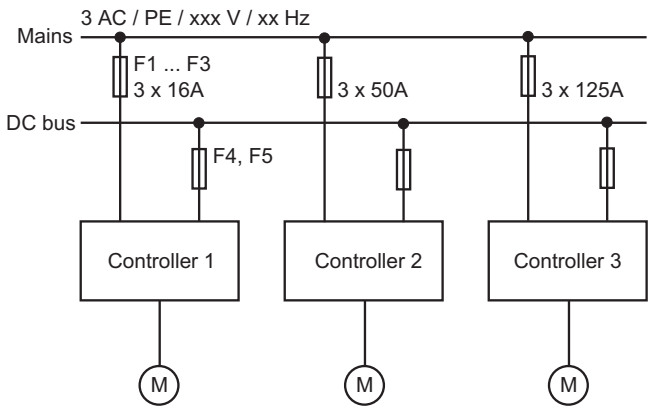
Operation of additional capacities in the DC bus can overload the input rectifier of the controller or the regenerative ower supply unit.

Therefore, provide corresponding load and symmetry resistors.

10.2.3 DC-bus connection

- Use short cable connections to the common DC-bus star point.
- Select the cable cross-section of the DC bus according to the sum of the mains supplies.

Example

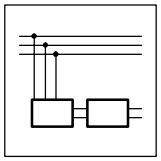


- Sum of the possible permanent r.m.s. currents of the parallel mains supplies: 16A + 50A + 125A = 191A
- The cable cross-section is selected according to the resulting current of 191A and the local conditions, as for instance, ambient temperature, conductor material, conductor type, routing, expansion, standards and regulations.

- Ensure low cable inductivity.
  – DC-bus star point in control cabinet above parallel busbar.
  – Route or twist cable between controller ($+U_G$, $-U_G$) and DC-bus star point in parallel.
- Use screened cables.
- Protect the controllers by means of assigned DC-bus fuses (F4 and F5). The fuses protect the controller:
  – internal short-circuit,
  – internal earth fault,
  – short-circuit in the DC bus $+U_G \rightarrow -U_G$,
  – earth fault in the DC bus $+U_G \rightarrow$ PE or $-U_G \rightarrow$ PE.

Note!

- With only two controllers connected to the network, one fuse pair F4/F5 is sufficient.
  – The rating must be made taking into account the weakest controller.
- Connect an additional fuse pair F4/F5 before each controller if you use more than two controllers in a network.
- Further information on protection: (📖 10-7)



10.2.4 Fuses and cable cross-sections for a network of several drives

The table values are valid for the operation of controllers in DC-bus networks with P_{DC} = 100%, i. e. use of the max. rated controller power on the DC-bus level. (📖 10-10)

For operation with reduced power it is possible to select smaller fuses and cable cross-sections.

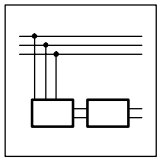
Type	Mains input L1, L2, L3, PE Operation with mains filter/mains choke					DC input +UG, -UG		
	Fuse F1, F2, F3		E.l.c.b.	Cable cross-section [1]		Fuse F4, F5	Cable cross-section [1]	
	VDE	UL	VDE	mm²	AWG		mm²	AWG
E82EV551_2B	M 6A	5A	B 6A	1	17	CC6A	1	17
E82EV751_2B	M 6A	5A	B 6A	1.5	15	CC8A	1	17
E82EV152_2B	M 10A	10A	B 10A	1.5	15	CC12A	1.5	15
E82EV222_2B	M 16A	15A	B 16A	2.5	14	CC16A	2.5	14
E82EV551_4B	M 6A	5A	B 6A	1	17	CC6A	1	17
E82EV751_4B	M 6A	5A	B 6A	1	17	CC6A	1	17
E82EV152_4B	M 10A	10A	B 10A	1.5	15	CC8A	1	17
E82EV222_4B	M 10A	10A	B 10A	1.5	15	CC10A	1	17
8221	M 50A	50A	-	16	5	80A	16	7
8222	M 80A	80A	-	25	3	100A	25	5
8223	M 80A	80A	-	25	3	100A	25	3
8224	M 125A	125A	-	70	2/0	2x 100A [2]	2x 25 (1x 70)	2x 3 (1x 2/0)
8225	M 125A	125A	-	70	2/0	2x 100A [2]	2x 25 (1x 70)	2x 3 (1x 2/0)
8226	M 160A	175A	-	95	3/0	3x 80A [2]	3x 16 (1x 95)	3x 5 (1x 3/0)
8227	M 200A	200A	-	120	4/0	3x 100A [2]	3x 25 (1x 120)	3x 3 (1x 4/0)
9321	M 6A	5A	B 6A	1	17	6.3A	1	17
9322	M 6A	5A	B 6A	1	17	6.3A	1	17
9323	M 10A	10A	B 10A	1.5	15	8A	1.5	15
9324	M 10A	10A	B 10A	1.5	15	12A	1.5	15
9325	M 16A	20A	B 20A	4	11	20A	4	11
9326	M 32A	25A	B 32A	6	9	40A	6	9
9327	M 35A	35A	-	10	7	50A	10	7
9328	M 50A	50A	-	16	5	80A	16	5
9329	M 80A	80A	-	25	3	100A	25	3
9330	M 100A	100A	-	50	0	2x 80A [2]	2x 16	2x 5
9331	M 125A	125A	-	70	2/0	2x 100A [2]	2x 25 (1x 70)	2x 3 (1x 2/0)
9332	M 160A	175A	-	95	3/0	3x 80A [2]	3x 16 (1x 95)	3x 5 (1x 3/0)

[1] Observe national and regional regulations (e. g. VDE0113, EN 60204)!

[2] Fuses connected in parallel.

Note!

With decentral supply we recommend fuse holders with alarm contacts for DC fuses. Thus, the whole drive network can be switched off in the event of a fuse failure.



10.2.5 Protection in network operation

You have the possibility of selecting a graded protection concept for network operation. The damage risks depend on the type of protection. The following table helps to analyze the risk.

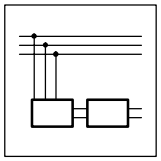
Please note:

On the motor side, the cable protection is supported by the current limitation of the controller. Condition:

- The current limit set for the controller corresponds to the rated current of the connected motor.
- For group drives we recommend the use of an additional protection.

Definition: ”internal fault”

- Controllers:
  – The fault is located between the connection point at the DC-bus and inside the unit in front of the terminals U, V, W.
- Supply modules:
  – The fault is located between the mains input (terminals L1, L2, L3) and the farthest point of the DC-bus.

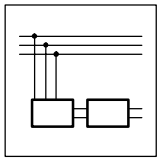


Network of several drives

	Protection by means of mains fuses without monitoring function (F1 ... F3)	
Protection of	**Cable protection** ● on the mains side ● on the DC-bus ● on the motor side	**No unit protection**
Possible faults	One or more controllers with ● internal short ciruit ($+U_G \rightarrow -U_G$) ● internal earth fault ($+U_G \rightarrow$ PE/$-U_{DC} \rightarrow$ PE) ● motor-side earth fault on phase W	Mains failure of a controller with decentral supply.
Risk	Several parallel controllers supply the fault location(s) via the DC-bus. This may lead to overload of the intact controller, as the faulty controller is not selectively activated on the DC-bus. Possible damage with central and decentral supply ● Destruction of the controller concerned ● Destruction of the controllers still intact ● Destruction of the supply unit	If a mains-side supply/input fails because F1...F3 blows, the active controller which is connected can be overloaded.
Note	The extent of destruction depends on the ratio "DC-bus power of the whole system / rated power of the controller concerned".	

	Protection by means of mains fuses with monitoring function (F1 ... F3)		
Protection of	**Cable protection** ● on the mains side ● on the DC-bus ● on the motor side	**Unit protection in the event of overload** If a supply/input fails because F1...F3 blows, the remaining controllers which are connected will not be overloaded as the alarm contact switches off the mains and thus the whole network.	**No unit protection in the event of short circuit**
Possible faults	One or more controllers with ● internal short ciruit ($+U_G \rightarrow -U_G$) ● internal earth fault ($+U_G \rightarrow$ PE/$-U_G \rightarrow$ PE) ● motor-side earth fault on phase W		
Risk	Several parallel controllers supply the fault location(s) via the DC-bus. This may lead to overload of the intact controller, as the faulty controller is not selectively activated on the DC-bus. Possible damage with central and decentral supply ● Destruction of the controller concerned ● Destruction of the controllers still intact ● Destruction of the supply unit		
Note	The extent of destruction depends on the ratio "DC-bus power of the whole system / rated power of the controller concerned".		

	Protection by means of mains fuses with monitoring function (F1 ... F3) and by means of DC fuses F4 ... F5		
Protection of	**Cable protection** ● on the mains side ● on the DC-bus ● on the motor side	**Unit protection in the event of overload** If a supply/input fails because F1...F3 blows, the remaining controllers which are connected will not be overloaded as the alarm contact switches off the mains and thus the whole network.	**Unit protection in the event of short circuit**
Possible faults	One or more controllers with – internal short ciruit ($+U_G \rightarrow -U_G$) – internal earth fault ($+U_G \rightarrow$ PE/$-U_G \rightarrow$ PE) – motor-side earth fault on phase W		
Risk	Possible damage with central and decentral supply ● Destruction of the controller concerned		
Note	The selective activation on the mains and DC side reduces the extent of destruction.		



10.3 Selection

In the following table you will find some basic data to select a drive network. Two examples explain the use of the tables.

10.3.1 Conditions

The unit data list in the table Tab. 10-2 are only valid if the network fulfills the following conditions:

	More conditions
All supplies	Connection to the three-phase AC mains only with prescribed mains filters/main chokes. Tab. 10-1
Mains voltage	V_{mains} = 400 V / 50 Hz (Tab. 10-2)
Chopper frequencies	93XX 8 kHz
	8200 vector 822X 4 kHz or 8 kHz.
Ambient temperature during operation	max. +40 °C
Motors (three-phase AC asynchronous motors, asynchronous servo motor, synchronous servo motors9	Simultaneity factor F_g = 1 (All motors run at 100 % motor load at the same time)

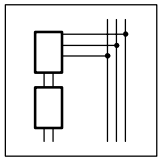
10.3.2 Required mains filters or mains chokes

Unit		**Mains filters/mains chokes**		
Type	**Mains current [A]**	**Inductivity [mH]**	**Rated current [A]**	**Order No. EZN3X...** [1]
9341	12	1.2	12 17	0120H012 ELN30120H017 [2]
9342	24	0.88	24 35	0088H024 ELN30088H035 [2]
9343	45	0.55	45 55	0055H045 ELN30055H055 [2]
9327, 8221	42	0.6	54	0060H054
9330, 8224	85	0.3	110	0030H110
E82EV551_4B, E82EV751_4B	2.4	15	2.5	1500H003
E82EV152_4B	5.5	5	7	0500H007
9331	166	0.165	200	0017H200
9328, 8222	46	0.6	54	0060H054
E82EV402_4B	9.5	3.0	13	0300H013
9322	3.2	9.0	4	0900H004
9332, 8226	175	0.165	200	0017H200
9326, E82EV113_4B	21	1.5	24	0150H024
E82EV752_4B	16	1.5	24	0150H024
8225	100	0.3	110	0030H110
9329, 8223	55	0.55	60	0055H060
E82EV222_4B	6.0	5.0	7	0500H007
E82EV302_4B	7.0	5.0	7	0500H007
9323	6.5	5.0	7	0500H007
8227	228	0.143	230	0015H230
9325, E82EV552_4B	12	3.0	13	0300H013
9324	7	5.0	7	0500H007
9321	4	9.0	4	0900H004

Tab. 10-1 Prescribed mains filters/mains chokes for the supply in network operation

[1] X = A: Mains filter RFI level A (EN55011), X = B: Mains filter RFI level B (EN55022)

[2] Mains choke



10.3.3 Input power 400 V controller

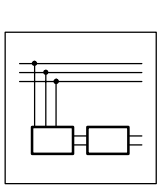
Input power in a network of several 400 V controllers																							
1 input	9341	9342	9343	9327 8221	9330 8224	551_4B 751_4B	152_4B	9331	9328 8222	402_4B	9322	9332 8226	9326 113_4B	752_4B	8225	9329 8223	222_4B	302_4B	9323	8227	9325 552_4B	9324	9321
P_V [kW]	0.1	0.2	0.4	0.43	1.1	0.06	0.1	1.47	0.64	0.24	0.065	1.96	0.4	0.32	1.47	0.81	0.13	0.18	0.1	2.4	0.28	0.15	0.05
$P_{DC100\%}$ [kW]	**7.2**	**14.4**	**27.0**	**29.0**	**58.7**	**2.0**	**2.0**	**114.8**	**31.4**	**6.2**	**2.0**	**117.0**	**13.0**	**13.0**	**67.9**	**37.6**	**4.1**	**4.1**	**4.2**	**158.0**	**7.2**	**4.9**	**2.8**
Input 2 ... n																							
9341																							
9342																							
9343																							
9327, 8221	13.6	19.9	23.3	23.7																			
9330, 8224	27.1	39.8	46.6	47.5	48.0																		
551_4B, 751_4B	0.9	1.3	1.5	1.5	1.5	1.6																	
152_4B	0.8	1.2	1.4	1.4	1.4	1.5	1.6																
9331	49.4	72.4	84.9	86.4	87.4	92.6	101.8	93.9															
9328, 8222	13.4	19.7	23.0	23.5	23.7	25.1	27.6	25.5	25.7														
402_4B	2.6	3.8	4.5	4.5	4.6	4.9	5.3	4.9	5.0	5.1													
9322	0.8	1.2	1.4	1.4	1.4	1.5	1.7	1.6	1.6	1.6	1.6												
9332, 8226	47.7	70.0	82.1	83.5	84.5	89.5	98.5	90.8	91.5	93.5	95.5	95.7											
9326, 113_4B	5.2	7.6	8.9	9.1	9.2	9.7	10.7	9.9	9.9	10.2	10.4	10.4	10.6										
752_4B	5.2	7.6	8.9	9.1	9.2	9.7	10.7	9.9	9.9	10.2	10.4	10.4	10.6	10.6									
8225	26.7	39.1	45.8	46.7	47.2	50.0	55.0	50.7	51.1	52.2	53.3	53.5	54.7	54.7	55.6								
9329, 8223	14.6	21.5	25.2	25.6	25.9	27.5	30.2	27.9	28.1	28.7	29.3	29.4	30.1	30.1	30.5	30.8							
222_4B	1.6	2.3	2.7	2.7	2.8	2.9	3.2	3.0	3.0	3.1	3.1	3.1	3.2	3.2	3.2	3.3	3.4						
302_4B	1.6	2.3	2.7	2.7	2.8	2.9	3.2	3.0	3.0	3.1	3.1	3.1	3.2	3.2	3.2	3.3	3.4	3.4					
9323	1.5	2.2	2.6	2.7	2.7	2.9	3.1	2.9	2.9	3.0	3.0	3.1	3.1	3.1	3.2	3.2	3.3	3.3	3.4				
8227	57.1	83.7	98.1	99.9	101.1	107.1	117.8	108.6	109.4	111.8	114.2	114.5	117.2	117.2	118.9	119.9	122.9	122.9	128.9	129.3			
9325, 552_4B	2.6	3.8	4.5	4.5	4.6	4.9	5.4	4.9	5.0	5.1	5.2	5.2	5.3	5.3	5.4	5.4	5.6	5.6	5.9	5.9	5.9		
9324	1.6	2.4	2.8	2.9	2.9	3.1	3.4	3.1	3.2	3.2	3.3	3.3	3.4	3.4	3.4	3.5	3.6	3.6	3.7	3.7	3.7	4.0	
9321	0.9	1.3	1.6	1.6	1.6	1.7	1.9	1.7	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.1	2.2	2.3

Tab. 10-2 Input in a network of several drives (400 V units)

Use the table:
1. Detect $P_{DC100\%}$ in line 4 for the first input
2. Here you can now find the input powers of other possible inputs

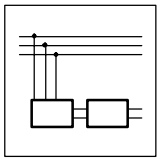
Empty — Combination of the inputs not possible

Parallel connection of regenerative power supply units not possible



10.3.4 Input power 240 V controller

in preparation



10.3.5 Selection examples

10.3.5.1 4 drives supplied via controllers (static power)

Drive data			
Drive	**Controller type**	**Motor P_M**	**Efficiency**
Drive 1	9328	22 kW	η = 0.9
Drive 2	9325	5.5 kW	
Drive 3	E82EV302_4B	3.0 kW	
Drive 4	E82EV152_4B	1.5 kW	

1. Determine DC-power requirements:
   – Power loss P_V Tab. 10-2.

$$P_{DC} = \sum_{i=1}^{4}\left(\frac{P_{M_i}}{\eta} + P_{V_i}\right)$$

$$P_{DC} = \frac{22\ kW}{0.9} + 0.64\ kW + \frac{5.5\ kW}{0.9} + 0.21\ kW + \frac{3.0\ kW}{0.9} + 0.1\ kW + \frac{1.5\ kW}{0.9} + 0.075\ kW = 34.575\ kW$$

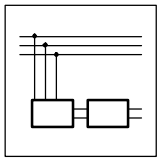
2. Determine first input:
   – $P_{DC100\%}$ Tab. 10-2.

	9328	**9325**	**E82EV302_4B**	**E82EV152_4B**
$P_{DC100\%}$	31.4 kW	7.2 kW	4.1 kW	2.0 kW

   – First selected input is 9328.
   – Additionally required input powers: 34.575 kW - 31.4 kW = 3.175 kW
3. Determine the second input:
   – Read input power for 9325, E82EV302_4B, E82EV152_4B in column ”9328/8222” in Tab. 10-2.

	9325	**E82EV302_4B**	**E82EV152_4B**
P_{DC2}	5.0 kW	3.0 kW	not possible

   – The power of 9325 is high enough.
4. Result:
   – This drive network must be connected to the three-phase AC mains via the controllers 9328 and 9325.



10.3.5.2 4 drives supplied via 934X regenerative power supply module (static power)

The previous example for 934X:

Drive data			
Drive	**Controller type**	**Motor P_M**	**Efficiency**
Drive 1	9328	22 kW	η = 0.9
Drive 2	9325	5.5 kW	
Drive 3	E82EV302_4B	3.0 kW	
Drive 4	E82EV152_4B	1.5 kW	

1. Determine DC-power requirements:
   – Power loss P_V Tab. 10-2.

$$P_{DC} = \sum_{i=1}^{4}\left(\frac{P_{M_i}}{\eta} + P_{V_i}\right)$$

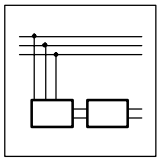
$$P_{DC} = \frac{22\ kW}{0.9} + 0.64\ kW + \frac{5.5\ kW}{0.9} + 0.21\ kW + \frac{3.0\ kW}{0.9} + 0.1\ kW + \frac{1.5\ kW}{0.9} + 0.075\ kW = 34.575\ kW$$

2. Determine required supply module:

	Powers	**9341**	**9342**	**9343**
	P_{DC}	34.575 kW	34.575 kW	34.575 kW
	P_{V934X}	0.1 kW	0.2 kW	0.4 kW
	$P_{DCtotal}$	34.675 kW	34.775 kW	34.975 kW
1 input	$P_{DC100\%934X}$	7.2 kW	14.4 kW	27.0 kW
2. supply(ies)	$P_{DC2100\%9328}$	13.4 kW	19.7 kW	23.0 kW
	$P_{DC2100\%9325}$	2.6 kW	3.8 kW	4.5 kW
	$P_{DC2100\%302\_4B}$	1.6 kW	2.3 kW	2.7 kW
	$P_{DC2100\%152\_4B}$	0.8 kW	1.2 kW	1.4 kW
	Max. possible input power	25.6 kW	41.4 kW	58.6 kW

   – Network operation is possible with 9342 or 9343. Since $P_{DCtotal}$ is higher than $P_{DC100\%934X}$, the network requires a second supply. The selection of the regenerative power supply module is now only dependent on the regenerative power.

3. Determine the second input:
   – Network with 9342: Second input at 9328, third at E82EV152_4B
   – Network with 9343: Second input at 9328



Network of several drives

Note!

The supply via a regenerative power supply unit offers advantages compared to the supply via controllers if

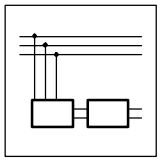
- additional brake power is required.
- the brake power must be dissipated without heat generation.
- the number of mains supplies and thus the wiring can be reduced.

An optimal "combination" of central and decentral supplies is independent of the drive task.

Example: If the brake power is low and the drive power is high, the regenerative power supply unit can only be adjusted to the brake power. The missing drive power is fed via decentralized controllers connected to a network.

Stop!

Regenerative power supply modules must never be connected in parallel, otherwise they might be damaged.



10.3.5.3 Selection of dynamic processes

Stop!

- The indications given in this chapter only apply to coordinated and rigid motion sequences! For all other applications, the drive network must be selected for static power. (📖 10-12, 10-13)
- The controllers can be damaged if they are not selected for dynamic processes.

If dynamic processes are considered in the drive network (motors run at changing power), the number of supplies can be reduced.

Most important for the selection of the supplies are the permanent power P_{DC} and the peak power P_{max} of the network:

1. Detection of the required permanent power
   – Graphical method. In general, this method gives exact values. (📖 10-16)
   – Approximate calculation

$$P_{DC} \approx \frac{\sum_{i=1}^{n}(P_i \cdot t_i)}{T}$$

Important
The approximate calculation is not meant for drive networks with considerably changing loads or controllers with rest phases!
T [s]: Cycle time
P_i [W]: Motoric partial power during a cycle
t_i [s]: Perod of P_i during a cycle

2. Graphical detection of the peak power (📖 10-16)
3. Consider the power losses
   – The power losses of all controller connected to the network must be considered for the calculation of the permanent power and the peak power. (📖 10-10)
4. Select supplies
   – Select controllers and/or regenerative power supply units (📖 10-12, 10-13)
   – It must be observed that the maximum overload (max. 60 s) of the supplies must be higher than the peak power of the drive network.

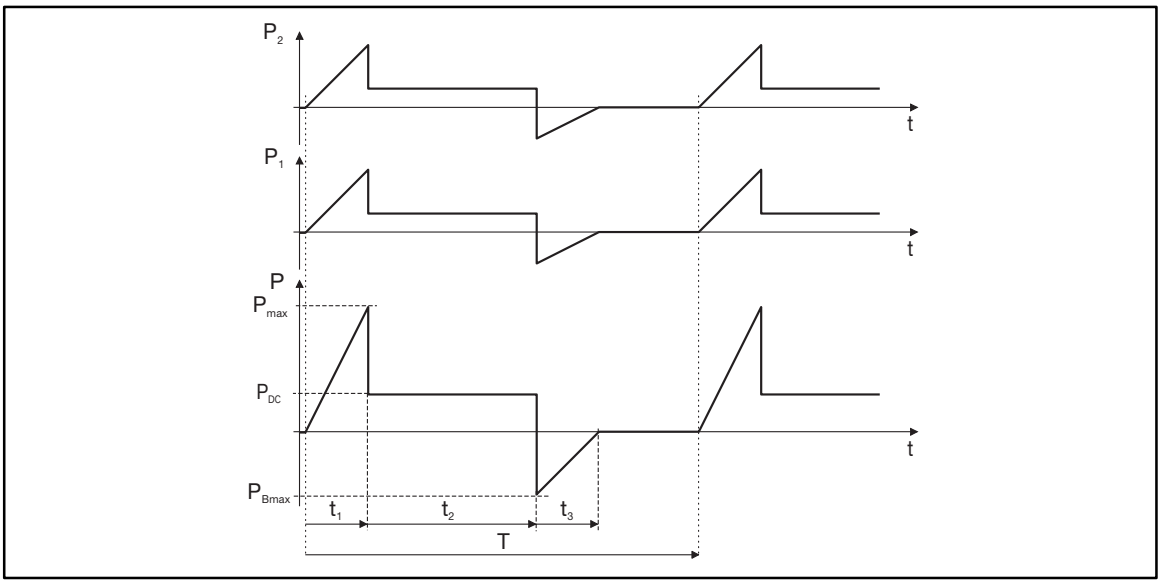


Fig. 10-2 Example with 2 **simultaneously** accelerated or decelerated drives

P1:	Power of the first drive
P2:	Power of the second drive
∑P:	Addition of the powers
P_{Bmax}:	Peak brake power of the drive network
P_{max}:	Peak drive power of the network
P_{DC}	Permanent power

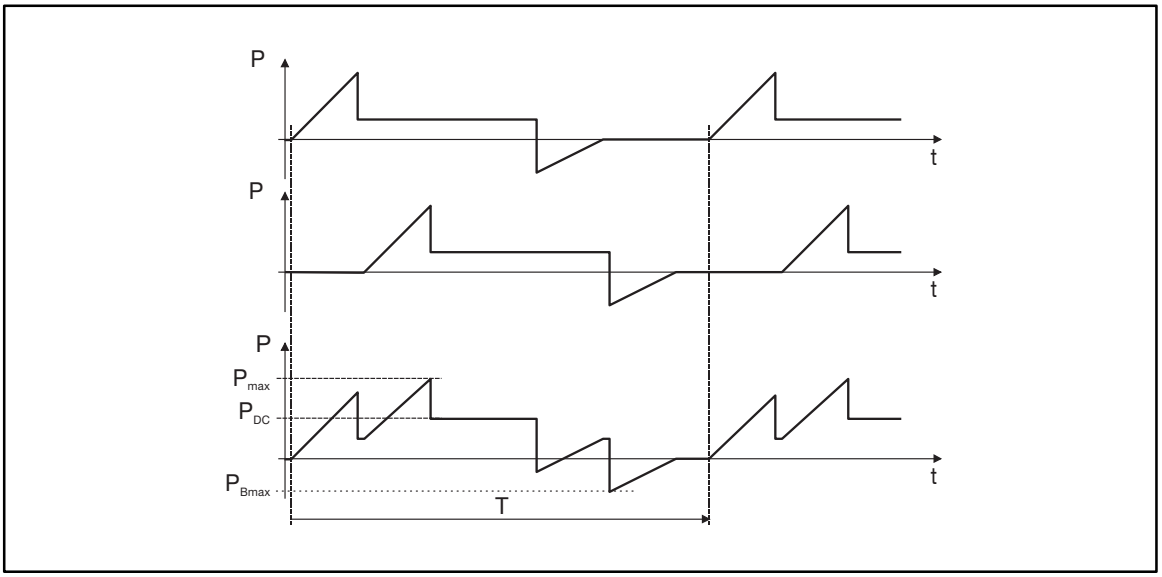


Fig. 10-3 Example with 2 **subsequently** accelerated or decelerated drives

P1:	Power of the first drive
P2:	Power of the second drive
∑P:	Sum power of the drive network
P_{Bmax}:	Peak brake power of the drive network
Pmax:	Peak drive power of the network
P_{DC}	Permanent power

In example Fig. 10-3 the required peak power (P_{max} and P_{Bmax}) is higher than in example Fig. 10-2.

10.4 Central supply

The DC-bus of the controllers is supplied through $+U_G$, $-U_G$ via **one** central supply. Supply sources are:

- Networks of 240 V controllers
  – 1 DC source
- Networks of 400 V controllers
  – 1 DC source
  – 1 regenerative power supply unit
  – 1 controller with reserve power

10.4.1 Central supply via external DC source

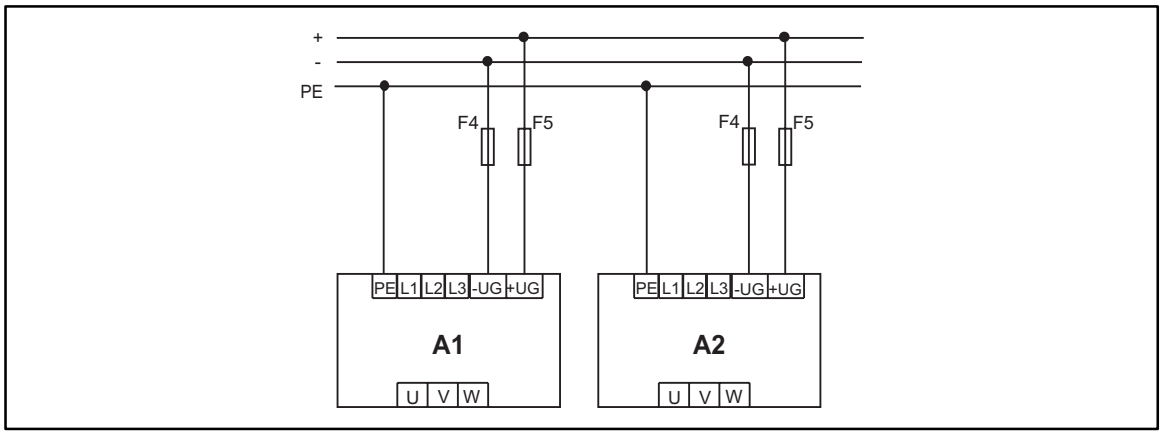


Fig. 10-4 Principle circuit diagram: Drive network of 240 V controllers with central supply via external DC source
A1, A2 240 V controllers of the 8200 vector series
F4, F5 Fuses on the DC level (📖 10-6)

Stop!

For fault-free operation, the following conditions must be met:

- General measures (📖 10-2)
- The voltage flow $+U_G \rightarrow$ PE / $-U_G \rightarrow$ PE must be symmetrical!
  – The controller will be destroyed, if $+U_G$ or $-U_G$ are grounded.

10.4.2 Central supply of 400 V controllers via 934X regenerative power supply units

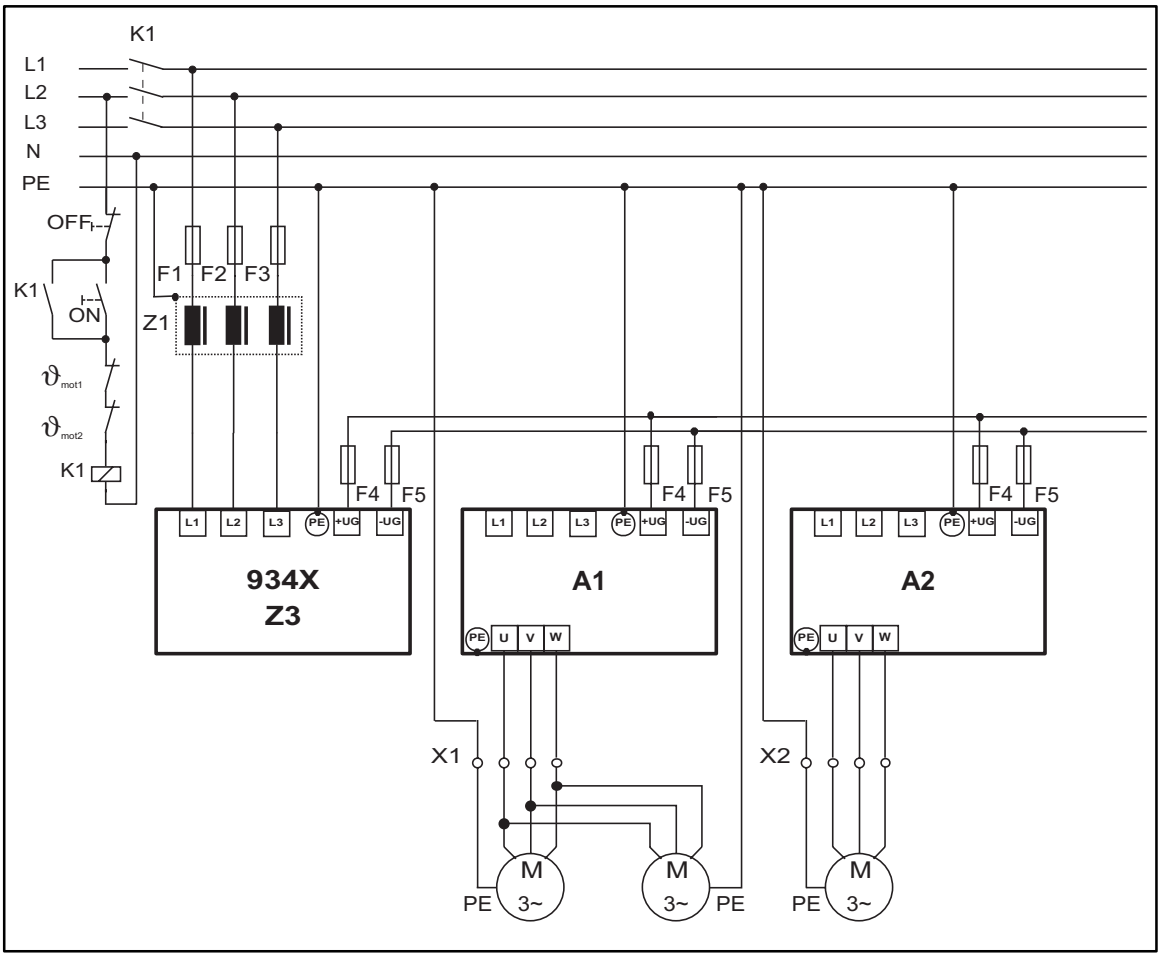


Fig. 10-5 Principle circuit diagram: Drive network of 400 V controllers with central supply via 934X regenerative power supply unit

A1, A2	400 V controllers of the 8200 vector, 8220 or 9300 series
Z1	Mains filters/mains chokes (📖 10-9)
Z3	934X regenerative power supply unit
F1 ... F3	Mains fuses (📖 10-6)
F4 ... F5	Fuses on the DC level (📖 10-6)
K1	Main contactor

10.5 Decentral supply (several supplies)

The DC-bus of the controllers is supplied through $+U_G$, $-U_G$ via **several** controllers which are connected to the mains in parallel. In addition, 400 V mains can be used with **one** regenerative power supply unit.

10.5.1 Decentral supply for single or two-phase mains connection

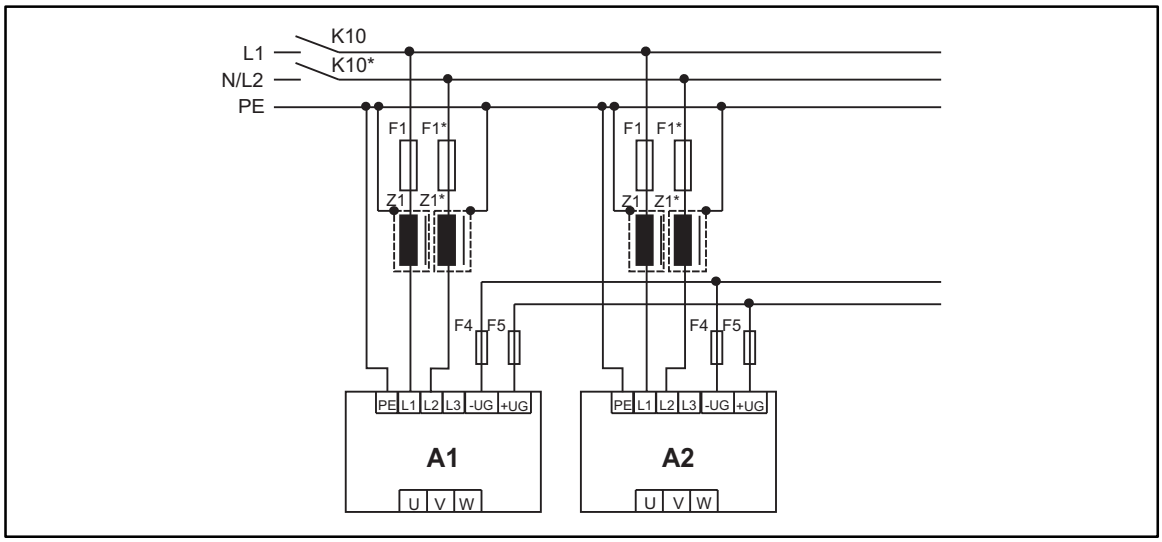


Fig. 10-6 Principle circuit diagram: Drive network of 240 V controllers with decentral supply in single or two-phase mains connection

A1, A2	240 V controllers of the 8200 vector series
Z1, Z1*	Mains choke/mains filter (📖 10-9)
F1, F1*	Mains fuses (📖 10-6)
F4, F5	Fuses on the DC level (📖 10-6)
K10, K10*	Mains contactor
F1*, K10*, Z1*	Only if connecte to 2AC PE 100 V - 0 % ... 260 V +0 %, 48 Hz -0 %... 62 Hz +0 %

Stop!

For fault-free operation, the following conditions must be met:

- General measures (📖 10-2)
- In-phase connection on the mains side!
- With two-phase supply
  – Cable and overload protection via second assigned mains fuse F1*.
  – Ensure current and power symmetry by the second mains choke/mains filter.

10.5.2 Decentral supply for three-phase mains connection

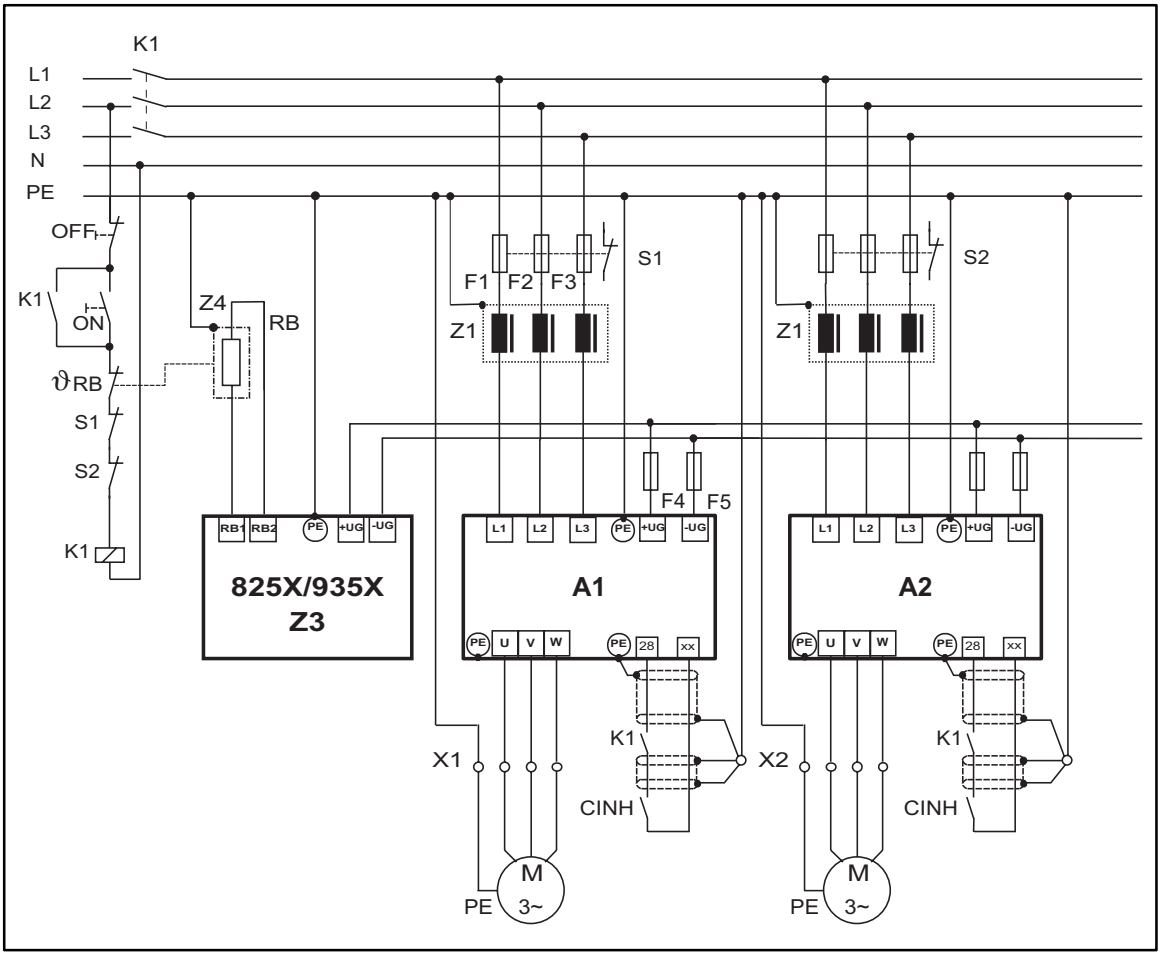
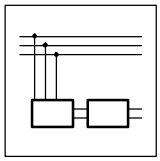


Fig. 10-7 Principle circuit diagram: Network of drives in three-phase mains connection with decentral supply and additional brake unit

A1, A2	240 V controllers 8200 vector or 400 V controllers 8200 vector, 8220 or 9300
Z1	Mains choke/mains filter (📖 10-9)
Z3	Brake unit (📖 12-1)
Z4	Brake resistor (📖 12-1)
F1, F2, F3	Mains fuses (📖 10-6)
F4, F5	Fuses on the DC level (📖 10-6)
K10	Mains contactor

Note!

With a 400 V mains, a 934X regenerative power supply unit can be used instead of a brake unit. Advantage: no heat generation in generator mode operation



10.6 Brake operation in drive networks

10.6.1 Possibilities

If the braking energy generated in generator mode operation is not dissipated, the voltage in the common DC-bus will be increased. If the max. DC-bus voltage is exceeded, the controller sets pulse inhibit (message "overvoltage") and the drives coast to standstill. The generated braking energy can be dissipated in several ways:

	Application with	Special features
934X regenerative power supply unit	Long braking	• The braking energy is fed back to the supplying mains • No heat generation
Brake modules 8251, 8252 or 9351	Frequent low-power braking Seldom medium-power braking	• Integrated brake resistor • No additional measures required • Example: (📖 10-20)
Brake chopper 8253 or 9352	Frequent high-power braking Long high-power braking	• External brake resistor required • Brake resistors may become very hot, if necessary, provide protection measures. • Example: (📖 10-20)
Brake resistor at controller	Frequent low-power braking Seldom medium-power braking	• Only with 8200 vector, because the brake transistor is integrated • See also: (📖 11-2)

Stop!

- Braking energy dissipation possible in a drive network
  – must not be combined.
  – must only be used once (e.g. do not connect two brake modules in parallel).
- Set the mains voltage for the 93XX controllers and the 935X brake units to the same values:
  – For 93XX via C0173
  – For 935X via switches S1 and S2

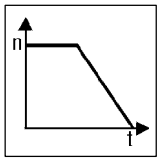
Otherwise, the components of the drive network may be damaged.

10.6.2 Selection

- The selection of the components for braking depends on the permanent brake power, the peak brake power and the application.
- Permanent brake power and peak brake power can be graphically detected:
  – Example: (📖 10-16)
  – Observe the emergency-off concepts (if available)
- When using a brake resistor or a brake module, provide a safety switch-off which is activated in the event of overheating. The thermostats of the brake resistor/brake module are used
  – to disconnect all controllers of the network from the mains.
  – to set controller inhibit (CINH) (terminal 28 = LOW) in all controllers
  – Example: (📖 10-20)

Note!

- Subsequently braking of single drives of the network can reduce the permanent and the peak brake power.
- Observe the permissible overload capacity of the regenerative power supply unit and the switch-on cycle of the brake brake resistor.



11 Brake operation

11.1 Brake operation without additional measures

The functions ”DC-injection brake” or ”AC-motor brake” can be parameterized for braking low masses.

- DC-injection brake: (📖 7-17)
- AC motor brake: (📖 7-18)

11.2 Brake operation with three-phase AC brake motor

Three-phase AC brake motors must be equipped with a brake rectifier to activate the electromechanical motor brake. Lenze brake motors can be equipped with brake rectifiers for brakes with a rated coil voltage of DC 180 V and DC 205 V.

Lenze brake rectifiers are available as bridge rectifiers or half-wave rectifiers. For overvoltage protection, they are equipped with varistors in the input and output. A spark suppressor suppresses interference voltages. It is switched on the DC side via the relay K1 of the controller. Compared to AC-side switching, the delay times are considerably shorter. Thus, for instance, a switch-off positioning with reproduceable brake path can be implemented.

Selection of the rectifier depending on the input voltage (V~) and the rated coil voltage (V_{rcoil}):

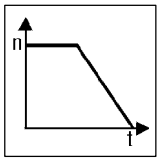
Brake rectifier	Output voltage V- [V]	Example
Bridge rectifier	V- = 0.90 · V~	V_{rcoil} = 205 V- at V~ = 230 V
Half-wave rectifier	V- = 0.45 · V~	V_{rcoil} = 180 V- at V~ = 400 V

Possible configuration of relay K1:

- C0415/1 = 6: Operating threshold Q_{min} reached (in connection with QSP)
  – Braking (QSP) is initialized by a digital signal, e.g. from a limit switch or pre-limit switch for additional creeping.

Note!

- Use electromechanical Lenze brakes. Contact your Lenze representative.
- With DC supply, the brake can be directly activated via relay K1 without using a brake rectifier. Observe the load capacity of relay K1.
- Observe that the brakes usually work according to the normally-on principle.
- Use electromechanical brakes for emergency-off concepts.



11.3 Brake operation with external brake resistor

External brake rectifiers are required to brake a higher moment of inertia or during long operation in generator mode. They convert mechanical brake energy into heat.

The brake transistor integrated in the controller connects the external brake resistor when the DC-bus voltage exceeds the switching threshold. By this, the controller does not set pulse inhibit when the fault "overvoltage" occurs and thus the drive does not coast to standstill. Thanks to the external brake resistor, braking is always controlled.

The switching threshold can be adapted to the mains voltage when using the 400 V controller 8200 vector.

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
[C0174]*	Brake transistor threshold	100	78 {1 %} 110 Recommended setting V_{mains} [3/PE AC xxx V] / C0174 [%] / V_{DC} [V DC]: 380 / 78 / 608 400 / 80 / 624 415 / 83 / 647 440 / 88 / 686 460 / 92 / 718 480 / 96 / 749 500 / 100 / 780	**Not active with 8200 motec and 240 V controller 8200 vector (fixed threshold)** • 100 % = Threshold DC 780 V • 110 % = Brake transistor switched off • V_{DC} = Threshold in V DC • The recommended setting is for max. 10 % mains overvoltage

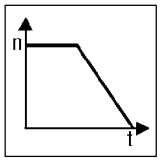
11.3.1 Selection of the brake resistors

Lenze brake resistors recommended in the tables are selected for the corresponding controller (ref. to 150 % generative power). They meet the requirements of most applications.

For special applications, e.g. for centrifuges, hoists, etc., the brake resistor must fulfill the following criteria:

Brake resistor	Application	
Criteria	with active load	with passive load
Permanent brake power [kW]	$\geq P_{max} \cdot \eta_e \cdot \eta_m \cdot \frac{t_1}{t_{zykl}}$	$\geq \frac{P_{max} \cdot \eta_e \cdot \eta_m}{2} \cdot \frac{t_1}{t_{zykl}}$
Thermal capacity [kWs]	$\geq P_{max} \cdot \eta_e \cdot \eta_m \cdot t_1$	$\geq \frac{P_{max} \cdot \eta_e \cdot \eta_m}{2} \cdot t_1$
Resistance [Ω]	$R_{min} \leq R \leq \frac{U_{DC}^2}{P_{max} \cdot \eta_e \cdot \eta_m}$	

Active load	Can start to move without being influenced by the drive. (E. g. hoists, unwinders)
Passive load	Stops without being influenced by the drive. (E. g. horizontal travelling drives, centrifuges, fans)
V_{DC} [V]	Brake transistor threshold under C0174
P_{max} [kW]	Max. brake power determined by the application
η_e	Electrical efficiency (controller + motor) Guide values: 0.54 (0.25 kW) ... 0.85 (11 kW)
η_m	Mechanical efficiency (gearbox, machine)
t_1 [s]	Brake time
t_{cycl} [s]	Cycle time = Time between two successive brake operations = t1 + break time)



11.3.2 Rated data of the integrated brake transistor

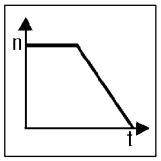
Brake transistor		240 V controller					
		E82EV251_2B	E82EV371_2B	E82EV551_2B	E82EV751_2B	E82EV152_2B	E82EV222_2B
Switching threshold V_{DC}	[V DC]	375 (fixed)					
Peak current Î	[A DC]	0.85		4.0		8.6	
Max. permanent current	[A DC]	0.85		2.0		5.8	
Peak brake power at V_{DC}	[kW]	0.3		1.5		3.2	
Permanent brake power	[kW]	0.3		0.75		2.2	
Lowest permissible brake resistance R_{min}	[Ω]	470		90		47	
Power derating		40 °C < T < 60 °C: 2 %/K 1000 m a.m.s.l. < h < 4000 m a.m.s.l.: 5 %/1000 m					
Switch-on cycle		Max. 60 s peak brake power, followed by min. 60 s break					
Recommended Lenze brake resistor	Order no.	ERBM470R050W		ERBM200R100W		ERBM100R150W	

Brake transistor		400 V controller			
		E82EV551_4B	E82EV751_4B	E82EV152_4B	E82EV222_4B
Switching threshold V_{DC}	[V DC]	780 (see C0174)			
Peak current Î	[A DC]	1.9		3.8	5.6
Max. permanent current	[A DC]	0.96		1.92	2.8
Peak brake power at V_{DC}	[kW]	1.5		3.0	4.4
Permanent brake power	[kW]	0.75		1.5	2.2
Lowest permissible brake resistance	[Ω]	455		230	155
Power derating		40 °C < T < 60 °C: 2 %/K 1000 m a.m.s.l. < h < 4000 m a.m.s.l.: 5 %/1000 m			
Switch-on cycle		Max. 60 s braking at peak brake power, followed by min. 60 s break			
Recommended Lenze brake resistor	Order no.	ERBM470R050W	ERBM470R100W	ERBM370R150W	ERBM240R200W

11.3.3 Rated data of the Lenze brake resistors

Lenze brake resistors							
Order number	R	Brake power		Thermal capacity	Switch-on cycle	Cable cross-section [1]	
		Peak	Permanent				
	[Ω]	[kW]	[kW]	[kWs]		[mm²]	AWG
ERBM470R050W	470	0.3	0.05	7.5	1 : 10 Max. 15 s braking at peak brake power, followed by min. 150 s recovery time	1	17
ERBM470R100W	470	1.0	0.1	15		1	17
ERBM200R100W	200	0.7	0.1	15		1	17
ERBM370R150W	370	1.5	0.15	22.5		1	17
ERBM100R150W	100	1.4	0.15	22.5		1	17
ERBM240R200W	240	2.0	0.2	30		1	17
ERBM082R200W	82	1.7	0.2	30		1	17
ERBD180R300W	180	3.0	0.3	45		1	17
ERBD100R600W	100	5.5	0.6	90		1	17
ERBD082R600W	82	6.5	0.6	90		1.5	15
ERBD068R800W	68	8.0	0.8	120		1.5	15
ERBD047R01k2	47	11.5	1.2	180		2.5	14

[1] Screw tightening torque of the connection terminals: 0.5 ... 0.6 Nm (4.4 ... 5.3 lbin)
Observe national and regional regulations (e. g. VDE 0113, EN 60204)



Brake operation

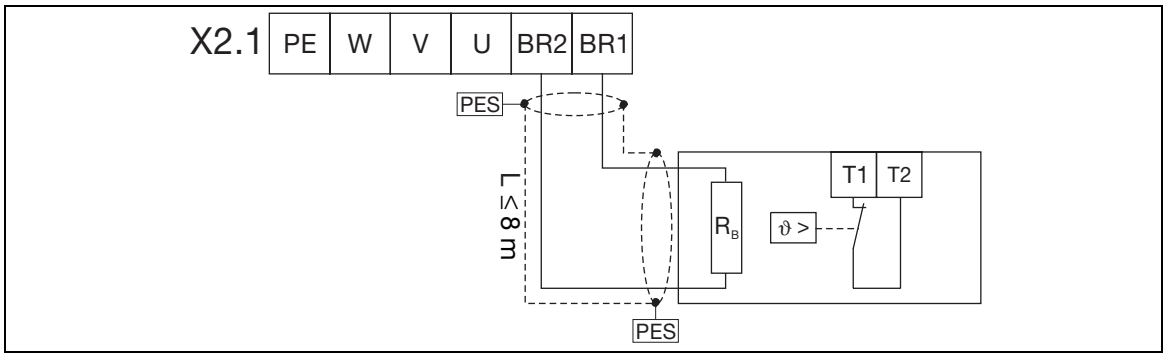
Installation

- Brake resistors can be very hot, they might even burn. Therefore, brake resistors must be mounted in such a way that the possibly very high temperatures cannot damage anything.
- Provide a safety switch-off for the event of overheating!
  – Use thermal contacts of the brake resistor (e. g. T1 / T2) as control contacts to separate the controller from the mains.
  – Connection proposal: (📖 10-20)

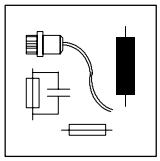
Note!

Screened cables are only required to comply with existing standards (e. g. VDE 0160, EN 50178).

Connection diagram



PES HF-screen end by PE connection through screen bracket.



12 Accessories

12.1 Overview

Accessories			Order number	See
Communication modules for AIF interfaces and accessories	Keypad		E82ZBC	📖 6-2
	Keypad with hand terminal		E82ZBB	
	Hand terminal		E82ZBH	
	Connection cable for hand terminal	2.5 m	E82ZWL025	
		5 m	E82ZWL050	
		10 m	E82ZWL100	
	Assembly set (door)		E82ZBHT	
	PC interface RS232/RS485 (LECOM-A/B)		EMF2102IB-V001	📖 6-8
	PC system cable RS232	0.5 m	EWL0048	
		5 m	EWL0020	
		10 m	EWL0021	
	PC parameter setting software “Global Drive Control (GDC)”		ESP-GDC2	
	LECOM-B (RS485)		EMF2102IB-V002	
	Level converter for RS485		EMF2101IB	
	LECOM-LI (optical fibre)		EMF2102IB-V003	
	INTERBUS		EMF2111IB	
	PROFIBUS-DP		EMF2131IB	
	System bus (CAN)		EMF2171IB	
	System bus (CAN) with hardware addressing		EMF2172IB	
Function modules für FIF interfaces and accessories	LECOM-B (RS485)		E82ZAFL	
	Level converter for RS485		EMF2101IB	
	INTERBUS		E82ZAFI	
	PROFIBUS-DP		E82ZAFP	
	System bus (CAN)		E82ZAFC	📖 9-1
	Standard-I/O		E82ZAFS	📖 4-8
	Application-I/O		E82ZAFA	📖 4-10
Accessories for braking operation	Brake module 8251	Integrated brake resistor	EMB8251-E	📖 10-21
	Brake module 8252		EMB8252-E	
	Brake module 9351		EMB9351-E	
	Brake chopper 8253		EMB8253-E	📖 11-2
	Brake chopper 9352		EMB9352-E	
	External brake resistors			📖 11-2
	Brake rectifier bridge circuit		E82ZWBR1	📖 11-1
	Brake rectifier single way connection		E82ZWBR3	

12.2 Documentation

Documentation		Order number		
		German	English	French
Operating Instructions	Global Drive frequency inverter 8200 vector	EDB82EVD	EDB82EVU	EDB82EVF
	Communication modules LECOM-A/B (RS232/RS485), LECOM-B (RS485), LECOM-LI (LWL)	EDB2102DB	EDB2102UB	EDB2102FB
	Communication module INTERBUS	EDB2111DB	EDB2111UB	EDB2111FB
	Communication module PROFIBUS-DP	EDB2131DB	EDB2131UB	EDB2131FB
	Communication module system bus (CAN) 2171/2172	EDB2172DB	EDB2172UB	EDB2172FB
	Fieldbus function modules PROFIBUS-DP, INTERBUS, LECOM-B (RS485)	EDB82ZAD	EDB82ZAU	EDB82ZAF
Catalogs	Please contact your Lenze representative for the catalog about the corresponding motors, geared motors and mechanical brakes.			

13 Application examples

13.1 Pressure control

The pressure in a pipeline network (e.g. in industrial systems or houses) is kept at a constant value.

Conditions

- Operation at a PLC (selection of pressure setpoint and derating during night)
- Setting at the site is possible.
- The pressure is lower during the night, the pump then operates in an uncontrolled mode and with a low and constant speed.
- The output frequency must never fall below 10 kHz (dry running).
- Avoid pressure peaks in the pipelines.
- Avoid mechanical resonances at approx. 30 Hz output frequency.
- Motor protection against overtemperature.
- Fault message to PLC.
- Display of actual pressure and operation status at the site.
- Pump stop directly at site.

Functions used

- Internal process controller for pressure control
  – Pressure setpoint from PLC (4 ... 20 mA)
  – Act. pressure value from sensor (0 ... 10 V)
- Manual/remote changeover for set-up operation at the site
  – Manual: Act. pressure via momentary contact with motor potentiometer function (UP/DOWN)
  – Remote: Pressure setpoint from PLC
- JOG speed for night derating (activated via PLC).
- Dry-running protection (setpoint-independent min. speed).
- Smooth start with S ramps.
- Suppression of mechanical resonances by skip frequencies.
- PTC motor monitoring.
- Trip message via digital output.
- Operating status via relay output.
- Configurable analog output for actual pressure value.
- Electrical controller inhibit (CINH).

Application-specific configuration

- Motor-parameter identification. (📖 7-28)

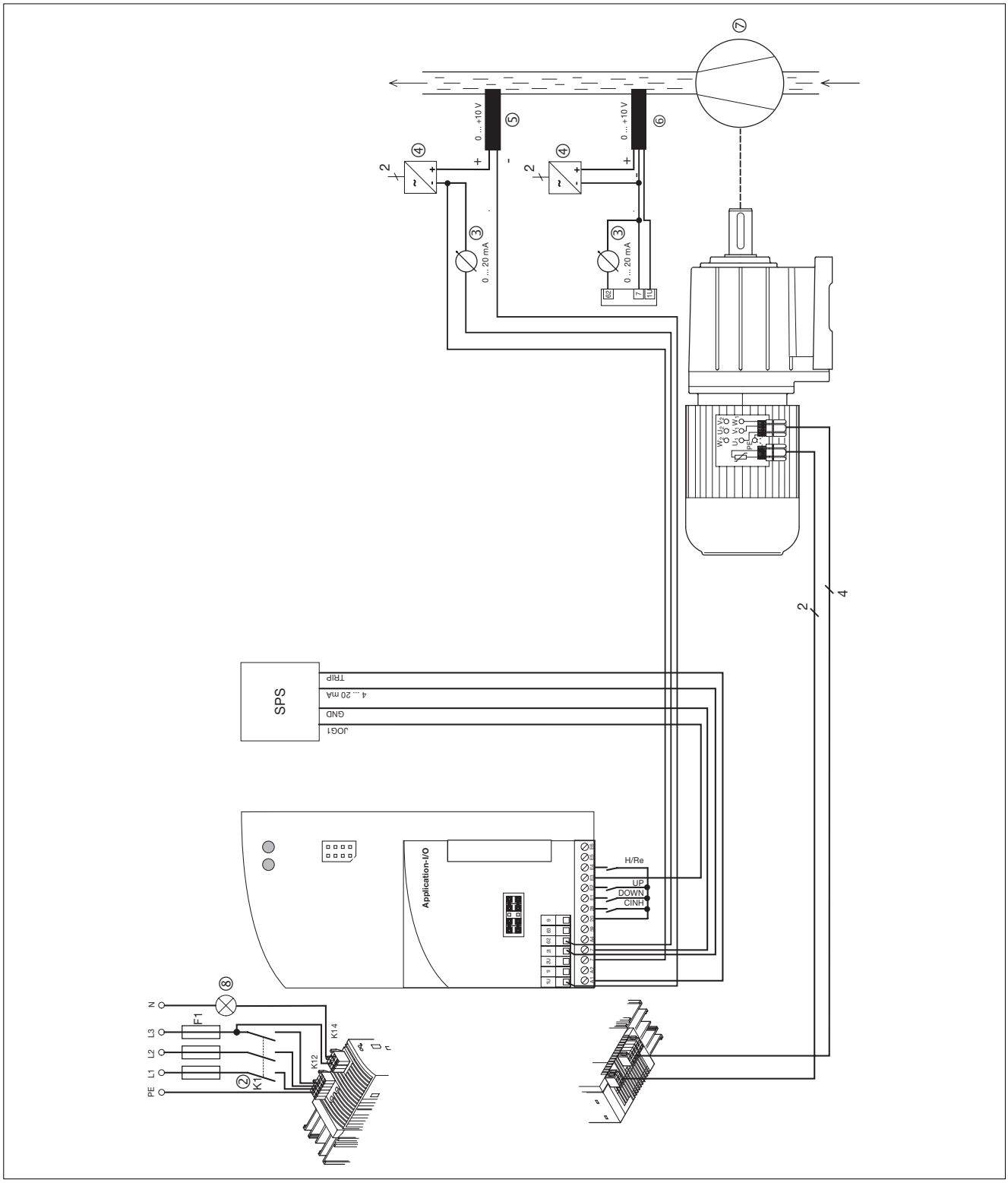
Code		Settings				IMPORTANT
No.	Name	Value	Meaning			
C0014↲	Control mode	3		V/f-characteristic control V ~ f		Square-law characteristic with constant V_{min} boost
C0410			Digital signal source			
8	DOWN	1	E1	Inputs of the momentary contacts “UP” and “DOWN”		
7	UP	2	E2			
1	JOG1/3	3	E3	JOG speed for night derating		Switching of the JOG speed deactivates the process controller.
19	PCTRL1-OFF	3	E3	Deactivate process controller		
17	M/Re	4	E4	Changeover PLC/set-up operation at site		
C0412			Analog signal source			
1	Setpoint 1 (NSET1-N1)	1	X3/2I			Pressure setpoint (manual)
2	Setpoint 2 (NSET1-N2)	3	MPOT1-OUT motor potentiometer function			Pressure setpoint (remote)
5	Act. process controller value (PCTRL1-ACT)	4	X3/1U			Act. pressure value
C0145	Source process controller setpoint	0		Total setpoint (PCTRL1-SET3)		Main setpoint + additional setpoint
C0070	Process controller gain	→				If necessary, adapt to process. → Further information: 📖 7-30 ff.
C0071	Integral action time of process controller	→				
C0072	Differential component process controller	→				
C0074	Influence of process controller	100.0	0.0	{0.1 %}	100.0	
C0238↲	Frequency precontrol	-0-	-0-	No precontrol (only process controller)		Full influence of process controller.
C0419	Free configuration of analog outputs		Analog signal source			
1	X3/62 (AOUT1-IN)	8		Act. process controller value		
C0037	JOG1	17				Fixed reduction to approx. 1/3 of the rated motor speed.
C0239↲	Lower frequency limit	10.00				Setpoint independent min. speed.
C0182*	Integration time S-ramps	0.50 s		Smooth start		
C0625*	Skip frequency 1	30.00 Hz				
C0628*	Bandwidth of skip frequencies	10.00 %				ref. to C0625
C0119↲	Configuration PTC input/earth-fault detection	4		PTC input active, TRIP set		
C0415	Free configuration of digital outputs					
1	Relay output K1	16		Ready for operation		
2	Digital output X3/A1	25		Trip fault message		

Jumper settings at application-I/O

- Jumper A in position 7-9 (act. pressure value 0 ... 10 V at X3/1U)
- Remove jumper B (setpoint input via master current to X3/2I), (observe C0034)
- Plug jumper C in position 3-5 (output of act. pressure as current signal to X3/62)
- Jumper D in position 2-4 or 4-6, since X3/63 is not assigned.

Note!

- For this application, the controller must be equipped with an application-I/O, because the application requires two analog inputs.
- If the pressure setpoint is selected via PC, keypad, or JOG frequency instead of PLC, a standard-I/O will do.



② Mains contactor
③ Analog display element for actual pressure value
④ External power supply
⑤ 2 conductor pressure sensors
⑥ 3 conductor pressure sensors
⑦ Pump
⑧ Light on = ready for operation

for ⑤, ⑥: use only one pressure sensor

Fig. 13-1 Principle drawing for a pressure control

13.2 Operation with medium-frequency motors

Medium-frequency asynchronous motors are used where high and controllable speeds are required. Possible applications are milling cutters for wood processing machines, fans, vacuum pumps, concrete condensers, grinding and polishing drives.

Selection notes

- If the motor is to be braked within a short time, high moments of inertia make external brake resistors necessary. (📖 11-2)
- Set the speed range so that self-ventilated motors are always cooled sufficiently (setting range as function of load).

Application-specific configuration

Code	Name	Setting	Note
C0011	Max. output frequency		Set the value indicated on the motor nameplate but do not exceed 400 Hz.
C0012	Acceleration time main setpoint		The setting must ensure acceleration below the current limit.
C0013	Deceleration time main setpoint		The setting must ensure braking with or without external brake resistor. The message “Overvoltage (OU)” must not occur.
C0014	Control mode	-2-	Linear characteristic (best operating behaviour for medium-frequency motors)
C0015	V/f-rated frequency		📖 7-4
C0016	V_{min} boost		The setting depends on the load with low frequencies. Recommended: 0 %
C0018	Chopper frequency	-3-	16 kHz (good smooth running at 16 kHz only) Observe power derating 📖 3-3
C0021	Slip compensation	0 %	Usually not necessary.
C0022	I_{max} limit (motor mode)		Setting to rated motor current. With short acceleration times and high moments of inertia to 150%.
C0023	I_{max} limit (generator mode)	150 %	Lenze setting
C0106	Holding time for DCB	0 s	The DC-injection brake must be deactivated!
C0144	Chopper-frequency reduction	-0-	No derating.

13.3 Dancer position control (line drive)

The dancer position control generates a constant material tension during operation. In this example, the material speed v_2 is synchronised to the line speed v_1 . This application requires an application-I/O.

Functions used

- Internal process controller as position controller.
- Selection of the line speed v_1 via X3/1U.
- Actual dancer position from the dancer potentiometer via X3/2U.
- Setting speed via X3/E3 as JOG frequency.
- Dancer controller switch-off via X3/E4 (external), or internally via Q_{min} (C0017) and C0415/1 = 6.

Application-specific configuration

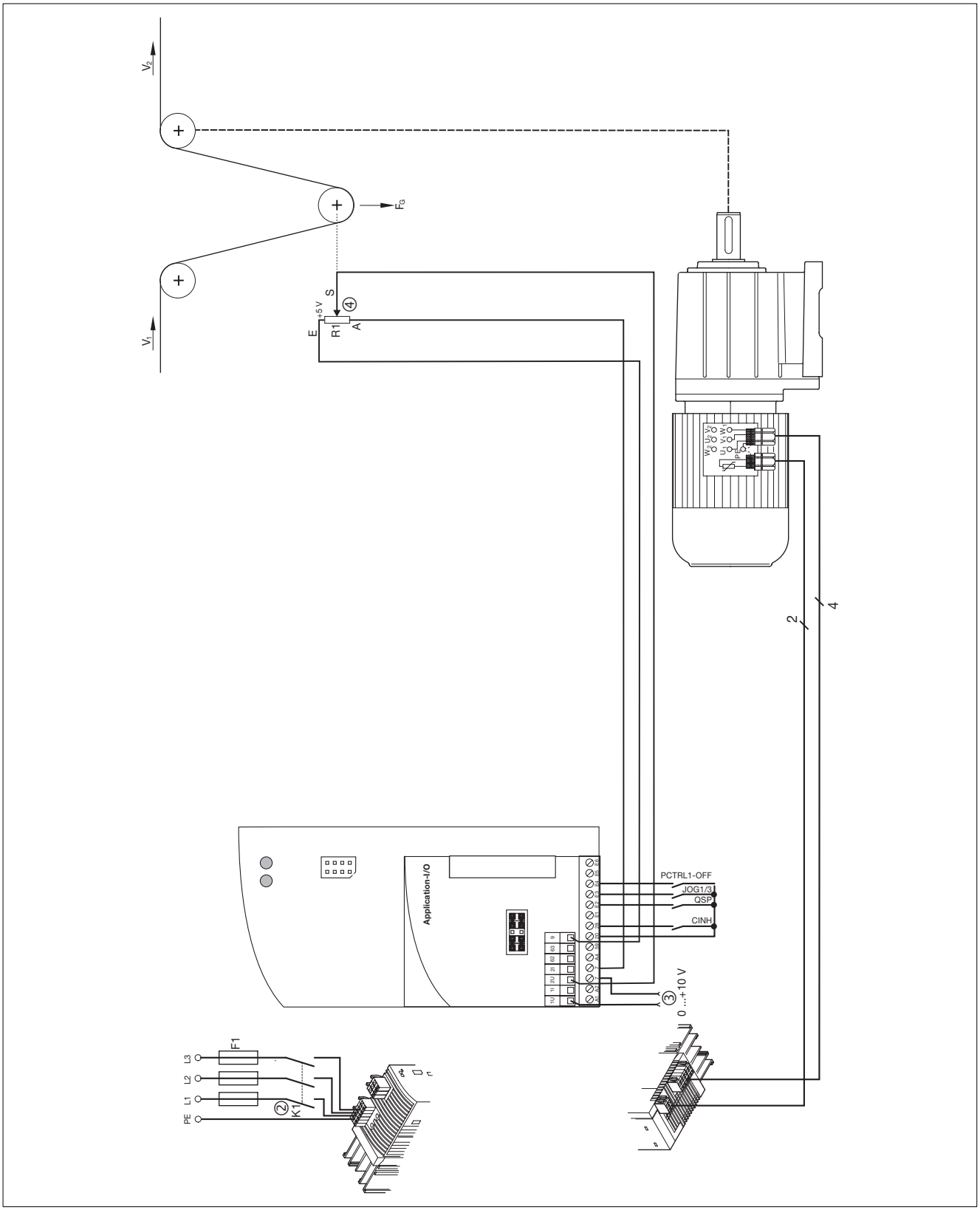
- Basic settings (📖 5-2)
- Motor-parameter identification. (📖 7-28)
- If necessary, calibration of setpoint and actual value to application datum. (📖 7-50)

Code		Settings		IMPORTANT
No.	Name	Value	Meaning	
C0410			Digital signal source	
1	JOG1/3	3	X3/E3	
4	QSP	2	X3/E2	
19	PCTRL1-OFF	4	X3/E4	
C0412			Analog signal source	
1	Setpoint 1 (NSET1-N1)	1	X3/1U	Line speed v_1
5	Act. process controller value (PCTRL1-ACT)	4	X3/2U	Actual dancer position value
C0037	JOG1	20.00		Fixed set-up speed v_1 for material guidance, individually adjustable.
C0070	Process controller gain	1.00		Adaptation to process Further information: 📖 7-30
C0071	Integral action time of process controller	100		
C0072	Differential component process controller	0.0		
C0074	Influence of process controller	10.0 %		
C0105	Deceleration time QSP	approx. 1 s		E.g. as emergency-stop function. The settings must ensure that the drive can be braked to standstill in the shortest possible time. If necessary, use an external brake resistor.
C0145	Source process controller setpoint	-1-	C0181 (PCTRL1-SET2)	
C0181*	Process controller setpoint 2 (PCTRL1-SET2)	Value from C0051	Set the dancer to required position, C0051 = read act. dancer value.	Do not set C0181 to “0”, otherwise the position setpoint would be generated by the main setpoint.
C0239↲	Lowest frequency limit	0.00 Hz		The direction of rotation cannot be changed via the process controller.
C0238↲	Frequency precontrol	-1-	Precontrol (total setpoint + process controller) Total setpoint (PCTRL1-SET3) = main setpoint + additional setpoint	Full influence of process controller.

Adjustment

Set C0070, C0071, C0072 so that, if the dancer is adjusted manually (change of the actual value); the original position can be reach again quickly and with only minimum overshoot:

1. X3/E4 = HIGH (stop process controller), C0072 = 0 (without influence).
2. Set C0070.
3. X3/E4 = LOW, C0072 = 0 (without influence).
4. Set C0071.
5. Set C0072.



② Mains contactor
③ Main setpoint ~V_1
④ Dancer potentiometer

Fig. 13-2 Principle circuit diagram for a dancer position control

13.4 Speed control

Example

Speed control with inductive, single track 3 phase sensor (e. g. Pepperl & Fuchs)

The speed control is to compensate the deviation of the actual speed from the speed setpoint.

For motor speed detection, the inductive sensor (e.g. gear) scans a metal fan wheel or cam. Scanning is possible directly at the motor or in the machine.

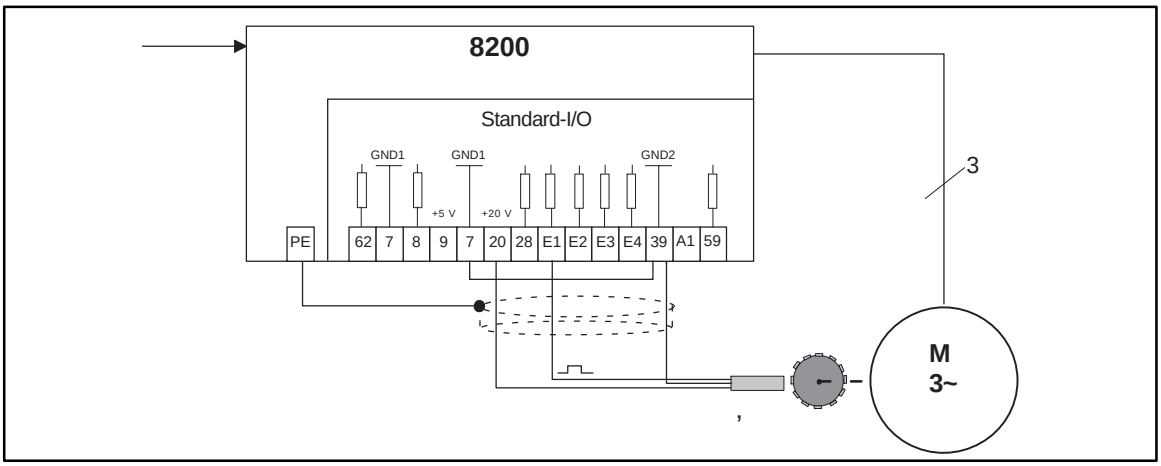


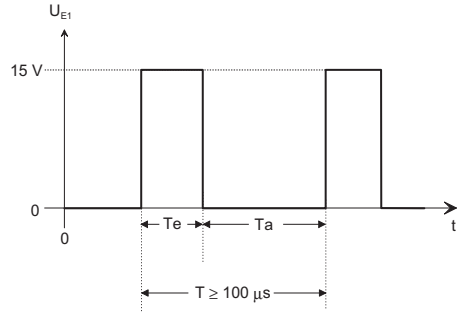
Fig. 13-3 Speed control with three-phase sensor

① Setpoint
② 3 phase sensor

8200: 8200 motec or 8200 vector

Demands on the speed sensor

• The maximum frequency of inductive sensors is within a range from 1 to 6 kHz depending on the design. • Select the number of damping cams per revolution at the detection point so that the output frequency of the sensor is as high as possible. • The output frequency (f_{act}) should be > 0.5 kHz to ensure sufficient dynamic control at rated speed. • If the current consumption of the sensor is not higher than the value permitted at X3/20, the 3-phase sensor can be directly connected to the controller.
Detection of the output frequency

$f_{ist} = \frac{z \cdot n}{60}$	z = No. of cams per revolution n = Speed at the detection point in [min^{-1}] $f_{act.}$ = Output frequency of the sensor in [Hz]
Permissible pulses at X3/E1	
	• Te = on (HIGH) • Ta = off (LOW) Permissible level range: • LOW: 0 ... +3 V • HIGH: +12 ... +30 V Permissible range of the scanning ratio: • Te : Ta = 1 : 1 to Te : Ta = 1 : 5 **Note!** Any digital speed sensor which meets the level and scanning requirements can be be used.

Application-specific configuration

- Basic settings (📖 5-2)

Code		Settings		IMPORTANT
		Value	Meaning	
C0410	Free configuration of digital input signals			Configuration frequency input X3/E1
24	DFIN1-ON	-1-		
C0412	Free configuration of analog input signals		Analog signal source	
5	Act. process controller value (PCTRL1-ACT)	-2-		
C0011	Maximum output frequency		$(1 + \frac{C0074\ [\%]}{100}) \cdot \frac{p}{60} \cdot n_{max}$	p = No. of pole pairs n_{max} = required maximum speed [min^{-1}]
C0014↲	Control mode	-2	V/f-characteristic control	For this application the dynamic response for the control mode “vector control” is too low.
C0019	Operating threshold of auto DCB	approx. 0.5 Hz		Adaptation to the application
C0021	Slip compensation	0 %		With controlled operation no slip compensation
C0035*↲	Selection DCB	-1-	Brake current selection under C0036	
C0036	Voltage/current DCB	50 ... 100 %		Adaptation to the application
C0070	Process controller gain	1 ... 15		5 = typical
C0071	Integral action time of process controller	50 ... 500 ms		100 ms = typical
C0072	Differential component process controller	0		Not active
C0074	Influence of process controller	2 ... 10 %	$S_N = \frac{n_0 - n_N}{n_0}$ Example $S_N = \frac{1500 - 1400}{1500} = 6.67\ \%$	• Adaptation to the application • Set 2 times rated motor slip (2 * S_r)
C0106	Holding time auto DCB	1 s		• Guide value • Afterwards the controller is inhibited
C0181*	Process controller setpoint 2 (PCTRL1-SET2)			• Adaptation to the application • Selection with keypad or PC • 📖 7-32 : Other possibilites to select the setpoint
C0196*↲	Activation of auto–DCB	-1-	DCB active if C0050 < C0019 and setpoint < C0019	
C0238↲	Frequency precontrol	-1-		With frequency precontrol
C0239↲	Lowest frequency limit	0 Hz		Unipolar, no reversal of the direction of rotation
C0425↲*	Configuration frequency input X3/E1 (DFIN1)			Adaptation to the application
C0426*	Gain frequency input X3/E1 (DFIN1-GAIN)			

Adjustment (see example in Fig. 13-3)

Frequency input X3/E1

The gear on the motor shaft provides 6 pulses/rev.

The motor is to run with up to 1500 min^{-1}.

The maximum frequency at X3/E1 is:

$$\frac{1500}{60\ s} \cdot 6 = 150\ Hz$$

The following setting results for the frequency input at X3/E1:

- C0425 = -0-
  - – Frequency =100 Hz
  - – Maximum frequency = 300 Hz

The input frequency at X3/E1 is normalized to the value of the preselected frequency (100 Hz), i.e. internally 100 Hz correspond to the output frequency set under C0011.

Gain C0426

- After every change of C0011, C0426 must be adapted.
- If the number of cams to be scanned (gear, fan wheel) is known:

$$C0426 = \frac{100\ Hz\ (Normalization\ frequency\ C0425)}{150\ Hz\ (Sensor\ frequency\ at\ 50\ Hz\ output\ frequency)} \cdot \frac{50\ Hz}{C0011} \cdot 100\ \%$$

- If the number of cams to be scanned (gear, fan wheel) is not known, the gain must be found out by experiment:

1. Set C0238 = 0 or 1.
2. Accelerate drive to the max. required output frequency. The output frequency is determined through the frequency precontrol.
3. Set the gain online under C0426 so that the actual value (C0051) corresponds to the setpoint (C0050).

13.5 Group drive (operation with several motors)

Several motors can be connected to the controller in parallel. The sum of the individual motor powers must not exceed the rated controller power.

Installation

- The motor cable is connected in parallel, e.g. in a terminal box.
- Each motor must be equipped with a thermostat (normally closed contact) which is connected in series to X2/T1 and X2/T2 with a separate cable.
- Only used shielded cables. (📖LEERER MERKER) . Connect the screen to PE with a surface as large as possible. (📖LEERER MERKER) .
- Resulting cable length:

$$l_{res} = \text{Sum of all motor cable lenghts} \times \sqrt{\text{Number of motor cables}}$$

Application-specific configuration

- Basic settings (📖 5-2)
- Control mode C0014 = -2- or -4-. (📖 7-2)
- PTC input C0119 = -1-. (📖 7-48)

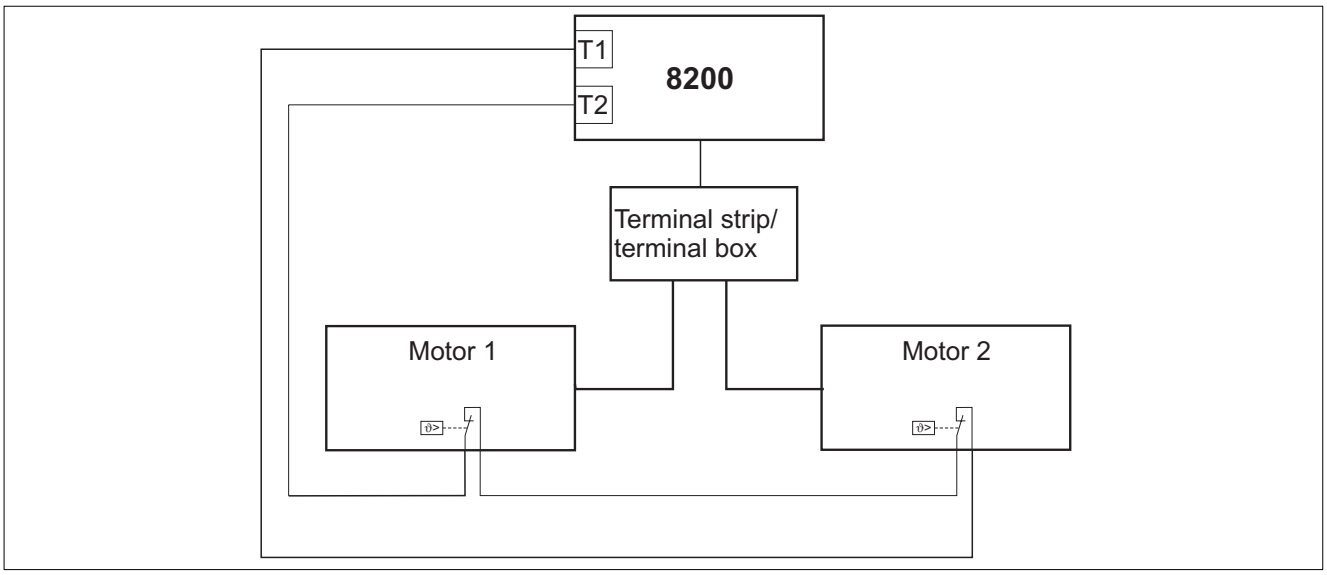


Fig. 13-4 Principle structure of a group drive

Note!

The motor cables and possibly connected switching elements can be monitored with the motor phase failure detection. (📖 14-39, C0597)

13.6 Sequential circuit

Two refrigerating compressors supply several consumers, which are irregularly connected and disconnected .

Conditions

- Compressor 1 is controlled via a 8200 motec or a 8200 vector.
- Compressor 2 is connected to the mains and - depending on the cold consumption - connected to or disconnected from the controller at compressor 1.
- The pressure setpoint of the refrigerating process is preselected at the controller.

Functions used

- Controller enable/inhibit to start and stop
- Process controller
- JOG frequency
- Programmable relay output
- Adjustable threshold
- Parameter set changeover

Application-specific configuration

- Basic settings (📖 5-2)
- Configure the process controller:
  – Optimize the process controller (📖 7-30)
  – Process controller has full influence: C0238 = -0-, C0074 = 100 %
  – Source process controller setpoint = total setpoint: C0145 = -0-
  – Process controller setpoint = JOG frequency JOG1 (in PAR1 and PAR2 permanently activated via X3/E1): C0037 = 50 Hz
- Adapt the parameter set 1 (PAR1) to the application.
  – X3/E1 permanently active (LOW-active): C0411 = -1-
  – Threshold for additional connection of compressor 2: C0017 = 45 Hz.
  – Configure the additional connection of compressor 2 via relay: C0415/1 = 6.
- Adapt parameter set 2 (PAR2) to the application:
  – X3/E1 permanently active (LOW-active): C0411 = -1-
  – Threshold for switch-off of compressor 2: C0010 = 15 Hz (minimum frequency).
  – Configure the switch-off of compressor 2 via relay: C0415/1 = 24.
  – Inversion of relay output: C0416 = -1-.
- PAR changeover (PAR1 ⇔ PAR2) via X3/E2: C0410/13 = 2.

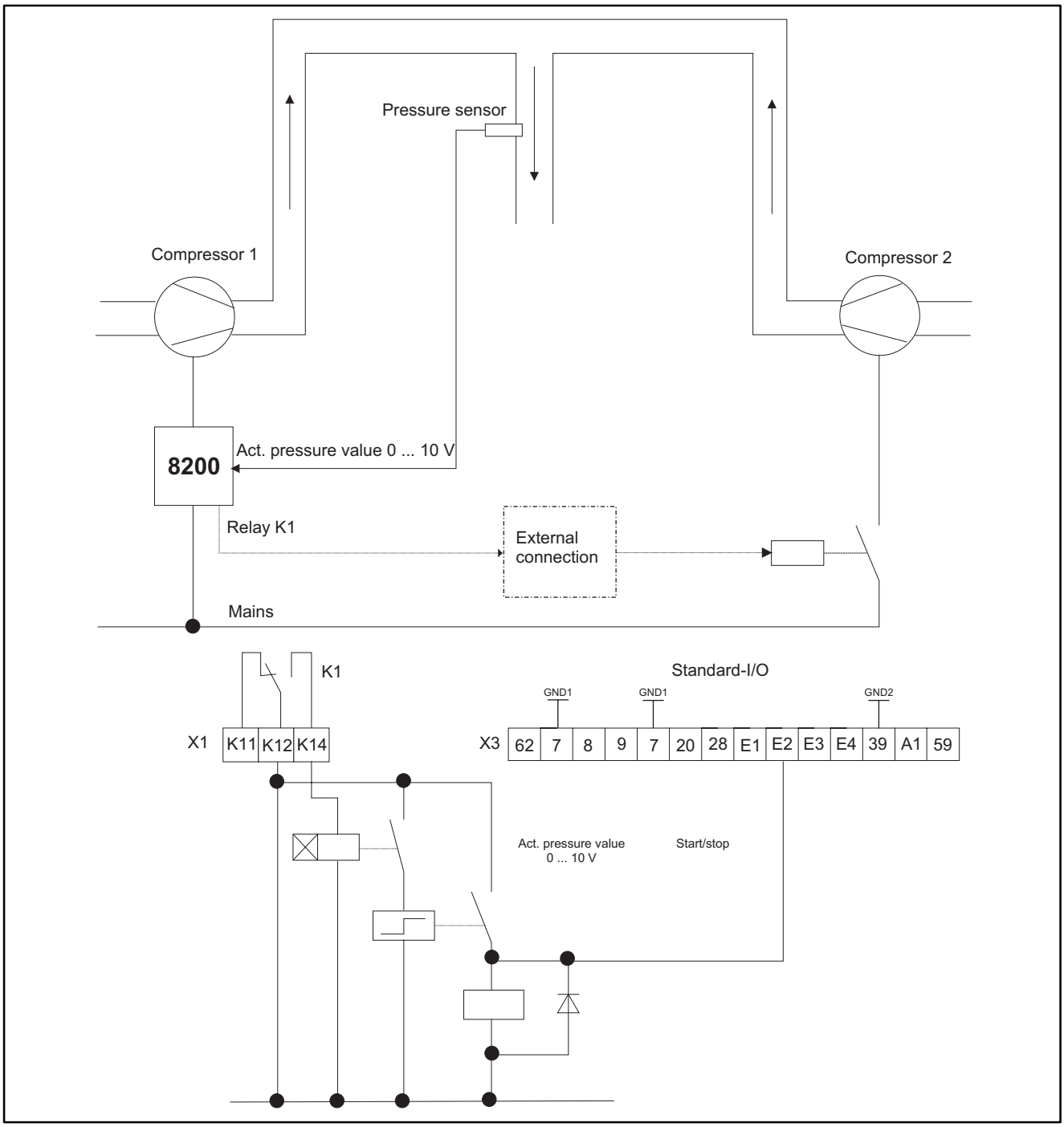


Fig. 13-5 Principle of a sequential circuit

8200: 8200 motec or 8200 vector

Function Fig. 13-5
1. In PAR1 K1 is activated at the threshold of 45 Hz.
2. If K1 remains active until K1T is activated, K2 is activated.
3. Compressor 2 is connected via K3. At the same time, the parameter sets change via X3/E2 (process controller continues operation without being influenced).
4. K1 is activated when the minimum frequency is reached (depending on the load capacity). After the time of K1T is over, K2 is activated again.
5. The compressor 2 is switched off. At the same time, the parameter set changes to PAR1.
● K1T debounces the switching point of compressor 2 (adapt delay time to process).

13.7 Setpoint summation (basic and additional load operation)

Hoists, pumps, etc. are often driven at a basic speed that can be increased if required.

The speed is determined by the selection of main and additional setpoints for the controller. The setpoints can come from different sources (e.g. PLC and setpoint potentiometer). The controller adds both analog setpoints and increases the motor speed accordingly.

For smooth acceleration, acceleration and deceleration ramps of both setpoints can be adjusted. The main setpoint ramps can also be adjusted in S-shape.

Application-specific configuration

- Basic settings (📖 5-2)
- Setpoint summation configuration: Assign the setpoints to be added to C0412/1 and C0012/3. (📖 7-35)
- If necessary, adjust the S-shape main setpoint ramps under C0182. (📖 7-15)

Note!

- Possible setpoint selections: (📖 7-19 ff)
- The additional setpoint can be displayed under C0049 C0049 (alternatively: selection if C0412/3 = 0).
- When using the controller with standard-I/O, the main setpoint must be selected via PC, keypad, JOG frequency or motor potentiometer function, because there is only one analog input.
- When using an application-I/O, the additional setpoint can be switched on or off during operation (C0410/31 ≠ 0)

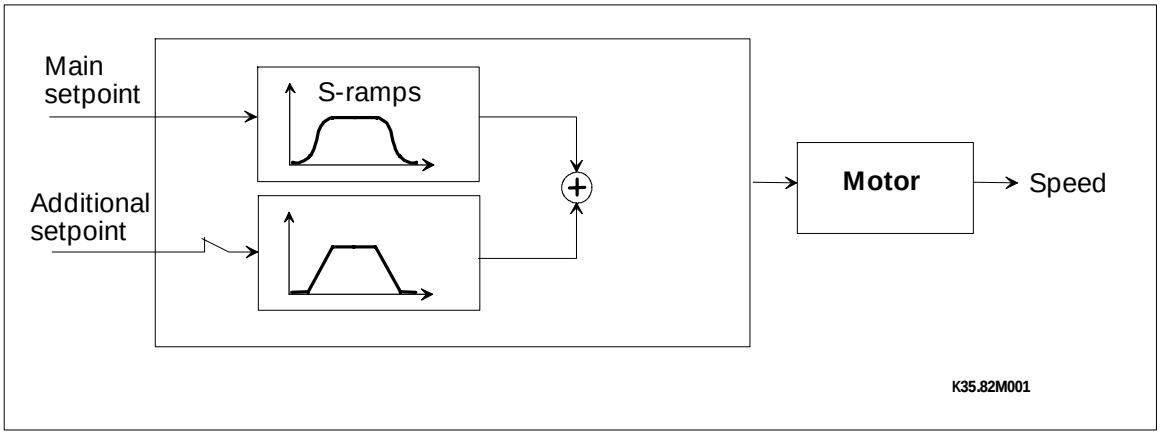


Fig. 13-6 Principle of the setpoint summation

13.8 Power control (torque limitation)

The power control (torque limitation) generates, for instance, a constant mass flow when a medium that changes its specific weight is moving - in general this is air in different ambient temperatures.

The torque limit and the speed setpoint are preselected for the controller. With a changing specific weight, the torque limit is kept because of the automatic speed adaptation. The speed setpoint must, however be set high enough so that is does not have a limiting effect.

With control mode "Sensorless torque control" (C0014 = 5):
With the sensorless torque control a constant torque is preselected and a defined speed limit cannot be exceeded (speed limitation).

Application-specific configuration

- Basic settings (📖 5-2)
- Select control mode: C0014 ≠ 5! (📖 7-2)
- Torque limit value configuration: Assign C0412/6.
- Speed setpoint configuration: Assign C0412/1.

Note!

- Set the max. output frequency C0011 to the value of the max. permissible speed. Thus the speed has not limiting effect and the drive runs continuously at the selected torque limit.
- The torque limit value can be indicated under C0047.
- Selection possibilities for speed and torque limits: (📖 7-19 ff)
- When using the controller with standard-I/O, the main setpoint must be selected via PC, keypad, JOG frequency or motor potentiometer function, because there is only one analog input.
- Acceleration time and moment of inertia require a torque reserve.
- Group drive should not be operated with power control

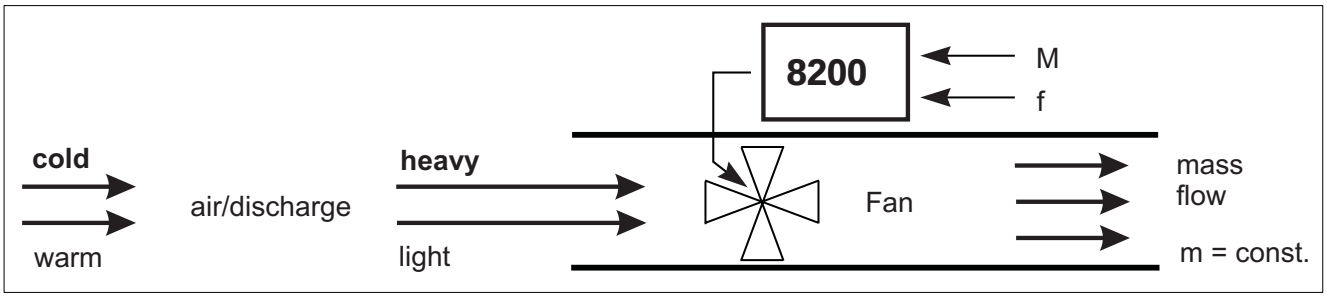


Fig. 13-7 Principle of a power control shown by the example of a fan

8200: 8200 motec or 8200 vector

Application examples

14 Appendix

14.1 Signal-flow charts

How to read the signal-flow charts

Symbol	Meaning
	Signal links in the Lenze setting
	Fixed signal connection
	Analog input can be freely connected to any analog output
	Analog output
	The only analog input to which the motor potentiometer output can be connected.
	Motor potentiometer output
	Digital input can be freely connected o any digital output
	Digital output

14.1.1 Controller with standard-I/O

14.1.1.1 Overview - signal processing

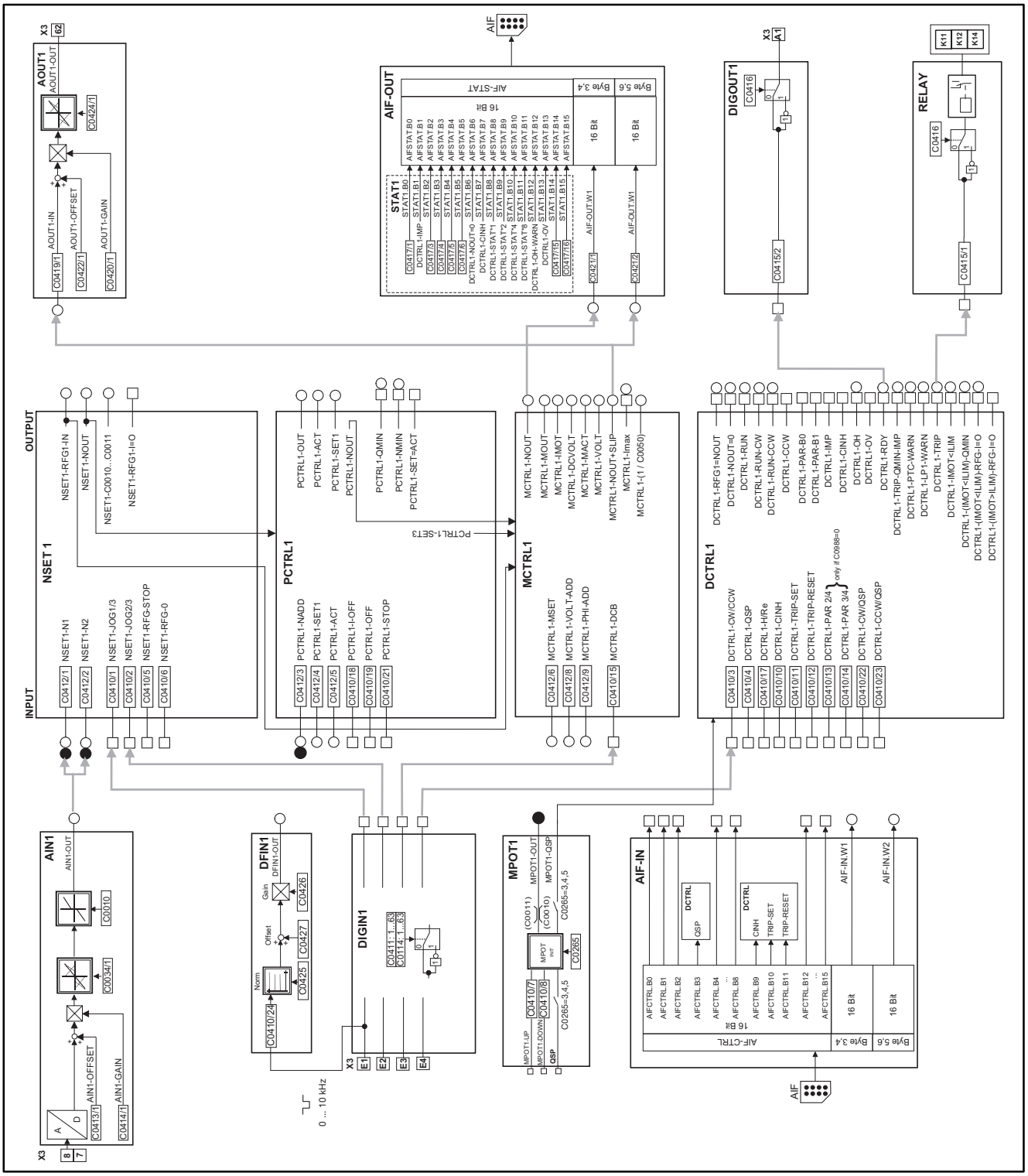


Fig. 14-1 Overview - signal processing standard-I/O

14.1.1.2 Process controller and setpoint processing

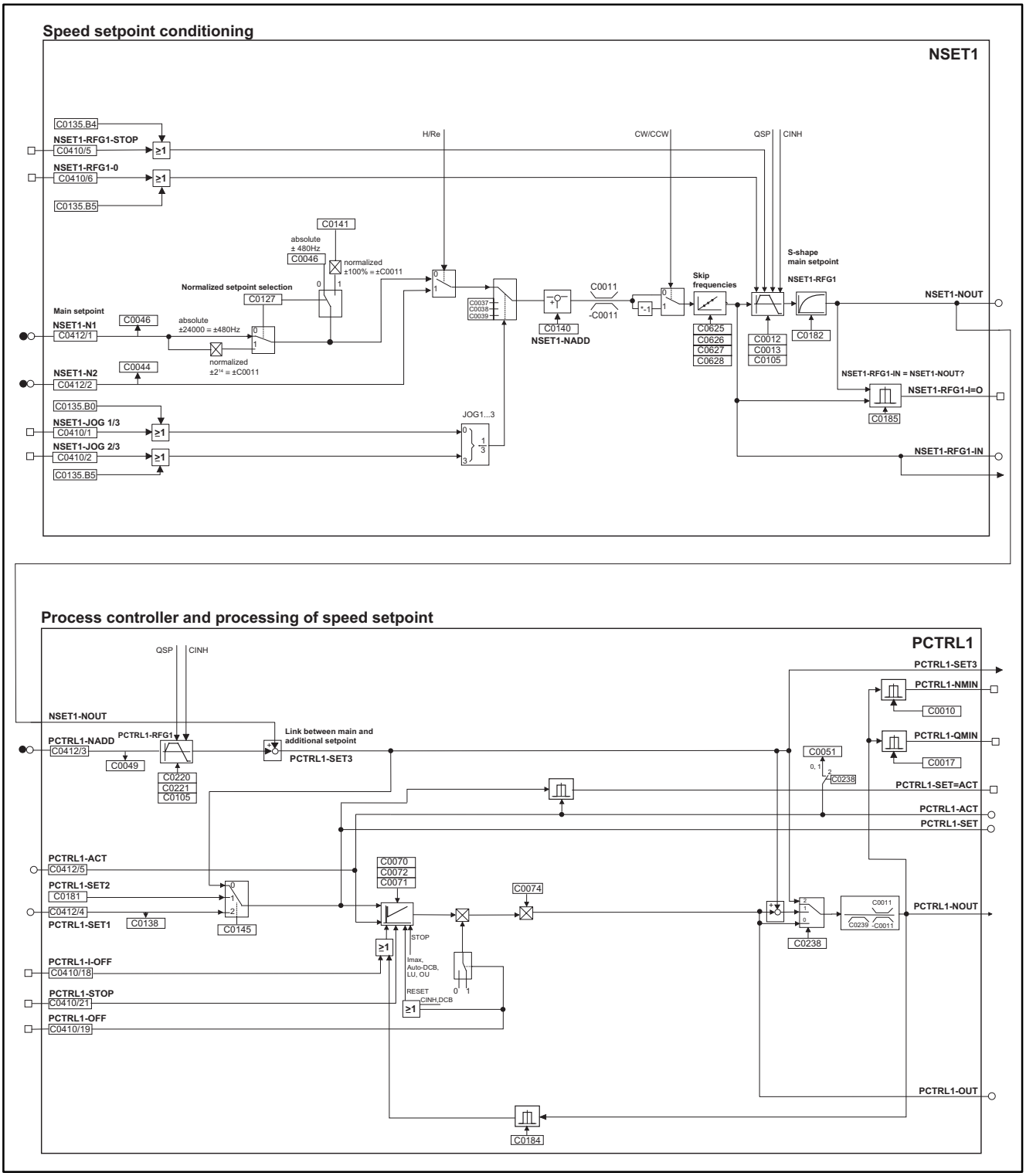


Fig. 14-2 Process controller and setpoint processing standard-I/O

14.1.1.3 Motor control

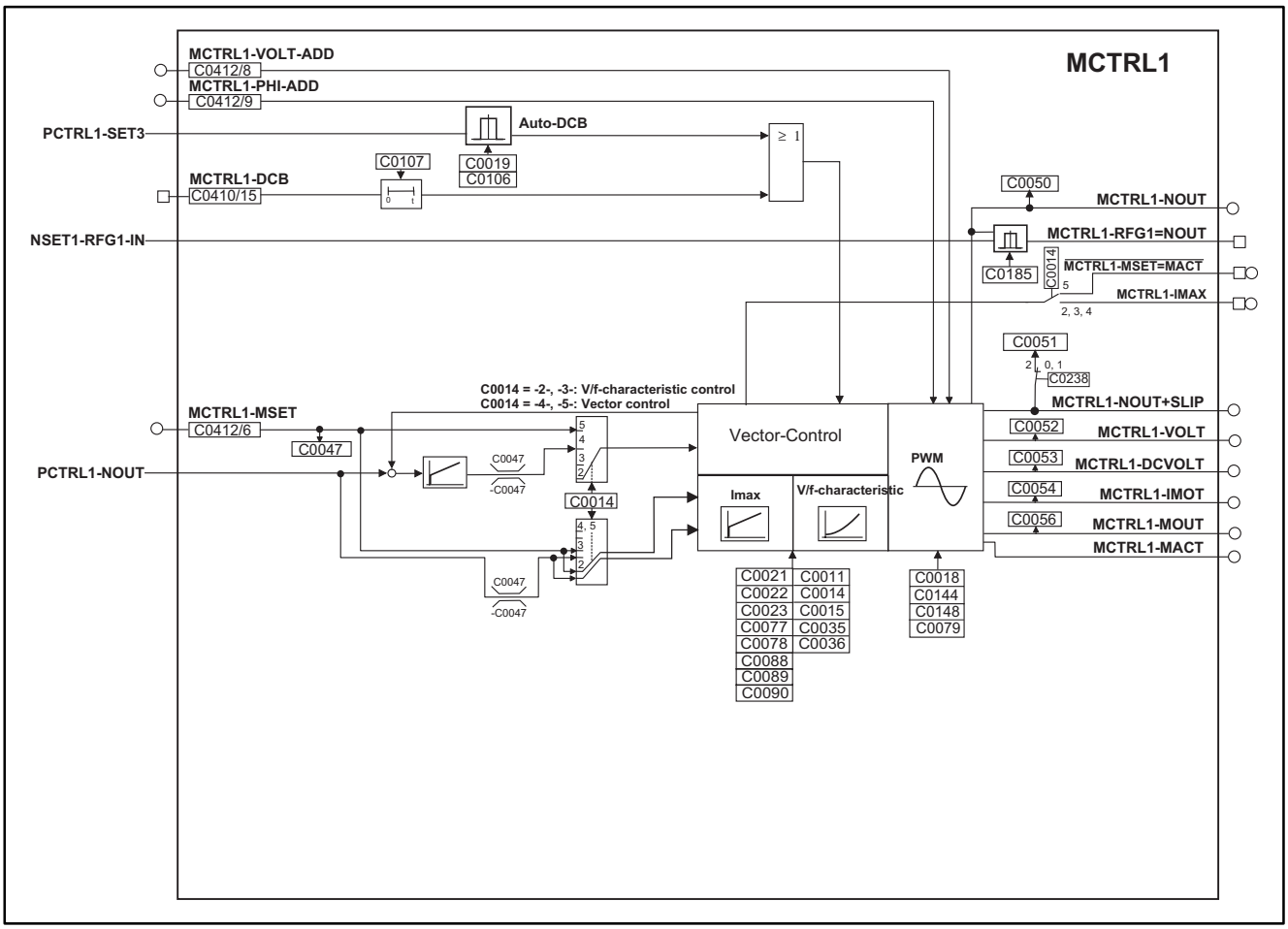


Fig. 14-3 Motor control standard-I/O

14.1.2 Controller with application-I/O

14.1.2.1 Overview - signal processing

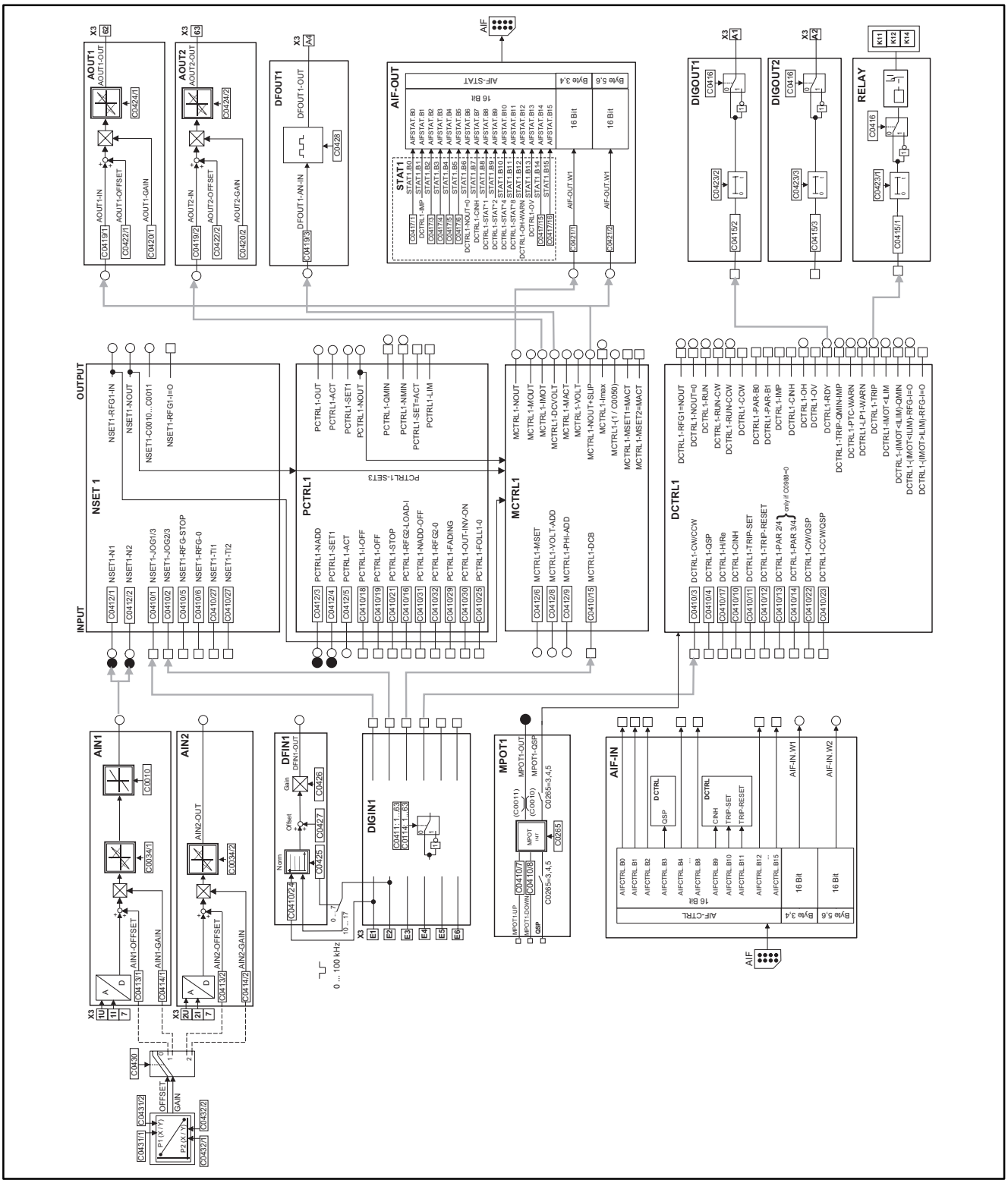


Fig. 14-4 Overview - signal processing application-I/O

14.1.2.2 Process controller and setpoint processing

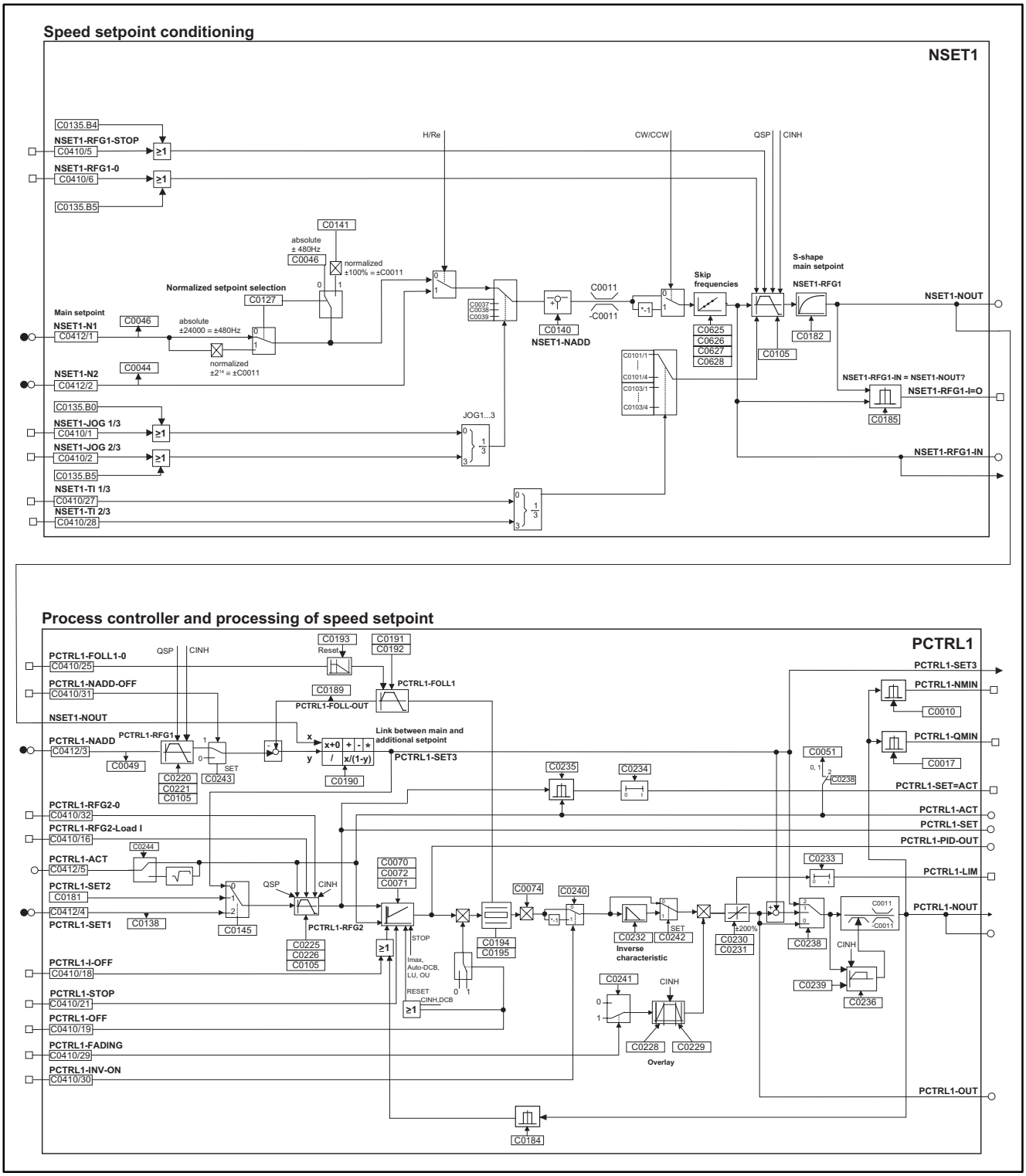


Fig. 14-5 Process controller and setpoint processing application-I/O

14.1.2.3 Motor control

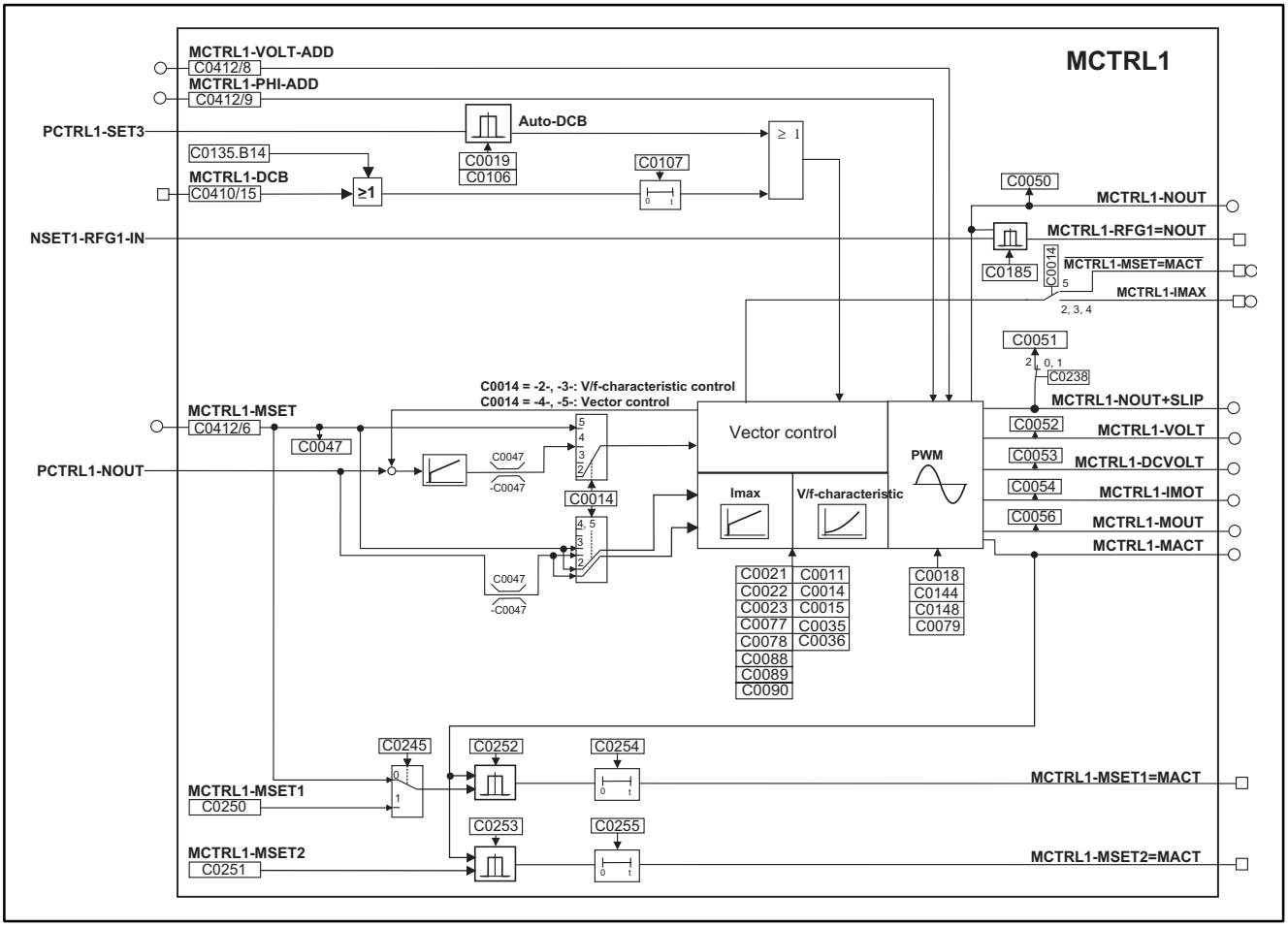
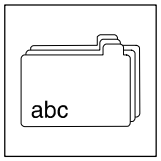
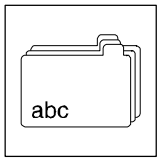


Fig. 14-6 Motor control application-I/O



Appendix

Signal-flow charts



14.2 Code table

Note!

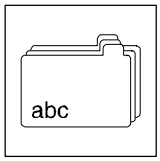
This code table is also valid for 8200 motec controllers as of version E82MV ... Vx1x!

- The codes are listed in an ascending order.
- Some functions can be set as free or fixed configuration. We recommend ”free configuration” because this mode ensures optimum flexibility.
- The references given under “IMPORTANT” help you to find more detailed information about the codes.
- How to read the code table:

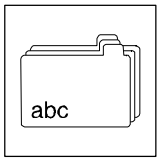
Column	Abbreviation		Meaning	
Code	Cxxxx		Code Cxxxx	• The parameter value of a code can be different in every parameter set. • The parameter value is accepted immediately (ONLINE)
	Cxxxx	1	Subcode 1 of Cxxxx	
	Cxxxx	2	Subcode 2 of Cxxxx	
	Cxxxx*		The parameter value of a code is the same in all parameter sets	
	Cxxxx↵		Changed parameters will be accepted after pressing ENTER	
	[Cxxxx]		Changed parameters will be accepted after pressing ENTER if the controller is inhibited	
	(A)		Code, subcode or selection are only available when using an application-I/O	
Name			Name of the code	
Lenze			Lenze setting (value set at delivery or after overwriting of C0002 with Lenze setting)	
	→		Further information can be obtained from ”IMPORTANT”	
Selection	1	{1 %} 99	Min. value {Steps/unit} Max. value	
IMPORTANT	- 📖 Page x		Brief, important explanations Indicates where to find more detailed information	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0001↵	Setpoint selection (operating mode)	-0-	-0-	Setpoint selection via AIN1 (X3/8 or X3/1U, X3/1I)	• Valid for C0001 = 0 ... 3: Control is alway possible via terminals or PC/keypad at the same time. • **The change of C0001 will be copied to the corresponding subcode of C0412. A free configuration of C0412 does not change C0001!** • If C0412 is freely configured (check C0005 = 255), C0001 has no influence on C0412. • C0001 = 3 must be set for the setpoint selection via a process data channel of an AIF bus module! Otherwise the process data will not be evaluated • AIF bus modules are INTERBUS 2111, PROFIBUS-DP 2131, system bus (CAN) 2171/2172, LECOM A/B/LI 2102	📖 7-19
			-1-	Setpoint selection via keypad or parameter channel of an AIF bus module		
			-2-	Setpoint selection via AIN1 (X3/8 or X3/1U, X3/1I)		
			-3-	Setpoint selection via a process data channel of an AIF bus module		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
[C0002]*	Parameter set transfer	-0-	-0-	Function executed		📖 7-52
			Parameter set of the controller			
			-1-	Lenze setting ⇨ PAR1	Overwrite the selected parameter set of the controller with the default setting.	
			-2-	Lenze setting ⇨ PAR2		
			-3-	Lenze setting ⇨ PAR3		
			-4-	Lenze setting ⇨ PAR4		
			-10-	Keypad ⇨ PAR1 ... PAR4	Overwrite all parameter sets of the controller with the keypad data	
			-11-	Keypad ⇨ PAR1	Overwrite a single parameter set with the keypad data.	
			-12-	Keypad ⇨ PAR2		
			-13-	Keypad ⇨ PAR3		
			-14-	Keypad ⇨ PAR4		
			-20-	PAR1 ... PAR4 ⇨ Keypad	Copy all parameter ets of the controller to the keypad.	
			Parameter set of a function module in FIF		Not for standard-I/O or system bus (CAN)	
			-31-	Lenze setting ⇨ FPAR1	Overwrite the selected parameter set of the function module with the default setting.	
			-32-	Lenze setting ⇨ FPAR2		
			-33-	Lenze setting ⇨ FPAR3		
			-34-	Lenze setting ⇨ FPAR4		
			-40-	Keypad ⇨ FPAR1 ... FPAR4	Overwrite all parameter sets of the function module with the data of the keypad.	
			-41-	Keypad ⇨ FPAR1	Overwrite a single parameter set of the function module with the data of the keypad.	
			-42-	Keypad ⇨ FPAR2		
			-43-	Keypad ⇨ FPAR3		
			-44-	Keypad ⇨ FPAR4		
			-50-	FPAR1 ... FPAR4 ⇨ Keypad	Copy all parameter sets of the function module to the keypad.	
			Parameter sets controller + function module in FIF		Not for standard-I/O or system bus (CAN) **For operation with application-I/O: The parameter sets of the controller and the application-I/O must be tranmitted at the same time!**	
			-61-	Lenze setting ⇨ PAR1 + FPAR1	Overwrite single parameter sets with the default setting	
			-62-	Lenze setting ⇨ PAR2 + FPAR2		
			-63-	Lenze setting ⇨ PAR3 + FPAR3		
			-64-	Lenze setting ⇨ PAR4 + FPAR4		
			-70-	Keypad ⇨ PAR1 ... PAR4 + FPAR1 ... FPAR4	Overwrite all parameter sets with the keypad data	
			-71-	Keypad ⇨ PAR1 + FPAR1	Overwrite single parameter sets with the keypad data	
			-72-	Keypad ⇨ PAR2 + FPAR2		
			-73-	Keypad ⇨ PAR3 + FPAR3		
			-74-	Keypad ⇨ PAR4 + FPAR4		
			-80-	PAR1 ... PAR4 + FPAR1 ... FPAR4 ⇨ Keypad	Copy all parameter sets to the keypad	
C0003*↲	Non-volatile parameter saving	-1-	-0-	Do not save parameter in EEPROM	Data loss after mains disconnection	
			-1-	Always save parameter in EEPROM	• Active after every main connection • Cyclic parameter changes via bus module are not allowed.	
C0004*↲	Bar-graph display	56		All codes possible 56 = controller load (C0056)	• The bar-graph display indicates the selected value in % after mains switch-on • Range -180 % ... +180 % • Display indicates C0517/1	



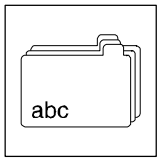
Code		Possible settings						IMPORTANT	
No.	Name	Lenze	Selection						
C0005↲	Fixed configuration of analog input signals	-0-						**The change of C0005 will be copied to the corresponding subcode of C0412. Free configuration in C0412 sets C0005 = 255!**	📖 7-35
			-0-	Setpoint for speed control via X3/8 or X3/1U, X3/1I					
			-1-	Setpoint for speed control via X3/8 with setpoint summation via frequency input X3/E1					
			-2-	Setpoint for speed control via frequency input X3/E1 with setpoint summation via X3/8					
			-3-	Setpoint for speed control via frequency input X3/E1, torque limitation via X3/8 (power control)					
			-4-	Setpoint for sensorless torque control via X3/8, speed limitation via C0011				Only active if C0014 = -5- (torque preselection)	
			-5-	Setpoint for sensorless torque control via X3/8, speed limitation via frequency input X3/E1					
			-6-	Controlled operation; setpoint via X3/8 with digital feedback via X3/E1					
			-7-	Controlled operation; setpoint via frequency input X3/E1 with analog feedback via X3/8					
			-200-	All digital and analog input signals come from the function modules INTERBUS and PROFIBUS				C0410/x = 0 and C0412/x = 0	
			-255-	Freely configured in C0412				Only display Do not change C0005, otherwise the settings under C0412 might be lost	
C0007↲	Fixed configuration of digital inputs	-0-		E4	E3	E2	E1		📖 7-41
			-0-	CW/CCW	DCB	JOG2/3	JOG1/3	• **The change of C0007 will be copied to the corresponding subcode of C0410. Free configuration in C0410 sets C0007 = -255-!** • CW = CW rotation • CCW = CCW rotation • DCB = DC-injection brake • PAR = Changeover (PAR1 ⇔ PAR2) PAR1 = LOW; PAR2 = HIGH – The corresponding terminal must be assigned to the function "PAR" in PAR1 and PAR2. – Configurations with "PAR" are only allowed if C0988 = -0- • JOG1/3, JOG2/3 = Selection of fixed setpoints JOG1: JOG1/3 = HIGH, JOG2/3 = LOW JOG2: JOG1/3 = LOW, JOG2/3 = HIGH JOG3: JOG1/3 = HIGH, JOG2/3 = HIGH • QSP = Quick stop • TRIP set = external fault • UP/DOWN = Motor potentiometer functions • M/Re = Manual/remote changeover • PCTRL1-I-OFF = Switch off the I-component of the process controller • DFIN1-ON = Digital frequency input 0 ... 10 kHz • PCTRL1-OFF = Switch off the process controller	
			-1-	CW/CCW	PAR	JOG2/3	JOG1/3		
			-2-	CW/CCW	QSP	JOG2/3	JOG1/3		
			-3-	CW/CCW	PAR	DCB	JOG1/3		
			-4-	CW/CCW	QSP	PAR	JOG1/3		
			-5-	CW/CCW	DCB	TRIP set	JOG1/3		
			-6-	CW/CCW	PAR	TRIP set	JOG1/3		
			-7-	CW/CCW	PAR	DCB	TRIP set		
			-8-	CW/CCW	QSP	PAR	TRIP set		
			-9-	CW/CCW	QSP	TRIP set	JOG1/3		
			-10-	CW/CCW	TRIP set	UP	DOWN		
			-11-	CW/CCW	DCB	UP	DOWN		
			-12-	CW/CCW	PAR	UP	DOWN		
			-13-	CW/CCW	QSP	UP	DOWN		
			-14-	CCW/QSP	CW/QSP	DCB	JOG1/3		
			-15-	CCW/QSP	CW/QSP	PAR	JOG1/3		
			-16-	CCW/QSP	CW/QSP	JOG2/3	JOG1/3		
			-17-	CCW/QSP	CW/QSP	PAR	DCB		
			-18-	CCW/QSP	CW/QSP	PAR	TRIP set		
			-19-	CCW/QSP	CW/QSP	DCB	TRIP set		
			-20-	CCW/QSP	CW/QSP	TRIP set	JOG1/3		
			-21-	CCW/QSP	CW/QSP	UP	DOWN		
			-22-	CCW/QSP	CW/QSP	UP	JOG1/3		
			-23-	M/Re	CW/CCW	UP	DOWN		



Appendix

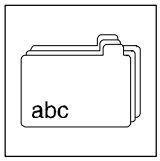
Code table

Code		Possible settings						IMPORTANT
No.	Name	Lenze	Selection					
C0007↲ (cont.)	Fixed configuration of digital inputs	-0-	-24-	M/Re	PAR	UP	DOWN	• **The change of C0007 will be copied to the corresponding subcode of C0410. Free configuration in C0410 sets C0007 = -255-!** • CW = CW rotation • CCW = CCW rotation • DCB = DC-injection brake • PAR = Changeover (PAR1 ⇔ PAR2) PAR1 = LOW; PAR2 = HIGH – The corresponding terminal must be assigned to the function "PAR" in PAR1 and PAR2. – Configurations with "PAR" are only allowed if C0988 = -0- • JOG1/3, JOG2/3 = Selection of fixed setpoints JOG1: JOG1/3 = HIGH, JOG2/3 = LOW JOG2: JOG1/3 = LOW, JOG2/3 = HIGH JOG3: JOG1/3 = HIGH, JOG2/3 = HIGH • QSP = Quick stop • TRIP set = external fault • UP/DOWN = Motor potentiometer functions • M/Re = Manual/remote changeover • PCTRL1-I-OFF = Switch off the I-component of the process controller • DFIN1-ON = Digital frequency input 0 ... 10 kHz • PCTRL1-OFF = Switch off the process controller
			-25-	M/Re	DCB	UP	DOWN	
			-26-	M/Re	JOG1/3	UP	DOWN	
			-27-	M/Re	TRIP set	UP	DOWN	
			-28-	JOG2/3	JOG1/3	PCTRL1-I-OFF	DFIN1-ON	
			-29-	JOG2/3	DCB	PCTRL1-I-OFF	DFIN1-ON	
			-30-	JOG2/3	QSP	PCTRL1-I-OFF	DFIN1-ON	
			-31-	DCB	QSP	PCTRL1-I-OFF	DFIN1-ON	
			-32-	TRIP set	QSP	PCTRL1-I-OFF	DFIN1-ON	
			-33-	QSP	PAR	PCTRL1-I-OFF	DFIN1-ON	
			-34-	CW/QSP	CCW/QSP	PCTRL1-I-OFF	DFIN1-ON	
			-35-	JOG2/3	JOG1/3	PAR	DFIN1-ON	
			-36-	DCB	QSP	PAR	DFIN1-ON	
			-37-	JOG1/3	QSP	PAR	DFIN1-ON	
			-38-	JOG1/3	PAR	TRIP set	DFIN1-ON	
			-39-	JOG2/3	JOG1/3	TRIP set	DFIN1-ON	
			-40-	JOG1/3	QSP	TRIP set	DFIN1-ON	
			-41-	JOG1/3	DCB	TRIP set	DFIN1-ON	
			-42-	QSP	DCB	TRIP set	DFIN1-ON	
			-43-	CW/CCW	QSP	TRIP set	DFIN1-ON	
			-44-	UP	DOWN	PAR	DFIN1-ON	
			-45-	CW/CCW	QSP	PAR	DFIN1-ON	
			-46-	M/Re	PAR	QSP	JOG1/3	
			-47-	CW/QSP	CCW/QSP	M/Re	JOG1/3	
			-48-	PCTRL1- OFF	DCB	PCTRL1-I-OFF	DFIN1-ON	
			-49-	PCTRL1- OFF	JOG1/3	QSP	DFIN1-ON	
			-50-	PCTRL1- OFF	JOG1/3	PCTRL1-I-OFF	DFIN1-ON	
			-51-	DCB	PAR	PCTRL1-I-OFF	DFIN1-ON	
			-255-	Freely configured in C0410				Only display Do not change C0007, otherwise the settings under C0410 might be lost



Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0008↲	Fixed configuration of relay output K1 (relay)	-1-				**Changes of C0008 will be copied to C0415/1. Free configuration in C0415/1 sets C0008 = -255-!**	📖 7-43
			-0-	Ready for operation (DCTRL1-RDY)			
			-1-	TRIP fault message (DCTRL1-TRIP)			
			-2-	Motor is running (DCTRL1-RUN)			
			-3-	Motor is running / CW rotation (DCTRL1-RUN-CW)			
			-4-	Motor is running / CCW rotation (DCTRL1-RUN-CCW)			
			-5-	Output frequency = 0 (DCTRL1-NOUT=0)			
			-6-	Frequency setpoint reached (MCTRL-RFG1=NOUT)			
			-7-	Q_{min} threshold reached (PCTRL1-QMIN)			
			-8-	I_{max} limit reached (MCTRL1-IMAX) C0014 = -5-: Torque setpoint reached			
			-9-	Overtemperature (ϑ_{max} - 5 °C) (DCTRL1-OH-WARN)			
			-10-	TRIP or Q_{min} or pulse inhibit (IMP) (DCTRL1-IMP)			
			-11-	PTC warning (DCTRL1-PTC-WARN)			
			-12-	Apparent motor current < current threshold (DCTRL1-IMOT<ILIM)		Belt monitoring Apparent motor current = C0054 Current threshold = C0156	
			-13-	Apparent motor current < current threshold and Q_{min} threshold reached (DCTRL1-(IMOT<ILIM)-QMIN)			
			-14-	Apparent motor current < current threshold and ramp function generator 1: input = output (DCTRL1-(IMOT<ILIM)-RFG1=0)			
			-15-	Warning motor phase failure (DCTRL1-LP1-WARN)			
			-16-	Min. output frequency reached (PCTRL1-NMIN)			
			-255-	Free configuration under C0415/1		Only display Do not change C0008, otherwise the settings under C0415/1 might be lost	
C0009*↲	Controller address	1	1	{1}	99	Only for communication modules in AIF: LECOM-A (RS232), LECOM-A/B/LI 2102, PROFIBUS-DP 2131, system bus (CAN) 2171/2172	
C0010	Minimum output frequency	0.00	0.00 → **14.5 Hz**	{0.02 Hz}	480.00	• C0010 not effective for bipolar setpoint selection (-10V ... + 10 V) • C0010 has no effect on AIN2 → **Speed setting range 1 : 6 for Lenze geared motors:** Setting absolutely required for operation with Lenze geared motors.	📖 7-13
C0011	Maximum output frequency	50.00	7.50 → **87 Hz**	{0.02 Hz}	480.00		
C0012	Acceleration time main setpoint	5.00	0.00	{0.02 s}	1300.00	Reference: frequency change 0 Hz ... C0011 • Additional setpoint ⇨ C0220 • Acceleration times can be activated via digital signals ⇨ C0101	📖 7-15
C0013	Deceleration time main setpoint	5.00	0.00	{0.02 s}	1300.00	Reference: frequency change C0011 ... 0 Hz • Additional setpoint ⇨ C0221 • Deceleration times can be activated via digital signals ⇨ C0103	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0014↲	Control mode	-2-	-2-	V/f-characteristic control V ~ f		Linear characteristic with constant V_{min} boost	📖 7-2
			-3-	V/f-characteristic control V ~ f^2		Square-law characteristic with constant V_{min} boost	
			-4-	Vector control		For initial selection with C0148, identify the motor parameters. Otherwise, commissioning is not possible.	
			-5-	Sensorless torque control with speed limitation • Torque setpoint via C0412/6 • Speed limitation via setpoint 1 (NSET1-N1), if C0412/1 is assigned, if not via max. frequency (C0011)			
C0015	V/f-rated frequency	50.00	7.50	{0.02 Hz}	960.00	Setting applies to all mains voltages permitted	📖 7-4
C0016	V_{min} boost	→	0.00	{0.2 %}	40.0	→ depends on the unit Setting applies to all mains voltages permitted	📖 7-5
C0017	Threshold Q_{min}	0.00	0.00	{0.02 Hz}	480.00	Reference: setpoint	
C0018↲	Chopper frequency	-2-	-0-	2 kHz			📖 7-7
			-1-	4 kHz			
			-2-	8 kHz			
			-3-	16 kHz			
C0019	Threshold for auto DCB	0.10	0.00	{0.02 Hz}	480.00	DCB= DC-injection brake 0.00 s = Auto DCB not active	📖 7-17
C0021	Slip compensation	0.0	-50.0	{0.1 %}	50.0		📖 7-6
C0022	I_{max} limit (motor mode)	150	30	{1 %}	150		📖 7-14
C0023	I_{max} limit (generator mode)	150	30	{1 %}	150	C0023 = 30 %: Function not active if C0014 = -2-, -3-:	
C0026*	Offset analog input 1 (AIN1–OFFSET)	0.0	-200.0	{0.1 %}	200.0	• Setting for X3/8 or X3/1U, X3/1I • The upper limit of the setpoint range in C0034 corresponds to 100% • C0026 and C0413/1 are the same	📖 7-20
C0027*	Gain analog input 1 (AIN1-GAIN)	100.0	-1500.0	{0.1 %}	1500.0	• Setting for X3/8 or X3/1U, X3/1I • 100.0 % = Gain 1 • Inverse setpoint selection through negative gain and negative offset • C0027 and C0414/1 are the same	
C0034*↲	Setpoint selection range Standard–I/O (X3/8)	-0-	-0-	0 ... 5 V / 0 ... 10 V / 0 ... 20 mA		• Observe the switch position of the function module! • C0034 = -2-: – C0010 not effective	📖 7-20
			-1-	4 ... 20 mA			
			-2-	-10 V ... +10 V			
			-3-	4 ... 20 mA Open-circuit monitoring (TRIP Sd5, if I < 4 mA)			
			-4- ... -13-	Reserved			
C0034*↲ (A)	Setpoint selection range Application-I/O					Observe the jumper setting of the function module!	📖 7-20
1	X3/1U, X3/1I	-0-	-0-	Voltage unipolar 0 ... 5 V / 0 ... 10 V			
2	X3/2U, X3/2I		-1-	Voltage bipolar -10 V ... +10 V		Minimum output frequency (C0010) not effective	
			-2-	Current 0 ... 20 mA			
			-3-	Current 4 ... 20 mA			
			-4-	Current 4 ... 20 mA open-circuit monitored		TRIP Sd5 if I < 4 mA	
C0035*↲	Selection DCB	-0-	-0-	Brake voltage selection under C0036			📖 7-17
			-1-	Brake current selection under C0036			
C0036	Voltage/current DCB	→	0	{0.02 %}	150 %	→ depends on the unit • Reference M_r, I_r • Setting applies to all mains voltages permitted	

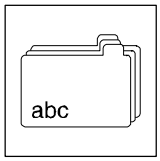


Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0037	JOG1	20.00	-480.00	{0.02 Hz}	480.00	JOG = JOG frequency	📖 7-26
C0038	JOG2	30.00	-480.00	{0.02 Hz}	480.00		
C0039	JOG3	40.00	-480.00	{0.02 Hz}	480.00		
C0040*↲	Controller inhibit		-0-	Controller inhibited (CINH)		Controller enable only possible if X3/28 = HIGH	
			-1-	Controller enabled ($\overline{\text{CINH}}$)			
C0043*↲	TRIP reset		-0-	No current fault		Reset active fault with C0043 = 0	
			-1-	Active fault			
C0044*	Setpoint 2 (NSET1-N2)		-480.00	{0.02 Hz}	480.00	• Selection if C0412/2 = FIXED-FREE • Display if C0412/2 ≠ FIXED-FREE	
C0046*	Setpoint 1 (NSET1-N1)		-480.00	{0.02 Hz}	480.00	• Selection if C0412/1 = FIXED-FREE • Display if C0412/1 ≠ FIXED-FREE	
C0047*	Torque setpoint or torque limit value (MCTRL1-MSET)		0	{%}	400	With control mode "Sensorless torque control" (C0014 = 5): • Selection of torque setpoint if C0412/6 = FIXED-FREE • Display of torque setpoint if C0412/6 ≠ FIXED-FREE With control mode "V/f-characteristic control" or "Vector control" (C0014 = 2, 3, 4): • Display of torque limit value if C0412/6 ≠ FIXED-FREE • Function not active (C0047 = 400) if C0412/6 = FIXED-FREE	
			Reference: Rated motor torque detected by motor parameter identification				
C0049*	Additional setpoint (PCTRL1-NADD)		-480.00	{Hz}	480.00	• Selection, if C0412/3 = 0 • Display if C0412/3 ≠ 0	
C0050*	Output frequency (MCTRL1-NOUT)		-480.00	{Hz}	480.00	Only display: Output frequency without slip compensation	
C0051*	Output frequency with slip compensation (MCTRL1-NOUT + SLIP) or Act. process controller value (PCTRL1-ACT)		-480.00	{Hz}	480.00	For operation without process controller (C0238 = 2): • Only display: output frequency with slip compensation (MCTRL1-NOUT+ SLIP) For operation with process controller (C0238 = 0, 1): • Selection if C0412/5 = FIXED-FREE • Display, if C0412/5 ≠ FIXED-FREE	📖 7-33
C0052*	Motor voltage (MCTRL1-VOLT)		0	{V}	1000	Only display	
C0053*	DC-bus voltage (MCTRL1-DCVOLT)		0	{V}	1000	Only display	
C0054*	Apparent motor current (MCTRL1-IMOT)		0	{A}	400	Only display	
C0056*	Controller load (MCTRL1-MOUT)		-255	{%}	255	Only display	
C0061*	Heat sink temperature		0	{°C}	255	Only display The controller sets TRIP "OH" if the heat sink temperature is > +85 °C	
C0070	Process controller gain	1.00	0.00	{0.01}	300.00	0.00 = P component not active	📖 7-30
C0071	Integral action time of process controller	100	10	{1}	9999	9999 = I-component not active	
C0072	Differential component process controller	0.0	0.0	{0.1}	5.0	0.0 = D-component not active	
C0074	Influence of process controller	0.0	0.0	{0.1 %}	100.0		

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0077*	Gain I_{max} controller	0.25	0.00	{0.01}	16.00	0.00 = P component not active	📖 7-34
C0078*	Integral action time I_{max} controller	65	12	{1 ms}	9990	9990 = I-component not active	
C0079	Oscillation damping	→	0	{1}	80	→ depends on the unit	📖 7-7
C0084	Motor stator resistance	0.000	0.000	{0.001 Ω}	64.000		📖 7-28
C0087	Rated motor speed	1390	300	{1 rpm}	16000		
C0088	Rated motor current	→	0.0	{0.1 A}	480.0	→ depends on the unit 0.0 ... 2.0 x rated controller output current	
C0089	Rated motor frequency	50	10	{1 Hz}	960		
C0090	Rated motor voltage	→	50	{1 V}	500	→ depends on the unit	
C0091	Motor cos φ	→	0.40	{0.1}	1.0	→ depends on the unit	
C0092	Motor stator inductance	0.0	0.0	{0.1 mH}	2000.0		
C0093*	Type		xxxy			Only display • xxx = Power data on the nameplate (e. g. 551 = 550 W) • y = Voltage class (2 = 240 V, 4 = 400 V)	
C0094*	User password		0	{1}	9999	0 = No pasword protection 1 ... 9999 = Free access only to user menu	📖 6-6
C0099*	Software version		x.y			Only display x = Version, y = Index	
C0101 (A)	Acceleration times main setpoint						
1	C0012	5.00	0.00	{0.02 s}	1300.00	Binary coding of the digital signal sources assigned under C0410/27 and C0410/28 determines the active times.	
2	T_{ir} 1	2.50					
3	T_{ir} 2	0.50					
4	T_{ir} 3	10.00					
C0103 (A)	Acceleration times main setpoint					C0410/27 C0410/28 active LOW LOW C0012; C0013 HIGH LOW T_{ir} 1; T_{if} 1 LOW HIGH T_{ir} 2; T_{if} 2 HIGH HIGH T_{ir} 3; T_{if} 3	
1	C0013	5.00	0.00	{0.02 s}	1300.00		
2	T_{if} 1	2.50					
3	T_{if} 2	0.50					
4	T_{if} 3	10.00					
C0105	Deceleration time QSP	5.00	0.00	{0.02 s}	1300.00	QSP = Quick stop	📖 7-16
C0106	Holding time auto DCB	0.50	0.00	{0.01 s}	999.00	Holding time, if DCB is activated because the value falls below the setting in C0019. 0.00 s = Auto DCB not active 999.00 s = ∞	📖 7-17
C0107	Holding time DCB	999.00	1.00	{0.01 s}	999.00	Holding time, if DCB is activated via an external terminal or control word. 999.00 s = ∞	📖 7-17
C0108*	Gain analog output X3/62 (AOUT1-GAIN)	128	0	{1}	255	Standard-I/O: C0108 and C0420 are the same Application-I/O: C0108 and C0420/1 are the same	📖 7-36
C0109*	Offset analog output X3/62 (AOUT1-OFFSET)	0.00	-10.00	{0.01 V}	10.00	Standard-I/O: C0109 and C0422 are the same Application-I/O: C0109 und C0422/1 sind gleich	

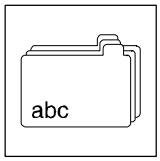
Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0111↲	Configuration analog output X3/62 (AOUT1-IN)			Analog signal output to terminal	**Changes of C0111 will be copied to C0419/1. Free configuration in C0419/1 sets C0111 = -255-!**	📖 7-36
		-0-	-0-	Output frequency (MCTRL1-NOUT+ SLIP)	6 V/12 mA ≡ C0011	
			-1-	Controller load (MCTRL1-MOUT)	3 V/6 mA ≡ Rated motor torque for vector control (C0014 = 4), otherwise rated effective current (effective current / C0091)	
			-2-	Apparent motor current (MCTRL1-IMOT)	3 V/6 mA ≡ Rated inverter current	
			-3-	DC-bus voltage (MCTRL1-DCVOLT)	6 V/12 mA ≡ DC 1000 V (400 V mains) 6 V/12 mA ≡ DC 380 V (240 V mains)	
			-4-	Motor power	3 V/6 mA ≡ Rated motor power	
			-5-	Motor voltage (MCTRL1-VOLT)	4.8 V/9.6 mA ≡ Rated motor voltage	
			-6-	1/output frequency (1/C0050) (MCTRL1-1/NOUT)	2 V/4 mA ≡ C0050 = 0.4 × C0011	
			-7-	Output frequency withing limits sets (NSET1-C0010...C0011)	0 V/0 mA/4 mA ≡ f = f_{min} (C0010) 6 V/12 mA ≡ f = f_{max} (C0011)	
			-8-	Operation with process controller (C0238 = 0, 1): Act. process controller value (PCTRL1-ACT) Operation without process controller (C0238 = 2): Output frequency without slip (MCTRL1-NOUT)	6 V/12 mA ≡ C0011	
			-9-	Ready for operation (DCTRL1-RDY)	Selection -9- ... -25- corresponds to the digital functions of the relay output K1 (C0008) or the digital output A1 (C0117): LOW = 0 V/0 mA/4 mA HIGH = 10 V/20 mA	
			-10-	TRIP fault message (DCTRL1-TRIP)		
			-11-	Motor is running (DCTRL1-RUN)		
			-12-	Motor is running / CW rotation (DCTRL1-RUN-CW)		
			-13-	Motor is running / CCW rotation (DCTRL1-RUN-CCW)		
			-14-	Output frequency = 0 (DCTRL1-NOUT=0)		
			-15-	Frequency setpoint reached (MCTRL1-RFG1=NOUT)		
			-16-	Q_{min} threshold reached (PCTRL1-QMIN)		
			-17-	I_{max} limit reached (MCTRL1-IMAX) C0014 = -5-: Torque setpoint reached		
			-18-	Overtemperature (ϑ_{max} - 5 °C) (DCTRL1-OH-WARN)		
			-19-	TRIP or Q_{min} or pulse inhibit (IMP) active (DCTRL1-TRIP-QMIN-IMP)		
			-20-	PTC warning (DCTRL1-PTC-WARN)		
			-21-	Apparent motor current < current threshold (DCTRL1-IMOT< ILIM)	Belt monitoring Apparent motor current = C0054 Current threshold = C0156	
			-22-	Apparent motor current < current threshold and Q_{min} threshold reached (DCTRL1-(IMOT< ILIM)-QMIN)		
			-23-	Apparent motor current < current threshold and ramp function generator 1: input = output (DCTRL1-(IMOT< ILIM)-RFG-I=0)		
			-24-	Warning motor phase failure (DCTRL1-LP1-WARN)		
			-25-	Min. output frequency reached (PCTRL1-NMIN)		
			-255-	Free configuration under C0419/1.	Only display Do not change C0111, otherwise the settings under C0419/1 might be lost	
C0114↲	Level inversion digital inputs E1 ... E6	-0-		E6 E5 E4 E3 E2 E1 2^5 2^4 2^3 2^2 2^1 2^0	• The binary value of the selection number determines the level pattern of the inputs: – 0: Ex is not inverted (HIGH active) – 1: Ex is inverted (LOW active) • C0114 and C0411 are the same • E5, E6 only application-I/O	
			-0-	0 0 0 0 0 0		
			-1-	0 0 0 0 0 1		
			-2-	0 0 0 0 1 0		
			-3-	0 0 0 0 1 1		
			...	...		
			-63-	1 1 1 1 1 1		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0117↲	Fixed configuration of digital output A1 (DIGOUT1)	-0-			**Changes of C0117 will be copied to C0415/2. Free configuration in C0415/2 sets C0117 = -255-!**	📖 7-43
			-0- ... -16-	see C0008		
			-255-	Free configuration under C0415/2.	Only display Do not change C0117, otherwise the settings under C0415/2 might be lost	
C0119↲	Configuration PTC input / earth fault detection	-0-	-0-	PTC input not active	Earth fault detection active	Deactivate the earth fault detection if it is activated unintentionally	📖 7-48
			-1-	PTC input active TRIP set		
			-2-	PTC input active Warning set		
			-3-	PTC input not active	Earth fault detection	
			-4-	PTC input active TRIP set		
			-5-	PTC input active Warning set		
C0120	I^2t switch off	0	0	{1 %} 200	C0120 = 0: I^2t switch-off not active	📖 7-47
C0125*↲	LECOM baud rate	-0-	-0-	9600 baud	Only for LECOM-A (RS232)	
			-1-	4800 baud		
			-2-	2400 baud		
			-3-	1200 baud		
			-4-	19200 baud		
C0126*↲	Reaction to communication fault	-2-	-0-	No TRIP if the communication is interrupted in the process channel AIF No TRIP if the communication is stopped between the controller and the function module in FIF.	Only for bus operation Function module in FIF: Application-I/O, INTERBUS, PROFIBUS-DP, system bus (CAN), LECOM-B (RS485)	
			-1-	TRIP (CE0) if the communication is stopped in the process channel AIF No TRIP if the communication is stopped between the controller and the function module in FIF.		
			-2-	No TRIP if the communication is interrupted in the process channel AIF TRIP (CE5) if the communication is stopped between the controller and the function module		
			-3-	TRIP (CE0) if the communication is stopped in the process channel AIF TRIP (CE5) if the communication is stopped between the controller and the function module		
C0127↲	Setpoint selection	-0-	-0-	Setpoint selection absolute in Hz via C0046 or process channel		
			-1-	Normalized setpoint selection via C0141 (0... 100 %) or process channel (±16384 = C0011)		



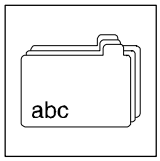
Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0135*	Controller control word (parameter channel)		Bit Assignment	• Control via the parameter channel. The most important control commands are summarized as bit commands. • C0135 cannot be changed using the keypad.	
			1|0 JOG1, JOG2, JOG3 oer C0046 (NSET1-JOG1/3, NSET1-JOG2/3) 00 C0046 active 01 JOG1 (C0037) active 10 JOG2 (C0038) active 11 JOG3 (C0039) active		
			2 Actual direction of rotation (DCTRL1-CW/CCW) 0 not inverted 1 inverted		
			3 Quick stop (DCTRL1-QSP) 0 not active 1 active		
			4 Stop ramp function generator 0 (NSET1-RFG1-STOP) 1 not active active		
			5 Ramp function generator input = 0 0 (NSET1-RFG1-0) 1 not active active (deceleration to C0013)	RFG1 = Ramp function generator main setpoint	
			6 UP function motor potentiometer (MPOT1-UP) 0 not active 1 active		
			7 DOWN function motor potentiometer 0 (MPOT1-DOWN) 1 not active active		
			8 Reserved		
			9 Controller inhibit (DCTRL1-CINH) 0 Controller enabled 1 Controller inhibited		
			10 TRIP set (DCTRL1-TRIP-SET)	Sets the fault message "external fault" (*EEr*, LECOM No. 91) (📖 8-3)	
			11 TRIP reset (DCTRL1-TRIP-RESET) 0 ⇒ 1 Signal resets TRIP		
			13|12 Parameter set changeover (DCTRL1-PAR2/4, DCTRL1-PAR3/4) 00 PAR1 01 PAR2 10 PAR3 11 PAR4		
			14 DC injection brake (MTCRL1-DCB) 0 not active 1 active		
			15 Reserved		
C0138*	Process controller setpoint 1 (PCTRL1-SET1)		-480.00 {0.02 Hz} 480.00	• Selection if C0412/4 = FIXED-FREE • Display if C0412/4 ≠ FIXED-FREE	📖 7-32
C0140*	Additive frequency setpoint (NSET1-NADD)		-480.00 {0.02 Hz} 480.00	• Selection via function Set of the keypad or the parameter channel • Non-volatile saving of the value. Value is added to the main setpoint.	
C0141*	Normalized setpoint		-100.00 {0.01 %} 100.00	Only effective if C0127 = 1 Reference: C0011	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0142↲	Start condition	-1-	-0-	Automatic start inhibited Flying restart not active	Start after LOW-HIGH level change at X3/28	📖 7-9
			-1-	Automatic start, if X3/28 = HIGH Flying restart not active		
			-2-	Automatic start inhibited Flying-restart circuit active	Start after LOW-HIGH level change at X3/28	
			-3-	Automatic start, if X3/28 = HIGH Flying-restart circuit active		
C0143*↲	Selection of flying-restart	-0-	-0-	Max. output frequency (C0011) ... 0 Hz	Motor speed selected for the indicated range	
			-1-	Last output frequency ... 0 Hz		
			-2-	Frequency setpoint addition (NSET1-NOUT)	The corresponding value is input after controller enable.	
			-3-	Act. process controller value (C0412/5) addition (PCTRL1-ACT)		
C0144↲	Chopper frequency derating	-1-	-0-	No chopper frequency derating		📖 7-7
			-1-	Automatic chopper frequency derating at ϑ_{max} - 5 °C		
C0145*↲	Source process controller setpoint	-0-	-0-	Total setpoint (PCTRL1-SET3)	Main setpoint + additional setpoint	📖 7-32
			-1-	C0181 (PCTRL1-SET2)		
			-2-	C0412/4 (PCTRL1-SET1)		
[C0148]*	Motor parameter identification	-0-	-0-	Identification not active	• C0087, C0088, C0089, C0090, C0091 must be entered correctly • The motor stator resistance (C0084) is measured • V/f-rated frequency (C0015), slip (C0021) and the motor stator inductivity are calculated • The identification takes approx. 30 s • After the identification is over, – the green LED at the controller is blinking. – the segment IMP at the keypad or in the GDC is active	📖 7-28
			-1-	Start identification		



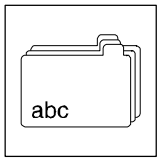
Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0150*	Controller status word 1 (parameter channel)		Bit Assignment 0 Mapping of C0417/1 1 Pulse inhibit (DCTRL1-IMP) 0 Power outputs enabled 1 Power outputs inhibited 2 Mapping of C0417/3 3 Mapping of C0417/4 4 Mapping of C0417/5 5 Mapping of C0417/6 6 Output frequency = 0 (DCTRL1-NOUT=0) 0 wrong 1 correct 7 Controller inhibit (DCTRL1-CINH) 0 Controller enabled 1 Controller inhibited 11|10|9|8 Controller status 0000 Controller initialization 0001 Switch-on inhibit 0011 Operation inhibited 0100 Flying-restart circuit active 0101 DC-injection brake active 0110 Operation enabled 0111 Message active 1000 Active fault 12 Overtemperature warning (DCTRL1-OH-WARN) 0 No warning 1 ϑ_{max} - 5 °C reached 13 DC-bus overvoltage (DCTRL1-OV) 0 No overvoltage 1 Overvoltage 14 Mapping of C0417/15 15 Mapping of C0417/16	• Controller status via the parameter channel. The most important status information are summarized as bit maps. • Some bits are freely configurable with internal digital signals. • Configuration in C0417	
C0151*	Controller status word 2 (parameter channel)		Bit Assignment 0 ... 15 Mapping of C0418/1 ... C0418/16	• The bits are freely linkable with internal digital signals • Configuration in C0418	
C0156*	Current threshold	0	0 {1 %} 150		
C0161*	Actual fault			Display history buffer contents • Keypad: three-digit, alpha numerical fault detection • 9371BB keypad: LECOM fault number	📖 8-1 📖 8-3
C0162*	Last fault				
C0163*	Last but one fault				
C0164*	Last but two fault				
C0168*	Actual fault				
C0170↲	Configuration TRIP reset	-0-	-0- TRIP reset by mains switching, STOP, LOW–signal at X3/28, via function module or communication module -1- Like -0- and additional auto TRIP reset -2- TRIP reset through mains switching, via function module or communication module -3- TRIP reset by mains switching	• TRIP reset via function module or communication module with C0043, C0410/12 or C0135 bit 11. • Auto TRIP reset after the time set under C0171.	📖 8-5
C0171	Delay for auto TRIP reset	0.00	0.00 {0.01 s} 60.00		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
[C0174]*	Brake transistor threshold	100	78 {1 %} 110 Recommended setting V_{mains} [3/PE AC xxx V] / C0174 [%] / V_{DC} [V DC]: 380 / 78 / 608 400 / 80 / 624 415 / 83 / 647 440 / 88 / 686 460 / 92 / 718 480 / 96 / 749 500 / 100 / 780		**Not active with 8200 motec and 240 V controller 8200 vector (fixed threshold)** • 100 % = Threshold DC 780 V • 110 % = Brake transistor switched off • V_{DC} = Threshold in V DC • The recommended setting is for max. 10 % mains overvoltage	11-2
C0178*	Operating hours		Total time CINH = HIGH {h}		Only display	
C0179*	Mains switch-on time		Total mains-on time-Ein {h}		Only display	
C0181*	Process controller setpoint 2 (PCTRL1-SET2)	0.00	-480.00 {0.02 Hz} 480.00			7-32
C0182*	Integration time S–ramps	0.00	0.00 {0.01 s} 50.00		• C0182 = 0.00: Linear ramp function generator operation • C0182 > 0.00: S-shaped ramp function generator (smooth)	7-15
C0183*	Diagnostics		0	No fault	Only display	
			102	TRIP active		
			104	Message "Overvoltage (*OU*)" or "Undervoltage (*LU*)" active		
			142	Pulse inhibit		
			151	Quick stop active		
			161	DC-injection brake active		
			250	Warning active		
C0184*	Frequency threshold PCTRL1-I-OFF	0.0	0.0 {0.1 Hz} 25.0		• For an output frequency < C0184 the I-component of the process controller will be switched off • 0.0 Hz = Function not active	7-32
C0185*	Window for "Frequency setpoint reached (C0415/x = 4)" and "NSET1-RFG1-I=0 (C0415/x = 5)"	0	0 {1 %} 80		• C0415/x = 4 and C0415/x = 5 are active within a window around NSET1-RFG1-IN. • Window if C0185 = 0%: ± 0.5 % ref. to C0011 • Window if C0185 > 0%: ± C0185 ref. to NSET1-RFG1-IN	
C0189* (A)	Output signal sensor compensation (PCTRL1-FOLL1-OUT)		-480.00 {0.02 Hz} 480.00		Only display Sensor compensation = PCTRL1-FOLL1	
C0190*↲ (A)	Link between main and additional setpoint (PCTRL1-ARITH1)	-1-	-0-	X + 0	Mathematical link between main setpoint (NSET1-NOUT) and additional setpoint (PCTRL1-NADD) X = NSET1-NOUT Y = PCTRL1-NADD	
			-1-	X + Y		
			-2-	X - Y		
			-3-	X × Y		
			-4-	X / Y		
			-5-	X / (1 - Y)		
C0191 (A)	Acceleration time sensor compensation	5.00	0.00 {0.02 s} 1300.00		Ref. to change 0 Hz ... C0011	
C0192 (A)	Deceleration time sensor compensation	5.00	0.00 {0.02 s} 1300.00		Ref. to change C0011 ... 0 Hz	
C0193 (A)	Sensor compensation reset	5.00	0.00 {0.02 s} 1300.00		Ref. to change C0011 ... 0 Hz Set the sensor compensation to "0"	



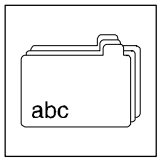
Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0194 (A)	Lower threshold for activation of sensor compensation	-200.00	-200.00	{0.01 %}	200.00	Ref. to C0011 If value falls below settings under C0194: Sensor compensation "operates" in C0191 or C0192 direction -C0011	
C0195 (A)	Upper threshold for activation of sensor compensation	200.00	-200.00	{0.01 %}	200.00	Ref. to C0011 If the value is higher than the settings under C0195: Sensor compensation "operates" in C0191 or C0192 direction +C0011	
C0196*↲	Activation of auto–DCB	-0-	-0-	Auto DCB active if PCTRL1-SET3 < C0019			📖 7-17
			-1-	Auto DCB active if PCTRL1-SET3 < C0019 **and** NSET1-RFG1-IN < C0019			
C0200*	Software identification					Only PC display	
C0201*	Software generation date					Only PC display	
C0202*	Software identification					Only keypad display	
1 ... 4						Output to keypad as string in 4 parts à 4 characters	
C0220*	Acceleration time additional setpoint (PCTRL1-NADD)	5.00	0.00	{0.02 s}	1300.00	Main setpoint ⇨ C0012	📖 7-15
C0221*	Deceleration time additional setpoint (PCTRL1-NADD)	5.00	0.00	{0.02 s}	1300.00	Main setpoint ⇨ C0013	
C0225 (A)	Acceleration time process controller setpoint (PCTRL1-SET1)	0.00	0.00	{0.02 s}	1300.00	Ramp function generator for process controller setpoint = PCTRL1-RFG2	
C0226 (A)	Deceleration time process controller setpoint (PCTRL1-SET1)	0.00	0.00	{0.02 s}	1300.00		
C0228 (A)	Overlay time process controller	0.000	0.000	{0.001 s}	32.000	0.000 = Process controller output is transferred without overlay	
C0229 (A)	Removal time process controller	0.000	0.000	{0.001 s}	32.000	0.000 = "Fading-off" switched off (C0241)	
C0230 (A)	Lower limit process controller output	-100.00	-200.00	{0.01 %}	200.00	Asymmetric limit of the process controller output referred to C0011 ● If the values are below C0230 or exceed C0231: – Output signal PCTRL1-LIM = HIGH after the time set under C0233 ● Set C0231 > C0230	
C0231 (A)	Upper limit process controller output	100.00	-200.00	{0.01 %}	200.00		
C0232 (A)	Offset inverse characterisitic process controller	0.00	-200.0	{0.1 %}	200.0	Ref. to C0011	
C0233* (A)	Delay PCTRL1-LIM= HIGH	0.000	0.000	{0.001 s}	65.000	"Debouncing" of the digital output signal PCTRL1-LIM (limit for the process controller output exceeded) ● Sets PCTRL1-LIM = HIGH, if - after the time set - – The value still falls below C0230 or exceeds C0231 ● Transition HIGH ⇨ LOW without delay	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0234* (A)	Delay PCTRL1-SET=ACT	0.000	0.000	{0.001 s}	65.000	"Debouncing" of the digital output signal PCTRL1-SET=ACT (process controller setpoint = actual process controller value) ● Sets PCTRL1-SET=ACT = HIGH, if - after the time set - – The difference between PCTRL1-SET and PCTRL1-ACT is withing the threshold under C0235 ● Transition HIGH ⇨ LOW without delay	
C0235* (A)	Difference threshold PCTRL1-SET=ACT	0.00	0.00	{0.01 Hz}	480.00	Threshold of the digital output signal PCTRL1-SET=ACT (process controller setpoint = actual process controller value) ● If the difference between PCTRL1-SET and PCTRL1-ACT is within C0235: – PCTRL1-SET=ACT = HIGH after the time set under C0234	
C0236 (A)	Acceleration time lower frequency limit	0.00	0.00	{0.02 s}	1300.00	Ref. to C0011 Lower frequency limit = C0239	
C0238↲	Frequency precontrol	-2-	-0-	No precontrol (only process controller)		Full influence of process controller	📖 7-32
			-1-	Precontrol (total setpoint + process controller)		Limited influence of process controller	
			-2-	No precontrol (only total setpoint)		No influence of process controller (not active)	
						Total setpoint (PCTRL1-SET3) = main setpoint + additional setpoint	
C0239	Lowest frequency limit	-480.00	-480.00	{0.02 Hz}	480.00	The value does not fall below limit independently of the setpoint.	📖 7-13
C0240↲ (A)	Invert process controller output (PCTRL1-INV-ON) (parameter channel)	-0-	-0-	Not inverted		Set digital signal PCTRL1-INV-ON (invert process controller output) via keypad/PC or parameter channel	
			-1-	Inverted			
C0241↲ (A)	Process controller overlay/removal (PCTRL1-FADING) (parameter channel)	-0-	-0-	Process controller overlay		Set digital signal PCTRL1-FADING (process controller overlay/removal) via keypad/PC or parameter channel	
			-1-	Process controller removal			
C0242↲ (A)	Activate process controller inverse control	-0-	-0-	Normal control		Act. value increases ⇨ Output frequency increases	
			-1-	Inverse control		Act. value increases ⇨ Output frequency decreases	
C0243↲ (A)	Deactivate additional setpoint (PCTRL1-NADD-OFF) (parameter channel)	-0-	-0-	PCTRL1-NADD active		Set digital signal PCTRL1-NADD-OFF (deactivate additional setpoint) via keypad/PC or parameter channel	
			-1-	PCTRL1-NADD not active			
C0244↲ (A)	Root function act. process controller value	-0-	-0-	Not active			
			-1-	$\pm \sqrt{\lvert \text{PCTRL1-ACT} \rvert}$		Internal calculation: 1. Save sign of PCTRL1-ACT 2. Calculate root of the value 3. Multiply the result with the sign	



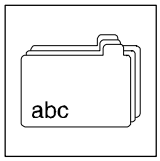
Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0245*↲ (A)	Selection of comparison value for MSET1=MACT	-0-	-0-	MCTRL1-MSET (C0412/6 or C0047)		Selection of the comparison value for setting the digital output signal MSET1=MACT (torque threshold 1 = act. torque value) ● If the difference between MCTRL1-MSET1 and MCTRL1-MACT is within C0250 or C0252: – MSET1=MACT = HIGH after the time set under C0254	
			-1-	Value in C0250			
C0250* (A)	Torque threshold 1 (MCTRL1-MSET1)	0.0	-200.0	{0.1 %}	200.0	Ref. to rated motor torque	
C0251* (A)	Torque threshold 2 (MCTRL1-MSET2)	0.0	-200.0	{0.1 %}	200.0	Ref. to rated motor torque Comparison value for setting the digital output signal MSET2=MACT (torque threshold 2 = act. torque value) ● If the difference between MCTRL1-MSET2 and MCTRL1-MACT is within C0253: – MSET2=MACT = HIGH after the time set under C0255	
C0252* (A)	Difference threshold for MSET1=MACT	0.0	0.0	{0.1 %}	100.0		
C0253* (A)	Difference threshold for MSET2=MACT	0.0	0.0	{0.1 %}	100.0		
C0254* (A)	Delay MSET1=MACT	0.000	0.000	{0.001 s}	65.000	"Debouncing" of the digital output signal MSET1=MACT ● Sets MSET1=MACT = HIGH, if - after the time set - – Difference between MCTRL1-MSET1 and MCTRL1-MACT or C0250 with the threshold set under C0252 ● Transition HIGH ⇨ LOW without delay	
C0255* (A)	Delay MSET2=MACT	0.000	0.000	{0.001 s}	65.000	"Debouncing" of the digital output signal MSET2=MACT ● Sets MSET2=MACT = HIGH, if - after the time set - – If the difference between MCTRL1-MSET2 and MCTRL1-MACT is within C0253: ● Transition HIGH ⇨ LOW without delay	
C0265*↲	Configuration motor potentiometer	-3-	-0-	Start value = power off		● Start value: output frequency which is approached with Tir (C0012) when the mains is switched on and the motor potentiometer is activated: – "Power off" = act. value if mains is off – "C0010": min. output frequency from C0010 – "0" = output frequency 0 Hz ● C0265 = -3-, -4-, -5-: – QSP reduces the motor potentiometer along the QSP ramp (C0105)	📖 7-25
			-1-	Start value = C0010			
			-2-	Start value = 0			
			-3-	Start value = power off QSP, if UP/DOWN = LOW			
			-4-	Start value = C0010 QSP, if UP/DOWN = LOW			
			-5-	Start value = 0 QSP, if UP/DOWN = LOW			
C0304 ... C0309	Service codes					**Modifications only by Lenze service!**	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0350*↲	System bus node address	1	1	{1}	63	Change will be effective after the command "Reset node"	📖 9-7
C0351*↲	System bus baud rate	-0-	-0-	500 kbit/s		Change will be effective after the command "Reset node"	
			-1-	250 kbit/s			
			-2-	125 kbit/s			
			-3-	50 kbit/s			
			-4-	Not supported			
			-5-	20 kbit/s			
C0352*↲	Configuration system bus participants	-0-	-0-	Slave		Change will be effective after the command "Reset node"	📖 9-7
			-1-	Master			
C0353*↲	Source system bus address					Address source for system bus process data channels	📖 9-8
1	CAN1 (Sync)	-0-	-0-	C0350 is source		Effective with Sync control (C0360 = 1)	
2	CAN2	-0-	-1-	C0354 is source			
3	CAN1 (time)	-0-				Effective with event or time control (C0360 = 0)	
C0354*↲	Selective system bus address		0	{1}	513	Individual addressing of the system bus process data objects	📖 9-9
1	CAN-IN1 (Sync)	129				Effective with Sync control (C0360 = 1)	
2	CAN-OUT1 (Sync)	1					
3	CAN-IN2	257					
4	CAN-OUT2	258					
5	CAN-IN1 (time)	385				Effective with event or time control (C0360 = 0)	
6	CAN-OUT1 (time)	386					
C0355*↲	System bus identifier		0	{1}	2047	Only display	
1	CAN-IN1					Identifier of CAN1 with Sync control (C0360 = 1)	
2	CAN-OUT1						
3	CAN-IN2						
4	CAN-OUT2						
5	CAN-IN1					Identifier of CAN1 with event or time control (C0360 = 0)	
6	CAN-OUT1						
C0356*↲	System bus time settings						📖 9-8
1	boot up	3000	0	{1 ms}	65000	Required for CAN networks without master	
2	CAN-OUT2 cycle time	0				0 and C0360 = 0: event controlled process data transfer > 0 und C0360 = 1: cyclic process data transfer	
3	CAN-OUT1 cycle time	0				0 = event controlled process data transfer > 0 = cyclic process data transfer	
4	CAN delay	20				Waiting time until cyclic sending starts after the boot-up	
C0357*↲	System bus monitoring times						📖 9-8
1	CAN-IN1 (Sync)	0	0	{1 ms}	65000	Valid for C0360 = 1	
2	CAN-IN2	0					
3	CAN-IN1 (time)	0				Valid for C0360 = 0	
C0358*↲	Reset node	-0-	-0-	without function		Install system bus reset node	📖 9-8
			-1-	System bus reset			
C0359*↲	System bus status		-0-	Operational		Only display	
			-1-	Pre-operational			
			-2-	Warning			
			-3-	Bus off			



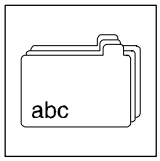
Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0360*↲	Control process data channel CAN1	-1-	-0-	Event or time control		
			-1-	Sync-control		
C0370*↲	Activate remote parameter setting		-0-	Deactivated		
			-1-...-63-	Activates corresponding CAN address	-1- = CAN address 1 -63- = CAN address 63	
			-255-	No system bus (CAN) available	Only display	
C0372*	Identification of function module		-0-	No function module	Only display	
			-1-	Standard-I/O		
			-2-	System bus (CAN)		
			-6-	Application-I/O, LECOM-B (RS485), INTERBUS or PROFIBUS		
			-10-	No valid identification		
C0395*↲	LONGWORD process input data		Bit 0..15	Controller control word (C0135)	Only for bus operation Sending of control word and main setpoint in a telegram to the controller	
			Bit 16...31	Setpoint 1 (NSET1-N1) (mapping to C0046)		
C0396*↲	LONGWORD process output data		Bit 0...15	Controller status word 1 (mapping of C0150)	Only for bus operation Reading of status word and output frequency in a telegram from the controller	
			Bit 16...31	Output frequency (MCTRL1-NOUT) (Mapping of C0050)		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0410↲	Free configuration of digital input signals			Linkage of external signal sources to internal digital signals Digital signal source	• **A selection made under C0007 is copied to the corresponding subcode of C0410. Change of C0410 sets C0007 = -255-!**	📖 7-41
1	NSET1-JOG1/3	1	0 255	Not assigned (FIXED-FREE)	Selection of fixed setpoints C0410/1 C0410/2 active LOW LOW C0046 HIGH LOW JOG1 LOW HIGH JOG2 HIGH HIGH JOG3	
2	NSET1-JOG2/3	2	1 ... 6	Digital inputs X3/E1 ... X3/E6 (DIGIN1 ... 6) X3/E1 (1) ... X3/E6 (6) E5, E6 only application-I/O		
3	DCTRL1-CW/CCW	4			CW = CW rotation LOW CCW = CCW rotation HIGH	
4	DCTRL1-QSP	255	10 ... 25	AIF control word (AIF-CTRL) Bit 0 (10) ... bit 15 (25)	Quick stop	
5	NSET1-RFG1-STOP	255			Stop ramp function generator main setpoint	
6	NSET1-RFG1-0	255	30 ... 45	CAN-IN1.W1 Bit 0 (30) ... bit 15 (45)	Set ramp function generator input for main setpoint to "0"	
7	MPOT1-UP	255			Motor potentiometer functions	
8	MPOT1-DOWN	255	50 ... 65	CAN-IN1.W2 Bit 0 (50) ... bit 15 (65)		
9	Reserved	255				
10	DCTRL1-CINH	255			Controller inhibit (LOW active)	
11	DCTRL1-TRIP-SET	255	70 ... 85	CAN-IN2.W1 Bit 0 (70) ... bit 15 (85)	External fault	
12	DCTRL1-TRIP-RESET	255			Reset fault	
13	DCTRL1-PAR2/4	255	90 ... 105	CAN-IN2.W2 Bit 0 (90) ... bit 15 (105)	Parameter set changeover (only with C0988 = 0)	
14	DCTRL1-PAR3/4	255			C0410/13 C0410/14 active LOW LOW PAR1 HIGH LOW PAR2 LOW HIGH PAR3 HIGH HIGH PAR4	
15	MCTRL1-DCB	3	200	Bit-by-bit assignment of FIF control words (FIF-CTRL1, FIF-CTRL2) from the function module INTERBUS or PROFIBUS-DP (see also C0005)	DC-injection brake	
16 (A)	PCTRL1-RFG2-LOADI	255			Add the actual process controller value (PCTRL1-ACT) to the process controller ramp function generator (PCTRL1-RFG2)	
17	DCTRL1-M/Re	255			Manual/remote changeover	
18	PCTRL1-I-OFF	255			Switch-off the I-component of the controller	
19	PCTRL1-OFF	255			Switch-off the controller	
20	Reserved	255				
21	PCTRL1-STOP	255			Stop the process controller ("freeze" the value)	
22	DCTRL1-CW/QSP	255			Failsafe change of the direction of rotation	
23	DCTRL1-CCW/QSP	255				
24	DFIN1-ON	255			Digital frequency 0 ... 10 kHz/ 0 ... 100 kHz (only selection 0 or 1)	



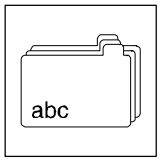
Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
25 (A)	PCTRL1-FOLL1-0	255		Set the sensor compensation to "0" under C0193 reset ramp	
26 (A)	Reserved	255			
27 (A)	NSET1-TI1/3	255		Add acceleration times	
28 (A)	NSET1-TI2/3	255		C0410/27 C0410/28 active LOW LOW C0012; C0013 HIGH LOW T_{ir} 1; T_{if} 1 LOW HIGH T_{ir} 2; T_{if} 2 HIGH HIGH T_{ir} 3; T_{if} 3	
29 (A)	PCTRL1-FADING	255		Activate (LOW) / deactivate (HIGH) process controller output	
30 (A)	PCTRL1-INV-ON	255		Inversion of process controller output	
31 (A)	PCTRL1-NADD-OFF	255		Switch-off addition setpoint	
32 (A)	PCTRL1-RFG2-0	255		Set the ramp function generator input process controller to "0" under C0226	
C0411↲	Level inversion digital inputs E1 ... E6	-0-	E6 E5 E4 E3 E2 E1 2^5 2^4 2^3 2^2 2^1 2^0 -0- 0 0 0 0 0 0 -1- 0 0 0 0 0 1 -2- 0 0 0 0 1 0 -3- 0 0 0 0 1 1 ... ... -63- 1 1 1 1 1 1	• The binary value of the selection number determines the level pattern of the inputs: – 0: Ex is not inverted (HIGH active) – 1: Ex is inverted (LOW active) • C0114 and C0411 are the same • E5, E6 only application-I/O	
C0412↲	Free configuration of analog input signals		Connection between external analog signal sources and internal analog signals Analog signal source	**A selection of C0001, C0005, C0007 is copied to the corresponding subcode of C0412. Change of C0412 setsC0001 = -255-, C0005 = -255-, C0007 = -255!**	📖 7-35
1	Setpoint 1 (NSET1–N1)	1	0 not assigned (FIXED-FREE) 255	Either NSET1-N1 or NSET1-N2 active Changeover under C0410/17	
2	Setpoint 2 (NSET1-N2)	1	1 X3/8 or X3/1U, X3/1I (AIN1-OUT)		
3	Additional setpoint (PCTRL1-NADD)	255	2 Frequency input (DFIN1-OUT) (observe C0410/24, C0425, C0426, C0427)	Is added to NSET1-N1, NSET1-N2, JOG values and the function Set of the keypad	
4	Process controller setpoint 1 (PCTRL1-SET1)	255	3 Motor potentiometer (MPOT1-OUT) 4 X3/2U, X3/2I (AIN2-OUT, application-I/O only)		
5	Act. process controller value (PCTRL1-ACT)	255	5 ... 9 Input signal = constant 0 (FIXED0)		
6	Torque setpoint or torque limit value (MCTRL1-MSET)	255	10 AIF input word 1 (AIF-IN.W1) 11 AIF input word 2 (AIF-IN.W2) (Only evaluated if C0001 = 3!)	Observe C0014! An actual torque value is not necessary. 16384 ≡ 100 % torque setpoint Condition for selection via terminal (C0412/6 = 1, 2 or 4): The gain of the analog input is set to: C0414/x, C0426 = 32768/C0011 [%]	
7	Reserved	255	20 ... 23 CAN-IN1.W1 ... W4 Word 1 (20) ... word 4 (23)		
8	MCTRL1-VOLT-ADD	255	30 ... 33 CAN-IN2.W1 ... W4 Word 1 (24) ... word 4 (27)	Only for special applications. Modifications only when agreed on by Lenze!	
9	MCTRL1-PHI-ADD	255	200 Word-by-word assignment of the signals from the function module INTERBUS or PROFIBUS (see C0005)		

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0413*	Offset analog inputs					The upper limit of the setpoint range in C0034 corresponds to 100%	📖 7-20
1	AIN1-OFFSET	0.0	-200.0	{0.1 %}	200.0	Setting for X3/8 or X3/1U, X3/1I C0413/1 and C0026 are the same	
2	AIN2-OFFSET	0.0				Setting for X3/2U, X3/2I (only application-I/O)	
C0414*	Gain analog inputs					• 100.0 % = Gain 1 • Inverse setpoint selection through negative gain and negative offset	
1	AIN1-GAIN	100.0	-1500.0	{0.1 %}	1500.0	Setting for X3/8 or X3/1U, X3/1I C0414/1 and C0027 are the same	
2	AIN2-GAIN	100.0				Setting for X3/2U, X3/2I (only application-I/O)	



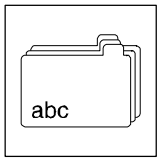
Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0415↲	Free configuration of digital outputs			Output of digital signals to terminals	• **A selection made under C0008 is copied to C0415/1. Change of C0415/1 sets C0008 = -255-!** • **A selection made under C0117 is copied to C0415/2. Change of C0415/2 sets C0117 = -255-!** • **C0415/3 only application–I/O**	📖 7-43
1	Relay output K1 (RELAY)	25	0 255	Not assigned (FIXED-FREE)		
			1	PAR-B0 active (DCTRL1-PAR-B0)		
			2	Pulse inhibit active (DCTRL1-IMP)		
2	Digital output X3/A1 (DIGOUT1)	16	3	I_{max} limit reached (MCTRL1-IMAX) (C0014 = -5-: Torque setpoint reached)		
			4	Frequency setpoint reached (MCTRL1-RFG1=NOUT)		
3	Digital output X3/A2 (DIGOUT2)	255	5	Ramp function generator 1: input = output (NSET1-RFG1-I=O)	RFG1 = Ramp function generator main setpoint	
			6	Q_{min} threshold reached (PCTRL1-QMIN)	active PAR-B1 PAR-B0 PAR1 LOW LOW PAR2 LOW HIGH PAR3 HIGH LOW PAR4 HIGH HIGH	
			7	Output frequency = 0 (DCTRL1-NOUT=0)		
			8	Controller inhibit active (DCTRL1-CINH)		
			9...12	Reserved		
			13	Overtemperature (ϑ_{max} - 5 °C) (DCTRL1-OH-WARN)		
			14	DC-bus overvoltage (DCTRL1-OV)		
			15	CCW rotation (DCTRL1-CCW)		
			16	Ready for operation (DCTRL1-RDY)		
			17	PAR-B1 active (DCTRL1-PAR-B1)		
			18	TRIP or Q_{min}or pulse inhibit (IMP) active (DCTRL1-TRIP-QMIN-IMP)		
			19	PTC warning (DCTRL1-PTC-WARN)		
			20	Apparent motor current < current threshold (DCTRL1-IMOT< ILIM)	Belt monitoring Apparent motor current = C0054 Current threshold = C0156	
			21	Apparent motor current < current threshold and Q_{min} threshold reached (DCTRL1-(IMOT< ILIM)-QMIN		
			22	Apparent motor current < current threshold and ramp function generator 1: input = output (DCTRL1-(IMOT< ILIM)-RFG-I=0)		
			23	Warning motor phase failure (DCTRL1-LP1-WARN)		
			24	Min. output frequency reached (PCTRL1-NMIN)		
			25	TRIP fault message (DCTRL1-TRIP)		
			26	Motor is running (DCTRL1-RUN)		
			27	Motor is running/CW rotation (DCTRL1-RUN-CW)		
			28	Motor is running/CCW rotation (DCTRL1-RUN-CCW)		
			29	Process controller input = process controller output (PCTRL1-SET=ACT)		
			30	Reserved		
			31	Apparent motor current> current threshold and ramp function generator 1: input = output (DCTRL1-(IMOT> ILIM)-RFG-I=0)	Overload monitoring Apparent motor current = C0054 Current threshold = C0156	
			32 ... 37	X3/E1 ... X3/E6, X3/E1 (32) ... X3/E6 (37)	Digital input terminals	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0415↲ (cont.)	Free configuration of digital outputs			Output of digital signals to terminals			📖 7-43
			40...55	AIF control word (AIF-CTRL) Bit 0 (40) ... bit 15 (55)		Bits of fieldbus input words Permanently assigned bits - AIF-CTRL: Bit 3: QSP Bit 7: CINH Bit 10: TRIP-SET Bit 11: TRIP-RESET	
			60...75	CAN-IN1.W1 or FIF-IN.W1 Bit 0 (60) ... bit 15 (75)			
			80...95	CAN-IN1.W2 or FIF-IN.W2 Bit 0 (80) ... bit 15 (95)			
			100...115	CAN-IN2.W1, bit 0 (100) ... bit 15 (115)			
			120...135	CAN-IN2.W2, bit 0 (120) ... bit 15 (135)			
			140...172	Status application-I/O		Only active in operation with application-I/O	
				140	Torque threshold 1 reached (MSET1=MACT)		
				141	Torque threshold 2 reached (MSET2=MACT)		
				142	Limitation process controller output reached (PCTRL1-LIM)		
				143 ... 172	Reserved		
C0416↲	Level inverted digital outputs	0		X3/A2	X3/A1	Relay K1	• 0: output not inverted (HIGH active) • 1: output inverted (LOW active) • X3/A2 only application-I/O
			-0-	0	0	0	
			-1-	0	0	1	
			-2-	0	1	0	
			-3-	0	1	1	
			-4-	1	0	0	
			-5-	1	0	1	
			-6-	1	1	0	
			-7-	1	1	1	



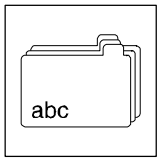
Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0417*↲	Free configuration of controller status (1)		Output of digital signals to bus	• The assignment is mapped to the – controller status word 1 (C0150) – AIF status word (AIF-STAT) – FIF output word 1 (FIF-OUT.W1) – Output word 1 in the CAN object 1 (CAN-OUT1.W1) → **Permanently assigned to AIF for operation with communication modules INTERBUS 2111, PROFIBUS-DP 2131 or LECOM-A/B/LI 2102. Changes not possible!** All bits are freely configuration in operation with function modules system bus (CAN), INTERBUS, PROFIBUS-DP in FIF.	📖 7-46
1	bit 0	1	Digital signal sources as in C0415		
2	bit 1	2 →			
3	bit 2	3			
4	bit 3	4			
5	bit 4	5			
6	bit 5	6			
7	bit 6	7 →			
8	Bit 7	8 →			
9	Bit 8	9 →	11|10|9|8 Controller status 0000 Controller initialization 0001 Switch-on inhibit 0011 Operation inhibited 0100 Flying-restart circuit active 0101 DC-injection brake active 0110 Operation enabled 0111 Message active 1000 Active fault		
10	Bit 9	10 →			
11	Bit 10	11 →			
12	Bit 11	12 →			
13	Bit 12	13 →			
14	Bit 13	14 →			
15	Bit 14	15			
16	Bit 15	16			
C0418*↲	Free configuration of controller status (2)		Output of digital signals to bus	• The assignment is mapped to the – Controller status word 2 (C0151) – FIF output word 2 (FIF-OUT.W2) – Output word 1 in the CAN object 2 (CAN-OUT2.W1) • All bits are free configurable	📖 7-46
1	bit 0	255	Digital signal sources as in C0415		
...	...				
16	Bit 15	255			

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0419*↲	Free configuration of analog outputs			Analog signal output to terminal Analog signal source	• **A selection made under C0111 is copied to C0419/1. Change of C0419/1 sets C0111 = 255!** • C0419/2, C0419/3 is only active when using an application–I/O • DFOUT1: 0 ... 10 kHz	📖 7-36
1	X3/62 (AOUT1-IN)	0	0	Output frequency (MCTRL1-NOUT+ SLIP)	6 V/12 mA/5.85 kHz ≡ C0011	
2	X3/63 (AOUT2-IN)	2	1	Controller load (MCTRL1-MOUT)	3 V/6 mA/2.925 kHz ≡ Rated motor torque for vector control (C0014 = 4), otherwise rated effective current (effective current / C0091)	
3	X3/A4 (DFOUT1-IN)	3	2	Apparent motor current (MCTRL1-IMOT)	3 V/6 mA/2.925 kHz ≡ Rated inverter current	
			3	DC-bus voltage (MCTRL1-DCVOLT)	6 V/12 mA/5.85 kHz ≡ DC 1000 V (400 V-mains) 6 V/12 mA/5.85 kHz ≡ DC 380 V (240 V mains)	
			4	Motor power	3 V/6 mA/2.925 kHz ≡ Rated motor power	
			5	Motor voltage (MCTRL1-VOLT)	4.8 V/9.6 mA/4.68 kHz ≡ Rated motor voltage	
			6	1/output frequency (1/C0050) (MCTRL1-1/NOUT)	2 V/4 mA/1.95 kHz ≡ C0050 = 0.4 × C0011	
			7	Output frequency withing limits sets (NSET1-C0010...C0011)	0 V/0 mA/4 mA/0 kHz ≡ f = f_{min} (C0010) 6 V/12 mA/5.85 kHz ≡ f = f_{max} (C0011)	
			8	Operation with process controller (C0238 = 0, 1): Act. process controller value (PCTRL1-ACT) Operation without process controller (C0238 = 2): Output frequency without slip (MCTRL1-NOUT)	6 V/12 mA/5.85 kHz ≡ C0011	
			9	Ready for operation (DCTRL1-RDY)	Selection -9- ... -25- corresponds to the digital functions of the relay output K1 (C0008) or the digital output A1 (C0117): LOW = 0 V/0 mA/4 mA/ 0 kHz HIGH = 10 V/20 mA/10 kHz	
			10	TRIP fault message (DCTRL1-TRIP)		
			11	Motor is running (DCTRL1-RUN)		
			12	Motor is running / CW rotation (DCTRL1-RUN-CW)		
			13	Motor is running / CCW rotation (DCTRL1-RUN-CCW)		
			14	Output frequency = 0 (DCTRL1-NOUT=0)		
			15	Frequency setpoint reached (MCTRL1-RFG1=NOUT)		
			16	Q_{min} threshold reached (PCTRL1-QMIN)		
			17	I_{max} limit reached (MCTRL1-IMAX) C0014 = -5-: Torque setpoint reached		
			18	Overtemperature (ϑ_{max} - 5 °C) (DCTRL1-OH-WARN)		
			19	TRIP or Q_{min} or pulse inhibit (IMP) active (DCTRL1-TRIP-QMIN-IMP)		
			20	PTC warning (DCTRL1-PTC-WARN)		
			21	Apparent motor current < current threshold (DCTRL1-IMOT< ILIM)	Belt monitoring Apparent motor current = C0054 Current threshold = C0156	
			22	Apparent motor current < current threshold and Q_{min} threshold reached (DCTRL1-(IMOT< ILIM)-QMIN)		
			23	Apparent motor current < current threshold and ramp function generator 1: input = output (DCTRL1-(IMOT< ILIM)-RFG-I=0)		
			24	Warning motor phase failure (DCTRL1-LP1-WARN)		
			25	Min. output frequency reached (PCTRL1-NMIN)		



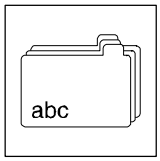
Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0419*↲ (cont.)	Free configuration of analog outputs		Analog signal output to terminal Analog signal source		📖 7-36
			27 Output frequency without slip (MCTRL1-NOUT)	6 V/12 mA/5.85 kHz ≡ C0011	
			28 Act. process controller value (PCTRL1-ACT)		
			29 Process controller setpoint (PCTRL1-SET1)	6 V/12 mA/5.85 kHz ≡ C0011	
			30 Process controller output (PCTRL1-OUT)		
			31 Ramp function generator input (NSET1-RFG1-IN)		
			32 Ramp function generator output (NSET1-NOUT)		
			35 Input signal at X3/8 or X3/1U, X3/1I, evaluated with gain (C0414/1 or C0027) and offset (C0413/1 or C0026) (AIN1-OUT)	10 V/20 mA/9.75 kHz ≡ Max. value of analog input signal (5 V, 10 V, 20 mA, 10 kHz) Precondition: The gain of the analog input or the frequendy input is set to: C0414/x, C0426 = 20/C0011 [%]	
			36 Input signal at frequency input X3/E1, evaluated with gain (C0426) and offset (C0427) (DFIN1-OUT)		
			37 Motor potentiometer output (MPOT1-OUT)		
			38 Input signal at X3/2U, X3/2I, evaluated with gain (C0414/2) and offset (C0413/2) (AIN2-OUT)		
			40 AIF input word 1 (AIF-IN.W1) 41 AIF input word 2 (AIF-IN.W2)	Setpoints to the controller from the communication module in AIF 10 V/20 mA/10 kHz ≡ 1000	
			50 ... 53 CAN-IN1.W1 ... 4 or FIF-IN.W1 ... FIF-IN.W4 Word 1 (50) ... word 4 (53) 60 ... 63 CAN-IN2.W1 ... 4 Word 1 (60) ... word 4 (63)	Setpoints to the controller from the function module in FIF 10 V/20 mA/10 kHz ≡ 1000	
			255 Not assigned (FIXED-FREE)		
C0420*	Gain analog output X3/62 (AOUT1-GAIN) Standard-I/O	128	0 {1} 255	128 ≡ Gain 1 C0420 and C0108 are the same	
C0420* (A)	Gain - analog outputs Application-I/O			128 ≡ Gain 1	
1	X3/62 (AOUT1-GAIN)	128	0 {1} 255	C0420/1 and C0108 are the same	
2	X3/63 (AOUT2-GAIN)				

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0421*↲	Free configuration of analog process data output words			Analog signal output to bus Analog signal source	• **With the Lenze setting, CAN-OUT1.W1 and FIF-OUT.W1 are defined as being digital and assigned to the 16 bit of the controller status word 1 (C0417)** • **If you want to output analog values (C0421/3 ≠ 255), the digital assignment must be deleted (C0417/x = 255)! Otherwise, the output signal would be wrong**	📖 7-39
1	AIF-OUT.W1	8	0	Output frequency (MCTRL1-NOUT+ SLIP)	24000 ≡ 480 Hz	📖 7-39
2	AIF-OUT.W2	0	1	Controller load (MCTRL1-MOUT)	16383 ≡ Rated motor torque for vector control (C0014 = 4), otherwise rated effective current (effective current / C0091)	
3	CAN-OUT1.W1 / FIF-OUT.W1	255	2	Apparent motor current (MCTRL1-IMOT)	16383 ≡ Rated inverter current	
4	CAN-OUT1.W2 / FIF-OUT.W2	255	3	DC-bus voltage (MCTRL1-DCVOLT)	16383 ≡ 1000 VDC at 400 V mains 16383 ≡ 380 VDC at 240 V mains	
5	CAN-OUT1.W3 / FIF-OUT.W3	255	4	Motor power	285 ≡ Rated motor power	
6	CAN-OUT1.W4 / FIF-OUT.W4	255	5	Motor voltage (MCTRL1-VOLT)	16383 ≡ Rated motor voltage	
7	CAN-OUT2.W1	255	6	1/output frequency (1/C0050) (MCTRL1-1/NOUT)	195 ≡ C0050 = 0.4 ×C0011	
8	CAN-OUT2.W2	255	7	Output frequency withing limits sets (NSET1-C0010...C0011)	24000 - C0010 ≡ 480 Hz - C0010	
9	CAN-OUT2.W3	255	8	Operation with process controller (C0238 = 0, 1): Act. process controller value (PCTRL1-ACT)	24000 ≡ 480 Hz	
10	CAN-OUT2.W4	255		Operation without process controller (C0238 = 2): Output frequency without slip (MCTRL1-NOUT)		
			9	Ready for operation (DCTRL1-RDY)	Selection -9- ... -25- corresponds to the digital functions of the relay output K1 (C0008) or the digital output A1 (C0117): LOW = 0 V/0 mA/4 mA HIGH = 10 V/20 mA	
			10	TRIP fault message (DCTRL1-TRIP)		
			11	Motor is running (DCTRL1-RUN)		
			12	Motor is running / CW rotation (DCTRL1-RUN-CW)		
			13	Motor is running / CCW rotation (DCTRL1-RUN-CCW)		
			14	Output frequency = 0 (DCTRL1-NOUT=0)		
			15	Frequency setpoint reached (MCTRL1-RFG1=NOUT)		
			16	Q_{min} threshold reached (PCTRL1-QMIN)		
			17	I_{max} limit reached (MCTRL1-IMAX) C0014 = -5-: Torque setpoint reached		
			18	Overtemperature (ϑ_{max} -5 °C) (DCTRL1-OH-WARN)		
			19	TRIP or Q_{min} or pulse inhibit (IMP) (DCTRL1-IMP)		
			20	PTC warning (DCTRL1-PTC-WARN)		
			21	Apparent motor current < current threshold (DCTRL1-IMOT< ILIM)	Belt monitoring Apparent motor current = C0054 Current threshold = C0156	
			22	Apparent motor current < current threshold and Q_{min} threshold reached (DCTRL1-(IMOT< ILIM)-QMIN)		
			23	Apparent motor current < current threshold and ramp function generator 1: input = output (DCTRL1-(IMOT< ILIM)-RFG-I=0)		
			24	Warning motor phase failure (DCTRL1-LP1-WARN)		
			25	Min. output frequency reached (PCTRL1-NMIN)		



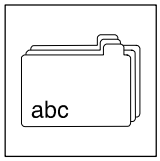
Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0421 (cont.)	Free configuration of analog process data output words			Analog signal output to bus Analog signal source			📖 7-39
			27	Output frequency without slip (MCTRL1-NOUT)		24000 ≡ 480 Hz	
			28	Act. process controller value (PCTRL1-ACT)			
			29	Process controller setpoint (PCTRL1-SET1)			
			30	Process controller output (PCTRL1-OUT)			
			31	Ramp function generator input (NSET1-RFG1-IN)			
			32	Ramp function generator output (NSET1NOUT)			
			35	Input signal at X3/8 or X3/1U, X3/1I, evaluated with gain (C0414/1 or C0027) and offset (C0413/1 or C0026) (AIN1-OUT)		10 V ≡ Max. value of analog input signal (5 V, 10 V, 20 mA, 10 kHz) Precondition: The gain of the analog input or the frequendy input is set to: C0414/x, C0426 = 20/C0011 [%]	
			36	Input signal at frequency input X3/E1, evaluated with gain (C0426) and offset (C0427) (DFIN1-OUT)			
			37	Motor potentiometer output (MPOT1-OUT)			
			38	Input signal at X3/2U, X3/2I, evaluated with gain (C0414/2) and offset (C0413/2) (AIN2-OUT)			
			40 41	AIF input word 1 (AIF-IN.W1) AIF input word 2 (AIF-IN.W2)		Setpoints to the controller from the communication module in AIF Normalization via AIF	
			50 ... 53 60 ... 63	CAN-IN1.W1 ... 4 or FIF-IN.W1 ... FIF-IN.W4 Word 1 (50) ... word 4 (53) CAN-IN2.W1 ... 4 Word 1 (60) ... word 4 (63)		Setpoints to the controller from CAN or function module in FIF Normalization via CAN or FIF	
			255	Not assigned (FIXED-FREE)			
C0422*	Offset analog output X3/62 (AOUT1-OFFSET) Standard-I/O	0.00	-10.00	{0.01 V}	10.00	C0422 and C0109 are the same	📖 7-36
C0422* (A)	Offset - analog outputs Application-I/O						
1	X3/62 (AOUT1-OFFSET)	0.00	-10.00	{0.01 V}	10.00	C0422/1 and C0109 are the same	
2	X3/63 (AOUT2-OFFSET)						
C0423* (A)	Delay digital outputs		0.000	{0.001 s}	65.000	"Debouncing" of the digital outputs (as of version application-I/O E82ZAFA ... Vx11) • Switches the digital output, if the linked signal is still active after the time set. • The digital output is reset without delay	
1	Relay output K1 (RELAY)	0.000					
2	Digital output X3/A1 (DIGOUT1)	0.000					
3	Digital output X3/A2 (DIGOUT2)	0.000					
C0424*↲ (A)	Output signal range - analog outputs Application–I/O					Observe the jumper setting of the function module! (as of version application-I/O E82ZAFA ... Vx11)	
1	X3/62 (AOUT1)	-0-	-0-	0 ... 10 V / 0 ... 20 mA			
2	X3/63 (AOUT2)	-0-	-1-	4 ... 20 mA			

Code		Possible settings						IMPORTANT	
No.	Name	Lenze	Selection						
C0425↲*	Configuration frequency input single track X3/E1 (DFIN1)	-2-		Frequency	Resolution	Scanning rate	Max. frequency	• "Frequency" refers to the internal normalization (e. g. C0011 etc.) • "Max. frequency" is the max. frequency which can be processed depending on C0425. If the value for a setting is exceeded, it can be porportionally adjusted under C0426: – Example: C0425 = -0-, (300 Hz) – C0426 = 33.3 % enables the correct evaluation with C0425 = -0- • Reference: C0011	📖 7-23
			-0-	100 Hz	1/200	1 s	300 Hz		
			-1-	1 kHz	1/200	100 ms	3 kHz		
			-2-	10 kHz	1/200	10 ms	10 kHz		
			-3-	10 kHz	1/1000	50 ms	10 kHz		
			-4-	10 kHz	1/10000	500 ms	10 kHz		
			-5- (A)	100 kHz	1/400	2 ms	100 kHz		
			-6- (A)	100 kHz	1/1000	5 ms	100 kHz		
			-7- (A)	100 kHz	1/2000	10 ms	100 kHz		
	Configuration frequency input two track X3/E1, X3/E2 (DFIN1)		-10- (A)	100 Hz	1/200	1 s	300 Hz		
			-11- (A)	1 kHz	1/200	100 ms	3 kHz		
			-12- (A)	10 kHz	1/200	10 ms	10 kHz		
			-13- (A)	10 kHz	1/1000	50 ms	10 kHz		
			-14- (A)	10 kHz	1/10000	500 ms	10 kHz		
			-15- (A)	100 kHz	1/400	2 ms	100 kHz		
			-16- (A)	100 kHz	1/1000	5 ms	100 kHz		
			-17- (A)	100 kHz	1/2000	10 ms	100 kHz		
C0426*	Gain frequency input X3/E1, X3/E2 (A) (DFIN1-GAIN)	100	-1500.0		{0.1 %}		1500.0		
C0427*	Offset frequency input X3/E1, X3/E2 (A) (DFIN1-OFFSET)	0.0	-100.0		{0.1 %}		100.0		
C0428* (A)	Gain frequency output (DFOUT1-OUT)	100	0.0		{0.1 %}		1500.0		
C0430*↲ (A)	Automatic adjustment analog inputs	-0-	-0-	Not active				The gain and the offset are calculated by entering two point of the setpoint characteristic. The more the points are apart, the more accurate the calculation. 1. Under C0430 select the input for which the gain and the offset are to be calculated. 2. Enter the X value (setpoint) and the Y value (output frequency) of point 1 in C0431 3. Enter the X value (setpoint) and the Y value (output frequency) of point 2 in C0432. 4. Calculated values are automatically entered in C0413 (offset) and C0414 (gain)	📖 7-22
			-1-	Enter points for X3/1U, X3/1I					
			-2-	Enter points for X3/2U, X3/2I					
C0431*↲ (A)	Coordinates points 1		-100.0		{0.1 %}		100.0		
1	X (P1)	-100.0	Analog setpoint of P1 100 % = max. input value (5 V, 10 V or 20 mA)						
2	Y (P1)	-100.0	Output frequency of P1 100 % = C0011						
C0432*↲ (A)	Coordinates point 2		-100.0		{0.1 %}		100.0		
1	X (P2)	100.0	Analog setpoint of P1 100 % = max. input value (5 V, 10 V or 20 mA)						
2	Y (P2)	100.0	Output frequency of P1 100 % = C0011						
C0435*↲ (A)	Automatic adjustment frequency input	0	0 = not active		{1}		4096	• Only required for speed control with digital feedback via HTL encoder • Calculates the gain C0426, depending on C0425 and C0011 • C0426 must be calculated again after every change of C0011 or C0425 • **Enter the increment divided by the number of pole pairs of the motor.** – Example: Increment encoder = 4096, motor 4-pole – C0435 = 2048	
[C0469]*	Function of key STOP of the keypad	-1-	-0-	Not active				Determines the function which is activated when pressing STOP .	
			-1-	CINH (controller inhibit)					
			-2-	QSP (quick stop)					



Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0500*	Cablibration of application datum numerator	2000	1	{1}	25000	• The codes C0010, C0011, C0017, C0019, C0037, C0038, C0039, C0044, C0046, C0049, C0050, C0051, C0138, C0139, C0140, C0181, C0239, C0625, C0626, C0627 can be calibrated to indicate an application datum on the keypad or PC. • If C0500/C0501 are changed, the unit "Hz" will not be displayed any longer	📖 7-50
C0501*	Calibration of application datum denominator	10	1	{1}	25000		
C0500* (A)	Calibration of application datum numerator	2000	1	{1}	25000	• The codes C0037, C0038, C0039, C0044, C0046, C0049, C0051, C0138, C0139, C0140, C0181 can be calibrated to indicate an application datum on the keypad in a unit selected under C0502 • The frequency related codes C0010, C0011, C0017, C0019, C0050, C0239, C0625, C0626, C0627 are always displayed in "Hz"	
C0501* (A)	Calibration of application datum denominator	10	1	{1}	25000		
C0502* (A)	Unit of application datum	0	0: — 1: ms 2: s 4: A 5: V	6: rpm 9: °C 10: Hz 11: kVA 12: Nm	13: % 14: kW 15: N 16: mV 17: mΩ	18: Ω 19: hex 34: m 35: h 42: mH	
C0517*↲	User menu					• After mains switching or when using the function Disp the code from C0517/1 will be displayed. • The Lenze setting of the user menu comprises the most important codes for commissioning the control mode "V/f characteristic control with linear characteristic" • When the password protection is activated, only the codes entered under C0517 are freely accessible. • Enter the required code numbers in the subcodes. • If codes are entered which are not available, C0050 will be copied to the memory	
1	Memory 1	50	C0050	Output frequency (MCTRL1-NOUT)			
2	Memory 2	34	C0034	Analog setpoint selection range			
3	Memory 3	7	C0007	Fixed configuration - digital input signals			
4	Memory 4	10	C0010	Minimum output frequency			
5	Memory 5	11	C0011	Maximum output frequency			
6	Memory 6	12	C0012	Acceleration time main setpoint			
7	Memory 7	13	C0013	Deceleration time main setpoint			
8	Memory 8	15	C0015	V/f rated frequency			
9	Memory 9	16	C0016	V_{min} boost			
10	Memory 10	2	C0002	Parameter set transfer			
C0518	Service codes					**Modifications only by Lenze service!**	
C0519							
C0520							
C0597*↲	Configuration motor phase failure detection	-0-	-0-	Not active		Fault messages:	
			-1-	TRIP fault message		Keypad: *LP1*, Bus: 32	
			-2-	Warning		Keypad: *LP1*, Bus: 182	
C0599*↲	Torque limit value motor phase failure detection	5	1	{1 %}	50	• Threshold for C0597 • Ref.: rated controller current	
C0625*	Skip frequency 1	480.00	0.00	{0.02 Hz}	480.00		📖 7-8
C0626*	Skip frequency 2	480.00	0.00	{0.02 Hz}	480.00		
C0627*	Skip frequency 3	480.00	0.00	{0.02 Hz}	480.00		
C0628*	Bandwidth of skip frequencies	0.00	0.00	{0.01 %}	100.00	Applies to C0625, C0626, C0627	
C0988*	DC-bus voltage threshold for DC-bus voltage control	0	0	{1 %}	200	• C988 = 0 % – Parameter set changeover via DC-bus voltage is deactivated • Changeover always between PAR1 and PAR2 • Parameter set changeover via terminal, bus or PC is not possible if C988 > 0!	📖 7-18 📖 7-10

Code		Possible settings		IMPORTANT	
No.	**Name**	**Lenze**	**Selection**		
C01500*	Software identification application-I/O			Only PC display	
C1501*	Software generation datum application-I/O			Only PC display	
C1502 (A)	Software identification application-I/O			Output to keypad as string in 4 parts à 4 characters	
1	Part 1				
...	...				
4	Part 4				
C1504 ... C1507	Service codes application-I/O			**Modifications only by Lenze service!**	



14.3 Attribute table

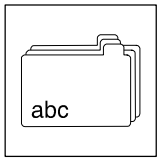
For writing programs it is necessary to have the data given in the attribute table. The table contains all information required for the parameter communication with the controller.

How to read the attribute table:

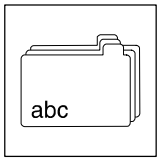
Column		Meaning	Entry	
Code		Name of the Lenze code	Cxxxx	
Index	dec	Index for parameter addressing. The subindex for array variables corresponds to the Lenze subcode number		Only required for control via INTERBUS, PROFIBUS-DP or system bus (CAN).
	hex			
Data	DS	Data structure	I	Single variable (one parameter element only)
			A	Array variable (several parameter elements)
	DA	No. 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 4 decimal codes
			I32	4 byte with sign
			U32	4 byte without sign
			VS	ASCII string
	DL	Data length in byte		
	Format	LECOM format	VD	ASCII decimal format
			VH	ASCII hexadecimal format
			VS	String format
			VO	Octett string format for data blocks
Access	LCM-R/W	Access permission for LECOM	Ra	Reading always allowed
			Wa	Writing always allowed
			W	Writing only under condition
	Condition	Condition for writing	CINH	

14.3.1 Attribute table - controller with standard-I/O

Code	Index		Data					Access	
	dec	hex	DS	DA	DL	DT	Format	LCM-R/W	Condition
C0001	24574dec	5FFEhex	E	1	4	FIX32	VD	Ra/Wa	
C0002	24573dec	5FFDhex	E	1	4	FIX32	VD	Ra/W	CINH
C0003	24572dec	5FFChex	E	1	4	FIX32	VD	Ra/Wa	
C0004	24571dec	5FFBhex	E	1	4	FIX32	VD	Ra/Wa	
C0005	24570dec	5FFAhex	E	1	4	FIX32	VD	Ra/Wa	
C0007	24568dec	5FF8hex	E	1	4	FIX32	VD	Ra/Wa	
C0008	24567dec	5FF7hex	E	1	4	FIX32	VD	Ra/Wa	
C0009	24566dec	5FF6hex	E	1	4	FIX32	VD	Ra/Wa	
C0010	24565dec	5FF5hex	E	1	4	FIX32	VD	Ra/Wa	
C0011	24564dec	5FF4hex	E	1	4	FIX32	VD	Ra/Wa	
C0012	24563dec	5FF3hex	E	1	4	FIX32	VD	Ra/Wa	
C0013	24562dec	5FF2hex	E	1	4	FIX32	VD	Ra/Wa	
C0014	24561dec	5FF1hex	E	1	4	FIX32	VD	Ra/Wa	
C0015	24560dec	5FF0hex	E	1	4	FIX32	VD	Ra/Wa	
C0016	24559dec	5FEFhex	E	1	4	FIX32	VD	Ra/Wa	
C0017	24558dec	5FEEhex	E	1	4	FIX32	VD	Ra/Wa	
C0018	24557dec	5FEDhex	E	1	4	FIX32	VD	Ra/Wa	
C0019	24556dec	5FEChex	E	1	4	FIX32	VD	Ra/Wa	
C0021	24554dec	5FEAhex	E	1	4	FIX32	VD	Ra/Wa	
C0022	24553dec	5FE9hex	E	1	4	FIX32	VD	Ra/Wa	
C0023	24552dec	5FE8hex	E	1	4	FIX32	VD	Ra/Wa	
C0026	24549dec	5FE5hex	E	1	4	FIX32	VD	Ra/Wa	
C0027	24548dec	5FE4hex	E	1	4	FIX32	VD	Ra/Wa	
C0034	24541dec	5FDDhex	E	1	4	FIX32	VD	Ra/Wa	
C0035	24540dec	5FDChex	E	1	4	FIX32	VD	Ra/Wa	
C0036	24539dec	5FDBhex	E	1	4	FIX32	VD	Ra/Wa	
C0037	24538dec	5FDAhex	E	1	4	FIX32	VD	Ra/Wa	
C0038	24537dec	5FD9hex	E	1	4	FIX32	VD	Ra/Wa	
C0039	24536dec	5FD8hex	E	1	4	FIX32	VD	Ra/Wa	
C0040	24535dec	5FD7hex	E	1	4	FIX32	VD	Ra/Wa	
C0043	24532dec	5FD4hex	E	1	4	FIX32	VD	Ra/Wa	
C0044	24531dec	5FD3hex	E	1	4	FIX32	VD	Ra	
C0046	24529dec	5FD1hex	E	1	4	FIX32	VD	Ra	
C0047	24528dec	5FD0hex	E	1	4	FIX32	VD	Ra	
C0049	24526dec	5FCEhex	E	1	4	FIX32	VD	Ra	
C0050	24525dec	5FCDhex	E	1	4	FIX32	VD	Ra	
C0051	24524dec	5FCChex	E	1	4	FIX32	VD	Ra	
C0052	24523dec	5FCBhex	E	1	4	FIX32	VD	Ra	
C0053	24522dec	5FCAhex	E	1	4	FIX32	VD	Ra	
C0054	24521dec	5FC9hex	E	1	4	FIX32	VD	Ra	
C0056	24519dec	5FC7hex	E	1	4	FIX32	VD	Ra	
C0061	24514dec	5FC2hex	E	1	4	FIX32	VD	Ra	
C0070	24505dec	5FB9hex	E	1	4	FIX32	VD	Ra/Wa	
C0071	24504dec	5FB8hex	E	1	4	FIX32	VD	Ra/Wa	
C0072	24503dec	5FB7hex	E	1	4	FIX32	VD	Ra/Wa	
C0074	24501dec	5FB5hex	E	1	4	FIX32	VD	Ra/Wa	
C0077	24498dec	5FB2hex	E	1	4	FIX32	VD	Ra/Wa	
C0078	24497dec	5FB1hex	E	1	4	FIX32	VD	Ra/Wa	
C0079	24496dec	5FB0hex	E	1	4	FIX32	VD	Ra/Wa	
C0084	24491dec	5FABhex	E	1	4	FIX32	VD	Ra/Wa	
C0087	24488dec	5FA8hex	E	1	4	FIX32	VD	Ra/Wa	
C0088	24487dec	5FA7hex	E	1	4	FIX32	VD	Ra/Wa	
C0089	24486dec	5FA6hex	E	1	4	FIX32	VD	Ra/Wa	
C0090	24485dec	5FA5hex	E	1	4	FIX32	VD	Ra/Wa	
C0091	24484dec	5FA4hex	E	1	4	FIX32	VD	Ra/Wa	
C0092	24483dec	5FA3hex	E	1	4	FIX32	VD	Ra/Wa	
C0093	24482dec	5FA2hex	E	1	4	FIX32	VD	Ra	
C0094	24481dec	5FA1hex	E	1	4	FIX32	VD	Ra	
C0099	24476dec	5F9Chex	E	1	4	FIX32	VD	Ra	
C0105	24470dec	5F96hex	E	1	4	FIX32	VD	Ra/Wa	



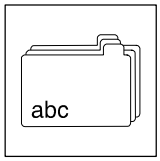
Code	Index		Data					Access	
	dec	hex	DS	DA	DL	DT	Format	LCM-R/W	Condition
C0106	24469dec	5F95hex	E	1	4	FIX32	VD	Ra/Wa	
C0107	24468dec	5F94hex	E	1	4	FIX32	VD	Ra/Wa	
C0108	24467dec	5F93hex	E	1	4	FIX32	VD	Ra/Wa	
C0109	24466dec	5F92hex	E	1	4	FIX32	VD	Ra/Wa	
C0111	24464dec	5F90hex	E	1	4	FIX32	VD	Ra/Wa	
C0114	24461dec	5F8Dhex	E	1	4	FIX32	VD	Ra/Wa	
C0117	24458dec	5F8Ahex	E	1	4	FIX32	VD	Ra/Wa	
C0119	24456dec	5F88hex	E	1	4	FIX32	VD	Ra/Wa	
C0120	24455dec	5F87hex	E	1	4	FIX32	VD	Ra/Wa	
C0125	24450dec	5F82hex	E	1	4	FIX32	VD	Ra/Wa	
C0126	24449dec	5F81hex	E	1	4	FIX32	VD	Ra/Wa	
C0127	24448dec	5F80hex	E	1	4	FIX32	VD	Ra/Wa	
C0135	24440dec	5F78hex	E	1	2	B16	VH	Ra	
C0138	24437dec	5F75hex	E	1	4	FIX32	VD	Ra	
C0139	24436dec	5F74hex	E	1	4	FIX32	VD	Ra	
C0140	24435dec	5F73hex	E	1	4	FIX32	VD	Ra/Wa	
C0141	24434dec	5F72hex	E	1	4	FIX32	VD	Ra/Wa	
C0142	24433dec	5F71hex	E	1	4	FIX32	VD	Ra/Wa	
C0143	24432dec	5F70hex	E	1	4	FIX32	VD	Ra/Wa	
C0144	24431dec	5F6Fhex	E	1	4	FIX32	VD	Ra/Wa	
C0145	24430dec	5F6Ehex	E	1	4	FIX32	VD	Ra/Wa	
C0148	24427dec	5F6Bhex	E	1	4	FIX32	VD	Ra/W	CINH
C0150	24425dec	5F69hex	E	1	2	B16	VH	Ra	
C0151	24424dec	5F68hex	E	1	2	B16	VH	Ra	
C0155	24420dec	5F64hex	E	1	2	B16	VH	Ra	
C0156	24419dec	5F63hex	E	1	4	FIX32	VD	Ra/Wa	
C0161	24414dec	5F5Ehex	E	1	4	FIX32	VD	Ra	
C0162	24413dec	5F5Dhex	E	1	4	FIX32	VD	Ra	
C0163	24412dec	5F5Chex	E	1	4	FIX32	VD	Ra	
C0164	24411dec	5F5Bhex	E	1	4	FIX32	VD	Ra	
C0165	24410dec	5F5Ahex	E	1	4	FIX32	VD	Ra/Wa	
C0168	24407dec	5F57hex	E	1	4	FIX32	VD	Ra	
C0170	24405dec	5F55hex	E	1	4	FIX32	VD	Ra/Wa	
C0171	24404dec	5F54hex	E	1	4	FIX32	VD	Ra/Wa	
C0174	24401dec	5F51hex	E	1	4	FIX32	VD	Ra/W	CINH
C0178	24397dec	5F4Dhex	E	1	4	FIX32	VD	Ra	
C0179	24396dec	5F4Chex	E	1	4	FIX32	VD	Ra	
C0181	24394dec	5F4Ahex	E	1	4	FIX32	VD	Ra/Wa	
C0182	24393dec	5F49hex	E	1	4	FIX32	VD	Ra/Wa	
C0183	24392dec	5F48hex	E	1	4	FIX32	VD	Ra	
C0184	24391dec	5F47hex	E	1	4	FIX32	VD	Ra/Wa	
C0185	24390dec	5F46hex	E	1	4	FIX32	VD	Ra/Wa	
C0196	24379dec	5F3Bhex	E	1	4	FIX32	VD	Ra/Wa	
C0200	24375dec	5F37hex	E	1	14	VS	VS	Ra	
C0201	24374dec	5F36hex	E	1	17	VS	VS	Ra	
C0202	24373dec	5F35hex	E	1	4	FIX32	VD	Ra	
C0220	24355dec	5F23hex	E	1	4	FIX32	VD	Ra/Wa	
C0221	24354dec	5F22hex	E	1	4	FIX32	VD	Ra/Wa	
C0238	24337dec	5F11hex	E	1	4	FIX32	VD	Ra/Wa	
C0239	24336dec	5F10hex	E	1	4	FIX32	VD	Ra/Wa	
C0265	24310dec	5EF6hex	E	1	4	FIX32	VD	Ra/Wa	
C0304	24271dec	5ECFhex	E	1	4	FIX32	VD	Ra/Wa	
C0305	24270dec	5ECEhex	E	1	4	FIX32	VD	Ra/Wa	
C0306	24269dec	5ECDhex	E	1	2	U16	VH	Ra/Wa	
C0307	24268dec	5ECChex	E	1	2	U16	VH	Ra/Wa	
C0308	24267dec	5ECBhex	E	1	4	FIX32	VD	Ra/Wa	
C0309	24266dec	5ECAhex	E	1	4	FIX32	VD	Ra/Wa	
C0350	24225dec	5EA1hex	E	1	4	FIX32	VD	Ra/Wa	
C0351	24224dec	5EA0hex	E	1	4	FIX32	VD	Ra/Wa	
C0352	24223dec	5E9Fhex	E	1	4	FIX32	VD	Ra/Wa	
C0353	24222dec	5E9Ehex	A	3	4	FIX32	VD	Ra/Wa	
C0354	24221dec	5E9Dhex	A	6	4	FIX32	VD	Ra/Wa	



Appendix

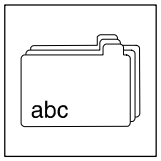
Attribute table

Code	Index		Data					Access	
	dec	hex	DS	DA	DL	DT	Format	LCM-R/W	Condition
C0355	24220dec	5E9Chex	A	6	4	FIX32	VD	Ra	
C0356	24219dec	5E9Bhex	A	4	4	FIX32	VD	Ra/Wa	
C0357	24218dec	5E9Ahex	A	3	4	FIX32	VD	Ra/Wa	
C0358	24217dec	5E99hex	E	1	4	FIX32	VD	Ra/Wa	
C0359	24216dec	5E98hex	E	1	4	FIX32	VD	Ra	
C0360	24215dec	5E97hex	E	1	4	FIX32	VD	Ra/Wa	
C0370	24205dec	5E8Dhex	E	1	4	FIX32	VD	Ra/Wa	
C0372	24203dec	5E8Bhex	E	1	4	FIX32	VD	Ra	
C0395	24180dec	5E74hex	E	1	4	B32	VH	Ra	
C0396	24179dec	5E73hex	E	1	4	B32	VH	Ra	
C0410	24165dec	5E65hex	A	25	4	FIX32	VD	Ra/Wa	
C0411	24164dec	5E64hex	E	1	4	FIX32	VD	Ra/Wa	
C0412	24163dec	5E63hex	A	9	4	FIX32	VD	Ra/Wa	
C0413	24162dec	5E62hex	A	2	4	FIX32	VD	Ra/Wa	
C0414	24161dec	5E61hex	A	2	4	FIX32	VD	Ra/Wa	
C0415	24160dec	5E60hex	A	3	4	FIX32	VD	Ra/Wa	
C0416	24159dec	5E5Fhex	E	1	4	FIX32	VD	Ra/Wa	
C0417	24158dec	5E5Ehex	A	16	4	FIX32	VD	Ra/Wa	
C0418	24157dec	5E5Dhex	A	16	4	FIX32	VD	Ra/Wa	
C0419	24156dec	5E5Chex	A	3	4	FIX32	VD	Ra/Wa	
C0420	24155dec	5E5Bhex	E	1	4	FIX32	VD	Ra/Wa	
C0421	24154dec	5E5Ahex	A	10	4	FIX32	VD	Ra/Wa	
C0422	24153dec	5E59hex	E	1	4	FIX32	VD	Ra/Wa	
C0425	24150dec	5E56hex	E	1	4	FIX32	VD	Ra/Wa	
C0426	24149dec	5E55hex	E	1	4	FIX32	VD	Ra/Wa	
C0427	24148dec	5E54hex	E	1	4	FIX32	VD	Ra/Wa	
C0469	24106dec	5E2Ahex	E	1	4	FIX32	VD	Ra/W	CINH
C0500	24075dec	5E0Bhex	E	1	4	FIX32	VD	Ra/Wa	
C0501	24074dec	5E0Ahex	E	1	4	FIX32	VD	Ra/Wa	
C0517	24058dec	5DFAhex	A	10	4	FIX32	VD	Ra/Wa	
C0518	24057dec	5DF9hex	A	250	4	FIX32	VD	Ra/Wa	
C0519	24056dec	5DF8hex	A	250	4	FIX32	VD	Ra	
C0597	23978dec	5DAAhex	E	1	4	FIX32	VD	Ra/Wa	
C0599	23976dec	5DA8hex	E	1	4	FIX32	VD	Ra/Wa	
C0625	23950dec	5D8Ehex	E	1	4	FIX32	VD	Ra/Wa	
C0626	23949dec	5D8Dhex	E	1	4	FIX32	VD	Ra/Wa	
C0627	23948dec	5D8Chex	E	1	4	FIX32	VD	Ra/Wa	
C0628	23947dec	5D8Bhex	E	1	4	FIX32	VD	Ra/Wa	
C0988	23587dec	5C23hex	E	1	4	FIX32	VD	Ra/Wa	



14.3.2 Attribute table - controller with application-I/O

Code	Index		Data					Access	
	dec	hex	DS	DA	DL	DT	Format	LCM-R/W	Condition
C0001	24574dec	5FFEhex	E	1	FIX32	4	VD	Ra/Wa	
C0002	24573dec	5FFDhex	E	1	FIX32	4	VD	Ra/W	CINH
C0003	24572dec	5FFChex	E	1	FIX32	4	VD	Ra/Wa	
C0004	24571dec	5FFBhex	E	1	FIX32	4	VD	Ra/Wa	
C0005	24570dec	5FFAhex	E	1	FIX32	4	VD	Ra/Wa	
C0007	24568dec	5FF8hex	E	1	FIX32	4	VD	Ra/Wa	
C0008	24567dec	5FF7hex	E	1	FIX32	4	VD	Ra/Wa	
C0009	24566dec	5FF6hex	E	1	FIX32	4	VD	Ra/Wa	
C0010	24565dec	5FF5hex	E	1	FIX32	4	VD	Ra/Wa	
C0011	24564dec	5FF4hex	E	1	FIX32	4	VD	Ra/Wa	
C0012	24563dec	5FF3hex	E	1	FIX32	4	VD	Ra/Wa	
C0013	24562dec	5FF2hex	E	1	FIX32	4	VD	Ra/Wa	
C0014	24561dec	5FF1hex	E	1	FIX32	4	VD	Ra/Wa	
C0015	24560dec	5FF0hex	E	1	FIX32	4	VD	Ra/Wa	
C0016	24559dec	5FEFhex	E	1	FIX32	4	VD	Ra/Wa	
C0017	24558dec	5FEEhex	E	1	FIX32	4	VD	Ra/Wa	
C0018	24557dec	5FEDhex	E	1	FIX32	4	VD	Ra/Wa	
C0019	24556dec	5FEChex	E	1	FIX32	4	VD	Ra/Wa	
C0021	24554dec	5FEAhex	E	1	FIX32	4	VD	Ra/Wa	
C0022	24553dec	5FE9hex	E	1	FIX32	4	VD	Ra/Wa	
C0023	24552dec	5FE8hex	E	1	FIX32	4	VD	Ra/Wa	
C0026	24549dec	5FE5hex	E	1	FIX32	4	VD	Ra/Wa	
C0027	24548dec	5FE4hex	E	1	FIX32	4	VD	Ra/Wa	
C0034	24541dec	5FDDhex	A	2	FIX32	4	VD	Ra/Wa	
C0035	24540dec	5FDChex	E	1	FIX32	4	VD	Ra/Wa	
C0036	24539dec	5FDBhex	E	1	FIX32	4	VD	Ra/Wa	
C0037	24538dec	5FDAhex	E	1	FIX32	4	VD	Ra/Wa	
C0038	24537dec	5FD9hex	E	1	FIX32	4	VD	Ra/Wa	
C0039	24536dec	5FD8hex	E	1	FIX32	4	VD	Ra/Wa	
C0040	24535dec	5FD7hex	E	1	FIX32	4	VD	Ra/Wa	
C0043	24532dec	5FD4hex	E	1	FIX32	4	VD	Ra/Wa	
C0044	24531dec	5FD3hex	E	1	FIX32	4	VD	Ra	
C0046	24529dec	5FD1hex	E	1	FIX32	4	VD	Ra	
C0047	24528dec	5FD0hex	E	1	FIX32	4	VD	Ra	
C0049	24526dec	5FCEhex	E	1	FIX32	4	VD	Ra	
C0050	24525dec	5FCDhex	E	1	FIX32	4	VD	Ra	
C0051	24524dec	5FCChex	E	1	FIX32	4	VD	Ra	
C0052	24523dec	5FCBhex	E	1	FIX32	4	VD	Ra	
C0053	24522dec	5FCAhex	E	1	FIX32	4	VD	Ra	
C0054	24521dec	5FC9hex	E	1	FIX32	4	VD	Ra	
C0056	24519dec	5FC7hex	E	1	FIX32	4	VD	Ra	
C0061	24514dec	5FC2hex	E	1	FIX32	4	VD	Ra	
C0070	24505dec	5FB9hex	E	1	FIX32	4	VD	Ra/Wa	
C0071	24504dec	5FB8hex	E	1	FIX32	4	VD	Ra/Wa	
C0072	24503dec	5FB7hex	E	1	FIX32	4	VD	Ra/Wa	
C0074	24501dec	5FB5hex	E	1	FIX32	4	VD	Ra/Wa	
C0077	24498dec	5FB2hex	E	1	FIX32	4	VD	Ra/Wa	
C0078	24497dec	5FB1hex	E	1	FIX32	4	VD	Ra/Wa	
C0079	24496dec	5FB0hex	E	1	FIX32	4	VD	Ra/Wa	
C0084	24491dec	5FABhex	E	1	FIX32	4	VD	Ra/Wa	
C0087	24488dec	5FA8hex	E	1	FIX32	4	VD	Ra/Wa	
C0088	24487dec	5FA7hex	E	1	FIX32	4	VD	Ra/Wa	
C0089	24486dec	5FA6hex	E	1	FIX32	4	VD	Ra/Wa	
C0090	24485dec	5FA5hex	E	1	FIX32	4	VD	Ra/Wa	
C0091	24484dec	5FA4hex	E	1	FIX32	4	VD	Ra/Wa	
C0092	24483dec	5FA3hex	E	1	FIX32	4	VD	Ra/Wa	
C0093	24482dec	5FA2hex	E	1	FIX32	4	VD	Ra	
C0094	24481dec	5FA1hex	E	1	FIX32	4	VD	Ra	
C0099	24476dec	5F9Chex	E	1	FIX32	4	VD	Ra	
C0101	24474dec	5F9Ahex	E	1	FIX32	4	VD	Ra/Wa	



Appendix

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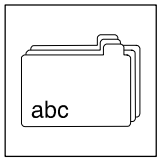
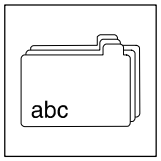
Code	Index		Data					Access	
	dec	hex	DS	DA	DL	DT	Format	LCM-R/W	Condition
C0103	24472dec	5F98hex	E	1	FIX32	4	VD	Ra/Wa	
C0105	24470dec	5F96hex	E	1	FIX32	4	VD	Ra/Wa	
C0106	24469dec	5F95hex	E	1	FIX32	4	VD	Ra/Wa	
C0107	24468dec	5F94hex	E	1	FIX32	4	VD	Ra/Wa	
C0108	24467dec	5F93hex	E	1	FIX32	4	VD	Ra/Wa	
C0109	24466dec	5F92hex	E	1	FIX32	4	VD	Ra/Wa	
C0111	24464dec	5F90hex	E	1	FIX32	4	VD	Ra/Wa	
C0114	24461dec	5F8Dhex	E	1	FIX32	4	VD	Ra/Wa	
C0117	24458dec	5F8Ahex	E	1	FIX32	4	VD	Ra/Wa	
C0119	24456dec	5F88hex	E	1	FIX32	4	VD	Ra/Wa	
C0120	24455dec	5F87hex	E	1	FIX32	4	VD	Ra/Wa	
C0125	24450dec	5F82hex	E	1	FIX32	4	VD	Ra/Wa	
C0126	24449dec	5F81hex	E	1	FIX32	4	VD	Ra/Wa	
C0127	24448dec	5F80hex	E	1	FIX32	4	VD	Ra/Wa	
C0135	24440dec	5F78hex	E	1	B16	2	VH	Ra	
C0138	24437dec	5F75hex	E	1	FIX32	4	VD	Ra	
C0139	24436dec	5F74hex	E	1	FIX32	4	VD	Ra	
C0140	24435dec	5F73hex	E	1	FIX32	4	VD	Ra/Wa	
C0141	24434dec	5F72hex	E	1	FIX32	4	VD	Ra/Wa	
C0142	24433dec	5F71hex	E	1	FIX32	4	VD	Ra/Wa	
C0143	24432dec	5F70hex	E	1	FIX32	4	VD	Ra/Wa	
C0144	24431dec	5F6Fhex	E	1	FIX32	4	VD	Ra/Wa	
C0145	24430dec	5F6Ehex	E	1	FIX32	4	VD	Ra/Wa	
C0148	24427dec	5F6Bhex	E	1	FIX32	4	VD	Ra/W	CINH
C0150	24425dec	5F69hex	E	1	B16	2	VH	Ra	
C0151	24424dec	5F68hex	E	1	B16	2	VH	Ra	
C0152	24423dec	5F67hex	E	1	B16	2	VH	Ra	
C0155	24420dec	5F64hex	E	1	B16	2	VH	Ra	
C0156	24419dec	5F63hex	E	1	FIX32	4	VD	Ra/Wa	
C0161	24414dec	5F5Ehex	E	1	FIX32	4	VD	Ra	
C0162	24413dec	5F5Dhex	E	1	FIX32	4	VD	Ra	
C0163	24412dec	5F5Chex	E	1	FIX32	4	VD	Ra	
C0164	24411dec	5F5Bhex	E	1	FIX32	4	VD	Ra	
C0165	24410dec	5F5Ahex	E	1	FIX32	4	VD	Ra/Wa	
C0168	24407dec	5F57hex	E	1	FIX32	4	VD	Ra	
C0170	24405dec	5F55hex	E	1	FIX32	4	VD	Ra/Wa	
C0171	24404dec	5F54hex	E	1	FIX32	4	VD	Ra/Wa	
C0174	24401dec	5F51hex	E	1	FIX32	4	VD	Ra/W	CINH
C0178	24397dec	5F4Dhex	E	1	FIX32	4	VD	Ra	
C0179	24396dec	5F4Chex	E	1	FIX32	4	VD	Ra	
C0181	24394dec	5F4Ahex	E	1	FIX32	4	VD	Ra/Wa	
C0182	24393dec	5F49hex	E	1	FIX32	4	VD	Ra/Wa	
C0183	24392dec	5F48hex	E	1	FIX32	4	VD	Ra	
C0184	24391dec	5F47hex	E	1	FIX32	4	VD	Ra/Wa	
C0185	24390dec	5F46hex	E	1	FIX32	4	VD	Ra/Wa	
C0189	24386dec	5F42hex	E	1	FIX32	4	VD	Ra	
C0190	24385dec	5F41hex	E	1	FIX32	4	VD	Ra/Wa	
C0191	24384dec	5F40hex	E	1	FIX32	4	VD	Ra/Wa	
C0192	24383dec	5F3Fhex	E	1	FIX32	4	VD	Ra/Wa	
C0193	24382dec	5F3Ehex	E	1	FIX32	4	VD	Ra/Wa	
C0194	24381dec	5F3Dhex	E	1	FIX32	4	VD	Ra/Wa	
C0195	24380dec	5F3Chex	E	1	FIX32	4	VD	Ra/Wa	
C0196	24379dec	5F3Bhex	E	1	FIX32	4	VD	Ra/Wa	
C0200	24375dec	5F37hex	E	1	VS	14	VS	Ra	
C0201	24374dec	5F36hex	E	1	VS	17	VS	Ra	
C0202	24373dec	5F35hex	E	1	FIX32	4	VD	Ra	
C0220	24355dec	5F23hex	E	1	FIX32	4	VD	Ra/Wa	
C0221	24354dec	5F22hex	E	1	FIX32	4	VD	Ra/Wa	
C0225	24350dec	5F1Ehex	E	1	FIX32	4	VD	Ra/Wa	
C0226	24349dec	5F1Dhex	E	1	FIX32	4	VD	Ra/Wa	
C0228	24347dec	5F1Bhex	E	1	FIX32	4	VD	Ra/Wa	
C0229	24346dec	5F1Ahex	E	1	FIX32	4	VD	Ra/Wa	



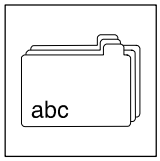
Code	Index		Data					Access	
	dec	hex	DS	DA	DL	DT	Format	LCM-R/W	Condition
C0230	24345dec	5F19hex	E	1	FIX32	4	VD	Ra/Wa	
C0231	24344dec	5F18hex	E	1	FIX32	4	VD	Ra/Wa	
C0232	24343dec	5F17hex	E	1	FIX32	4	VD	Ra/Wa	
C0233	24342dec	5F16hex	E	1	FIX32	4	VD	Ra/Wa	
C0234	24341dec	5F15hex	E	1	FIX32	4	VD	Ra/Wa	
C0235	24340dec	5F14hex	E	1	FIX32	4	VD	Ra/Wa	
C0236	24339dec	5F13hex	E	1	FIX32	4	VD	Ra/Wa	
C0238	24337dec	5F11hex	E	1	FIX32	4	VD	Ra/Wa	
C0239	24336dec	5F10hex	E	1	FIX32	4	VD	Ra/Wa	
C0240	24335dec	5F0Fhex	E	1	FIX32	4	VD	Ra/Wa	
C0241	24334dec	5F0Ehex	E	1	FIX32	4	VD	Ra/Wa	
C0242	24333dec	5F0Dhex	E	1	FIX32	4	VD	Ra/Wa	
C0243	24332dec	5F0Chex	E	1	FIX32	4	VD	Ra/Wa	
C0244	24331dec	5F0Bhex	E	1	FIX32	4	VD	Ra/Wa	
C0245	24330dec	5F0Ahex	E	1	FIX32	4	VD	Ra/Wa	
C0250	24325dec	5F05hex	E	1	FIX32	4	VD	Ra/Wa	
C0251	24324dec	5F04hex	E	1	FIX32	4	VD	Ra/Wa	
C0252	24323dec	5F03hex	E	1	FIX32	4	VD	Ra/Wa	
C0253	24322dec	5F02hex	E	1	FIX32	4	VD	Ra/Wa	
C0254	24321dec	5F01hex	E	1	FIX32	4	VD	Ra/Wa	
C0255	24320dec	5F00hex	E	1	FIX32	4	VD	Ra/Wa	
C0265	24310dec	5EF6hex	E	1	FIX32	4	VD	Ra/Wa	
C0304	24271dec	5ECFhex	E	1	FIX32	4	VD	Ra/Wa	
C0305	24270dec	5ECEhex	E	1	FIX32	4	VD	Ra/Wa	
C0306	24269dec	5ECDhex	E	1	U16	2	VH	Ra/Wa	
C0307	24268dec	5ECChex	E	1	U16	2	VH	Ra/Wa	
C0308	24267dec	5ECBhex	E	1	FIX32	4	VD	Ra/Wa	
C0309	24266dec	5ECAhex	E	1	FIX32	4	VD	Ra/Wa	
C0350	24225dec	5EA1hex	E	1	FIX32	4	VD	Ra/Wa	
C0351	24224dec	5EA0hex	E	1	FIX32	4	VD	Ra/Wa	
C0352	24223dec	5E9Fhex	E	1	FIX32	4	VD	Ra/Wa	
C0353	24222dec	5E9Ehex	A	3	FIX32	4	VD	Ra/Wa	
C0354	24221dec	5E9Dhex	A	6	FIX32	4	VD	Ra/Wa	
C0355	24220dec	5E9Chex	A	6	FIX32	4	VD	Ra	
C0356	24219dec	5E9Bhex	A	4	FIX32	4	VD	Ra/Wa	
C0357	24218dec	5E9Ahex	A	3	FIX32	4	VD	Ra/Wa	
C0358	24217dec	5E99hex	E	1	FIX32	4	VD	Ra/Wa	
C0359	24216dec	5E98hex	E	1	FIX32	4	VD	Ra	
C0360	24215dec	5E97hex	E	1	FIX32	4	VD	Ra/Wa	
C0370	24205dec	5E8Dhex	E	1	FIX32	4	VD	Ra/Wa	
C0372	24203dec	5E8Bhex	E	1	FIX32	4	VD	Ra	
C0395	24180dec	5E74hex	E	1	B32	4	VH	Ra	
C0396	24179dec	5E73hex	E	1	B32	4	VH	Ra	
C0410	24165dec	5E65hex	A	32	FIX32	4	VD	Ra/Wa	
C0411	24164dec	5E64hex	E	1	FIX32	4	VD	Ra/Wa	
C0412	24163dec	5E63hex	A	9	FIX32	4	VD	Ra/Wa	
C0413	24162dec	5E62hex	A	2	FIX32	4	VD	Ra/Wa	
C0414	24161dec	5E61hex	A	2	FIX32	4	VD	Ra/Wa	
C0415	24160dec	5E60hex	A	3	FIX32	4	VD	Ra/Wa	
C0416	24159dec	5E5Fhex	E	1	FIX32	4	VD	Ra/Wa	
C0417	24158dec	5E5Ehex	A	16	FIX32	4	VD	Ra/Wa	
C0418	24157dec	5E5Dhex	A	16	FIX32	4	VD	Ra/Wa	
C0419	24156dec	5E5Chex	A	3	FIX32	4	VD	Ra/Wa	
C0420	24155dec	5E5Bhex	E	1	FIX32	4	VD	Ra/Wa	
C0421	24154dec	5E5Ahex	A	10	FIX32	4	VD	Ra/Wa	
C0422	24153dec	5E59hex	E	1	FIX32	4	VD	Ra/Wa	
C0423	24152dec	5E58hex	A	3	FIX32	4	VD	Ra/Wa	
C0424	24151dec	5E57hex	A	2	FIX32	4	VD	Ra/Wa	
C0425	24150dec	5E56hex	E	1	FIX32	4	VD	Ra/Wa	
C0426	24149dec	5E55hex	E	1	FIX32	4	VD	Ra/Wa	
C0427	24148dec	5E54hex	E	1	FIX32	4	VD	Ra/Wa	
C0428	24147dec	5E53hex	E	1	FIX32	4	VD	Ra/Wa	



Appendix

Attribute table

Code	Index		Data					Access	
	dec	hex	DS	DA	DL	DT	Format	LCM-R/W	Condition
C0430	24145dec	5E51hex	E	1	FIX32	4	VD	Ra/Wa	
C0431	24144dec	5E50hex	E	1	FIX32	4	VD	Ra/Wa	
C0432	24143dec	5E4Fhex	E	1	FIX32	4	VD	Ra/Wa	
C0435	24140dec	5E4Chex	E	1	FIX32	4	VD	Ra/Wa	
C0469	24106dec	5E2Ahex	E	1	FIX32	4	VD	Ra/W	CINH
C0500	24075dec	5E0Bhex	E	1	FIX32	4	VD	Ra/Wa	
C0501	24074dec	5E0Ahex	E	1	FIX32	4	VD	Ra/Wa	
C0502	24073dec	5E09hex	E	1	FIX32	4	VD	Ra/Wa	
C0517	24058dec	5DFAhex	A	10	FIX32	4	VD	Ra/Wa	
C0518	24057dec	5DF9hex	A	250	FIX32	4	VD	Ra/Wa	
C0519	24056dec	5DF8hex	A	250	FIX32	4	VD	Ra	
C0597	23978dec	5DAAhex	E	1	FIX32	4	VD	Ra/Wa	
C0599	23976dec	5DA8hex	E	1	FIX32	4	VD	Ra/Wa	
C0625	23950dec	5D8Ehex	E	1	FIX32	4	VD	Ra/Wa	
C0626	23949dec	5D8Dhex	E	1	FIX32	4	VD	Ra/Wa	
C0627	23948dec	5D8Chex	E	1	FIX32	4	VD	Ra/Wa	
C0628	23947dec	5D8Bhex	E	1	FIX32	4	VD	Ra/Wa	
C0988	23587dec	5C23hex	E	1	FIX32	4	VD	Ra/Wa	
C1500	23075dec	5A23hex	E	1	VS	14	VS	Ra	
C1501	23074dec	5A22hex	E	1	VS	17	VS	Ra	
C1504	23071dec	5A1Fhex	E	1	FIX32	4	VD	Ra/Wa	
C1505	23070dec	5A1Ehex	E	1	FIX32	4	VD	Ra/Wa	
C1506	23069dec	5A1Dhex	E	1	U16	2	VH	Ra/Wa	
C1507	23068dec	5A1Chex	E	1	U16	2	VH	Ra/Wa	
C1550	23025dec	59F1hex	E	1	FIX32	4	VD	Ra/W	CINH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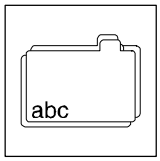

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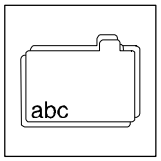

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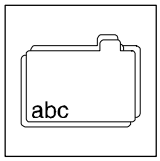

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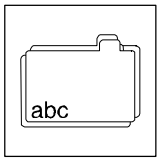

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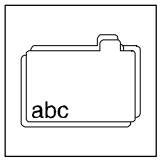

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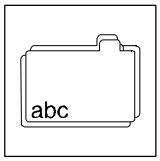

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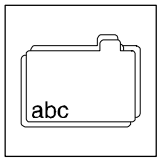

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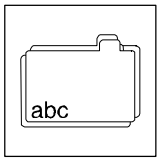

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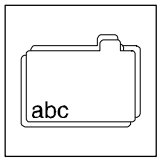

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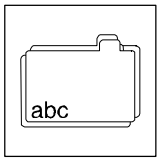

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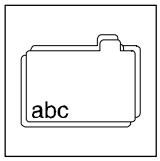
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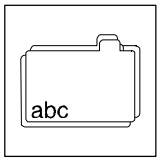

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