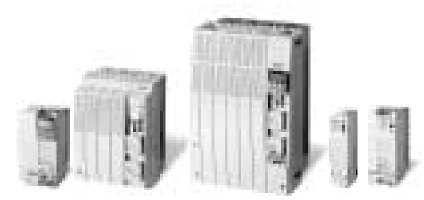
Frequency inverter

8200 vector

0.25 ... 90.0 kW

Global Drive



Manual

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System Manual

8200 vector frequency inverter

0.25 kW ... 90 kW

Lenze Drive Systems GmbH
Postfach 101352
31763 Hameln

1 Preface

1.1 Contents

Show/Hide Bookmarks

1.2 The 8200 vector frequency inverter

The system

The mains task of 8200 vector frequency inverters is the electronic speed adjustment of three-phase AC motors. Together with a Lenze geared motor or a Lenze three-phase AC motor the 8200 vector forms an electronic variable-speed drive and provides excellent drive features. Different combination possibilities of frequency inverters and application-specific modules, which can be connected via two interfaces, ensure high flexibility.

Additional features

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

1.3 How to use this System Manual

1.3.1 Information provided by the System Manual

Target group

This System Manual is intended for all persons who install, commission and adjust the frequency inverter 8200 vector.

Together with the catalog it forms the basis of project planning for the manufacturers of plants and machinery.

Contents

The System Manual is meant as an addition to the Mounting Instructions which are part of the delivery package:

- The features and functions are described in detail.
- It provides detailed information on additional ranges of application.
- Examples describe how to set the parameters for typical applications.
- In case of doubt, the Mounting Instructions delivered together with the 8200 vector frequency inverter apply.

How to find information

A chapter informs entirely about a subject:

- You therefore only have to read the chapter you are interested in at the moment.
- The Table of Contents and Index help you to find all information about a certain topic.
- Descriptions and data of other Lenze products (drive PLC, Lenze geared motors, Lenze motors, ...) can be found in the corresponding catalogs, Operating Instructions and Manuals. The required documentation can be ordered at your Lenze sales partner or downloaded as PDF file from the internet.

Paper or PDF

The System Manual is designed as a loose-leaf collection so that we are able to inform you quickly and specifically about news and changes. Each page is marked by publication date and version.

Simultaneously we make the System Manual available as PDF file in the internet.

Note!

Current documentation and software updates for Lenze products can be found in the internet in the area "Downloads" under

http://www.Lenze.com

1.3.2 Products to which the System Manual applies

①						②	③
E82xV	xxx	K	x	x	xxx	3x	3x

Type
E = Built-in unit
D = Built-in unit in push-through technique
C = Built-in unit in “Cold Plate” technique

Power
(e. g. 152 = 15 × 10^2 W = 1.5 kW)
(e. g. 113 = 11 × 10^3 W = 11 kW)

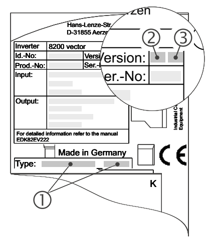
Voltage class
2 = 230 V
4 = 400 V/500 V

Controller generation
C (0.25 ... 11 kW)
B (15 ... 90 kW)

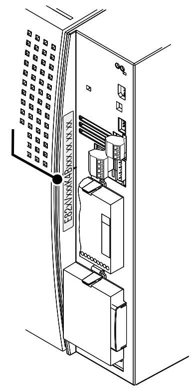
Version, variant
0xx = EMC filter integrated
1xx = For IT systems (15 ... 90 kW)
2xx = Without EMC filter
x0x = Without function ”Safe standstill”
x4x = With function ”Safe standstill” (3 ... 90 kW)
xx0 = Not coated
xx1 = Coated

Hardware version

Software version



0.25 ... 11 kW



15 ... 90 kW

1.4 Legal regulations

Labelling

Lenze controllers are unambiguously designated by the contents of the nameplate.

Manufacturer

Lenze Drive Systems GmbH, Postfach 101352, D-31763 Hameln

CE conformity

Conforms to the EC Low-Voltage Directive

Application as directed

8200 vector frequency inverters and accessories

- must only be operated under the conditions prescribed in this System Manual.
- are components
  - for open and closed loop control of variable speed drives with asynchronous standard 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 purposes of the EC Machinery Directive.
- are not to be used as domestic appliances, but only for industrial purposes.

Drives with 8200 vector frequency inverters

- 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
  - in industrial premises as well as residential and commercial premises.
- The user is responsible for the compliance of his application with the EC directives.

Any other use shall be deemed inappropriate!

Liability

The information, data, and notes in this System Manual 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 this Manual.

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

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

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

- Diregarding this System Manual
- Unauthorized modifications to the controller
- Operating errors
- Improper working on and with the controller

Warranty

See Sales and Delivery Conditions of Lenze Drive Systems GmbH.

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

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

2 Guide

2.1 Contents

2.2 Glossary

2.2.1 Terminology and abbreviations used

AIF	**Automation interface** AIF interface, interface for communication modules
FIF	**Function interface** FIF interface, interface for function modules
Controller	Any frequency inverter, servo inverter or DC controller
Drive	Lenze controller in combination with a geared motor, a three-phase AC motor or other Lenze drive components.
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)
🕮	Refers to a chapter with the corresponding page number
U_{mains} [V]	Mains voltage
U_{DC} [V]	DC supply voltage
U_{M} [V]	Output voltage
I_{mains} [A]	Mains current
I_{r} [A]	Rated output current
I_{max} [A]	Maximum output current
I_{PE} [mA]	Discharge current
P_{r} [kW]	Rated motor power
P_{V} [W]	Power loss of inverter
P_{DC} [kW]	For operation with power-adapted motors additional power to be taken from the DC bus
S_{r} [kVA]	Output power of controller
M_{r} [Nm]	Rated torque
f_{max} [Hz]	Maximum frequency
L [mH]	Inductivity
R [Ω]	Resistance
AC	AC current or AC voltage
DC	DC current or DC voltage
DIN	Deutsches Institut für Normung
EMC	Electromagnetic compatibility
EN	European standard

IEC	International Electrotechnical Commission
IP	International Protection Code
NEMA	National Electrical Manufacturers Association
VDE	Verband deutscher Elektrotechniker
CE	Communauté Européene
UL	Underwriters Laboratories

2.2.2 Meaning of the signal names

AIF-IN	**Automation interface input** Function block AIF input
AIF-OUT	**Automation interface output** Function block AIF output
AIN1	**Analog input 1** Function block analog input 1
AIN1-GAIN	**Analog input 1 gain** Gain of analog input 1
AIN1-OFFSET	**Analog input 1 offset** Offset of analog input 1
AIN1-OUT	**Analog input 1 output** Output of analog input 1
AIN2	**Analog input 2** Function block analog input 2
AIN2-GAIN	**Analog input 2 gain** Gain of analog input 2
AIN2-OFFSET	**Analog input 2 offset** Offset of analog input 2
AIN2-OUT	**Analog input 2 output** Output of analog input 2
AOUT1	**Analog output 1** Function block analog output 1
AOUT1-GAIN	**Analog output 1 gain** Gain of analog output 1
AOUT1-IN	**Analog output 1 in** Input of analog output 1
AOUT1-OFFSET	**Analog output 1 offset** Offset of analog output 1
AOUT1-OUT	**Analog output 1 out** Output of analog output 1
AOUT2	**Analog output 2** Function block analog output 2
AOUT2-GAIN	**Analog output 2 gain** Gain of analog output 2

AOUT2-IN	**Analog output 2 in** Input of analog output 2
AOUT2-OFFSET	**Analog output 2 offset** Offset of analog output 2
AOUT2-OUT	**Analog output 2 out** Output of analog output 2
DCTRL1	**Digital control 1** Function block device control
DCTRL1-C0010...C0011	**DCTRL1-output speed between C0010 and C0011** Status signal: Output frequency within the set limits of C0010 and C0011
DCTRL1-CCW	**DCTRL1-counter-clockwise** Status signal: CCW rotation
DCTRL1-CCW/QSP	**DCTRL1-counter-clockwise/quickstop** Activates CCW rotation with quickstop
DCTRL1-CINH	**DCTRL1-controller inhibit** Controller inhibit or status signal: Controller inhibited
DCTRL1-CW/CCW	**DCTRL1-clockwise/counter-clockwise** CW/CCW rotation changeover
DCTRL1-CW/QSP	**DCTRL1-clockwise/quickstop** Activates CW rotation with quickstop
DCTRL1-H/RE	**DCTRL1-hand/remote** Hand control/remote control changeover
DCTRL1-IMOT<ILIM	**DCTRL1-motor current < current limit** Status signal: Apparent motor current < current threshold
DCTRL1-(IMOT<ILIM)-QMIN	**DCTRL1-motor current < current limit and Qmin active** Status signal: Apparent motor current < values remain under current threshold and frequency threshold Qmin
DCTRL1-(IMOT<ILIM)-RFG-I=O	**DCTRL1-motor current < current limit and RFG in=out** Status signal: Apparent motor current < current threshold and ramp-function generator = ramp-function generator output
DCTRL1-(IMOT>ILIM)-RFG-I=O	**DCTRL1-motor current > current limit and RFG in=out** Status signal: Apparent motor current > current threshold and ramp function generator input = ramp function generator output
DCTRL1-IMP	**DCTRL1-pulse inhibit** Status signal: Pulse inhibit
DCTRL1-LP1-WARN	**DCTRL1-lost phase 1 warning** Warning signal: Motor phase failure

DCTRL1-NOUT=0	**DCTRL1-speed output = 0** Status signal: Output frequency = 0 Hz
DCTRL1-OH-WARN	**DCTRL1-overheat warning** Warning signal: Overtemperature
DCTRL1-OH-PTC-LP1-FAN1-WARN	**DCTRL1-warning: overheat or motor temperature or lost phase or fan failure** Warning signal: Overtemperature or motor temperature too high or motor phase or fan have failed
DCTRL1-OV	**DCTRL1-overvoltage** Warning signal: DC bus overvoltage
DCTRL1-PAR-B0	**DCTRL1-parameter set 2 or 4 active** Status signal: Parameter set 2 or 4 active
DCTRL1-PAR-B1	**DCTRL1-parameter set 3 or 4 active** Status signal: Parameter set 3 or 4 active
DCTRL1-PAR2/4	**DCTRL1-activation of parameter set 2 or 4** Activates parameter set 2 or 4
DCTRL1-PAR3/4	**DCTRL1-activation of parameter set 3 or 4** Activates parameter set 3 or 4
DCTRL1-PTC-WARN	**DCTRL1-motor temperature warning** Warning signal: Motor temperature too high
DCTRL1-QSP	**DCTRL1-activation of quickstop** Activates quickstop
DCTRL1-RDY	**DCTRL1 ready** Status signal: Ready for operation
DCTRL1-RFG1=NOUT	**DCTRL1-RFG1 = speed output** Status signal: Frequency setpoint has been reached
DCTRL1-RUN	**DCTRL1-motor is running** Status signal: Motor runs
DCTRL1-RUN-CCW	**DCTRL1-motor runs counter-clockwise** Status signal: Motor runs/CCW rotation
DCTRL1-RUN-CW	**DCTRL1-motor runs clockwise** Status signal: Motor runs/CW rotation
DCTRL1-TRIP	**DCTRL1-TRIP active** Status signal: Fault message (TRIP) active
DCTRL1-TRIP-QMIN-IMP	**DCTRL1-TRIP or Qmin or IMP active** Status signal: TRIP or Qmin have not been reached or pulse inhibit active

DCTRL1-TRIP-RESET	**DCTRL1-TRIP-reset** Fault message reset
DCTRL1-TRIP-SET	**DCTRL1-external TRIP active** Evaluation of external fault messages
DFIN1	**Digital frequency input 1** Function block frequency input 1
DFIN1-GAIN	**Digital frequency input 1 gain** Gain of frequency input 1
DFIN1-NORM	**Digital frequency input 1 normalisation** Normalisation of frequency input 1
DFIN1-OFFSET	**Digital frequency input 1 offset** Offset of frequency input 1
DFIN1-ON	**Digital frequency input 1 on** Activation of frequency input 1
DFIN1-OUT	**Digital frequency input 1 output** Output of frequency input 1
DFOUT1	**Digital frequency output 1** Function block frequency input 1
DFOUT1-AN-IN	**Analog input of digital frequency output 1** Analog input of frequency output 1
DFOUT1-OUT	**Digital frequency output 1 output** Output of frequency output 1
DIGIN1	**Digital Input 1** Function block digital inputs 1
DIGOUT1	**Digital output 1** Function block digital output 1
DIGOUT2	**Digital output 2** Function block digital output 2
FIXED-FREE	**Input or output not connected** Input or output not assigned
MCTRL1	**Motor controL 1** Function block motor control 1
MCTRL1-DCB	**MCTRL1-activation of direct current brake** Activates DC braking
MCTRL1-DCVOLT	**MCTRL1-DC voltage** DC bus voltage
MCTRL1-Imax	**MCTRL1-Imax** Status signal: Maximum current of controller is reached or torque setpoint is reached
MCTRL1-IMOT	**MCTRL1-motor current** Apparent motor current
MCTRL1-MOUT	**MCTRL1-torque output** Torque delivered (utilisation)

MCTRL1-MSET	**MCTRL1-torque setpoint** Torque setpoint or torque limiting value
MCTRL1-MSET1	**MCTRL1-torque setting 1** Torque threshold 1
MCTRL1-MSET1=MACT	**MCTRL1-torque setting 1= actual torque** Torque threshold 1 is reached
MCTRL1-MSET2	**MCTRL1-torque setting 2** Torque threshold 2
MCTRL1-MSET2=MACT	**MCTRL1-torque setting 2= actual torque** Torque threshold 2 is reached
MCTRL1-NOUT	**MCTRL1-speed output** Output frequency
MCTRL1-(1/NOUT)	**MCTRL1-(1/speed output)** Output signal 1/C0050
MCTRL1-NOUT+SLIP	**MCTRL1-speed output + slip** Output frequency with slip compensation
MCTRL1-PHI-ADD	**MCTRL1-additional phase** Additional phase
MCTRL1-VOLT	**MCTRL1-voltage** Motor voltage
MCTRL1-VOLT-ADD	**MCTRL1-additional voltage** Additional motor voltage
MPOT1	**Motor potentiometer 1** Motor potentiometer 1
MPOT1-DOWN	**MPOT1-down** Setpoint is driven to minimum output frequency at main setpoint deceleration ramp
MPOT1-INIT	**MPOT1-initialisation** Configuration motor potentiometer
MPOT1-QSP	**MPOT1-quickstop** Activation of quickstop via motor potentiometer
MPOT1-OUT	**MPOT1-output** Motor potentiometer output
MPOT1-UP	**MPOT1-up** Setpoint is driven to maximum output frequency at main setpoint acceleration ramp
NSET1	**Speed setting 1** Function block speed setting
NSET1-JOG1/3	**NSET1-activation of fixed setpoint 1 or 3** Activates fixed setpoint (JOG) 1 or 3
NSET1-JOG1/3/5/7	**NSET1-activation of fixed setpoint 1, 3, 5 or 7** Activates fixed setpoint (JOG) 1, 3, 5 or 7
NSET1-JOG2/3	**NSET1-activation of fixed frequency 2 or 3** Activates fixed setpoint (JOG) 2 or 3

NSET1-JOG2/3/6/7	**NSET1-activation of fixed frequency 2, 3, 6 or 7** Activates fixed setpoint (JOG) 2, 3, 6 or 7
NSET1-JOG4/5/6/7	**NSET1-activation of fixed frequency 4, 5, 6 or 7** Activates fixed setpoint (JOG) 2, 3, 6 or 7
NSET1-N1	**NSET1-speed setpoint 1** Main setpoint 1
NSET1-N2	**NSET1-speed setpoint 2** Main setpoint 2
NSET1-NADD	**NSET1-additional speed setpoint** Additional setpoint via keypad or parameter channel (C0140)
NSET1-NOUT	**NSET1-speed output** Output of ramp function generator 1
NSET1-RFG1	**NSET1-ramp function generator 1** Ramp function generator 1 for main setpoint
NSET1-RFG1-0	**NSET1-ramp function generator 1 = 0** Ramp function generator input must be set to ”0” for mains setpoint
NSET1-RFG1-I=O	**NSET1-ramp function generator 1 input=output** Status signal: Ramp function generator, input = output
NSET1-RFG1-IN	**NSET1-ramp function generator 1 input** Signal at ramp function generator input
NSET1-RFG1-STOP	**NSET1-ramp function generator 1 stop** Stop of ramp function generator for main setpoint
NSET1-TI1/3	**NSET1-activation of timer 1 or 3** Activates additional acceleration time/deceleration time 1 or 3
NSET1-TI2/3	**NSET1-activation of timer 2 or 3** Activates additional acceleration time/deceleration time 2 or 3
PCTRL1	**Process control 1** Function block process controller 1
PCTRL1-INV-ON	**PCTRL1-inversion on** Process controller output inversion
PCTRL1-ACT	**PCTRL1-actual value** Actual process controller value
PCTRL1-FADING	**PCTRL1-fading** Fading in or fading out process controller output
PCTRL1-FOLL1	**PCTRL1-follow1** Servo controller 1
PCTRL1-FOLL-OUT	**PCTRL1-follow1 output** Servo controller output
PCTRL1-FOLL1-0	**PCTRL1-follow1 = 0** Setting of servo controller to ”0”
PCTRL1-I-OFF	**PCTRL1-integration off** Switches off I-component of the process controller

PCTRL1-LIM	**PCTRL1-limit** Status signal: Limitation of process controller output is reached
PCTRL1-NADD	**PCTRL1-additional speed setpoint** Additional setpoint
PCTRL1-NADD-OFF	**PCTRL1- additional speed setpoint off** Additional setpoint is switched off
PCTRL1-NMIN	**PCTRL1-speed minimum** Status signal: Minimum output frequency is reached
PCTRL1-NOUT	**PCTRL1-speed output** Total setpoint = main setpoint, additional setpoint and process controller setpoint with pilot control
PCTRL1-OFF	**PCTRL1-off** Process controller switch off
PCTRL1-OUT	**PCTRL1-output** Process controller output without pilot control
PCTRL1-PID-OUT	**PCTRL1-PID controller output** Output signal PID controller
PCTRL1-QMIN	**PCTRL1-Qmin** Status signal: Frequency threshold Qmin is not reached
PCTRL1-RFG1	**PCTRL1-ramp function generator1** Process controller of ramp function generator 1 for additional setpoint PCTRL1-NADD
PCTRL1-RFG2	**PCTRL1-ramp function generator2** Process controller of ramp function generator 2 for process controller setpoint
PCTRL1-RFG2-LOAD-I	**PCTRL1-load actual value to ramp function generator2** Loads the actual process controller value to the ramp function generator of the process controller
PCTRL1-RFG2-0	**PCTRL1- ramp function generator2 = 0** Ramp function generator input is set to "0"
PCTRL1-SET	**PCTRL1-setpoint** Output signal of process controller setpoint
PCTRL1-SET=ACT	**PCTRL1-setpoint = actual value** Status signal: Process controller setpoint = actual process controller value
PCTRL1-SET1	**PCTRL1-setpoint 1** Process controller setpoint 1
PCTRL1-SET2	**PCTRL1-setpoint 2** Process controller setpoint 2
PCTRL1-SET3	**PCTRL1-setpoint 3** Total setpoint = main setpoint and additional setpoint without process controller setpoint and without pilot control
PCTRL1-STOP	**PCTRL1-stop** Process controller stop

RELAY1	**Relay 1** Relay 1
RELAY2	**Relay 2** Relay 2
RFG	**Ramp function generator** Ramp function generator

2.3 Total index

B

C

2.4 List of illustrations

List of illustrations

3 Safety information

3.1 Contents

3.2 Safety and application notes for Lenze controllers

(in conformity with the Low-Voltage Directive 73/23/EEC)

General

Lenze controllers (frequency inverters, servo inverters, DC controllers) can include live and rotating parts - depending on their type of protection - during operation. Surfaces can be hot.

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

For more detailed information please see the documentation.

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

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

Application as directed

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

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

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

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

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

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

Transport, storage

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

Observe the climatic conditions according to EN 50178.

Installation

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

Ensure proper handling and avoid mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts.

Controllers contain electrostatically sensitive components, which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

Electrical connection

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

The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). Additional information can be obtained from the documentation.

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

Operation

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

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

All covers and doors must be closed during operation.

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

Safe standstill

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

Maintenance and servicing

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

If the ambient air is polluted, the ventilation slots of the controller may be blocked up. For this reason a regular control of the ventilation slots is necessary. Blocked ventilation slots must only be cleaned with a vacuum cleaner, never use sharp or peaked objects!

Disposal

Recycle metals and plastics. Dispose of printed board assemblies according to the state of the art.

The product-specific safety and application notes in these instructions must also be observed!

3.3 General safety and application notes for Lenze motors

(in comformity with the Low-Voltage Directive 73/23/EEC)

General

Low-voltage machines have dangerous, live and rotating parts as well as possibly hot surfaces. All operations serving transport, connection, commissioning and maintenance are to be carried out by skilled, responsible technical personnel (observe EN 50110-1 (VDE 0105-100); IEC 60364). Improper handling can cause severe injuries or damages.

Synchronous machines induce voltages at open terminals during operation.

Application as directed

These low-voltage machines are intended for industrial and commercial installations. They comply with the harmonized standards of the series EN 60034 (VDE O53O). Their use in hazardous areas is prohibited unless they are expressly intended for such use (follow additional instructions).

Degrees of protection ≤ IP23 are only intended for outdoor use when applying special protective measures. Air-cooled designs are rated for ambient temperatures from -15 °C and -10 °C to +40 °C and altitudes ≤ 1000 m a.m.s.l., from -20 °C to +40 °C without brake or with spring-operated brake, with non-ventilated or with integral fan, from -15 °C to +40 °C with permanent magnet brake and from -10 °C to +40 °C with separate fan. Check indications on the nameplate and if other, observe them. The conditions on site must correspond to all nameplate data.

Low-voltage machines are components for the installation into machines as defined in the Machinery Directive 98/37/EC. Commissioning is prohibited until the conformity of the end product with this Directive has been established (follow a.o. EN 60204-1).

The integrated brakes cannot be used as safety brakes. It cannot be guaranteed that factors, which cannot be influenced, such as oil ingression because of a defective A-side shaft seal, cause a torque reduction.

Transport, storage

The forwarder must be informed directly after receipt of the goods about all damages or deficiencies; if necessary, commissioning must be stopped. Tighten screwed-in ring bolts before transport. They are designed for the weight of the low-voltage machine, do not apply extra loads. If necessary, use suitable and adequately dimensioned means of transport (e.g. rope guides).

Remove the shipping brace before commissioning. Reuse it for further transports. For storage of low-voltage machines ensure a dry, dust free and low-vibration (v_{rms} ≤ 0.2 mm/s) environment (damage while being stored). Measure the insulation resistance before commissioning. If the values are ≤ 1 kΩ per volt of rated voltage, dry the winding.

Installation

Ensure an even surface, solid foot or flange mounting and exact alignment if a direct clutch is connected. Avoid resonances with the rotational frequency and double mains frequency which may be caused during assembly. Turn rotor by hand, listen for unusual slipping noises. Check the direction of rotation when the clutch is not active (observe section 5).

Use appropriate tools to mount or remove belt pulleys and clutches (heat generation!) and cover them with a touch guard. Impermissible belt tensions must be avoided (technical list).

The machines are half-key balanced. The clutch must be half-key balanced, too. The visible outstanding part of the key must be removed.

If required, provide pipe connections. Designs with shaft end at bottom must be protected with a cover which prevents the ingression of foreign particles into the fan. Free circulation of the cooling air must be ensured. The exhaust air - also the exhaust air of other machines next to the drive system - must not be taken in again immediately.

Electrical connection

All operations must only be carried out by qualified and skilled personnel when the low-voltage machine is at standstill and when the machine is de-energized and protected against unintentional restart. This also applies to auxiliary circuits (e.g. brake, encoder, separate fan).

Check safe isolation from the supply!

If the tolerances in EN 60034-1; IEC 34 (VDE 0530-1) - voltage ±5 %, frequency ±2 %, wave form, symmetry - are exceeded, more heat will be generated and the electromagnetic compatibility will be influenced.

Observe the indications on the nameplate, operating notes, and the connection diagram in the terminal box.

The connection must ensure a continuous and safe electrical supply (no loose wire ends); use appropriate cable terminals. The connection to the PE conductor must be safe. The plug-in connector must be bolt tightly (to stop).

The clearances between blank, live parts and earth must not fall below 8 mm at $V_r \leq 550$ V, 10 mm at $U_r \leq 725$ V, 14 mm at $U_r \leq 1000$ V.

The terminal box must be clean and dry; foreign particles, dirt and moisture disturb operation. All unused cable entries and the box itself must be sealed against dust and water. For the trial run without output elements, lock the key. Check brake operation before commissioning of low-voltage machines with brakes.

Operation

Vibration severities $v_{rms} \leq 3.5$ mm/s ($P_r \leq 15$ kW) and 4.5 mm/s ($P_r > 15$ kW) are acceptable when the clutch is activated. If deviations from normal operation occur, e.g. increased temperatures, noises, vibrations, find the cause and, if necessary, contact the manufacturer. Switch off the machine in problematic situations.

If the drive is exposed to dirt, clean it regularly.

Do not switch off the protection devices, not even for trial runs.

Integrated temperature sensors do not provide full protection. If necessary, limit the maximum current. Connect the function blocks to the option switch-off after several seconds of operation at $I > I_r$, especially if blocking may occur.

Shaft seals and bearings have a limited service life.

Regrease the bearings using the relubrication facility while the low-voltage machine is running. Observe the saponification number. If the grease drain hole is sealed with a plug (IP54 drive end; IP23 drive end and non-drive end), remove the plug before commissioning. Seal the bore holes with grease. Replace the prelubricated bearings (2Z bearings) after approx. 10,000 h - 20,000 h, at the latest however after 3 - 4 years. Observe the manufacturer's instructions.

3.4 Residual hazards

Protection of persons

- Before working on the controller check that no voltage is applied to the power terminals, the relay output and the pins of the FIF interface,
  – because the power terminals U, V, W, +UG, -UG, BR1 and BR2 remain live for at least 3 minutes after mains switch-off.
  – because the power terminals L1, L2, L3; U, V, W, +UG, -UG, BR1 and BR2 remain live when the motor is stopped.
  – because the relay outputs K11, K12, K14 can remain live when the controller is disconnected from the mains.
- If you use the not-open-circuit protected function “Selection of direction of rotation” via the digital signal DCTRL1-CW/CCW (C0007 = 0 ... 13, C0410/3 ≠ 255):
  – In the event of an open circuit or failure of the control voltage, the drive can change its direction of rotation.
- If you use the function ”Flying-restart circuit” (C0142 = 2, 3) with machines with a low moment of inertia and a minimum friction:
  – After controller enable in standstill, the motor can start for a short time or change its direction of rotation for a short time.
- The heat sink of the controller has an operating temperature of > 80°C:
  – Direct skin contact with the heat sink 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 supply voltage can overload and destroy the input current limitation of the controller:
  – In case of cyclic mains switching over a longer period of time three minutes have to pass between two starting operations!

Motor protection

- 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.

Controller/system protection

- Drives 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.

c UL us

Warnings!
- The device has no overspeed protection.
- Must be provided with external or remote overload protection.
- Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 240 V maximum (240 V devices) or 500 V maximum (400/500 V devices) resp.
- Use 60/75 °C or 75 °C copper wire only.
- Shall be installed in a pollution degree 2 macro-environment.

3.5 Layout of safety notes

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

Pictograph (indicates the type of danger)

Signal word! (indicates the severity of danger)

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

Pictograph	Signal word		Possible consequences if the safety information are disregarded
	Signal word	Meaning	
Dangerous electrical voltage General danger	**Danger!**	**Impending danger for persons**	Death or most severe injuries
	Warning!	**Possible, very dangerous situation for persons**	Death or most severe injuries
	Caution!	**Possible, dangerous situation for persons**	Injuries
STOP	**Stop!**	**Possible material damage**	Damage of the drive system or its surroundings
	Note!	**Useful note or tip** If you observe it, handling of the drive system will be easier.	

4 Technical data

4.1 Contents

4.2 General data/application conditions

Standards and application conditions

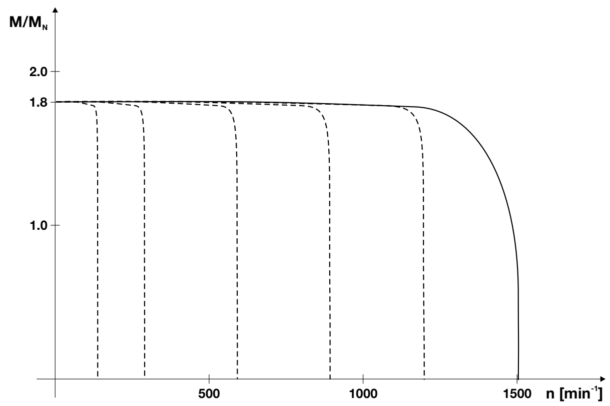
Conformity	CE	Low-Voltage Directive (73/23/EEC)
Approvals	UL 508C	Underwriter Laboratories (File-No. E132659) Power Conversion Equipment
Max. permissible motor cable length	For rated mains voltage and chopper frequency of 8 kHz without additional output filters	
shielded	50 m	For compliance with EMC regulations, the permissible cable lengths must be changed
unshielded	100 m	
Vibration resistance	Acceleration resistance up to 0.7g (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 ranges		
Transport	-25 °C ... +70 °C	
Storage	-25 °C ... +60 °C	
Operation	-10 °C ... +55 °C	above +40 °C the rated output current is to be reduced by 2.5 %/°C
	-10 °C ... +50 °C (only 8200 vector 15 ... 90 kW)	
Permissible installation height	0 ... 4000 m amsl	above 1000 m amsl the rated output current is to be reduced by 5 %/1000 m
Mounting positions	vertical	
Mounting clearances		
above/below	≥100 mm	
to the sides	Side-by-side mounting with a distance of 3 mm	
DC group operation	possible, except E82EV251K2C and E82EV371K2C	

General technical data

EMC	Compliance with EN 61800-3/A11		
Noise emission	Compliance with limit value classes A and B to EN 55011		
0.25 ... 11 kW	E82xVxxxKxC0xx	without additional measures	
	E82xVxxxKxC2xx	by means of external filters	
15 ... 90 kW	E82EVxxxK4B3xx	without additional measures	
	E82xVxxxK4B2xx	by means of external filters	
Noise immunity	Requirements to EN 61800-3 incl. A11 noise immunity		
	Requirements	**Standard**	**Severities**
	ESD	EN 61000-4-2	3, i.e. 8 kV with air discharge, 6 kV with contact discharge
	High frequency in cables	EN 61000-4-6	150 kHz ... 80 MHz, 10 V/m 80 % AM (1kHz)
	RF interference (enclosure)	EN 61000-4-3	80 MHz ... 1000 MHz, 10 V/m 80 % AM (1kHz)
	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 resistance	Overvoltage category III acc. to VDE 0110		
Discharge current to PE (to EN 50178)	> 3.5 mA, i. e. fixed installation and double PE connection are required.		
Enclosure	IP20		
Protection measures against	Short circuit, earth fault (earth-fault protected during operation, limited earth-fault protection during power up), motor stalling, motor overtemperature (input for PTC or thermal contact, I^2t monitoring)		
Insulation of control circuits	Safe mains isolation: Double/reinforced insulation to EN 50178		
Permissible mains types	Operation at TT systems, TN systems or systems with grounded star point without additional measures		
	Operation at IT systems is only possible with variant "1xx" of the 8200 vector basic devices 15 ... 90 kW		
Operation in public supply networks	Limitation of harmonic currents according to EN 61000-3-2		
	Total power connected to the mains	Compliance with the requirements [1]	
	< 0.5 kW	With mains choke	
	0.5 kW ... 1 kW	With active filter (in preparation)	
	> 1 kW	Without additional measures	

[1] The additional measures described only ensure that the controllers meet the requirements of the EN 61000-3-2. The machine/system manufacturer is responsible for the compliance with the regulations of the machine!

Control

Control types	V/f characteristic control (linear/square-law), vector control, torque selection	
Chopper frequency		
0.25 ... 11 kW	2 kHz, 4 kHz, 8 kHz, 16 kHz with optimised noise level	
15 ... 90 kW	1 kHz, 2 kHz, 4 kHz, 8 kHz, 16 kHz, optionally with optimised noise level or optimised power loss	
Torque characteristic		
Maximum torque 0.25 ... 11 kW	1.8 x M_r for 60s	if rated motor power = rated controller power
Maximum torque 15 ... 90 kW	1.8 x M_r for 60s 2.1 x M_r for 3 s after controller enable	
Setting range	1:10	over the speed range of 3 ... 50 Hz, accuracy < 8 %
Torque/speed characteristic		
Vector control (sensorless speed control)		
Minimum output frequency	1.0 Hz (0 ... M_r)	
Setting range	1 : 50	Ref. to 50 Hz and M_r
Accuracy	± 0.5 %	over the speed range 3 ... 50 Hz
Smooth running	± 0.1 Hz	
Output frequency		
Field	- 650 Hz ... + 650 Hz	
Absolute resolution	0.02 Hz	
Normalised resolution	Parameter data: 0.01 %, process data: 0.006 % (= 2^{14})	
Digital setpoint selection		
Accuracy	± 0.0001 %	
Analog setpoint selection		
Linearity	± 0.5 %	related to instantaneous value
Temperature sensitivity	+ 0.3 % (0 ... +60 °C)	related to instantaneous value
Offset	± 0 %	
A/D converter	Resolution 10 bits	
	Fault 1 digit	≡ 0.1 % related to final value

Inputs and outputs

Analog inputs **Analog outputs**		
With standard I/O	1 input, optionally bipolar 1 output	
With application I/O	2 inputs, optionally bipolar 2 inputs, optionally bipolar	
Digital inputs **Digital outputs**		
With standard I/O	4 inputs	optionally 1 frequency input single-track 0 ... 10 kHz or double-track 0 ... 1 kHz
	1 input for controller inhibit 1 output	
With application I/O	6 inputs	optionally 1 frequency input single-track/double-track 0 ... 100 kHz;
	1 input for controller inhibit 2 outputs, 1 frequency output 50 Hz ... 10 kHz	
Cycle times		
Digital inputs	1 ms	
Digital outputs	4 ms	
Analog inputs	2 msec	
Analog outputs	4 ms (smoothing time: τ = 10 ms)	
Relay output		
0.25 ... 11 kW	1 relay output (changeover contact)	AC 250 V/3 A, DC 24 V/2 A ... 240 V/0.16 A
15 ... 90 kW	2 relay outputs (changeover contact)	AC 250 V/3 A, DC 24 V/2 A ... 240 V/0.22 A
Operation in generator mode		
0.25 ... 11 kW	Integrated brake transistor	
15 ... 90 kW	With brake chopper 8253 or 9352	

4.3 Operation with rated power (normal operation)

4.3.1 Rated data for mains voltage 230 V

Typical motor power Three-phase AC asynchronous motor (4 pole)		**P_r [kW]**	**0.25**	**0.37**
		P_r [hp]	0.34	0.5
8200 vector type		EMC filter integrated	**E82EV251K2C0xx**	**E82EV371K2C0xx**
		Without EMC filter	**E82EV251K2C2xx**	**E82EV371K2C2xx**
Mains voltage		U_{mains} [V]	1/N/PE AC 180 V - 0 % ... 264 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %	
Alternative DC supply		U_{DC} [V]	not possible	
Data for operation with 1/N/PE AC 230 V				
Rated mains current	without mains choke	I_{mains}[A]	3.4	5.0
	with mains choke	I_{mains} [A]	3.0	4.2
Output power U, V, W		**S_r [kVA]**	**0.68**	**1.0**
Output power $+U_G$, $-U_G$ 2)		P_{DC} [kW]	DC bus operation not possible	
Rated output current at chopper frequency	2 kHz sin 4 kHz sin	I_r [A] 5)	1.7	2.4
	8 kHz sin	**I_r [A]**	**1.7**	**2.4**
	16 kHz sin 4)	I_r [A]	1.1	1.6
Max. permissible output current for 60 s at chopper frequency 3)	2 kHz sin 4 kHz sin	I_{max} [A]	2.5	3.6
	8 kHz sin	**I_{max} [A]**	**2.5**	**3.6**
	16 kHz sin 4)	I_{max} [A]	1.7	2.3
Output voltage	without mains choke	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz	
	with mains choke	U_M [V]	3~ 0 ... approx. 94 % U_{mains} / 0 ... 650 Hz	
Power loss (operation with I_{r8})		P_v [W]	30	40
Required mains choke		Type	-	-
Dimensions		H x W x D [mm]	120 x 60 x 140	
Weight		m [kg]	0.8	0.8

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

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

4) Chopper frequency is reduced to 4 kHz if ϑ_{max} reaches - 5 °C

5) Possible for other types with different application conditions: Operation with increased rated output current and the same load change (📖 4.4-1)

4.3 Operation with rated power (normal operation)

4.3.1 Rated data for mains voltage 230 V

Typical motor power Three-phase AC asynchronous motor (4 pole)		**P_r [kW]**	**0.55**		**0.75**		**1.5**		**2.2**	
		P_r [hp]	0.75		1.0		2.0		3.0	
8200 vector type		EMC filter integrated	**E82EV551K2C0xx**		**E82EV751K2C0xx**		**E82EV152K2C0xx**		**E82EV222K2C0xx**	
		Without EMC filter	**E82EV551K2C2xx**		**E82EV751K2C2xx**		**E82EV152K2C2xx**		**E82EV222K2C2xx**	
Mains voltage		U_{mains} [V]	1/N/PE AC 180 V - 0 % ... 264 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 % 3/PE AC 100 V - 0 % ... 264 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %							
Alternative DC supply		U_{DC} [V]	DC 140 V - 0 % ... 370 V + 0 %							
Data for operation with 1/N/PE (3/PE) AC 230 V or DC 325 V			1/N/PE	3/PE	1/N/PE	3/PE	1/N/PE	3/PE	1/N/PE 1)	3/PE
Rated mains current	without mains choke	I_{mains} [A]	6.0	3.9	9.0	5.2	15.0	9.1	-	12.4
	with mains choke	I_{mains} [A]	5.6	2.7	7.5	3.6	12.5	6.3	18.0	9.0
Output power U, V, W		**S_r [kVA]**	**1.2**		**1.6**		**2.8**		**3.8**	
Output power $+U_G$, $-U_G$ 2)		P_{DC} [kW]	-	0.3	-	0.1	-	1.1	-	0.4
Rated output current at chopper frequency	2 kHz sin 4 kHz sin	I_r [A] 5)	3.0		4.0		7.0		9.5	
	8 kHz sin	**I_r [A]**	**3.0**		**4.0**		**7.0**		**9.5**	
	16 kHz sin 4)	I_r [A]	2.0		2.6		4.6		6.2	
Max. permissible output current for 60 s at chopper frequency 3)	2 kHz sin 4 kHz sin	I_{max} [A]	4.5		6.0		10.5		14.2	
	8 kHz sin	**I_{max} [A]**	**4.5**		**6.0**		**10.5**		**14.2**	
	16 kHz sin 4)	I_{max} [A]	2.9		3.9		6.9		9.3	
Output voltage	without mains choke/mains filter	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz							
	with mains choke/mains filter	U_M [V]	3~ 0 ... approx. 94 % U_{mains} / 0 ... 650 Hz							
Power loss (operation with I_{r8})		P_V [W]	50		60		100		130	
Required mains choke		Type	-		-		-		ELN1-0250H018	-
Dimensions		H x W x D [mm]	180 x 60 x 140				240 x 60 x 140			
Weight		m [kg]	1.2				1.6			

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

1) Operation only with mains choke

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

4) Chopper frequency is reduced to 4 kHz if ϑ_{max} reaches - 5 °C

5) With different application conditions for other types possible: Operation with increased rated output current and the same load change (📖 4.4-1)

Technical data

Operation with rated power (normal operation)

Rated data for mains voltage 230 V

Typical motor power Three-phase AC asynchronous motor (4 pole)		P_r [kW]	**3.0**	**4.0**	**5.5**	**7.5**
		P_r [hp]	4.1	5.4	7.5	10.2
8200 vector type		EMC filter integrated	**E82EV302K2C0xx**	**E82EV402K2C0xx**	**E82EV552K2C0xx**	**E82EV752K2C0xx** 1)
		without EMC filter	**E82EV302K2C2xx**	**E82EV402K2C2xx**	**E82EV552K2C2xx**	**E82EV752K2C2xx** 1)
Mains voltage		U_{mains} [V]	3/PE AC 100 V - 0 % ... 264 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %			
Alternative DC supply		U_{DC} [V]	DC 140 V - 0 % ... 370 V + 0 %			
Data for operation with 3/PE AC 230 V or DC 325 V						
Rated mains current without mains choke		I_{mains} [A]	15.6	21.3	29.3	-
Rated mains current with mains choke		I_{mains} [A]	12.0	16.0	21.0	28.0
Output power U, V, W		**S_r [kVA]**	**4.8**	**6.6**	**9.0**	**11.4**
Output power $+U_G$, $-U_G$ 2)		P_{DC} [kW]	0.9	0.8	1.1	0
Rated output current at chopper frequency	2 kHz sin 4 kHz sin	I_r [A] 5)	12.0	19.8	22.5	28.6
	8 kHz sin	**I_r [A]**	**12.0**	**16.5**	**22.5**	**28.6**
	16 kHz sin 4)	I_r [A]	7.8	10.7	14.6	18.6
Max. permissible output current for 60 s at chopper frequency 3)	2 kHz sin 4 kHz sin	I_{max} [A]	18.0	24.8	33.8	42.9
	8 kHz sin	**I_{max} [A]**	**18.0**	**24.8**	**33.8**	**42.9**
	16 kHz sin 4)	I_{max} [A]	11.7	16.1	21.9	27.9
Output voltage without mains choke/mains filter		U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz			
Output voltage with mains choke/mains filter		U_M [V]	3~ 0 ... approx. 94 % U_{mains} / 0 ... 650 Hz			
Power loss (operation with I_{r8})		P_V [W]	150	190	250	320
Required mains choke		Type	-	-	-	ELN3-0088H035
Dimensions		H x W x D [mm]	240 x 100 x 140		240 x 125 x 140	
Weight		m [kg]	2,9		3.6	

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

1) Operation only with mains choke

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

4) Chopper frequency is reduced to 4 kHz if ϑ_{max} reaches - 5 °C

5) With different application conditions for other types possible: Operation with increased rated output current and the same load change (4.4-1)

Fuses and cable cross-sections (operation with rated power, mains voltage 230 V)

8200 vector		Mains	Operation without mains choke					FI
			Installation to EN 60204-1			Installation to UL [1]		
Type	[kW]		①	②	L1, L2, L3, PE [mm²]	①	L1, L2, L3, PE [AWG]	
E82EV251K2C	0.25	1/N/PE AC 2/PE AC 180 ... 264 V; 45 ... 65 Hz	M10 A	C10 A	1.5	10 A	16	≥ 30 mA [2]
E82EV371K2C	0.37		M10 A	C10 A	1.5	10 A	16	
E82EV551K2C	0.55		M10 A	B10 A	1.5	10 A	16	
E82EV751K2C	0.75		M16 A	B16 A	2.5	15 A	14	
E82EV152K2C	1.5		M20 A	B20 A	2 x 1.5	20 A	2 x 16	
E82EV222K2C	2.2		Operation only with mains choke					
E82EV551K2C	0.55	3/PE AC 100 ... 264 V; 45 ... 65 Hz	M6 A	B6 A	1	5 A	18	≥ 30 mA [3]
E82EV751K2C	0.75		M10 A	B10 A	1.5	10 A	16	
E82EV152K2C	1.5		M16 A	B16 A	2.5	15 A	14	
E82EV222K2C	2.2		M16 A	B16 A	2.5	15 A	14	
E82EV302K2C	3.0		M20 A	B20 A	4	20 A	12	≥ 300 mA [4] ≥ 30 mA [5]
E82EV402K2C	4.0		M25 A	B25 A	4	25 A	10	
E82EV552K2C	5.5		M35 A	-	6 [6]	35 A	8	
E82EV752K2C	7.5		Operation only with mains choke					

8200 vector		Mains	Operating with mains choke					FI
			Installation to EN 60204-1			Installation to UL [1]		
Type	[kW]		①	②	L1, L2, L3, PE [mm²]	①	L1, L2, L3, PE [AWG]	
E82EV251K2C	0.25	1/N/PE AC 2/PE AC 180 ... 264 V; 45 ... 65 Hz	M10 A	C10 A	1.5	10 A	16	≥ 30 mA [2]
E82EV371K2C	0.37		M10 A	C10 A	1.5	10 A	16	
E82EV551K2C	0.55		M10 A	B10 A	1.5	10 A	16	
E82EV751K2C	0.75		M10 A	B10 A	1.5	10 A	16	
E82EV152K2C	1.5		M16 A	B16 A	2 x 1.5	15 A	2 x 16	
E82EV222K2C	2.2		M20 A	B20 A	2 x 1.5	20 A	2 x 16	
E82EV551K2C	0.55	3/PE AC 100 ... 264 V; 45 ... 65 Hz	M6 A	B6 A	1	5 A	18	≥ 30 mA [3]
E82EV751K2C	0.75		M6 A	B6 A	1	5 A	18	
E82EV152K2C	1.5		M10 A	B10 A	1.5	10 A	16	
E82EV222K2C	2.2		M10 A	B10 A	1.5	10 A	16	
E82EV302K2C	3.0		M16 A	B16 A	2.5	15 A	14	≥ 300 mA [4] ≥ 30 mA [5]
E82EV402K2C	4.0		M20 A	B20 A	4	20 A	12	
E82EV552K2C	5.5		M25 A	B25 A	4	25 A	10	
E82EV752K2C	7.5		M35 A	-	6 [6]	35 A	8	

① Fuse

② E.l.c.b.

[1] Use UL-approved cables, fuses and fuse holders only.
UL fuse: voltage 240 V, tripping characteristic "H" or "K5"

[2] Pulse-current or universal-current sensitive earth leakage circuit breaker

[3] All-current sensitive e.l.c.b.

[4] All-current sensitive e.l.c.b. for use with E82EVxxxK2C0xx

[5] All-current sensitive e.l.c.b. for use with E82EVxxxK2C2xx

[6] Flexible cable can only be connected using pin end connectors.

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

4.3.2 Rated data for mains voltage 400 V

Typical motor power Three-phase AC asynchronous motor (4 pole)	**P_r [kW]**	**0.55**	**0.75**	**1.5**	**2.2**
	P_r [hp]	0.75	1.0	2.0	3.0
8200 vector type	EMC filter integrated	**E82EV551K4C0xx** [6]	**E82EV751K4C0xx** [6]	**E82EV152K4C0xx** [6]	**E82EV222K4C0xx** [6]
	Without EMC filter	**E82EV551K4C2xx**	**E82EV751K4C2xx**	**E82EV152K4C2xx**	**E82EV222K4C2xx**
Mains voltage	U_{mains} [V]	3/PE AC 320 V - 0 % ... 550 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %			
Alternative DC supply	U_{DC} [V]	DC 450 V - 0 % ... 775 V + 0 %			
Data for operation with 3/PE AC 400 V or DC 565 V					
Rated mains current					
without mains choke	I_{mains} [A]	2.5	3.3	5.5	7.3
with mains choke	I_{mains} [A]	2.0	2.3	3.9	5.1
Output power U, V, W	**S_r [kVA]**	**1.3**	**1.7**	**2.7**	**3.9**
Output power $+U_G$, $-U_G$ [2]	P_{DC} [kW]	0.3	0.1	1.1	0.4
Rated output current at chopper frequency 2 kHz sin / 4 kHz sin	I_r [A] [5]	1.8	2.4	4.7	5.6
8 kHz sin	**I_r [A]**	**1.8**	**2.4**	**3.9**	**5.6**
16 kHz sin [4]	I_r [A]	1.2	1.6	2.5	3.6
Max. permissible output current for 60 s at chopper frequency [3] 2 kHz sin / 4 kHz sin	I_{max} [A]	2.7	3.6	5.9	8.4
8 kHz sin	**I_{max} [A]**	**2.7**	**3.6**	**5.9**	**8.4**
16 kHz sin [4]	I_{max} [A]	1.8	2.4	3.8	5.5
Output voltage					
without mains choke	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz			
with mains choke	U_M [V]	3~ 0 ... approx. 94 % U_{mains} / 0 ... 650 Hz			
Power loss (operation with I_{r8})	P_V [W]	50	60	100	130
Required mains choke	Type	-	-	-	-
Required brake resistor [6]	Type	ERBM470R100W		ERBM370R150W	ERBM240R200W
Dimensions	H x W x D [mm]	180 x 60 x 140		240 x 60 x 140	
Weight	m [kg]	1.2		1.6	

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

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

4) Chopper frequency is reduced to 4 kHz if ϑ_{max} reaches - 5 °C

5) Possible for other types with different application conditions: Operation with increased rated output current and the same load change (📖 4.4-4)

6) Operation at mains voltages 484 V - 0 % ... 550 V + 0 % is only permissible with brake resistor!

Typical motor power Three-phase AC asynchronous motor (4 pole)		P_r **[kW]**	**3.0**	**4.0**	**5.5**	**7.5**	**11**
		P_r [hp]	4.1	5.4	7.5	10.2	15
8200 vector type		EMC filter integrated	**E82EV302K4C0xx**	**E82EV402K4C0xx**	**E82EV552K4C0xx**	**E82EV752K4C0xx**	**E82EV113K4C0xx** [1]
		Without EMC filter	**E82EV302K4C2xx**	**E82EV402K4C2xx**	**E82EV552K4C2xx**	**E82EV752K4C2xx**	**E82EV113K4C2xx** [1]
Mains voltage		U_{mains} [V]	3/PE AC 320 V - 0 % ... 550 V + 0 % ; 45 Hz - 0 % ... 65Hz + 0 %				
Alternative DC supply		U_{DC} [V]	DC 450 V - 0 % ... 775 V + 0 %				
Data for operation with 3/PE AC 400 V or DC 565 V							
Rated mains current without mains choke		I_{mains} [A]	9.0	12.3	16.8	21.5	-
Rated mains current with mains choke		I_{mains} [A]	7.0	8.8	12.0	15.0	21.0
Output power U, V, W		S_r **[kVA]**	**5.1**	**6.6**	**9.0**	**11.4**	**16.3**
Output power $+U_G$, $-U_G$ [2]		P_{DC} [kW]	1.7	0.8	1.1	1.5	0
Rated output current at chopper frequency	2 kHz sin / 4 kHz sin	I_r [A] [5]	7.3	9.5	13.0	16.5	23.5
	8 kHz sin	I_r **[A]**	**7.3**	**9.5**	**13.0**	**16.5**	**23.5**
	16 kHz sin [4]	I_r [A]	4.7	6.1	8.4	10.7	13.0
Max. permissible output current for 60 s at chopper frequency [3]	2 kHz sin / 4 kHz sin	I_{max} [A]	11.0	14.2	19.5	24.8	35.3
	8 kHz sin	I_{max} **[A]**	**11.0**	**14.2**	**19.5**	**24.8**	**35.3**
	16 kHz sin [4]	I_{max} [A]	7.0	9.1	12.6	16.0	19.5
Output voltage without mains choke		U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz				
Output voltage with mains choke		U_M [V]	3~ 0 ... approx. 94 % U_{mains} / 0 ... 650 Hz				
Power loss (operation with I_{r8})		P_V [W]	145	180	230	300	410
Required mains choke		Type	-	-	-	-	ELN3-150H024
Dimensions		H x W x D [mm]	240 x 100 x 140			240 x 125 x 140	
Weight		m [kg]	2.9			3.6	

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

1) Operation only with mains choke

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

4) Chopper frequency is reduced to 4 kHz if ϑ_{max} reaches - 5 °C

5) With different application conditions for other types possible: Operation with increased rated output current and the same load change (4.4-4)

Technical data

Operation with rated power (normal operation)

Rated data for mains voltage 400 V

Typical motor power Three-phase AC asynchronous motor (4 pole)		**P_r [kW]**	**15**	**22**	**30**
		P_r [hp]	20	30	40
8200 vector type		With mains filter	**E82EV153K4B3xx**	**E82EV223K4B3xx**	**E82EV303K4B3xx**
		Without mains filter	**E82EV153K4B2xx**	**E82EV223K4B2xx** 1)	**E82EV303K4B2xx** 1)
Mains voltage		U_{mains} [V]	3/PE AC 320 V - 0 % ... 550 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %		
Alternative DC supply		U_{DC} [V]	DC 450 V - 0 % ... 775 V + 0 %		
Data for operation with 3/PE AC 400 V or DC 565 V					
Rated mains current	Without mains choke	I_{mains} [A]	43.5	-	-
	With mains choke	I_{mains} [A]	29.0	42.0	55.0
Output power U, V, W		**S_r [kVA]**	**22.2**	**32.6**	**41.6**
Output power $+U_G$, $-U_G$ 2)		P_{DC} [kW]	10.2	4.0	0
Rated output current at chopper frequency	1 kHz sin 2 kHz sin 4 kHz sin	I_r [A] 5)	32	47	59
	8 kHz sin	I_r [A]	29	43	47 6)
	16 kHz sin 4)	I_r [A]	21	30	35
	1 kHz 2 kHz 4 kHz	I_r [A] 5)	32	47	59
	8 kHz	**I_r [A]**	**32**	**47**	**59**
	16 kHz 4)	I_r [A]	24	35	44
Max. permissible output current for 60 s at chopper frequency 3)	1 kHz sin 2 kHz sin 4 kHz sin	I_{max} [A]	48	70.5	89
	8 kHz sin	I_{max} [A]	43	64	70 6)
	16 kHz sin 4)	I_{max} [A]	31	46	53
	1 kHz 2 kHz 4 kHz	I_{max} [A]	48	70.5	89
	8 kHz	**I_{max} [A]**	**48**	**70.5**	**89**
	16 kHz 4)	I_{max} [A]	36	53	66
Output voltage	without mains choke	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz		
	with mains choke	U_M [V]	3~ 0 ... approx. 94 % U_{mains} / 0 ... 650 Hz		
Power loss (operation with I_{r8})		P_v [W]	430	640	810
Required mains choke		type]	-	ELN3-0075H045	ELN3-0055H055
Dimensions	with mains filter	H x W x D [mm]	350 x 250 x 340		
	without mains filter	H x W x D [mm]	350 x 250 x 250		
Weight	with mains filter	m [kg]	34		
	without mains filter	m [kg]	15		

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

1) Operation only with mains choke or mains filter

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

4) Chopper frequency is reduced to 4 kHz if ϑ_{max} reaches - 5 °C

5) With different application conditions for other types possible: Operation with increased rated output current and the same load change (📖 4.4-4)

6) Operation only with automatic chopper frequency reduction (C144 = 1). Ensure not to exceed the declared currents.

Typical motor power Three-phase AC asynchronous motor (4 pole)		P_r[kW]	45	55	75	90
		P_r [hp]	60	75	100	120
8200 vector type		With mains filter	**E82EV453K4B3xx**	**E82EV553K4B3xx**	**E82EV753K4B3xx**	**E82EV903K4B3xx**
		Without mains filter	**E82EV453K4B2xx** [1]	**E82EV553K4B2xx** [1]	**E82EV753K4B2xx** [1]	**E82EV903K4B2xx** [1]
Mains voltage		U_{mains} [V]	3/PE AC 320 V - 0 % ... 550 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %			
Alternative DC supply		U_{DC} [V]	DC 450 V - 0 % ... 775 V + 0 %			
Data for operation with 3/PE AC 400 V or DC 565 V						
Rated mains current	without mains choke	I_{mains} [A]	-	-	-	-
	with mains choke	I_{mains} [A]	80.0	100	135	165
Output power U, V, W		**S_r [kVA]**	**61.7**	**76.2**	**103.9**	**124.7**
Output power $+U_G$, $-U_G$ [2]		P_{DC} [kW]	5.1	0	28.1	40.8
Rated output current at chopper frequency	1 kHz sin 2 kHz sin 4 kHz sin	I_r [A] [5]	89	110	150	159 [6]
	8 kHz sin	I_r [A]	59 [6]	76 [6]	92 [6]	100 [6]
	16 kHz sin [4]	I_r [A]	46	60	67	72
	1 kHz 2 kHz 4 kHz	I_r [A] [5]	89	110	150	180
	8 kHz	**I_r [A]**	**89**	**110**	**150**	**171**
	16 kHz [4]	I_r [A]	54	77	105	108
Max. permissible output current for 60 s at chopper frequency [3]	1 kHz sin 2 kHz sin 4 kHz sin	I_{max} [A]	134	165	225	238 [6]
	8 kHz sin	I_{max} [A]	88 [6]	114 [6]	138 [6]	150 [6]
	16 kHz sin [4]	I_{max} [A]	69	78	87	94
	1 kHz 2 kHz 4 kHz	I_{max} [A]	134	165	225	270
	8 kHz	**I_{max} [A]**	**134**	**165**	**225**	**221**
	16 kHz [4]	I_{max} [A]	81	100	136	140
Output voltage	without mains choke	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz			
	with mains choke	U_M [V]	3~ 0 ... approx. 94 % U_{mains} / 0 ... 650 Hz			
Power loss (operation with I_{r8})		P_V [W]	1100	1470	1960	2400
Required mains choke		Type	ELN3-0038H085	ELN3-0027H105	ELN3-0022H130	ELN3-0017H170
Dimensions	with mains filter	H x W x D [mm]	510 x 340 x 375	591 x 340 x 375	680 x 450 x 375	
	without mains filter	H x W x D [mm]	510 x 340 x 285	591 x 340 x 285	680 x 450 x 285	
Weight	with mains filter	m [kg]	60	66	112	
	without mains filter	m [kg]	34	37	59	

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

1) Operation only with mains choke or mains filter

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_{rx}

4) Chopper frequency is reduced to 4 kHz if ϑ_{max} reaches - 5 °C

5) Possible for other types with different application conditions: Operation with increased rated output current and the same load change (📖 4.4-4)

6) Operation only with automatic chopper frequency reduction (C144 = 1). Ensure not to exceed the declared currents.

Technical data

Operation with rated power (normal operation)

Rated data for mains voltage 400 V

Fuses and cable cross-sections (operation with rated power, mains voltage 400 V)

			Operation without mains choke					
			Installation to EN 60204-1			Installation to UL [1]		
8200 vector		**mains**	①	②	L1, L2, L3, PE	①	L1, L2, L3, PE	**FI**
Type	[kW]				[mm^2]		[AWG]	
E82EV551K4C	0.55	3/PE AC 320 ... 440 V; 45 ... 65 Hz	M6 A	B6 A	1	5 A	18	≥ 300 mA [2] ≥ 30 mA [3]
E82EV751K4C	0.75		M6 A	B6 A	1	5 A	18	
E82EV152K4C	1.5		M10 A	B10 A	1.5	10 A	16	
E82EV222K4C	2.2		M10 A	B10 A	1.5	10 A	16	
E82EV302K4C	3.0		M16 A	B16 A	2.5	15 A	14	
E82EV402K4C	4.0		M16 A	B16 A	2.5	15 A	14	
E82EV552K4C	5.5		M25 A	B25 A	4	20 A	12	
E82EV752K4C	7.5		M32 A	B32 A	6 [4]	25 A	10	
E82EV113K4C	11		Operation only with mains choke					
E82EV153K4B	15		M63 A	-	25	63 A	4	≥ 300 mA
E82EV223K4B	22		Operation only with mains choke					
E82EV303K4B	30							
E82EV453K4B	45							
E82EV553K4B	55							
E82EV753K4B	75							
E82EV903K4B	90							

			Operation with mains choke					
			Installation to EN 60204-1			Installation to UL [1]		
8200 vector		**mains**	①	②	L1, L2, L3, PE	①	L1, L2, L3, PE	**FI**
Type	[kW]				[mm^2]		[AWG]	
E82EV551K4C	0.55	3/PE AC 320 ... 440 V; 45 ... 65 Hz	M6 A	B6 A	1	5 A	18	≥ 300 mA [2] ≥ 30 mA [3]
E82EV751K4C	0.75		M6 A	B6 A	1	5 A	18	
E82EV152K4C	1.5		M10 A	B10 A	1.5	10 A	16	
E82EV222K4C	2.2		M10 A	B10 A	1.5	10 A	16	
E82EV302K4C	3.0		M10 A	B10 A	1.5	10 A	16	
E82EV402K4C	4.0		M16 A	B16 A	2.5	15 A	14	
E82EV552K4C	5.5		M20 A	B20 A	4	20 A	12	
E82EV752K4C	7.5		M20 A	B20 A	4	20 A	12	
E82EV113K4C	11		M32 A	B32 A	6 [4]	25 A	10	
E82EV153K4B	15		M35 A	-	10	35 A	8	≥ 300 mA
E82EV223K4B	22		M50 A	-	16	50 A	6	
E82EV303K4B	30		M80 A	-	25	80 A	3	
E82EV453K4B	45		M100 A	-	50	100 A	1	
E82EV553K4B	55		M125 A	-	50	125 A	0	
E82EV753K4B	75		M160 A	-	70	175 A	2/0	
E82EV903K4B	90		M200 A	-	95	200 A	3/0	

① Fuse

② E.l.c.b.

1) Use UL-approved cables, fuses and fuse holders only.
UL fuse: Voltage 500 ... 600 V, tripping characteristic "H" or "K5"

2) All-current sensitive e.l.c.b. for use with E82EVxxxK4C0xx

3) All-current sensitive e.l.c.b. for use with E82EVxxxK4C2xx

4) Flexible cable can only be connected using pin end connectors.

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

4.3.3 Rated data for mains voltage 500 V

Typical motor power Three-phase AC asynchronous motor (4 pole)		**P_r [kW]**	**0.55**	**0.75**	**1.5**	**2.2**
		P_r [hp]	0.75	1.0	2.0	3.0
8200 vector type		EMC filter integrated	**E82EV551K4C0xx** 6)	**E82EV751K4C0xx** 6)	**E82EV152K4C0xx** 6)	**E82EV222K4C0xx** 6)
		Without EMC filter	**E82EV551K4C2xx**	**E82EV751K4C2xx**	**E82EV152K4C2xx**	**E82EV222K4C2xx**
Mains voltage		U_{mains} [V]	3/PE AC 320 V - 0 % ... 550 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %			
Alternative DC supply		U_{DC} [V]	DC 450 V - 0 % ... 775 V + 0 %			
Data for operation with 3/PE AC 500 V or DC 710 V						
Rated mains current	without mains choke	I_{mains} [A]	2.0	2.6	4.4	5.8
	with mains choke	I_{mains} [A]	1.4	1.8	3.1	4.1
Output power U, V, W		**S_r [kVA]**	**1.3**	**1.7**	**2.7**	**3.9**
Output power $+U_G$, $-U_G$ 2)		P_{DC} [kW]	0.3	0.1	1.1	0.4
Rated output current at chopper frequency	2 kHz sin / 4 kHz sin	I_r [A]	1.4	1.9	3.1	4.5
	8 kHz sin	**I_r [A]**	**1.4**	**1.9**	**3.1**	**4.5**
	16 kHz sin 4)	I_r [A]	0.9 5)	1.2 5)	2.0	2.9
Max. permissible output current for 60 s at chopper frequency 3)	2 kHz sin / 4 kHz sin	I_{max} [A]	2.7	3.6	5.9	8.4
	8 kHz sin	**I_{max} [A]**	**2.7**	**3.6**	**5.9**	**8.4**
	16 kHz sin 4)	I_{max} [A]	1.35 5)	1.85 5)	3.0	4.4
Output voltage	without mains choke	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz			
	with mains choke	U_M [V]	3~ 0 ... approx. 94 % U_{mains} / 0 ... 650 Hz			
Power loss (operation with I_{r8})		P_v [W]	50	60	100	130
Required mains choke		Type	-	-	-	-
Required brake resistor 6)		Type	ERBM470R100W		ERBM370R150W	ERBM240R200W
Dimensions		H x W x D [mm]	180 x 60 x 140		240 x 60 x 140	
Weight		m [kg]	1.2		1.6	

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

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

4) Chopper frequency is reduced to 4 kHz if ϑ_{max} reaches - 5 °C

5) Maximum motor cable length 10 m!

6) Operation at mains voltages 484 V - 0 % ... 550 V + 0 % is only permissible with brake resistor!

Technical data

Operation with rated power (normal operation)

Rated data for mains voltage 500 V

Typical motor power Three-phase AC asynchronous motor (4 pole)		**P_r [kW]**	**3.0**	**4.0**	**5.5**	**7.5**	**11**
		P_r [hp]	4.1	5.4	7.5	10.2	15
8200 vector type		EMC filter integrated	**E82EV302K4C0xx**	**E82EV402K4C0xx**	**E82EV552K4C0xx**	**E82EV752K4C0xx**	**E82EV113K4C0xx** 1)
		Without EMC filter	**E82EV302K4C2xx**	**E82EV402K4C2xx**	**E82EV552K4C2xx**	**E82EV752K4C2xx**	**E82EV113K4C2xx** 1)
Mains voltage		U_{mains} [V]	3/PE AC 320 V - 0 % ... 550 V + 0 % ; 45 Hz - 0 % ... 65Hz + 0 %				
Alternative DC supply		U_{DC} [V]	DC 450 V - 0 % ... 775 V + 0 %				
Data for operation with 3/PE AC 500 V or DC 710 V							
Rated mains current	without mains choke	I_{mains} [A]	7.2	9.8	13.4	17.2	-
	with mains choke	I_{mains} [A]	5.6	7.0	9.6	12.0	16.8
Output power U, V, W		**S_r [kVA]**	**5.1**	**6.6**	**9.0**	**11.4**	**16.3**
Output power $+U_G$, $-U_G$ 2)		P_{DC} [kW]	1.7	0.8	1.1	1.5	0
Rated output current at chopper frequency	2 kHz sin	I_r [A]	5.8	7.6	10.4	13.2	18.8
	4 kHz sin						
	8 kHz sin	**I_r [A]**	**5.8**	**7.6**	**10.4**	**13.2**	**18.8**
	16 kHz sin 4)	I_r [A]	3.8	4.9	6.8	8.6	12.2
Max. permissible output current for 60 s at chopper frequency 3)	2 kHz sin	I_{max} [A]	11.0	14.2	19.5	24.8	35.3
	4 kHz sin						
	8 kHz sin	**I_{max} [A]**	**11.0**	**14.2**	**19.5**	**24.8**	**35.3**
	16 kHz sin 4)	I_{max} [A]	5.7	7.9	10.0	12.9	18.3
Output voltage	without mains choke	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz				
	with mains choke	U_M [V]	3~ 0 ... approx. 94 % U_{mains} / 0 ... 650 Hz				
Power loss (operation with I_{r8})		P_v [W]	145	180	230	300	410
Required mains choke		Type	-	-	-	-	ELN3-150H024
Dimensions		H x W x D [mm]	240 x 100 x 140			240 x 125 x 140	
Weight		m [kg]	2.9			3.6	

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

1) Operation only with mains choke

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

4) Chopper frequency is reduced to 4 kHz if ϑ_{max} reaches - 5 °C

Typical motor power Three-phase AC asynchronous motor (4 pole)		**P_r [kW]**	**18.5**	**30**	**37**
		P_r [hp]	25	40	49.5
8200 vector type		With mains filter	**E82EV153K4B3xx**	**E82EV223K4B3xx**	**E82EV303K4B3xx**
		Without mains filter	**E82EV153K4B2xx**	**E82EV223K4B2xx** [1]	**E82EV303K4B2xx** [1]
Mains voltage		U_{mains} [V]	3/PE AC 320 V - 0 % ... 550 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %		
Alternative DC supply		U_{DC} [V]	DC 450 V - 0 % ... 775 V + 0 %		
Data for operation with 3/PE AC 500 V or DC 710 V					
Rated mains current					
without mains choke/mains filter		I_{mains} [A]	43.5	-	-
with mains choke/mains filter		I_{mains} [A]	29.0	42.0	55.0
Output power U, V, W		**S_r [kVA]**	**26.6**	**39.1**	**49.9**
Output power $+U_G$, $-U_G$ [2]		P_{DC} [kW]	11.8	4.6	0
Rated output current at chopper frequency	1 kHz sin	I_r [A] [5]	30.5	45	56
	2 kHz sin				
	4 kHz sin				
	8 kHz sin	I_r [A]	27	41	44 [5]
	16 kHz sin [4]	I_r [A]	19	28	30
	1 kHz	I_r [A]	32	47	56
	2 kHz				
	4 kHz				
	8 kHz	**I_r [A]**	**32**	**47**	**56**
	16 kHz [4]	I_r [A]	22	33	41
Max. permissible output current for 60 s at chopper frequency [3]	1 kHz sin	I_{max} [A]	46	66.5	65
	2 kHz sin				
	4 kHz sin				
	8 kHz sin	I_{max} [A]	41	61	65 [5]
	16 kHz sin [4]	I_{max} [A]	29	42	45
	1 kHz	I_{max} [A]	48	70.5	84
	2 kHz				
	4 kHz				
	8 kHz	**I_{max} [A]**	**48**	**70.5**	**84**
	16 kHz [4]	I_{max} [A]	33	49	61
Output voltage					
without mains choke/mains filter		U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz		
with mains choke/mains filter		U_M [V]	3~ 0 ... approx. 94 % U_{mains} / 0 ... 650 Hz		
Power loss (operation with I_{r8})		P_V [W]	430	640	810
Required mains choke		Type	-	ELN3-0075H045	ELN3-0055H055
Dimensions					
with mains filter		H x W x D [mm]	350 x 250 x 340		
without mains filter		H x W x D [mm]	350 x 250 x 250		
Weight					
with mains filter		m [kg]	34		
without mains filter		m [kg]	15		

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

1) Operation only with mains choke or mains filter

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

4) Chopper frequency is reduced to 4 kHz if ϑ_{max} reaches - 5 °C

5) Operation only with automatic chopper frequency reduction (C0144 = 1). Ensure not to exceed the declared currents.

Technical data

Operation with rated power (normal operation)

Rated data for mains voltage 500 V

Typical motor power Three-phase AC asynchronous motor (4 pole)		**P_r [kW]**	**55**	**75**	**90**	**110**
		P_r [hp]	74	100	120	148
8200 vector type		With mains filter	**E82EV453K4B3xx**	**E82EV553K4B3xx**	**E82EV753K4B3xx**	**E82EV903K4B3xx**
		Without mains filter	**E82EV453K4B2xx** [1]	**E82EV553K4B2xx** [1]	**E82EV753K4B2xx** [1]	**E82EV903K4B2xx** [1]
Mains voltage		U_{mains} [V]	3/PE AC 320 V - 0 % ... 550 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %			
Alternative DC supply		U_{DC} [V]	DC 450 V - 0 % ... 775 V + 0 %			
Data for operation with 3/PE AC 500 V or DC 710 V						
Rated mains current	without mains choke/mains filter	I_{mains} [A]	-	-	-	-
	with mains choke/mains filter	I_{mains} [A]	80.0	100	135	165
Output power U, V, W		**S_r [kVA]**	**73.9**	**91.4**	**124**	**149**
Output power $+U_G$, $-U_G$ [2]		P_{DC} [kW]	5.9	0	32.4	47.1
Rated output current at chopper frequency	1 kHz sin, 2 kHz sin, 4 kHz sin	I_r [A] [5]	84	104	141	149 [5]
	8 kHz sin	I_r [A]	55 [5]	71 [5]	86 [5]	94 [5]
	16 kHz sin [4]	I_r [A]	39	55	60	63
	1 kHz, 2 kHz, 4 kHz	I_r [A]	84	105	142	171
	8 kHz	**I_r [A]**	**84**	**105**	**142**	**162**
	16 kHz [4]	I_r [A]	58	72	98	99
Max. permissible output current for 60 s at chopper frequency [3]	1 kHz sin, 2 kHz sin, 4 kHz sin	I_{max} [A]	126	156	212	223 [5]
	8 kHz sin	I_{max} [A]	82 [5]	107 [5]	169 [5]	141 [5]
	16 kHz sin [4]	I_{max} [A]	63	72	78	83
	1 kHz, 2 kHz, 4 kHz	I_{max} [A]	126	157	213	256
	8 kHz	**I_{max} [A]**	**126**	**157**	**213**	**211**
	16 kHz [4]	I_{max} [A]	75	94	128	130
Output voltage	without mains choke/mains filter	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz			
	with mains choke/mains filter	U_M [V]	3~ 0 ... approx. 94 % U_{mains} / 0 ... 650 Hz			
Power loss (operation with I_{r8})		P_v [W]	1100	1470	1960	2400
Required mains choke		Type	ELN3-0038H085	ELN3-0027H105	ELN3-0022H130	ELN3-0017H170
Dimensions	with mains filter	H x W x D [mm]	510 x 340 x 375	591 x 340 x 375	680 x 450 x 375	
	without mains filter	H x W x D [mm]	510 x 340 x 285	591 x 340 x 285	680 x 450 x 285	
Weight	with mains filter	m [kg]	60	66	112	
	without mains filter	m [kg]	34	37	59	

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

1) Operation only with mains choke or mains filter

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

4) Chopper frequency is reduced to 4 kHz if ϑ_{max} reaches - 5 °C

5) Operation only with automatic chopper frequency reduction (C0144 = 1). Ensure not to exceed the declared currents.

Fuses and cable cross-sections (operation with rated power, mains voltage 500 V)

			Operation without mains choke					
			Installation to EN 60204-1			Installation to UL [1]		
8200 vector		**mains**	①	②	L1, L2, L3, PE	①	L1, L2, L3, PE	**FI**
Type	[kW]				[mm²]		[AWG]	
E82EV551K4C	0.55	3/PE AC 320 ... 550 V; 45 ... 65 Hz	M6 A	B6 A	1	5 A	18	≥ 300 mA [2] ≥ 30 mA [3]
E82EV751K4C	0.75		M6 A	B6 A	1	5 A	18	
E82EV152K4C	1.5		M10 A	B10 A	1.5	10 A	16	
E82EV222K4C	2.2		M10 A	B10 A	1.5	10 A	16	
E82EV302K4C	3.0		M16 A	B16 A	2.5	15 A	14	
E82EV402K4C	4.0		M16 A	B16 A	2.5	15 A	14	
E82EV552K4C	5.5		M25 A	B25 A	4	20 A	12	
E82EV752K4C	7.5		M32 A	B32 A	6 [4]	25 A	10	
E82EV113K4C	11		Operation only with mains choke					
E82EV153K4B	15		M63 A	-	25	63 A	4	≥ 300 mA
E82EV223K4B	22		Operation only with mains choke					
E82EV303K4B	30							
E82EV453K4B	45							
E82EV553K4B	55							
E82EV753K4B	75							
E82EV903K4B	90							

			Operation with mains choke					
			Installation to EN 60204-1			Installation to UL [1]		
8200 vector		**mains**	①	②	L1, L2, L3, PE	①	L1, L2, L3, PE	**FI**
Type	[kW]				[mm²]		[AWG]	
E82EV551K4C	0.55	3/PE AC 320 ... 550 V; 45 ... 65 Hz	M6 A	B6 A	1	5 A	18	≥ 300 mA [2] ≥ 30 mA [3]
E82EV751K4C	0.75		M6 A	B6 A	1	5 A	18	
E82EV152K4C	1.5		M10 A	B10 A	1.5	10 A	16	
E82EV222K4C	2.2		M10 A	B10 A	1.5	10 A	16	
E82EV302K4C	3.0		M10 A	B10 A	1.5	10 A	16	
E82EV402K4C	4.0		M16 A	B16 A	2.5	15 A	14	
E82EV552K4C	5.5		M20 A	B20 A	4	20 A	12	
E82EV752K4C	7.5		M20 A	B20 A	4	20 A	12	
E82EV113K4C	11		M32 A	B32 A	6 [4]	25 A	10	
E82EV153K4B	15		M35 A	-	10	35 A	8	≥ 300 mA
E82EV223K4B	22		M50 A	-	16	50 A	6	
E82EV303K4B	30		M80 A	-	25	80 A	3	
E82EV453K4B	45		M100 A	-	50	100 A	1	
E82EV553K4B	55		M125 A	-	50	125 A	0	
E82EV753K4B	75		M160 A	-	70	175 A	2/0	
E82EV903K4B	90		M200 A	-	95	200 A	3/0	

① Fuse

② E.l.c.b.

1) Use UL-approved cables, fuses and fuse holders only.
UL fuse: Voltage 500 ... 600 V, tripping characteristic "H" or "K5"

2) All-current sensitive e.l.c.b. for use with E82EVxxxK4C0xx

3) All-current sensitive e.l.c.b. for use with E82EVxxxK4C2xx

4) Flexible cable can only be connected using pin end connectors.

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

4.4 Operation with increased rated power

Under the application conditions described here the controller can be operated in continuous operation with a motor of higher performance. The overload capacity is reduced to 120 %.

Typical applications are pumps with square-law load characteristic or blowers.

Note!

Operation with increased rated power is only permissible
- with the drive controllers mentioned
- within the mains voltage range mentioned
- with the chopper frequency mentioned
- with the prescribed fuses, cable cross-sections and mains chokes

4.4.1 Rated data for mains voltage 230 V

Maximum motor power Three-phase AC asynchronous motor (4 pole)	**P_r [kW]**	**0.37**	**0.75**		**1.1**		**2.2**	
	P_r [hp]	0.5	1.0		1.5		3.0	
8200 vector type	EMC filter integrated	**E82EV251K2C0xx**	**E82EV551K2C0xx** [1]		**E82EV751K2C0xx** [1]		**E82EV152K2C0xx**	
	Without EMC filter	**E82EV251K2C2xx**	**E82EV551K2C2xx** [1]		**E82EV751K2C2xx** [1]		**E82EV152K2C2xx**	
Mains voltage	V_{mains} [V]	1/N/PE AC 180 V - 0 % ... 264 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 % 3/PE AC 100 V - 0 % ... 264 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %						
Alternative DC supply	U_{DC} [V]	not possible	DC 140 V - 0 % ... 370 V + 0 %					
Data for operation with 1/N/PE (3 PE) AC 230 V or DC 325 V		1/N/PE	1/N/PE	3/PE	1/N/PE	3/PE	1/N/PE	3/PE
Rated mains current without mains choke	I_{mains} [A]	4.1	-	-	-	-	18.0	10.4
Rated mains current with mains choke	I_{mains} [A]	3.6	6.7	3.3	9.0	4.4	15.0	7.6
Output power U, V, W	S_r [kVA]	0.8	1.4		1.9		3.3	
Output power $+U_G$, $-U_G$ [2]	P_{DC} [kW]	DC bus operation not possible	0.1		0		0.4	
Rated output current at chopper frequency 2 kHz sin / 4 kHz sin	I_r [A]	2.0	3.6		4.8		8.4	
Max. permissible output current for 60 s at chopper frequency [3] 2 kHz sin / 4 kHz sin	I_{max} [A]	2.5	4.5		6.0		10.5	
Output voltage without mains choke	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz						
Output voltage with mains choke	U_M [V]	3~ 0 ... approx. 94 % V_{mains} / 0 ... 650 Hz						
Power loss (operation with I_{N24})	P_v [W]	30	50		60		100	
Required mains choke	Type	-	ELN1-0500H005		ELN1-0500H009	E82ZL75132B	-	
Dimensions	H x W x D [mm]	120 x 60 x 140	180 x 60 x 140				240 x 60 x 140	
Weight	m [kg]	0.8	1.2				1.6	

1) Operation only with mains choke

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

Maximum motor power Three-phase AC asynchronous motor (4 pole)	**P_r [kW]**	**4.0**	**7.5**
	P_r [hp]	5.4	10.2
8200 vector type	EMC filter integrated	**E82EV302K2C0xx**	**E82EV552K2C0xx** 1)
	Without EMC filter	**E82EV302K2C2xx**	**E82EV552K2C2xx** 1)
Mains voltage	V_{mains} [V]	3/PE AC 100 V - 0 % ... 264 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %	
Alternative DC supply	V_{DC} [V]	DC 140 V - 0 % ... 370 V + 0 %	
Data for operation with 3/PE AC 230 V or DC 325 V			
Rated mains current without mains choke	I_{mains} [A]	18.7	-
Rated mains current with mains choke	I_{mains} [A]	14.4	25.2
Output power U, V, W	S_r [kVA]	5.7	10.8
Output power $+U_G$, $-U_G$ 2)	P_{DC} [kW]	0	0
Rated output current at chopper frequency 2 kHz sin / 4 kHz sin	I_r [A]	14.4	27.0
Max. permissible output current for 60 s at chopper frequency 3) 2 kHz sin / 4 kHz sin	I_{max} [A]	18.0	33.8
Output voltage without mains choke	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz	
Output voltage with mains choke	U_M [V]	3~ 0 ... approx. 94 % V_{mains} / 0 ... 650 Hz	
Power loss (operation with I_{N24})	P_V [W]	150	250
Required mains choke	Type	-	ELN3-088H035
Dimensions	H x W x D [mm]	240 x 100 x 140	240 x 125 x 140
Weight	m [kg]	2.9	3.6

1) Operation only with mains choke

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

Operation with increased rated power 4.4

Rated data for mains voltage 230 V 4.4.1

Fuses and cable cross-sections (operation with increases rated power, mains voltage 230 V)

			Operation without mains choke					
			Installation to EN 60204-1			Installation to UL 1)		
8200 vector		Mains	①	②	L1, L2, L3, PE	①	L1, L2, L3, PE	FI
Type	[kW]				[mm²]		[AWG]	
E82EV251K2C	0.25	1/N/PE AC 180 ... 264 V; 45 ... 65 Hz	M10 A	C10 A	1.5	10 A	16	≥ 30 mA 2)
E82EV551K2C	0.55		Operation only with mains choke					
E82EV751K2C	0.75		Operation only with mains choke					
E82EV152K2C	1.5		M20 A	B20 A	2 x 1.5	20 A	2 x 16	
E82EV551K2C	0.55	3/PE AC 100 ... 264 V; 45 ... 65 Hz	Operation only with mains choke					≥ 30 mA 3)
E82EV751K2C	0.75		Operation only with mains choke					
E82EV152K2C	1.5		M16 A	B16 A	2.5	15 A	14	
E82EV302K2C	3.0		M25 A	B25 A	4	25 A	10	≥ 300 mA 4) ≥ 30 mA 5)
E82EV552K2C	5.5		Operation only with mains choke					

			Operation with mains choke					
			Installation to EN 60204-1			Installation to UL 1)		
8200 vector		Mains	①	②	L1, L2, L3, PE	①	L1, L2, L3, PE	FI
Type	[kW]				[mm²]		[AWG]	
E82EV251K2C	0.25	1/N/PE AC 180 ... 264 V; 45 ... 65 Hz	M10 A	C10 A	1.5	10 A	16	≥ 30 mA 2)
E82EV551K2C	0.55		M10 A	B10 A	1.5	10 A	16	
E82EV751K2C	0.75		M10 A	B10 A	1.5	10 A	16	
E82EV152K2C	1.5		M16 A	B16 A	2 x 1.5	15 A	2 x 16	
E82EV551K2C	0.55	3/PE AC 100 ... 264 V; 45 ... 65 Hz	M6 A	B6 A	1	5 A	18	≥ 30 mA 3)
E82EV751K2C	0.75		M10 A	B10 A	1.5	10 A	16	
E82EV152K2C	1.5		M10 A	B10 A	1.5	10 A	16	
E82EV302K2C	3.0		M20 A	B20 A	4	20 A	12	≥ 300 mA 4) ≥ 30 mA 5)
E82EV552K2C	5.5		M32 A	B32 A	6 6)	35 A	8	

① Fuse

② E.l.c.b.

1) Use UL-approved cables, fuses and fuse holders only.
UL fuse: voltage 240 V, tripping characteristic "H" or "K5"

2) Pulse-current or universal-current sensitive earth leakage circuit breaker

3) All-current sensitive e.l.c.b.

4) All-current sensitive e.l.c.b. for use with E82EVxxxK2C0xx

5) All-current sensitive e.l.c.b. for use with E82EVxxxK2C2xx

6) Flexible cable can only be connected using pin end connectors.

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

4.4.2 Rated data for mains voltage 400 V

Maximum motor power Three-phase AC asynchronous motor (4 pole)	**P_r [kW]**	**0.75**	**1.1**	**3.0**
	P_r [hp]	1.0	1.5	4.0
8200 vector type	EMC filter integrated	**E82EV551K4C0xx**	**E82EV751K4C0xx** [1]	**E82EV222K4C0xx** [1]
	Without EMC filter	**E82EV551K4C2xx**	**E82EV751K4C2xx** [1]	**E82EV222K4C2xx** [1]
Mains voltage	V_{mains} [V]	3/PE AC 320 V - 0 % ... 440 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %		
Alternative DC supply	V_{DC} [V]	DC 450 V - 0 % ... 625 V + 0 %		
Data for operation with 3/PE AC 400 V or DC 565 V				
Rated mains current without mains choke	I_{mains} [A]	2.9	-	-
Rated mains current with mains choke	I_{mains} [A]	2.4	2.8	6.1
Output power U, V, W	S_r [kVA]	1.5	2.0	4.6
Output power $+U_G$, $-U_G$ [2]	P_{DC} [kW]	0.1	0	0
Rated output current at chopper frequency 2 kHz sin / 4 kHz sin	I_r [A]	2.2	2.9	6.7
Max. permissible output current for 60 s at chopper frequency [3] 2 kHz sin / 4 kHz sin	I_{max} [A]	2.7	3.6	8.4
Output voltage without mains choke	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz		
Output voltage with mains choke	U_M [V]	3~ 0 ...approx. 94 % V_{mains} / 0 ... 650 Hz		
Power loss (operation with I_{r8})	P_V [W]	50	60	130
Required mains choke	Type	-	EZN3A1500H003	E82ZL22234B
Dimensions	H x W x D [mm]	180 x 60 x 140		240 x 60 x 140
Weight	m [kg]	1.2		1.6

1) Operation only with mains choke
2) For operation with power-adapted motors additional power to be taken from the DC bus
3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

Technical data

Operation with increased rated power

Rated data for mains voltage 400 V

Maximum motor power Three-phase AC asynchronous motor (4 pole)		**P_r [kW]**	**4.0**	**5.5**	**11**
		P_r [hp]	5.4	7.5	15
8200 vector type		EMC filter integrated	**E82EV302K4C0xx**	**E82EV402K4C0xx** [1)]	**E82EV752K4C0xx** [1)]
		Without EMC filter	**E82EV302K4C2xx**	**E82EV402K4C2xx** [1)]	**E82EV752K4C2xx** [1)]
Mains voltage		V_{mains} [V]	3/PE AC 320 V - 0 % ... 440 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %		
Alternative DC supply		V_{DC} [V]	DC 450 V - 0 % ... 625 V + 0 %		
Data for operation with 3/PE AC 400 V or DC 565 V					
Rated mains current	without mains choke	I_{mains} [A]	10.8	-	-
	with mains choke	I_{mains} [A]	8.4	10.6	18.0
Output power U, V, W		S_r [kVA]	6.0	7.9	13.7
Output power $+U_G$, $-U_G$ [2)]		P_{DC} [kW]	0.7	0	0
Rated output current at chopper frequency	2 kHz sin	I_r [A]	8.7	11.4	19.8
	4 kHz sin				
Max. permissible output current for 60 s at chopper frequency [3)]	2 kHz sin	I_{max} [A]	11.0	14.2	24.8
	4 kHz sin				
Output voltage	without mains choke	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz		
	with mains choke	U_M [V]	3~ 0 ...approx. 94 % V_{mains} / 0 ... 650 Hz		
Power loss (operation with I_{r8})		P_V [W]	145	180	300
Required mains choke		Type	-	EZN3A0300H013	ELN3-0150H024
Dimensions		H x W x D [mm]	240 x 100 140		240 x 125 x 140
Weight		m [kg]	2.9		3.6

1) Operation only with mains choke
2) For operation with power-adapted motors additional power to be taken from the DC bus
3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

Maximum motor power Three-phase AC asynchronous motor (4 pole)		**P_r [kW]**	**22**	**30**	**37**
		P_r [hp]	30	40	50
8200 vector type		With mains filter	**E82EV153K4B3xx**	**E82EV223K4B3xx**	**-**
		Without mains filter	**E82EV153K4B2xx** [1)]	**E82EV223K4B2xx** [1)]	**E82EV303K4B2xx** [1) 4)]
Mains voltage		U_{mains} [V]	3/PE AC 320 V - 0 % ... 440 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %		
Alternative DC supply		U_{DC} [V]	DC 450 V - 0 % ... 625 V + 0 %		
Data for operation with 3/PE AC 400 V or DC 565 V					
Rated mains current without mains choke/mains filter		I_{mains} [A]	-	-	-
with mains chokde/mains filter		I_{mains} [A]	39.0	50.0	60.0
Output power U, V, W		S_{N4} [kVA]	29.8	39.5	46.4
Output power $+U_G$, $-U_G$ [2)]		P_{DC} [kW]	10.2	4.0	0
Rated output current at chopper frequency	1 kHz sin	I_r [A]	32	47	59
	2 kHz sin				
	4 kHz sin				
	1 kHz	I_r [A]	43	56	66
	2 kHz				
	4 kHz				
Max. permissible output current for 60 s at chopper frequency [3)]	1 kHz sin	I_{max}[A]	48	70.5	89
	2 kHz sin				
	4 kHz sin				
	1 kHz	I_{max} [A]	48	70.5	89
	2 kHz				
	4 kHz				
Output voltage without mains choke/mains filter		U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz		
with mains chokde/mains filter		U_M [V]	3~ 0 ... approx. 94 % V_{mains} / 0 ... 650 Hz		
Power loss (operation with I_{r8})		P_V [W]	430	640	810
Required mains choke		type]	ELN3-0075H045	ELN3-0055H055	ELN3-0055H055
Dimensions with mains filter		H x W x D [mm]	350 x 250 x 340		
without mains filter		H x W x D [mm]	350 x 250 x 250		
Weight with mains filter		m [kg]	34		
without mains filter		m [kg]	15		

1) Operation only with mains choke or mains filter

2) For operation with power-adapted motors additional power to be taken from the DC bus

3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r

4) Maximum permissible ambient operating temperature +35 °C

Technical data

Operation with increased rated power

Rated data for mains voltage 400 V

Typical motor power	**P_r [kW]**	**55**	**75**	**90**	**110**
Three-phase AC asynchronous motor (4 pole)	P_r [hp]	75	100	120	148
8200 vector type	With mains filter	-	**E82EV553K4B3xx** [4]	-	-
	Without mains filter	**E82EV453K4B2xx** [1]	**E82EV553K4B2xx** [1) 4]	**E82EV753K4B2xx** [1]	**E82EV903K4B2xx** [1) 4]
Mains voltage	V_{mains} [V]	3/PE AC 320 V - 0 % ... 440 V + 0 % ; 45 Hz - 0 % ... 65 Hz + 0 %			
Alternative DC supply	U_{DC} [V]	DC 450 V - 0 % ... 625 V + 0 %			
Data for operation with 3/PE AC 400 V or DC 565 V					
Rated mains current without mains choke/mains filter	I_{mains} [A]	-	-	-	-
Rated mains current with mains chokde/mains filter	I_{mains} [A]	97.0	119	144	185
Output power U, V, W	**S_{r8} [kVA]**	**74.8**	**91.5**	**110**	**142**
Output power $+U_G$, $-U_G$ [2]	P_{DC} [kW]	5.1	0	28.1	40.8
Rated output current at chopper frequency 1 kHz sin / 2 kHz sin / 4 kHz sin	I_r [A]	89	110	150	159 [5]
Rated output current at chopper frequency 1 kHz / 2 kHz / 4 kHz	I_r [A]	100	135	159	205
Max. permissible output current for 60 s at chopper frequency [3] 1 kHz sin / 2 kHz sin / 4 kHz sin	I_{max} [A]	134	165	225	238 [5]
Max. permissible output current for 60 s at chopper frequency [3] 1 kHz / 2 kHz / 4 kHz	I_{max} [A]	134	165	225	270
Output voltage without mains choke/mains filter	U_M [V]	3~ 0 ... V_{mains} / 0 ... 650 Hz			
Output voltage with mains chokde/mains filter	U_M [V]	3~ 0 ... approx. 94 % v_{mains} / 0 ... 650 Hz			
Power loss (operation with I_{r8})	P_v [W]	1100	1470	1960	2400
Required mains choke	Type	ELN3-0027H105	ELN3-0022H130	ELN3-0017H170	ELN3-0014H200
Dimensions with mains filter	H x W x D [mm]	510 x 340 x 375	591 x 340 x 375	680 x 450 x 375	
Dimensions without mains filter	H x W x D [mm]	510 x 340 x 285	591 x 340 x 285	680 x 450 x 285	
Weight with mains filter	m [kg]	60	66	112	
Weight without mains filter	m [kg]	34	37	59	

1) Operation only with mains choke or mains filter
2) For operation with power-adapted motors additional power to be taken from the DC bus
3) Currents for periodic load change: 1 min overcurrent with I_{max} and 2 min basic load with 75 % I_r
4) Maximum permissible ambient operating temperature +35 °C
5) Operation only with automatic chopper frequency reduction (C144 = 1). Ensure not to exceed the declared currents.

Fuses and cable cross-sections (operation with increased rated power, mains voltage 400 V)

8200 vector Type	[kW]	Mains	Operation without mains choke: Installation to EN 60204-1 ①	②	L1, L2, L3, PE [mm²]	Installation to UL [1] ①	L1, L2, L3, PE [AWG]	FI
E82EV551K4C	0.55	3/PE AC 320 ... 440 V; 45 ... 65 Hz	M6 A	B6 A	1	5 A	18	≥ 300 mA [2] ≥ 30 mA [3]
E82EV751K4C	0.75		Operation only with mains choke					
E82EV222K4C	2.2		Operation only with mains choke					
E82EV302K4C	3.0		M16 A	B16 A	2.5	15 A	14	
E82EV402K4C	4.0		Operation only with mains choke					
E82EV752K4C	7.5		Operation only with mains choke					
E82EV153K4B	15		Operation only with mains choke					
E82EV223K4B	22							
E82EV303K4B	30							
E82EV453K4B	45							
E82EV553K4B	55							
E82EV753K4B	75							
E82EV903K4B	90							

8200 vector Type	[kW]	Mains	Operation with mains choke: Installation to EN 60204-1 ①	②	L1, L2, L3, PE [mm²]	Installation to UL [1] ①	L1, L2, L3, PE [AWG]	FI
E82EV551K4C	0.55	3/PE AC 320 ... 440 V; 45 ... 65 Hz	M6 A	B6 A	1	5 A	18	≥ 300 mA [2] ≥ 30 mA [3]
E82EV751K4C	0.75		M6 A	B6 A	1	5 A	18	
E82EV222K4C	2.2		M10 A	B10 A	1.5	10 A	16	
E82EV302K4C	3.0		M10 A	B10 A	1.5	10 A	16	
E82EV402K4C	4.0		M16 A	B16 A	2.5	15 A	14	
E82EV752K4C	7.5		M25 A	B25 A	4	25 A	10	
E82EV153K4B	15		M50 A	-	16	50 A	6	≥ 300 mA
E82EV223K4B	22		M63 A	-	25	63 A	4	
E82EV303K4B	30		M80 A	-	25	80 A	3	
E82EV453K4B	45		M125 A	-	50	125 A	0	
E82EV553K4B	55		M160 A	-	70	175 A	2/0	
E82EV753K4B	75		M160 A	-	70	175 A	2/0	
E82EV903K4B	90		M200 A	-	95	200 A	3/0	

① Fuse
② E.l.c.b.
1) Use UL-approved cables, fuses and fuse holders only.
UL fuse: Voltage 500 ... 600 V, tripping characteristic "H" or "K5"
2) All-current sensitive e.l.c.b. for use with E82EVxxxK4C0xx
3) All-current sensitive e.l.c.b. for use with E82EVxxxK4C2xx

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

4.4.3 Mains voltage 500 V

The operation with increased rated power is not possible for 500 V rated mains voltage.

5 Basic device installation

5.1 Contents

5.2 Important notes

- 8200 vector frequency inverters should only be used as built-in units
- If the cooling air contains pollutants (dust, fluff, grease, aggressive gases) ensure suitable measures to protect the inverter (e.g. filters, regular cleaning, etc.)
- Free space:
  – It is possible to mount several devices side by side with a clearance depending on the corresponding type.
  – Ensure unimpeded ventilation of cooling air and outlet of exhaust air.
  – Allow a free space of 100 mm above and below the inverter.
- With continuous vibrations and shocks: Use shock absorbers.
- The indicated dimensions apply to types according to this key:

①						②	③
E82xV	xxx	K	x	x	xxx	3x	3x

Type
E = Built-in unit
D = Built-in unit in push-through technique
C = Built-in unit in “Cold Plate” technique

Power
(e. g. 152 = 15 × 10^2 W = 1.5 kW)
(e. g. 113 = 11 × 10^3 W = 11 kW)

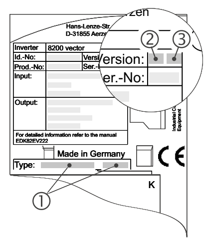
Voltage class
2 = 230 V
4 = 400 V/500 V

Controller generation
C (0.25 ... 11 kW)
B (15 ... 90 kW)

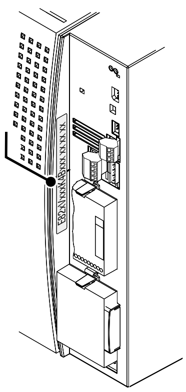
Version, variant
0xx = EMC filter integrated
1xx = For IT systems (15 ... 90 kW)
2xx = Without EMC filter
x0x = Without function ”Safe standstill”
x4x = With function ”Safe standstill” (3 ... 90 kW)
xx0 = Not coated
xx1 = Coated

Hardware version

Software version



0.25 ... 11 kW



15 ... 90 kW

5.3 Basic units in the power range 0.25 ... 2.2 kW

5.3.1 Mounting with fixing rails (standard)

8200 vector 0.25 ... 2.2 kW

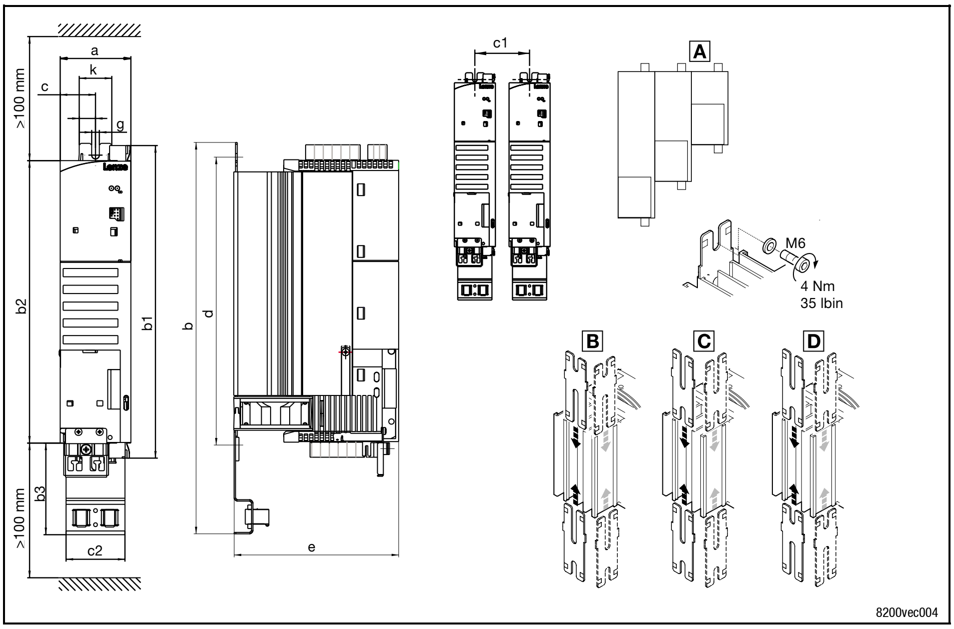


Fig. 5.3-1 Standard mounting with fixing rails 0.25 ... 2.2 kW

A Different sizes can only be mounted side by side when the smaller units are mounted to the right-hand-side of the bigger units!

	Dimensions [mm]															
	a	b B	b C	b D	b1	b2	b3	c	c1	c2	d B	d C	d D	e	g	k
E82EV251K2C E82EV371K2C		213	243	263	148	120					130...140	120...170	110...200	140	6.5	28
E82EV551KxC E82EV751KxC	60	273	303	323	208	180	78	30	63	50	190...200	180...230	170...260			
E82EV152KxC 1) E82EV222KxC 1)		333 359 2)	363	-	268	240					250...260 280...295 2)	240...290	-	140 162 2)	6.5	28

1) Lateral mounting only possible with swivel mounting unit E82ZJ001 (accessories)

2) with E82ZJ001

5.3.2 Thermally separated mounting (push-through technique)

For mounting in push-through technique use the controller type E82 **D** V... . The delivery package includes all parts and components required for mounting.

8200 vector 0.25 ... 0.75 kW

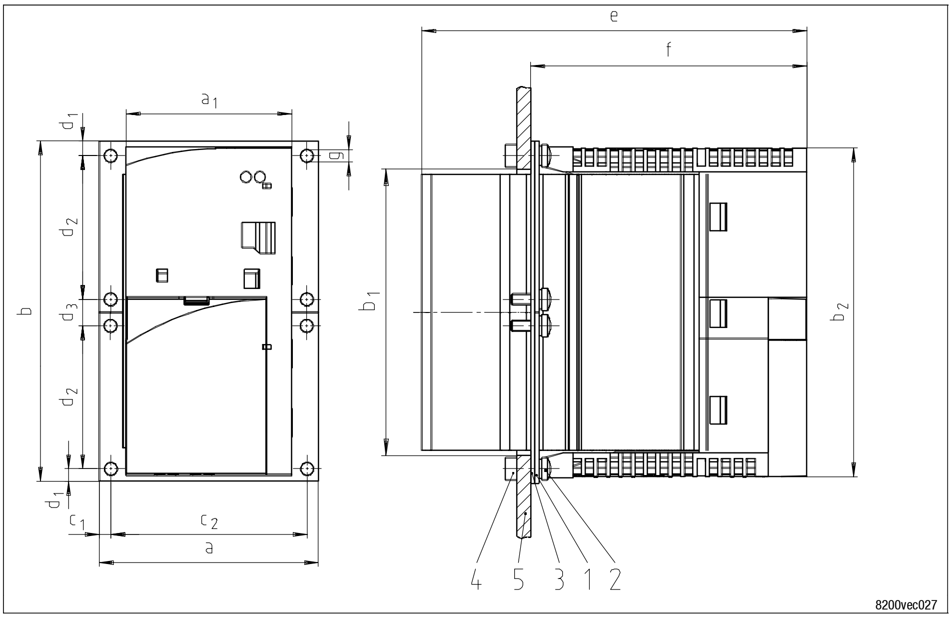


Fig. 5.3-2 Dimensions for thermally separated mounting 0.25 ... 0.75 kW

1 Fixing frames
2 Screw M4x10
3 Gasket
4 Hex nut M4
5 Control cabinet rear panel

8200 vector	Dimensions [mm] a	b	b_2	c_1	c_2	d_1	d_2	d_3	e	f	g
E82DV251K2C	79.4	124	120	4.2	71	5	52	10	140	100	4.5
E82DV371K2C											
E82DV551KxC		184	180				82				
E82DV751KxC											

Cutout in control cabinet

8200 vector	Dimensions [mm] a_1	b_1	Fixing frames
E82DV251K2C	61	101	E82ZJ003
E82DV371K2C			
E82DV551KxC		161	
E82DV751KxC			

Mounting

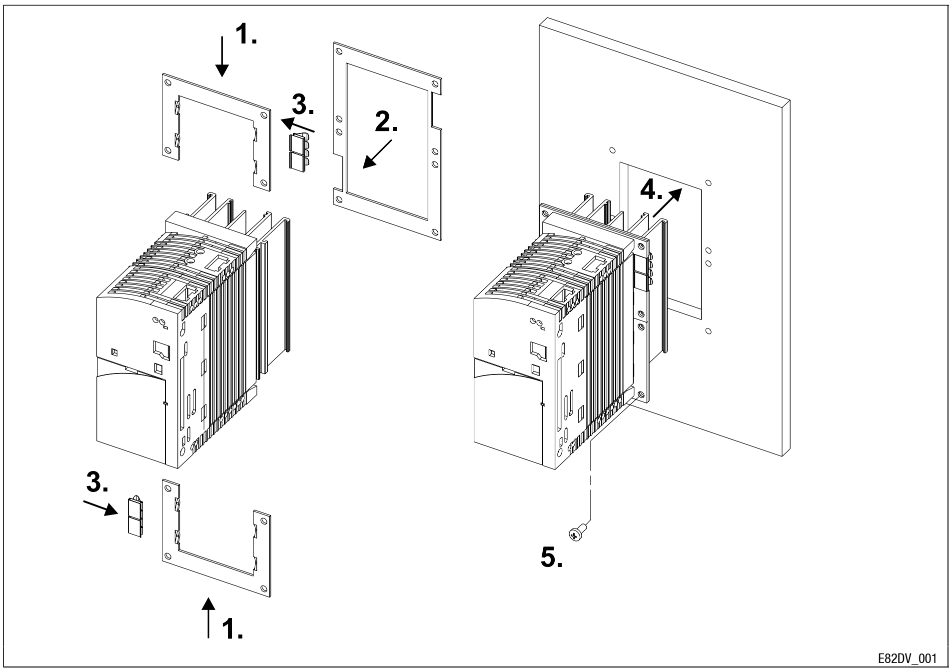


Fig. 5.3-3 Thermally separated mounting 0.25 ... 0.75 kW

1. Push in the fixing frames
2 Insert seal
3. Push the grounding terminals with the correct end onto the fixing frame:
   – The contact springs must point to the rear panel of the control cabinet
   – The cutouts of the seal determine the positions
4. Insert the 8200 vector into the cutout
5. Fasten it with 8 M4x10 screws

8200 vector 1.5 ... 2.2 kW

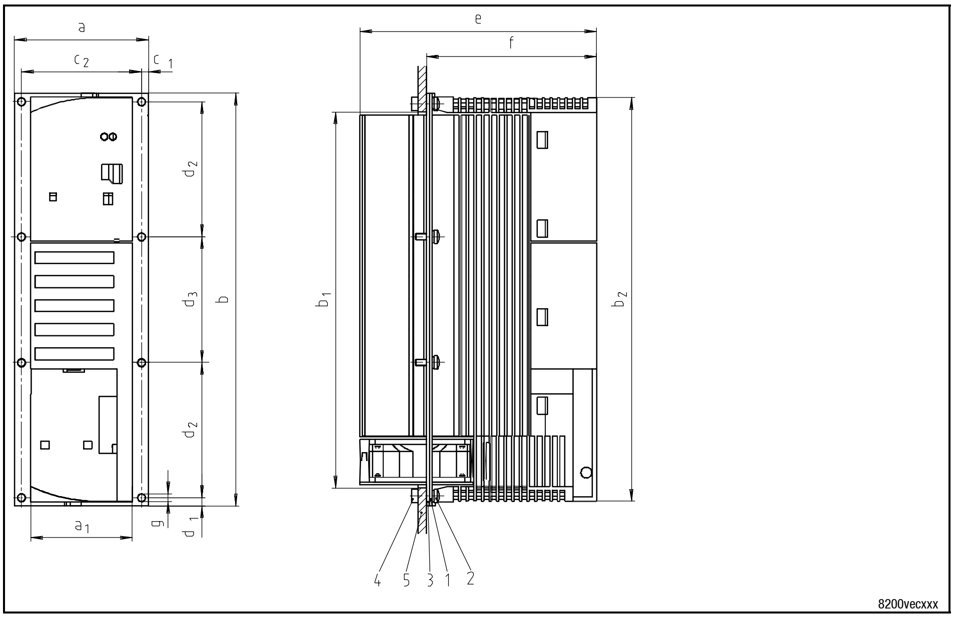


Fig. 5.3-4 Dimensions for thermally separated mounting 1.5 ... 2.2 kW

1 Fixing frames
2 Screw M4x10
3 Gasket
4 Hex nut M4
5 Control cabinet rear panel

	Dimensions [mm]										
8200 vector	**a**	**b**	**b_2**	**c_1**	**c_2**	**d_1**	**d_2**	**d_3**	**e**	**f**	**g**
E82DV152K2C E82DV222K2C E82DV152K4C E82DV222k4C	79.4	244.5	240	4.2	71	5	80	74.5	140	100	4,5

Cutout in control cabinet

	Dimensions [mm]		
8200 vector	**a_1**	**b_1**	Fixing frames
E82DV152K2C E82DV222K2C E82DV152K4C E82DV222k4C	61	221	E82ZJ00x

Mounting

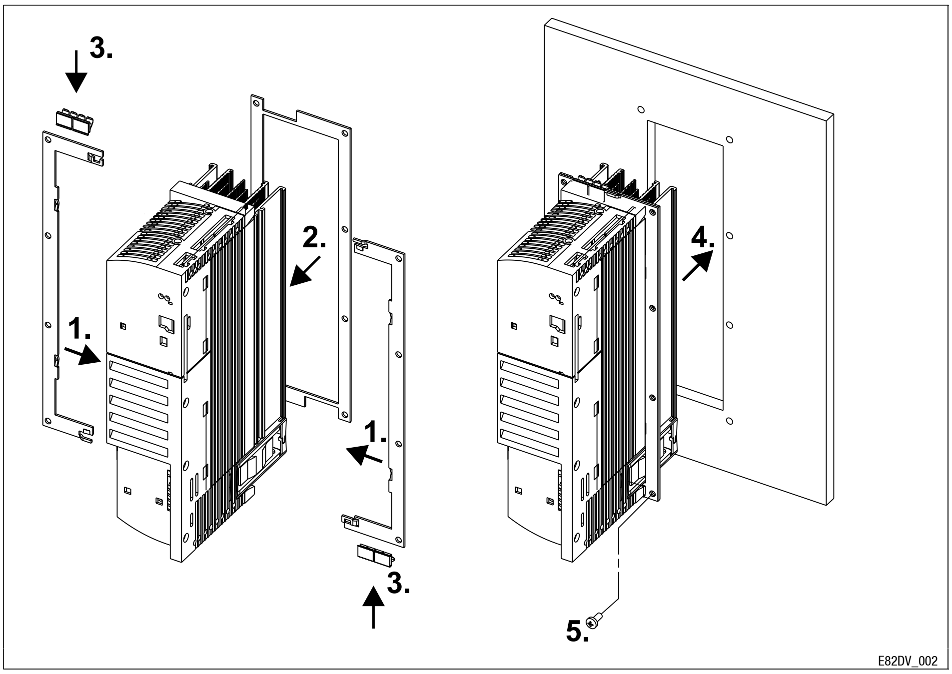


Fig. 5.3-5 Thermally separated mounting 1.5 ... 2.2 kW

1. Push in the fixing frames
2 Insert seal
3. Push the grounding terminals with the correct end onto the fixing frame:
   – The contact springs must point to the rear panel of the control cabinet
   – The cutouts of the seal determine the positions
4. Insert the 8200 vector into the cutout
5. Fasten it with 8 M4x10 screws

5.3.3 Mounting in "cold plate" technique

When using "cold plate" technique the controllers can be mounted to sum coolers. Use controllers of type E82**C**V... .

Requirements on the cooler

The following points are important to ensure a safe operation of the drive controllers:

- Good thermal contact with the cooler:
  - The contact area between the cooler and the drive controller must be at least as large as the cooling plate of the drive controller.
  - Plane contact area, deviation max. to 0.05 mm.
  - The cooler and heatsink must be attached using all the screwed joints that are specified.
- Thermal resistance R_{th} according to table. The values are valid for operation with the drive controllers under rated conditions.

8200 vector Type	Power to be dissipated P_{loss} [W]	Cooling path Heatsink - environment R_{th} [°C/W]	Ground [kg]
E82CV251K2C	15	≤ 1.50	0.6
E82CV371K2C	20	≤ 1.50	0.6
E82CV551K2C	30	≤ 1.00	0.9
E82CV751K2C	40	≤ 1.00	0.9
E82CV152K2C	70	≤ 0.30	1.1
E82CV222K2C [1)]	100	≤ 0.30	1.1
E82CV551K4C	30	≤ 1.00	0.9
E82CV751K4C	40	≤ 1.00	0.9
E82CV152K4C	65	≤ 0.30	1.1
E82CV222K4C	100	≤ 0.30	1.1

1) Max. output current at 8 kHz chopper frequency: 8.5 A!

Environmental conditions

- Ambient temperature - controllers
  - The rated data and the derating for higher temperatures still apply for the ambient temperature of the drive controller.
- Heat distribution between common heatsinks/coolers within the control cabinet
  - If you mount several components (drive controller, brake units etc.) on a common cooler, then care must be taken that the temperature of the controller heatsinks does not exceed 75 °C.

8200 vector 0.25 ... 2.2 kW

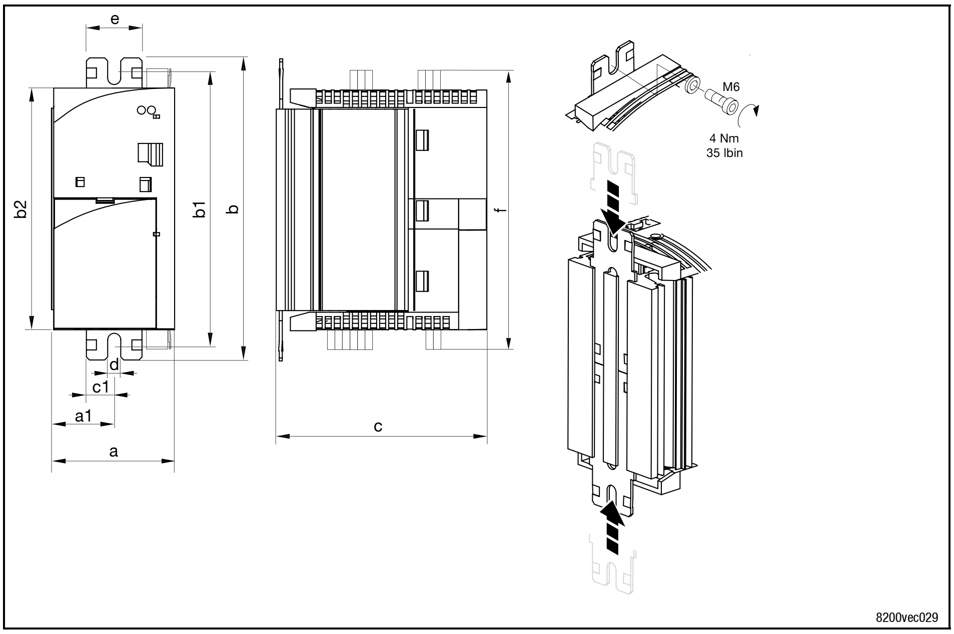


Fig. 5.3-6 Dimensions for mounting in ”Cold plate” technique 0.25 ... 2.2 kW

8200 vector	Dimensions [mm] a	a1	b	b1	b2	c	d	e	f
E82CV251K2B E82CV371K2B	60	30	150	130 ... 140	120	106	6.5	27.5	148
E82CV551KxB E82CV751KxB			210	190 ... 200	180				208
E82CV152KxB E82CV222KxB			270	250 ... 260	240				268

Mounting

Note!

- Apply heat-conducting paste before you bolt together the cooler and the heatsink to keep the thermal resistance as low as possible.
- The quantity of heat-conducting paste supplied in the delivery package is sufficient for approx. 1000 cm^2.

1. Slide the mounting rails into the heatsink from the top and from the bottom
2. Clean the area of contact between the heatsink and the cooler with methylated spirits.
3. Apply a thin layer of heat-conducting paste.
4. Bolt the drive controller onto the cooler using two screws.

5.3.4 DIN rail mounting

Note!

This mounting variant does not enable a CE-typical drive system to be installed.

The accessories for DIN rail mounting are not included in the delivery package.

Order number: E82ZJ002 for 8200 vector 0.25 ... 2.2 kW

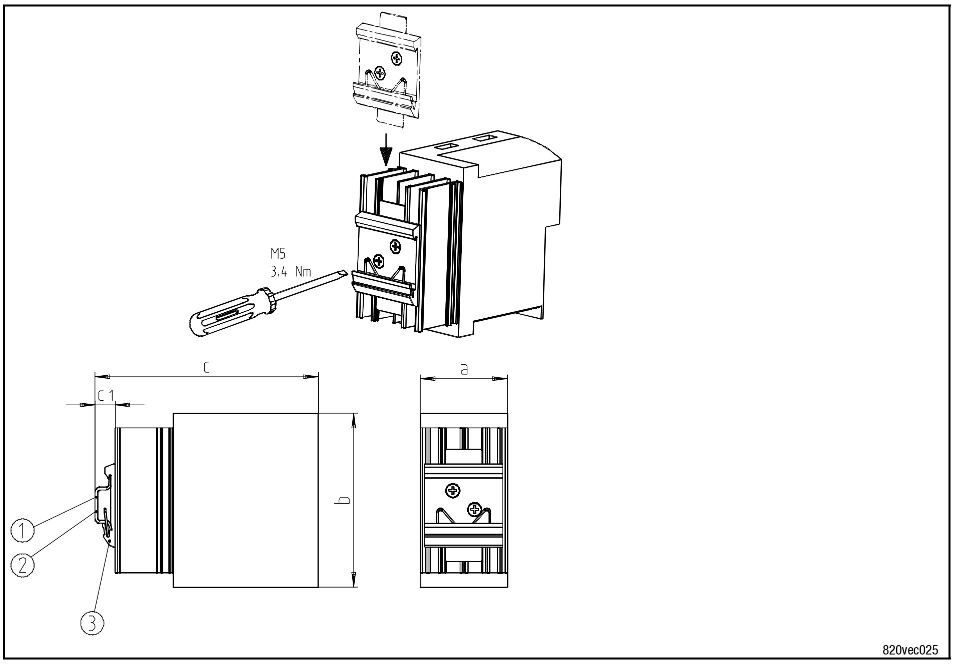


Fig. 5.3-7 DIN rail mounting 0.25 ... 2.2 kW

① DIN rail 35 x 15
② DIN rail 35 x 7.5
③ DIN rail mounting

	Dimensions [mm]					
	a	b	c		c_1	
8200 vector			①	②	①	②
E82EV251K2C E82EV371K2C	60	120	158	151	18	11
E82EV551KxC E82EV751KxC		180				
E82EV152KxC E82EV222KxC		240				

5.3.5 Lateral mounting

Note!

This mounting variant does not enable a CE-typical drive system to be installed.

Lateral mounting of the controller is possible on both sides. The controller is either fixed or can be swivelled depending on the mounting point. Both mounting types use the same mounting kit.

Fixed lateral mounting

- The controllers 0.25 ... 0.75 kW can be mounted with the rails included in the delivery package.
- The controllers 1.5 ... 2.2 kW require a mounting kit.
  – Order number E82ZJ001 for 8200 vector 1.5 ... 2.2 kW

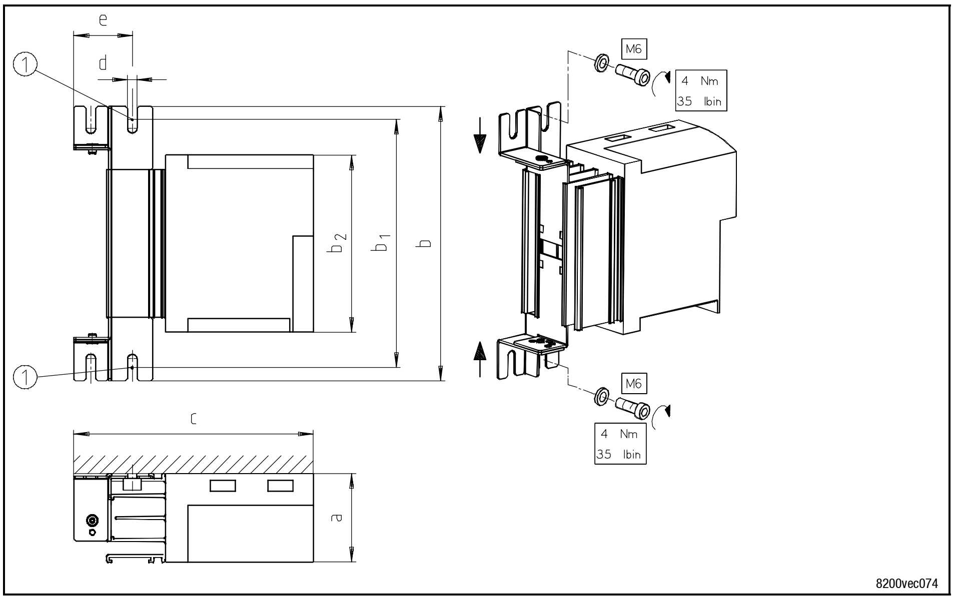


Fig. 5.3-8 Fixed lateral mounting

① Bolt here

8200 vector	Mounting kit	Dimensions in mm a	b	b_1	b_2	c	d	e
E82EV251K2C E82EV371K2C E82EV551KxC E82EV751KxC	-	Use the rails included in the delivery package for fixed lateral mounting. Dimensions: 🕮 5.3-1						
E82EV152KxC E82EV222KxC	E82ZJ001	60	306	280 ... 295	240	162	6.5	39

Swivelling lateral mounting

- All controllers require a mounting kit:
  – Order number E82ZJ001 for 8200 vector 0.25 ... 2.2 kW

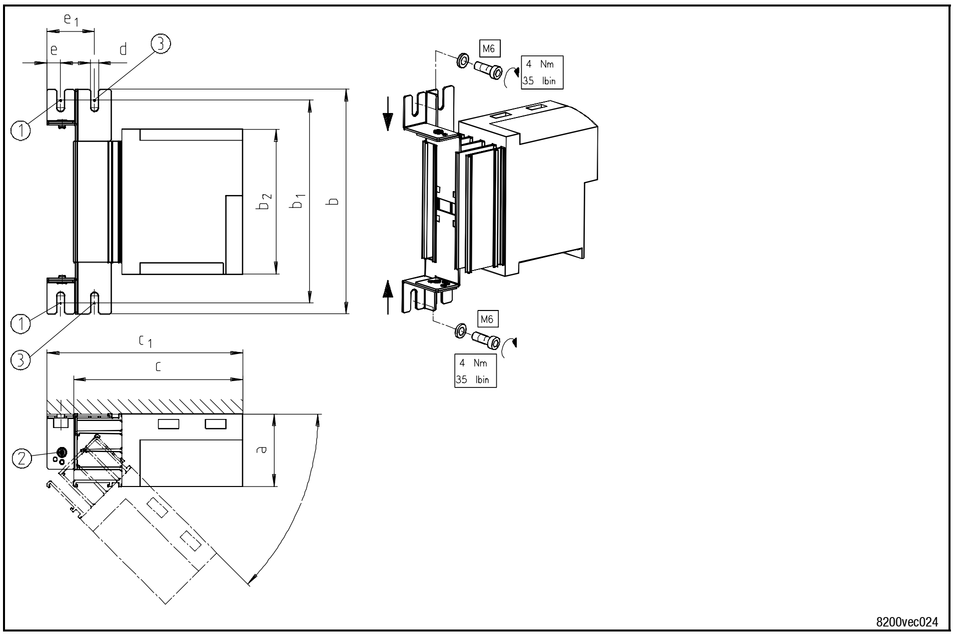


Fig. 5.3-9 Swivelling lateral mounting

① Bolt here
② Rotating point, stops at 45°, 90°, 135°, 180°
③ Bolt here to fasten the controller at 0° position.

8200 vector	Mounting kit	Dimensions [mm] a	b	b_1	b_2	c	c_1	d	e	e_1
E82EV251K2C E82EV371K2C	E82ZJ001	60	186	160 ... 175	120	140	162	6.5	11.5	39
E82EV551KxC E82EV751KxC			246	220 ... 235	180					
E82EV152KxC E82EV222KxC			306	280 ... 295	240					

5.4 Basic units in the power range 3 ... 11 kW

5.4.1 Mounting with fixing rails (standard)

8200 vector 3 ... 11 kW

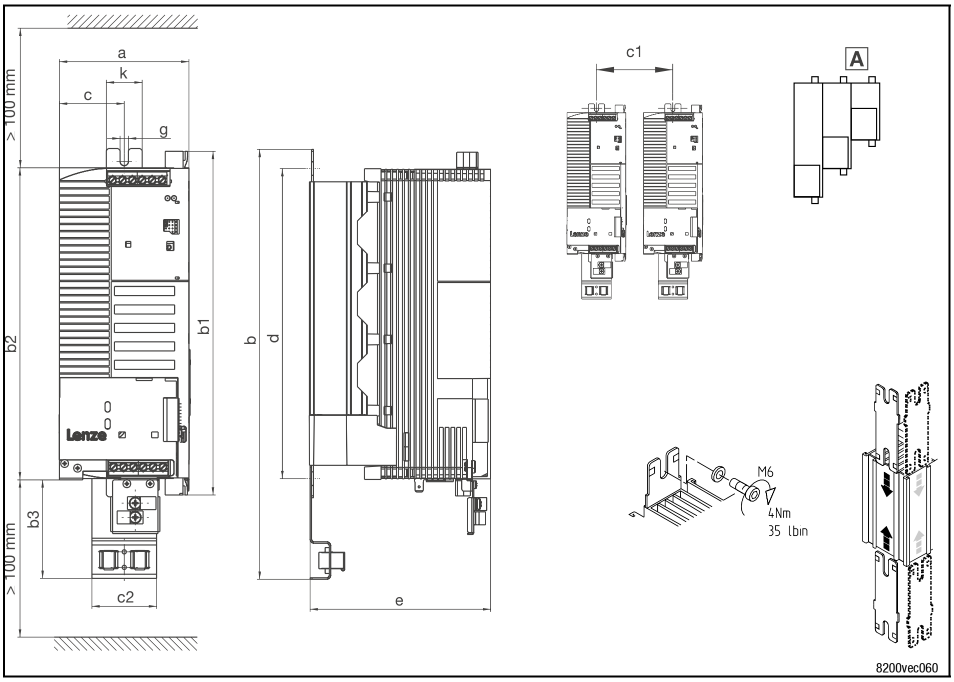


Fig. 5.4-1 Standard mounting with fixing rails 3 ... 11 kW

A Different sizes can only be mounted side by side when the smaller units are mounted to the right-hand-side of the bigger units!

8200 vector	Dimensions in mm a	b	b1	b2	b3	c	c1	c2	d	e	g	k
E82EV302K2C	100	333	268	240	78	50	103	50	255	140	6.5	28
E82EV402K2C							103					
E82EV552K2C 1)	125	333				62.5	128		255	140		
E82EV752K2C 1)		359 2)					128		280 ... 295 2)	162 2)		
E82EV302K4C	100	333				50	103		255	140		
E82EV402K4C							103					
E82EV552K4C							103					
E82EV752K4C 1)	125	333				62.5	128		255	140		
E82EV113K4C 1)		359 2)					128		280 ... 295 2)	162 2)		

1) Side mounting only possible with swivel holding unit E82ZJ006 (accessories)

2) with E82ZJ006

5.4.2 Thermally separated mounting (push-through technique)

For mounting in push-through technique use the controller type E82 **D** V... . The delivery package includes all parts and components required for mounting.

8200 vector 3 ... 11 kW

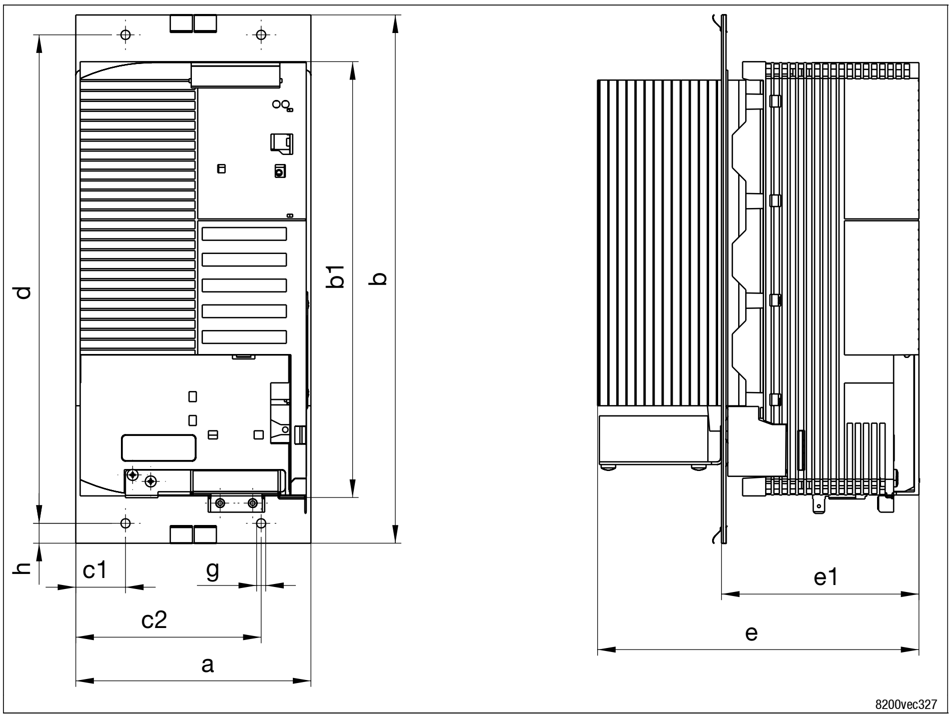


Fig. 5.4-2 Dimensions for thermally separated mounting 3 ... 11 kW

8200 vector	Dimensions [mm] a	b	b1	c1	c2	d	e	e1	g	h
E82DV302K2C E82DV402K2C	100	292	240	25	75	270	178	109.5	5	11
E82DV552K2C E82DV752K2C	130			27.5	102.5					
E82DV302K4C E82DV402K4C E82DV552K4C	100			25	75					
E82DV752K4C E82DV113K4C	130			27.5	102.5					

Mounting

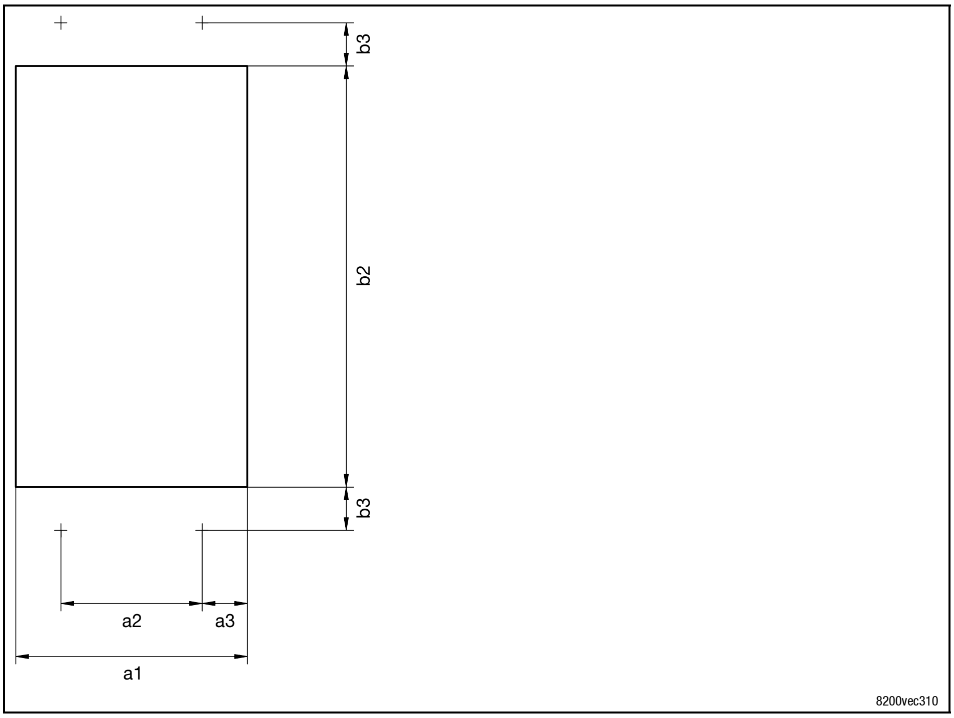


Fig. 5.4-3 Dimensions for thermally separated mounting cutout 3 ... 11 kW

1. Push the grounding terminals with the correct end onto the fixing frame:
   – The contact springs must point to the rear panel of the control cabinet
   – The cutouts of the seal determine the positions
2. Insert the 8200 vector into the cutout
3. Fasten it with 4 M4x10 screws

	Dimensions [mm]					
8200 vector	**a1**	**a2**	**a3**	**b2**	**b3**	Fixing frames
E82DV302K2C E82DV402K2C	80^{+1}	50	15	224^{+1}	23	integrated with seal
E82DV552K2C E82DV752K2C	123^{+1}	75	24			
E82DV302K4C E82DV402K4C E82DV552K4C	80^{+1}	50	15			
E82DV752K4C E82DV113K4C	123^{+1}	75	24			

5.4.3 Mounting in ”cold plate” technique

When using ”cold plate” technique the controllers can be mounted to sum coolers. Use controllers of type E82**C**V... .

Requirements on the cooler

The following points are important to ensure a safe operation of the drive controllers:

- Good thermal contact with the cooler:
  - The contact area between the cooler and the drive controller must be at least as large as the cooling plate of the drive controller.
  - Plane contact area, deviation max. to 0.05 mm.
  - The cooler and heatsink must be attached using all the screwed joints that are specified.
- Thermal resistance R_{th} according to table. The values are valid for operation with the drive controllers under rated conditions.

8200 vector		Cooling path	Ground
	Power to be dissipated	Heatsink - environment	
Type	P_{loss} [W]	R_{th} [°C/W]	[kg]
E82CV302K2C	110	≤ 0.23	2.4
E82CV402K2C	150	≤ 0.23	2.4
E82CV552K2C	205	≤ 0.13	3
E82CV752K2C	270	≤ 0.13	3
E82CV302K4C	110	≤ 0.23	2.4
E82CV402K4C	140	≤ 0.23	2.4
E82CV552K4C	190	≤ 0.23	3
E82CV752K4C	255	≤ 0.13	3
E82CV113K4C	360	≤ 0.13	3

Environmental conditions

- Ambient temperature - controllers
  - The rated data and the derating for higher temperatures still apply for the ambient temperature of the drive controller.
- Heat distribution between common heatsinks/coolers within the control cabinet
  - If you mount several components (drive controller, brake units etc.) on a common cooler, then care must be taken that the temperature of the controller heatsinks does not exceed 75 °C.

8200 vector 3 ... 11 kW

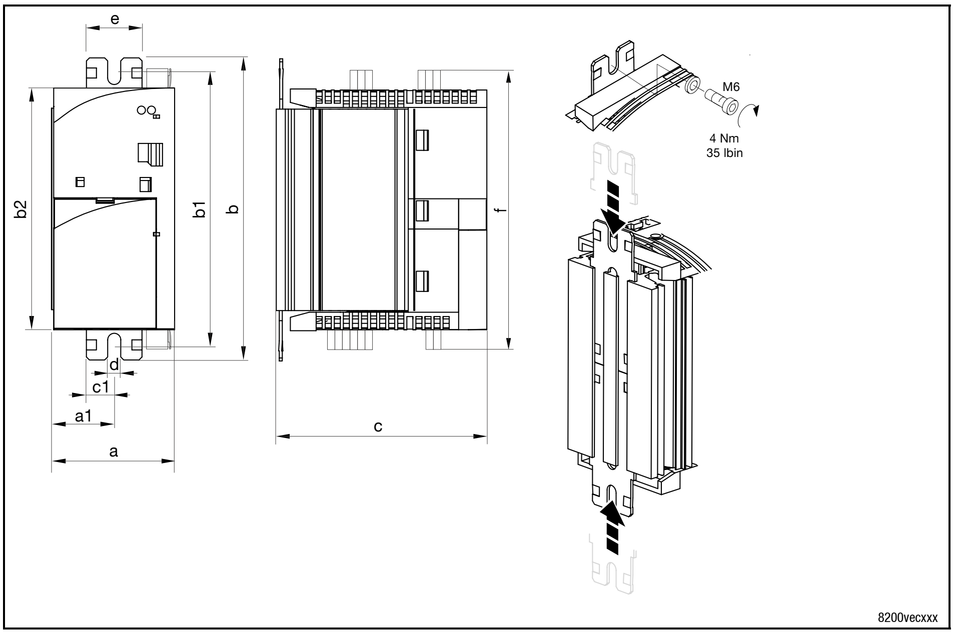


Fig. 5.4-4 Dimensions for mounting in ”cold plate” technique 3 ... 11 kW

<table>
<tr><th rowspan="2">8200 vector</th><th colspan="13">Dimensions [mm]</th></tr>
<tr><th>a</th><th>b</th><th>b1</th><th>b2</th><th>b3</th><th>c1</th><th>c2</th><th>c3</th><th>c4</th><th>d1</th><th>d2</th><th>e</th><th>g</th></tr>
<tr><td>E82CV302K2C</td><td rowspan="2">100</td><td rowspan="9">318</td><td rowspan="9">268</td><td rowspan="9">240</td><td rowspan="9">78</td><td rowspan="2">19</td><td rowspan="2">62.5</td><td rowspan="2">103</td><td rowspan="9">50</td><td rowspan="9">140</td><td rowspan="9">30</td><td rowspan="9">106</td><td rowspan="9">M4
10
deep</td></tr>
<tr><td>E82CV402K2C</td></tr>
<tr><td>E82CV552K2C</td><td rowspan="2">125</td><td rowspan="2">22</td><td rowspan="2">84.5</td><td rowspan="2">128</td></tr>
<tr><td>E82CV752K2C</td></tr>
<tr><td>E82CV302K4C</td><td rowspan="3">100</td><td rowspan="3">19</td><td rowspan="3">62.5</td><td rowspan="3">103</td></tr>
<tr><td>E82CV402K4C</td></tr>
<tr><td>E82CV552K4C</td></tr>
<tr><td>E82CV752K4C</td><td rowspan="2">125</td><td rowspan="2">22</td><td rowspan="2">84.5</td><td rowspan="2">128</td></tr>
<tr><td>E82CV113K4C</td></tr>
</table>

Mounting

Note!

- Apply heat-conducting paste before you bolt together the cooler and the heatsink to keep the thermal resistance as low as possible.
- The quantity of heat-conducting paste supplied in the delivery package is sufficient for approx. 1000 cm^2.

1. Slide the mounting rails into the heatsink from the top and from the bottom
2. Clean the area of contact between the heatsink and the cooler with methylated spirits.
3. Apply a thin layer of heat-conducting paste.
4. Bolt the drive controller onto the cooler using two screws.

5.4.4 Lateral mounting

Note!

This mounting variant does not enable a CE-typical drive system to be installed.

Lateral mounting of the controller is possible on both sides. The controller is either fixed or can be swivelled depending on the mounting point. Both mounting types use the same mounting kit.

Fixed lateral mounting

- All controllers require a mounting kit:
  - – Order number E82ZJ005 for 8200 vector 3 ... 4 kW (230 V)
  - – Order number E82ZJ006 for 8200 vector 5.5 ... 7.5 kW (230 V)
  - – Order number E82ZJ005 for 8200 vector 3 ... 5.5 kW (400/500 V)
  - – Order number E82ZJ006 for 8200 vector 7.5 ... 11 kW (400/500 V)

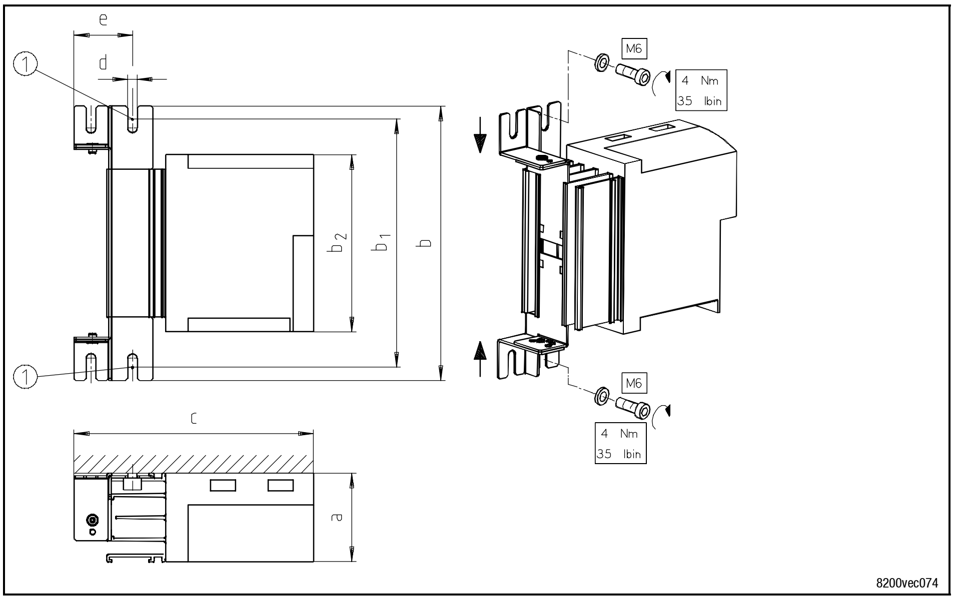


Fig. 5.4-5 Fixed lateral mounting

① Bolt here

8200 vector	Mounting kit	Dimensions [mm] a	b	b_1	b_2	c	d	e
E82EV302K2C E82EV402K2C	E82ZJ005	100	306	280 ... 295	240	162	6.5	39
E82EV552K2C E82EV752K2C	E82ZJ006	125						
E82EV302K4C E82EV402K4C E82EV552K4C	E82ZJ005	100						
E82EV752K4C E82EV113K4C	E82ZJ006	125						

Swivelling lateral mounting

- All controllers require a mounting kit:
  - Order number E82ZJ005 for 8200 vector 3 ... 4 kW (230 V)
  - Order number E82ZJ006 for 8200 vector 5.5 ... 7.5 kW (230 V)
  - Order number E82ZJ005 for 8200 vector 3 ... 5.5 kW (400/500 V)
  - Order number E82ZJ006 for 8200 vector 7.5 ... 11 kW (400/500 V)

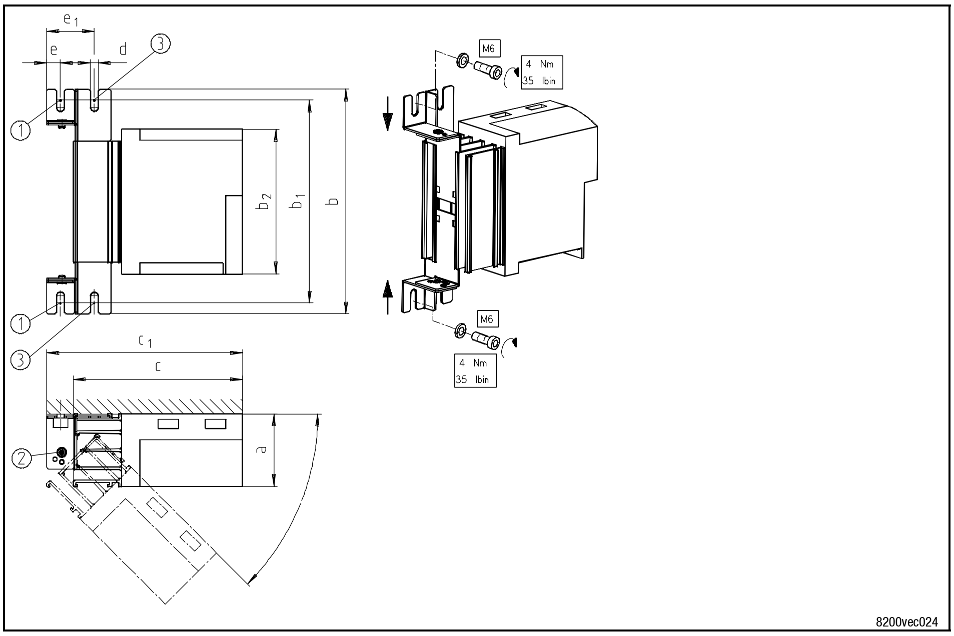


Fig. 5.4-6 Swivelling lateral mounting

① Bolt here
② Rotating point, stops at 45°, 90°, 135°, 180°
③ Bolt here to fasten the controller at 0° position.

8200 vector	Mounting kit	Dimensions [mm] a	b	b_1	b_2	c	c_1	d	e	e_1
E82EV302K2C E82EV402K2C	E82ZJ005	100	306	280 ... 295	240	140	162	6.5	11.5	39
E82EV552K2C E82EV752K2C	E82ZJ006	125								
E82EV302K4C E82EV402K4C E82EV552K4C	E82ZJ005	100								
E82EV752K4C E82EV113K4C	E82ZJ006	125								

5.5 Basic units in the power range 15 ... 30 kW

5.5.1 Mounting with fixing brackets and mains choke (standard)

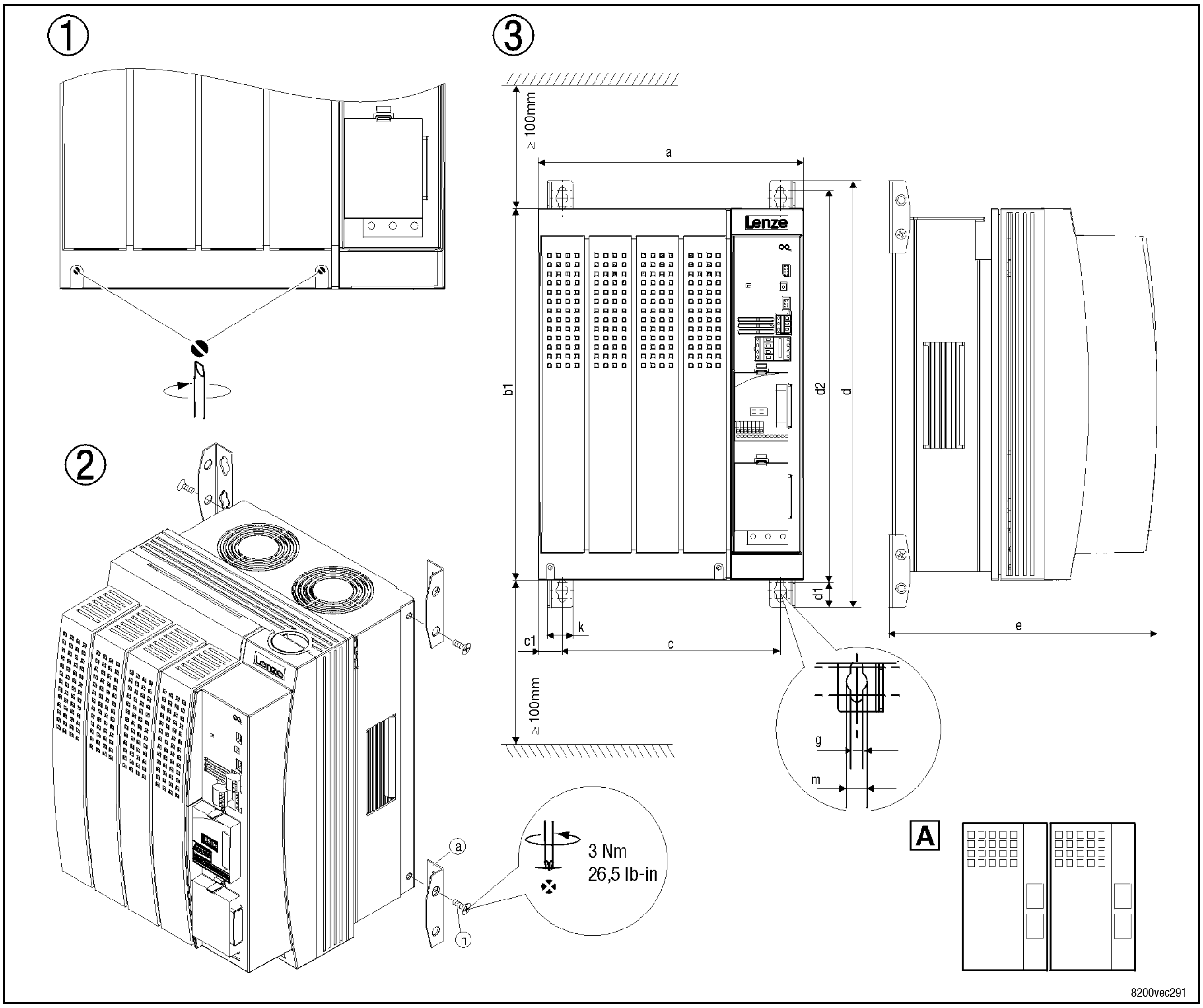


Fig. 5.5-1 Standard mounting with mains choke 15 ... 30 kW

① Loose both screws in order to remove the housing cover. The assembly kit can be found under the housing cover.
② Mounting of the fixing brackets
③ Dimensions
A Drive controllers can be mounted side by side without a certain space to each other.

8200 vector	Mains choke	Dimensions [mm] a	b1	c	c1	d	d1	d2	e	g	k	m
E82EV153K4B2x1	ELN3-0088H035	250	350	205	22	402	24	370	250	6.5	24	11
E82EV223K4B2x1	ELN3-0075H045											
E82EV303K4B2x1	ELN3-0055H055											

5.5.2 Mounting with fixing brackets and footprint mains filter

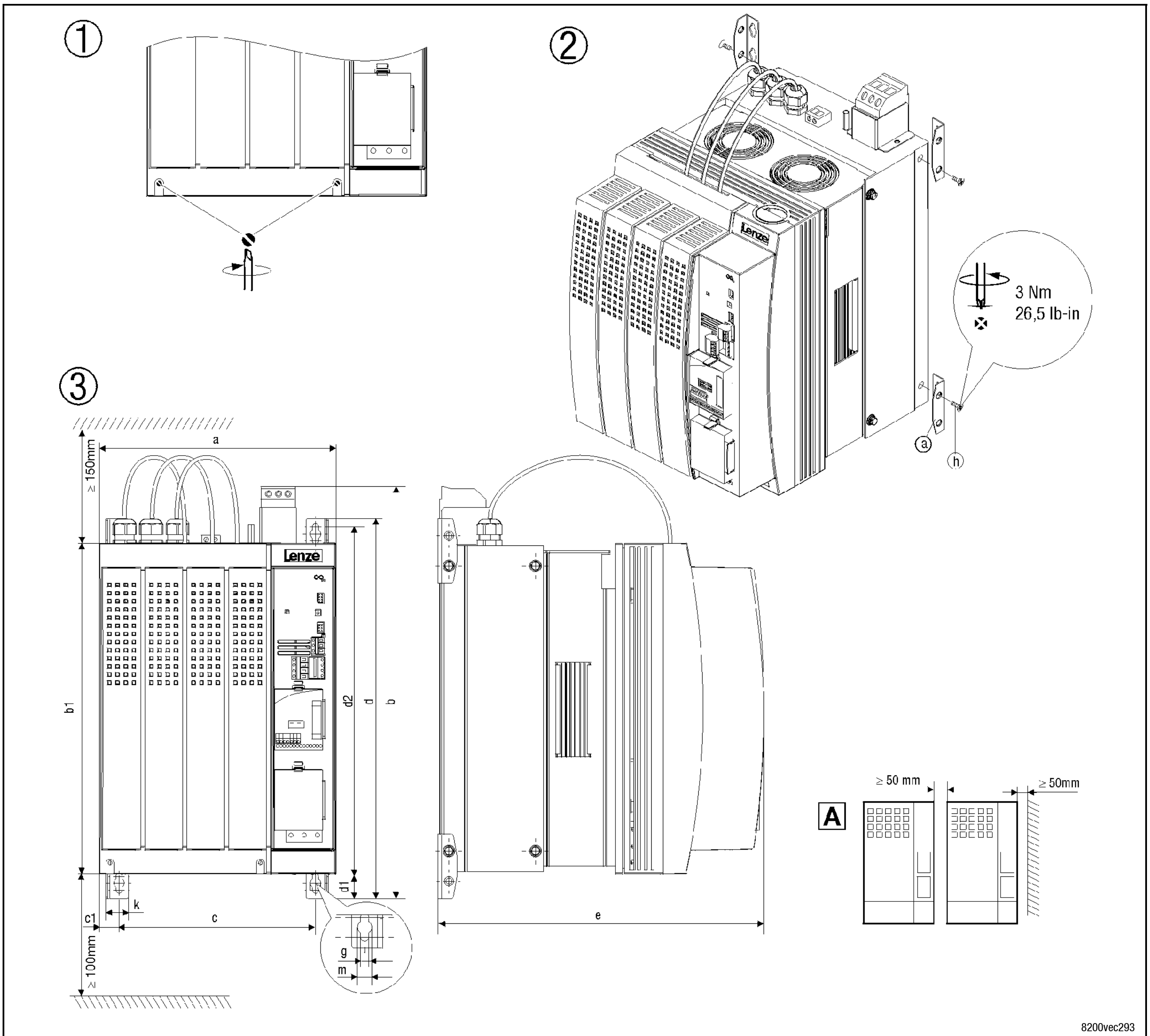


Fig. 5.5-2 Standard mounting with footprint mains filter 15 ...30 kW

① Loose both screws in order to remove the housing cover. The assembly kit can be found under the housing cover.
② Mounting of the fixing brackets
③ Dimensions
A Mount the drive controllers side by side with a certain space to each other in order to dismount lifting-eye bolts, if necessary.

8200 vector	Dimensions [mm] a	b	b1	c	c1	d	d1	d2	e	g	k	m
E82EV153K4B3xx E82EV223K4B3xx E82EV303K4B3xx	250	456	350	205	22	402	24	370	340	6.5	24	11

5.5.3 Mounting with fixing brackets and built-on mains filter

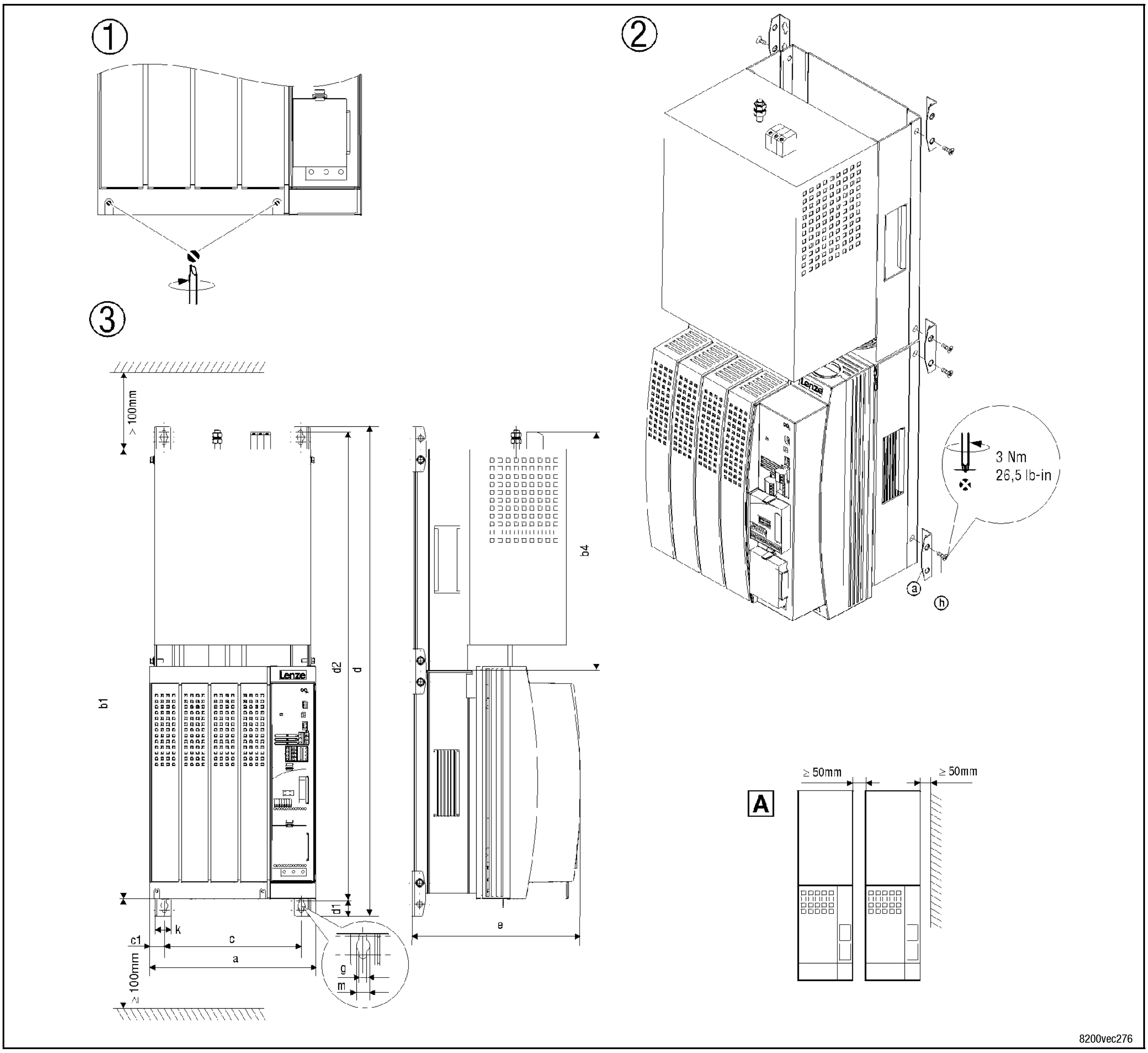


Fig. 5.5-3 Standard mounting with built-on mains filter 15 ... 30 kW

① Loose both screws in order to remove the housing cover. The assembly kit can be found under the housing cover.
② Mounting of the fixing brackets
③ Dimensions
A Mount the drive controllers side by side with a certain space to each other in order to dismount lifting-eye bolts, if necessary.

8200 vector	Mains filter type A or type B	Dimensions [mm] a	b1	b4	c	c1	d	d1	d2	e	g	k	m
E82EV153K4B2x1	EZN3x0110H030	250	680	365	205	22	740	24	705	250	6.5	24	11
E82EV223K4B2x1	EZN3x0080H042												
E82EV303K4B2x1	EZN3x0055H060	250	680	365	205	22	740	24	705	285	6.5	24	11

5.5.4 Thermally separated mounting (push-through technique)

For mounting in push-through technique use the controller type E82 **D** V... . The delivery package includes all parts and components required for mounting.

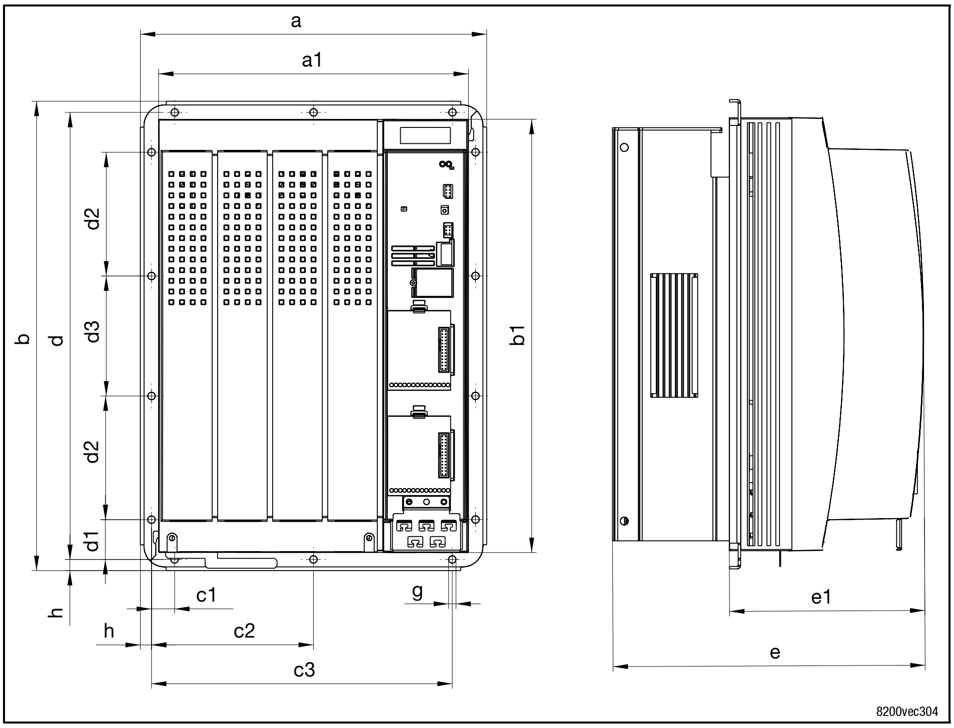


Fig. 5.5-4 Dimensions for thermally separated mounting 15 ... 30 kW

	Dimensions [mm]														
8200 vector	**a**	**a1**	**b**	**b1**	**c1**	**c2**	**c3**	**d**	**d1**	**d2**	**d3**	**e**	**e1**	**g**	**h**
E82DV153K4B	279.5	250	379.5	350	19	131	261.5	361.5	32	100	97	250	159.5	4.2	9
E82DV223K4B															
E82DV303K4B															

Mounting cutout in the control cabinet

	Dimensions [mm]	
8200 vector	**a**	**a1**
E82DV153K4B	279.5	250
E82DV223K4B		
E82DV303K4B		

5.5.5 Mounting in ”cold plate” technique

When using ”cold plate” technique the controllers can be mounted to sum coolers. Use controllers of type E82**C**V... .

Requirements on the cooler

The following points are important to ensure a safe operation of the drive controllers:

- Good thermal contact with the cooler:
  - The contact area between the cooler and the drive controller must be at least as large as the cooling plate of the drive controller.
  - Plane contact area, deviation max. to 0.05 mm.
  - The cooler and heatsink must be attached using all the screwed joints that are specified.
- Thermal resistance R_{th} according to table. The values are valid for operation with the drive controllers under rated conditions.

8200 vector Type	Power to be dissipated P_{loss} [W]	Cooling path Heatsink - environment R_{th} [°C/W]	Ground [kg]
E82CV153K4B	410	≤ 0.085	
E82CV223K4B	610	≤ 0.057	

Environmental conditions

- Ambient temperature - controllers
  - The rated data and the derating for higher temperatures still apply for the ambient temperature of the drive controller.
- Heat distribution between common heatsinks/coolers within the control cabinet
  - If you mount several components (drive controller, brake units etc.) on a common cooler, then care must be taken that the temperature of the controller heatsinks does not exceed 75 °C.

Without mains filter

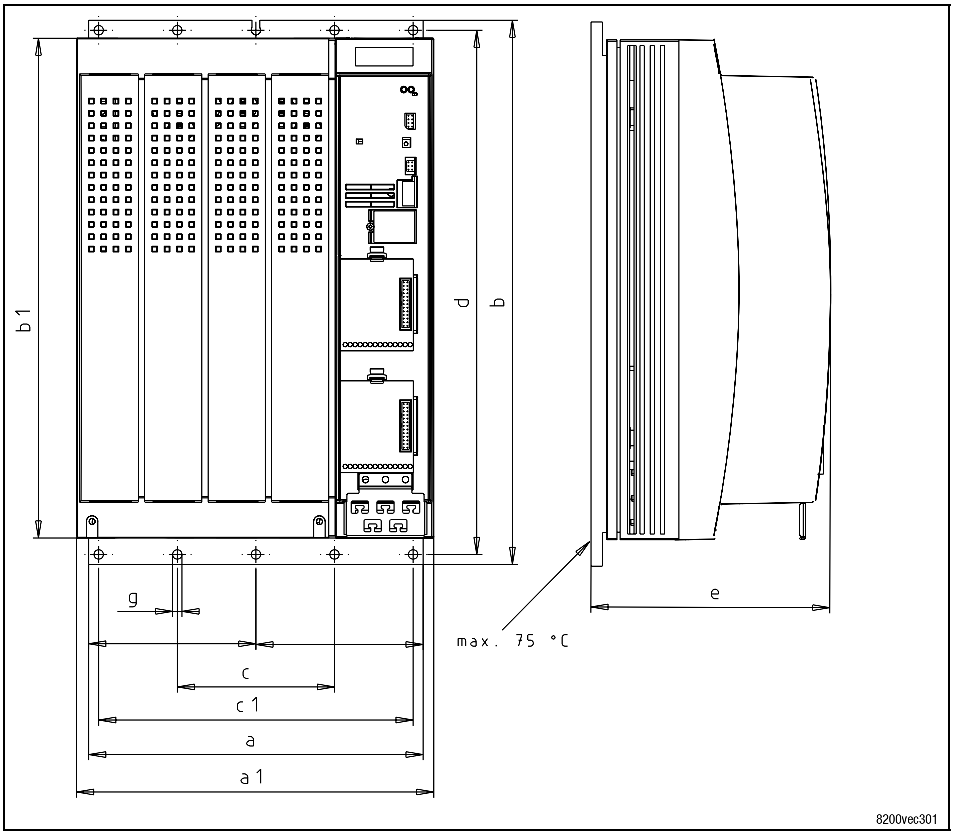


Fig. 5.5-5 Dimensions for 8200 vector in "cold plate" technique 15 ... 22 kW

	Dimensions [mm]								
8200 vector	**a**	**a1**	**b**	**b1**	**c**	**c1**	**d**	**e**	**g**
E82CV153K4B E82CV223K4B	234	250	381	350	110	220	387	171	6.5

Basic device installation

Basic units in the power range 15 ... 30 kW
Mounting in ”cold plate” technique

With mains filter

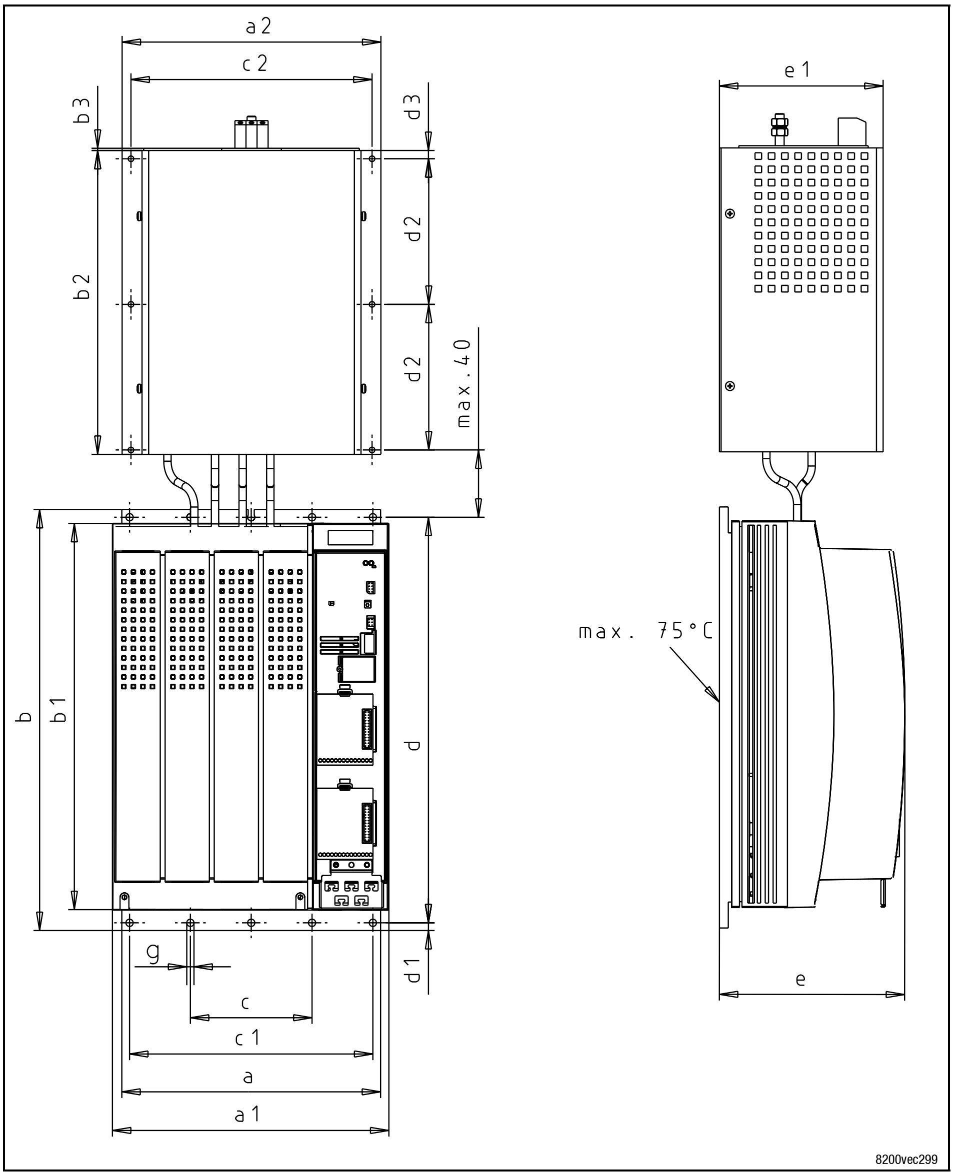


Fig. 5.5-6 Dimensions for 8200 vector in ”cold plate” technique 15 ... 22 kW

	Dimensions [mm]								
8200 vector	**a**	**a1**	**b**	**b1**	**c**	**c1**	**d**	**e**	**g**
E82CV153K4B E82CV223K4B	234	250	381	350	110	220	387	171	6.5

	Dimensions [mm]							
8200 vector	**a2**	**b2**	**b3**	**c2**	**d1**	**d2**	**d3**	**e1**
E82CV153K4B E82CV223K4B	234	275	2	218	7	131.8	7.5	148

5.6 Basic units in the power range 45 ... 55 kW

5.6.1 Mounting with fixing brackets and mains choke (standard)

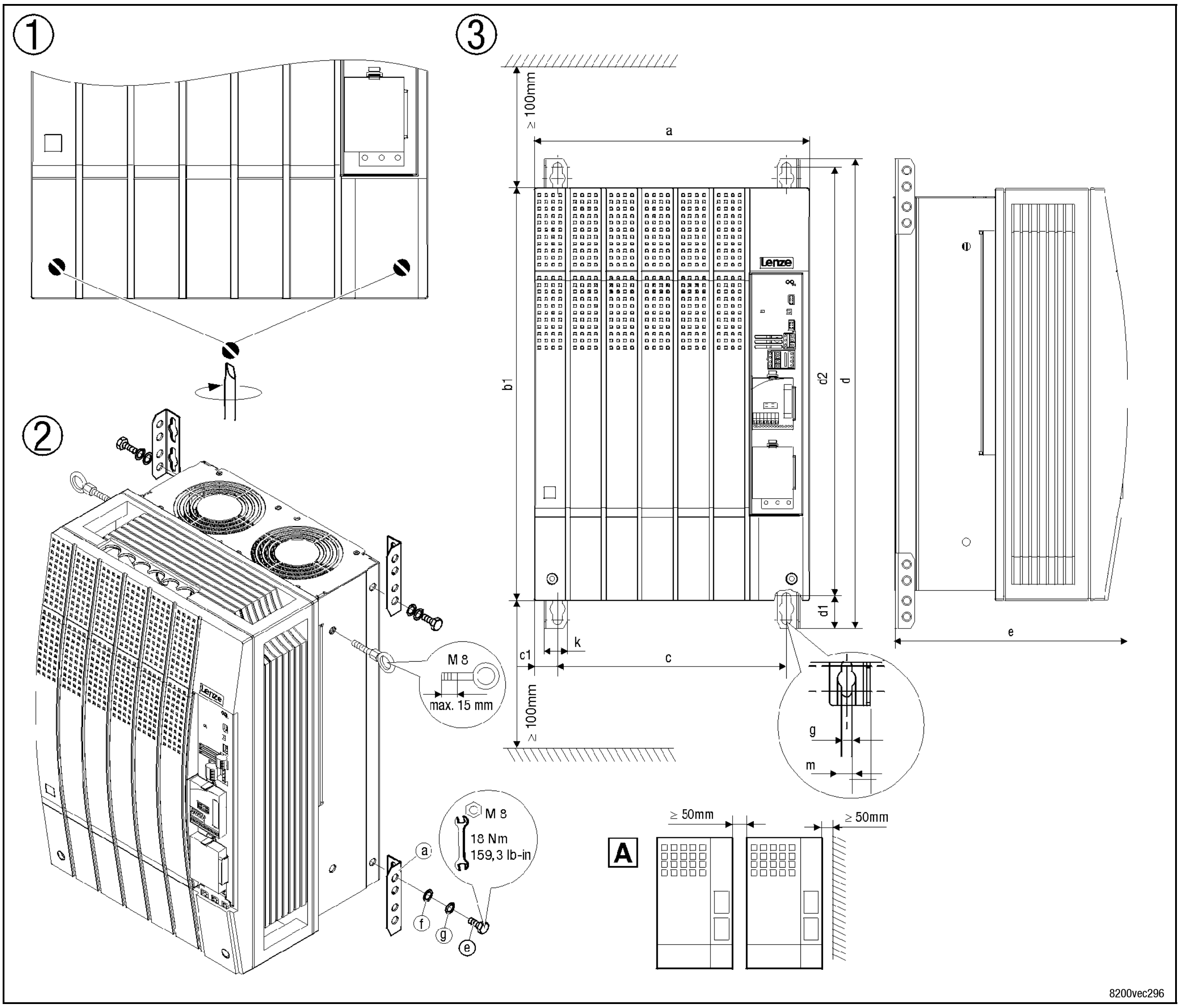


Fig. 5.6-1 Standard mounting with mains choke 45 ... 55 kW

① Loose both screws in order to remove the housing cover.
② Mounting of the fixing brackets
③ Dimensions
A Mount the drive controllers side by side leaving a certain space for dismounting the lifting-eye bolt.

		Dimensions [mm]										
8200 vector	Mains choke	a	b1	c	c1	d	d1	d2	e	g	k	m
E82EV453K4B2x1	ELN3-0038H085	340	510	284	28	580	38	532	285	11	28	18
E82EV553K4B2x1	ELN3-0027H105	340	591	284	28	672	38	624	285	11	28	18

5.6.2 Mounting with fixing brackets and footprint mains filter

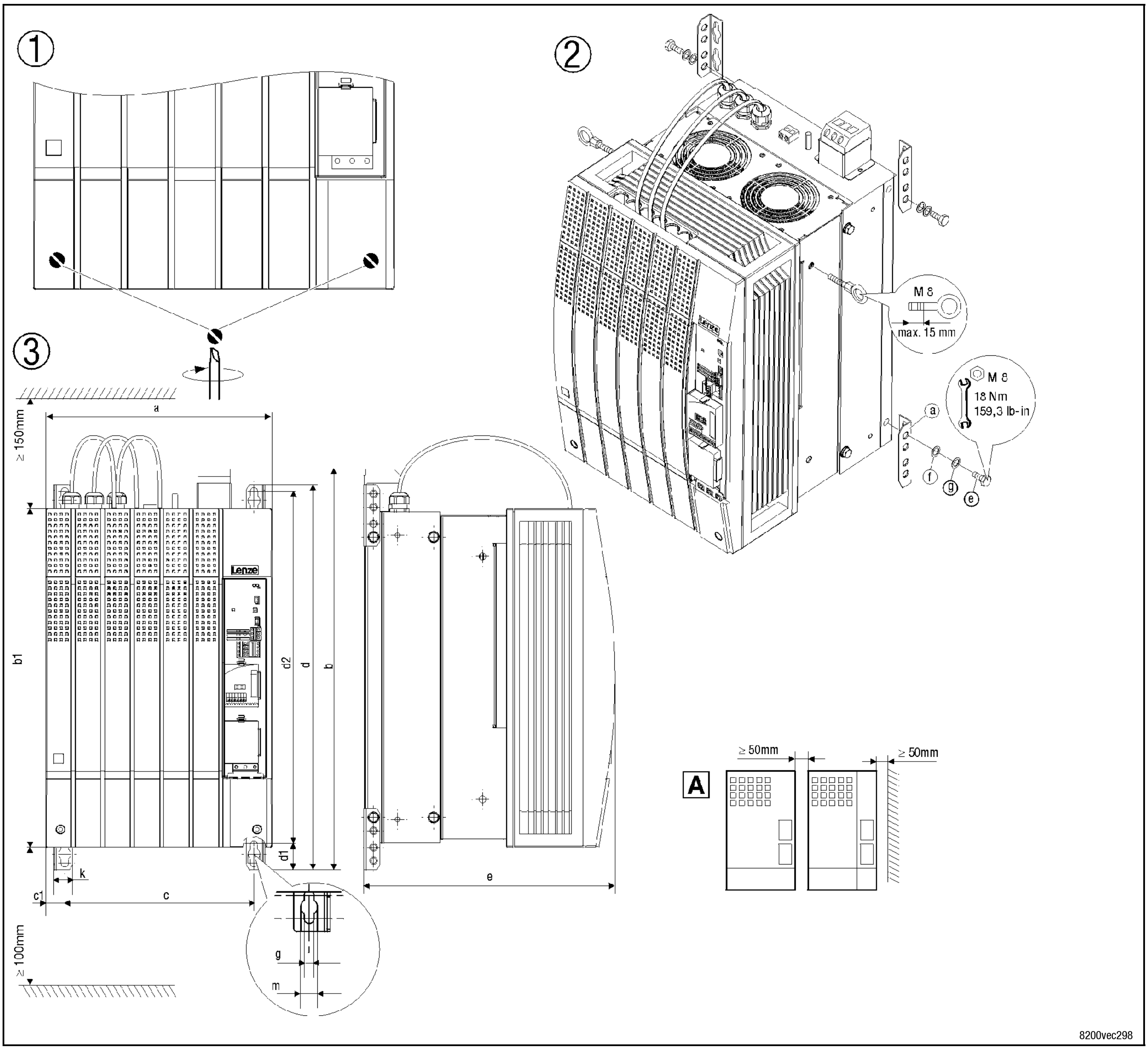


Fig. 5.6-2 Standard mounting with footprint mains filter 45 ... 55 kW

① Loose both screws in order to remove the housing cover.
② Mounting of the fixing brackets
③ Dimensions
A Mount the drive controllers side by side leaving a certain space for dismounting the lifting-eye bolt.

	Dimensions [mm]											
8200 vector	a	b	b1	c	c1	d	d1	d2	e	g	k	m
E82EV453K4B3xx	340	619	510	284	28	580	38	532	375	11	28	18
E82EV553K4B3xx	340	729	591	284	28	672	38	624	375	11	28	18

5.6.3 Mounting with fixing brackets and built-on mains filter

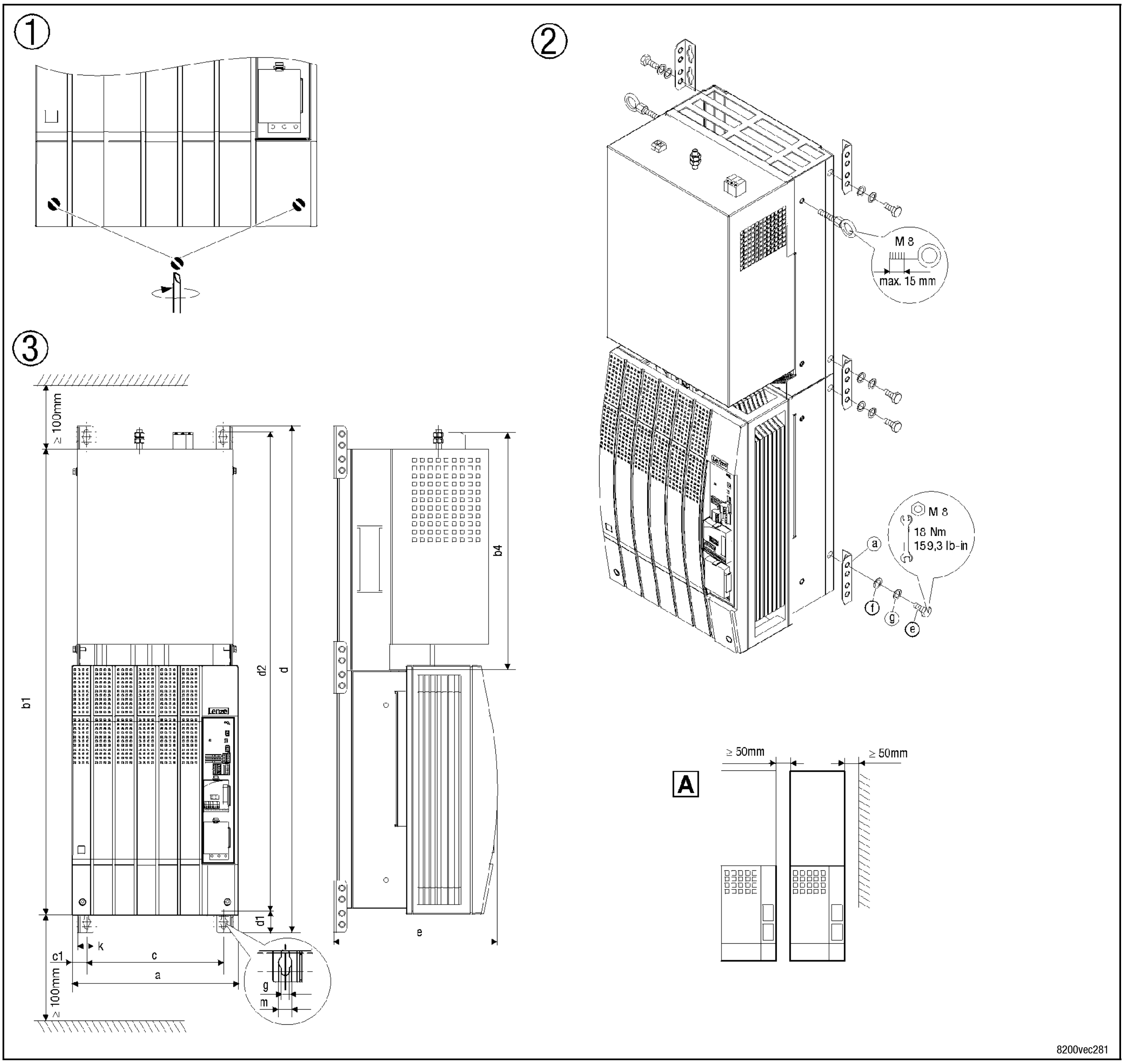


Fig. 5.6-3 Standard mounting with built-on mains filter

① Loose both screws in order to remove the housing cover.
② Mounting of the fixing brackets
③ Dimensions
A Mount the drive controllers side by side leaving a certain space for dismounting the lifting-eye bolt.

8200 vector	Mains filter type A or type B	Dimensions [mm]											
		a	b1	b4	c	c1	d	d1	d2	e	g	k	m
E82EV453K4B	EZN3x0037H090	340	973	508	284	28	1050	38	1000	285	11	28	18
E82EV553K4B	EZN3x0030H110												

5.6.4 Thermally separated mounting (push-through technique)

For mounting in push-through technique use the controller type E82 **D** V... . The delivery package includes all parts and components required for mounting.

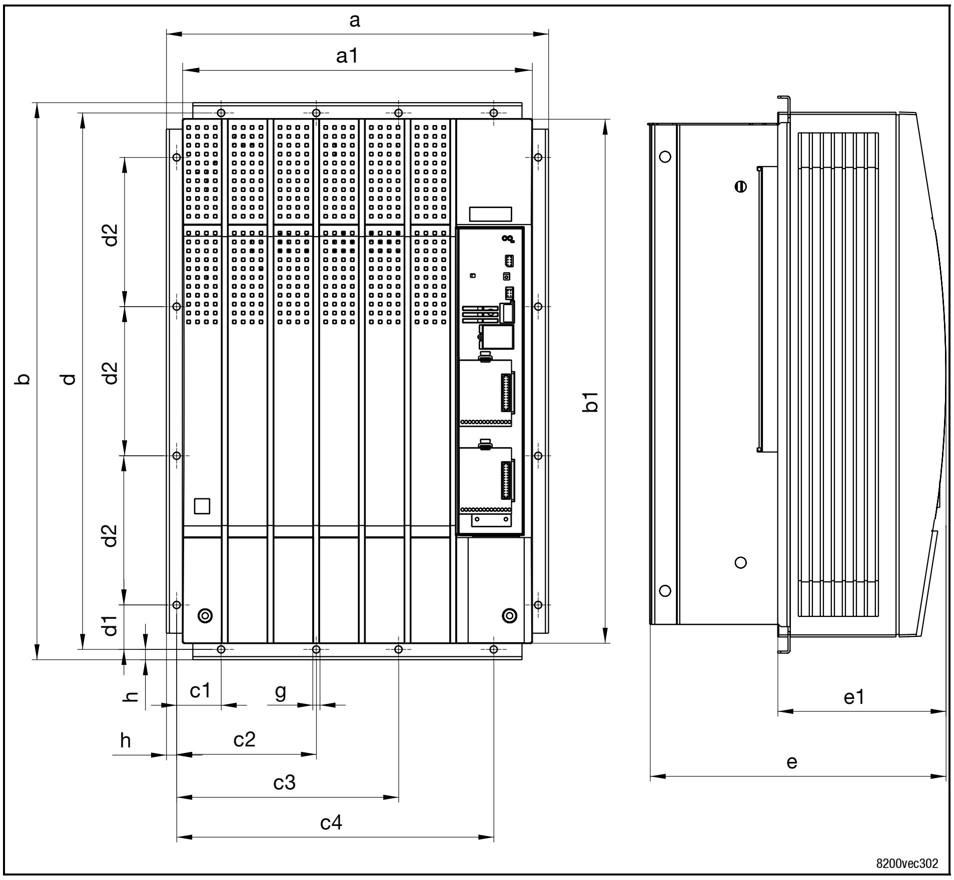


Fig. 5.6-4 Dimensions for thermally separated mounting 45 ... 55 kW

	Dimensions [mm]														
8200 vector	**a**	**a1**	**b**	**b1**	**c1**	**c2**	**c3**	**c4**	**d**	**d1**	**d2**	**e**	**e1**	**g**	**h**
E82DV453K4B E82DV553K4B	373	340	543	510	45	92.5	172.5	265	525	45	145	285	163.5	7	9

Mounting cutout in the control cabinet

	Dimensions [mm]	
8200 vector	**a**	**a1**
E82DV453K4B E82DV553K4B	373	340

5.7 Basic units in the power range 75 ... 90 kW

5.7.1 Mounting with fixing brackets and mains choke (standard)

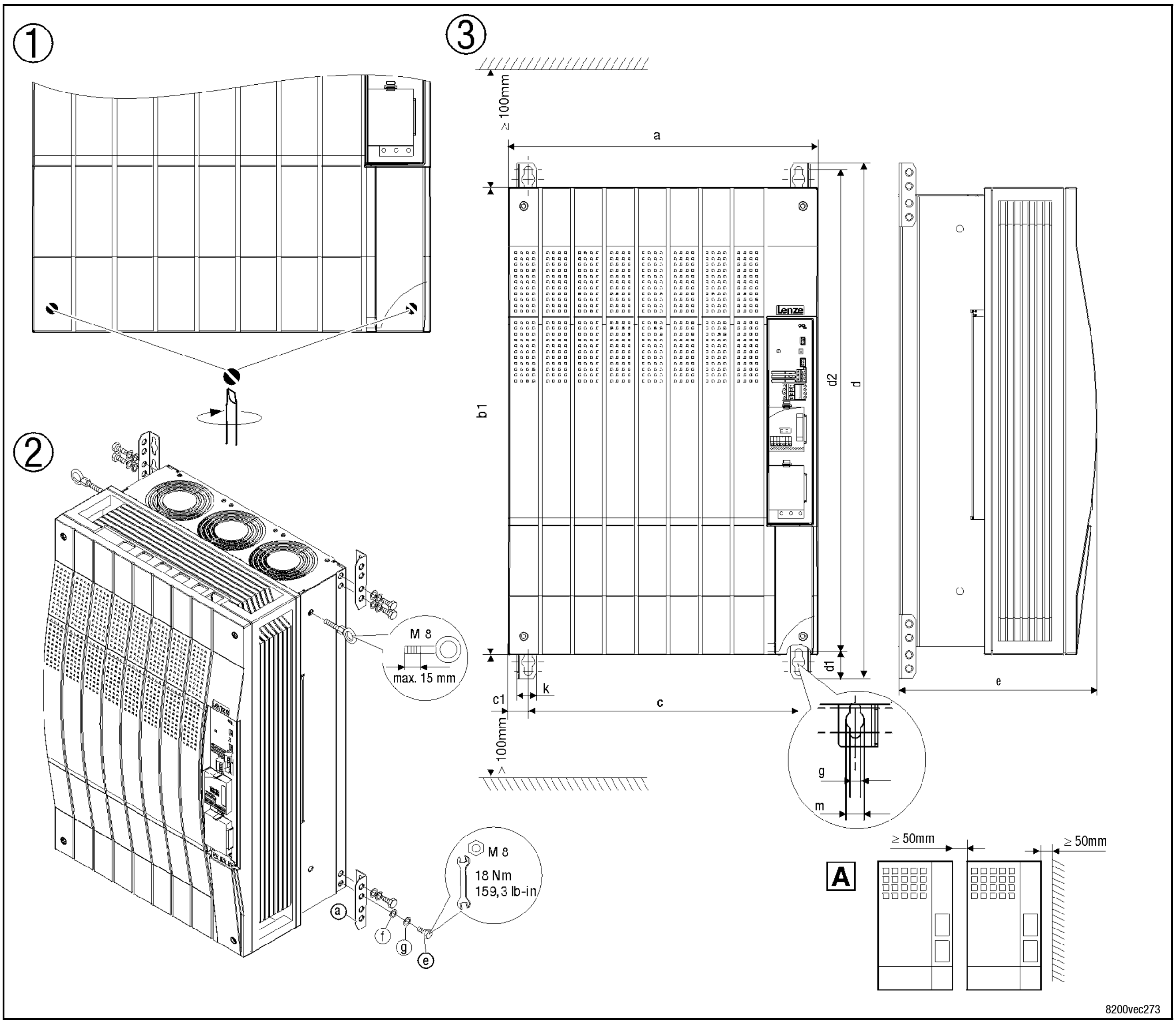


Fig. 5.7-1 Standard mounting with mains choke 75 ... 90 kW

① Loose both screws in order to remove the housing cover.
② Mounting of the fixing brackets
③ Dimensions
A Mount the drive controllers side by side leaving a certain space for dismounting the lifting-eye bolt.

8200 vector	Mains choke	Dimensions [mm] a	b1	c	c1	d	d1	d2	e	g	k	m
E82EV753K4B2x1 E82EV903K4B2x1	ELN3-0017H170	450	680	395	30.5	750	38	702	285	11	28	18

5.7.2 Mounting with fixing brackets and footprint mains filter

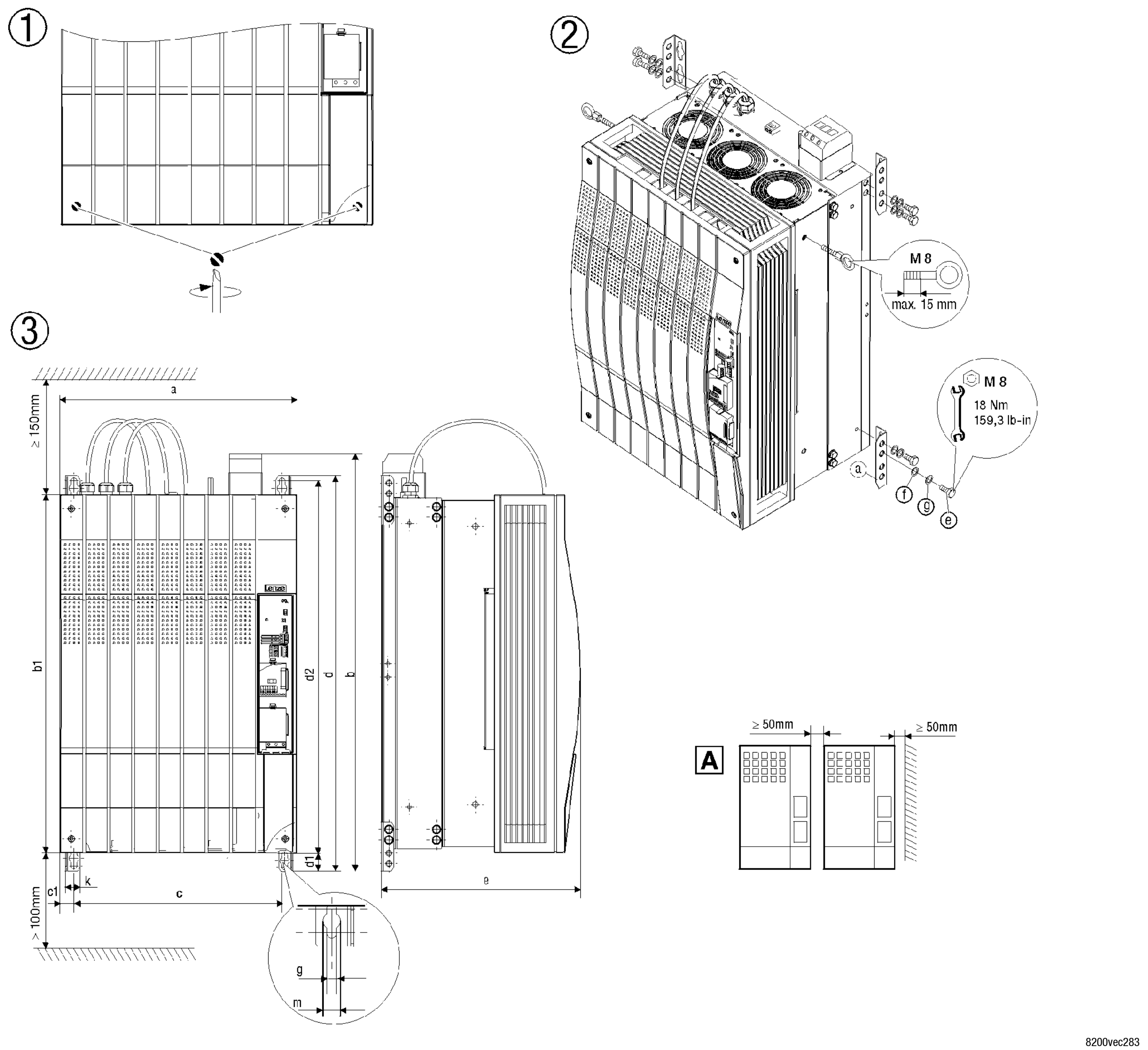


Fig. 5.7-2 Standard mounting with footprint mains filter 75 ... 90 kW

① Loose both screws in order to remove the housing cover.
② Mounting of the fixing brackets
③ Dimensions
A Mount the drive controllers side by side leaving a certain space for dismounting the lifting-eye bolt.

8200 vector	Dimensions [mm]										
	a	b	b1	c	c1	d	d1	d2	e	g	k	m
E82EV753K4B3xx E82EV903K4B3xx	450	802	680	395	30.5	750	38	702	375	11	28	18

5.7.3 Mounting with fixing brackets and built-on mains filter (mounting variant 1)

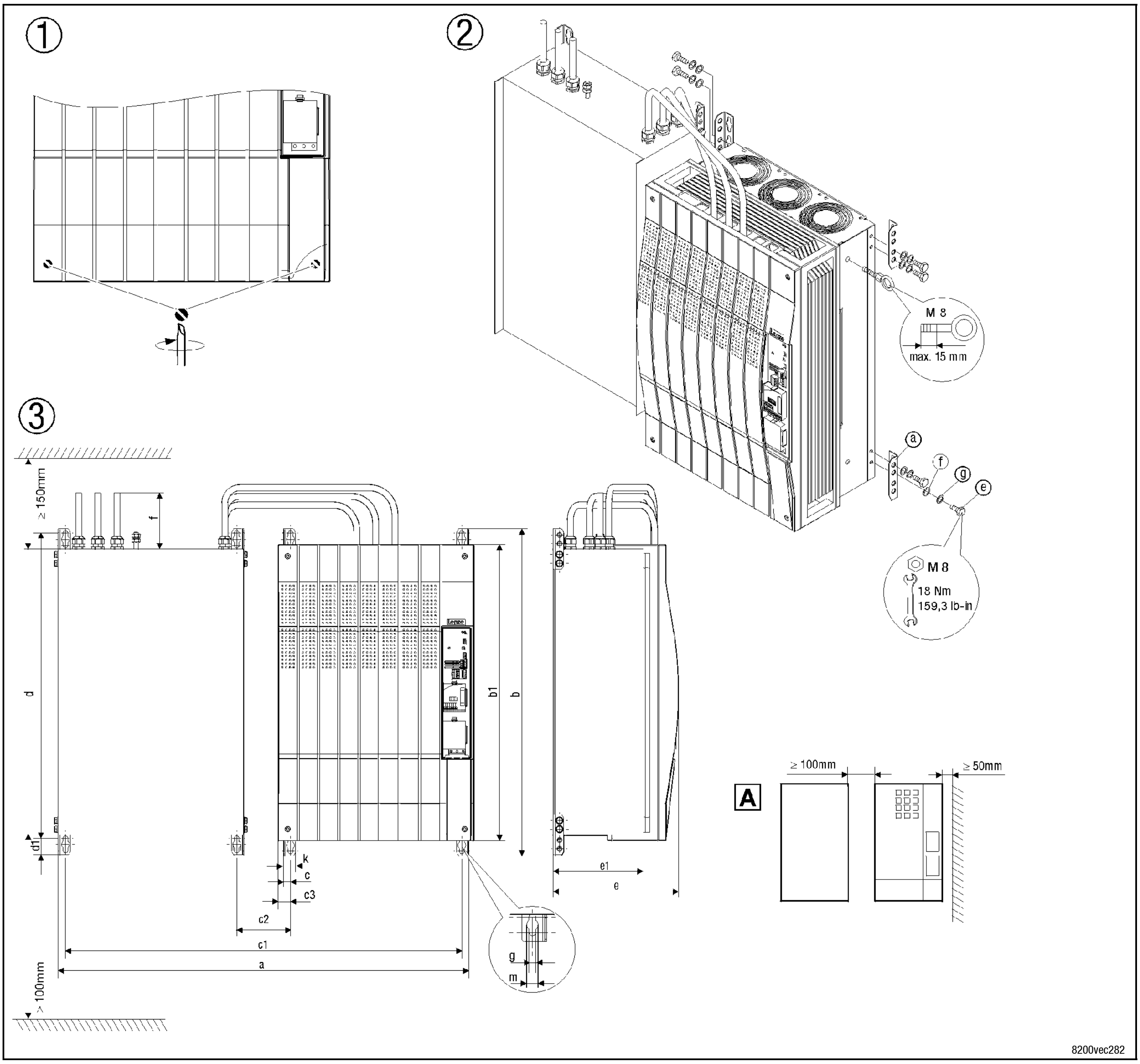


Fig. 5.7-3 Standard mounting with built-on mains filter 75 ... 90 kW (mounting variant 1)

① Loose both screws in order to remove the housing cover.
② Mounting of the fixing brackets
③ Dimensions
A Mount the drive controllers side by side leaving a certain space for dismounting the lifting-eye bolt.

8200 vector	Mains filter type A or type B	Dimensions [mm] a	b	c	c1	c2	c3	d	d1	e	e1	f	g	k	m
E82EV753K4B2x1	EZN3x0022H150	1000	750	16	970	180	30.5	702	38	285	207.5	1000	11	28	18
E82EV903K4B2x1	EZN3x0017H200														

5.7.4 Mounting with fixing brackets and built-on mains filter (mounting variant 2)

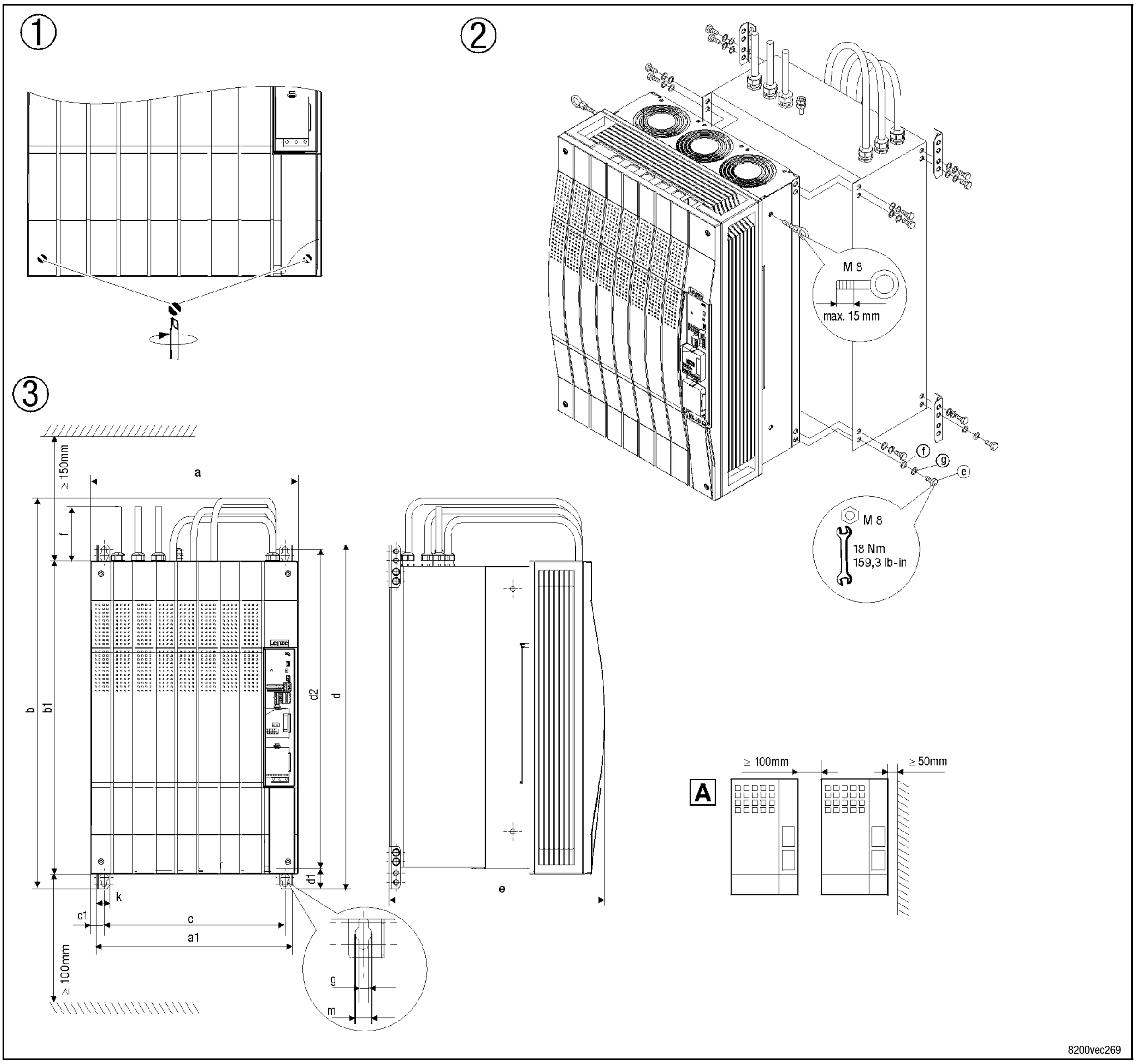


Fig. 5.7-4 Standard mounting with built-on mains filter 75 ...90 kW (mounting variant 2)

① Loose both screws in order to remove the housing cover.
② Mounting of the fixing brackets
③ Dimensions
A Mount the drive controllers side by side leaving a certain space for dismounting the lifting-eye bolt.

8200 vector	Mains filter type A or type B	Dimensions [mm] a	a1	b	b1	c	c1	d	d1	d2	d3	e	f	g	k	m
E82EV753K4B2x1	EZN3x0022H150	450	428	800	680	395	30.5	750	38	702	328	470	1000	11	28	18
E82EV903K4B2x1	EZN3x0017H200															

5.7.5 Thermally separated mounting (push-through technique)

For mounting in push-through technique use the controller type E82 **D** V... . The delivery package includes all parts and components required for mounting.

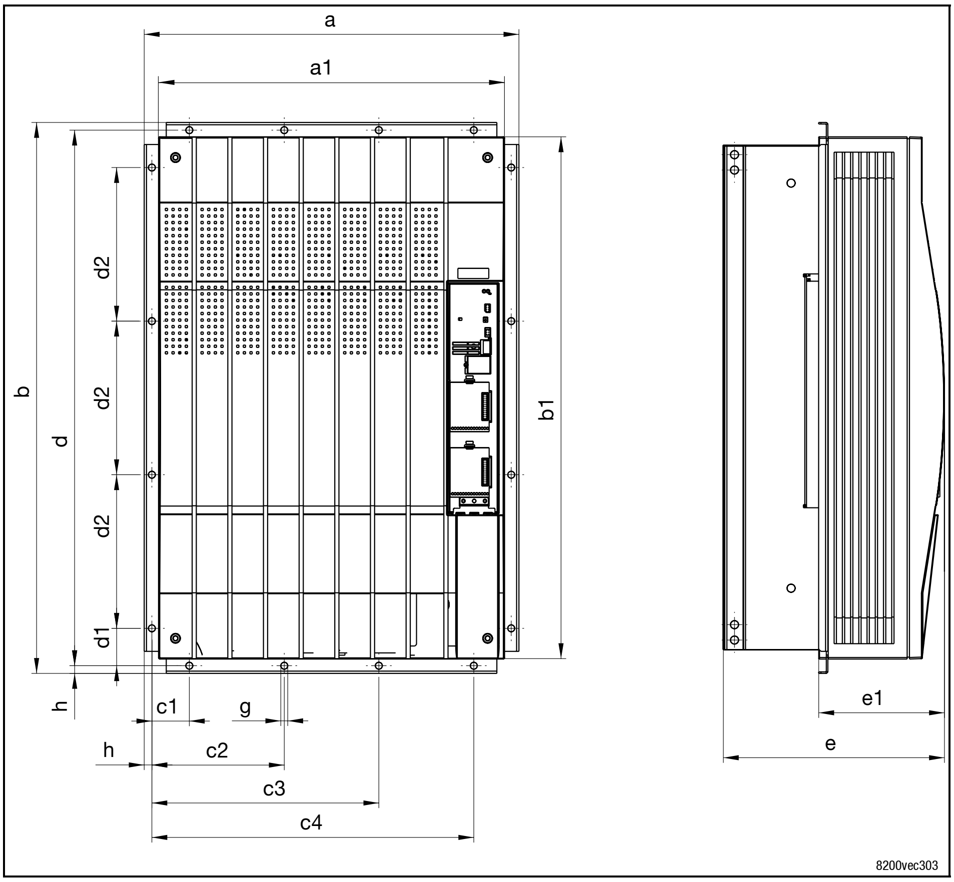


Fig. 5.7-5 Dimensions for thermally separated mounting 75 ... 90 kW

8200 vector	Dimensions [mm]														
	a	**a1**	**b**	**b1**	**c1**	**c2**	**c3**	**c4**	**d**	**d1**	**d2**	**e**	**e1**	**g**	**h**
E82DV753K4B E82DV903K4B	488	450	718	680	49	172.5	295.5	419	698	49	200	285	163.5	9	10

Mounting cutout in the control cabinet

8200 vector	Dimensions [mm]	
	a	**a1**
E82DV753K4B E82DV903K4B	488	450

6 Basic unit wiring

6.1 Contents

Contents

6.2 Important notes

Stop!

The drive controller contains electrostatically sensitive components!

The personnel must be free of electrostatic charge prior to assembly and service operations.

6.2.1 Protection of persons

Danger!

Before working on the controller check that no voltage is applied to the power terminals, the relay output and the pins of the FIF interface

- because the power terminals U, V, W, BR1, BR2 and the pins of the FIF interface remain live for at least 3 minutes after mains switch-off.
- because the power terminals L1, L2, L3; U, V, W, +UG, -UG, BR1, BR2 and the pins of the FIF interface remain live when the motor is stopped.
- because the relay outputs K11, K12, K14 can remain live when the controller is disconnected from the mains.

Use of e.l.c.bs

The use of e.l.c.bs will be dealt with later in this Manual (6.2-4).

Pluggable terminal strips

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

Replace defective fuses

- Replace defective fuses with the prescribed type only when no voltage is applied.
- In DC-bus connection all controllers must be inhibited and disconnected from the mains.

Disconnect controller from the mains

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

6.2.2 Motor protection

- Extensive protection against overload:
  – By overcurrent relays or temperature monitoring
  – We recommend PTC thermistors or thermal contacts to monitor the motor temperature. (Lenze three-phase AC motors are all equipped with thermal contacts (NC contacts)
  – PTCs or thermal contacts can be connected to the controller.
- Only use motors, which insulation is suitable for inverter operation:
  – Insulation resistance: min. û = 1.5 kV, min. du/dt = 5 kV/μs
  – Lenze-three-phase AC motors are designed for inverter operation.
  – If you want to use motors with an unknown insulation resistance, please contact your motor supplier.

6.2.3 Mains types/mains conditions

Please observe the restrictions of each mains type!

Mains	Operation of the controllers	Notes
With earthed neutral (TT/TN mains)	No restrictions	Observe controller ratings
With isolated neutral (IT mains)	Possible, if the controller is protected in the event of an earth fault in the mains supply • by suitable equipment for detecting an earth fault and • the controller is disconnected directly from the mains	In the event of an earth fault at the inverter output, safe operation cannot be guaranteed.
DC supply via $+U_{DC}$/$-U_{DC}$	Allowed if the DC voltage is symmetrical with PE	Controller will be destroyed if $+U_{DC}$ or $-U_{DC}$-conductor are earthed.

6.2.4 Operation on public mains (compliance with EN 61000-3-2)

The European Standard EN 61000-3-2 stipulates limit values for harmonic currents. Non-linear consumption (e.g. by frequency inverters) causes harmonic currents which 'interfere' the supplying mains. The standard helps to ensure the high quality of public mains systems and reduce mains load.

Note!

The standard only applies to public mains systems. Mains systems which have their own transformer station as common in industry are not public. The standard does not apply to them.

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

If you observe all measures stated, the controllers do not exceed the limit values according to EN 61000-3-2. The machine/system manufacturer is responsible for the compliance with the regulations of the machine:

<table>
<tr><th></th><th>Connection voltage</th><th>Power</th><th>Measure</th></tr>
<tr><th>8200 vector</th><th>[V]</th><th>[kW]</th><th></th></tr>
<tr><td>E82EV251K2C</td><td rowspan="4">1/N/PE AC 230 V</td><td>0.25</td><td rowspan="2">Use assigned mains choke</td></tr>
<tr><td>E82EV371K2C</td><td>0.37</td></tr>
<tr><td>E82EV551K2C</td><td>0.55</td><td rowspan="2">Use active filter (in preparation)</td></tr>
<tr><td>E82EV751K2C</td><td>0.75</td></tr>
<tr><td>E82EV551K2C</td><td rowspan="2">3/PE AC 230 V</td><td>0.55</td><td rowspan="4">Use assigned mains choke</td></tr>
<tr><td>E82EV751K2C</td><td>0.75</td></tr>
<tr><td>E82EV551K4C</td><td rowspan="2">3/PE AC 400 V</td><td>0.55</td></tr>
<tr><td>E82EV751K4C</td><td>0.75</td></tr>
</table>

6.2.5 Operation with e.l.c.bs (earth-leakage circuit-breakers)

Danger!

The controllers have an internal mains rectifier. In the event of a short-circuit to frame, a DC fault current can prevent the activation of the AC-sensitive or pulse-current sensitive e.l.c.b. and thus block the protective function for all electrical equipment operated on this e.l.c.b..

- We recommend the following to protect persons and animals (DIN VDE 0100):
  - Pulse-current sensitive e.l.c.bs in machines where controllers are connected to a single-phase mains (L1/N).
  - All-current sensitive e.l.c.bs in machines where controllers are connected to a three-phase mains (L1/L2/L3).
- E.l.c.bs must only be installed between mains supply and controller.
- E.l.c.bs can be activated although not wanted by
  - capacitive leakage currents of the cable shields during operation (especially with long, shielded motor cables),
  - the simultaneous connection of several controllers to the mains supply,
  - Use of additional RFI filters
- The specifications for e.l.c.bs given in the chapter "Technical data" apply to low-capacity and shielded motor cables (guide value):
  - E82EVxxxKxB without additional measures
  - E82EVxxxKxB200 with SD RFI filter

6.2.6 Interactions with compensation equipment

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

6.2.7 Specification of cables used

Power connections

- The cables used must comply with the approvals required for the application (e.g. UL).
- Use low-capacitance motor cables:

8200 vector power range	Capacitance per unit length	
	Core/core	Core/shield
0.25 ... 2.2 kW	up to 1.5 mm^2 $\leq$ 75 pF/m	$\leq$ 150 pF/m
3 ... 11 kW	from 2.5 mm^2 $\leq$ 100 pF/m	
15 ... 30 kW	$\leq$ 140 pF/m	$\leq$ 230 pF/m
45 ... 55 kW	$\leq$ 190 pF/m	$\leq$ 320 pF/m
75 ... 90 kW	$\leq$ 250 pF/m	$\leq$ 410 pF/m

- Max. permissible motor cable length without additional measures (if you have to comply with EMC regulations, the permissible cable lengths can change):
  – shielded: 50 m
  – unshielded: 100 m

Control connections

- Control cables must always be shielded to avoid interference.

Shielded cables

The efficiency of shielded cables is determined by

- a good shield connection
  – a contact surface as large as possible
- a low resistance:
  – Only use shields with tin-plated or nickel-plated copper braids!
  – Shields of steel braid are not suitable.
- For the overlapping degree of the shield braid:
  – Min. 70 to 80 % with overlap angle of 90°.

6.2.8 Wiring of terminal strips

The enclosed terminal strips are tested according to the specifications of the

- DIN VDE 0627:1986-06 (partially)
- DIN EN 60999:1994-04 (partially)

Checked and tested are, for instance, mechanical, electrical and thermal load, vibration, damage of conductors, loose conductors, corrosion, ageing.

STOP

Stop!

Proceed as follows to avoid damage of the contacts:

- Mount only when the controller is not connected to the mains.
- Wire the terminal strips before connecting them!
- Unused terminal strips must also be plugged in to protect the contacts.

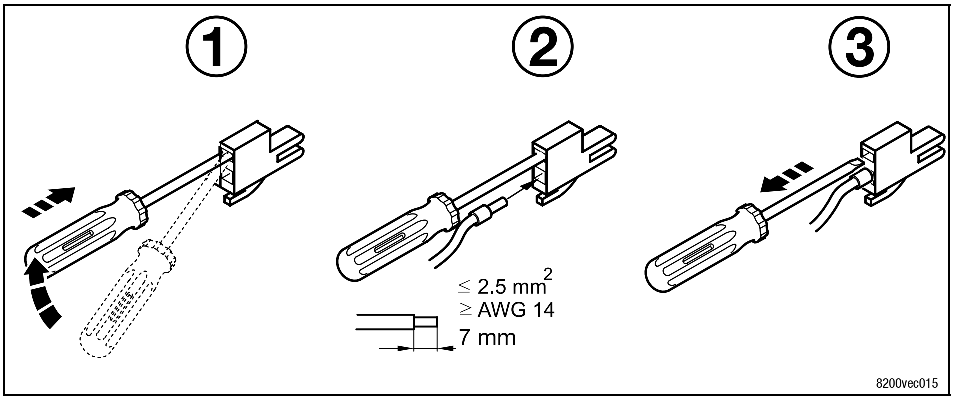


Fig. 6.2-1 Wiring of the terminal strips

Note!

Wiring without wire end ferrules is always possible.

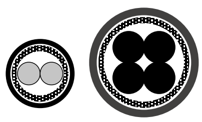
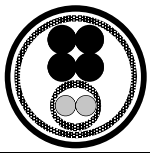
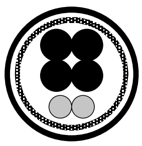
6.3 Basics for wiring according to EMC

6.3.1 Requirements on the cables

Motor cable design

- Only use shielded, four-core motor cable (core U, V, W, PE and overall shield).
- Cables with a YCY copper braid have a good shielding effect, cables with SY steel-tape armour are less suitable (high shield resistance).
- The contact ratio of the braid:
  – At least 70% to 80% with overlap angle 90°
  –
- **Use low-capacity cables** to minimise the leakage currents.
  – The values depend on the cable cross-section.
- The rated voltage of the motor cable for inverter operation amounts to Uo/U= 0.6/1 kV.
- The cables used must comply with the required approvals of the application (e.g. UL).

The EMC safety for the temperature monitoring of the motor depends on how the shielded connecting cables are layed.

EMC safety	Type of laying		Comment
Very good	Motor cable and PTC/thermal contact cable are layed separately		Ideal type of laying with very low interference injections Use PTC/thermal contact cable as a control cable
Medium	Motor cable and PTC/thermal contact cable are layed together with separate shields		Type of laying is permitted but show higher interference injections
Unfavorable	Motor cable and PTC/thermal contact cable are layed together with a common shield		High-energy interference injections

Cable design for DC supply and brake resistor

- These DC cables must be designed as the motor cable.
  – Shielding
  – Rated voltage
  – Approval
- Being relatively short, low-capacity versions are not necessary.

Control cable design

Control cables must be shielded to minimise interferences.

6.3.2 Shielding

Requirements

The quality of shielding is determined by:

- a good shield connection
  – a contact surface as large as possible
- a low resistance:
  – Only use shields with tin-plated or nickel-plated copper braids!

Wiring technique

- Always connect the shield to the conductive and grounded mounting plate with a surface as large as possible via a conductive clamp.
- Connect the shield directly to the corresponding device shield sheet.
- Do **not** only connect the shield to the cable clamp.
- The unshielded cable ends must be as short as possible.
- Terminals must be separated, minimum distance: 100 mm
- Minimum distance between the shield clamps for control cable and motor cable: 50 mm

Motor cables

- If the motor cable must be interrupted due to chokes or terminals, the unshielded cable must not be longer than 40 - max. 100 m (depending on the cable cross-section).
- If the motor cable must be interrupted due to contactors, switches or terminals, these must be separated from the other components. (at least a distance of 100 mm)
- In case of cable lengths up to 500 mm a second shield (shield connection) is not required.

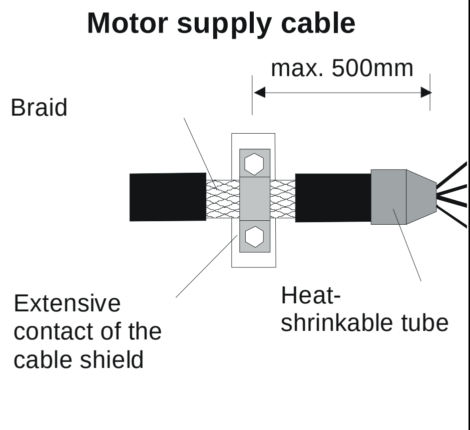
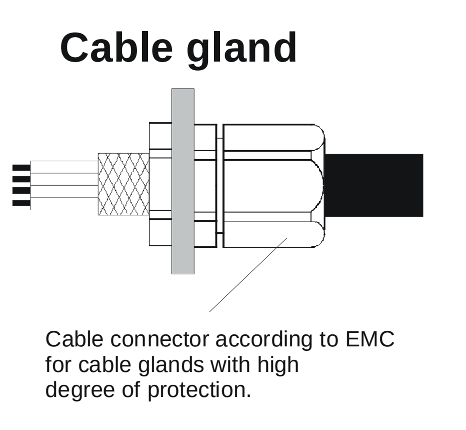
Motor cables	Cable gland
	

Fig. 6.3-1 Shielding of the motor cable

Control cables

- The cables of the analog and digital inputs and outputs must be shielded. If short (up to 200 mm), unshielded cables are used, they must be twisted.
- In case of the analog cables the shield must be connected to one side of the controller.
- In unfavorable conditions (very long cable, high interferences) it is possible in case of analog cables to connect one shield end to PE via a capacitor (e.g. 10 nF/250 V) to have a better shielding effect (see sketch).
- In case of digital cables the shield must be connected to both sides.
- The shields of the control cables must have a minimum distance of 50 mm to the shield connections of the motor cables and DC cables.

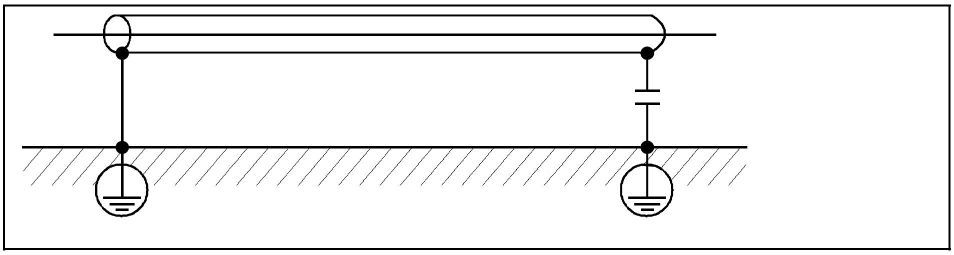


Fig. 6.3-2 Shielding of long, analog control cables

6.3.3 Installation in the control cabinet

Mounting plate requirements

- Only use mounting plates with electrically conductive surface (zinc-coated or V2A).
- Varnished mounting plates are unsuitable, even if the varnish is removed from the contact surfaces.
- When using several mounting plates, make a conductive connection over a large surface (e.g. using grounding strips).

Mounting of the components

- Connect the controller and RFI filter to the grounded mounting plate with a surface as large as possible.
- No DIN rail mounting!

Optimum cable routing

- Control cables and mains cables must be separated from the motor cable.
- Install separate terminals for the motor cables at the control cabinet entry with a minimum distance from the other terminals of at least 100 mm.
- The cables must always be layed close to the mounting plate (reference potential), as loose cables act like aerials.
- The cables must be routed in a straight line to the terminals (avoid “tangle of cables”)!
- Use a separate cable duct for mains cables and control cables. Do not mix up different types of cables in one cable duct.
- Never lay motor cables in parallel with mains cables and control cables.
- Cross the motor cable vertically with mains cables and control cables.
- Twist unshielded cables of the same circuit (go-and-return line) and ensure that the area between go-and-return-line is as small as possible.
- Minimise coupling capacitances and inductances due to unnecessary cable lengths and reserve loops.
- Short-circuit cable ends of unused cables to the reference potential.

Grounding system

- Connect all components (controller, RFI filter, filter, choke) to one central ground point (mounting plate of the control cabinet).
- Set up a star-shape grounding system.
- Comply with the corresponding minimum cable cross-sections.

Continuation of cable routing

Separation of the "hot" motor cable from control cables, signal cables and mains cables:

- Never lay motor cables and signal cables in parallel. Crossings must be layed at right angles.
- The cables of a 24V mains supply (positive and negative cable) must be routed together over the total length.

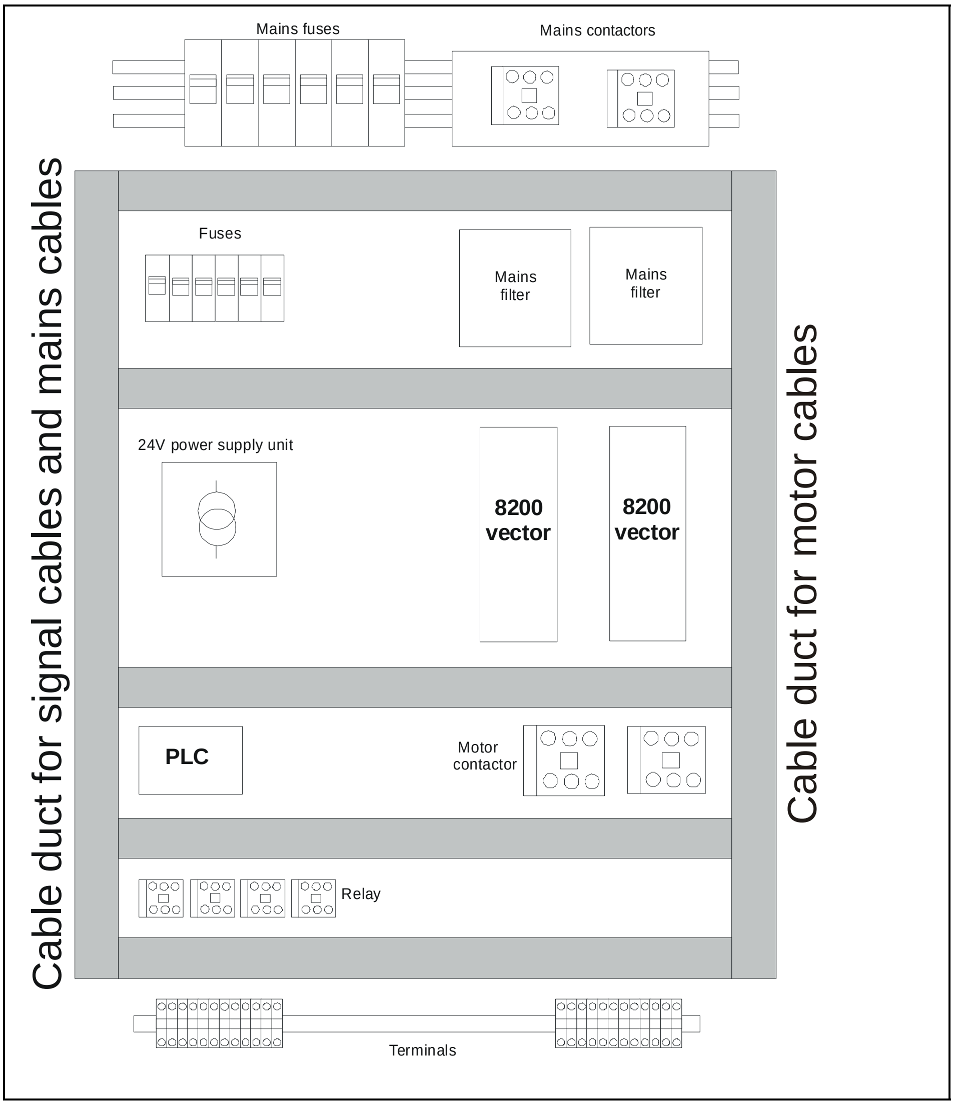


Fig. 6.3-3 Cable routing in the control cabinet

6.3.4 Wiring outside the control cabinet

Notes for cable laying outside the control cabinet:

- The longer the cables the greater must be the space between the cables.
- In case of parallel cable routing of cables with different types of signals it is possible to minimise the interferences by means of a metal barrier or separated cable ducts.

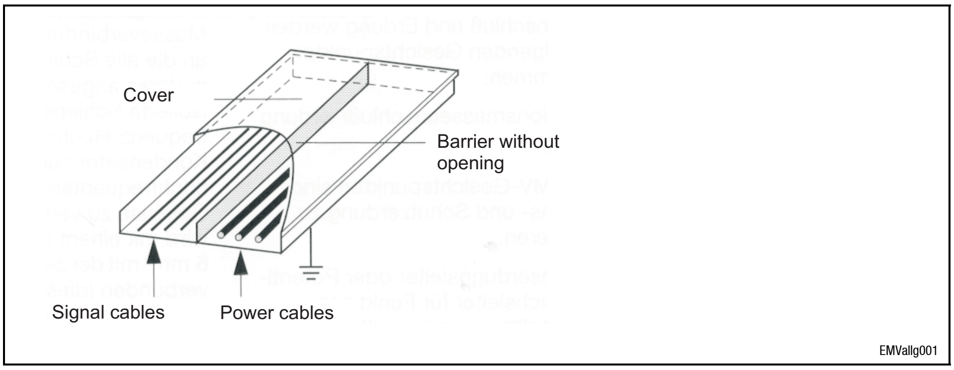


Fig. 6.3-4 Cable routing in the cable duct with barrier

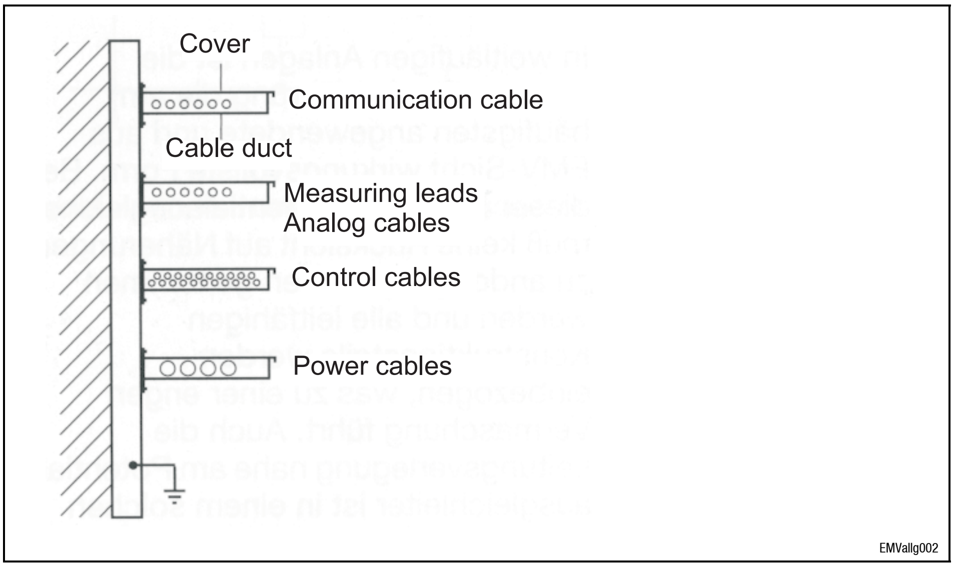


Fig. 6.3-5 Cable routing in separated cable ducts

Wiring on the mains side

- It is possible to connect the controller, mains choke or RFI filter to the mains via single cores or unshielded cables.
- The cable cross-section must be rated for the assigned fuse protection (VDE 0160).

Wiring on the motor side

STOP

Stop!

The motor cable is highly susceptible to interference. For this reason you achieve an optimum wiring on the motor side, if you

- use shielded and low-capacity motor cables only.
- do **not** incorporate further cables in the motor cable (e.g. for brake control, external fans etc.).
- shield the cable for temperature monitoring of the motor (PTC or thermal contact) and separate it from the motor cable.

In special cases it is possible to incorporate the cable for motor temperature monitoring in the motor cable. (🕮 6.3-1)

6.4 Basic units in the power range 0.25 ... 2.2 kW

This page remains blank to give you a clearly arranged overview of the following subject on the next double page.

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

Drives comply with the EMC Directive if they are installed according to the guidelines for CE-typical drive systems. The user is responsible for the compliance of his application with the EC directives.

Note!

- Control cables and mains cables must be separated from the motor cable to avoid interferences.
- Control cable must always be shielded.
- We recommend to shield the supply cable for the PTC or thermal contact and route it separately from the motor cable.
- If the cores for motor connection and PTC or thermal contact are together in one cable with a common shield:
  - In order to reduce interference injections on the PTC cable, we recommend to install additionally the PTC module type E82ZPEx.
- An optimum HF shield connection of the motor cable can be reached by using the terminal C for motor PE and motor shield.

Basic unit wiring

Basic units in the power range 0.25 ... 2.2 kW

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

Realisation

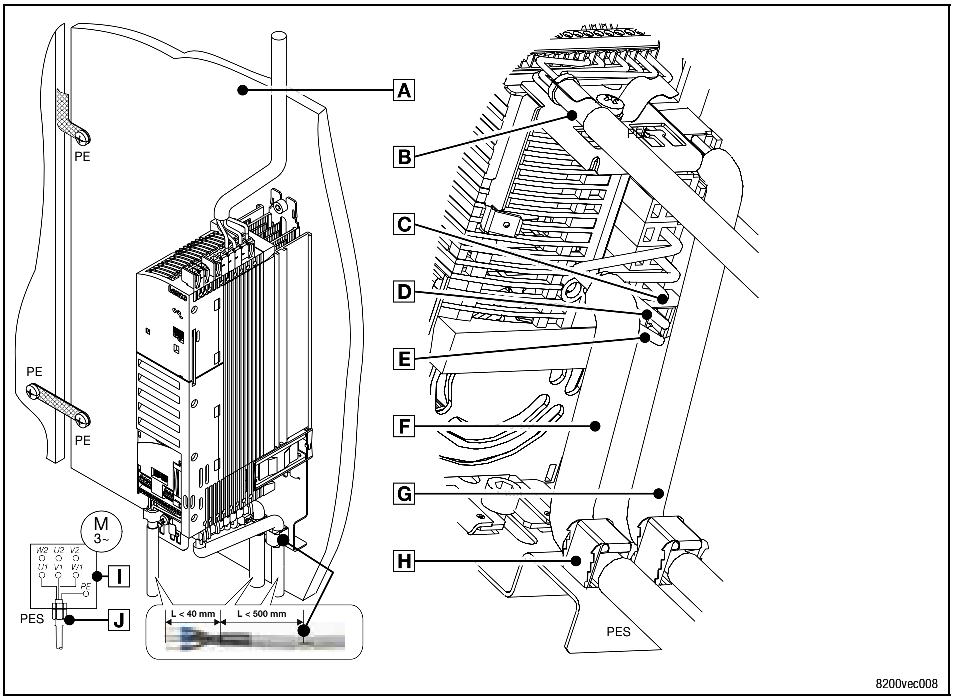


Fig. 6.4-1 Wiring in compliance with EMC standards

- A Mounting plate with electrically conductive surface
- B Control cable to function module, connect the shielding to the EMC shield sheet (PES) with a surface as large as possible
- C 2-pole terminal for motor PE and motor shield
- D PE of the motor cable
- E Shield of the motor cable
- F Shielded motor cable, low-capacity
  (core/core up to 1.5 mm^2 $\leq$ 75 pF/m; from 2.5 mm^2 $\leq$ 100 pF/m; core/shield $\leq$ 150 pF/m)
- G Shielded PTC cable or thermal contact cable
- H Connect cable shields to the EMC shield sheet (PES) with a surface as large as possible. Use enclosed clamps.
- I Star or delta connection as indicated on the motor nameplate
- J EMC-cable connector (not included in the delivery package)

6.4.2 Power connections for 230 V mains voltage

Mains connection 230/240 V

Stop!

- Controller type E82EVxxxK **2** C must only be connected to a mains voltage of 1/N/PE AC 180 ... 264 V or 3/PE AC 100 ... 264 V. Higher mains voltages will destroy the controller!
- The discharge current to PE is > 3.5 mA. EN 50178 requires a fixed installation. Double PE connection required.

8200 vector 0.25 ... 2.2 kW

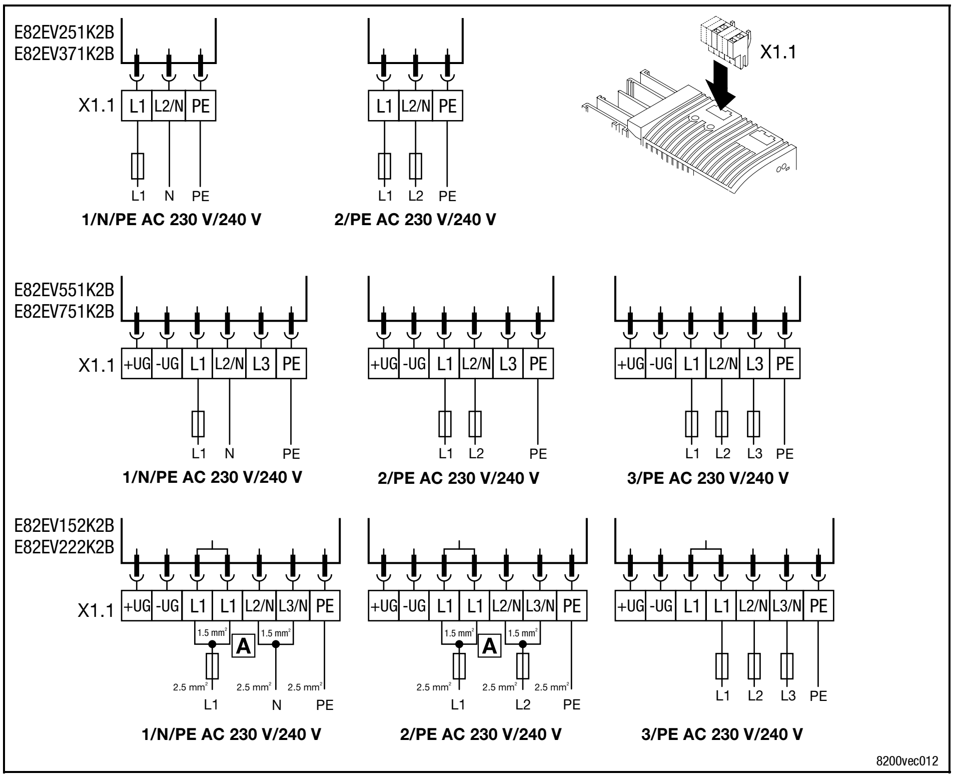


Fig. 6.4-2 Mains connection 230/240 V 0.25 ... 2.2 kW

A	Use two separate cables 1.5 mm² to connect the terminals!
X1.1/+UG, X1.1/-UG	DC supply (DC-bus operation - see Operating Instructions)
E82EV222K2C	Operation only with mains choke

6.4.3 Power connections for 400 V mains voltage

Mains connection 400/500 V

STOP

Stop!

- Controller type E82EVxxxK **4** C must only be connected to a mains voltage of 3/PE AC 320 ... 500 V. Higher mains voltages will destroy the controller!
- The discharge current to PE is > 3.5 mA. EN 50178 requires a fixed installation. Double PE connection required.

8200 vector 0.55 ... 2.2 kW

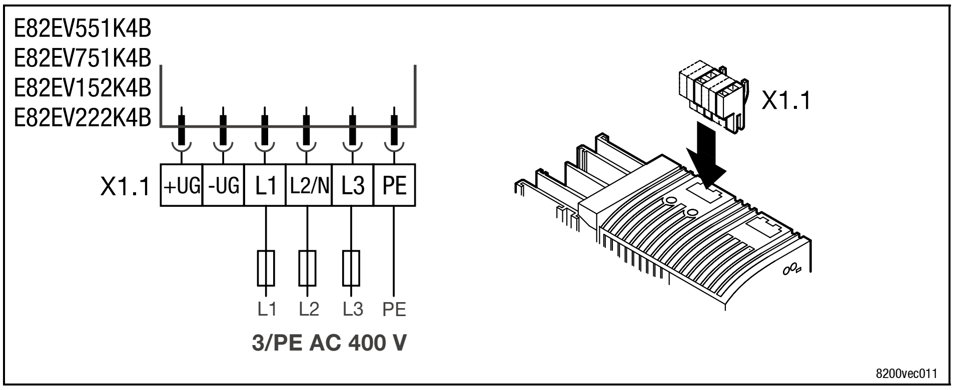


Fig. 6.4-3 Mains connection 400/500 V 0.55 ... 2.2 kW

X1.1/+UG, X1.1/-UG	DC supply (DC-bus operation - see Operating Instructions)

6.4.4 Connection of motor/external brake resistor

Danger!
- After the connection of a PTC thermistor or thermal contact all control terminals only have a basic insulation (single insulating distance).
- Protection against contact in the event of a defective insulating distance can only be ensured by external measures (e.g. double insulation).

8200 vector 0.25 ... 2.2 kW

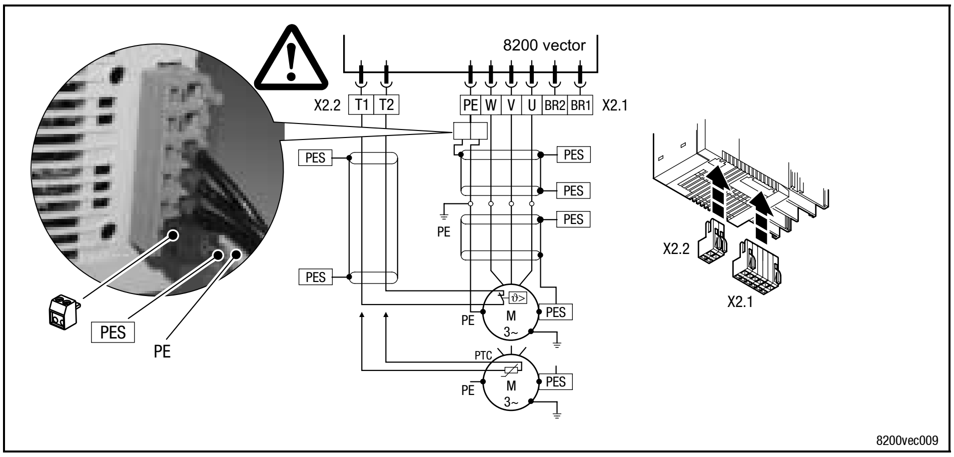


Fig. 6.4-4 Motor connection 0.25 ... 2.2 kW

Use low-capacity motor cables! (core/core up to 1.5 mm^2 ≤ 75 pF/m; from 2.5 mm^2 ≤ 100 pF/m; core/shield ≤ 150 pF/m) The shorter the motor cables, the better the drive response!	
PES	HF-shield end by PE connection through shield bracket or EMC cable connection.
X2.1/PE	Earthing of the 8200 vector at the output side
X2.1/BR1, X2.1/BR2	Connection terminals for the brake resistor (For information about the operation with brake resistor see the Operating Instructions)
X2.2/T1, X2.2/T2	Connection terminals motor temperature monitoring through PTC thermistors or thermal contacts **Activate motor temperature monitoring under C0119 (e. g. C0119 = 1)!**

Cable cross-sections U, V, W, PE					
Type	mm^2	AWG	**Type**	mm^2	AWG
E82EV251K2C / E82EV371K2C	1	18			
E82EV551K2C / E82EV751K2C	1	18	E82EV551K4C / E82EV751K4C	1	18
E82EV152K2C / E82EV222K2C	1.5	16	E82EV152K4C / E82EV222K4C	1.5	16

6.4.5 Relay output connection

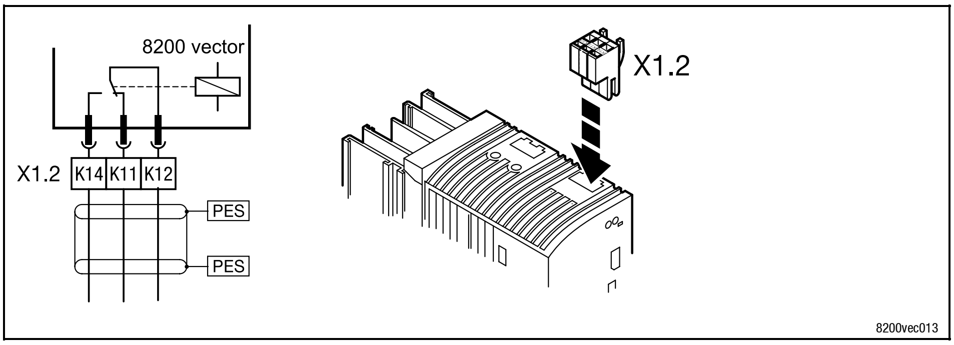


Fig. 6.4-5 Relay connection 0.25 ... 11 kW

	Function	Relay position set	Message (Lenze setting)	Technical data
X1.2/K11	Relay output normally-closed contact	open	TRIP	AC 250 V/3 A DC 24 V/2 A ... DC 240 V/0.16 A
X1.2/K12	Mid position contact			
X1.2/K14	Relay output - normally-open contact	closed	TRIP	
PES	HF-shield end by PE connection through shield bracket.			

Note!

- For switching the control signals use shielded cables and establish an HF shield termination by PE connection.
- For mains potential switching unshielded cables are sufficient.
- The service life of the relay depends on the type of load (ohmic, inductive or capacitive) and the value of the switching capacity.
- The output message can be changed under C0008 or C0415/1.

Stop!

If you control a holding brake at the motor with the relay output, a spark suppressor must be used in case of DC switching:

- Universal spark suppressor for 24 V DC brake,
- 6-pole Lenze brake rectifier for 180 V/205 V DC brake.

6.5 Basic units in the power range 3 ... 11 kW

This page remains blank to give you a clearly arranged overview of the following subject on the next double page.

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

Drives comply with the EMC Directive if they are installed according to the guidelines for CE-typical drive systems. The user is responsible for the compliance of his application with the EC directives.

Note!

- Control cables and mains cables must be separated from the motor cable to avoid interferences.
- Control cable must always be shielded.
- We recommend to shield the supply cable for the PTC or thermal contact and route it separately from the motor cable.
- If the cores for motor connection and PTC or thermal contact are together in one cable with a common shield:
  – In order to reduce interference injections on the PTC cable, we recommend to install additionally the PTC module type E82ZPEx.
- An optimum HF shield connection of the motor cable can be reached by using the terminal Ⓒ for motor PE and motor shield.

Basic unit wiring

Basic units in the power range 3 ... 11 kW

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

Realisation

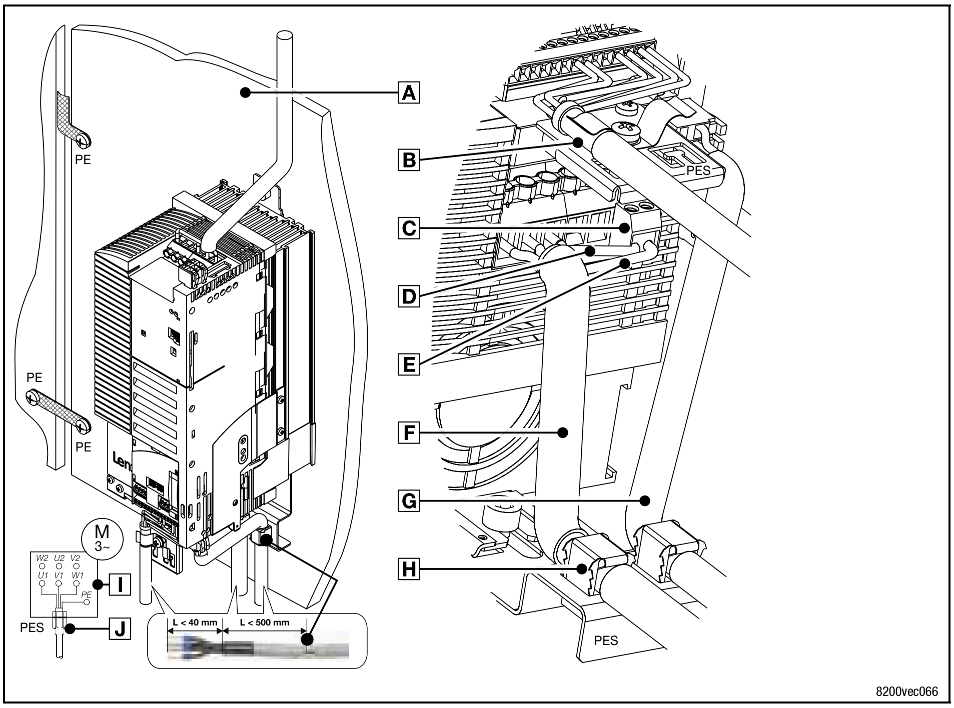


Fig. 6.5-1 Wiring in compliance with EMC standards

- A Mounting plate with electrically conductive surface
- B Control cable to function module, connect the shielding to the EMC shield sheet (PES) with a surface as large as possible
- C 2-pole terminal for motor PE and motor shield
- D PE of the motor cable
- E Shield of the motor cable
- F Shielded motor cable, low-capacity (core/core up to 1.5 mm^2 ≤ 75 pF/m; from 2.5 mm^2 ≤ 100 pF/m; core/shield ≤ 150 pF/m)
- G Shielded PTC cable or thermal contact cable
- H Connect cable shields to the EMC shield sheet (PES) with a surface as large as possible. Use enclosed clamps.
- I Star or delta connection as indicated on the motor nameplate
- J EMC-cable connector (not included in the delivery package)

6.5.2 Power connections for 230 V mains voltage

STOP

Stop!

- Controller type E82EVxxxK **2** C must only be connected to a mains voltage of 1/N/PE AC 180 ... 264 V or 3/PE AC 100 ... 264 V. Higher mains voltages will destroy the controller!
- The discharge current to PE is > 3.5 mA. EN 50178 requires a fixed installation. Double PE connection required.

8200 vector 3 ... 7.5 kW

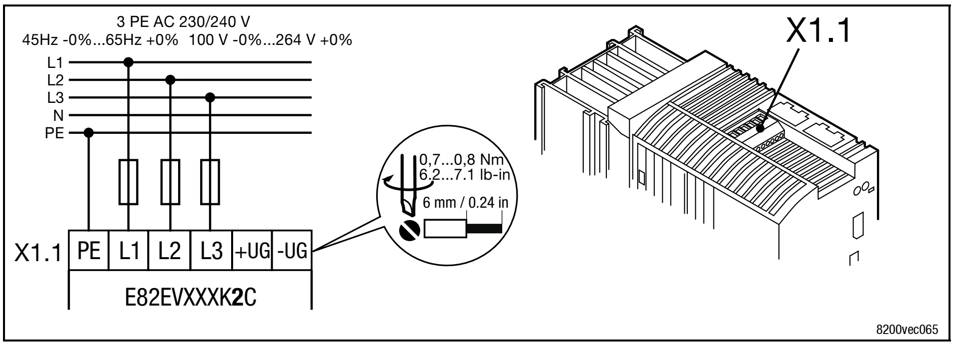


Fig. 6.5-2 Mains connection 230/240 V 3 ... 7.5 kW

E82EV752K2C	Operation only with mains choke
X1.1/+UG, X1.1/-UG	DC supply (DC-bus operation - see Operating Instructions)

6.5.3 Power connections for 400 V mains voltage

Stop!

- Controller type E82EVxxxK **4** C must only be connected to a mains voltage of 3/PE AC 320 ... 500 V. Higher mains voltages will destroy the controller!
- The discharge current to PE is > 3.5 mA. EN 50178 requires a fixed installation. Double PE connection required.

8200 vector 3 ... 11 kW

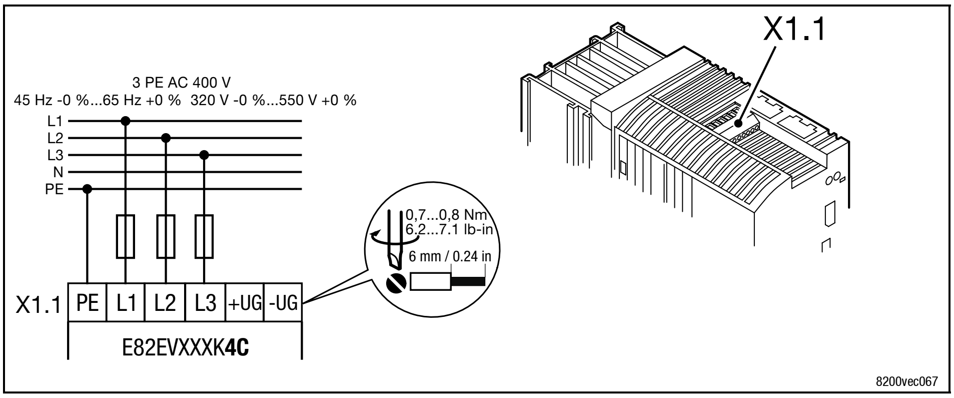


Fig. 6.5-3 Mains connection 400/500 V controller 3 ... 11 kW

X1.1/+UG, X1.1/-UG	DC supply (DC-bus operation - see Operating Instructions)

6.5.4 Connection of motor/external brake resistor

Danger!

- After the connection of a PTC thermistor or thermal contact all control terminals only have a basic insulation (single insulating distance).
- Protection against contact in the event of a defective insulating distance can only be ensured by external measures (e.g. double insulation).

8200 vector 3 ... 11 kW

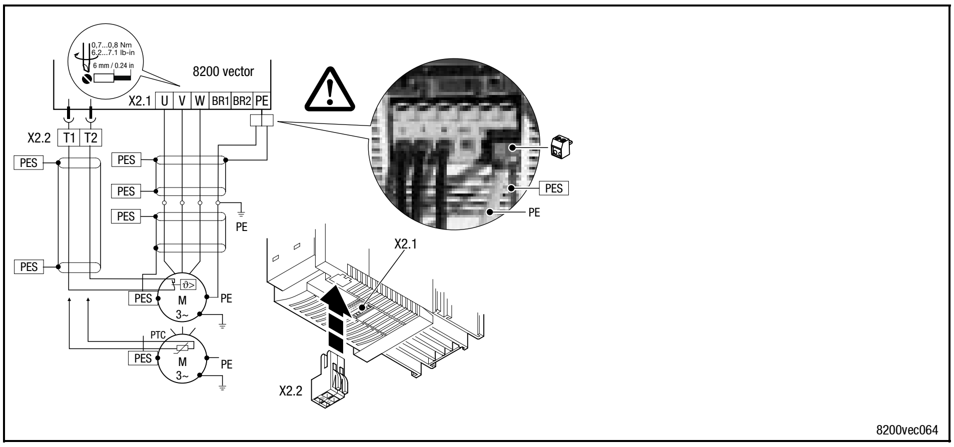


Fig. 6.5-4 Motor connection 3 ... 11 kW

Use low-capacity motor cables! (core/core up to 1.5 mm² ≤ 75 pF/m; from 2.5 mm² ≤ 100 pF/m; core/shield ≤ 150 pF/m) The shorter the motor cables, the better the drive response!	
PES	HF-shield end by PE connection through shield bracket or EMC cable connection.
X2.1/PE	Earthing of the 8200 vector at the output side
X2.1/BR1, X2.1/BR2	Connection terminals for the brake resistor (For information about the operation with brake resistor see the Operating Instructions)
X2.2/T1, X2.2/T2	Connection terminals motor temperature monitoring through PTC thermistors or thermal contacts **Activate motor temperature monitoring under C0119 (e. g. C0119 = 1)!**

Cable cross-sections U, V, W, PE

Type	mm²	AWG		Type	mm²	AWG
E82EV302K2C	2.5	12		E82EV302K4C	1	16
E82EV402K2C	4	10		E82EV402K4C	1.5	14
E82EV552K2C	6	10		E82EV552K4C	2.5	12
E82EV752K2C	6	10		E82EV752K4C	4	10
				E82EV113K4C	4	10

6.5.5 Relay output connection

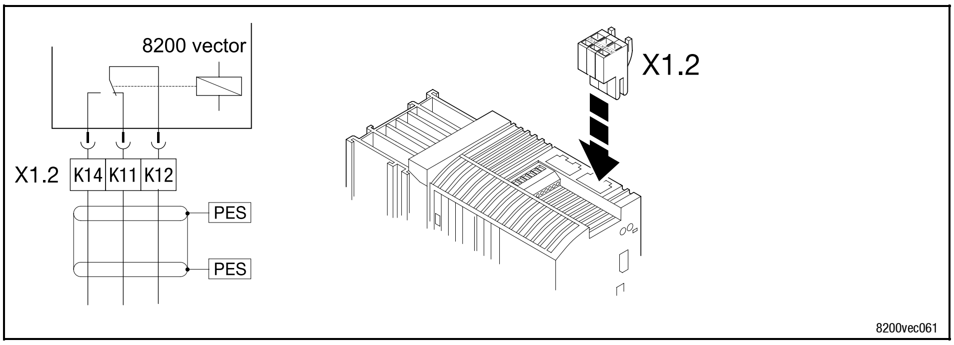


Fig. 6.5-5 Relay connection 3 ... 11 kW

	Function	Relay position set	Message (Lenze setting)	Technical data
X1.2/K11	Relay output normally-closed contact	open	TRIP	AC 250 V/3 A DC 24 V/2 A ... DC 240 V/0.16 A
X1.2/K12	Mid position contact			
X1.2/K14	Relay output - normally-open contact	closed	TRIP	
PES	HF-shield end by PE connection through shield bracket.			

Note!

- For switching the control signals use shielded cables and establish an HF shield termination by PE connection.
- For mains potential switching unshielded cables are sufficient.
- The service life of the relay depends on the type of load (ohmic, inductive or capacitive) and the value of the switching capacity.
- The output message can be changed under C0008 or C0415/1.

Stop!

If you control a holding brake at the motor with the relay output, a spark suppressor must be used in case of DC switching:

- Universal spark suppressor for 24 V DC brake,
- 6-pole Lenze brake rectifier for 180 V/205 V DC brake.

6.6 Basic units in the power range 15 ... 30 kW

Drives comply with the EMC Directive if they are installed according to the guidelines for CE-typical drive systems. The user is responsible for the compliance of his application with the EC directives.

Note!

- Control cables and mains cables must be separated from the motor cable to avoid interferences.
- Control cable must always be shielded.
- We recommend to shield the supply cable for the PTC or thermal contact and route it separately from the motor cable.

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

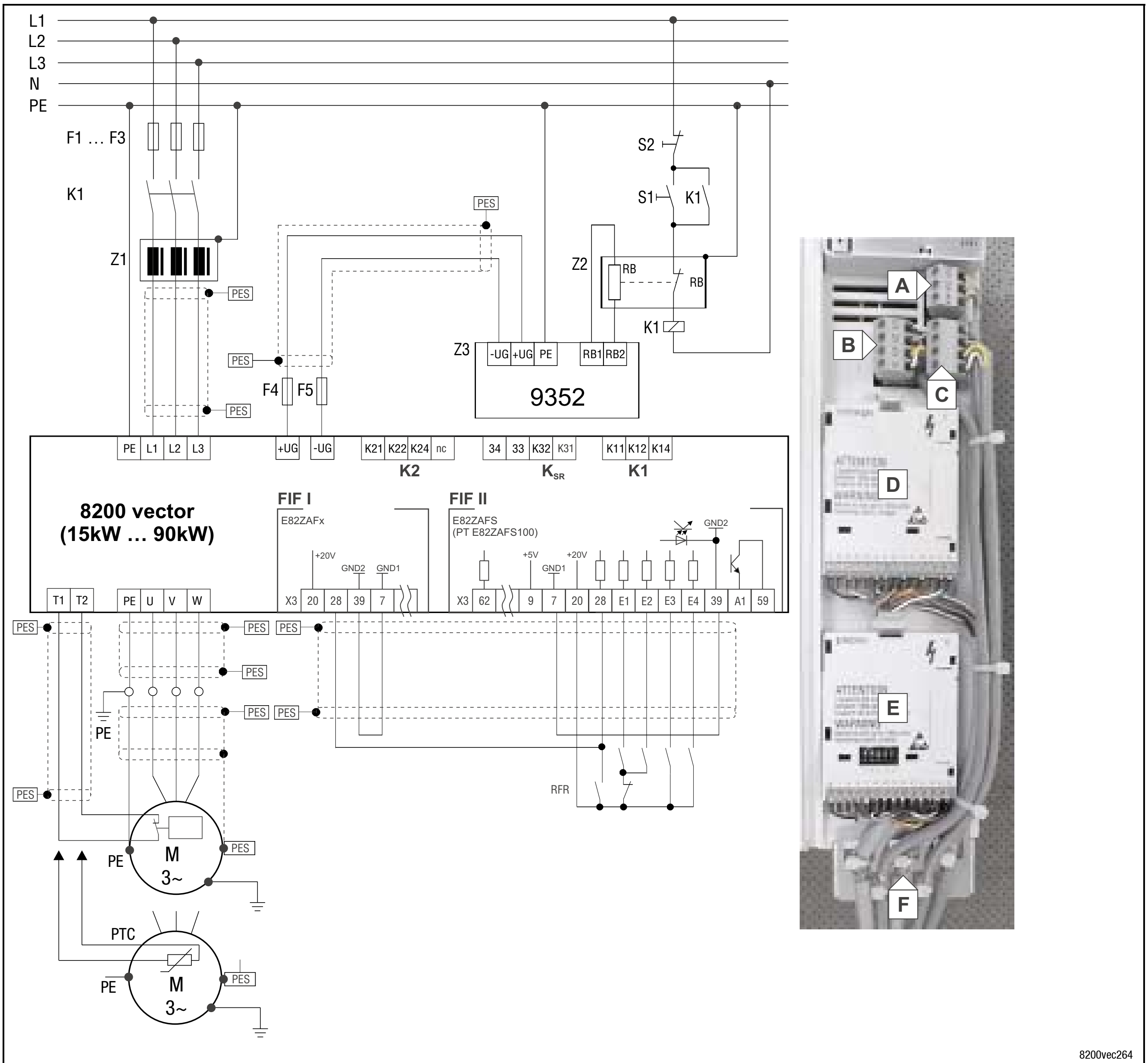


Fig. 6.6-1 Wiring according to EMC requirements 15 ... 90 kW

Basic unit wiring

Basic units in the power range 15 ... 30 kW

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

F1 ... F5	Fuses
K1	Mains contactor
PES	HF shield termination through large-surface connection to PE
Z1	Mains filters/mains chokes
Z2	Brake resistor
Z3	Brake chopper
A	Relay connection K1
B	Relay connection K2
C	Relay connection KSR “Safe standstill” (only for variant B241)
D	Fieldbus function module on interface FIF I
E	Function module standard I/O on interface FIF II
F	Shield connection - control cable (fix the shield with cable binder to the sheet)

6.6.2 Power connections

Mains connection 400/500 V

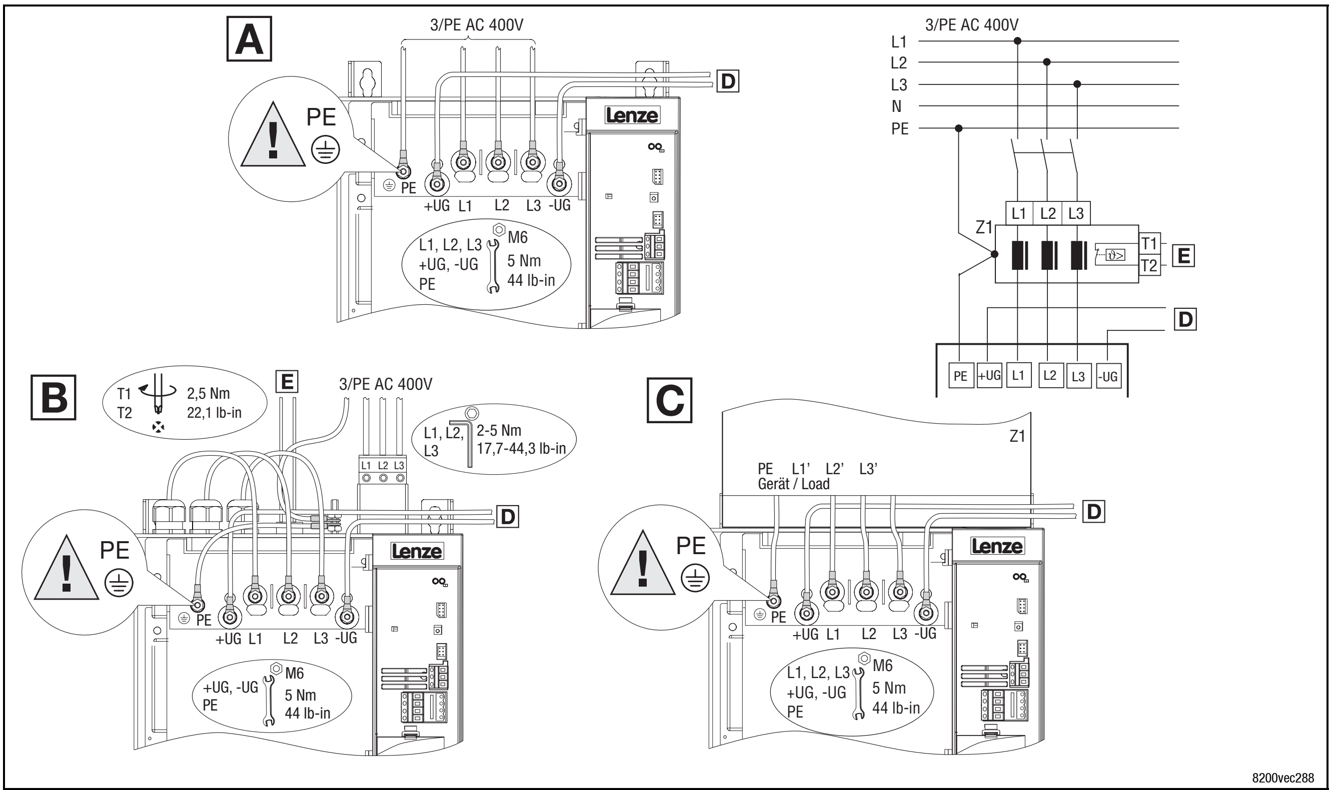


Fig. 6.6-2 Mains connection 15 ... 30 kW

- A Connection with mains choke
- B Connection with footprint mains filter
- C Connection with built-on mains filter
- D Connection brake chopper (🕮 Operating Instructions for the brake chopper)
- E Connection of temperature monitoring for mains filter (thermal contact)
- Z1 Mains choke/mains filter

Fuses and cable cross-sections

8200 vector	Mains	Installation to EN 60204-1		Installation to UL [3]		FI [4]
		Fuse	L1, L2, L3, PE [mm^2]	Fuse	L1, L2, L3, PE [AWG]	
E82EV153K4B2x1 [1]	3/PE AC 320 V -0 % ... 550 V +0 % 45 Hz -0 % ... 65 Hz +0 % DC 450 V -0 % ... 775 V +0 %	M63 A	10	35 A	8	≥300 mA
E82EV153K4B2x1 [2]		M35 A	25	63 A	4	
E82EV223K4B2x1 [2]		M50 A	16	50 A	6	
E82EV303K4B2x1 [2]		M80 A	25	80 A	3	

1) Without mains choke

2) With mains choke

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

3) Use UL-approved cables, fuses and fuse holders only. UL fuse: 500 ... 600 V, tripping characteristic "H" or "K5"

4) All-current sensitive e.l.c.b.

Basic unit wiring

Basic units in the power range 15 ... 30 kW

Power connections

Please observe the following when using e.l.c.bs:

- E.l.c.bs must only be installed between mains supply and controller.
- E.l.c.bs can trip incorrectly because of
  – capacitive leakage currents of the cable shields during operation (especially with long, shielded motor cables),
  – simultaneous connection of several controllers to the mains supply,
  – use of additional RFI filters.

Motor connection

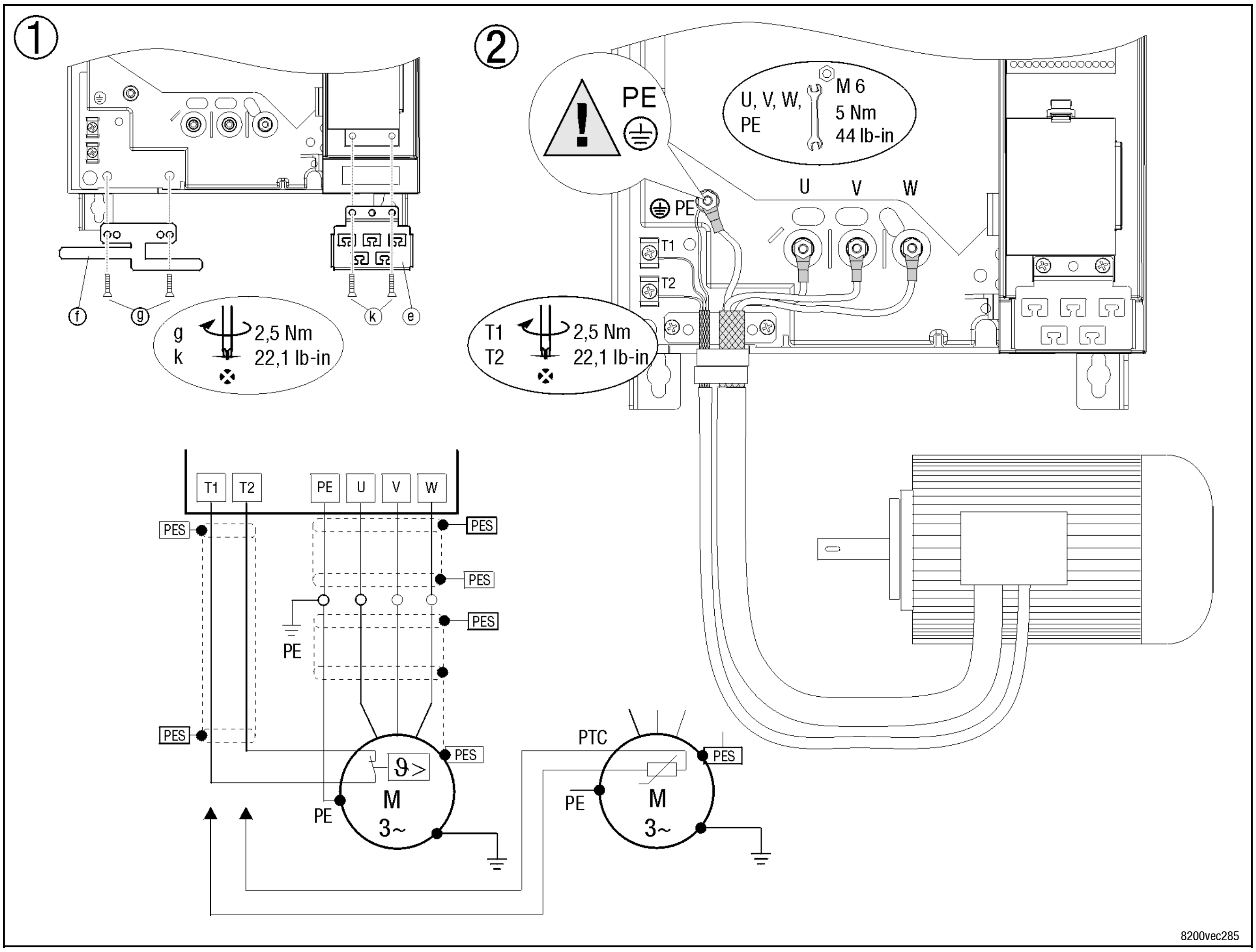


Fig. 6.6-3 Motor connection 15 ... 30 kW

	Use low-capacity motor cables! (Core/core ≤ 140 pF/m, core/shield ≤ 230 pF/m)
	Use short motor cables if possible!
PES	HF-shield end by PE connection via shield clamp.
T1, T2	Connection terminals of motor temperature monitoring with PTC thermistor or thermal contact (NC contact).
	Route a separate cable (shielded) to X2/T1 and X2/T2 for the motor temperature monitoring.

Activate the motor temperature monitoring under C0119 (e. g. C0119 = 1)!
Route the control and mains cables separately from the motor cable!

Cable cross-sections

Cable cross-sections U, V, W, PE		
8200 vector	mm^2	AWG
E82EV153K4B	10	8
E82EV223K4B	16	6
E82EV303K4B	25	3

6.6.3 Connection of relay outputs K1 and K2

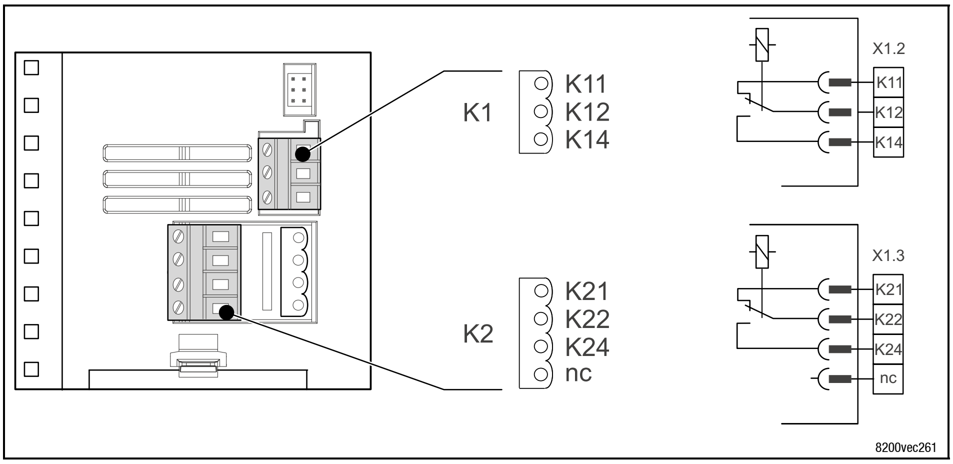


Fig. 6.6-4 Relay connections K1 and K2

Relay K1

	Function	Relay position set	Message (Lenze setting)	Technical data
X1.2/K11	Relay output normally-closed contact	open	TRIP	AC 250 V/3 A DC 24 V/2 A ... DC 240 V/0.22 A
X1.2/K12	Mid position contact			
X1.2/K14	Relay output - normally-open contact	closed	TRIP	
PES	HF-shield end by PE connection through shield bracket.			

Note!

- For switching the control signals use shielded cables and establish an HF shield termination by PE connection.
- For mains potential switching unshielded cables are sufficient.
- The service life of the relay depends on the type of load (ohmic, inductive or capacitive) and the value of the switching capacity.
- The output message can be changed under C0008 or C0415/1.

Stop!

If you control a holding brake at the motor with the relay output, a spark suppressor must be used in case of DC switching:

- Universal spark suppressor for 24 V DC brake,
- 6-pole Lenze brake rectifier for 180 V/205 V DC brake.

Relay K2

	Function	Relay position set	Message (Lenze setting)	data
X1.3/K21	Relay output normally-closed contact	open	not assigned	AC 250 V/3 A DC 24 V/2 A ... DC 240 V/0.22 A
X1.3/K22	Mid position contact			
X1.3/K24	Relay output - normally-open contact	closed	not assigned	
PES	HF-shield end by PE connection through shield bracket.			

Note!

- For switching the control signals use shielded cables and establish an HF shield termination by PE connection.
- For mains potential switching unshielded cables are sufficient.
- The service life of the relay depends on the type of load (ohmic, inductive or capacitive) and the value of the switching capacity.

- The output message can be changed under C0409.
- If you use a function module application I/O:
  – The relay is only active with application I/O as of version E82ZAFAVx21.

Stop!

If you control a holding brake at the motor with the relay output, a spark suppressor must be used in case of DC switching:

- Universal spark suppressor for 24 V DC brake,
- 6-pole Lenze brake rectifier for 180 V/205 V DC brake.

6.7 Basic units in the power range 45 ... 55 kW

Drives comply with the EMC Directive if they are installed according to the guidelines for CE-typical drive systems. The user is responsible for the compliance of his application with the EC directives.

Note!

- Control cables and mains cables must be separated from the motor cable to avoid interferences.
- Control cable must always be shielded.
- We recommend to shield the supply cable for the PTC or thermal contact and route it separately from the motor cable.

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

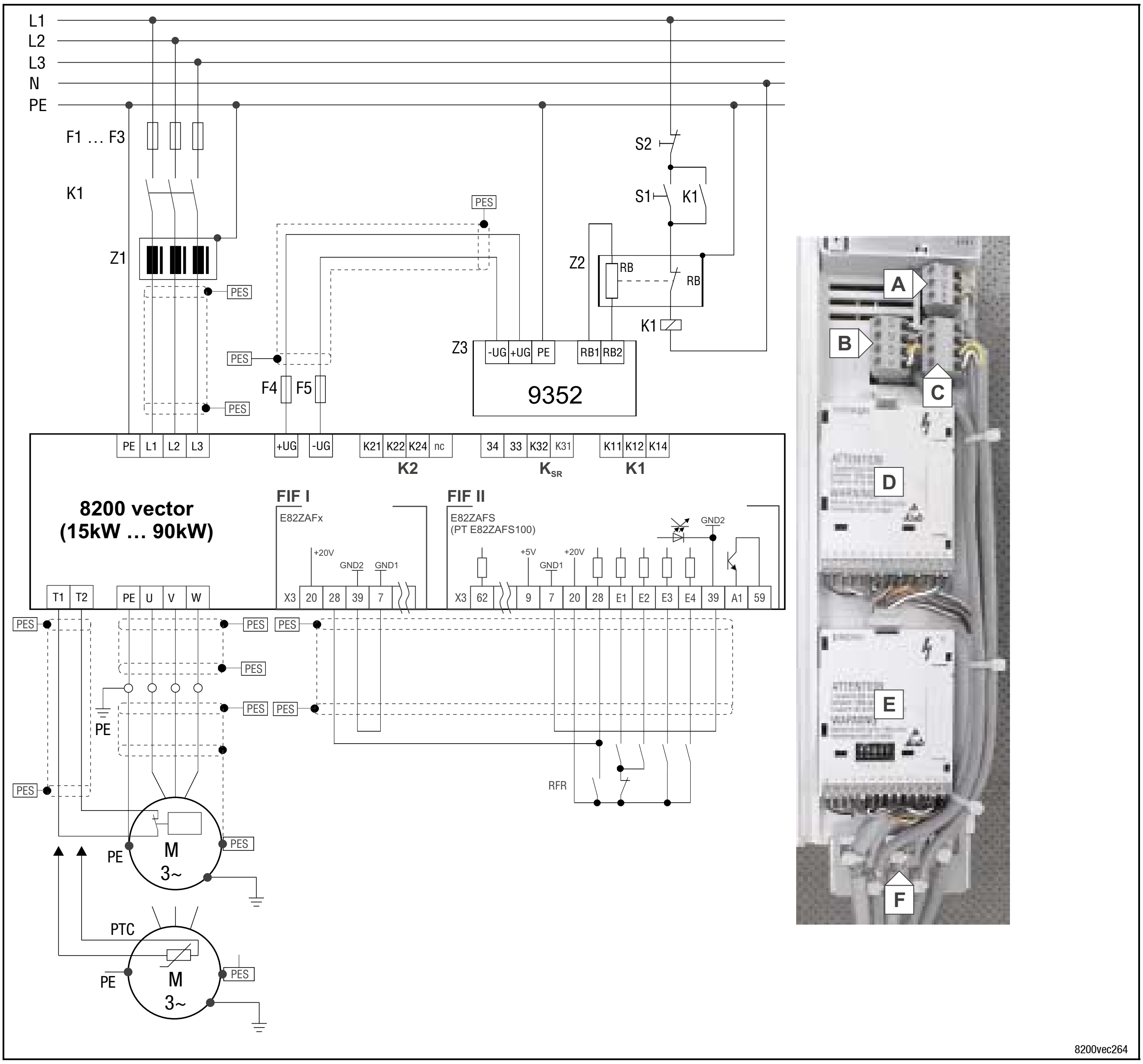


Fig. 6.7-1 Wiring according to EMC requirements 15 ... 90 kW

Basic unit wiring

Basic units in the power range 45 ... 55 kW

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

F1 ... F5	Fuses
K1	Mains contactor
PES	HF shield termination through large-surface connection to PE
Z1	Mains filters/mains chokes
Z2	Brake resistor
Z3	Brake chopper
A	Relay connection K1
B	Relay connection K2
C	Relay connection KSR "Safe standstill" (only for variant B241)
D	Fieldbus function module on interface FIF I
E	Function module standard I/O on interface FIF II
F	Shield connection - control cable (fix the shield with cable binder to the sheet)

6.7.2 Power connections

Mains connection 400/500 V

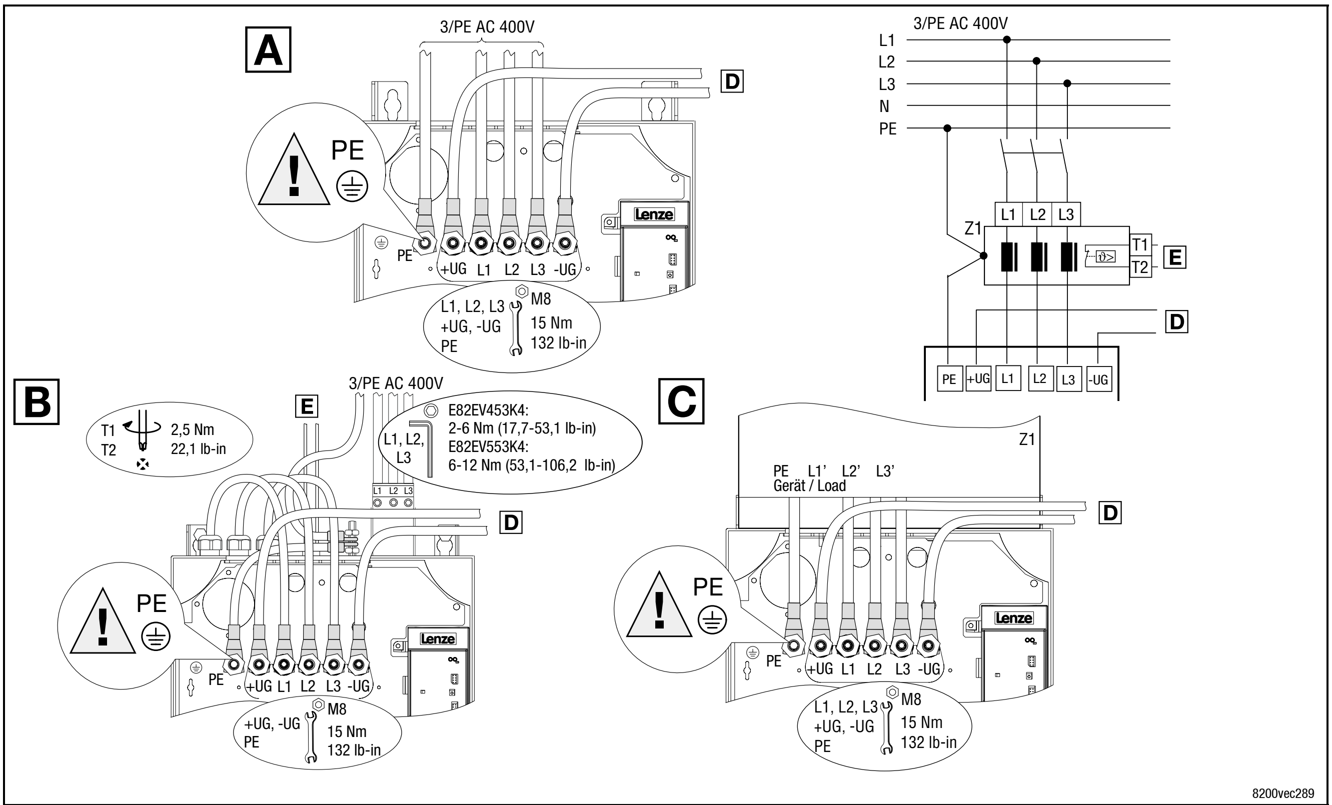


Fig. 6.7-2 Mains connection 45 ... 55 kW

- A Connection with mains choke
- B Connection with footprint mains filter
- C Connection with built-on mains filter
- D Connection brake chopper (Operating Instructions for the brake chopper)
- E Connection of temperature monitoring for mains filter (thermal contact)
- Z1 Mains choke/mains filter

Fuses and cable cross-sections

8200 vector	Mains	Installation to EN 60204-1		Installation to UL [1]		FI [2]
		Fuse	L1, L2, L3, PE [mm²]	Fuse	L1, L2, L3, PE [AWG]	
E82EV453K4B	3/PE AC 320 V -0 % ... 550 V +0 % 45 Hz -0 % ... 65 Hz +0 % DC 450 V -0 % ... 775 V +0 %	M100 A	50	100 A	1	≥300 mA
E82EV553K4B		M125 A	50	125 A	0	

1) Use UL-approved cables, fuses and fuse holders only. UL fuse: 500 ... 600 V, tripping characteristic ”H” or ”K5”

2) All-current sensitive e.l.c.b.

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

Basic unit wiring

Basic units in the power range 45 ... 55 kW

Power connections

Please observe the following when using e.l.c.bs:

- E.l.c.bs must only be installed between mains supply and controller.
- E.l.c.bs can trip incorrectly because of
  – capacitive leakage currents of the cable shields during operation (especially with long, shielded motor cables),
  – simultaneous connection of several controllers to the mains supply,
  – use of additional RFI filters.

Motor connection

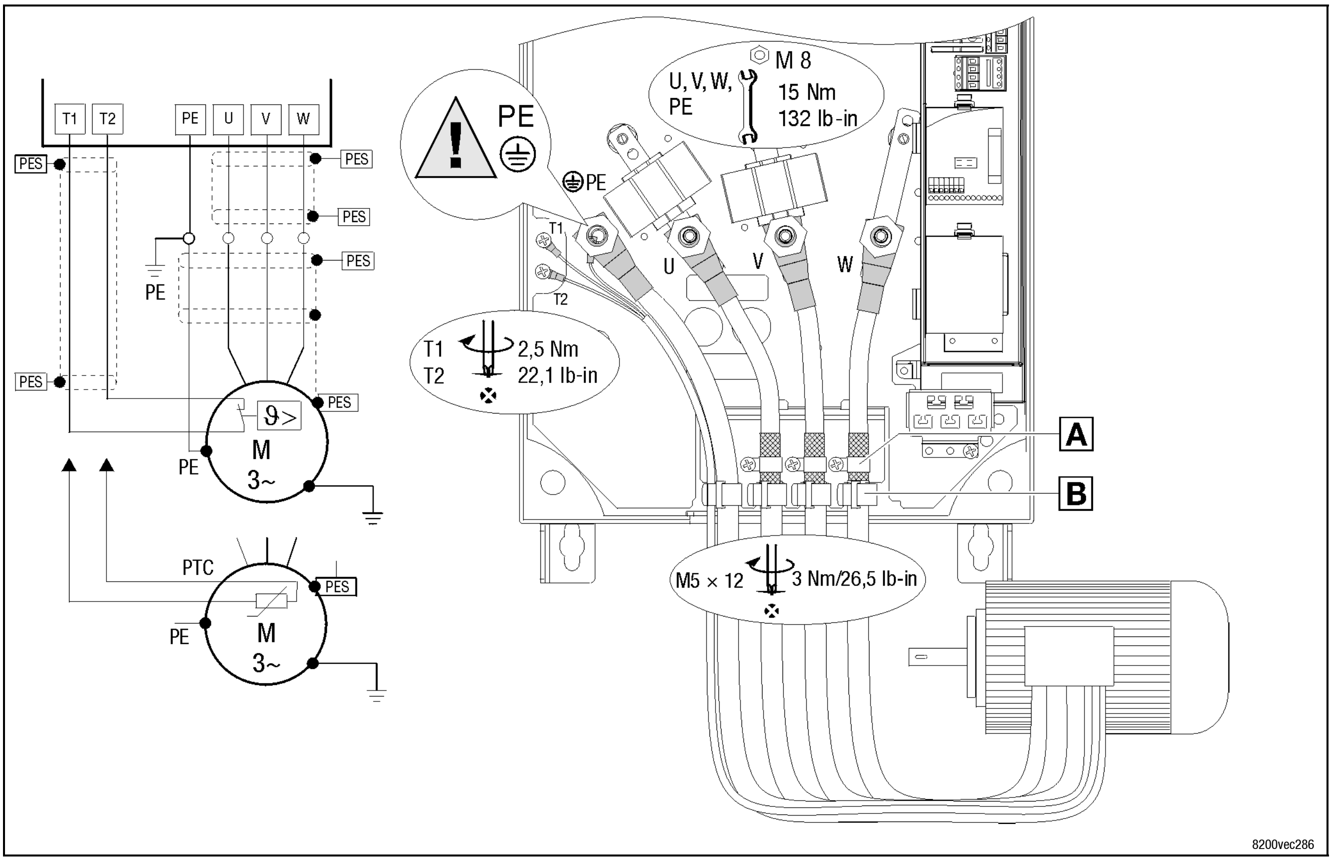


Fig. 6.7-3 Motor connection 45 ... 55 kW

A	Connect the shields of the motor cables with the shield clamp and screws M5 12 mm to the shield sheet.
B	Strain relief with cable ties.
	Use low-capacity motor cables! (Core/core ≤ 190 pF/m, core/shield ≤ 320 pF/m)
	Use short motor cables if possible!
PES	HF-shield end by PE connection via shield clamp.
T1, T2	Connection terminals of motor temperature monitoring with PTC thermistor or thermal contact (NC contact).
	Route a separate cable (shielded) to X2/T1 and X2/T2 for the motor temperature monitoring.
	Activate the motor temperature monitoring under C0119 (e. g. C0119 = 1)!
	Route the control and mains cables separately from the motor cable!

Cable cross-sections

Cable cross-sections U, V, W, PE		
8200 vector	mm^2	AWG
E82EV453K4B	50	1
E82EV553K4B	50	0

6.7.3 Connection of relay outputs K1 and K2

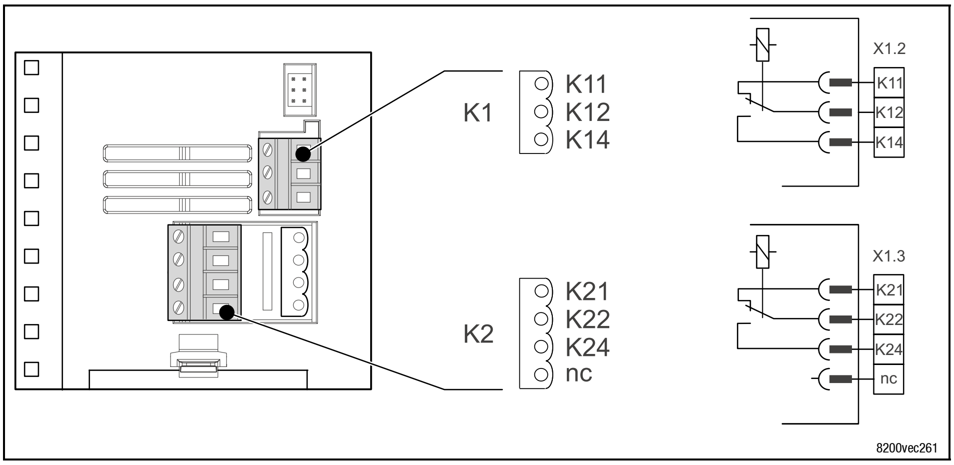


Fig. 6.7-4 Relay connections K1 and K2

Relay K1

	Function	Relay position set	Message (Lenze setting)	Technical data
X1.2/K11	Relay output normally-closed contact	open	TRIP	AC 250 V/3 A DC 24 V/2 A ... DC 240 V/0.22 A
X1.2/K12	Mid position contact			
X1.2/K14	Relay output - normally-open contact	closed	TRIP	
PES	HF-shield end by PE connection through shield bracket.			

Note!

- For switching the control signals use shielded cables and establish an HF shield termination by PE connection.
- For mains potential switching unshielded cables are sufficient.
- The service life of the relay depends on the type of load (ohmic, inductive or capacitive) and the value of the switching capacity.
- The output message can be changed under C0008 or C0415/1.

Stop!

If you control a holding brake at the motor with the relay output, a spark suppressor must be used in case of DC switching:

- Universal spark suppressor for 24 V DC brake,
- 6-pole Lenze brake rectifier for 180 V/205 V DC brake.

Basic units in the power range 45 ... 55 kW

Connection of relay outputs K1 and K2

Relay K2

	Function	Relay position set	Message (Lenze setting)	data
X1.3/K21	Relay output normally-closed contact	open	not assigned	AC 250 V/3 A DC 24 V/2 A ... DC 240 V/0.22 A
X1.3/K22	Mid position contact			
X1.3/K24	Relay output - normally-open contact	closed	not assigned	
PES	HF-shield end by PE connection through shield bracket.			

Note!

- For switching the control signals use shielded cables and establish an HF shield termination by PE connection.
- For mains potential switching unshielded cables are sufficient.
- The service life of the relay depends on the type of load (ohmic, inductive or capacitive) and the value of the switching capacity.

- The output message can be changed under C0409.
- If you use a function module application I/O:
  – The relay is only active with application I/O as of version E82ZAFAVx21.

Stop!

If you control a holding brake at the motor with the relay output, a spark suppressor must be used in case of DC switching:

- Universal spark suppressor for 24 V DC brake,
- 6-pole Lenze brake rectifier for 180 V/205 V DC brake.

6.8 Basic units in the power range 75 ... 90 kW

Drives comply with the EMC Directive if they are installed according to the guidelines for CE-typical drive systems. The user is responsible for the compliance of his application with the EC directives.

Note!

- Control cables and mains cables must be separated from the motor cable to avoid interferences.
- Control cable must always be shielded.
- We recommend to shield the supply cable for the PTC or thermal contact and route it separately from the motor cable.

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

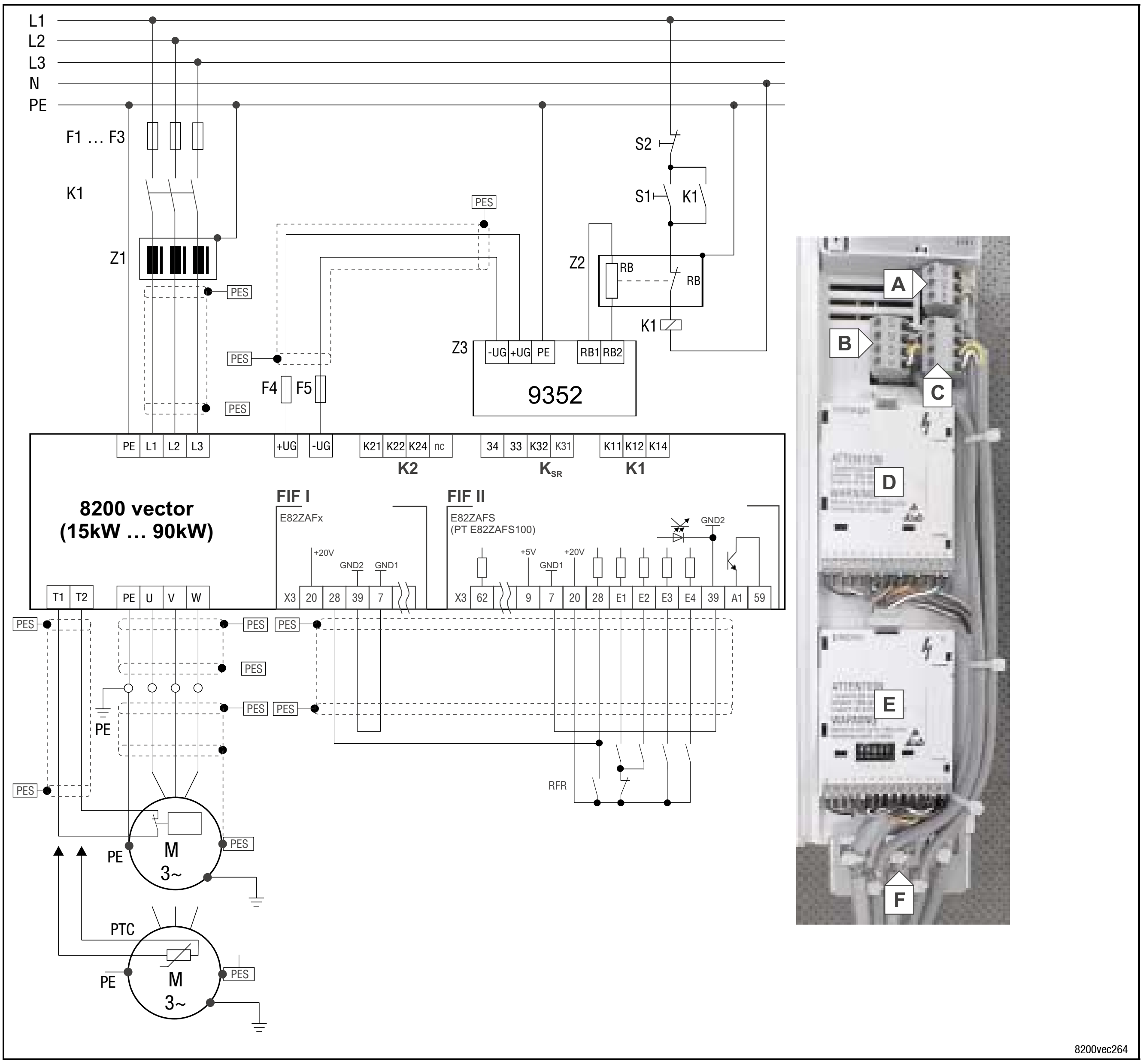


Fig. 6.8-1 Wiring according to EMC requirements 15 ... 90 kW

Basic unit wiring

Basic units in the power range 75 ... 90 kW

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

F1 ... F5	Fuses
K1	Mains contactor
PES	HF shield termination through large-surface connection to PE
Z1	Mains filters/mains chokes
Z2	Brake resistor
Z3	Brake chopper
A	Relay connection K1
B	Relay connection K2
C	Relay connection KSR "Safe standstill" (only for variant B241)
D	Fieldbus function module on interface FIF I
E	Function module standard I/O on interface FIF II
F	Shield connection - control cable (fix the shield with cable binder to the sheet)

6.8.2 Power connections

Mains connection 400/500 V

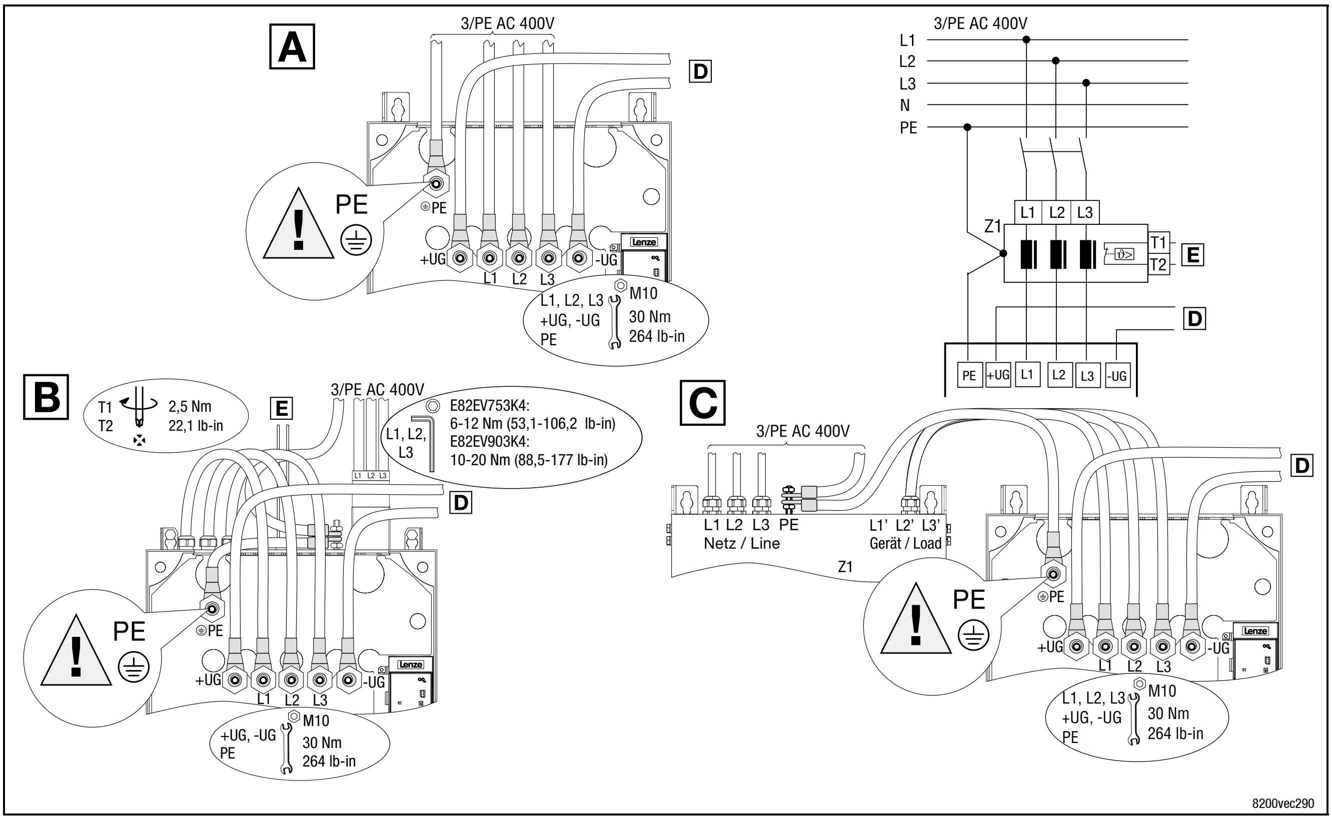


Fig. 6.8-2 Mains connection 75 ... 90 kW

- A Connection with mains choke
- B Connection with footprint mains filter
- C Connection with built-on mains filter
- D Connection brake chopper (Operating Instructions for the brake chopper)
- E Connection of temperature monitoring for mains filter (thermal contact)
- Z1 Mains choke/mains filter

Fuses and cable cross-sections

8200 vector	mains	Installation to EN 60204-1		Installation to UL [1]		FI [2]
		Fuse	L1, L2, L3, PE [mm^2]	Fuse	L1, L2, L3, PE [AWG]	
E82EV753K4B	3/PE AC 320 V -0 % ... 550 V +0 % 45 Hz -0 % ... 65 Hz +0 % DC 450 V -0 % ... 775 V +0 %	M160 A	70	175 A	2 / 0	≥300 mA
E82EV903K4B		M200 A	95	200 A	3 / 0	

1) Use UL-approved cables, fuses and fuse holders only. UL fuse: 500 ... 600 V, tripping characteristic ”H” or ”K5”
2) All-current sensitive e.l.c.b.
Observe national and regional regulations (e. g. VDE 0113, EN 60204)

Please observe the following when using e.l.c.bs:

- E.l.c.bs must only be installed between mains supply and controller.
- E.l.c.bs can trip incorrectly because of
  – capacitive leakage currents of the cable shields during operation (especially with long, shielded motor cables),
  – simultaneous connection of several controllers to the mains supply,
  – use of additional RFI filters.

Motor connection

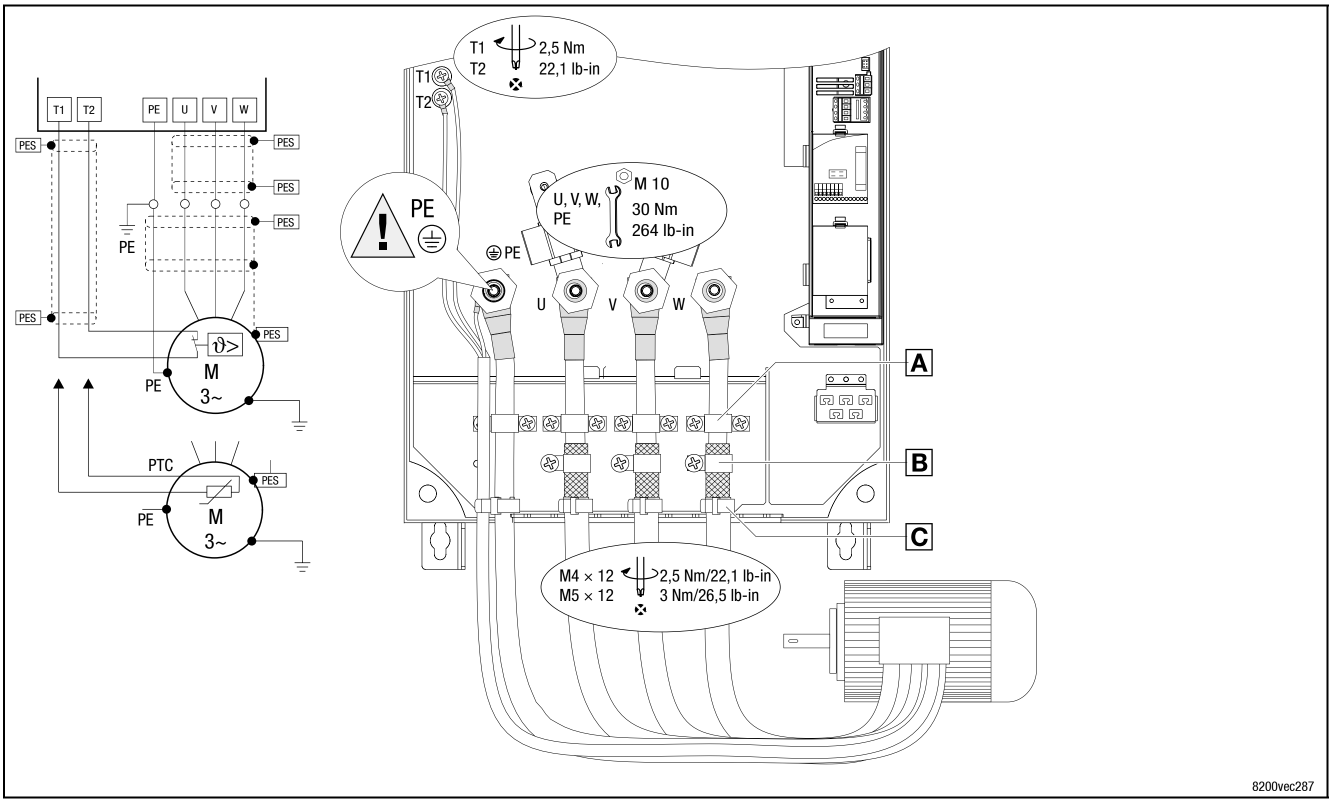


Fig. 6.8-3 Motor connection 75 ... 90 kW

A	Strain relief with cable clamps and screws M4 12 mm.
B	Connect the shields of the motor cables with the shield clamp and screws M5 12 mm to the shield sheet.
C	Additional strain relief with cable ties.
	Use low-capacity motor cables! (Core/core ≤ 250 pF/m, core/shield ≤ 410 pF/m)
	Use short motor cables if possible!
PES	HF-shield end by PE connection via shield clamp.
T1, T2	Connection terminals of motor temperature monitoring with PTC thermistor or thermal contact (NC contact).
	Route a separate cable (shielded) to X2/T1 and X2/T2 for the motor temperature monitoring.
	Activate the motor temperature monitoring under C0119 (e. g. C0119 = 1)!
	Route the control and mains cables separately from the motor cable!

Cable cross-sections

Cable cross-sections U, V, W, PE		
8200 vector	mm^2	AWG
E82EV753K4B	70	2 / 0
E82EV903K4B	95	3 / 0

6.8.3 Connection of relay outputs K1 and K2

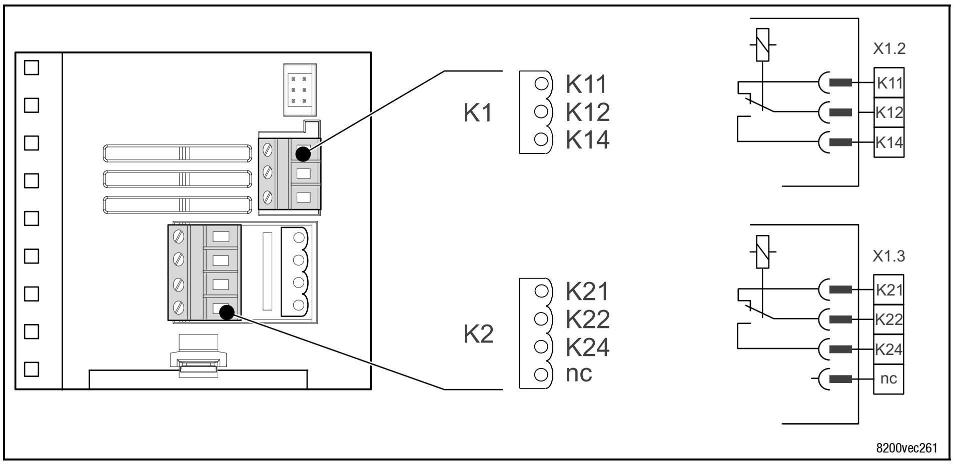


Fig. 6.8-4 Relay connections K1 and K2

Relay K1

	Function	Relay position set	Message (Lenze setting)	Technical data
X1.2/K11	Relay output normally-closed contact	open	TRIP	AC 250 V/3 A DC 24 V/2 A ... DC 240 V/0.22 A
X1.2/K12	Mid position contact			
X1.2/K14	Relay output - normally-open contact	closed	TRIP	
PES	HF-shield end by PE connection through shield bracket.			

Note!

- For switching the control signals use shielded cables and establish an HF shield termination by PE connection.
- For mains potential switching unshielded cables are sufficient.
- The service life of the relay depends on the type of load (ohmic, inductive or capacitive) and the value of the switching capacity.
- The output message can be changed under C0008 or C0415/1.

Stop!

If you control a holding brake at the motor with the relay output, a spark suppressor must be used in case of DC switching:

- Universal spark suppressor for 24 V DC brake,
- 6-pole Lenze brake rectifier for 180 V/205 V DC brake.

Relay K2

	Function	Relay position set	Message (Lenze setting)	data
X1.3/K21	Relay output normally-closed contact	open	not assigned	AC 250 V/3 A DC 24 V/2 A ... DC 240 V/0.22 A
X1.3/K22	Mid position contact			
X1.3/K24	Relay output - normally-open contact	closed	not assigned	
PES	HF-shield end by PE connection through shield bracket.			

Note!

- For switching the control signals use shielded cables and establish an HF shield termination by PE connection.
- For mains potential switching unshielded cables are sufficient.
- The service life of the relay depends on the type of load (ohmic, inductive or capacitive) and the value of the switching capacity.
- The output message can be changed under C0409.
- If you use a function module application I/O:
  – The relay is only active with application I/O as of version E82ZAFAVx21.

Stop!

If you control a holding brake at the motor with the relay output, a spark suppressor must be used in case of DC switching:

- Universal spark suppressor for 24 V DC brake,
- 6-pole Lenze brake rectifier for 180 V/205 V DC brake.

7 Extensions for automation

7.1 Contents

7.2 Basic units in the power range 0.25 ... 2.2 kW

7.2.1 Function modules

Important notes

The basic controller version is not equipped with control terminals. The controllers can be equipped with control terminals by using different I/O function modules for the FIF interface.

Dismount the function module only if it is absolutely necessary (e.g. when the controller is replaced).

The pin strip which is used to connect the function module is part of the contact system of the controller. It has not been designed for repeated connection and disconnection of the function module.

Mounting of function modules

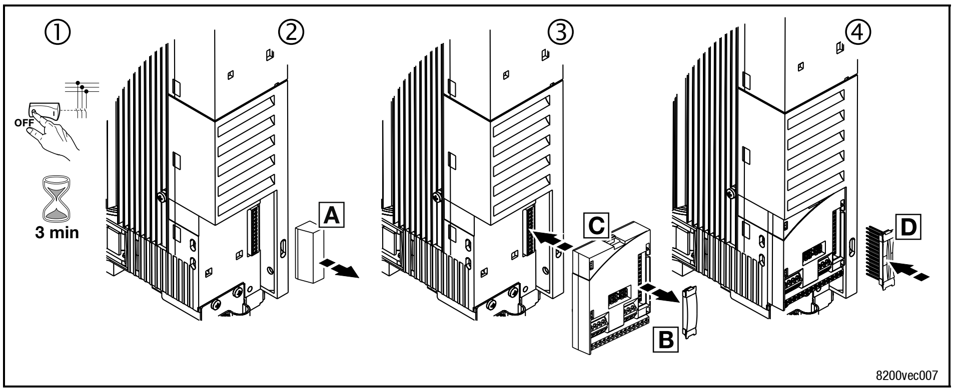


Fig. 7.2-1 Worksteps

1. **Disconnect the controller from the mains and wait for at least 3 minutes!**
2. Remove the FIF protection cover A and keep it.
3. Remove the protection cover B of the function module.
4. Plug the function module C onto the FIF interface.
5. Plug the plug connector D into the contact bank of the function module until it is snapped into place.
6. For wiring see Mounting Instructions for the function module.

Mounting of function modules in ”PT” version

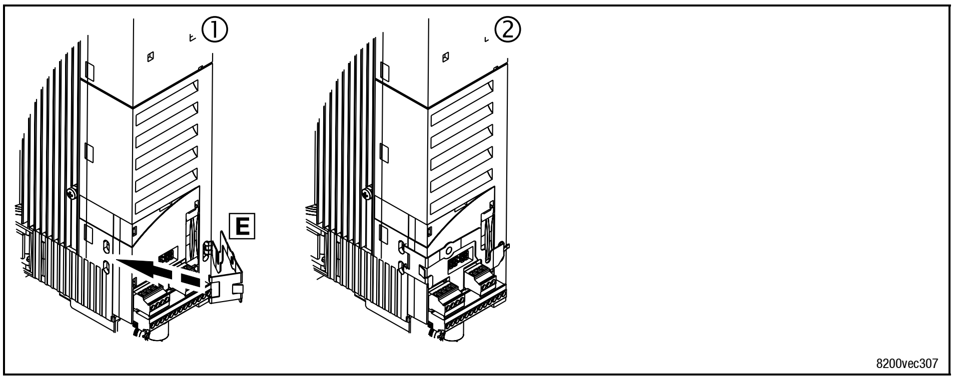


Fig. 7.2-2 Additional worksteps

In addition fix the safety clip, so that the module is prevented from being pulled out together with the terminal strips:

1. Turn the safety clip E in the openings.
2. Fold the safety clip over the function module until it snaps into place.

Dismounting of the function modules

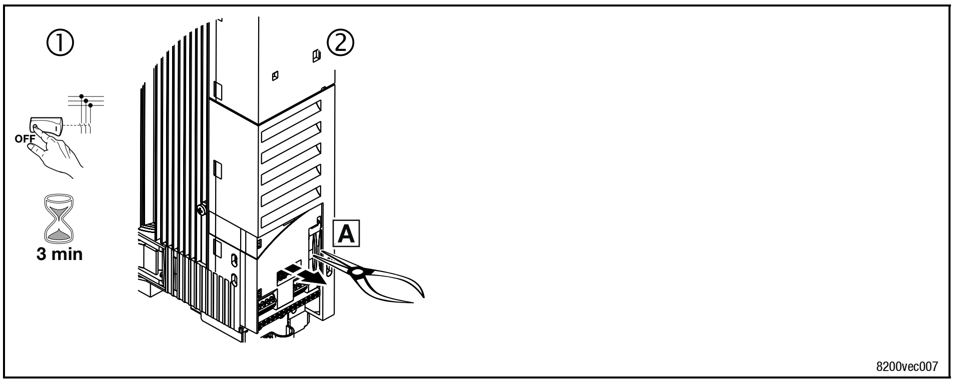


Fig. 7.2-3 Worksteps

1. **Disconnect the controller from the mains and wait for at least 3 minutes!**
2. Catch the bar of the plug connector with pliers and pull A . Plug connector and function module are dismounted together.

Dismounting of the function module version "PT"

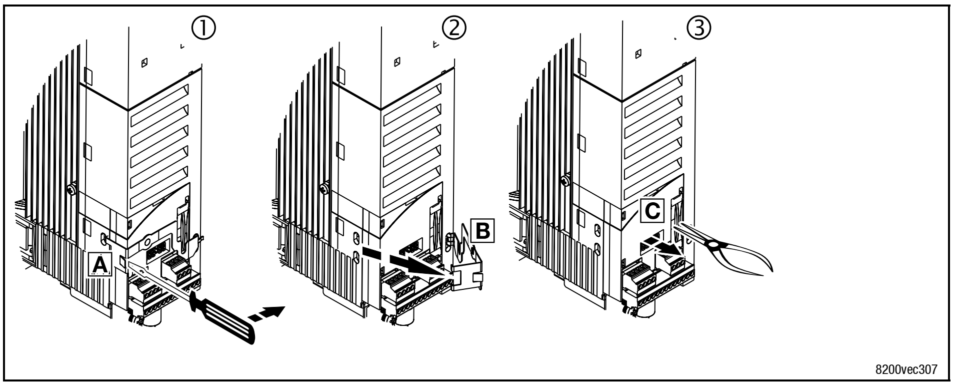


Fig. 7.2-4 Additional worksteps

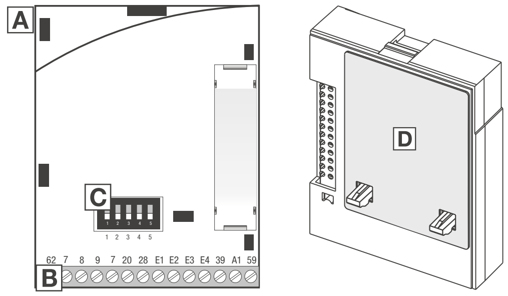
After the function module version "PT" has been switched off, first of all the safety clip must be removed.

1. Position the screw driver between safety clip and function module A. The safety clip is disengaged by pressing to the right.
2. Turn the safety clip B to the right.
3. Catch the bar of the plug connector with pliers and pull C. Plug connector and function module are dismounted together.

7.2.2 Terminal assignment - Standard I/O E82ZAFSC

Note!

Shield control cables to avoid interferences!



E82ZAFS006/AFX009

Fig. 7.2-5 Front and rear view

- A E82ZAFSC function module
- B Terminal strip X3, digital and analog inputs and outputs
- C DIP switch for configuration of the analog input 1 (AIN1) at X3/8
- D Nameplate

The device is wired using a terminal strip which is integrated into the module.

Screw terminal data

Electrical connection	Terminal strip with screw connection
Possible connections	rigid: 1.5 mm^2 (AWG 16)
	flexible: without wire crimp cap 1.0 mm^2 (AWG 18) with wire crimp cap, without plastic sleeve 0.5 mm^2 (AWG 20) with wire crimp cap, with plastic sleeve 0.5 mm^2 (AWG 20)
Tightening torque	0.22 ... 0.25 Nm (1.9 ... 2.2 lb-in)
Bare end	5 mm

Configuration of the analog input

Note!

- DIP switch and C0034 must be set for the same range, otherwise the controller cannot interprete the analog signal to X3/8 correctly.
- If a setpoint potentiometer is internally supplied through X3/9, the DIP switch must be set for a voltage range of 0 ... 5 V. Otherwise not the whole speed range can be provided.

Signal to 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

Terminal assignment

X3/	Signal type	Function	Level Lenze setting: Bold print
62	Analog output	**Output frequency**	**0 ... + 6 V** 0 ... + 10 V 1)
7	-	GND1, reference potential for analog signals	-
8	Analog input	Act. or setpoint input Change range using the DIP switch and C0034	
		• Master voltage	0 ... +5 V **0 ... +10 V** -10 V ... +10 V 2)
		• Master current	0 ... +20 mA +4 ... +20 mA +4 ... +20 mA (open-circuit monitored)
9	-	Internal, stabilised DC voltage supply for setpoint potentiometer	+5.2 V
20	-	Internal DC voltage supply for control of digital inputs and output	+20 V ± 10 % (ref.: X3/7)
28	Digital inputs	Controller inhibit (CINH)	1 = START
E1 3) E2 3)	Digital inputs	**Activation of JOG frequencies** **JOG1 = 20 Hz** **JOG2 = 30 Hz** **JOG3 = 40 Hz**	| E1 | E2 JOG1 | 1 | 0 JOG2 | 0 | 1 JOG3 | 1 | 1
E3	Digital inputs	**DC-injection brake (DCB)**	1 = DCB
E4	Digital inputs	**Change of direction of rotation** **CW/CCW rotation**	| E4 CW | 0 CCW | 1
39	-	GND2, reference potential for digital signals	-
A1	Digital output	**Ready for operation with** – internal supply: – external supply:	 0 ... +20 V 0 ... +24 V
59	-	DC supply for X3/A1 – internal (bridge to X3/20): – external:	 +20 V +24 V

1) Output level 0 ... + 10 V: Adapt offset (C0109/C0422) and gain (C0108/C0420)

2) Adjust offset (C0026) and gain (C0027) separately for each function module:
After replacing the function module or the basic device
After loading the Lenze setting

3) Optional frequency input 0 ... 10 kHz single-tracked or 0 ...1 kHz double-tracked, configuration via C0425

Technical data

X3/	
62	Resolution: 10 bit Linearity fault: ±0,5 % Temperature drift (0...+60 °C): 0.3 % Load capability I_{max} = 2 mA
8	Resolution: 10 bit Linearity fault: ± 0.5 % Temperature drift: 0.3 % (0...+60°C) Input resistance • Voltage signal: > 50 k Ω • Current signal: 250 Ω
9	Load capability I_{max} = 10 mA
7	Isolated from terminal X3/39 (GND2)
20	Load capability: Σ I_{max} = 40 mA
28	Input resistance: 3.3 kΩ 1 = HIGH (+12 ... +30 V), PLC level, HTL 0 = LOW (0 ... +3 V), PLC level, HTL
E1 [1]	
E2 [1]	
E3	
E4	
39	Isolated from terminal X3/7 (GND1)
A1	Load capability: I_{max} = 10 mA, at internal supply I_{max} = 50 mA, at external supply

1) Optional frequency input 0 ... 10 kHz single-tracked or 0 ... 1 kHz double-tracked, configuration via C0425

Wiring

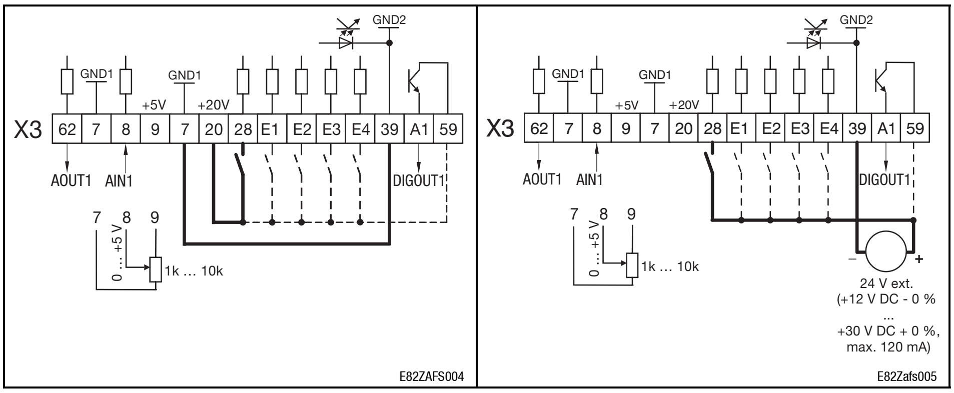


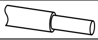
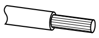
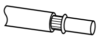
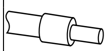
Fig. 7.2-6 Wiring at internal /external supply

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

7.2.3 Terminal assignment - Standard I/O PT E82ZAFS010

- The device is wired using an attachable terminal block for larger cable cross-sections. The function module stands out approx. 13 mm because of the attachable terminal block.
- The standard I/O PT is wired like the standard I/O.
- Please note: The standard I/O PT has got one terminal 7 (GND1) only.

Data of the spring-clamp terminals

Electrical connection	Plug connector with spring connection	
Possible connections		rigid: 1.5 mm^2 (AWG 16)
		flexible:
		without wire crimp cap 1.5 mm^2 (AWG 16)
		with wire crimp cap,without plastic sleeve 1.5 mm^2 (AWG 16)
		with wire crimp cap, with plastic sleeve 0.5 mm^2 (AWG 20)
Bare end	9 mm	

7.2.4 Terminal assignment - Application I/O E82ZAFA

Note!
Shield control cables to avoid interferences!

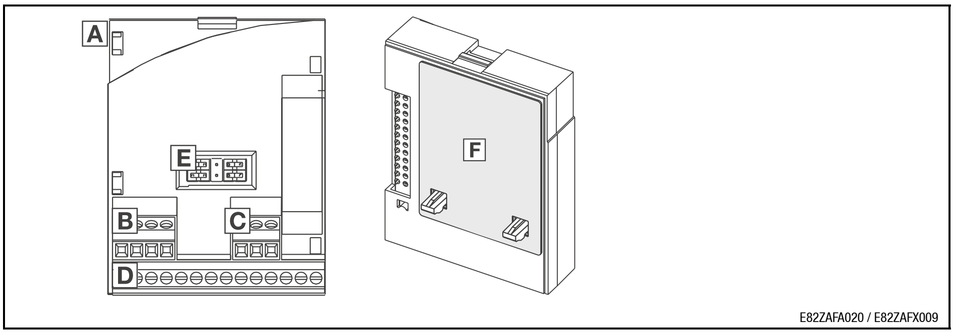
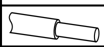
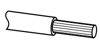
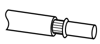
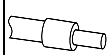


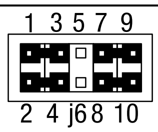
Fig. 7.2-7 Front and rear view

- A E82ZAFAC function module
- B Terminal strip X3.1, analog inputs
- C Terminal strip X3.2, analog outputs
- D Terminal strip X3.3, digital inputs and outputs
- E Jumper for configuring analog inputs and outputs
- F Nameplate

Screw terminal data

Electrical connection	Terminal strip with screw connection	
Possible connections		rigid: 1.5 mm^2 (AWG 16)
		flexible:
		without wire crimp cap 1.0 mm^2 (AWG 18)
		with wire crimp cap, without plastic sleeve 0.5 mm^2 (AWG 20)
		with wire crimp cap, with plastic sleeve 0.5 mm^2 (AWG 20)
Tightening torque	0.22 ... 0.25 Nm (1.9 ... 2.2 lb-in)	
Bare end	5 mm	

Configuration of analog inputs and outputs



Lenze setting (see bold print in tables)
- 1 - 3
- 2 - 4
- 7 - 9
- 8 - 10

Note!

If a setpoint potentiometer is internally supplied through X3.2/9, the jumper must be set for a voltage range of 0 ... 5 V. Otherwise it is not possible to provide the whole speed range.

X3.1/1U Analog input1, AIN1	**Possible levels**	0 ... 5 V	**0 ... 10 V** [2]	-10 V ... +10 V
	Jumper	7 - 9: free	**7 - 9**	7 - 9
	Code	C0034/1 = 0	**C0034/1 = 0**	C0034/1 = 1

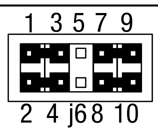
X3.1/2U Analog input2, AIN2	Possible levels	0 ... 5 V	**0 ... 10 V** [2]	-10 V ... +10 V
	Jumper	8 - 10: free	**8 - 10**	8 - 10
	Code	C0034/2 = 0	**C0034/2 = 0**	C0034/2 = 1

X3.1/1I Analog input1, AIN1	Possible levels	0 ... 20 mA	4 ... 20 mA	4 ... 20 mA [1]
	Jumper	optional	optional	optional
	Code	C0034/1 = 2	C0034/1 = 3	C0034/1 = 4

X3.1/2I Analog input2, AIN2	Possible levels	0 ... 20 mA	4 ... 20 mA	4 ... 20 mA [1]
	Jumper	optional	optional	optional
	Code	C0034/2 = 2	C0034/2 = 3	C0034/2 = 4

[1] Open-circuit monitoring

[2] Lenze setting (condition when supplied)



Lenze setting (see bold print in tables)
- 1 - 3
- 2 - 4
- 7 - 9
- 8 - 10

X3.1/62 Analog output, AOUT1	Possible levels	**0 ... 10 V**	0 ... 20 mA	4 ... 20 mA
	Jumper	**1 - 3**	3 - 5	3 - 5
	Code	**C0424/1 = 0**	C0424/1 = 0	C0424/1 = 1

X3.1/63 Analog output, AOUT2	Possible levels	**0 ... 10 V**	0 ... 20 mA	4 ... 20 mA
	Jumper	**2 - 4**	4 - 6	4 - 6
	Code	**C0424/2 = 0**	C0424/2 = 0	C0424/2 = 1

Terminal assignment

X3.1/	**Signal type**	**Function**	**Level** (Lenze setting, in bold print)
1U/2U	Analog inputs	Actual or setpoint inputs (master voltage) Use jumper and C0034 to change range	0 ... +5 V **0 ... +10 V** -10 V ... +10 V
1I/2I		Actual or setpoint inputs (master current) Use jumper and C0034 to change range	0 ... +20 mA +4 ... +20 mA +4 ... +20 mA (open-circuit monitored)

X3.2/	**Signal type**	**Function** (Lenze setting, in bold print)	**Level** (Lenze setting, in bold print)
62	Analog outputs	**Output frequency**	Voltage output: **0 ... +6 V** 0 ... +10 V [1]
63		**Motor current**	Current output: **(0 ... +12 mA)** 0 ... +20 mA [1] 4 ... +20 mA
9	-	Internal, stabilised DC voltage supply for setpoint potentiometer	+5.2 V

1) Output level 0 ... + 10 V or 0 ... +20 mA: Adapt offset (C0422) and gain (C0420)

<table>
<tr><th>X3.3/</th><th>Signal type</th><th>Function</th><th colspan="3">Level
(Lenze setting, in bold print)</th></tr>
<tr><td>A1</td><td rowspan="2">Digital outputs</td><td>Ready for operation</td><td colspan="3" rowspan="2">0/+20 V at DC internal
0/+24 V at DC external</td></tr>
<tr><td>A2</td><td>not prefabricated</td></tr>
<tr><td>7</td><td>-</td><td>GND, reference potential</td><td colspan="3">-</td></tr>
<tr><td>A4</td><td>Frequency output</td><td>DC bus voltage</td><td colspan="3">HIGH:
+15 V...+24 V (HTL)
LOW: 0 V</td></tr>
<tr><td rowspan="2">59</td><td rowspan="2">-</td><td rowspan="2">DC supply for X3/A1 and X3/A2</td><td colspan="3">+20 V (internal, bridge to X3/20)</td></tr>
<tr><td colspan="3">+24 V (external)</td></tr>
<tr><td>20</td><td>-</td><td>Internal DC voltage supply for control of digital inputs and output</td><td colspan="3">+20 V ± 10 %</td></tr>
<tr><td>28</td><td rowspan="12">Digital inputs</td><td>Controller inhibit (CINH)</td><td colspan="3">1 = START</td></tr>
<tr><td rowspan="2">E1[2]</td><td rowspan="4">Activation of JOG frequencies
JOG1 = 20 Hz
JOG2 = 30 Hz
JOG3 = 40 Hz</td><td></td><td>E1</td><td>E2</td></tr>
<tr><td>JOG1</td><td>1</td><td>0</td></tr>
<tr><td rowspan="2">E2[2]</td><td>JOG2</td><td>0</td><td>1</td></tr>
<tr><td>JOG3</td><td>1</td><td>1</td></tr>
<tr><td>E3</td><td>DC-injection brake (DCB)</td><td colspan="3">1 = DCB</td></tr>
<tr><td rowspan="3">E4</td><td rowspan="3">Change of direction of rotation
CW/CCW rotation</td><td></td><td>E4</td><td rowspan="3"></td></tr>
<tr><td>CW</td><td>0</td></tr>
<tr><td>CCW</td><td>1</td></tr>
<tr><td>E5</td><td>not prefabricated</td><td colspan="3">-</td></tr>
<tr><td>E6</td><td>not prefabricated</td><td colspan="3">-</td></tr>
</table>

2) Optional frequency input 0 ... 100 kHz, single-tracked or double-tracked, configuration via C0425

Technical data

X3.1/	
1U/2U 1I/2I	Temperature error (0...+60°C) for level (ref. to current value): • 0 ... +5 V: 1 % • 0 ... +10 V: 0.6 % • -10 V ... +10 V: 0.6 % • 0/4 ... +20 mA: 0.6 % Linearity fault: ± 0.5 % A/D converter: Resolution: 10 bit, Error (ref. to limit value): 1 digit ≡ 0.1 % Input resistance: Voltage signal: > 50 k Ω, current signal: 250 Ω
X3.2/	
62 63	Resolution: 10 bit Linearity fault (ref. to current value): ±0.5 % Temperature error (0...+60 °C): 0.6 % Load capacity (0 ... +10 V): I_{max} = 2 mA Load resistance (0/4... 20 mA): ≤ 500 Ω
9	Load capacity: I_{max} = 5 mA
X3.3/	
A1 A2	Load capacity: • I_{max} = 10 mA, with internal supply • I_{max} = 50 mA, with external supply
A4	Load capacity: I_{max} = 8 mA f = 50 Hz ...10 kHz
20	Load capacity: Σ I_{max} = 60 mA
28 E1[1)] E2[1)] E3 E4 E5 E6	Input resistance: 3.2 kΩ 1 = HIGH (+12 ... +30 V), PLC level, HTL 0 = LOW (0 ... +3 V), PLC level, HTL

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

Wiring

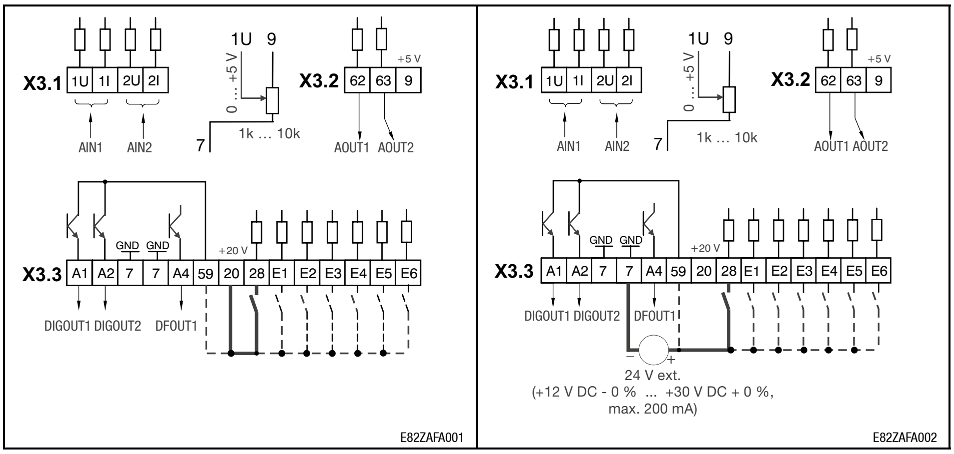


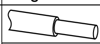
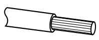
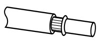
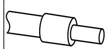
Fig. 7.2-8 Wiring at internal /external supply

internal	voltage source X3/20 (+20 V DC, max. 60 mA)
external	voltage source + 24 V DC (+12 V DC - 0 % ... +30 V DC + 0 %, max. 200 mA)
———	The min. wiring requirements for operation

7.2.5 Terminal assignment - Application I/O PT E82ZAFA...

- The device is wired using an attachable terminal block for larger cable cross-sections. The function module stands out approx. 13 mm because of the attachable terminal block.
- The application I/O PT is wired like the application I/O.
- Please note: The application I/O PT has got one terminal 7 (GND) only.

Data of the spring-clamp terminals

Electrical connection	Plug connector with spring connection	
Possible connections		rigid: 1.5 mm^2 (AWG 16)
	  	flexible: without wire crimp cap 1.5 mm^2 (AWG 16) with wire crimp cap,without plastic sleeve 1.5 mm^2 (AWG 16) with wire crimp cap, with plastic sleeve 0.5 mm^2 (AWG 20)
Bare end	9 mm	

7.2.6 Bus function modules

Note!

For information on wiring and using bus function modules please see the corresponding Mounting Instructions and Manuals.

Possible modules:

- INTERBUS
- PROFIBUS-DP
- LECOM-B
- System bus (CAN)
- System bus I/O-RS
- System bus I/O
- CANopen / DeviceNet (in preparation)
- AS-I

7.2.7 Communication modules

Note!

For information on wiring and using bus communication modules please see the corresponding Mounting Instructions and Manuals.

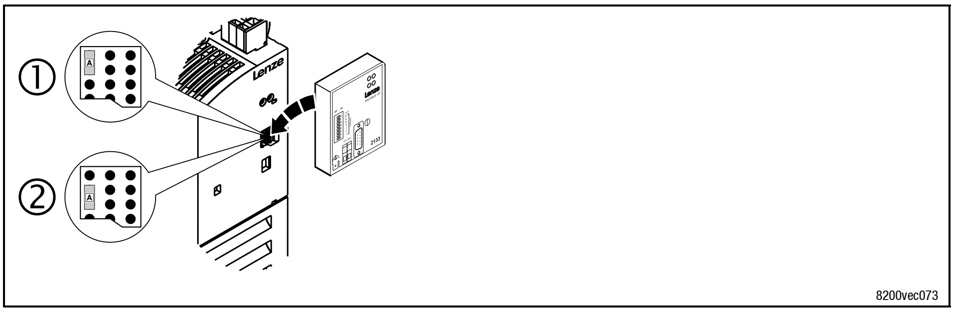


Fig. 7.2-9 Mounting and selecting the voltage supply of the communication modules

A Jumper for selecting the voltage supply

① External voltage supply (delivery state)
② Voltage supply via internal voltage source

Attach/detach the communication module to/from the AIF interface. This is also possible during operation.

Possible combinations		Communication module on AIF							
Function module in FIF (Design: Standard or PT)		Keypad E82ZBC 1) Keypad XT EMZ9371BC 1)	LECOM -A/B 2102.V001 -LI 2102.V003 -A 2102.V004 1)	LECOM-B (RS485) 2102.V002	INTERBUS 2111/2113 INTERBUS-Loop 2112	PROFIBUS-DP 2131/2133	System bus (CAN) 2171/2172	CANopen / DeviceNet 2175	LON 2141
Standard I/O	E82ZAFSC	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Application I/O	E82ZAFAC	✓✓	✓	✓	✓	✓	✓	✓	✓
INTERBUS	E82ZAFIC	✓✓	(✓)	☒	☒	☒	☒	☒	☒
PROFIBUS-DP	E82ZAFPC	✓✓	(✓)	☒	☒	☒	☒	☒	☒
LECOM-B (RS485)	E82ZAFLC	✓✓	(✓)	☒	☒	☒	☒	☒	☒
System bus (CAN) System bus I/O-RS System bus I/O	E82ZAFCC E82ZAFCC100 E82ZAFCC200	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
CANopen / DeviceNet 2)	E82ZAFD	✓✓	✓✓	☒	☒	☒	☒	☒	☒
AS-i	E82ZAFFC	✓✓	✓✓	☒	☒	☒	☒	☒	☒

1) Independently of the jumper position always supplied internally.

2) In preparation

✓✓ Combination possible, internal or external supply of the communication module

✓ Combination possible, external voltage supply!

(✓) Combination possible, communication module can only be used for parameter setting.

☒ Combination not possible

7.3 Basic units in the power range 3 ... 11 kW

7.3.1 Function modules

Important notes

The basic controller version is not equipped with control terminals. The controllers can be equipped with control terminals by using different I/O function modules for the FIF interface.

Dismount the function module only if it is absolutely necessary (e.g. when the controller is replaced).

The pin strip which is used to connect the function module is part of the contact system of the controller. It has not been designed for repeated connection and disconnection of the function module.

Mounting of function modules

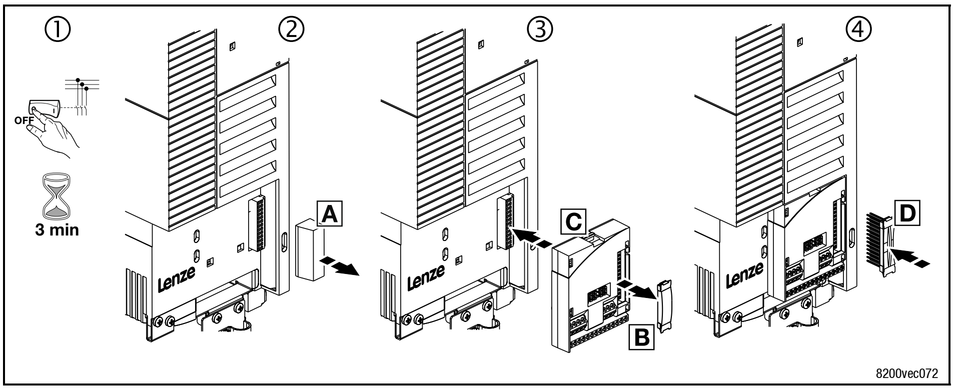


Fig. 7.3-1 Worksteps

1. **Disconnect the controller from the mains and wait for at least 3 minutes!**
2. Remove the FIF protection cover A and keep it.
3. Remove the protection cover B of the function module.
4. Plug the function module C onto the FIF interface.
5. Plug the plug connector D into the contact bank of the function module until it is snapped into place.
6. For wiring see Mounting Instructions for the function module.

Mounting of function modules in ”PT” version

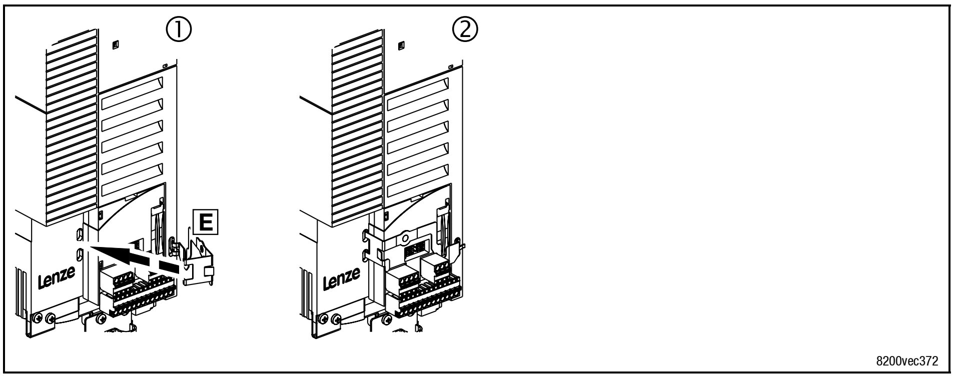


Fig. 7.3-2 Additional worksteps

In addition fix the safety clip, so that the module is prevented from being pulled out together with the terminal strips:

1. Turn the safety clip E in the openings.
2. Fold the safety clip over the function module until it snaps into place.

Dismounting of the function modules

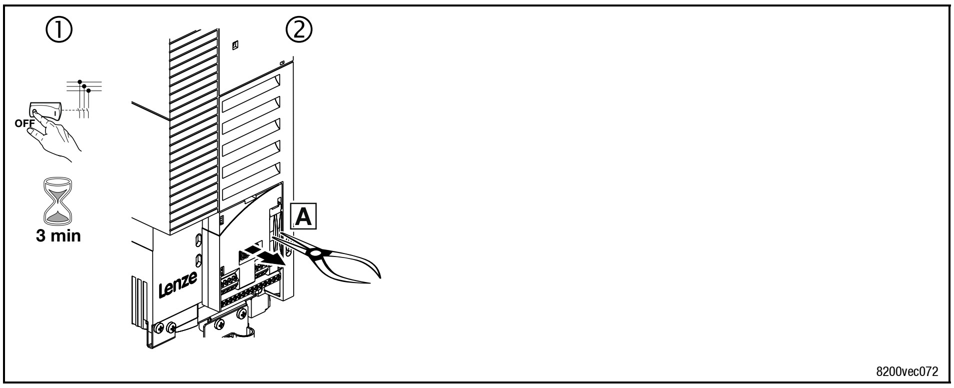


Fig. 7.3-3 Worksteps

1. **Disconnect the controller from the mains and wait for at least 3 minutes!**
2. Catch the bar of the plug connector with pliers and pull A . Plug connector and function module are dismounted together.

Dismounting of the function module version ”PT”

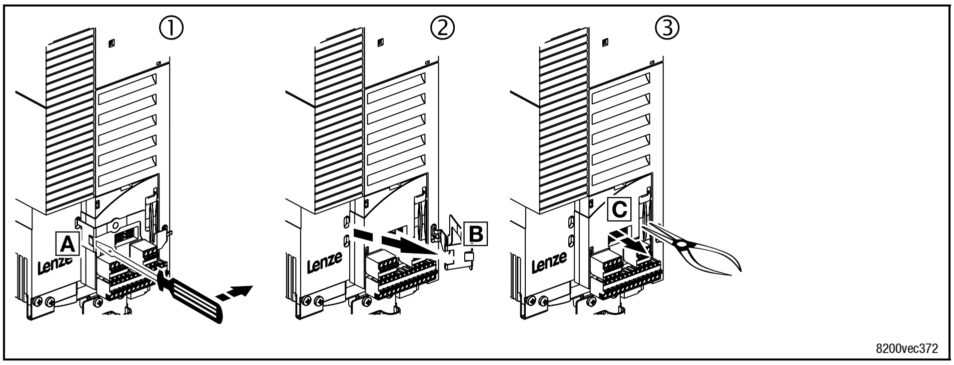


Fig. 7.3-4 Additional worksteps

After the function module version ”PT” has been switched off, first of all the safety clip must be removed.

1. Position the screw driver between safety clip and function module A. The safety clip is disengaged by pressing to the right.
2. Turn the safety clip B to the right.
3. Catch the bar of the plug connector with pliers and pull C. Plug connector and function module are dismounted together.

7.3.2 Terminal assignment - Standard I/O E82ZAFSC

Note!
Shield control cables to avoid interferences!

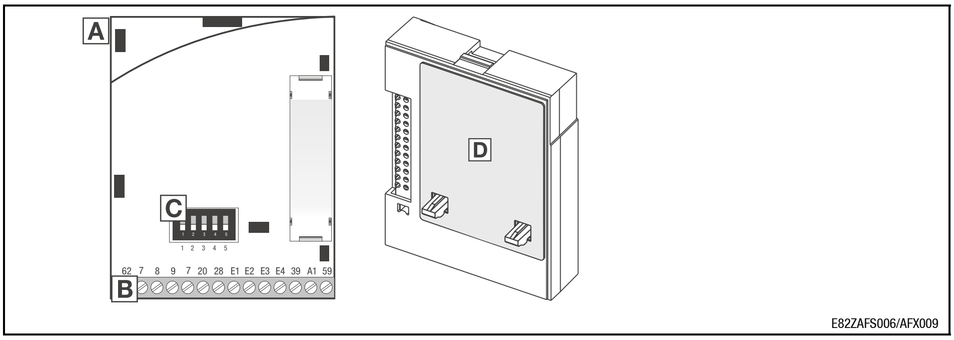
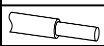
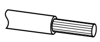
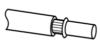
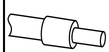


Fig. 7.3-5 Front and rear view

- A E82ZAFSC function module
- B Terminal strip X3, digital and analog inputs and outputs
- C DIP switch for configuration of the analog input 1 (AIN1) at X3/8
- D Nameplate

The device is wired using a terminal strip which is integrated into the module.

Screw terminal data

Electrical connection	Terminal strip with screw connection
Possible connections	 rigid: 1.5 mm^2 (AWG 16)
	flexible:  without wire crimp cap 1.0 mm^2 (AWG 18)  with wire crimp cap, without plastic sleeve 0.5 mm^2 (AWG 20)  with wire crimp cap, with plastic sleeve 0.5 mm^2 (AWG 20)
Tightening torque	0.22 ... 0.25 Nm (1.9 ... 2.2 lb-in)
Bare end	5 mm

Configuration of the analog input

Note!

- DIP switch and C0034 must be set for the same range, otherwise the controller cannot interprete the analog signal to X3/8 correctly.
- If a setpoint potentiometer is internally supplied through X3/9, the DIP switch must be set for a voltage range of 0 ... 5 V. Otherwise not the whole speed range can be provided.

Signal to 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

Terminal assignment

<table>
<tr><th>X3/</th><th>Signal type</th><th>Function</th><th>Level
Lenze setting: Bold print</th></tr>
<tr><td>62</td><td>Analog output</td><td>Output frequency</td><td>0 ... + 6 V
0 ... + 10 V 1)</td></tr>
<tr><td>7</td><td>-</td><td>GND1, reference potential for analog signals</td><td>-</td></tr>
<tr><td rowspan="3">8</td><td rowspan="3">Analog input</td><td colspan="2">Act. or setpoint input
Change range using the DIP switch and C0034</td></tr>
<tr><td>• Master voltage</td><td>0 ... +5 V
0 ... +10 V
-10 V ... +10 V 2)</td></tr>
<tr><td>• Master current</td><td>0 ... +20 mA
+4 ... +20 mA
+4 ... +20 mA (open-circuit monitored)</td></tr>
<tr><td>9</td><td>-</td><td>Internal, stabilised DC voltage supply for setpoint potentiometer</td><td>+5.2 V</td></tr>
<tr><td>20</td><td>-</td><td>Internal DC voltage supply for control of digital inputs and output</td><td>+20 V ± 10 % (ref.: X3/7)</td></tr>
<tr><td>28</td><td rowspan="4">Digital inputs</td><td>Controller inhibit (CINH)</td><td>1 = START</td></tr>
<tr><td>E1 3)
E2 3)</td><td>Activation of JOG frequencies
JOG1 = 20 Hz
JOG2 = 30 Hz
JOG3 = 40 Hz</td><td><table><tr><td></td><td>E1</td><td>E2</td></tr><tr><td>JOG1</td><td>1</td><td>0</td></tr><tr><td>JOG2</td><td>0</td><td>1</td></tr><tr><td>JOG3</td><td>1</td><td>1</td></tr></table></td></tr>
<tr><td>E3</td><td>DC-injection brake (DCB)</td><td>1 = DCB</td></tr>
<tr><td>E4</td><td>Change of direction of rotation
CW/CCW rotation</td><td><table><tr><td></td><td>E4</td></tr><tr><td>CW</td><td>0</td></tr><tr><td>CCW</td><td>1</td></tr></table></td></tr>
<tr><td>39</td><td>-</td><td>GND2, reference potential for digital signals</td><td>-</td></tr>
<tr><td>A1</td><td>Digital output</td><td>Ready for operation with
– internal supply:
– external supply:</td><td>
0 ... +20 V
0 ... +24 V</td></tr>
<tr><td>59</td><td>-</td><td>DC supply for X3/A1
– internal (bridge to X3/20):
– external:</td><td>
+20 V
+24 V</td></tr>
</table>

1) Output level 0 ... + 10 V: Adapt offset (C0109/C0422) and gain (C0108/C0420)

2) Adjust offset (C0026) and gain (C0027) separately for each function module:
After replacing the function module or the basic device
After loading the Lenze setting

3) Optional frequency input 0 ... 10 kHz single-tracked or 0 ...1 kHz double-tracked, configuration via C0425

Technical data

X3/	
62	Resolution: 10 bit Linearity fault: ±0,5 % Temperature drift (0...+60 °C): 0.3 % Load capability I_{max} = 2 mA
8	Resolution: 10 bit Linearity fault: ± 0.5 % Temperature drift: 0.3 % (0...+60°C) <u>Input resistance</u> • Voltage signal: > 50 k Ω • Current signal: 250 Ω
9	Load capability I_{max} = 10 mA
7	Isolated from terminal X3/39 (GND2)
20	Load capability: ΣI_{max} = 40 mA
28	Input resistance: 3.3 kΩ 1 = HIGH (+12 ... +30 V), PLC level, HTL 0 = LOW (0 ... +3 V), PLC level, HTL
E1 [1]	
E2 [1]	
E3	
E4	
39	Isolated from terminal X3/7 (GND1)
A1	Load capability: I_{max} = 10 mA, at internal supply I_{max} = 50 mA, at external supply

[1] Optional frequency input 0 ... 10 kHz single-tracked or 0 ... 1 kHz double-tracked, configuration via C0425

Wiring

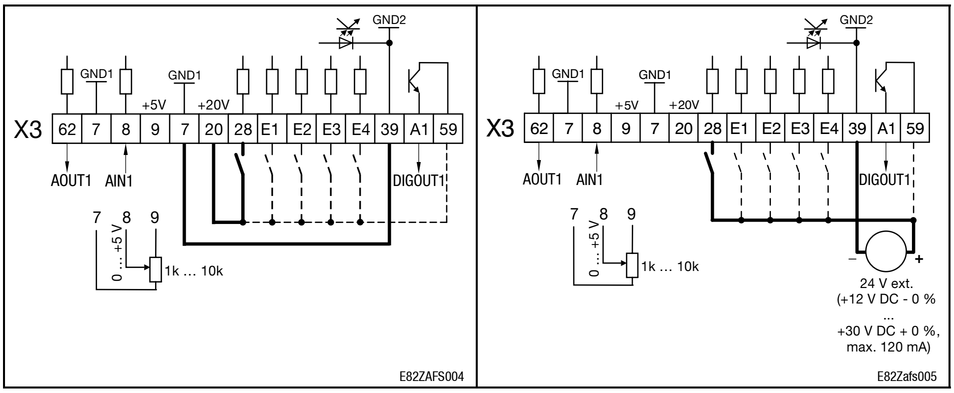


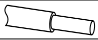
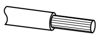
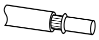
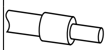
Fig. 7.3-6 Wiring at internal /external supply

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

7.3.3 Terminal assignment - Standard I/O PT E82ZAFS010

- The device is wired using an attachable terminal block for larger cable cross-sections. The function module stands out approx. 13 mm because of the attachable terminal block.
- The standard I/O PT is wired like the standard I/O.
- Please note: The standard I/O PT has got one terminal 7 (GND1) only.

Data of the spring-clamp terminals

Electrical connection	Plug connector with spring connection	
Possible connections		rigid: 1.5 mm^2 (AWG 16)
		flexible:
		without wire crimp cap 1.5 mm^2 (AWG 16)
		with wire crimp cap,without plastic sleeve 1.5 mm^2 (AWG 16)
		with wire crimp cap, with plastic sleeve 0.5 mm^2 (AWG 20)
Bare end	9 mm	

7.3.4 Terminal assignment - Application I/O E82ZAFA

Note!

Shield control cables to avoid interferences!

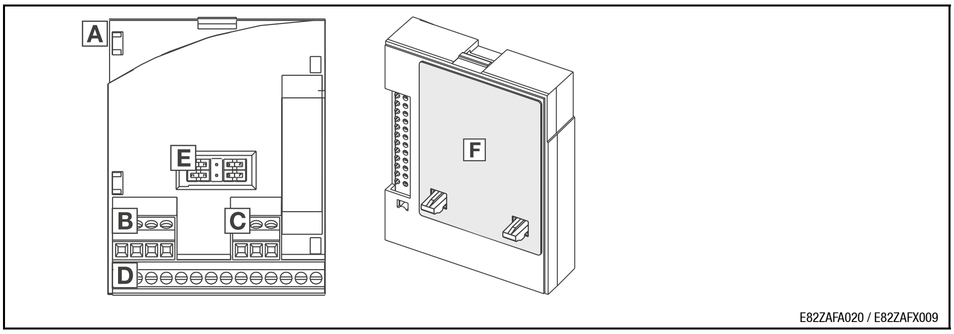


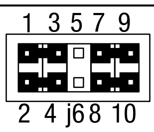
Fig. 7.3-7 Front and rear view

- A E82ZAFAC function module
- B Terminal strip X3.1, analog inputs
- C Terminal strip X3.2, analog outputs
- D Terminal strip X3.3, digital inputs and outputs
- E Jumper for configuring analog inputs and outputs
- F Nameplate

Screw terminal data

Electrical connection	Terminal strip with screw connection
Possible connections	rigid: 1.5 mm² (AWG 16)
	flexible: without wire crimp cap 1.0 mm² (AWG 18) with wire crimp cap, without plastic sleeve 0.5 mm² (AWG 20) with wire crimp cap, with plastic sleeve 0.5 mm² (AWG 20)
Tightening torque	0.22 ... 0.25 Nm (1.9 ... 2.2 lb-in)
Bare end	5 mm

Configuration of analog inputs and outputs



Lenze setting (see bold print in tables)
- 1 - 3
- 2 - 4
- 7 - 9
- 8 - 10

Note!

If a setpoint potentiometer is internally supplied through X3.2/9, the jumper must be set for a voltage range of 0 ... 5 V. Otherwise it is not possible to provide the whole speed range.

X3.1/1U	**Possible levels**	0 ... 5 V	**0 ... 10 V** [2]	-10 V ... +10 V
Analog input1, AIN1	Jumper	7 - 9: free	**7 - 9**	7 - 9
	Code	C0034/1 = 0	**C0034/1 = 0**	C0034/1 = 1

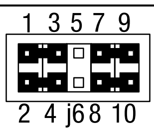
X3.1/2U	Possible levels	0 ... 5 V	**0 ... 10 V** [2]	-10 V ... +10 V
Analog input2, AIN2	Jumper	8 - 10: free	**8 - 10**	8 - 10
	Code	C0034/2 = 0	**C0034/2 = 0**	C0034/2 = 1

X3.1/1I	Possible levels	0 ... 20 mA	4 ... 20 mA	4 ... 20 mA [1]
Analog input1, AIN1	Jumper	optional	optional	optional
	Code	C0034/1 = 2	C0034/1 = 3	C0034/1 = 4

X3.1/2I	Possible levels	0 ... 20 mA	4 ... 20 mA	4 ... 20 mA [1]
Analog input2, AIN2	Jumper	optional	optional	optional
	Code	C0034/2 = 2	C0034/2 = 3	C0034/2 = 4

[1] Open-circuit monitoring

[2] Lenze setting (condition when supplied)



Lenze setting (see bold print in tables)
- 1 - 3
- 2 - 4
- 7 - 9
- 8 - 10

X3.1/62	Possible levels	**0 ... 10 V**	0 ... 20 mA	4 ... 20 mA
Analog output, AOUT1	Jumper	**1 - 3**	3 - 5	3 - 5
	Code	**C0424/1 = 0**	C0424/1 = 0	C0424/1 = 1

X3.1/63	Possible levels	**0 ... 10 V**	0 ... 20 mA	4 ... 20 mA
Analog output, AOUT2	Jumper	**2 - 4**	4 - 6	4 - 6
	Code	**C0424/2 = 0**	C0424/2 = 0	C0424/2 = 1

Extensions for automation

Basic units in the power range 3 ... 11 kW

Terminal assignment - Application I/O E82ZAFA

Terminal assignment

X3.1/	Signal type	Function	Level (Lenze setting, in bold print)
1U/2U	Analog inputs	Actual or setpoint inputs (master voltage) Use jumper and C0034 to change range	0 ... +5 V **0 ... +10 V** -10 V ... +10 V
1I/2I		Actual or setpoint inputs (master current) Use jumper and C0034 to change range	0 ... +20 mA +4 ... +20 mA +4 ... +20 mA (open-circuit monitored)

X3.2/	Signal type	Function (Lenze setting, in bold print)	Level (Lenze setting, in bold print)
62	Analog outputs	**Output frequency**	Voltage output: **0 ... +6 V** 0 ... +10 V [1] Current output: **(0 ... +12 mA)** 0 ... +20 mA [1] 4 ... +20 mA
63		**Motor current**	
9	-	Internal, stabilised DC voltage supply for setpoint potentiometer	+5.2 V

[1] Output level 0 ... + 10 V or 0 ... +20 mA: Adapt offset (C0422) and gain (C0420)

<table>
<tr><th>X3.3/</th><th>Signal type</th><th>Function</th><th colspan="3">Level
(Lenze setting, in bold print)</th></tr>
<tr><td>A1</td><td rowspan="2">Digital outputs</td><td>Ready for operation</td><td colspan="3" rowspan="2">0/+20 V at DC internal
0/+24 V at DC external</td></tr>
<tr><td>A2</td><td>not prefabricated</td></tr>
<tr><td>7</td><td>-</td><td>GND, reference potential</td><td colspan="3">-</td></tr>
<tr><td>A4</td><td>Frequency output</td><td>DC bus voltage</td><td colspan="3">HIGH:
+15 V...+24 V (HTL)
LOW: 0 V</td></tr>
<tr><td>59</td><td>-</td><td>DC supply for X3/A1 and X3/A2</td><td colspan="3">+20 V (internal, bridge to X3/20)
+24 V (external)</td></tr>
<tr><td>20</td><td>-</td><td>Internal DC voltage supply for control of digital inputs and output</td><td colspan="3">+20 V ± 10 %</td></tr>
<tr><td>28</td><td rowspan="8">Digital inputs</td><td>Controller inhibit (CINH)</td><td colspan="3">1 = START</td></tr>
<tr><td>E1[2]</td><td rowspan="2">Activation of JOG frequencies
JOG1 = 20 Hz
JOG2 = 30 Hz
JOG3 = 40 Hz</td><td></td><td>E1</td><td>E2</td></tr>
<tr><td>E2[2]</td><td>JOG1
JOG2
JOG3</td><td>1
0
1</td><td>0
1
1</td></tr>
<tr><td>E3</td><td>DC-injection brake (DCB)</td><td colspan="3">1 = DCB</td></tr>
<tr><td>E4</td><td>Change of direction of rotation
CW/CCW rotation</td><td>
CW
CCW</td><td>E4
0
1</td><td></td></tr>
<tr><td>E5</td><td>not prefabricated</td><td colspan="3">-</td></tr>
<tr><td>E6</td><td>not prefabricated</td><td colspan="3">-</td></tr>
</table>

[2] Optional frequency input 0 ... 100 kHz, single-tracked or double-tracked, configuration via C0425

Technical data

X3.1/	
1U/2U 1I/2I	Temperature error (0...+60°C) for level (ref. to current value): • 0 ... +5 V: 1 % • 0 ... +10 V: 0.6 % • -10 V ... +10 V: 0.6 % • 0/4 ... +20 mA: 0.6 % Linearity fault: ± 0.5 % A/D converter: Resolution: 10 bit, Error (ref. to limit value): 1 digit ≡ 0.1 % Input resistance: Voltage signal: > 50 k Ω, current signal: 250 Ω
X3.2/	
62 63	Resolution: 10 bit Linearity fault (ref. to current value): ±0.5 % Temperature error (0...+60 °C): 0.6 % Load capacity (0 ... +10 V): I_{max} = 2 mA Load resistance (0/4... 20 mA): ≤ 500 Ω
9	Load capacity: I_{max} = 5 mA
X3.3/	
A1 A2	Load capacity: • I_{max} = 10 mA, with internal supply • I_{max} = 50 mA, with external supply
A4	Load capacity: I_{max} = 8 mA f = 50 Hz ...10 kHz
20	Load capacity: Σ I_{max} = 60 mA
28	Input resistance: 3.2 kΩ 1 = HIGH (+12 ... +30 V), PLC level, HTL 0 = LOW (0 ... +3 V), PLC level, HTL
E1[1)]	
E2[1)]	
E3	
E4	
E5	
E6	

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

Wiring

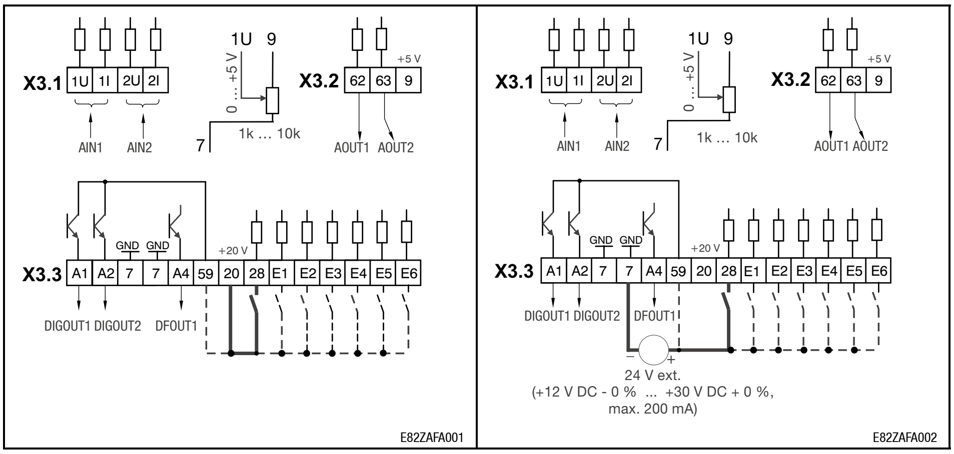


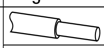
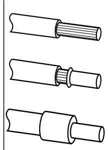
Fig. 7.3-8 Wiring at internal /external supply

internal	voltage source X3/20 (+20 V DC, max. 60 mA)
external	voltage source + 24 V DC (+12 V DC - 0 % ... +30 V DC + 0 %, max. 200 mA)
———	The min. wiring requirements for operation

7.3.5 Terminal assignment - Application I/O PT E82ZAFA...

- The device is wired using an attachable terminal block for larger cable cross-sections. The function module stands out approx. 13 mm because of the attachable terminal block.
- The application I/O PT is wired like the application I/O.
- Please note: The application I/O PT has got one terminal 7 (GND) only.

Data of the spring-clamp terminals

Electrical connection	Plug connector with spring connection	
Possible connections		rigid: 1.5 mm^2 (AWG 16)
		flexible: without wire crimp cap 1.5 mm^2 (AWG 16) with wire crimp cap,without plastic sleeve 1.5 mm^2 (AWG 16) with wire crimp cap, with plastic sleeve 0.5 mm^2 (AWG 20)
Bare end	9 mm	

7.3.6 Bus function modules

Note!
For information on wiring and using bus function modules please see the corresponding Mounting Instructions and Manuals.

Possible modules:

- INTERBUS
- PROFIBUS-DP
- LECOM-B
- System bus (CAN)
- System bus I/O-RS
- System bus I/O
- CANopen / DeviceNet (in preparation)
- AS-I

7.3.7 Communication modules

Note!

For information on wiring and using bus communication modules please see the corresponding Mounting Instructions and Manuals.

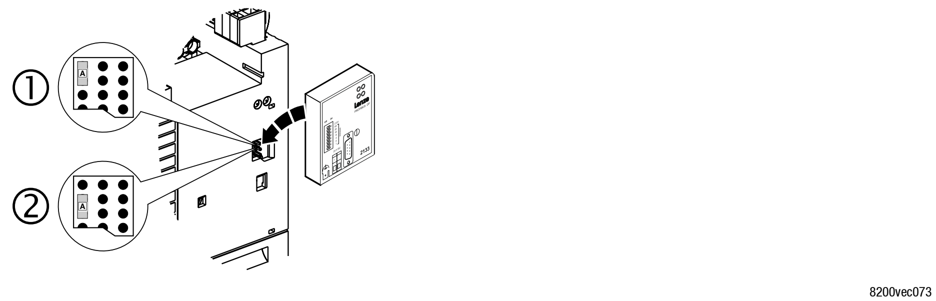


Fig. 7.3-9 Mounting and selecting the voltage supply of the communication modules

A Jumper for selecting the voltage supply

① External voltage supply (delivery state)
② Voltage supply via internal voltage source

Attach/detach the communication module to/from the AIF interface. This is also possible during operation.

Possible combinations		Communication module on AIF							
Function module in FIF (Design: Standard or PT)		Keypad E82ZBC 1) Keypad XT EMZ9371BC 1)	LECOM -A/B 2102.V001 -LI 2102.V003 -A 2102.V004 1)	LECOM-B (RS485) 2102.V002	INTERBUS 2111/2113 INTERBUS-Loop 2112	PROFIBUS-DP 2131/2133	System bus (CAN) 2171/2172	CANopen / DeviceNet 2175	LON 2141
Standard I/O	E82ZAFSC	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Application I/O	E82ZAFAC	✓✓	✓	✓	✓	✓	✓	✓	✓
INTERBUS	E82ZAFIC	✓✓	(✓)	⊠	⊠	⊠	⊠	⊠	⊠
PROFIBUS-DP	E82ZAFPC	✓✓	(✓)	⊠	⊠	⊠	⊠	⊠	⊠
LECOM-B (RS485)	E82ZAFLC	✓✓	(✓)	⊠	⊠	⊠	⊠	⊠	⊠
System bus (CAN) System bus I/O-RS System bus I/O	E82ZAFCC E82ZAFCC100 E82ZAFCC200	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
CANopen / DeviceNet 2)	E82ZAFD	✓✓	✓✓	⊠	⊠	⊠	⊠	⊠	⊠
AS-i	E82ZAFFC	✓✓	✓✓	⊠	⊠	⊠	⊠	⊠	⊠

1) Independently of the jumper position always supplied internally.
2) In preparation
✓✓ Combination possible, internal or external supply of the communication module
✓ Combination possible, external voltage supply!
(✓) Combination possible, communication module can only be used for parameter setting.
⊠ Combination not possible

7.3.8 Connection of relay output K_{SR} for ”Safe standstill”

(only active with variant E82EVxxxK4Cx **4** x)

Controller variant x**4**x supports the safety function ”Safe standstill”, protection against unintended start, according to the requirements of EN 954-1 and EN 1037. Depending on the external circuitry it is possible to reach ”Category 3” to EN 954-1.

For this purpose the controllers have an integrated safety relay with feedback contact. The safety relay switches off the voltage supply of the optocoupler for pulse transfer to the IGBT. It must be externally controlled with DC +24 V.

- Only skilled personnel is authorized to install and commission the function ”Safe standstill”.
- All safety-relevant external cables (e.g. control cable for the safety relay, feedback contact) must be protected, e. g. in the cable duct. Ensure that short-circuits and lateral connection cannot occur!
- If external forces act on the drive axes, additional brakes are necessary. Especially consider the force of gravity acting on suspended loads!
- After the initial commissioning the operator must check the function of the safety circuits. This must be repeated periodically.

Danger!

- The electrical reference point for the coil of the safety relay must be connected with the protective circuit (DIN EN 60204-1 Abs. 9.4.3)!
  – Only in this way the protection against faulty operation is guaranteed.
- Without additional measures the function ”Safe standstill” does not provide an ”Emergency-off”:
  – There is neither an electrical isolation between motor and controller nor a ”service switch” or a ”repair switch”
  – An ”Emergency-off” requires an electrical isolation, e.g. by means of a central mains contactor!

Wiring

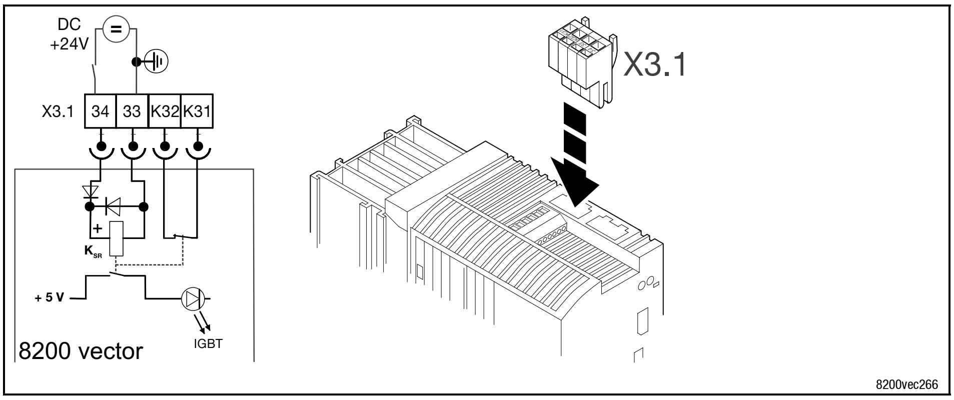


Fig. 7.3-10 Relay K_{SR}

Fig. 7.3-11 Relay connection K_{SR}

Terminal assignment		**Data**		
33	Reference potential for the input safety shutdown	Safety relay	Coil voltage at +40°C	DC +24 V (+19.5 ... 36 V)
			Coil current at 24 V DC	30 mA
			Test voltage contact → coil	AC 1500 V_{eff} for 1 min
34	Input safety shutdown		Test voltage contact → contact	AC 1500 V_{eff} for 1 min
			Electrical endurance at rated load	~ 10^7 switching operations
			Mechanical endurance	~ 10^7 switching operations
K31	Feedback contact	Feedback contact	Switching voltage	DC 24 V
K32			Continuous current	5 ... 700 mA

7.4 Basic units in the power range of 15 ... 90 kW

7.4.1 Function modules

Important notes

The basic controller version is not equipped with control terminals. The controllers can be equipped with control terminals by using different I/O function modules for the FIF interface.

Dismount the function module only if it is absolutely necessary (e.g. when the controller is replaced).

The pin strip which is used to connect the function module is part of the contact system of the controller. It has not been designed for repeated connection and disconnection of the function module.

Danger!

- The pins of the FIF interface have a basic insulation (single-insulating distance).
- Protection against contact - in the event of a defective insulating distance - can only be ensured by external measures, e.g. double insulation.

Which function modules can be used?

8200 vector with a function module	**Possible function modules on FIF I**	Standard I/O	E82ZAFSC
		Standard I/O PT	E82ZAFSC010
		Application I/O	E82ZAFAC
		INTERBUS	E82ZAFIC
		PROFIBUS-DP	E82ZAFPC
		LECOM-B (RS485)	E82ZAFLC
		System bus (CAN)	E82ZAFCC
8200 vector with two function modules	**Possible function modules on FIF I**	INTERBUS	E82ZAFIC
		PROFIBUS-DP	E82ZAFPC
		LECOM-B (RS485)	E82ZAFLC
		System bus (CAN)	E82ZAFCC
	Possible function modules on FIF II	Standard I/O	E82ZAFSC
		Standard I/O PT	E82ZAFSC100

Mounting of function modules

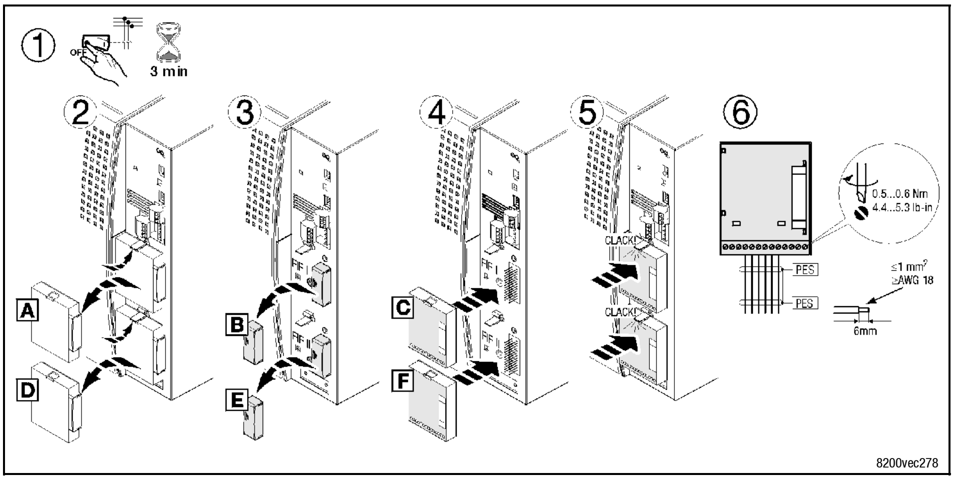


Fig. 7.4-1 Worksteps for the basic devices 15 ... 90 kW

Function module on interface FIF I

1. Disconnect the controller from the mains and wait for at least 3 minutes!
2. Remove blind cover A and keep it.
3. Remove the FIF protection cover B and keep it.
4. Plug the function module C on the interface FIF I.
5. Press against the function module until it is snapped into place.
6. Assign the terminals of the function modules (PES: HF- shield connection by connecting the shield to PE)

Function module on interface FIF II

1. Disconnect the controller from the mains and wait for at least 3 minutes!
2. Remove blind cover D and keep it.
3. Remove the FIF protection cover E and keep it.
4. Plug the function module standard I/O F on the interface FIF II.
5. Press against the function module until it is snapped into place.
6. Assign the terminals of the function modules (PES: HF- shield connection by connecting the shield to PE)
   – Wiring of the terminals “controller inhibit (CINH)”: 7.4-14

Dismounting of the function modules

Dismount the function module only if it is absolutely necessary (e.g. when the controller is replaced).

The pin strip which is used to connect the function module is part of the contact system of the controller. It has not been designed for repeated connection and disconnection of the function module.

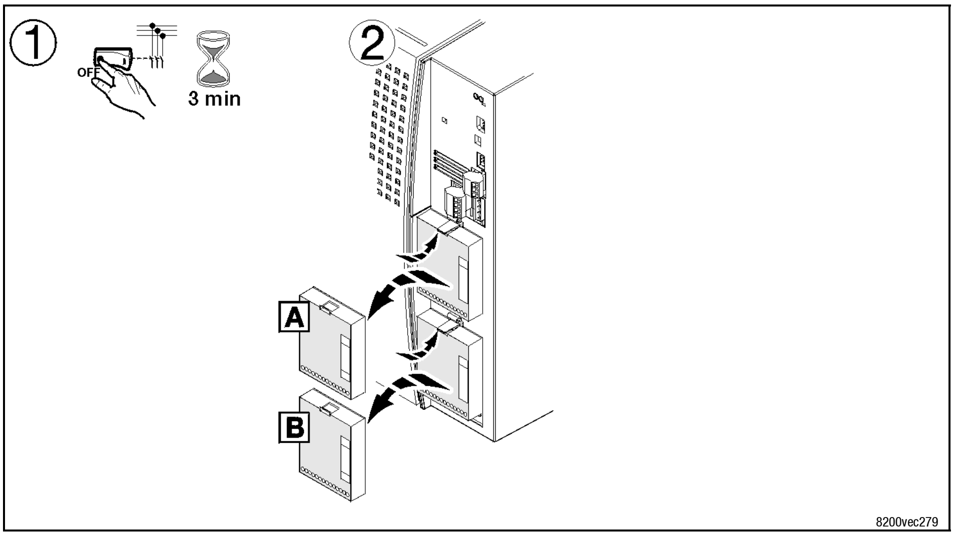


Fig. 7.4-2 Worksteps for the basic devices 15 ... 90 kW

① Disconnect the controller from the mains and wait for at least 3 minutes!
② Unplug the function module A or B from the interface.

7.4.2 Terminal assignment - Standard I/O E82ZAFSC

Note!
Shield control cables to avoid interferences!

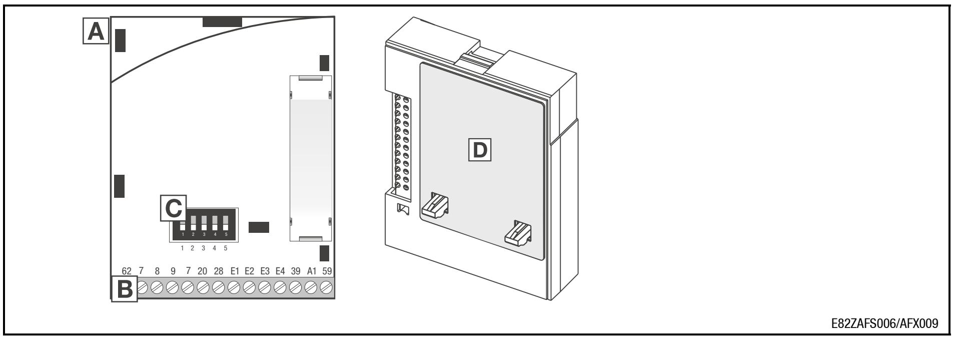


Fig. 7.4-3 Front and rear view

- A E82ZAFSC function module
- B Terminal strip X3, digital and analog inputs and outputs
- C DIP switch for configuration of the analog input 1 (AIN1) at X3/8
- D Nameplate

The device is wired using a terminal strip which is integrated into the module.

Screw terminal data

Electrical connection	Terminal strip with screw connection
Possible connections	rigid: 1.5 mm^2 (AWG 16)
	flexible: without wire crimp cap 1.0 mm^2 (AWG 18) with wire crimp cap, without plastic sleeve 0.5 mm^2 (AWG 20) with wire crimp cap, with plastic sleeve 0.5 mm^2 (AWG 20)
Tightening torque	0.22 ... 0.25 Nm (1.9 ... 2.2 lb-in)
Bare end	5 mm

Configuration of the analog input

Note!

- DIP switch and C0034 must be set for the same range, otherwise the controller cannot interprete the analog signal to X3/8 correctly.
- If a setpoint potentiometer is internally supplied through X3/9, the DIP switch must be set for a voltage range of 0 ... 5 V. Otherwise not the whole speed range can be provided.

Signal to 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

Terminal assignment

<table>
<tr><th>X3/</th><th>Signal type</th><th>Function</th><th colspan="3">Level
Lenze setting: Bold print</th></tr>
<tr><td>62</td><td>Analog output</td><td>Output frequency</td><td colspan="3">0 ... + 6 V
0 ... + 10 V 1)</td></tr>
<tr><td>7</td><td>-</td><td>GND1, reference potential for analog signals</td><td colspan="3">-</td></tr>
<tr><td rowspan="3">8</td><td rowspan="3">Analog input</td><td colspan="4">Act. or setpoint input
Change range using the DIP switch and C0034</td></tr>
<tr><td>• Master voltage</td><td colspan="3">0 ... +5 V
0 ... +10 V
-10 V ... +10 V 2)</td></tr>
<tr><td>• Master current</td><td colspan="3">0 ... +20 mA
+4 ... +20 mA
+4 ... +20 mA (open-circuit monitored)</td></tr>
<tr><td>9</td><td>-</td><td>Internal, stabilised DC voltage supply for setpoint potentiometer</td><td colspan="3">+5.2 V</td></tr>
<tr><td>20</td><td>-</td><td>Internal DC voltage supply for control of digital inputs and output</td><td colspan="3">+20 V ± 10 % (ref.: X3/7)</td></tr>
<tr><td>28</td><td rowspan="9">Digital inputs</td><td>Controller inhibit (CINH)</td><td colspan="3">1 = START</td></tr>
<tr><td rowspan="2">E1 3)</td><td rowspan="4">Activation of JOG frequencies
JOG1 = 20 Hz
JOG2 = 30 Hz
JOG3 = 40 Hz</td><td></td><td>E1</td><td>E2</td></tr>
<tr><td>JOG1</td><td>1</td><td>0</td></tr>
<tr><td rowspan="2">E2 3)</td><td>JOG2</td><td>0</td><td>1</td></tr>
<tr><td>JOG3</td><td>1</td><td>1</td></tr>
<tr><td>E3</td><td>DC-injection brake (DCB)</td><td colspan="3">1 = DCB</td></tr>
<tr><td rowspan="3">E4</td><td rowspan="3">Change of direction of rotation
CW/CCW rotation</td><td></td><td>E4</td><td></td></tr>
<tr><td>CW</td><td>0</td><td></td></tr>
<tr><td>CCW</td><td>1</td><td></td></tr>
<tr><td>39</td><td>-</td><td>GND2, reference potential for digital signals</td><td colspan="3">-</td></tr>
<tr><td>A1</td><td>Digital output</td><td>Ready for operation with
– internal supply:
– external supply:</td><td colspan="3">
0 ... +20 V
0 ... +24 V</td></tr>
<tr><td>59</td><td>-</td><td>DC supply for X3/A1
– internal (bridge to X3/20):
– external:</td><td colspan="3">
+20 V
+24 V</td></tr>
</table>

1) Output level 0 ... + 10 V: Adapt offset (C0109/C0422) and gain (C0108/C0420)

2) Adjust offset (C0026) and gain (C0027) separately for each function module:
After replacing the function module or the basic device
After loading the Lenze setting

3) Optional frequency input 0 ... 10 kHz single-tracked or 0 ...1 kHz double-tracked, configuration via C0425

Technical data

X3/	
62	Resolution: 10 bit Linearity fault: ±0,5 % Temperature drift (0...+60 °C): 0.3 % Load capability I_{max} = 2 mA
8	Resolution: 10 bit Linearity fault: ± 0.5 % Temperature drift: 0.3 % (0...+60°C) Input resistance • Voltage signal: > 50 k Ω • Current signal: 250 Ω
9	Load capability I_{max} = 10 mA
7	Isolated from terminal X3/39 (GND2)
20	Load capability: ΣI_{max} = 40 mA
28	Input resistance: 3.3 kΩ 1 = HIGH (+12 ... +30 V), PLC level, HTL 0 = LOW (0 ... +3 V), PLC level, HTL
E1 [1]	
E2 [1]	
E3	
E4	
39	Isolated from terminal X3/7 (GND1)
A1	Load capability: I_{max} = 10 mA, at internal supply I_{max} = 50 mA, at external supply

[1] Optional frequency input 0 ... 10 kHz single-tracked or 0 ... 1 kHz double-tracked, configuration via C0425

Wiring

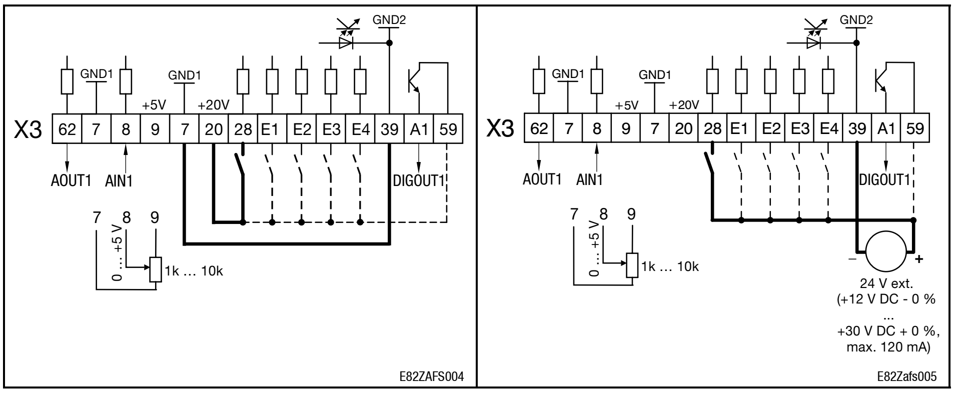


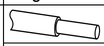
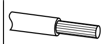
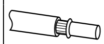
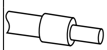
Fig. 7.4-4 Wiring at internal /external supply

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

7.4.3 Terminal assignment - Standard I/O PT E82ZAFS010

- The device is wired using an attachable terminal block for larger cable cross-sections. The function module stands out approx. 13 mm because of the attachable terminal block.
- The standard I/O PT is wired like the standard I/O.
- Please note: The standard I/O PT has got one terminal 7 (GND1) only.

Data of the spring-clamp terminals

Electrical connection	Plug connector with spring connection	
Possible connections		rigid: 1.5 mm^2 (AWG 16)
	  	flexible: without wire crimp cap 1.5 mm^2 (AWG 16) with wire crimp cap,without plastic sleeve 1.5 mm^2 (AWG 16) with wire crimp cap, with plastic sleeve 0.5 mm^2 (AWG 20)
Bare end	9 mm	

7.4.4 Terminal assignment - Application I/O E82ZAFA

Note!
Shield control cables to avoid interferences!

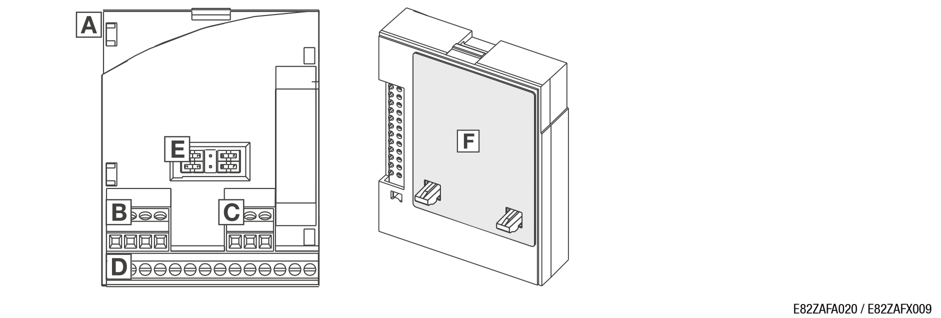


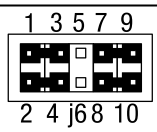
Fig. 7.4-5 Front and rear view

- A E82ZAFAC function module
- B Terminal strip X3.1, analog inputs
- C Terminal strip X3.2, analog outputs
- D Terminal strip X3.3, digital inputs and outputs
- E Jumper for configuring analog inputs and outputs
- F Nameplate

Screw terminal data

Electrical connection	Terminal strip with screw connection
Possible connections	rigid: 1.5 mm^2 (AWG 16)
	flexible: without wire crimp cap 1.0 mm^2 (AWG 18) with wire crimp cap, without plastic sleeve 0.5 mm^2 (AWG 20) with wire crimp cap, with plastic sleeve 0.5 mm^2 (AWG 20)
Tightening torque	0.22 ... 0.25 Nm (1.9 ... 2.2 lb-in)
Bare end	5 mm

Configuration of analog inputs and outputs



Lenze setting (see bold print in tables)
- 1 - 3
- 2 - 4
- 7 - 9
- 8 - 10

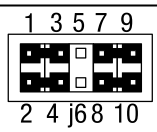
Note!

If a setpoint potentiometer is internally supplied through X3.2/9, the jumper must be set for a voltage range of 0 ... 5 V. Otherwise it is not possible to provide the whole speed range.

X3.1/1U Analog input1, AIN1	**Possible levels**	0 ... 5 V	**0 ... 10 V 2)**	-10 V ... +10 V
	Jumper	7 - 9: free	**7 - 9**	7 - 9
	Code	C0034/1 = 0	**C0034/1 = 0**	C0034/1 = 1
X3.1/2U Analog input2, AIN2	Possible levels	0 ... 5 V	**0 ... 10 V 2)**	-10 V ... +10 V
	Jumper	8 - 10: free	**8 - 10**	8 - 10
	Code	C0034/2 = 0	**C0034/2 = 0**	C0034/2 = 1
X3.1/1I Analog input1, AIN1	Possible levels	0 ... 20 mA	4 ... 20 mA	4 ... 20 mA 1)
	Jumper	optional	optional	optional
	Code	C0034/1 = 2	C0034/1 = 3	C0034/1 = 4
X3.1/2I Analog input2, AIN2	Possible levels	0 ... 20 mA	4 ... 20 mA	4 ... 20 mA 1)
	Jumper	optional	optional	optional
	Code	C0034/2 = 2	C0034/2 = 3	C0034/2 = 4

1) Open-circuit monitoring

2) Lenze setting (condition when supplied)



Lenze setting (see bold print in tables)
- 1 - 3
- 2 - 4
- 7 - 9
- 8 - 10

X3.1/62 Analog output, AOUT1	Possible levels	**0 ... 10 V**	0 ... 20 mA	4 ... 20 mA
	Jumper	**1 - 3**	3 - 5	3 - 5
	Code	**C0424/1 = 0**	C0424/1 = 0	C0424/1 = 1
X3.1/63 Analog output, AOUT2	Possible levels	**0 ... 10 V**	0 ... 20 mA	4 ... 20 mA
	Jumper	**2 - 4**	4 - 6	4 - 6
	Code	**C0424/2 = 0**	C0424/2 = 0	C0424/2 = 1

Terminal assignment

X3.1/	Signal type	Function	Level (Lenze setting, in bold print)
1U/2U	Analog inputs	Actual or setpoint inputs (master voltage) Use jumper and C0034 to change range	0 ... +5 V **0 ... +10 V** -10 V ... +10 V
1I/2I		Actual or setpoint inputs (master current) Use jumper and C0034 to change range	0 ... +20 mA +4 ... +20 mA +4 ... +20 mA (open-circuit monitored)

X3.2/	Signal type	Function (Lenze setting, in bold print)	Level (Lenze setting, in bold print)
62	Analog outputs	**Output frequency**	Voltage output: **0 ... +6 V** 0 ... +10 V 1) Current output: **(0 ... +12 mA)** 0 ... +20 mA 1) 4 ... +20 mA
63		**Motor current**	
9	-	Internal, stabilised DC voltage supply for setpoint potentiometer	+5.2 V

1) Output level 0 ... + 10 V or 0 ... +20 mA: Adapt offset (C0422) and gain (C0420)

X3.3/	Signal type	Function	Level (Lenze setting, in bold print)		
A1	Digital outputs	**Ready for operation**	0/+20 V at DC internal 0/+24 V at DC external		
A2		**not prefabricated**			
7	-	GND, reference potential	-		
A4	Frequency output	**DC bus voltage**	HIGH: +15 V...+24 V (HTL) LOW: 0 V		
59	-	DC supply for X3/A1 and X3/A2	+20 V (internal, bridge to X3/20) +24 V (external)		
20	-	Internal DC voltage supply for control of digital inputs and output	+20 V ± 10 %		
28	Digital inputs	Controller inhibit (CINH)	1 = START		
E1 2)		**Activation of JOG frequencies** **JOG1 = 20 Hz** **JOG2 = 30 Hz** **JOG3 = 40 Hz**		E1	E2
			JOG1	1	0
E2 2)			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 prefabricated**	-		
E6		**not prefabricated**	-		

2) Optional frequency input 0 ... 100 kHz, single-tracked or double-tracked, configuration via C0425

Technical data

X3.1/	
1U/2U 1I/2I	Temperature error (0...+60°C) for level (ref. to current value): • 0 ... +5 V: 1 % • 0 ... +10 V: 0.6 % • -10 V ... +10 V: 0.6 % • 0/4 ... +20 mA: 0.6 % Linearity fault: ± 0.5 % A/D converter: Resolution: 10 bit, Error (ref. to limit value): 1 digit ≡ 0.1 % Input resistance: Voltage signal: > 50 k Ω, current signal: 250 Ω
X3.2/	
62 63	Resolution: 10 bit Linearity fault (ref. to current value): ±0.5 % Temperature error (0...+60 °C): 0.6 % Load capacity (0 ... +10 V): I_{max} = 2 mA Load resistance (0/4... 20 mA): ≤ 500 Ω
9	Load capacity: I_{max} = 5 mA
X3.3/	
A1 A2	Load capacity: • I_{max} = 10 mA, with internal supply • I_{max} = 50 mA, with external supply
A4	Load capacity: I_{max} = 8 mA f = 50 Hz ...10 kHz
20	Load capacity: Σ I_{max} = 60 mA
28 E1[1)] E2[1)] E3 E4 E5 E6	Input resistance: 3.2 kΩ 1 = HIGH (+12 ... +30 V), PLC level, HTL 0 = LOW (0 ... +3 V), PLC level, HTL

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

Wiring

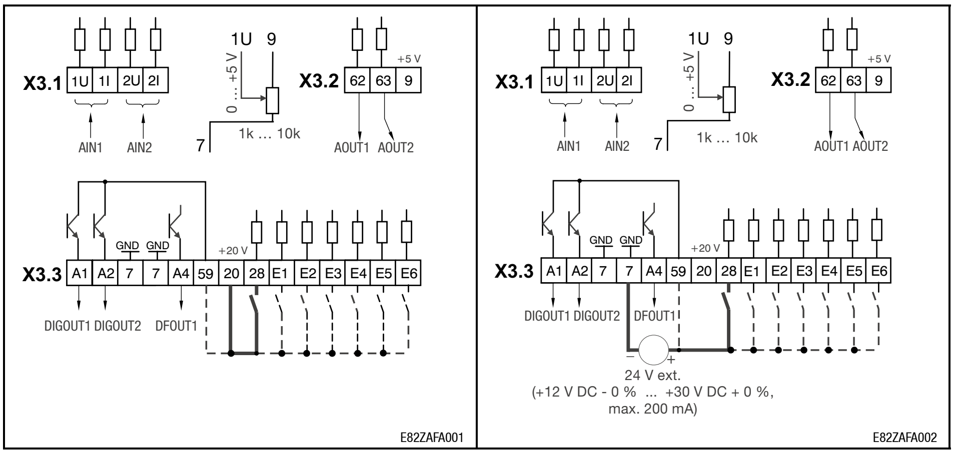


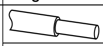
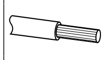
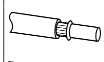
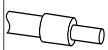
Fig. 7.4-6 Wiring at internal /external supply

internal	voltage source X3/20 (+20 V DC, max. 60 mA)
external	voltage source + 24 V DC (+12 V DC - 0 % ... +30 V DC + 0 %, max. 200 mA)
———	The min. wiring requirements for operation

7.4.5 Terminal assignment - Application I/O PT E82ZAFA...

- The device is wired using an attachable terminal block for larger cable cross-sections. The function module stands out approx. 13 mm because of the attachable terminal block.
- The application I/O PT is wired like the application I/O.
- Please note: The application I/O PT has got one terminal 7 (GND) only.

Data of the spring-clamp terminals

Electrical connection	Plug connector with spring connection	
Possible connections		rigid: 1.5 mm^2 (AWG 16)
	  	flexible: without wire crimp cap 1.5 mm^2 (AWG 16) with wire crimp cap,without plastic sleeve 1.5 mm^2 (AWG 16) with wire crimp cap, with plastic sleeve 0.5 mm^2 (AWG 20)
Bare end	9 mm	

7.4.6 Wiring of the terminals “controller inhibit (CINH)” when operating two function modules

Note!

- Both terminals X3/28 of the interface FIF I and FIF II are evaluated internally via an AND-operation.
- The following illustrations show possible methods of wiring. Considering the AND-operation of both terminals X3/28, wiring can be adapted to your application.

Internal supply voltage

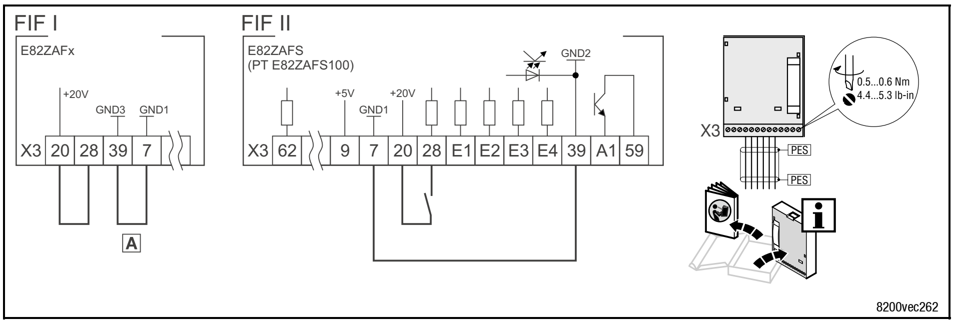


Fig. 7.4-7 Wiring of the controller inhibit with internal voltage supply

A For function modules with terminals X3/7 and X3/39: Fix a wire jumper between X3/7 and X3/39
PES HF shield termination through large-surface connection to PE
Wiring of the other terminals: 🕮 Mounting Instructions for the function modules

External supply voltage

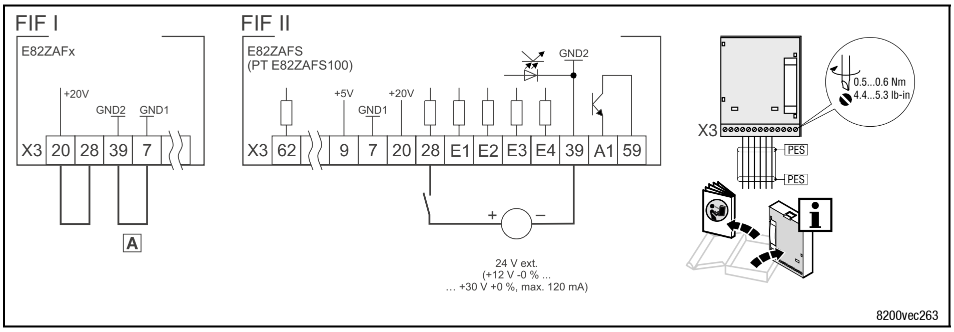


Fig. 7.4-8 Wiring of the controller inhibit with external voltage supply

A For function modules with terminals X3/7 and X3/39: Fix a wire jumper between X3/7 and X3/39
PES HF shield termination through large-surface connection to PE
Wiring of the other terminals: 🕮 Mounting Instructions for the function modules

7.4.7 Bus function modules

Note!
For information on wiring and using bus function modules please see the corresponding Mounting Instructions and Manuals.

Possible modules:

- INTERBUS
- PROFIBUS-DP
- LECOM-B
- System bus (CAN)
- System bus I/O-RS
- System bus I/O
- CANopen / DeviceNet (in preparation)
- AS-I

7.4.8 Communication modules

Note!
For information on wiring and using bus communication modules please see the corresponding Mounting Instructions and Manuals.

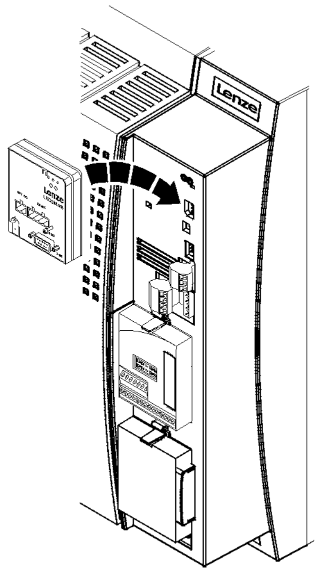


Fig. 7.4-9 Mounting/dismounting of the communication module

Attach/detach the communication module to/from the AIF interface.
This is also possible during operation.

Possible combinations		Function module on FIF II	Communication module on AIF				
Function module on FIF I		Standard I/O E82ZAFS PT E82ZAFS100	Keypad E82ZBC	LECOM-A/B (RS232/RS485) 2102.V001 LECOM-B (RS485) 2102.V002 LECOM-LI (LWL) 2102.V003	INTERBUS 2111	PROFIBUS-DP 2131	System bus (CAN) 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 possible, communication module can only be used for parameterising.
⊠ Combination not possible

7.4.9 Connection of relay output K_{SR} for "Safe standstill"

(only active with variant E82EVxxxK4Cx **4** x)

Controller variant x**4**x supports the safety function "Safe standstill", protection against unintended start, according to the requirements of EN 954-1 and EN 1037. Depending on the external circuitry it is possible to reach "Category 3" to EN 954-1.

For this purpose the controllers have an integrated safety relay with feedback contact. The safety relay switches off the voltage supply of the optocoupler for pulse transfer to the IGBT. It must be externally controlled with DC +24 V.

- Only skilled personnel is authorized to install and commission the function "Safe standstill".
- All safety-relevant external cables (e.g. control cable for the safety relay, feedback contact) must be protected, e. g. in the cable duct. Ensure that short-circuits and lateral connection cannot occur!
- If external forces act on the drive axes, additional brakes are necessary. Especially consider the force of gravity acting on suspended loads!
- After the initial commissioning the operator must check the function of the safety circuits. This must be repeated periodically.

Danger!

- The electrical reference point for the coil of the safety relay must be connected with the protective circuit (DIN EN 60204-1 Abs. 9.4.3)!
  - Only in this way the protection against faulty operation is guaranteed.
- Without additional measures the function "Safe standstill" does not provide an "Emergency-off":
  - There is neither an electrical isolation between motor and controller nor a "service switch" or a "repair switch"
  - An "Emergency-off" requires an electrical isolation, e.g. by means of a central mains contactor!

Wiring

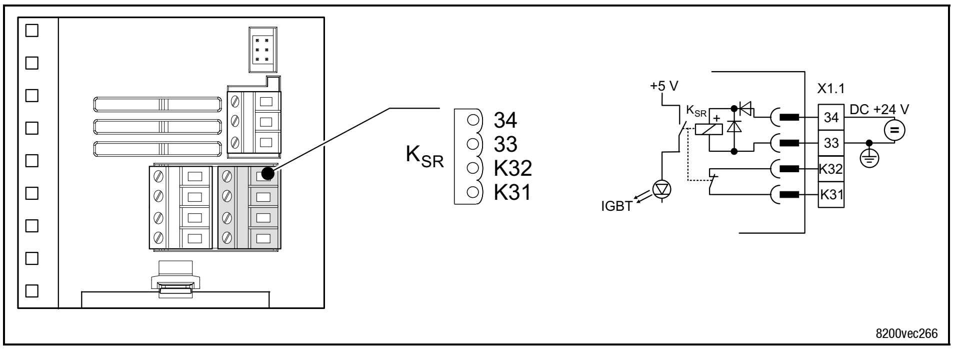


Fig. 7.4-10 Relay connection "Safe standstill" 15 ... 90 kW

	Function	Relay position set
X1.1/34 X1.1/33	Relay control	
X1.1/K32 X1.1/K31	Relay output - normally-open contact	open

Electrical data	
Coil voltage	DC +24 V (+19.5 ... 36.0 V)
Coil resistance at 20 °C	823 Ω ±10 %
Switching voltage	max. AC 250 V or DC 200 V
Permanent current at max. permissible ambient temperature	max. 1.5 A (AC 250 V) max. 1.5 A (DC 60 V) max. 0.5 A (DC 200 V)
Test voltage contact → coil Test voltage contact → contact	AC 1500 V_{eff} for 1 min AC 1500 V_{eff} for 1 min
Electrical endurance at rated load	~ 10^5 switching operations
Mechanical endurance	~ 10^7 switching operations
Max. permissible cable cross-section Screw-tightening torques	1.5 mm^2 0.5 ... 0.6 Nm (4.4 ... 5.3 lb-in)

8 Commissioning

8.1 Contents

8.2 Before switching on

Note!

- Do not change the switch-on sequence.
- In the event of an error during commissioning please see the chapter "Fault detection and elimination".

Check the following to avoid damage to persons or material...

...before the mains voltage is connected:

- Wiring for completeness, short circuit and earth fault
- "Emergency-off" function of system
- Motor connection (star/delta) must be adapted to output voltage of controller.
- If you do not use a function module ensure that the FIF cover is mounted properly (as delivered).
- If the internal voltage supply is connected, for instance, to X3/20 of the standard-I/O, terminals X3/7 and X3/39 must be bridged.

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

- Are the drive parameters relevant for your application set correctly?
  – e. g. configuration of analog and digital inputs and outputs

8.3 Selection of the control mode

The method of control of the controller can be selected via the operating mode. You can select between

- V/f characteristic control
- Vector control
- Sensorless torque control

Selection of the correct operating mode

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

The vector control provides better control features than the V/f characteristic control because of:

- a higher torque over the whole speed range
- higher speed accuracy and smooth running features
- higher efficiency

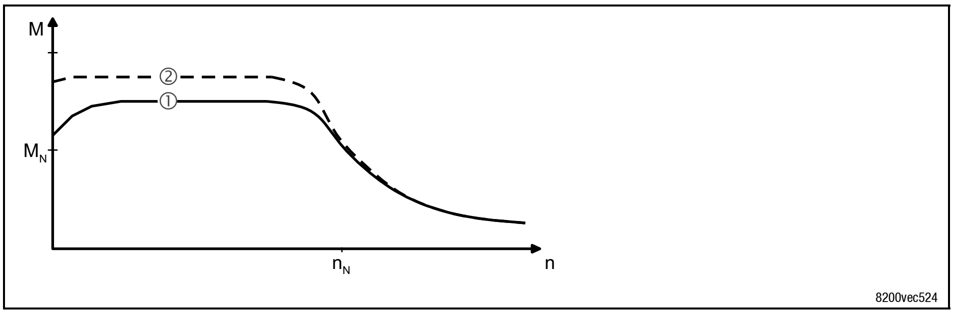


Fig. 8.3-1 Comparison of V/f characteristic control and vector control

① V/f characteristic control

② Vector control

Operating modes recommended for standard applications

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

Application	Operating mode	
	Setting in C0014	
Single drives	**recommended**	**alternatively**
with extremely alternating loads	4	2
with heavy start conditions	4	2
with speed control (speed feedback)	2	4
with high dynamic response (e. g. positioning and infeed drives)	2	-
with torque setpoint	5	-
with torque limitation (power control)	2	4
Three-phase AC reluctance motors	2	-
Three-phase sliding rotor motors	2	-
Three phase motors with assigned frequency-voltage characteristic	2	-
Pump and fan drives with square-law load characteristic	3	2 or 4
Group drives (several motors connected to controller)		
identical motors and identical loads	2	-
different motors and/or changing loads	2	-

C0014 = 2: linear V/f characteristic control

C0014 = 3: square-law V/F characteristic control

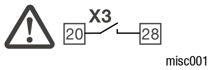
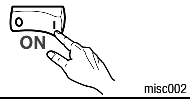
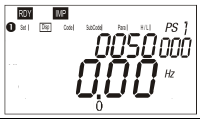
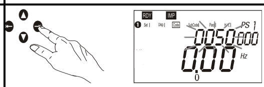
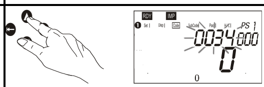
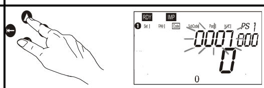
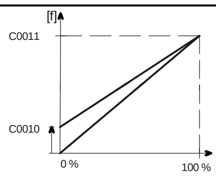
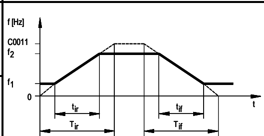
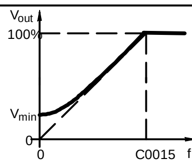
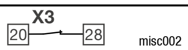
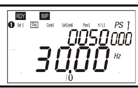
C0014 = 4: vector control

C0014 = 5: sensorless torque control

8.4 Parameter setting with the E82ZBC keypad

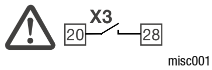
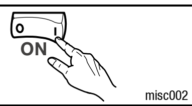
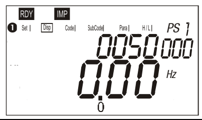
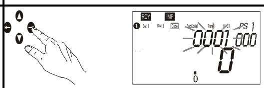
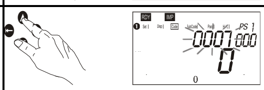
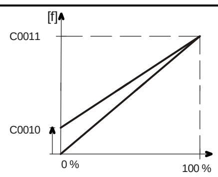
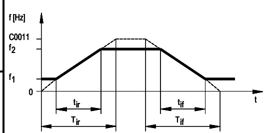
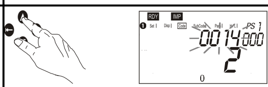
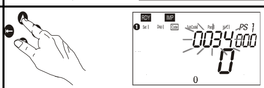
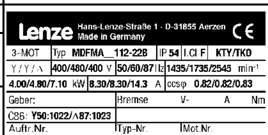
8.4.1 V/f characteristic control

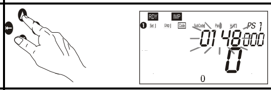
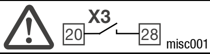
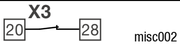
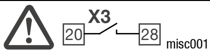
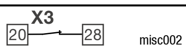
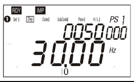
The following instructions apply to controllers equipped with a standard-I/O function module and a three-phase AC motor which has been selected accordingly.

Switch-on sequence			**Note**
1.	Attach the keypad		
2.	Ensure that controller inhibit is active after mains connection.		Terminal X3/28 = LOW
3.	Switch on the mains		
4.	The keypad is in “Disp” mode after approx. 2 s and indicates the output frequency (C0050)		The menu USEr is active
5.	Change to the Code mode to configure the basic settings for your drive		Blinking on the display: 0050
6.	Adapt the voltage range/current range to the analog setpoint (C0034) Lenze setting: -0-, (0 ... 5 V/0 ... 10 V/0 ... 20 mA)		Set the DIP switch on the standard I/O to the same range (see Mounting Instructions for the standard I/O)
7.	Adapt the terminal configuration to the wiring (C0007) Lenze setting: -0-, i. e. E1: JOG1/3 fixed setpoint selection E2: JOG2/3 E3: DCB DC brake E4: CW/CCW operation		
8.	Set the minimum output frequency (C0010) Lenze setting: 0.00 Hz		
9.	Set the maximum output frequency (C0011) Lenze setting: 50.00 Hz		
10.	Set the acceleration time T_{ir} (C0012) Lenze setting: 5.00 s		$T_{ir} = t_{ir} \cdot \frac{C0011}{f_2 - f_1}$ t_{ir} = acceleration time wanted
11.	Set the deceleration time T_{if} (C0013) Lenze setting: 5.00 s		$T_{if} = t_{if} \cdot \frac{C0011}{f_2 - f_1}$ t_{if} = deceleration time wanted
12.	Set the V/f-rated frequency (C0015) Lenze setting: 50.00 Hz		
13.	Set the V_{min} boost (C0016) Lenze settings: Depending on the controller type		The Lenze setting is suitable for all common applications
14.	If you want to change the settings, please go to the menu ALL .	activate e. g. JOG frequencies (C0037, C0038, C0039) or motor temperature monitoring (C0119)	
When you are ready with parameter setting:			
15.	Setpoint selection	e. g. via potentiometer at the terminals 7, 8, 9	
16.	Enable the controller.		Terminal X3/28 = HIGH
17.	The drive should be running now at e.g. 30 Hz		If the drive does not start, press RUN in addition.

8.4.2 Vector control

The following instructions apply to controllers equipped with a standard-I/O function module and a three-phase AC motor which has been selected accordingly.

Switch-on sequence			Comment
1.	Attach the keypad		
2.	Ensure that controller inhibit is active after mains connection.		Terminal X3/28 = LOW
3.	Switch on the mains		
4.	The keypad is in “Disp” mode after approx. 2 s and indicates the output frequency (C0050)		The menu USEr is active
5.	Change to the menu ALL		
6.	Change to the Code mode to configure the basic settings for your drive		Blinking on the display: 0001
7.	Adapt the terminal configuration to the wiring (C0007) Lenze setting: 0, i. e. E1: JOG1/3 fixed setpoint selection E2: JOG2/3 E3: DCB DC brake E4: CW/CCW operation		
8.	Set the minimum output frequency (C0010) Lenze setting: 0.00 Hz		
9.	Set the maximum output frequency (C0011) Lenze setting: 50.00 Hz		
10.	Set the acceleration time T_{ir} (C0012) Lenze setting: 5.00 s		$T_{ir} = t_{ir} \cdot \frac{C0011}{f_2 - f_1}$ t_{ir} = acceleration time wanted
11.	Set the deceleration time T_{if} (C0013) Lenze setting: 5.00 s		$T_{if} = t_{if} \cdot \frac{C0011}{f_2 - f_1}$ t_{if} = deceleration time wanted
12.	Activate the control mode ”vector control” (C0014 = 4) Lenze setting: Linear V/f characterisitic control (C0014 = 2)		
13.	Adapt the voltage/current range to the analog setpoint (C0034) Lenze setting: 0, (0 ... 5 V/0 ... 10 V/0 ... 20 mA)		Set the DIP switch on the standard-I/O to the same range (see Mounting Instructions for the standard-I/O)
14.	Enter the motor data		See motor nameplate
A)	Rated motor speed (C0087) Lenze setting: 1390 rpm		
B)	Rated motor current (C0088) Lenze setting: Depending on the controller		Enter the value for the motor connection type (star/delta) selected!
C)	Rated motor frequency (C0089) Lenze setting: 50 Hz		
D)	Rated motor voltage (C0090) Lenze setting: Depending on the controller		Enter the value for the motor connection type (star/delta) selected!
E)	Motor-cosφ (C0091) Lenze setting: Depending on the controller		

Switch-on sequence			Comment
15.	Start the motor parameter identification (C0148)		**Only when the motor is cold!**
A)	Ensure that the controller is inhibited		Terminal X3/28 = LOW
B)	Set C0148 = 1	Press ENTER in addition	
C)	Enable the controller.		• Terminal X3/28 = HIGH • The identification starts: – The segment IMP is off – The motor consumes current and makes a "high-pitched" tone. – The motor does not rotate!
D)	If the segment IMP becomes active after approx. 30 s, inhibit the controller once again		• Terminal X3/28 = LOW • Identification is completed. • Calculated and stored: – V/f rated frequency (C0015) – Slip compensation (C0021) – Motor stator inductance (C0092) • Measured and stored: – Motor stator resistance (C0084) = Total resistance of motor cable and motor
16.	If necessary, adjust more parameters	Activate e. g. JOG frequencies (JOG) (C0037, C0038, C0039 or motor parameter monitoring (C0119)	
After parameter setting:			
17.	Setpoint selection	E.g. via potentiometer at terminals 7, 8, 9	
18.	Enable the controller.		Terminal X3/28 = HIGH
19.	The drive should now be running at e.g. 30 Hz		If the drive does not start, press RUN in addition

Optimising the vector control

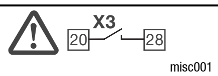
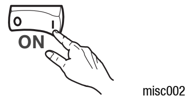
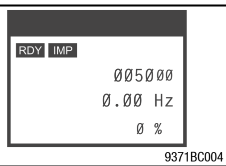
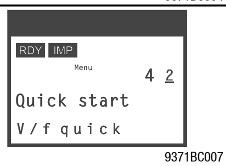
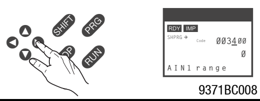
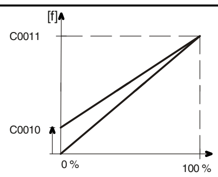
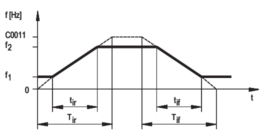
In general, the vector control is ready for operation after the motor parameters have been identified. Vector control must only be optimised for the following drive performance:

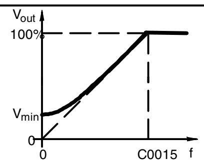
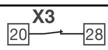
Drive performance	Remedy
Rough motor run and motor current (C0054) > 60 % rated motor current in idle running (stationary operation)	1. Reduction of motor inductance (C0092) by 10 % 2. Check of motor current under C0054 3. If the motor current (C0054) > 50 % of the rated motor current: – C0092 must be reduced until the motor current amounts to 50 % of the rated motor current – Reduce C0092 by max. 20 %! – Note: If you reduce C0092 the torque will decrease!
Torque too low for frequencies f < 5 Hz (starting torque)	Increase of motor resistance (C0084) or increase of motor inductance (C0092)
Poor constant speed at high loads (setpoint and motor speed are not proportional).	Increase of slip compensation (C0021) Overcompensation results in drive instability!
Error messages OC1, OC3, OC4 or OC5 during acceleration times (C0012) < 1 s (drive controller is no longer able to follow the dynamic processes)	Change readjustment time of the I_{max} controller (C0078): • Reduction of C0078 = I_{max} controller becomes quicker (more dynamic) • Increase of C0078 = I_{max} controller becomes slower ("smoother")

8.5 Parameter setting with the XT EMZ9371BC keypad

8.5.1 V/f characteristic control

The following instructions apply to controllers equipped with a standard-I/O function module and a three-phase AC motor which has been selected accordingly.

Switch-on sequence			Note
1.	Attach the keypad		
2.	Ensure that controller inhibit is active after mains connection.		Terminal X3/28 = LOW
3.	Switch on the mains		
4.	The keypad is in the operation level and indicates the output frequency (C0050) and device load (C0056)		
5.	For quick commissioning select the menu "Quick start"		The submenu "V/f quick" contains the codes you need for the commissioning of a standard application. The digital inputs are configurated in the Lenze setting: X3/E1, X3/E2: Activation of JOG setpoints X3/E3: Activation of DC-injection brake (DCB) X3/E4: CW rotation/CCW rotation
A)	Change to the menu level with PRG		
B)	Change to the menu "Quick start" and there select the submenu "V/f quick" with ▲ ▲ ▶ ▲		
C)	Change to the code level in order to parameterise you drive with ▶		
6.	Adapt the voltage range/current range to the analog setpoint (C0034) Lenze setting: 0, (0 ... 5 V/0 ... 10 V/0 ... 20 mA)		Set the DIP switch on the standard I/O to the same range (see Mounting Instructions for the standard I/O)
7.	If necessary, adapt the JOG setpoints.		
A)	JOG 1 (C0037) Lenze setting: 20 Hz		Activation: X3/E1 = HIGH, X3/E2 = LOW
B)	JOG 2 (C0038) Lenze setting: 30 Hz		Activation: X3/E1 = LOW, X3/E2 = HIGH
C)	JOG 3 (C0039) Lenze setting: 40 Hz		Activation: X3/E1 = HIGH, X3/E2 = HIGH
8.	Set the minimum output frequency (C0010) Lenze setting: 0.00 Hz		
9.	Set the maximum output frequency (C0011) Lenze setting: 50.00 Hz		
10.	Set the acceleration time T_{ir} (C0012) Lenze setting: 5.00 s		$T_{ir} = t_{ir} \cdot \frac{C0011}{f_2 - f_1}$ t_{ir} = acceleration time wanted
11.	Set the deceleration time T_{if} (C0013) Lenze setting: 5.00 s		$T_{if} = t_{if} \cdot \frac{C0011}{f_2 - f_1}$ t_{if} = deceleration time wanted

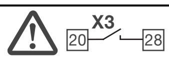
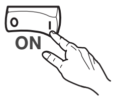
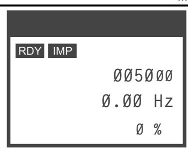
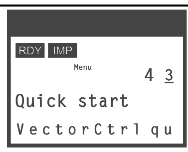
Switch-on sequence			Note
12.	Set the V/f-rated frequency (C0015) Lenze setting: 50.00 Hz		
13.	Set the V_{min} boost (C0016) Lenze setting: dependent on the controller type		The Lenze setting is suitable for all common applications
14.	Activate the motor temperature monitoring (C0119) if a PTC or thermal contact is connected to the terminal X2.2. Lenze setting: switched-off		Setting possibilities: (📖 8.6-5)
15.	Setpoint selection	e. g. via potentiometer at the terminals 7, 8, 9	
16.	Enable the controller.	 misc002	Terminal X3/28 = HIGH
17.	The drive should be running now		CW rotation: X3/E4 = LOW CCW rotation: X3/E4 = HIGH If the drive does not start, press RUN

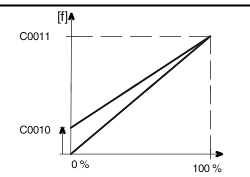
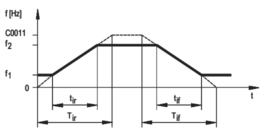
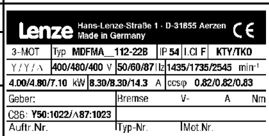
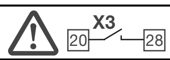
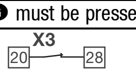
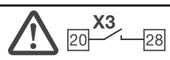
Note!

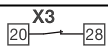
In the menu "Diagnostic" the most important drive parameters can be monitored

8.5.2 Vector control

The following instructions apply to controllers equipped with a standard-I/O function module and a three-phase AC motor which has been selected accordingly.

Switch-on sequence			Note
1.	Attach the keypad		
2.	Ensure that controller inhibit is active after mains connection.	 misc001	Terminal X3/28 = LOW
3.	Switch on the mains	 misc002	
4.	The keypad is in the operation level after approx. 3 sec and indicates the output frequency (C0050) and device load (C0056)	 9371BC004	
5.	For quick commissioning select the menu "Quick start"	 9371BC006	The submenu "VectorCtrl qu" contains the codes you need for the commissioning of a standard application. The digital inputs are configurated in the Lenze setting: X3/E1, X3/E2: Activation of JOG setpoints X3/E3: Activation of DC-injection brake (DCB) X3/E4: CW rotation/CCW rotation
A)	Change to the menu level with PRG		
B)	Change to the menu "Quick start" and there select the submenu "VectorCtrl qu" with ▲ ▲ ▶ ▲ ▲		
C)	Change to the code level in order to parameterise you drive with ▶	 9371BC008	
6.	Adapt the voltage range/current range to the analog setpoint (C0034) Lenze setting: 0, (0 ... 5 V/0 ... 10 V/0 ... 20 mA)		Set the DIP switch on the standard I/O to the same range (see Mounting Instructions for the standard I/O)

Switch-on sequence			Note
7.	If necessary, adapt the JOG setpoints.		
A)	JOG 1 (C0037) Lenze setting: 20 Hz		Activation: X3/E1 = HIGH, X3/E2 = LOW
B)	JOG 2 (C0038) Lenze setting: 30 Hz		Activation: X3/E1 = LOW, X3/E2 = HIGH
C)	JOG 3 (C0039) Lenze setting: 40 Hz		Activation: X3/E1 = HIGH, X3/E2 = HIGH
8.	Set the minimum output frequency (C0010) Lenze setting: 0.00 Hz		
9.	Set the maximum output frequency (C0011) Lenze setting: 50.00 Hz		
10.	Set the acceleration time T_{ir} (C0012) Lenze setting: 5.00 s		$T_{ir} = t_{ir} \cdot \frac{C0011}{f_2 - f_1}$ t_{ir} = acceleration time wanted
11.	Set the deceleration time T_{if} (C0013) Lenze setting: 5.00 s		$T_{if} = t_{if} \cdot \frac{C0011}{f_2 - f_1}$ t_{if} = deceleration time wanted
12.	Set the control mode "Vector control" (C0014 = 4) Lenze setting: Linear V/f characteristic control (C0014 = 2)	 9371BC008	
13.	Enter the motor data		See motor nameplate
A)	Rated motor speed (C0087) Lenze setting: 1390 rpm		
B)	Rated motor current (C0088) Lenze setting: Depending on the controller		Enter the value for the motor connection type (star/delta) selected!
C)	Rated motor frequency (C0089) Lenze setting: 50 Hz		
D)	Rated motor voltage (C0090) Lenze setting: Depending on the controller		Enter the value for the motor connection type (star/delta) selected!
E)	Motor-cosφ (C0091) Lenze setting: Depending on the controller		
14.	Start the motor parameter identification (C0148)		**Only when the motor is cold!**
A)	Ensure that the controller is inhibited	 misc001	Terminal X3/28 = LOW
B)	Set C0148 = 1	SHIFT PRG must be pressed	
C)	Enable the controller.	 misc002	• Terminal X3/28 = HIGH • The identification starts: – The segment IMP goes out – The motor consumes current and makes a "high-pitched" tone. – The motor does not rotate!
D)	If the segment IMP becomes active after approx. 30 s, inhibit the controller once again.	 misc001	• Terminal X3/28 = LOW • Identification is completed. • Calculated and stored: – V/f rated frequency (C0015) – Slip compensation (C0021) – Motor stator inductance (C0092) • Measured and stored: – Motor stator resistance (C0084) = Total resistance of motor cable and motor

Switch-on sequence			Note
15.	Activate the motor temperature monitoring (C0119), if a PTC or thermal contact is connected to the terminal X2.2 Lenze setting: switched-off		Setting possibilities: (8.6-5)
16.	Setpoint selection	e. g. via potentiometer at the terminals 7, 8, 9	
17.	Enable the controller.	 misc002	Terminal X3/28 = HIGH
18.	The drive should be running now		CW rotation: X3/E4 = LOW CCW rotation: X3/E4 = HIGH If the drive does not start, press RUN

Note!

In the menu "Diagnostic" the most important drive parameters can be monitored

Optimising the vector control

In general, the vector control is ready for operation after the motor parameters have been identified. Vector control must only be optimised for the following drive performance:

Drive performance	Remedy
Rough motor run and motor current (C0054) > 60 % rated motor current in idle running (stationary operation)	1. Reduction of motor inductance (C0092) by 10 % 2. Check of motor current under C0054 3. If the motor current (C0054) > 50 % of the rated motor current: – C0092 must be reduced until the motor current amounts to 50 % of the rated motor current – Reduce C0092 by max. 20 %! – Note: If you reduce C0092 the torque will decrease!
Torque too low for frequencies f < 5 Hz (starting torque)	Increase of motor resistance (C0084) or increase of motor inductance (C0092)
Poor constant speed at high loads (setpoint and motor speed are not proportional).	Increase of slip compensation (C0021) Overcompensation results in drive instability!
Error messages OC1, OC3, OC4 or OC5 during acceleration times (C0012) < 1 s (drive controller is no longer able to follow the dynamic processes)	Change readjustment time of the I_{max} controller (C0078): • Reduction of C0078 = I_{max} controller becomes quicker (more dynamic) • Increase of C0078 = I_{max} controller becomes slower ("smoother")

8.6 Important codes for quick commissioning

Note!

- The following table describes the codes mentioned in the examples for commissioning!
- All codes are described in detail in the function library.

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. • Parameter value accepted immediately (ONLINE)
		1	Subcode 1 of Cxxxx	
		2	Subcode 2 of Cxxxx	
	*		Parameter value of the code is the same in all parameter sets	
	ENTER		Keypad E82ZBC	Changed parameters will be accepted after pressing ENTER
			Keypad XT EMZ9371BC	Changed parameters will be accepted after pressing SHIFT PRG
	STOP		Keypad E82ZBC	Changed parameters will be accepted after pressing ENTER if the controller is inhibited
			Keypad XT EMZ9371BC	Changed parameters will be accepted after pressing SHIFT PRG if the controller is inhibited
	(A)		Code, subcode or selection are only available when using an Application-I/O	
	uSEr		With Lenze setting the code is available in the USER-menu	
Name			Name of the code	
Lenze			Lenze setting (default setting/value set under C0002)	
	→		Further information can be obtained from "IMPORTANT"	
Selection	1 {%} 99		Min. value {unit} Max. value	
IMPORTANT	-		Brief, important explanations	

Code		Possible settings			IMPORTANT	
No.	**Name**	**Lenze**	**Selection**			
C0002* STOP uSEr	Parameter set management	0	0	Ready	**PAR1 ... PAR4:** • Parameter sets of the controller • PAR1 ... PAR4 also contain parameters for Standard-I/O, Application-I/O, AS interface or system bus (CAN) **FPAR1:** • Module-specific parameter set of the fieldbus function modules INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen • FPAR1 is saved in the function module	10.17-1
	Restorage of default setting		1	Lenze setting ⇨ PAR1	Restorage of factory setting in the selected parameter set	
			2	Lenze setting ⇨ PAR2		
			3	Lenze setting ⇨ PAR3		
			4	Lenze setting ⇨ PAR4		
			31	Lenze setting ⇨ FPAR1	Restorage of default setting in the fieldbus function module	
			61	Lenze setting ⇨ PAR1 + FPAR1	Restorage of default setting in the selected parameter set of the controller and the fieldbus function module	
			62	Lenze setting ⇨ PAR2 + FPAR1		
			63	Lenze setting ⇨ PAR3 + FPAR1		
			64	Lenze setting ⇨ PAR4 + FPAR1		

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0002* STOP uSEr (cont.)	Parameter set transfer using the keypad				Use the keypad to transfer parameter sets to other controllers. **During transfer the parameters cannot be accessed via other channels!**
				Keypad ⇨ Controller	All available parameter sets (PAR1 ... PAR4, and FPAR1) are overwritten with the corresponding keypad data
			70	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
			10	With all other function modules	
C0002* STOP uSEr (cont.)	Parameter set transfer using the keypad			Keypad ⇨ PAR1 (+ FPAR1)	Overwrite selected parameter set and, if necessary, FPAR1 with the corresponding keypad data
			71	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
			11	With all other function modules	
				Keypad ⇨ PAR2 (+ FPAR1)	
			72	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
			12	With all other function modules	
				Keypad ⇨ PAR3 (+ FPAR1)	
			73	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
			13	With all other function modules	
				Keypad ⇨ PAR4 (+ FPAR1)	
			74	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
			14	With all other function modules	
				Controller ⇨ Keypad	All available parameter sets (PAR1 ... PAR4, and FPAR1) are copied to the keypad
			80	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
			20	With all other function modules	
				Keypad ⇨ Function module	Overwrite the module-specific parameter set FPAR1 only
			40	Only with function module INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
				Function module ⇨ Keypad	Copy the module-specific parameter set FPAR1 only
			50	Only with function module INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
C0002* STOP uSEr (cont.)	Saving of own settings		9	PAR1 ⇨ Own settings	You can save your own basic settings for a controller (e.g. machine delivery status): 1. Ensure that parameter set 1 is active 2. Controller inhibit 3. Set C0003 = 3, acknowledge with ENTER 4. Set C0002 = 9, acknowledge with ENTER, to save your own basic settings 5. Set C0003 = 1, acknowledge with ENTER 6. Enable the controller.
C0002* STOP uSEr (cont.)	Loading/copying of your own basic settings				Using this function, PAR1 can be copied to parameter sets PAR2 ... PAR4
			5	Own settings ⇨ PAR1	Restorage of own basic setting in the selected parameter set
			6	Own settings ⇨ PAR2	
			7	Own settings ⇨ PAR3	
			8	Own settings ⇨ PAR4	
C0003* ENTER	Non-volatile parameter saving	1	0	Parameter not saved in EEPROM	Data loss after mains disconnection
			1	Parameter always saved in EEPROM	• Active after every mains connection • Cyclic parameter changes via bus module are not allowed.
			3	Own settings saved in EEPROM	The parameter set 1 saved as own basic setting with C0002 = 9

Important codes for quick commissioning

Code		Possible settings						IMPORTANT	
No.	**Name**	**Lenze**	**Selection**						
C0007 ENTER uSEr	Fixed configuration of digital inputs							**Change under C0007 will be copied to the corresponding subcode of C0410. Free configuration under C0410 sets C0007 = 255!**	10.13-1
		0		E4	E3	E2	E1	• CW/CCW = CW rotation/CCW rotation	
			0	CW/CCW	DCB	JOG2/3	JOG1/3	• DCB = DC-injection brake	
			1	CW/CCW	PAR	JOG2/3	JOG1/3	• QSP = Quick stop	
			2	CW/CCW	QSP	JOG2/3	JOG1/3	• PAR = Parameter set changeover (PAR1 ⇔ PAR2)	
			3	CW/CCW	PAR	DCB	JOG1/3	– PAR1 = LOW, PAR2 = HIGH	
			4	CW/CCW	QSP	PAR	JOG1/3	– The terminal must be assigned to the function "PAR" in PAR1 and PAR2.	
			5	CW/CCW	DCB	TRIP set	JOG1/3		
			j6	CW/CCW	PAR	TRIP set	JOG1/3	– Configurations with "PAR" are only allowed if C0988 = 0	
			7	CW/CCW	PAR	DCB	TRIP set	• TRIP set = external fault	
			8	CW/CCW	QSP	PAR	TRIP set		
			9	CW/CCW	QSP	TRIP set	JOG1/3		
			10	CW/CCW	TRIP set	UP	DOWN		
C0007 ENTER uSEr (cont.)				E4	E3	E2	E1	• Selection of fixed setpoints	
			11	CW/CCW	DCB	UP	DOWN	JOG1/3 JOG2/3 — active C0046	
			12	CW/CCW	PAR	UP	DOWN	LOW LOW — JOG1	
			13	CW/CCW	QSP	UP	DOWN	HIGH LOW — JOG2	
			14	CCW/QSP	CW/QSP	DCB	JOG1/3	LOW HIGH — JOG3	
			15	CCW/QSP	CW/QSP	PAR	JOG1/3	HIGH HIGH	
			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		
C0007 ENTER uSEr (cont.)				E4	E3	E2	E1	• UP/DOWN = Motor potentiometer functions	
			20	CCW/QSP	CW/QSP	TRIP set	JOG1/3	• H/Re = Hand/remote changeover	
			21	CCW/QSP	CW/QSP	UP	DOWN	• PCTRL1-I-OFF = Switch-off process controller I component	
			22	CCW/QSP	CW/QSP	UP	JOG1/3		
			23	M/Re	CW/CCW	UP	DOWN	• DFIN1-ON = Digital frequency input 0 ... 10 kHz	
			24	M/Re	PAR	UP	DOWN	• PCTRL1-OFF = Switch off 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		
C0007 ENTER uSEr (cont.)				E4	E3	E2	E1		
			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		

Code		Possible settings						IMPORTANT	
No.	**Name**	**Lenze**	**Selection**						
C0007 ENTER uSEr (cont.)				E4	E3	E2	E1		
			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	Free configuration under C0410				Only display Do not change C0007 since settings under C0410 can be lost	
C0010 uSEr	Minimum output frequency	0.00	0.00 → **14.5 Hz**		{0.02 Hz}		650.00	• C0010 is not effective with bipolar setpoint selection (-10 V ... + 10 V) • C0010 only defines the analog input 1 → **Speed setting range 1 : 6 for Lenze geared motors:** Setting absolutely required for operation with Lenze geared motors.	🕮 10.6-1
C0011 uSEr	Maximum output frequency	50.00	7.50 → **87 Hz**		{0.02 Hz}		650.00		
C0012 uSEr	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	🕮 10.7-1
C0013 uSEr	Deceleration time main setpoint	5.00	0.00		{0.02 s}		1300.00	Reference: frequency change C0011 ... 0 Hz • Additional setpoint ⇨ C0221 • Deceleration times to be activated via digital signals ⇨ C0103	🕮 10.7-1
C0014 ENTER	Operating mode	2	2	V/f characteristic control V ~ f (Linear characteristic with constant V_{min} boost)				• Commissioning without motor parameter identification possible • Benefit of identification with C0148: – Improved smooth running at low speed – V/f rated frequency (C0015) and slip (C0021) are calculated and stored. They do not have to be entered	🕮 10.3-1
			3	V/f characteristic control V ~ f^2 (Square-law characteristic with constant V_{min} boost)					
			4	Vector control				**For initial selection enter the motor data and identify the motor parameters with C0148** **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 uSEr	V/f rated frequency	50.00	7.50		{0.02 Hz}		960.00	• C0015 is calculated and stored under C0148 when the motor parameters are identified • Settings applies to all possible mains voltages	🕮 8.4-1 🕮 8.4-3
C0016 uSEr	V_{min} boost	→	0.00		{0.01 %}		40.00	→ Depending on the controller Setting applies to all mains voltages permitted	🕮 8.4-1

Code No.	Code Name	Possible settings: Lenze	Possible settings: Selection				IMPORTANT	
C0034* ENTER uSEr	Setpoint selection range Standard–I/O (X3/8)						Observe the switch position of the function module!	📖 10.8-3
		0	0	Unipolar voltage 0 ... 5 V / 0 ... 10 V Current 0 ... 20 mA				
			1	Current 4 ... 20 mA			Changing the direction of rotation is only possible with a digital signal.	
			2	Bipolar voltage -10 V ... +10 V			• Minimum output frequency (C0010) not effective • Individual adjustment of offset and gain	
			3	Current 4 ... 20 mA open-circuit monitored			TRIP Sd5, if I < 4 mA Changing the direction of rotation is only possible with a digital signal.	
C0034* ENTER (A) uSEr	Setpoint selection range Application I/O						Observe the jumper setting of the function module!	📖 10.8-3
1	X3/1U, X3/1I	0	0	Unipolar voltage 0 ... 5 V / 0 ... 10 V				
2	X3/2U, X3/2I		1	Bipolar voltage -10 V ... +10 V			Minimum output frequency (C0010) not effective	
			2	Current 0 ... 20 mA				
			3	Current 4 ... 20 mA			Changing the direction of rotation is only possible with a digital signal.	
			4	Current 4 ... 20 mA open-circuit monitored			Changing the direction of rotation is only possible with a digital signal. TRIP Sd5 if I < 4 mA	
C0037	JOG1	20.00	-650.00	{0.02 Hz}		650.00	JOG = Setpoint Additional JOG frequencies ⇨ C0440	📖 10.8-13
C0038	JOG2	30.00	-650.00	{0.02 Hz}		650.00		
C0039	JOG3	40.00	-650.00	{0.02 Hz}		650.00		
C0050* uSEr	Output frequency (MCTRL1-NOUT)		-650.00	{Hz}		650.00	Only display: Output frequency without slip compensation	
C0087	Rated motor speed	→	300	{1 rpm}		16000	→ Depending on the controller	📖 10.9-1
C0088	Rated motor current	→	0.0	{0.1 A}		650.0	→ Depending on the controller 0.0 ... 2.0 x rated output current of the controller	📖 10.9-1
C0089	Rated motor frequency	50	10	{1 Hz}		960		📖 10.9-1
C0090	Rated motor voltage	→	50	{1 V}		500	→ 230 V with 230 V controllers, 400 V with 400 V controllers	📖 10.9-1
C0091	Motor cos φ	→	0.40	{0.1}		1.0	→ Depending on the controller	📖 10.9-1
C0119 ENTER	Configuration of motor temperature monitoring (PTC input) / earth fault detection	0	0	PTC input not active	Earth fault detection active		• Signal output configuration under C0415 • If several parameter sets are used, the monitoring must be separately adjusted for each parameter set. • Deactivate the earth fault detection, if it has been activated unintentionally. • If the earth fault detection is active, the motor starts after controller enable with a delay of approx.40 ms.	📖 10.14-3
			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				
C0140*	Additive frequency setpoint (NSET1-NADD)	0.00	-650.00	{0.02 Hz}		650.00	• Selection via function Set of the keypad or the parameter channel • Is added to main setpoint • Value is stored when switching the mains or removing the keypad	📖 10.8-15

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0148* STOP	Motor parameter identification	0	0	Ready	**Only when the motor is cold!** 1. Inhibit controller, wait until drive is in standstill 2. Enter the correct motor data under C0087, C0088, C0089, C0090, C0091 (see motor nameplate). 3. C0148 = set 1 by ENTER 4. Enable controller The identification – starts, IMP gets out – the motor makes a high-pitched tone, but does not rotate! – takes approx. 30 s – is completed when IMP is on again 5. Controller inhibit	10.9-1
			1	Start identification • V/f-rated frequency (C0015), slip compensation (C0021) and motor stator inductivity (C0092) are calculated and saved. • The motor stator resistance (C0084) = total resistance of motor cable and motor is measured and saved		
C0517* ENTER	User menu				• After mains switching or when using the function Disp the code from C0517/1 will be displayed. • In Lenze setting, the user menu contains the most important codes for setting up 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. **Codes, which are only active when being used together with an Application-I/O, cannot be entered!**	10.18-1
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	U_{min} boost		
10	Memory 10	2	C0002	Parameter set transfer		

9 Parameter setting

9.1 Contents

9.2 Important notes

Adapting the functions of the controller to the application

The controller functions can be adapted to your application by setting parameters. The parameters are set using a keypad or PC or via the parameter channel of a bus system.

The function library describes in detail the functions and the functional block diagram contains all the signals to be configured.

Parameters and codes

The function parameters are stored as numerical codes:

- Codes are marked in the text with a "C" (e.g. C0002).
- The code table gives a quick overview over all codes. The codes are sorted according to their numbers and can be used as reference. (📖 10.20-1)

Parameter setting via keypad

For quick parameter setting two operating modules (keypad) are available in different designs. Both serve simultaneously as status display, fault diagnostics and parameter transfer to other controllers:

	Keypad E82ZBC	**Keypad XT EMZ9371BC**
Can be used with	8200 vector, 8200 motec, starttec	8200 vector, 8200 motec, starttec, Drive PLC, 9300 vector, 9300 servo
Operator buttons	8	8
Text display	yes	yes
Plain text display	no	yes
Menu structure	User menu, code list	User-specific menus
Configurable menu ("user menu")	yes	yes
Menu for quick commissioning ("Quickstart")	no	yes
Predefined basic configurations	no	yes
Non-volatile memory for parameter transfer	yes	yes
Password protection	yes	yes
Hand terminal	yes	yes
Installation into control cabinet	yes	no
Enclosure	IP 55	IP 20
Detailed description	📖 9.3-1	📖 9.4-1

Parameter setting via PC

The communication module LECOM-A/B (RS232/RS485) EMF2102IB-V001 and the PC program Global Drive Control (GDC) or the program GDC easy are required as serial interface.

The PC programs of the Global Drive Control family are easy-to-understand and clearly arranged tools for operation, parameter setting and diagnostics of Lenze controllers.

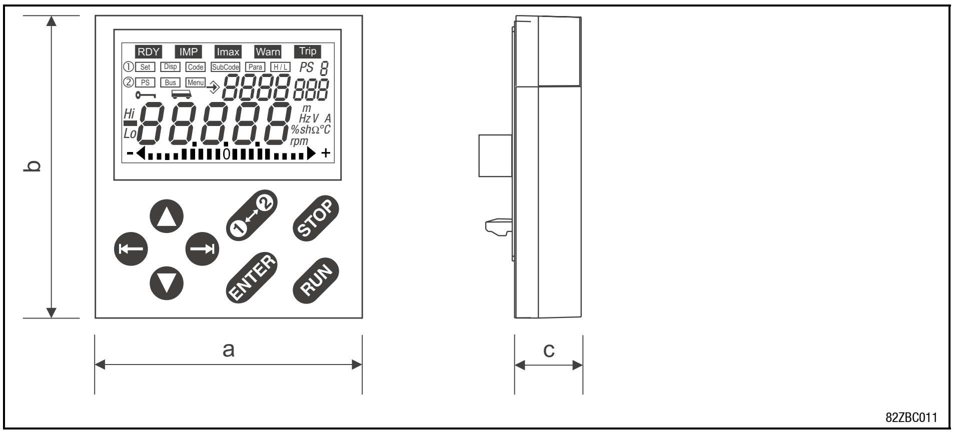
		GDC easy ESP-GDC2-E	GDC ESP-GDC2
Delivery		CD free of charge or download from the internet under www.lenze.com	Program package must be charged for
Operation in interactive mode		yes	yes
Extensive help functions		yes	yes
Menu ”Quick commissioning” for:			
	8200	yes	yes
	8200 vector/motec	yes	yes
	9300 vector	no	yes
	9300 Servo	no	yes
Monitor window for displaying operating parameters and diagnostics		yes	yes
Saving and printing parameter settings as code list		yes	yes
Loading of parameter files from the controller into the PC		yes	yes
Saving parameter files from the PC into controller		yes	yes
Function block editor		no	yes
Technology functions for 9300 Servo		no	yes
Oscilloscope function for 9300 Servo and 9300 vector		no	yes
Detailed description		Online help of the program	Online help of the program

Parameter setting via bus system

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

9.3 Parameter setting with the E82ZBC keypad

9.3.1 General data and application conditions



Dimensions	a b c	60 mm 74 mm 17 mm
Enclosure	IP20 (E82ZBC) IP55 with diagnosis terminal (E82ZBB)	
Ambient temperature	During operation: Transportation: during storage	- 10°C ... +60 °C -25 °C ... +70 °C -25 °C ... +60 °C
Climatic conditions	Class 3K3 to EN 50178 (without condensation, average relative humidity 85 %)	

9.3.2 Installation and commissioning

Note!

The keypad is rear-mounted to the terminal with a screw (remove rubber protection).

The keypad can be mounted into a control cabinet door using the "Mounting kit for control cabinets" E82ZBHT (board cutout 45.3 mm x 45.3 mm).

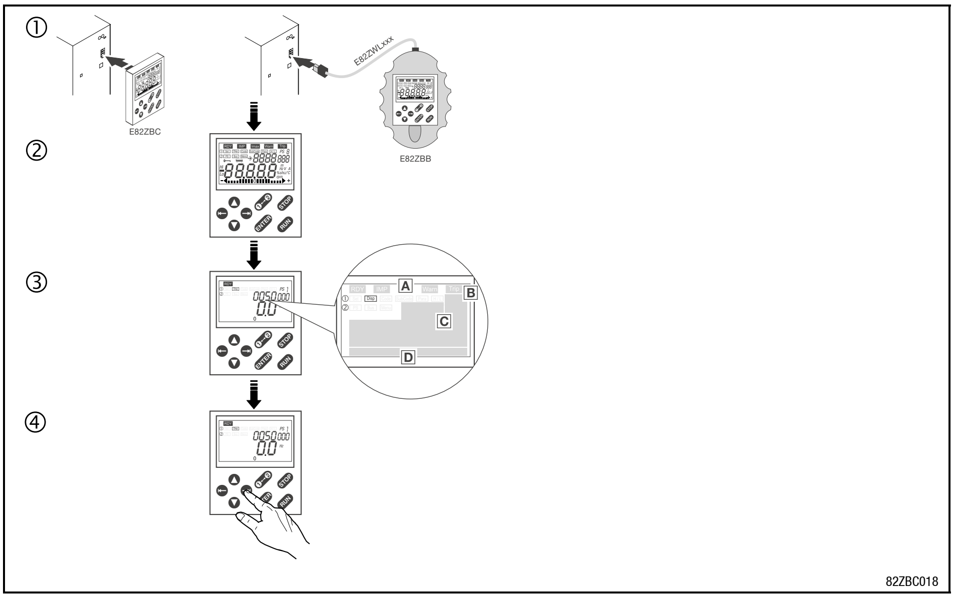


Fig. 9.3-1 Installation and commissioning of the E82ZBC keypad or E82ZBB diagnosis terminal

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

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

③ The keypad is ready for operation, if it displays the "Disp" mode:

A Current state of the controller

B Parameter set activated via terminal

C Memory location 1 of the user menu (C0517):
Code number, subcode number, and current value

D Current value in % of the status display defined in C0004

④ Press ➡ to leave the "Disp" mode

9.3.3 Display elements and function keys

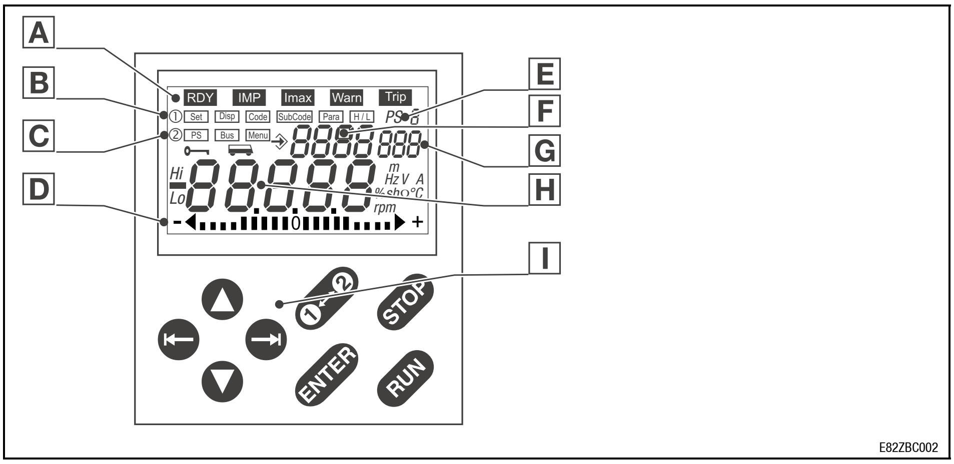


Fig. 9.3-2 Display elements and function keys of the E82ZBC keypad

A	**Status displays**		
		Meaning	**Explanation**
	RDY	Ready for operation	
	IMP	Pulse inhibit active	Power outputs inhibited
	Imax	Adjusted current limitation is exceeded in motor-mode or generator-mode	C0022 (motor mode) or C0023 (generator mode)
	Warn	Warning active	
	Trip	Active fault	
B	**Function bar 1**		
		Meaning	**Explanation**
	Set	Setpoint selection via ▼▲	Not possible when password protection is active (display = "LOC")
	Disp	Display function: • User menu, memory location 1 (C0517/1), display • Display active parameter set	Active after every mains connection
	Code	Code selection	Four-digit display of the active code number F
	SubCode	Select subcodes	Three-digit display of the active subcode number G
	Para	Change the parameter value of a (sub) code	Five-digit display of the current value H
	H/L	Display of values longer than 5 digits	
		H: high-order positions	Display "HI"
		L: low-order positions	Display "LO"
C	**Function bar 2**		
		Meaning	**Explanation**
	PS	Select parameter set 1 ... 4 for changing	• Display, e.g. PS 2 (E) • The parameter sets can only be activated via digital signals (configuration with C0410)
	Bus	Selection of system bus (CAN) devices	The selected device can be parameterised by the current drive = function active
	Menu	Select menu **The user menu is active after mains switching**	uSEr List of codes in the user menu (C0517)
			ALL List of all codes
			FunCI Only specific codes for bus function modules, e.g. INTERBUS, PROFIBUS-DP, LECOM-B, ...
D	**Bargraph display**		
		Value set under C0004 in % (Lenze setting: Controller load C0056)	Display range: - 180 % ... + 180 % (every bar = 20 %)

E	**Display of parameter set**		
		In the mode Disp: Display of the parameter set activated via digital signal	
		Otherwise: Display of the parameter set active for changing	Select the single parameter sets in the mode PS in the function bar 2
F	**Display of code number**		
G	**Display of subcode number**		
H	**Display of parameter set or fault message**		
I	**Function keys**		
		Function	**Explanation**
	RUN	Enable controller	For operation with function module, the terminal X3/28 must also be assigned to HIGH level
	STOP	Inhibit controller (CINH) or quick stop (QSP)	Configuration in C0469
	1↔2	Change to function bar 1 ↔ Function bar 2	
	→←	To right/left in active function bar	The active function is framed
	▲▼	Increase/decrease value Quick change: Keep key pressed.	Only blinking values can be changed
	ENTER	Parameters can be stored if ⇛ blinking Acknowledgement by STOrE in the display	

9.3.4 Changing and saving parameters

Note!

- The user menu uSEr is active after mains switching. Change to the menu ALL to address all codes.
- In the different parameter sets only parameter values can be changed with the keypad.
- Digital signals must be used to activate a parameter set for operation (configuration with C0410)!
- In the function Disp the display shows the parameter set which is just active during operation.

Step		Keys	Result	Action
1.	Connect keypad		Disp XX.XX Hz	Function Disp is activated. The first code in the user menu will be displayed (C0517/1, Lenze setting: C0050 = output frequency).
2.	If necessary 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	Confirm selection and change to function bar 1
6.	Select parameter set for change	❶↔❷	❷	Change to function bar 2
7.		◀▶	PS	
8.		▼▲	1 ... 4	Select parameter set to be changed
9.		❶↔❷	❶	Confirm selection and change to function bar 1
10.	Inhibit controller	STOP	RDY IMP	Only necessary if you want to change C0002, C0148, C0174 and/or C0469
11.	Set parameters	◀▶	Code	
12.		▼▲	XXXX	Select code
13.		▶	SubCode 001	For codes without subcodes: Jump automatically to Para
14.		▼▲	XXX	Select subcode
15.		▶	Para	
16.		▼▲	XXXXX	Set parameters
17.		ENTER	STOrE	Confirm entry if ➾ is blinking
		◀		Confirm entry if ➾ is not blinking; ENTER is not active
18.				Restart the "loop" at 11. or 6. to set other parameters.

9.3.5 Transfer parameters to other controllers

The keypad enables you to easily copy parameter settings from one controller to another.

Copying parameter sets from the controller to the keypad

Step		Keys	Result	Action
1.	Connect the keypad to controller 1		Disp XX.XX Hz	Function Disp is activated. The first code in the user menu will be displayed (C0517/1, Lenze setting: C0050 = output frequency).
2.	Inhibit controller	STOP	RDY IMP	The drive is idling
3.	Select C0002 in the user menu	⇒	Code	
4.		▲	0002	Select C0002
5.		⇒	Para	
6.	Select the correct copy function			The settings stored in the keypad are overwritten.
	• Copying all parameter sets available (PAR1 ... PAR4, ggf. FPAR1) to the keypad:			
	– Controller with function module application I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	▲	80	Copy PAR1 ... PAR4 und FPAR1: ⇨ Set ”80”
	– Controller with all other function modules	▲	20	Copy PAR1 ... PAR4: ⇨ Set ”20”
	• Copying only the module-specific parameter set FPAR1 to the keypad:			
	– Only possible for controllers with function module INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen:	▲	50	Copy FPAR1: ⇨ Set ”50”
7.	Start copying	ENTER	STOrE SAVE	The selected parameter sets are copied to the keypad. If SAVE stops, the copy process is completed.
8.	Enable the controller.	RUN		The drive should be running again

Copying parameter sets from the keypad to the controller

Step		Keys	Result	Action
1.	Connect keypad to controller 2		Disp XX.XX Hz	Function Disp is activated. The first code in the user menu will be displayed (C0517/1, Lenze setting: C0050 = output frequency).
2.	Inhibit controller	STOP	RDY IMP	The drive is idling
3.	Select C0002 in the user menu		Code	
4.			0002	Select C0002
5.			Para	
6.	Select the correct copy function			The settings stored in the controller or in the function module are overwritten.
	• Copying all parameter sets available (PAR1 ... PAR4, ggf. FPAR1) to the controller:			
	– Controller with function module application I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen		70	Copy PAR1 ... PAR4 und FPAR1: ⇨ Set "70"
	– Controller with all other function modules		10	Copy PAR1 ... PAR4: ⇨ Set "10"
	• Copying single parameter sets (PARx und ggf. FPAR1) to the controller:			
	– Controller with function module application I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen		71	Copy PAR1 and FPAR1: ⇨ Set "71"
			72	Copy PAR2 and FPAR1: ⇨ Set "72"
			73	Copy PAR3 and FPAR1: ⇨ Set "73"
			74	Copy PAR4 and FPAR1: ⇨ Set "74"
	– Controller with all other function modules		11	PAR1: ⇨ Set "11"
			12	PAR2: ⇨ Set "12"
			13	PAR3: ⇨ Set "13"
			14	PAR4: ⇨ Set "14"
	• Copying only the module-specific parameter set FPAR1 to the function module:			
	– Only possible for controllers with function module INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen:		40	Copy FPAR1: ⇨ Set "40"
7.	Start copying	ENTER	STOr-E LOAd	The selected parameter sets are copied to the controller or the function module. If LOAd stops, the copy process is completed.
8.	Enable the controller.	RUN		The drive should be running again

9.3.6 Activation of password protection

(Available as of version E82 ... Vx11 together with the keypad, version E82B ... Vx10)

Note!

If the password protection is activated (C0094 = 1 ... 9999) only the user menu uSEr can be freely accessed.

- All other functions can only be carried out, if you enter the password before.

Please note:

- During the parameter set transfer you also overwrite the parameters that are password-protected.
- The password will not be transferred.

Do not forget your password! If you cannot remember the password, it can only be reset via PC or a bus system.

Activation of password protection

Step		Keys	Result	Action
1.	Change to the menu ALL	❶→❷	❷	Change to function bar 2
2.		⇐⇒	Menu	
3.		▼▲	ALL	Select menu ALL (list of all codes)
4.		❶→❷	❶	Confirm selection and change to function bar 1
5.	Enter password	⇒	Code	
6.		▲	0094	Password code
7.		⇒	Para	
8.		▲	XXXX	Set password
9.		ENTER	STOrE	Confirm password
10.	Activate password by changing to the menu uSEr	❶→❷	❷	Change to function bar 2
11.		⇐⇒	Menu	
12.		▼▲	uSEr	Select menu uSEr
13.		❶→❷	❶ key symbol	Confirm selection and change to function bar 1 The key symbol indicates that the password protection is active

The password protection is active now:

- Every time you want to leave the user menu, the following will be displayed: PASS.
- If you enter the correct password and confirm with ENTER all function are freely accessible again.

Calling up a password-protected function

Step		Keys	Result	Action
1.	Call up a password protected function	Various	PASS 0 ⊶	You tried to call up a password protected function. 0 blinking
2.	Temporarily deactivate password protection	▲	PASS XXXX ⊶	Set password
3.		ENTER	STOrE	Confirm password ⊶ Off
4.	Free access to all functions	Various		All functions can be freely accessed.
5.	Reactivate password protection by changing to the menu uSEr	①↔②	②	Change to function bar 2
6.		◄►	Menu	
7.		▼▲	uSEr	Select menu uSEr
8.		①↔②	① ⊶	Confirm selection and change to function bar 1
The password protection is active again.				

Cancel password protection

Step		Keys	Result	Action
1.	Change to the menu ALL	①↔②	PASS 0 ⊶	0 blinking
2.		▲	PASS XXXX ⊶	Set password
3.		ENTER	STOrE	Confirm password ⊶ Off
4.		①↔②	②	Change to function bar 2
5.		◄►	Menu	
6.		▼▲	ALL	Select menu ALL (list of all codes)
7.		①↔②	①	Confirm selection and change to function bar 1
8.	Permanent deactivation of the password protection	►	Code	
9.		▲	0094	Select code for password
10.		►	Para	
11.		▼	0	Delete password
12.		ENTER	STOrE	Confirm entry
The password protection has been cancelled now. All functions are freely available again.				

9.3.7 Remote parameter setting for system bus participants

If controllers are networked via system bus (CAN) it is possible to remotely parameterise all other system bus participants from one central place of the network.

For this purpose use the function Bus.

Note!

Instead of using function Bus the system bus device can also be selected under C0370.

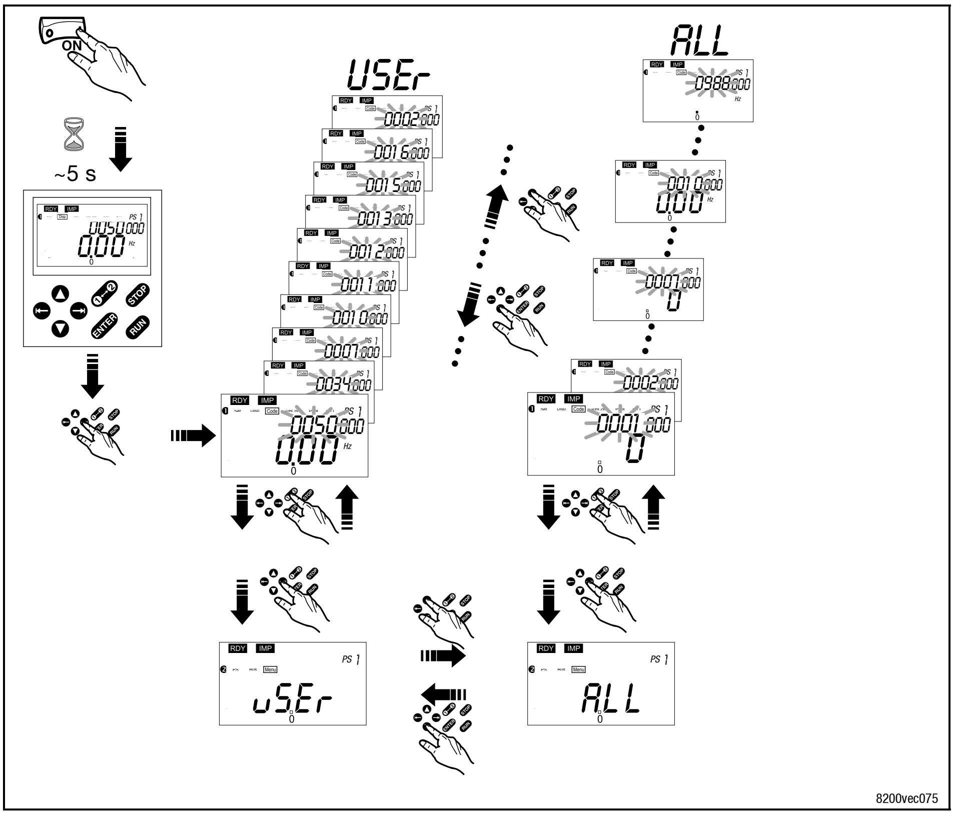
Step		Keys	Result	Action
1.	Select function	①↔②	❷	Change to function bar 2
2.		⬅➡	Bus	
3.	Select the device's address.	▼▲	1 ... 63	Select the device address
4.		①↔②	❶	Confirm the address and change to function bar 1. The device can now be remotely parameterised.
5.	Set parameters			All settings are directed to the selected device.
6.	Parameterise remotely other system bus devices, if necessary			Restart "loop" at step 1.
Do not forget to switch off the remote parameter setting after having completed the settings:				
7.	Switch off the remote parameter setting	①↔②	❷	Change to function bar 2
8.		⬅➡	Bus	
9.		▼	0	Switch off the remote parameter setting
10.		①↔②	❶	Confirm and change to function bar 1
The remote parameter setting is completed				

9.3.8 Menu structure

For easy operation the codes are divided in two groups:

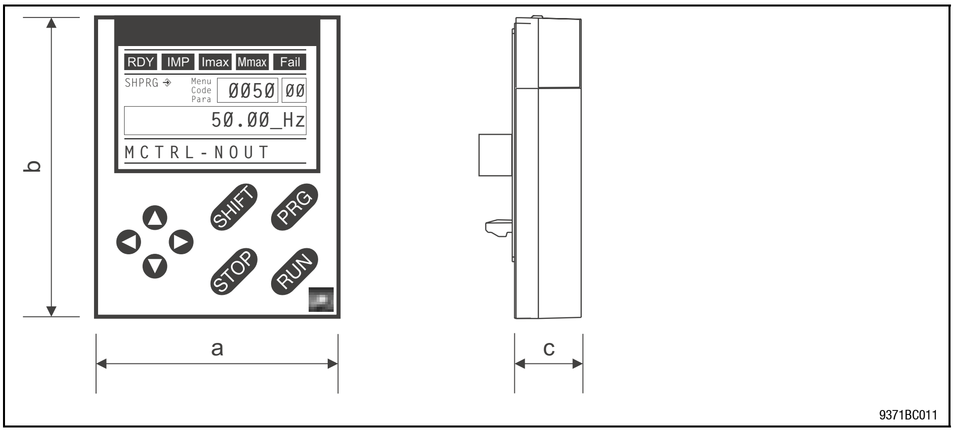
- The menu uSEr
  - is active after every mains switching or keypad attachment during operation.
  - contains all codes for a standard application with linear V/f characteristic control (Lenze setting).
  - can be modified as required under C0517.
- The menu ALL
  - contains all codes.
  - shows a list of all codes in ascending order.

Change between the menus uSEr and ALL



9.4 Parameter setting with the XT EMZ9371BC keypad

9.4.1 General data and application conditions



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

9.4.2 Installation and commissioning

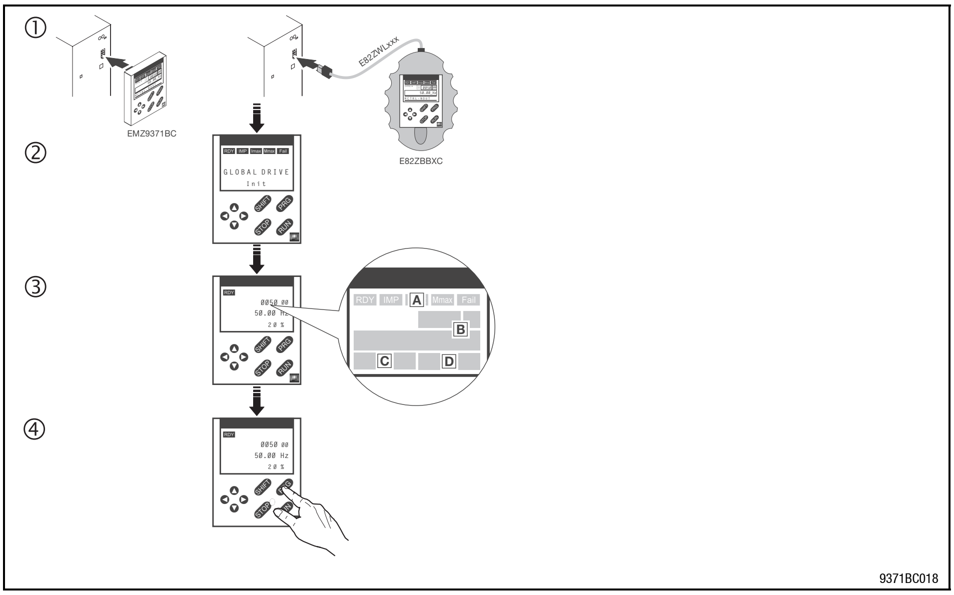


Fig. 9.4-1 Installation and commissioning of XT EMZ9371BC keypad or E82ZBBXC diagnosis terminal

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

9.4.3 Display elements and function keys

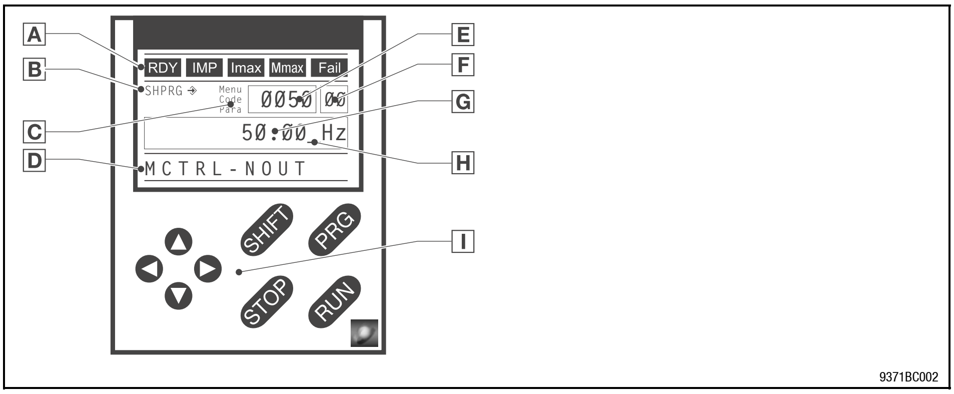


Fig. 9.4-2 Display elements and function keys of the XT EMZ9371BC keypad

Parameter setting

Parameter setting with the XT EMZ9371BC keypad

Display elements and function keys

Display elements

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

Function keys

Note!

Press the key combinations with SHIFT:

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

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

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

9.4.4 Changing and saving parameters

Note!

Your settings in the menus are always stored in the parameter set 1.

If you want to store settings in the parameter sets 2, 3 or 4, two menus can be used:

- In menu 2 ”Code list” it is possible to access to all available codes.
- In menu 7 ”Param managm” it is possible to copy parameter set 1 into the oter parameter sets.
  – **Please note, that with copying the ”own basic setting” will be overwritten by the settings of parameter set 1!**

Step		Keys	Action
1.	Select menu	▲ ▼ ► ◄	Select the desired menu with arrow keys
2.	Change to the code level	►	Display of first code in the menu
3.	Select code or subcode	▼ ▲	Display of current parameter value
4.	Change to parameter level	PRG	
5.	If SHPRG is displayed, inhibit controller	STOP	The drive is idling
6.	Change parameters		
	A)	► ◄	Move cursor under the digit to be changed
	B)	▼ ▲	Change digit
		SHIFT ▼ SHIFT ▲	Change digit quickly
7.	Accept changed parameter		
	Display of SHPRG or SHPRG →	SHIFT PRG	Confirm change to accept parameter Display ”OK”
	Display →	-	The parameter was accepted immediately
8.	If necessary, enable controller	RUN	The drive should be running again
9.	Change to the code level		
	A)	PRG	Display of operation level
	B)	PRG	Display of the code with changed parameters
10.	Change further parameters		Restart ”loop” at step 1. or step 3.

9.4.5 Transfer parameters to other controllers

The keypad enables you to easily copy parameter settings from one controller to another.

For this purpose use the menu 7 ”Param managm”:

Copying parameter sets from the controller to the keypad

Step		Keys	Action
1.	Connect the keypad to controller 1		
2.	Inhibit controller	STOP	The drive is idling
3.	Select the submenu 7.1 ”Load/Store” in the menu 7 ”Param managm”	▲ ▼ ▶ ◀	Change to the submenu ”Load/Store” with the arrow keys
4.	Change to the code level	▶	Display C0002 ”Param managm”
5.	Change to parameter level	PRG	Display ”0” and ”READY”
6.	Select the correct copy function		The settings stored in the keypad are overwritten.
	• Copying all parameter sets available (PAR1 ... PAR4, ggf. FPAR1) to the keypad:		
	– Controller with function module application I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	▲	Copy PAR1 ... PAR4 und FPAR1: ⇨ Set ”80” ”F1&PAR1-4->Key”
	– Controller with all other function modules		Copy PAR1 ... PAR4: ⇨ Set ”20” ”PAR1-4->Keypad”
	• Copying only the module-specific parameter set FPAR1 to the keypad:		
	– Only possible for controllers with function module INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen:	▲	Copy FPAR1: ⇨ Set ”50” ”FPAR1->Keypad”
7.	Start copying	SHIFT PRG	The selected parameter sets are copied to the keypad. ”SAVING...” is indicated. If ”SAVING...” stops, the copy process is completed.
8.	Change to the code level		
	A)	PRG	Display of operation level
	B)	PRG	Display C0002 ”Param managm”
9.	Enable the controller.	RUN	The drive should be running again
10.	Remove the keypad from the controller 1		

Copying parameter sets from the keypad to the controller

Step		Keys	Action
1.	Connect keypad to controller 2		
2.	Inhibit controller	STOP	The drive is idling
3.	Select the submenu 7.1 "Load/Store" in the menu 7 "Param managm"	▲ ▼ ▶ ◀	Change to the submenu "Load/Store" with the arrow keys
4.	Change to the code level	▶	Display C0002 "Param managm"
5.	Change to parameter level	PRG	Display "0" and "READY"
6.	Select the correct copy function		The settings stored in the controller or in the function module are overwritten.
	• Copying all parameter sets available (PAR1 ... PAR4, ggf. FPAR1) to the controller:		
	– Controller with function module application I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	▲	Copy PAR1 ... PAR4 und FPAR1: ⇨ Set "70" "Key->F1&PAR1-4"
	– Controller with all other function modules		Copy PAR1 ... PAR4: ⇨ Set "10" "Keypad->PAR1-4"
	• Copying single parameter sets (PARx und ggf. FPAR1) to the controller:		
	– Controller with function module application I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	▲	Copy PAR1 and FPAR1: ⇨ Set "71" "Key->FP1&PAR1"
			Copy PAR2 and FPAR1: ⇨ Set "72" "Key->FP1&PAR2"
			Copy PAR3 and FPAR1: ⇨Set "73" "Key->FP1&PAR3"
			Copy PAR4 and FPAR1: ⇨Set "74" "Key->FP1&PAR4"
	– Controller with all other function modules or controller without function module		Copy PAR1: ⇨ Set "11" "Keypad->PAR1"
			Copy PAR2: ⇨ Set "12" "Keypad->PAR2"
			Copy PAR3: ⇨ Set "13" "Keypad->PAR3"
			Copy PAR4: ⇨ Set "14" "Keypad->PAR4"
	• Copying only the module-specific parameter set FPAR1 to the function module:		
	– Only possible for controllers with function module INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen:	▲	Copy FPAR1: ⇨ Set "40" "Keypad->FPAR1"
7.	Start copying	SHIFT PRG	The selected parameter sets are copied to the controller or the function module. "LOADING..." is indicated. If "LOADING..." stops, the copy process is completed.
8.	Change to the code level		
	A)	PRG	Display of operation level
	B)	PRG	Display C0002 "Param managm"
9.	Enable the controller.	RUN	The drive should be running again

9.4.6 Activation of password protection

Note!

- If the password protection is activated (C0094 = 1 ... 9999) only the user menu can be freely accessed.
- To get into the other menus you must enter the password first.
- Please observe that also the password-protected parameters will be overwritten when parameter sets are transferred to other controllers. The password will be transferred, too.
- Do not forget your password! If you cannot remember the password, it can only be reset via PC or a bus system.

Activation of password protection

Step			Keys	Action
1.	Select the submenu 2.1 "ALL" in the menu 2		▲ ▼ ► ◄	Change to the submenu "ALL" with the arrow keys
2.	Change to the code level		►	Display of code C0001 "Setpt setup"
3.	Select C0094		▲	Display of code C0094 "User password"
4.	Change to parameter level		PRG	Display "0" (no password protection)
5.	Set password			
		A)	▲	Select password (1 ... 9999)
		B)	SHIFT PRG	Confirm password
6.	Change to the code level			
		A)	PRG	Display of operation level
		B)	PRG	Display of C0094 and "User password"
7.	Change to menu 1 "USER menu"		◄ ◄ ▼	

The password protection is active now:
- Every time you want to leave the user menu, "Enter password" is displayed.
- If you enter the correct password and confirm it with SHIFT PRG all menus are freely accessible again.

Cancel password protection

Step			Keys	Action
1.	Leave the user menu		▲	
2.	The password is demanded			"Enter password" is displayed
3.	Enter password			
		A)	▲	Enter stored password
		B)	SHIFT PRG	Confirm password
4.	Select the submenu 2.1 "ALL" in the menu 2		►	Change to the submenu "ALL"
5.	Change to the code level		►	Display of code C0001 "Setpt setup"
6.	Select C0094		▲	Display of code C0094 "User password"
7.	Change to parameter level		PRG	Display of "-xxxxx" (password protection is active)
8.	Reset password			
		A)	▲	Enter "0"
		B)	SHIFT PRG	Confirm
9.	Change to the code level			
		A)	PRG	Display of operation level
		B)	PRG	Display of C0094 "User password"

The password protection has been cancelled now. All menus are freely available again.

9.4.7 Remote parameter setting for system bus participants

If controllers are networked via system bus (CAN) it is possible to remotely parameterise all other system bus participants from one central place of the network.

For this purpose use the menu ”Remote para”:

Step			Keys	Action
1.	Select menu 3 ”Remote para”		▲ ▼ ► ◄	Change to the menu ”Remote para” with the arrow keys
2.	Change to the code level		►	Display of code C0370 ”CANremot para”
3.	Change to parameter level		PRG	Display of the current parameter value: ”0” = OFF
4.	Set the node address of the system bus participant you want to parameterise			
		A)	▲	Select node address Display of ”Nodexx”
		B)	SHIFT PRG	Confirm node address
5.	Change to the code level			
		A)	PRG	Display of operation level
		B)	PRG	Display of C0370 ”CANremot para”
6.	Set parameters			All settings are directed to the selected system bus participant
7.	Parameterise remotely other system bus participants, if necessary			Restart ”loop” at step 1.
Do not forget to switch off the remote parameter setting after having completed the settings:				
8.	Select menu 3 ”Remote para”		▲ ▼ ► ◄	Change to the menu ”Remote para” with the arrow keys
9.	Change to the code level		►	Display of code C0370 ”CANremot para”
10.	Change to parameter level		PRG	Display of the node address ”Nodexx” activated last
11.	Switch off the remote parameter setting		▼	Set ”0” = OFF
The remote parameter setting is completed				

9.4.8 Menu structure

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

Main menu		Submenus		Description
No.	**Display**	**No.**	**Display**	
1	**USER menu**			**Defined codes in C0517**
2	**Code list**			**All available codes**
		2.1	ALL	All available codes in ascending order (C0001 ... C7999)
		2.2	Para set 1	Codes in parameter set 1 (C0001 ... C1999)
		2.3	Para set 2	Codes in parameter set 2 (C2001 ... C3999)
		2.4	Para set 3	Codes in parameter set 3 (C4001 ... C5999)
		2.5	Para set 4	Codes in parameter set 4 (C6001 ... C7999)

Parameter setting with the XT EMZ9371BC keypad

Menu structure

Main menu		Submenus		Description
No.	**Display**	**No.**	**Display**	
3	**Remote para**			**Remote parameter setting** Only active with function module system bus (CAN)
4	**Quick start**			**Quick commissioning of standard applications**
		4.1	Keypad quick	Function check Frequency setpoint via keypad (C0140)
		4.2	V/f quick	Linear V/f-characteristic control Frequency setpoint selectable analogically via potentiometer, fixed setpoints (JOG) selectable via terminal
		4.3	VectorCtrl qu	Vector control Frequency setpoint selectable analogically via potentiometer, fixed setpoints (JOG) selectable via terminal
5	**Short setup**			**Quick configuration of predefined applications** **Observe the different key functions for the change from submenu to configuration menu!** • Press SHIFT PRG until "Loading..." is displayed: – Change to configuration menu, Lenze settings are loaded – Required signals are linked automatically – Complete the configuration subsequently • Press ➔ : – Change to configuration menu without linking signals – You can edit existing configurations
		Speed control in the operating mode "U/f characteristic control"		
		5.1	Speed-Ctrl 0	Frequency setpoint analog via analog input 1 (AIN1) Actual frequency digital via frequency input (DFIN)
		5.1.1	Freq setpt	Frequency setpoint configuration
		5.1.2	Actual value	Actual frequency configuration
		5.1.3	PCTRL setup	Process controller configuration
		5.1.4	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.1.5	Motor param	Motor current control, motor monitoring configuration
		5.2	Speed-Ctrl 1	Frequency setpoint via parameter channel (C0046) Actual frequency digital via frequency input (DFIN)
		5.2.1	Freq setpt	Frequency setpoint configuration
		5.2.2	Actual value	Actual frequency configuration
		5.2.3	PCTRL setup	Process controller configuration
		5.2.4	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.2.5	Motor param	Motor current control, motor monitoring configuration
		5.3	Speed-Ctrl 3	Frequency setpoint via AIF process data channel (AIF-IN.W1) Actual frequency digital via frequency input (DFIN)
		5.3.1	Freq setpt	Frequency setpoint configuration
		5.3.2	Actual value	Actual frequency configuration
		5.3.3	PCTRL setup	Process controller configuration
		5.3.4	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.3.5	Motor param	Motor current control, motor monitoring configuration
		5.4	Speed-Ctrl 5	Operation with function module system bus (CAN) on FIF Frequency setpoint via process data channel (CAN-IN1.W2) Actual frequency via process data channel (CAN-IN1.W3)
		5.4.1	CAN managem	Set up system bus (CAN) communication
		5.4.2	Freq setpt	Frequency setpoint configuration
		5.4.3	Actual value	Actual frequency configuration
		5.4.4	PCTRL setup	Process controller configuration
		5.4.5	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.4.6	Motor param	Motor current control, motor monitoring configuration

Main menu		Submenus		Description
No.	Display	No.	Display	
		5.5	Speed-Ctrl 7	Operation with fieldbus function module on FIF (DRIVECOM control) Frequency setpoint via process data channel Actual frequency via process data channel
		5.5.1	FIF managem	Set up fieldbus communication
		5.5.2	Freq setpt	Frequency setpoint configuration
		5.5.3	Actual value	Actual frequency configuration
		5.5.4	PCTRL setup	Process controller configuration
		5.5.5	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.5.6	Motor param	Motor current control, motor monitoring configuration
		Speed control in the operating mode "U/f characteristic control"		
		5.6	OpenLoopV/f 0	Frequency setpoint analog via analog input 1 (AIN1)
		5.6.1	Freq setpt	Frequency setpoint configuration
		5.6.2	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.6.3	Motor param	Motor current control, motor monitoring configuration
		5.7	OpenLoopV/f 1	Frequency setpoint via parameter channel (C0046)
		5.7.1	Freq setpt	Frequency setpoint configuration
		5.7.2	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.7.3	Motor param	Motor current control, motor monitoring configuration
		5.8	OpenLoopV/f 3	Frequency setpoint via AIF process data channel (AIF-IN.W1)
		5.8.1	Freq setpt	Frequency setpoint configuration
		5.8.2	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.8.3	Motor param	Motor current control, motor monitoring configuration
		5.9	OpenLoopV/f 5	Operation with function module system bus (CAN) on FIF Frequency setpoint via process data channel (CAN-IN1.W2)
		5.9.1	CAN managem	Set up system bus (CAN) communication
		5.9.2	Freq setpt	Frequency setpoint configuration
		5.9.3	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.9.4	Motor param	Motor current control, motor monitoring configuration
		5.10	OpenLoopV/f 7	Operation with fieldbus function module on FIF (DRIVECOM control) Frequency setpoint via process data channel
		5.10.1	FIF managem	Set up fieldbus communication
		5.10.2	Freq setpt	Frequency setpoint configuration
		5.10.3	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.10.4	Motor param	Motor current control, motor monitoring configuration
		Speed control in the operating mode "Vector control"		
		5.11	Vector-Ctrl 0	Frequency setpoint analog via analog input 1 (AIN1)
		5.11.1	Freq setpt	Frequency setpoint configuration
		5.11.2	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.11.3	Motor param	Motor current control, motor monitoring configuration
		5.11.4	Motor ident	Motor parameter identification
		5.12	Vector-Ctrl 1	Frequency setpoint via parameter channel (C0046)
		5.12.1	Freq setpt	Frequency setpoint configuration
		5.12.2	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.12.3	Motor param	Motor current control, motor monitoring configuration
		5.12.4	Motor ident	Motor parameter identification

Main menu		Submenus		Description
No.	Display	No.	Display	
		5.13	Vector-Ctrl 3	Frequency setpoint via AIF process data channel (AIF-IN.W1)
		5.13.1	Freq setpt	Frequency setpoint configuration
		5.13.2	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.13.3	Motor param	Motor current control, motor monitoring configuration
		5.13.4	Motor ident	Motor parameter identification
		5.14	Vector-Ctrl 5	Operation with function module system bus (CAN) on FIF Frequency setpoint via process data channel (CAN-IN1.W2)
		5.14.1	CAN managem	Set up system bus (CAN) communication
		5.14.2	Freq setpt	Frequency setpoint configuration
		5.14.3	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.14.4	Motor param	Motor current control, motor monitoring configuration
		5.14.5	Motor ident	Motor parameter identification
		5.15	Vector-Ctrl 7	Operation with fieldbus function module on FIF (DRIVECOM control) Frequency setpoint via process data channel
		5.15.1	FIF managem	Set up fieldbus communication
		5.15.2	Freq setpt	Frequency setpoint configuration
		5.15.3	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.15.4	Motor param	Motor current control, motor monitoring configuration
		5.15.5	Motor ident	Motor parameter identification
		Sensorless torque control with speed limitation		
		5.16	Torque-Ctrl 0	Torque setpoint analog via analog input 1 (AIN1) Speed limitation via maximum frequency C0011
		5.16.1	Torque setpt	Torque setpoint configuration
		5.16.2	f limit	Speed limitation configuration
		5.16.3	Motor param	Motor current control, motor monitoring configuration
		5.16.4	Motor ident	Motor parameter identification
		5.17	Torque-Ctrl 1	Torque setpoint analog via parameter channel (C0047) Speed limitation via maximum frequency C0011
		5.17.1	Torque setpt	Torque setpoint configuration
		5.17.2	f limit	Speed limitation configuration
		5.17.3	Motor param	Motor current control, motor monitoring configuration
		5.17.4	Motor ident	Motor parameter identification
		5.18	Torque-Ctrl 2	Analog torque setpoint via analog input 1 (AIN1) Analog speed limitation via analog input 2 (AIN2)
		5.18.1	Torque setpt	Torque setpoint configuration
		5.18.2	f limit	Speed limitation configuration
		5.18.3	Motor param	Motor current control, motor monitoring configuration
		5.18.4	Motor ident	Motor parameter identification
		5.19	Torque-Ctrl 3	Torque setpoint via AIF process data channel (AIF-IN.W1) Speed limitation via maximum frequency C0011
		5.19.1	Torque setpt	Torque setpoint configuration
		5.19.2	f limit	Speed limitation configuration
		5.19.3	Motor param	Motor current control, motor monitoring configuration
		5.19.4	Motor ident	Motor parameter identification
		5.20	Torque-Ctrl 5	Operation with function module system bus (CAN) on FIF Torque setpoint via process data channel (CAN-IN1.W2) Speed limitation via process data channel (CAN-IN1.W3)
		5.20.1	CAN managem	Set up system bus (CAN) communication
		5.20.2	Torque setpt	Torque setpoint configuration
		5.20.3	f limit	Speed limitation configuration
		5.20.4	Motor param	Motor current control, motor monitoring configuration
		5.20.5	Motor ident	Motor parameter identification

Main menu No.	Main menu Display	Submenus No.	Submenus Display	Description
		5.21	Torque-Ctrl 7	Operation with fieldbus function module on FIF (DRIVECOM control) Torque setpoint via process data channel Speed limitation via process data channel
		5.21.1	FIF managem	Set up fieldbus communication
		5.21.2	Torque setpt	Torque setpoint configuration
		5.21.3	f limit	Speed limitation configuration
		5.21.4	Motor param	Motor current control, motor monitoring configuration
		5.21.5	Motor ident	Motor parameter identification
		Process control with PID controller in the operating mode ”U/f characteristic control”		
		5.22	PID-Ctrl 0	Setpoint via parameter channel (C0181) Analog actual value via analog input 1 (AIN1)
		5.22.1	Setpoint	Setpoint configuration
		5.22.2	Actual value	Configuration act. value
		5.22.3	PCTRL setup	Process controller configuration
		5.22.4	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.22.5	Motor param	Motor current control, motor monitoring configuration
		5.23	PID-Ctrl 1	Setpoint via parameter channel (C0138) Analog actual value via analog input 1 (AIN1)
		5.23.1	Setpoint	Setpoint configuration
		5.23.2	Actual value	Configuration act. value
		5.23.3	PCTRL setup	Process controller configuration
		5.23.4	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.23.5	Motor param	Motor current control, motor monitoring configuration
		5.24	PID-Ctrl 2	Analog setpoint via analog input 1 (AIN1) Analog actual value via analog input 2 (AIN2)
		5.24.1	Setpoint	Setpoint configuration
		5.24.2	Actual value	Configuration act. value
		5.24.3	PCTRL setup	Process controller configuration
		5.24.4	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.24.5	Motor param	Motor current control, motor monitoring configuration
		5.25	PID-Ctrl 3	Setpoint via AIF process data channel (AIF-IN.W1) Analog actual value via analog input 1 (AIN1)
		5.25.1	Setpoint	Setpoint configuration
		5.25.2	Actual value	Configuration act. value
		5.25.3	PCTRL setup	Process controller configuration
		5.25.4	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.25.5	Motor param	Motor current control, motor monitoring configuration
		5.26	PID-Ctrl 5	Operation with function module system bus (CAN) on FIF Setpoint via process data channel (CAN-IN1.W2) Actual value via process data channel (CAN-IN1.W3)
		5.26.1	CAN managem	Set up system bus (CAN) communication
		5.26.2	Setpoint	Setpoint configuration
		5.26.3	Actual value	Configuration act. value
		5.26.4	PCTRL setup	Process controller configuration
		5.26.5	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.26.6	Motor param	Motor current control, motor monitoring configuration

Main menu		Submenus		Description
No.	Display	No.	Display	
		5.27	PID-Ctrl 7	Operation with fieldbus function module on FIF (DRIVECOM control) Frequency setpoint via process data channel Actual frequency via process data channel
		5.27.1	FIF managem	Set up fieldbus communication
		5.27.2	Setpoint	Setpoint configuration
		5.27.3	Actual value	Configuration act. value
		5.27.4	PCTRL setup	Process controller configuration
		5.27.5	f limit/ramp	Output frequency, acceleration time, deceleration time configuration
		5.27.6	Motor param	Motor current control, motor monitoring configuration
6	**Diagnostic**			**Diagnostics**
		6.1	Fault history	Error analysis with history buffer
		6.2	Status words	Display of status words
		6.3	Monit drive	Display codes in order to monitor drive
		6.4	Monit FIF	Display codes in order to monitor a field bus function module
7	**Param managm**			**Parameter set management**
		7.1	Load/Store	Parameter set transfer, restore delivery status
		7.2	Copy PAR1 ->2	Copy parameter set 1 into parameter set 2
		7.3	Copy PAR1 ->3	Copy parameter set 1 into parameter set 3
		7.4	Copy PAR1 ->4	Copy parameter set 1 into parameter set 4
8	**Main FB**			**Configuration of function blocks**
		8.1	Cfg NSET1	Setpoint processing
		8.2	Cfg PCTRL1	Process controller
		8.3	Cfg DCTRL1	Internal control
		8.4	Cfg MCTRL1	Motor control
9	**Controller**			**Configuration of internal control parameters**
		9.1	V/f-Ctrl	V/f characteristic control
		9.2	Vector-Ctrl	Vector control
		9.3	PCTRL setpt	Process controller setpoints
		9.4	PCTRL act val	Actual process controller values
		9.5	PCTRL setup	Process control
		9.6	Current setup	Current limits and current controllers
		9.7	Setpt setup	Setpoints
		9.8	Ramp times	Acceleration times, deceleration times
		9.9	DCB (DC brk)	DC-injection brake
		9.10	Fault monit	Fault monitoring, fault indication
10	**Terminal I/O**			**Linking inputs and outputs with internal signals and signal level display at the terminals** Type and equipment determine which submenus are displayed.
		10.1	AIN1	Analog input 1
		10.2	AIN2	Analog input 2
		10.3	AOUT1	Analog output 1
		10.4	AOUT2	Analog output 2
		10.5	DIGIN1/PTC	Digital inputs and PTC input
		10.6	RELAY1	Relay output 1
		10.7	RELAY2	Relay output 2
		10.8	DIGOUT1	Digital output 1
		10.9	DIGOUT2	Digital output 2
		10.10	DFIN1	Frequency input
		10.11	DFOUT1	Frequency output
		10.12	MPOT1	Motor potentiometer function

Main menu No.	Main menu Display	Submenus No.	Submenus Display	Description
		Active only in basic controllers as from software version 2.2: Change to the code level to display the levels at the terminals. The levels of analog inputs and outputs are evaluated with offset and gain.		
		10.13	Monit AIN1	Level at analog input 1 0 ... 100 % (reference C0034)
		10.14	Monit AIN2	Level at analog input 2 0 ... 100 % (reference C0034)
		10.15	Monit AOUT1	Level at analog output 1 0 ... 100 % (Reference standard-I/O: 10 V) (Reference application-I/O: C0424)
		10.16	Monit AOUT2	Level at analog output 2 0 ... 100 % (reference C0424)
		10.17	Monit PTC	Status of PTC input 0 ≡ open, 1 ≡ closed
		10.18	Monit DIGIN	Status of digital inputs and input for controller inhibit X3/28 0 ≡ LOW, 1 ≡ HIGH
		10.19	Monit DIGOUT	Status of digital outputs and status of normally-open contact of relay outputs: 0 ≡ LOW, 1 ≡ HIGH
11	**LECOM/AIF**			**Configuration of operation with communication modules**
		11.1	LECOM setup	Serial interface
		11.2	AIF setup	Process data
		11.3	Status words	Display of status words
12	**FIF system bus**			**Configuration of operation with function module system bus (CAN) and display of the contents of the CAN objects** Only active with function module system bus (CAN)
		12.1	CAN managem	CAN communication parameters
		12.2	Cfg CAN-IN1	CAN object 1
		12.3	Cfg CAN-OUT1	
		12.4	Cfg CAN-IN2	CAN object 2
		12.5	Cfg CAN-OUT2	
		12.6	Status words	Display of status words
		12.7	CAN diagn	CAN diagnosis
		Active only in basic controllers as from software version 2.2: Change to the code level to display the content of the data words. The contents of the data words are displayed.		
		12.8	Mon IN1 W1-2	Content of 4 input words or 4 output words of CAN object 1 Analog words: 5DC0h ≡ 480 Hz Digital words: Hexadecimal representation of the individual bits
		12.9	Mon IN1 W3-4	
		12.10	Mon OUT1 W1-2	
		12.11	Mon OUT1 W3-4	
		12.12	Mon IN2 W1-2	Content of 4 input words or 4 output words of CAN object 2 Analog words: 5DC0h ≡ 480 Hz Digital words: Hexadecimal representation of the individual bits
		12.13	Mon IN2 W3-4	
		12.14	Mon OUT2 W1-2	
		12.15	Mon OUT2 W3-4	

Main menu		Submenus		Description
No.	Display	No.	Display	
13	FIF fieldbus			**Configuration operation with fieldbus function modules and display of the process data word contents** Only active with fieldbus function module
		13.1	Identify	Software state display and type fieldbus function module
		13.2	FIF managem	FIF communication parameters
		13.3	POW setup	Process data from master to fieldbus function module
		13.4	PIW setup	Process data from fieldbus function module to master
		13.5	Com.err setup	Communication monitoring
		Change to the code level to display the contents of the data words. The contents of the data words are displayed as decimal value.		
		13.6	Monit PIW	Process data display from fieldbus function module to master
		13.7	Monit POW	Process data display from master to fieldbus function module
		13.8	Monit FIF-IN	Process data display from fieldbus function module to controller
		13.9	Monit FIF-OUT	Process data display from controller to fieldbus function module
14	Motor/Feedb.			**Input of motor data, configuration of speed feedback**
		14.1	Motor data	Motor data
		14.2	Feedback DFIN	Frequency input DFIN, encoder
15	Identify			**Identification**
		15.1	Drive	Software version controller
		15.2	Keypad	Software version keypad
		15.3	FIF module	Software version and function module type

10 Function library

10.1 Contents

Contents

10.2 Important notes

The function library provides detailed information on how to adapt the controller to your application.

Correct signal linkage

In order to control the controller or output status messages, internal digital and analog signal can be freely linked with sources and targets.

Maloperation can be avoided by observing the following:

- Select the source from the targets point of view:
  - Ask yourself "Where does the signal come from?"
  - That makes it easy to find the correct entry for a code.
- A source can have several targets:
  - It is thus possible that double assignments occur when targets are assigned to sources.
  - Ensure that only the targets wanted are assigned to a source.
  - For instance, the assignment of E1 remains the same even if the frequency input E1 is activated (Lenze setting: "JOG1 activation!). The previous assignment must be deleted with C0410/1 = 255 to ensure trouble-free operation.
- A target can have one source only.

Overview of code table and signal flow diagram

The code table serves as a "reference book" including all functions with brief explanations. (📖 10.20-1 ff.)

The signal flow diagrams show the integration of the codes into the internal signal processing. (📖 16.1-1 ff.)

10.3 Operating mode

Description

The method of control of the controller can be selected via the operating mode. You can select between

- V/f characteristic control
- Vector control
- Sensorless torque control

Selection of the correct operating mode

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

The vector control provides better control features than the V/f characteristic control because of:

- a higher torque over the whole speed range
- higher speed accuracy and smooth running features
- higher efficiency

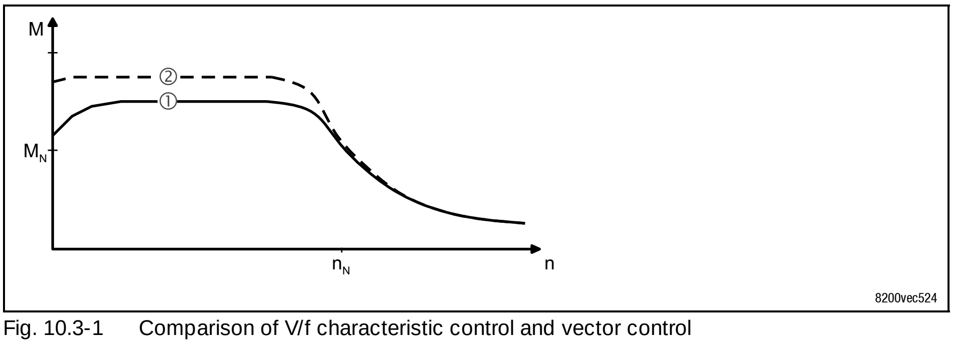


Fig. 10.3-1 Comparison of V/f characteristic control and vector control

① V/f characteristic control

② Vector control

Operating modes recommended for standard applications

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

Application	Operating mode	
	Setting in C0014	
Single drives	**recommended**	**alternatively**
with extremely alternating loads	4	2
with heavy start conditions	4	2
with speed control (speed feedback)	2	4
with high dynamic response (e. g. positioning and infeed drives)	2	-
with torque setpoint	5	-
with torque limitation (power control)	2	4
Three-phase AC reluctance motors	2	-
Three-phase sliding rotor motors	2	-
Three phase motors with assigned frequency-voltage characteristic	2	-
Pump and fan drives with square-law load characteristic	3	2 or 4
Group drives (several motors connected to controller)		
identical motors and identical loads	2	-
different motors and/or changing loads	2	-

C0014 = 2: linear V/f characteristic control

C0014 = 3: square-law V/F characteristic control

C0014 = 4: vector control

C0014 = 5: sensorless torque control

Note!

- Only change between the operating modes if the controller is inhibited!
- Do not use the operating mode ”Torque control” for applications with power control!
- Optimum drive behaviour in process controller applications, e.g. with speed control or dancer position control can be achieved with the control modes ”linear V/f characteristic control” or with ”vector control”.
  – If you need a high torque at low speed we recommend the operating mode “vector control”.

10.3.1 V/f characteristic control

Description

The output voltage of the controller follows a defined characteristic. For lower output frequencies the characteristic can be boosted. The characteristic can be adapted to different load profiles:

- 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 is not suitable for operation with a square-law V/f characteristic, select the linear V/f characteristic or the operating mode "vector control".

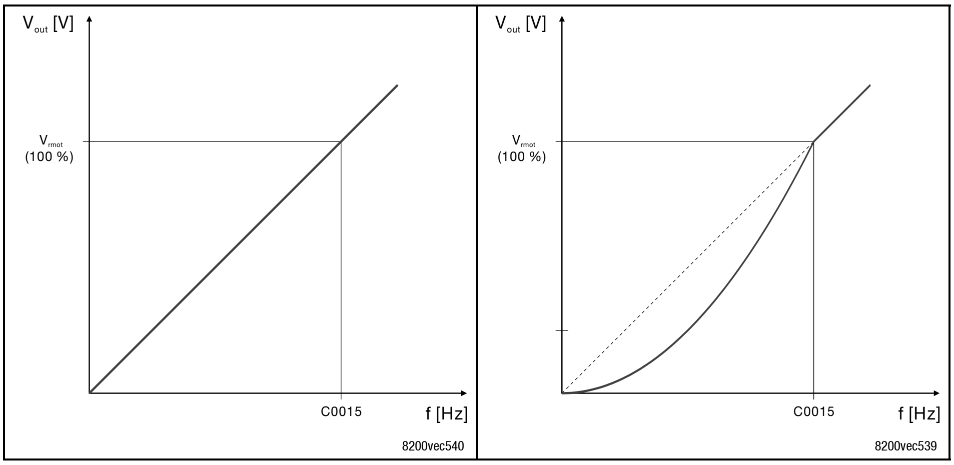


Fig. 10.3-2 Linear and square-low V/f characteristic

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	**Name**	**Lenze**	**Selection**			
C0014 ENTER	Operating mode	2	2	V/f characteristic control V ~ f (Linear characteristic with constant V_{min} boost)	• Commissioning without motor parameter identification possible • Benefit of identification with C0148: – Improved smooth running at low speed – V/f rated frequency (C0015) and slip (C0021) are calculated and stored. They do not have to be entered	10.3-1
			3	V/f characteristic control V ~ f^2 (Square-law characteristic with constant V_{min} boost)		
			4	Vector control	**For initial selection enter the motor data and identify the motor parameters with C0148** **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 uSEr	V/f rated frequency	50.00	7.50	{0.02 Hz} 960.00	• C0015 is calculated and stored under C0148 when the motor parameters are identified • Settings applies to all possible mains voltages	10.3-3 10.3-8
C0016 uSEr	V_{min} boost	→	0.00	{0.01 %} 40.00	→ Depending on the controller Setting applies to all mains voltages permitted	10.3-3

Setting the V/f characteristic

Under C0014 select the V/f characteristic suitable for your application.

Note!

The following must be observed when operating drives with square-law V/f characteristic:

- High moments of inertia reduce the acceleration of the drive.
- This drive behaviour can be avoided by using the linear V/f characteristic via the parameter set changeover during the acceleration.

Setting of V/f rated frequency

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.

- The setting under C0015 applies to all admitted mains voltages.
- The internal mains voltage compensation compensates deviations in the mains during operation. Therefore, they do not have to be considered for the setting of C0015.
- Depending on the settings under C0015 it can be necessary to adapt the maximum output frequency under C0011 to ensure that the entire speed range will be used.
- The V/f rated frequency depends on the rated controller voltage, the rated motor voltage, and the rated motor frequency:

$$C0015\ [Hz] = \frac{U\ [V]}{U_r\ [V]} \cdot f_r\ [Hz]$$

V	400 V for E82xVxxxK4C types
V	230 V for E82xVxxxK2C types
V_r	Rated motor voltage depending on type of connection, see nameplate
f_r	Rated motor frequency according to nameplate

Note!

The identification of the motor parameters calculates C0015 and automatically saves the value.

Typical values for C0015

400 V E82xVxxxK4 controller				230 V E82xVxxxK2 controller			
motor			C0015	motor			C0015
Voltage	Frequency	Connection		Voltage	Frequency	Connection	
230/400 V	50 Hz	⅄	50 Hz	230/400 V	50 Hz	Δ	50 Hz
220/380 V	50 Hz	⅄	52.6 Hz	220/380 V	50 Hz	Δ	52.3 Hz
280/480 V	60 Hz	⅄	50 Hz				
400/690 V 400 V	50 Hz 50 Hz	Δ	50 Hz				
230/400 V 280/480 V 400 V	50 Hz 60 Hz 87 Hz	Δ	87 Hz				
220/380 V	50 Hz	Δ	90.9 Hz				

Note!

- 4-pole asynchronous motors which are designed for a rated frequency of 50 Hz in star connection, can be operated in delta connection if the constant excitement does not exceed 87 Hz.
  - – The motor current and the motor power increase by the factor $\sqrt{3}$ = 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 for motors with other pole numbers.
  - – Observe the mechanical limit speed when using 2-pole asynchronous motors.

Setting of V_{min} boost

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

C0016 must always be adapted to the asynchronous motor used. Otherwise, the motor might be destroyed by overtemperature or the controller might be driven with overcurrent:

1. Operate the motor in idle running at slip frequency (f ≈ 5 Hz):

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

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

f_s	Slip frequency [Hz]
f_r	Rated motor frequency according to nameplate [Hz]
r_{rsyn}	Synchronous motor speed [min^{-1}]
r_r	Rated motor speed according to nameplate [min^{-1}]
p	Number of pole pairs

2. V_{min} until the following motor current is reached:

A) Motor in short-term operation at 0 Hz ≤ f ≤ 25 Hz:
   - Motor with integrated ventilation: $I_{motor} \leq I_{r\ motor}$
   - Motor with forced ventilation: $I_{motor} \leq I_{r\ motor}$

B) Motor in continuous operation at 0 Hz ≤ f ≤ 25 Hz:
   - Motor with integrated ventilation: $I_{motor} \leq 0{,}8 \cdot I_{r\ motor}$
   - Motor with forced ventilation: $I_{Motor} \leq I_{r\ motor}$

Note!

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

- As experience shows it is possible to operate standard asynchronous motors with insulation class B for a short time with rated current 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.

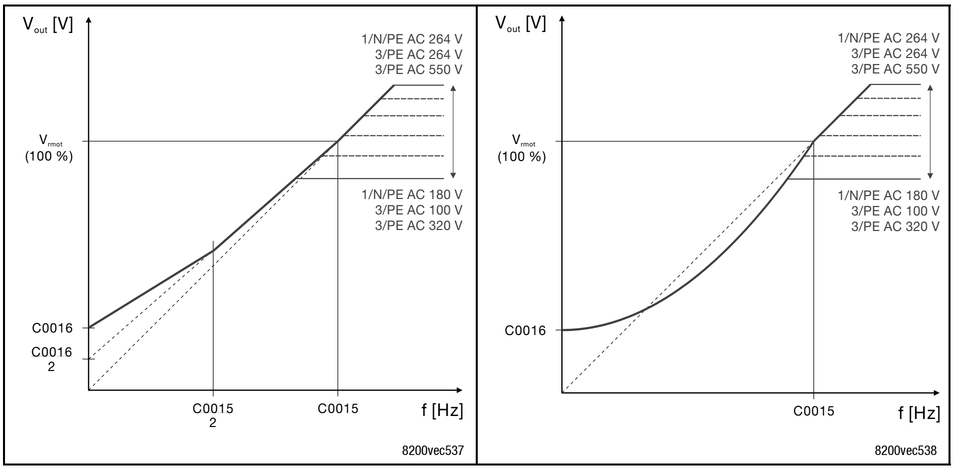


Fig. 10.3-3 Umin boost at linear and square-law V/f characteristic

10.3.2 Vector control

Description

Compared with the V/f characteristic control the vector control offers considerably higher torque and lower current consumption during idle running. The vector control is an improved motor current control following the Lenze FTC technology. Select vector control for operation of the following drives:

- Single drives with extremely changing loads
- Single drives with heavy start conditions
- Sensorless speed control of standard three-phase AC motors

Note!

- The connected motor should maximally be two power classes lower than the motor assigned to the controller.
- The operation with vector control is not possible if several drives are operated on one controller.
- The motor parameter identification is absolutely vital! Otherwise commissioning is not possible.

Codes for parameter setting

Code		Possible settings					IMPORTANT	
No.	Name	Lenze	Selection					
C0014 ENTER	Operating mode	2	2	V/f characteristic control V ~ f (Linear characteristic with constant V_{min} boost)			• Commissioning without motor parameter identification possible • Benefit of identification with C0148: – Improved smooth running at low speed – V/f rated frequency (C0015) and slip (C0021) are calculated and stored. They do not have to be entered	📖 10.3-1
			3	V/f characteristic control V ~ f^2 (Square-law characteristic with constant V_{min} boost)				
			4	Vector control			**For initial selection enter the motor data and identify the motor parameters with C0148** **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 uSEr	V/f rated frequency	50.00	7.50	{0.02 Hz}		960.00	• C0015 is calculated and stored under C0148 when the motor parameters are identified • Settings applies to all possible mains voltages	📖 10.3-3 📖 10.3-8
C0021	Slip compensation	0.0	-50.0	{0.1 %}		50.0	C0021 is calculated and stored under C0148 when the motor parameters are identified	📖 10.4-1
C0054*	Apparent motor current (MCTRL1-IMOT)		0.0	{A}		2000.0	Only display	
C0087	Rated motor speed	→	300	{1 rpm}		16000	→ Depending on the controller	📖 10.9-1
C0088	Rated motor current	→	0.0	{0.1 A}		650.0	→ Depending on the controller 0.0 ... 2.0 x rated output current of the controller	📖 10.9-1
C0089	Rated motor frequency	50	10	{1 Hz}		960		📖 10.9-1

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0090	Rated motor voltage	→	50	{1 V}	500	→ 230 V with 230 V controllers, 400 V with 400 V controllers	📖 10.9-1
C0091	Motor cos φ	→	0.40	{0.1}	1.0	→ Depending on the controller	📖 10.9-1
C0092	Motor stator inductance	0.0	0.000	{0.1 mH}	200.0		📖 10.9-1
		0.00	0.00	{0.01 mH}	200.00	Only 8200 vector 15 ... 90 kW	
C0148* STOP	Motor parameter identification	0	0	Ready		**Only when the motor is cold!** 1. Inhibit controller, wait until drive is in standstill 2. Enter the correct motor data under C0087, C0088, C0089, C0090, C0091 (see motor nameplate). 3. C0148 = set 1 by ENTER 4. Enable controller The identification – starts, IMP gets out – the motor makes a high-pitched tone, but does not rotate! – takes approx. 30 s – is completed when IMP is on again 5. Controller inhibit	📖 10.9-1
			1	Start identification • V/f-rated frequency (C0015), slip compensation (C0021) and motor stator inductivity (C0092) are calculated and saved. • The motor stator resistance (C0084) = total resistance of motor cable and motor is measured and saved			

Setting of vector control

Use C0014 = 4 to set the operating mode "vector control".

Preparing motor parameter identification

You must enter the motor data of the motor nameplate:

- Rated motor speed (C0087)
- Rated motor current (C0088)
- Rated motor frequency (C0089)
- Rated motor voltage (C0090)
- Motor cos φ (C0091)

Motor parameter identification

Carry out the motor parameter identification. (📖 10.9-1)

Automatically detected parameters

V/f-rated frequency (C0015), slip compensation (C0021) and motor stator inductivity (C0092) are calculated and saved. The total resistance of motor cable and motor is measured and saved as motor stator resistance (C0084).

Optimising the vector control

In general, the vector control is ready for operation after the motor parameters have been identified. Vector control must only be optimised for the following drive performance:

Drive performance	Remedy
Rough motor run and motor current (C0054) > 60 % rated motor current in idle running (stationary operation)	1. Reduction of motor inductance (C0092) by 10 % 2. Check of motor current under C0054 3. If the motor current (C0054) > 50 % of the rated motor current: – C0092 must be reduced until the motor current amounts to 50 % of the rated motor current – Reduce C0092 by max. 20 %! – Note: If you reduce C0092 the torque will decrease!
Torque too low for frequencies f < 5 Hz (starting torque)	Increase of motor resistance (C0084) or increase of motor inductance (C0092)
Poor constant speed at high loads (setpoint and motor speed are not proportional).	Increase of slip compensation (C0021) Overcompensation results in drive instability!
Error messages OC1, OC3, OC4 or OC5 during acceleration times (C0012) < 1 s (drive controller is no longer able to follow the dynamic processes)	Change readjustment time of the I_{max} controller (C0078): • Reduction of C0078 = I_{max} controller becomes quicker (more dynamic) • Increase of C0078 = I_{max} controller becomes slower ("smoother")

10.3.3 Sensorless torque control with speed limitation

Description

The setpoint linked with C0412/6 is interpreted as torque setpoint. Actual values are not required. The controller varies the speed within the set frequency range in dependence of the load and the torque selected.

The speed is limited via setpoint 1 or the maximum frequency.

Application with, for instance, winding drives.

Note!

- The sensorless torque control only operates in motor mode, not in generator mode.
- The motor parameter identification is absolutely vital! Otherwise commissioning is not possible.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	**Name**	**Lenze**	**Selection**		
C0014 ENTER	Operating mode	2	2 V/f characteristic control V ~ f (Linear characteristic with constant V_{min} boost)	• Commissioning without motor parameter identification possible • Benefit of identification with C0148: – Improved smooth running at low speed – V/f rated frequency (C0015) and slip (C0021) are calculated and stored. They do not have to be entered	📖 10.3-1
			3 V/f characteristic control V ~ f^2 (Square-law characteristic with constant V_{min} boost)		
			4 Vector control	**For initial selection enter the motor data and identify the motor parameters with C0148** **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)		
C0047*	Torque setpoint or torque limit value (MCTRL1-MSET)	400	0 {1 %} 400 Ref.: Rated motor torque detected by motor parameter identification	**The value set will be lost when switching the mains!** Control mode ”Sensorless torque control” (C0014 = 5): • Torque setpoint selection if C0412/6 = FIXED-FREE (not assigned) • Torque setpoint display if C0412/6 is linked with a signal source Control mode ”V/f characteristic control” or ”Vector control” (C0014 = 2, 3, 4): • Torque limit value is displayed if C0412/6 is linked with a signal source • C0047 = 400 is displayed if C0412/6 = FIXED-FREE (not assigned)	📖 10.3-11
C0077*	Gain I_{max} controller	0.25	0.00 {0.01} 16.00 = P component not active		📖 10.11-1
C0078*	Integral action time I_{max} controller	65 → 130	12 {1 ms} 9990 = I component not active	→ Only 8200 vector 15 ... 90 kW	📖 10.11-1
C0087	Rated motor speed	→	300 {1 rpm} 16000	→ Depending on the controller	📖 10.9-1
C0088	Rated motor current	→	0.0 {0.1 A} 650.0	→ Depending on the controller 0.0 ... 2.0 x rated output current of the controller	📖 10.9-1

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0089	Rated motor frequency	50	10 {1 Hz} 960		10.9-1
C0090	Rated motor voltage	→	50 {1 V} 500	→ 230 V with 230 V controllers, 400 V with 400 V controllers	10.9-1
C0091	Motor cos φ	→	0.40 {0.1} 1.0	→ Depending on the controller	10.9-1
C0092	Motor stator inductance	0.0	0.000 {0.1 mH} 200.0		10.9-1
		0.00	0.00 {0.01 mH} 200.00	Only 8200 vector 15 ... 90 kW	
C0148* STOP	Motor parameter identification	0	0 Ready 1 Start identification • V/f-rated frequency (C0015), slip compensation (C0021) and motor stator inductivity (C0092) are calculated and saved. • The motor stator resistance (C0084) = total resistance of motor cable and motor is measured and saved	**Only when the motor is cold!** 1. Inhibit controller, wait until drive is in standstill 2. Enter the correct motor data under C0087, C0088, C0089, C0090, C0091 (see motor nameplate). 3. C0148 = set 1 by ENTER 4. Enable controller The identification – starts, IMP gets out – the motor makes a high-pitched tone, but does not rotate! – takes approx. 30 s – is completed when IMP is on again 5. Controller inhibit	10.9-1

Setting of torque control

Use C0014 = 5 to set the operating mode ”sensorless torque control”.

Linking setpoint and selecting speed limitation

Link an external setpoint source with the torque setpoint via C0412/6. (10.12-1)

Select the type of speed limitation. The speed is limited via setpoint 1 or the maximum frequency:

- Setpoint 1, if C0412/1 is linked with a setpoint source.
- Maximum frequency, if C0412/1 is not assigned.

Preparing motor parameter identification

You must enter the motor data of the motor nameplate:

- Rated motor speed (C0087)
- Rated motor current (C0088)
- Rated motor frequency (C0089)
- Rated motor voltage (C0090)
- Motor cos φ (C0091)

Motor parameter identification

Carry out the motor parameter identification. (10.9-1)

Automatically detected parameters

V/f-rated frequency (C0015), slip compensation (C0021) and motor stator inductivity (C0092) are calculated and saved. The total resistance of motor cable and motor is measured and saved as motor stator resistance (C0084).

Optimising the sensorless torque control

In general, the sensorless torque control is ready for operation after the motor parameters have been identified. The drive performance can be optimised by manually setting several parameters:

Drive performance	Remedy
Torque is not constant	Reduce motor inductance (C0092) by approx. 10 ... 20 %. Idle current and maximum current decrease.
Drive does not accelerate from standstill	Raise the torque setpoint to 20 ... 25 %.
Controller is not able to follow the quick load changes	Adapt gain C0077) and adjustment time (C0078) of the I_{max}-controller: • Reduction of C0078 = I_{max} controller becomes quicker (more dynamic) • Increase of C0078 = I_{max} controller becomes slower (”smoother”)

Tip

- The minimum torque setpoint must not fall below 10 % (setting range 1 : 10).
- The motor may stall at operation with output frequencies < 3 Hz. If so, reset the internal control by quickly switching the controller inhibit.
- If C0412/6 is combined with an analog signal source it is possible to display the torque setpoint under C0047.
- If C0412/6 is not combined with an analog signal source (FIXED-FREE) it is possible to select the torque setpoint under C0047. Please note:
  – When disconnecting the mains, the value set will be lost!
  – Before releasing the controller it is absolutely necessary at the restart to select the correct setpoint under C0047. Otherwise the drive would start with the maximum torque.

Note!

In the control modes ”V/f characteristic control” and ”vector control” the signal combined with C0412/6 or C0047 act as a torque limitation.

10.4 Optimising the operating behaviour

10.4.1 Slip compensation

Description

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

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0021	Slip compensation	0.0	-50.0	{0.1 %}	50.0	C0021 is calculated and stored under C0148 when the motor parameters are identified	🕮 10.4-1

Automatic adjustment

The slip compensation is calculated during the motor parameter identification and entered under C0021.

Preparing motor parameter identification

You must enter the motor data of the motor nameplate:

- Rated motor speed (C0087)
- Rated motor current (C0088)
- Rated motor frequency (C0089)
- Rated motor voltage (C0090)
- Motor cos φ (C0091)

Motor parameter identification

Carry out the motor parameter identification. (🕮 10.9-1)

Automatically detected parameters

V/f-rated frequency (C0015), slip compensation (C0021) and motor stator inductivity (C0092) are calculated and saved. The total resistance of motor cable and motor is measured and saved as motor stator resistance (C0084).

Manual adjustment

The slip compensation must only be set if the motor parameter identification is not carried out. For this purpose the slip compensation initially must be coarsely adjusted on the basis of the motor data. The fine adjustment is made empirically during operation:

Coarse adjustment

1. Coarsely detect slip compensation and enter under C0021:

$s = \frac{n_{rsyn} - n_r}{n_{rsyn}} \cdot 100\ \%$	s	Slip constant (C0021) [%]
	r_{rsyn}	Synchronous motor speed [min^{-1}]
	r_r	Rated motor speed to motor nameplate [min^{-1}]
$n_{rsyn} = \frac{f_r \cdot 60}{p}$	f_r	Rated motor frequency to motor nameplate [Hz]
	p	No. of pole pairs (1, 2, 3, ...) of the motor
$n_{rsyn} = \frac{50Hz \cdot 60}{2} = 1500\ min^{-1}$ $s = \frac{1500\ min^{-1} - 1435\ min^{-1}}{1500\ min^{-1}} \cdot 100\ \% = 4.33\ \%$	Example for 4-pole motor / 1435 min^{-1} / 50 Hz: Preset C0021 = 4.3 %	

Fine adjustment

2. Correct C0021 during operation until no load-dependent speed drop occurs in the required speed range between idle running and maximum motor load. The following is regarded as the standard value for the correctly adjusted slip compensation:
   – Deviation of the rated speed ≤ 0.5 % for an output frequency of 5 ... 50 Hz (87 Hz)
   – Greater deviations are possible in the field weakening range

Note!

If C0021 is set too high, the drive can get instable.

Tip

- Set C0021 = 0.0 for speed control with internal process controller.
- Negative slip (C0021 < 0) at V/f characteristic control causes a “smoother” drive behaviour with high load impacts or multi-motor applications.

10.4.2 Inverter chopper frequency

Description

The chopper frequency of the inverter influences the concentricity behaviour, the power loss in the controller and the noise generated in the connected motor. The Lenze setting of 8 kHz is the optimum value for standard applications. The following rule of thumb applies:

The lower the chopper frequency

- the lower the power loss.
- the higher the noise generation.
- the quality of concentricity.

In addition it is possible to adjust whether the chopper frequency is changed to 4 kHz, if the heatsink temperature amounts to only 5°C below the permissible maximum temperature. With this measure you avoid that the drive will be inhibited through the fault ”overtemperature” and the motor will coast without torque.

Note!

Please consider that, when operating with a chopper frequency of 16 kHz, the output current must be reduced to prevent the controller from being overheated (derating).

You must adapt the current limiting values (C0022 and C0023) so that the current indicated in the technical data will not be exceeded.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	**Name**	**Lenze**	**Selection**				
C0018 ENTER	Chopper frequency	2	0	2 kHz sin		General rule: The lower the chopper frequency • the lower the power loss • the higher the noise generation • the better the smooth running quality **Medium-frequency motors are only allowed to be operated at 8 kHz sin or 16 kHz sin (C0018 = 2 or 3)!**	📖 10.4-3
			1	4 kHz sin			
			2	8 kHz sin	low noise generation		
			3	16 kHz sin			
C0018 ENTER	Chopper frequency (only 8200 vector 15 ... 90 kW)	6	0	2 kHz sin		General rule: The lower the chopper frequency • the lower the power loss • the higher the noise generation • the better the smooth running quality **Medium-frequency motors are only allowed to be operated at 8 kHz sin or 16 kHz sin (C0018 = 2 or 3)!**	📖 10.4-3
			1	4 kHz sin			
			2	8 kHz sin	low noise generation		
			3	16 kHz sin			
			4	2 kHz			
			5	4 kHz	low power loss		
			6	8 kHz			
			7	16 kHz			
			8	1 kHz sin			
			9 ... 11	Reserved			
			12	1 kHz f_top	low power loss		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0144 ENTER	No temperature depending chopper frequency derating	1	0	No temperature-depending chopper frequency derating	When operating with a chopper frequency of 16 kHz it is also possible to derate it to 4 kHz. The behaviour can be changed under C0310.	10.4-3
			1	Automatic chopper frequency derating to 4 kHz, if $\vartheta_{max\ reaches}$ - 5 °C		

Automatic chopper frequency reduction

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

If the maximum heatsink temperature (ϑ_{max} is exceeded when using a chopper frequency of 8 kHz or 16 kHz) the inverter will be inhibited, TRIP ”OH” (overtemperature) will be set and the motor will coast to standstill.

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

- If the heatsink temperature ϑ_{max} - 5 °C is reached when using a chopper frequency of 8 kHz or 16 kHz the controller automatically reduces the chopper frequency to 4 kHz thus keeping the operation running.
- After cooling the heatsink the controller automatically changes to the chopper frequency set.

Note!

The chopper frequency is automatically set to its optimum value depending on the apparent motor current and output frequency to ensure trouble-free operation.

- The noise emission changes.
- The user cannot influence this function.

Tip

Medium-frequency motors are only allowed to be operated on 8 kHz sin or 16 kHz sin.

10.4.3 Oscillation damping

Description

Suppression of idling oscillations when:

- the rated power of controller and motor of a drive do not match, e.g. at 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 show this behaviour when being operated with an output frequency of approx. 20 ... 40 Hz. As a result, operation can be instable (current and speed fluctuations).

Function library

Optimising the operating behaviour

Oscillation damping

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0079	Oscillation damping	2	0	{1}	140		📖 10.4-4

Adjustment

1. Approach with speed oscillations.
2. Reduce the speed oscillations by changing C0079 step by step. Additional indicators for smooth running can be:
   – uniform motor current
   – reduction of mechanical vibrations in the bearing seat

Note!

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

10.4.4 Skip frequencies

Description

With certain output frequencies, mechanical resonances might occur (e. g. fan).The skip frequencies suppress these unwanted output frequencies. The bandwidth (Δf) determines the skip frequency range.

The function is in the block NSET1 before the ramp function generator.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0625*	Skip frequency 1	0.00	0.00	{0.02 Hz}	650.00		10.4-6
C0626*	Skip frequency 2	0.00	0.00	{0.02 Hz}	650.00		
C0627*	Skip frequency 3	0.00	0.00	{0.02 Hz}	650.00		
C0628*	Bandwidth of skip frequencies	0.00	0.00	{0.01 %}	100.00	Applies to C0625, C0626, C0627	

Adjustment

Note!

- Skip frequencies only effect main setpoints.
- C0625, C0626, C0627, C0628 are the same for all parameter sets.

- Set the required skip frequencies under C0625, C0626, C0627.
- C0628 defines the bandwidth for skip frequencies.
  – Calculation of bandwidth (Δf) for the respective skip frequency:

$$\Delta f\,[\mathrm{Hz}] = 2 \cdot f_s\,[\mathrm{Hz}] \cdot \frac{\mathrm{C0628}\,[\%]}{100\,\%}$$

f_s Skip frequency

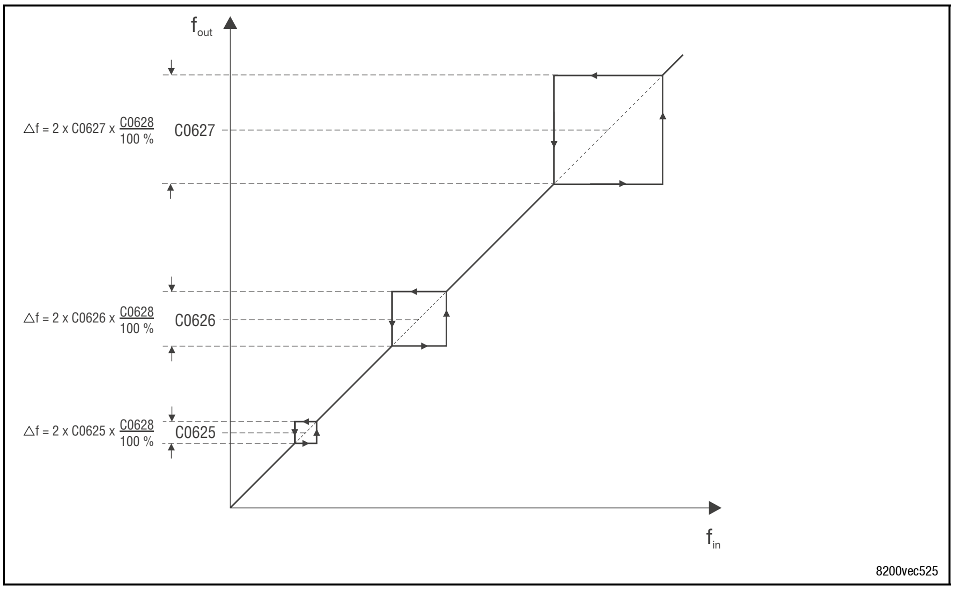


Fig. 10.4-1 Effect of the skip frequencies

f_{in}	Input frequency of the function
f_{out}	Output frequency of the function

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

10.5.1 Start conditions/flying-restart circuit

Description

Determines the controller behaviour after a restart after controller inhibit, mains switching or a mains failure.

With activated flying-restart circuit the controller automatically synchronises to a coasting motor after mains disconnection or adds a setpoint signal.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	**Name**	**Lenze**	**Selection**			
C0142 ENTER	Start condition	1	0	Automatic restart after mains connection inhibited Flying restart not active	Start after HIGH-LOW-HIGH changes at X3/28	📖 10.5-1
			1	Automatic start, if X3/28 = HIGH Flying restart circuit not active		
			2	Automatic restart after mains connection inhibited Flying-restart circuit active	Start after HIGH-LOW-HIGH changes at X3/28	
			3	Automatic start, if X3/28 = HIGH Flying restart circuit active		
C0143* ENTER	Selection of flying-restart	0	0	Max. output frequency (C0011) ... 0 Hz	Motor speed selected for the indicated range	📖 10.5-1
			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)		

Drive behaviour without flying-restart circuit

Manual start (C0142 = 0):

After mains interruption the drive only restarts after a LOW/HIGH level change at the ”Controller inhibit” terminal (X3/28).

Automatic start (C0142 = 1)

After mains interruption the drive only restarts if a HIGH level is applied to the ”controller inhibit”terminal (X3/28).

The controller sets all integrators to zero and releases them again.

Drive behaviour with flying-restart circuit

Manual start with flying-restart circuit (C0142 = 2)

After mains interruption the drive only restarts after a LOW/HIGH level change at the ”Controller inhibit” terminal (X3/28).

Automatic start with flying-restart circuit (C0142 = 3)

After mains interruption the drive only restarts if a HIGH level is applied to the ”controller inhibit”terminal (X3/28).

Flying restart

With the selection of the flying restart(C0143) you define whether the controller searches for the motor speed after the restart or adds a signal.

Searching for the motor speed (C0143 = 0, C0143 = 1)

The drive starts if the momentary motor speed has been found. The acceleration is steady and smooth

Note!

- The flying-restart circuit must not be used if several motors with different rotating masses are connected to a controller.
- The flying restart method is safe and reliable for drives with great rotating masses.
- With machines with low moments of inertia and small friction, the motor can restart for a short time or reverse after controller enable.

- The controller only searches the given direction of rotation.
- The controller calculates the output frequency required for the current speed of the idling motor, is connected and accelerates the motor until it reaches its setpoint.

Adding a signal (C0143 = 2, C0143 = 3)

The controller adds the output frequency corresponding to the frequency setpoint or the actual process controller value.

Note!

The actual process controller value must only be set if a speed-proportional signal is available in C0412/5!

Tip

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** for the first mains connection.

10.5.2 Controller inhibit

Description

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

- The drive idles to standstill without torque.
- Keypad status display: Pulse inhibit IMP
- Status display of the controller: The green LED is blinking.

Danger!

Do not use controller inhibit (DCTRL1-CINH) as emergency off.
The controller inhibit only inhibits the power outputs and does **not** disconnect the controller from the mains!

The drive could restart any time.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0040* ENTER	Controller inhibit (CINH)		-0-	controller inhibited (CINH)	Controller can only be enabled if X3/28 = HIGH	10.5-3
			-1-	Controller enabled (CINH)		

Activation

- Via terminal X3/28:
  – LOW level at the terminal activates the controller inhibit (cannot be inverted)
  – HIGH level releases the controller again
- Via digital signal (linking C0410/10 with a signal source):
  – LOW level at the signal source activates the controller inhibit (level inversion is possible with C0411)
  – HIGH level releases the controller again
- Via keypad (condition: C0469 = 1):
  – STOP activates the controller inhibit
  – RUN releases the controller again
- Via code C0040:
  – C0040 = 0 activates the controller inhibit
  – C0040 = 1 releases the controller again

Note!

- The sources for controller inhibit are ANDed, i. e. the drive only restarts when the controller inhibit is cancelled at all signal sources.
- The restart begins with an output frequency of 0 Hz, i.e. if the flying-restart circuit is not activated, still rotating masses can lead to generative overload.

10.5.3 Controlled deceleration after mains failure/mains disconnection

Description

Note!
- The function can be used for a rated controller power of maximally 1.5 kW.
- The deceleration time until standstill cannot be defined. It depends on the machine/system components (moment of inertia, friction,...). .

Controlled motor deceleration to standstill (f = 0) in the event of a mains disconnection or mains failure.

The function can be used with or without external brake resistor:

This function prevents the motor from coasting at emergency off (controller is disconnected from the mains).

Without brake resistor

Without external brake resistor
- Controlled motor deceleration to standstill (f = 0) when controller is active.
- The brake energy comes from system losses (controller and motor).

With brake resistor

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

Function procedure

1. The mains voltage is interrupted.
2. The DC-bus voltage (U_{DC}) falls below the value under C0988 ⇒ the controller switches to parameter set 1.
3. The drive decelerates along the quick-stop ramp (C0105 in parameter set 1).
4. By operating in generator mode, U_{DC} will be greater than the value under C0988 ⇒ the controller switches to parameter set 2.
5. The motor accelerates along the acceleration ramp (C0012 in parameter set 1).
6. When the DC-bus voltage falls below the value under C0988 the ”loop” restarts at 2.

The ”loop” 2. to 6. is repeated until the motor speed is approx. 0, since the rotational energy in the motor keeps up V_{DC} .

If the motor is not at standstill when the mains is reconnected, the drive will accelerate to the selected setpoint (C0012) along the acceleration ramp. The drive starts immediately. The transition to the restart is ”harder” than in the flying-restart circuit.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0988*	DC-bus voltage threshold for DC-bus voltage control	0	0 Parameter set changeover via DC-bus voltage deactivated	{1 %}	200	• Changeover always between PAR1 nd PAR2 • Parameter set changeover is not possible via terminal, bus or PC if C988 > 0!	10.5-4 10.7-8

Adjustment

Parameter	Code	Parameter set 1 (active in the event of mains failure)	Parameter set 2 (active in normal operation)
Changeover threshold	C0988	Set C0988 to approx. 10 % undervoltage: AC 230 V ⇨ C0988 = 75 ... 85 % AC 400 V ⇨ C0988 = 75 ... 85 % AC 460 V ⇨ C0988 = 75 ... 98 %	
Terminal configuration	C0410	Link C0410/4 (DCTRL1-QSP) with a digital input (X3/E1 ... X3/E6).	Set terminal configuration for normal operation.
Quick stop (QSP) is active in normal operation		Invert this input under C0411. (Lenze setting = LOW active)	Link the digital input linked with DCTRL1-QSP in parameter set 1 with DCTRL1-QSP (not inverted), too, and connect the digital input.
No quick stop (QSP) in normal operation		Do not use this input.	Do not use the digital input linked with DCTRL1-QSP in parameter set 1.
Deceleration time for quick stop (QSP)	C0105	**Without external brake resistor** 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 parameter set 2. 2. Switch off the mains voltage. – Parameter set 1 is activated. – Observe whether the controller indicates “Overvoltage OU” during controlled deceleration. 3. Repeat the controlled deceleration and reduce C0105 until the controller indicates ”OU”. 4. Increase this value by approx. 20 % and use it as final setting.	Set the QSP deceleration time required for this application.
		With external brake resistor Select a sufficiently high external brake resistance. 1. Set C0105 as in parameter set 2. 2. Reduce C0105 until the required deceleration time after mains switch-off is available.	

Tip

The smoothest deceleration can be achieved by setting the max. limit of the bandwidth set under C0988.

The current limit in generator mode must not be exceeded during controlled deceleration.

Note!

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

10.6 Limit value setting

10.6.1 Speed range

Description

The speed setting range required for the application can be set via the selection of output frequencies:

- The minimum output frequency (C0010) corresponds to the speed at 0 % speed setpoint selection.
- The maximum output frequency (C0011) corresponds to the speed at 100 % speed setpoint selection.
- The lower frequency limitation (C0239) sets the speed. Independently of the setpoint, the value cannot fall below this speed (e.g. for fans, dancer position control, or dry running protection for pumps).

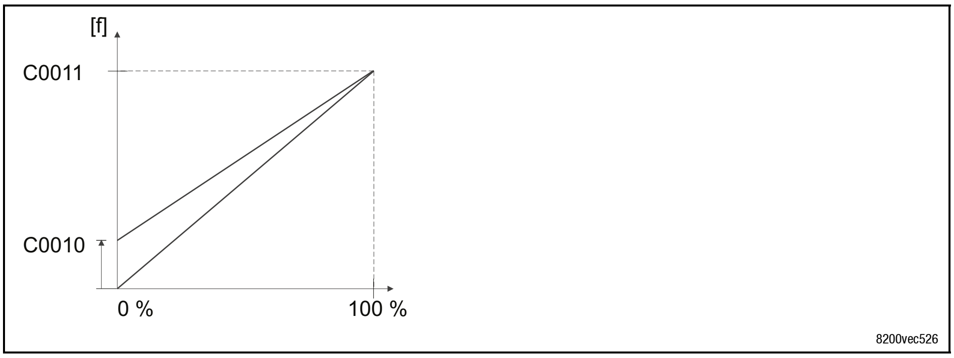


Fig. 10.6-1 Relation between setpoint and minimum and maximum output frequency

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	**Name**	**Lenze**	**Selection**				
C0010 uSEr	Minimum output frequency	0.00	0.00 → **14.5 Hz**	{0.02 Hz}	650.00	• C0010 is not effective with bipolar setpoint selection (-10 V ... + 10 V) • C0010 only defines the analog input 1 → **Speed setting range 1 : 6 for Lenze geared motors:** Setting absolutely required for operation with Lenze geared motors.	🕮 10.6-1
C0011 uSEr	Maximum output frequency	50.00	7.50 → **87 Hz**	{0.02 Hz}	650.00		
C0239	Lowest frequency limit	-650.00	-650.00	{0.02 Hz}	650.00	• The value does not fall below limit independently of the setpoint. • If the minimum frequency limitation is active, the automatic DC-injection brake (auto DCB) must be deactivated (C0019 = 0 or C0106 = 0).	🕮 10.6-1
C0236 (A)	Acceleration time - minimum frequency limitation	0.00	0.00	{0.02 s}	1300.00	Ref. to C0011 Minimum frequency limitation = C0239	🕮 10.6-1

Adjustment

Relation between output frequency and synchronous speed of the motor:

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

r_{rsyn}	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

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

C0010

”Minimum output frequency” characteristics:

- C0010 is approached via the acceleration ramp.
- C0010 has no effect
  – on the analog input 2 of the application I/O.
  – when the setpoint is selected via frequency input.
- C0010 $\geq$ C0011:
  – C0011 is approached via the acceleration ramp regardless of the selected analog setpoint.
  – The output frequency is limited to C0011.
  – The analog input gain must be set to zero (C0027 = 0), to ensure a trouble-free operation.

C0011

”Maximum output frequency” characteristics:

- When selecting fixed setpoint (JOG) C0011 acts as limitation.
- C0011 is an internal normalisation variable! Bigger changes should only be made when the controller is inhibited!

STOP

Stop!

Set C0011 so that the maximum permissible motor speed will not be exceeded.
Otherwise the motor can be destroyed.

C0239

”Lower frequency limitation” characteristics:

- When using standard I/O, C0239 is approached without acceleration ramp (jolt!). When using application I/O, C0236 can be used to set an acceleration time for C0239.
- C0239 = 0.00 Hz only allows one direction of rotation.

Tip

- For output frequencies > 300 Hz, chopper frequencies < 8 kHz must be avoided.
- The display values of C0010 and C0011 can be related to a process variable under C0500 and C0501.

10.6.2 Current limits

Description

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 C0023 for generator load. If the current limit is exceeded, the controller will change its dynamic behaviour:

Controller performance when a limit value is reached

Motor overload during acceleration:

The controller prolongs the acceleration ramp.

Generator overload during deceleration:

The controller prolongs the deceleration ramp.

With increasing load and constant speed:

- When the current limit of the motor mode is reached:
  - The controller reduces the output frequency to 0 Hz.
  - The controller cancels the change of the output frequency if the load falls below the limit value.
- When the current limit in the generator mode is reached:
  - The controller increases the output frequency up to the maximum frequency (C0011).
  - The controller cancels the change of the output frequency if the load falls below the limit value.
- If suddenly a load is applied to the motor shaft (e.g. drive is blocked), the overcurrent switch-off can be activated (error message OCX).

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	**Name**	**Lenze**	**Selection**				
C0022	I_{max} limit (motor mode)	150	30	{1 %}	150	Only 8200 vector 15 ... 90 kW: If C0022 = 150 %, 180 % I_r are available for max. 3 s. after controller enable	📖 10.6-3
C0023	I_{max}-limit in the generator mode	150	30	{1 %}	150	C0023 = 30 %: function is inactive, if C0014 = 2, 3:	📖 10.6-3

Adjustment

- Set the acceleration and deceleration times so that the drive can follow the speed profile without reaching I_{max} of the controller.
- C0022 and C0023 refer to the rated output current at a chopper frequency of 8 kHz.
- When operating with a chopper frequency of 16 kHz you must adapt C0022 and C0023 to the permissible output currents (derating).
- Correct current control for operation in generator mode is only possible with external brake resistor.

C0023 = 30 %

At V/f characteristic control the current-limit controller is not active for the operation in generator mode with C0023 = 30%:

- Possibly reasonable in applications with medium frequency asynchronous motors if motor and generator mode cannot be detected as fault-free.
- Drive behaviour in case of motor and generator overload (C0054 > C0022):
  – The controller reduces the output frequency to 0 Hz.
  – The controller cancels the change of the output frequency if the load falls below the limit value.

10.7 Acceleration, deceleration, braking, stopping

10.7.1 Setting of acceleration times, deceleration times and S-shaped ramps

Description

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

The ramp function generator for the main setpoint can be set linearly or S-shaped. The S-shape selection of the main setpoint enables the drive to start and stop smoothly.

When operating with application I/O three additional deceleration times and acceleration times can be activated via digital signals.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0012 uSEr	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	📖 10.7-1
C0013 uSEr	Deceleration time main setpoint	5.00	0.00	{0.02 s}	1300.00	Reference: frequency change C0011 ... 0 Hz • Additional setpoint ⇨ C0221 • Deceleration times to be activated via digital signals ⇨ C0103	📖 10.7-1
C0101 (A)	Main setpoint acceleration times						📖 10.7-1
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 active time pair	
2	T_{ir} 1	2.50					
3	T_{ir} 2	0.50					
4	T_{ir} 3	10.00					
C0103 (A)	Main setpoint deceleration times					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					
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)	📖 10.7-1
C0220*	Acceleration time - additional setpoint (PCTRL1-NADD)	5.00	0.00	{0.02 s}	1300.00	Main setpoint ⇨ C0012	📖 10.7-1
C0221*	Deceleration time - additional setpoint (PCTRL1-NADD)	5.00	0.00	{0.02 s}	1300.00	Main setpoint ⇨ C0013	

Adjustment

- The acceleration and deceleration times refer to an output frequency change from 0 Hz to the max. output frequency set under C0011.
- Calculate the times T_{ir} and T_{if}, which must be set under C0012 and C0013.

$T_{ir} = t_{ir} \cdot \frac{C0011}{f_2 - f_1}$ $T_{if} = t_{if} \cdot \frac{C0011}{f_2 - f_1}$	t_{ir} and t_{if} are the times required for the change between f_1 and f_2:

Note!

If the acceleration and deceleration times are set too short the controller may switch off with TRIP OC5 under unfavorable service conditions. 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.

Linear ramp setting

C0182 = 0.00: Linear ramp function generator operation for the main setpoint.

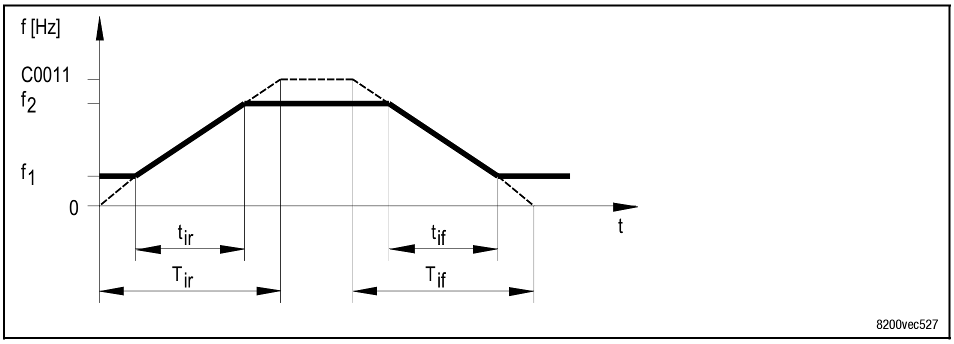


Fig. 10.7-1 Acceleration times and deceleration times for linear ramp function generator

S-shaped ramp setting

C0182 > 0.00: S–shaped (smooth) ramp function generator operation for the main setpoint.

- The value of C0182 determines the shape of the S-curve.
- C0182 has no effect on the additional setpoint (PCTRL1-NADD).

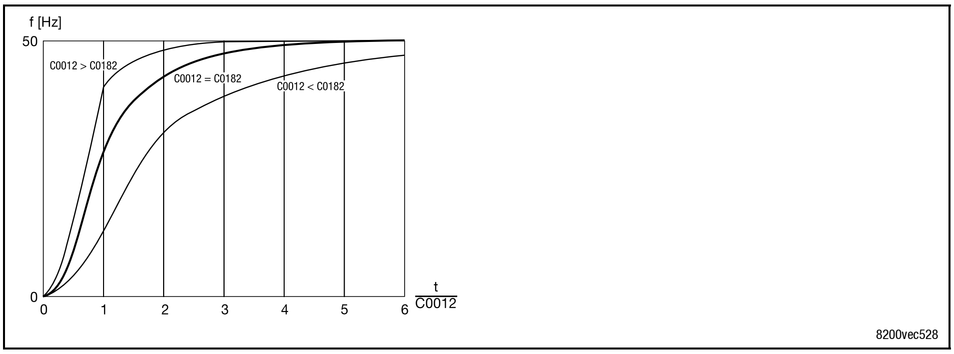


Fig. 10.7-2 Acceleration times and deceleration times for linear ramp function generator

Note!

- The ramp function generator operation in the parameter sets must not differ as C0182 is the same in all parameter sets.
- The S-shaped ramp also has an effect on the deceleration time for quick stop!

Special functions for the ramp function generator

Setting the ramp function generator to 0

The ramp function generator input of the main setpoint can be set to 0 under C0410/6:

- The main setpoint decelerates to 0 Hz along the deceleration ramp (C0013) as long as the function is active.
- With setpoint summation or in controlled operation the drive can continue to run.

Stopping the ramp function generator

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.

10.7.2 Quick stop

Description

Quick stop decelerates the drive to standstill according to the deceleration time set under C0105, as soon as the signal DCTRL1-QSP is activated.

If the output frequency falls below the threshold C0019, the automatic DC injection brake (DCB) is activated. After the holding time (C0106) the controller sets pulse inhibit (display: IMP).

Quick stop acts on

- the main setpoint (NSET1-N1, NSET1-N2).
- the additional setpoint (PCTRL1-NADD).
- the process controller setpoint 1 (PCTRL1-SET1) (only application I/O).

Note!

The S-shaped ramp (C0182) has also an effect on quick stop! Therefore the real deceleration time is longer than set under C0105.

Reduce the time setting under C0105 to reach the desired deceleration time for quick stop.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0105	Deceleration time quick stop (QSP)	5.00	0.00	{0.02 s}	1300.00	• Quick stop (QSP) decelerates the drive to standstill according to the ramp set under C0105. • If the output frequency falls below the threshold C0019, the DC-injection brake (DCB) will be activated. • The S-shaped ramp (C0182) has also an effect on quick stop! – Reduce the time setting under C0105 to reach the desired deceleration time for quick stop. – The S-shaped ramp for the quick stop can be switched off under C0311 (as of software 3.1).	🕮 10.7-4
C0019	Threshold for automatic DC-injection brake (Auto DCB)	0.10	0.00 = not active	{0.02 Hz}	650.00	Holding time ⇨ C0106 Deactivate the automatic DC injection brake when the minimum frequency limit C0239 is active	🕮 10.7-6
C0106	Holding time for automatic DC-injection brake (Auto DCB)	0.50	0.00 = auto DCB not active	{0.01 s}	999.00 = ∞	Holding time, if DC-injection brake is activated because the value falls below the setting under C0019.	🕮 10.7-6

Activation

Via digital signal:

C0410/4 must be combined with digital signal source.

- LOW level at the signal source activates quick stop
- Level inversion with C0411 is possible

Note!
Quick stop can also be activated when using the function ”fail-safe change of the direction of rotation”. (📖 10.7-5)
In addition to the free configuration under C0410 you can also use the fixed assignment under C0007 to combine the function with a digital input.

Via keypad:

Assign the key with the quick stop function (C0469 = 2):

– STOP activates quick stop
– RUN restarts the drive

10.7.3 Change of direction of rotation

Description

Change of direction of motor rotation via digital control signals. Only the main setpoint is changed over.

The direction of rotation can be changed in two ways, fail-safe or nonfail-safe. According to the selected type of change-over the controller brakes the motor to 0 Hz along the deceleration ramp or quick-stop ramp to accelerate the motor in the other direction of rotation along the acceleration ramp.

The change-over time depends on the ramp times set for the main setpoint or quick stop.

Activating nonfail-safe change

Nonfail-safe change of the direction of rotation

C0410/3 must be linked with a digital signal source.

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

If all connections are correct in phase and the signal is HIGH-active, the direction of rotation will be:

- LOW = CW rotation
- HIGH = CCW rotation

Note!
The drive can reverse the direction of rotation in the event of a control-voltage failure or an open circuit.

Activating fail-safe change

Fail-safe change of the direction of rotation

Link C0410/22 **and** C0410/23 with a signal source each.

When the direction of rotation is changed the drive brakes along the quick-stop ramp (C0105) and accelerates along the acceleration ramp (C0012) in the other direction of rotation.

If all connections are correct in phase and the signal is HIGH-active, the direction of rotation will be:

Direction of rotation	Signal level at		Notes
	C0410/22 (DCTRL1-CW/QSP)	C0410/23 (DCTRL1-CCW/QSP)	
CCW rotation:	LOW	HIGH	
CW rotation:	HIGH	LOW	
Quick stop	LOW	LOW	
unchanged	HIGH	HIGH	• During operation: The direction of rotation results from the first active signal. • When switching on the mains: The controller activates quick stop (QSP).

Note!

In addition to the free configuration you can also use the fixed assignment under C0007 to link the function ”Change of direction of rotation” with a digital input.

10.7.4 DC braking (DCB)

Description

The DC-injection brake enables quick deceleration of the drive to standstill without using an external brake resistor. The DC-injection brake can be activated via terminal or automatically.

- The braking torque amounts to approx. 20 ... 30 % of the rated motor torque. It is lower than for braking in generator mode with external brake resistor.
- A brake voltage or a brake current can be selected.
- Automatic DC braking improves the starting performance of the motor e.g. when operating hoists.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0019	Threshold for automatic DC-injection brake (Auto DCB)	0.10	0.00 {0.02 Hz} 650.00 = not active	Holding time ➩ C0106 Deactivate the automatic DC injection brake when the minimum frequency limit C0239 is active	🕮 10.7-6
C0035* ENTER	DC injection brake (DCB) control mode	0	0 Brake voltage selection under C0036 1 Brake current selection under C0036	Holding time ➩ C0107	🕮 10.7-6
C0036	Voltage/current DC injection brake (DCB)	→	0.00 {0.01 %} 150.00 %	→ Depending on the controller • Reference M_r, I_r • Setting applies to all mains voltages permitted	🕮 10.7-6

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0106	Holding time for automatic DC-injection brake (Auto DCB)	0.50	0.00 = auto DCB not active	{0.01 s} 999.00 = ∞	Holding time, if DC-injection brake is activated because the value falls below the setting under C0019.	10.7-6
C0107	Holding time DC injection brake (DCB)	999.00	1.00	{0.01 s} 999.00 = ∞	Holding time, if DC-injection brakes are activated via an external terminal or control word.	10.7-6
C0196* ENTER	Activation of auto–DCB	0	0	Auto-DCB active, if PCTRL1-SET3 < C0019		10.7-6
			1	Auto-DCB active, if PCTRL1-SET3 < C0019 **and** NSET1-RFG1-IN < C0019		

Adjustment

1. Select under C0035 whether you want to use a brake voltage or brake current.
2. Enter the brake voltage or brake current in per cent under C0036.
   – If C0035 = 0 the value indicated refers to the rated controller voltage.
   – If C0035 = 1 the value indicated refers to the rated controller current.
3. Select how to activate the DC-injection brake:
   – Via digital input signal (configuration with C0410/15)
   – Automatically when the value falls below the threshold set under C0019 (condition: C0106 > 0.00 s)

Activation via input signal

DC braking via input signal (DCB)

C0410/15 must be linked with a digital signal source.

At HIGH active inputs DC braking (DCB) is active as long as the signal is assigned to the HIGH level.

After the holding time (C0107) the controller sets pulse inhibit (display: IMP).

Note!

In addition to the free configuration under C0410 you can also use the fixed assignment under C0007 to combine the function with a digital input.

Automatic activation

Automatic DC braking (auto DCB)

1. Select the holding time >0.00 s under C0106:
   – The automatic DC braking (auto DCB) is active for the time set.
   – Afterwards, the controller sets pulse inhibit (display: IMP).
2. Select the conditions under C0196 for activating the automatic DC braking:
   – C0196 = 0: Auto DCB is active when the output frequency is lower than the operating threshold (C0050 < C0019)
   – C0196 = 1: Auto DCB is active when the output frequency is lower than the operating threshold (C0050 < C0019) **and** the setpoint is lower than the operating threshold (setpoint < C0019)
3. Set the threshold under C0019.

Note!
Overlong operation of DC braking with high brake current or high brake voltage can overheat the connected motor!

Tip

- Use C0019 to adjust the deadband in the setpoint. If the DC-injection brake is not to be active, set C0106 = 0.00 s.
- C0019 can be related to a process variable .

10.7.5 AC motor braking

Description

With the parameter set changeover in dependence of the DC-bus voltage, the AC motor braking can be used as alternative for DC braking (DCB). The AC motor braking is a braking method without external brake resistor for the control mode "V/f characteristic control with linear characteristic".

Note!
The AC motor braking can only be used with the control mode "V/f characteristic control with linear characteristic" (C0014 = 2).

- With mains voltages up to approx. AC 400 V shorter braking times can be reached than with the DC injection braking.
- The braking times for braking via an external brake resistor are approx. 33 % shorter than for AC motor braking.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0988*	DC-bus voltage threshold for DC-bus voltage control	0	0 Parameter set changeover via DC-bus voltage deactivated	{1 %}	200	• Changeover always between PAR1 nd PAR2 • Parameter set changeover is not possible via terminal, bus or PC if C988 > 0!	📖 10.5-4 📖 10.7-8

Adjustment

Parameter	Code	Parameter set 1 (active in normal operation)	Parameter set 2 (active in braking operation)
Changeover threshold	C0988	Set C0988 in accordance with the mains voltage: AC 230 V ⇨ C0988 = 112 % AC 400 V ⇨ C0988 = 112 % AC 440 V ⇨ C0988 = 123 % AC 460 V ⇨ C0988 = 129 % AC 480 V ⇨ C0988 = 134 % AC 500 V ⇨ C0988 = 140 %	
V/F-rated frequency	C0015	A value adapted to the drive, e.g. 50 Hz	Depending on the drive power up to min. 25% of the value under C0015 in parameter set 1: • Rule of thumb: 2.2 kW ⇨ 50 % • Decrease for lower drive power, increase for higher drive power. When operating with parameter set 2 the energy of motor will be reduced by overexcitation.
V_{min} boost	C0016	A value adapted to the drive, e.g. 5 %	Depending on the drive power up to 500% of the value under C0016 in parameter set 1: • Rule of thumb: 2.2 kW ⇨ factor 3 • Increase the factor for lower drive power, decrease the factor for higher drive power. When operating with parameter set 2 the energy of the motor will be reduced by overexcitation even in the lower speed range.
Deceleration time for quick stop when braking along the quick stop ramp:	C0105	Braking time required for AC braking	Deceleration time of the drive with max. inertia load without getting the message OU (overvoltage) during deceleration
Deceleration time for braking along the main setpoint ramp:	C0013		

Tip

The higher the mains voltage the longer the deceleration time for AC braking must be set in parameter set 1 to perform the AC motor braking. For this reason braking times with the DC injection brake are shorter at mains voltages > 400 V.

Note!

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

10.8 Configuration of analog and digital setpoints and actual values

10.8.1 Setpoint source selection

Description

Fixed setpoint source selection.

- C0001 = 0, 2: Setpoint source as described in the following. Link the setpoint source with the internal analog signal under C0412.
- C0001 = 1: Setpoint source is the parameter channel of AIF. The freely configurable signals are “switched off” (C0412/x = 0 or 255). The setpoint must be written to the codes which are assigned to the signals (see signal flow charts or description of C0412).
- C0001 = 3: Setpoint source is the process data channel of AIF. The setpoint is written to an AIF input word (AIF-IN.W1 or AIF-IN.W2). Link the AIF input word with the internal analog signal under C0412.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0001 ENTER	Selection of setpoint entry (operating mode)	0			• Changing C0001 will cause the changes mentioned below under C0412 and C0410, if no free configuration under C0412 was made before. • In the event that a free configuration was made under C0412 (verification = C0005 = 255), C0001 does not influence C0412 and C0410. The signals must be linked manually. • Free configuration under C0412 or C0410 does not change C0001! • The control can be realised via terminals or PC/keypad	10.8-1
			0	Setpoint entry via AIN1 (X3/8 or X3/1U, X3/1I)	• C0412/1 and C0412/2 are linked with the analog input 1(C0412/1 = 1, C0412/2 = 1). • C0410 is not changed.	
			1	Setpoint entry via keypad or parameter channel of an AIF bus module	• Under C0412 the linkage with the analog input is separated (C0412/1 = 255, C0412/2 = 255). • Setpoint selection via C0044 or C0046. • C0410 is not changed.	
			2	Setpoint selection via AIN1 (X3/8 or X3/1U, X3/1I)	• C0412/1 and C0412/2 are linked with the analog input 1 (C0412/1 = 1, C0412/2 = 1) • C0410 is not changed.	
			3	Setpoint selection via process channel of an AIF bus module	• C0001 = 3 must be set to select a setpoint via a process data channel of an AIF bus module (types 210x, 211x, 213x, 217x)! Otherwise the process data will not be evaluated. • C0412/1 and C0412/2 are linked with the analog input words AIF-IN.W1 and AIF-IN.W2 (C0412/1 = 10, C0412/2 = 11). • C0410/1 ... C0410/16 are linked with the single bit of the AIF control word (AIF-CTRL) (C0410/1 = 10 ... C0410/16 = 25)	

Note!

- With C0001 = 0, 1 or 2 the operation can start after the controller has been released.
- C0001 = 3 must be set to select a setpoint via a process data channel of an AIF bus module! Otherwise the process data will not be evaluated.
- With C0001 = 3 quick stop (QSP) is set after mains switch-on !
  – PC: Deactivate QSP using the control word C0135, bit 3 = 0.
  – Keypad: Set C0469 = -2-. RUN pressing.

10.8.2 Analog setpoints via terminal

Description

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

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0034* ENTER uSEr	Setpoint selection range Standard–I/O (X3/8)					Observe the switch position of the function module!	📖 10.8-3
		0	0	Unipolar voltage 0 ... 5 V / 0 ... 10 V Current 0 ... 20 mA			
			1	Current 4 ... 20 mA		Changing the direction of rotation is only possible with a digital signal.	
			2	Bipolar voltage -10 V ... +10 V		• Minimum output frequency (C0010) not effective • Individual adjustment of offset and gain	
			3	Current 4 ... 20 mA open-circuit monitored		TRIP Sd5, if I < 4 mA Changing the direction of rotation is only possible with a digital signal.	
C0034* ENTER (A) uSEr	Setpoint selection range Application I/O					Observe the jumper setting of the function module!	📖 10.8-3
1	X3/1U, X3/1I	0	0	Unipolar voltage 0 ... 5 V / 0 ... 10 V			
2	X3/2U, X3/2I		1	Bipolar voltage -10 V ... +10 V		Minimum output frequency (C0010) not effective	
			2	Current 0 ... 20 mA			
			3	Current 4 ... 20 mA		Changing the direction of rotation is only possible with a digital signal.	
			4	Current 4 ... 20 mA open-circuit monitored		Changing the direction of rotation is only possible with a digital signal. TRIP Sd5 if I < 4 mA	
C0026*	Offset analog input 1 (AIN1–OFFSET)	0.0	-200.0	{0.1 %}	200.0	• Settings for X3/8 and X3/1U, X3/1I • The max. limit of the setpoint value range of C0034 equals 100 % • C0026 and C0413/1 are identical	📖 10.8-3
C0027*	Gain analog input 1 (AIN1-GAIN)	100.0	-1500.0	{0.1 %}	1500.0	• Settings for X3/8 and X3/1U, X3/1I • 100.0 % = Gain 1 • Inverse setpoint selection by negative gain and negative offset • C0027 and C0414/1 are identical	📖 10.8-3
C0413*	Offset analog inputs					The max. limit of the setpoint value range of C0034 equals 100 %	📖 10.8-3
1	AIN1-OFFSET	0.0	-200.0	{0.1 %}	200.0	Settings for X3/8 and X3/1U, X3/1I C0413/1 and C0026 are identical	
2	AIN2-OFFSET	0.0				Setting for X3/2U, X3/2I (application I/O only)	
C0414*	Analog input gain					• 100.0 % = Gain 1 • Inverse setpoint selection by negative gain and negative offset	
1	AIN1-GAIN	100.0	-1500.0	{0.1 %}	1500.0	Settings for X3/8 and X3/1U, X3/1I C0414/1 and C0027 are identical	
2	AIN2-GAIN	100.0				Setting for X3/2U, X3/2I (application I/O only)	

Code		Possible settings		IMPORTANT	
No.	**Name**	**Lenze**	**Selection**		
C0430* ENTER (A)	Automatic analog input adjustment	0	0 not active 1 Input point for X3/1U, X3/1I 2 Input points for X3/2U, X3/2I	Gain and offset are calculated by two points from the setpoint characteristic. Choose two points distant from each other to increase the calculation accuracy. 1. Select and input under C0430 which you want to calculate gain and offset for 2. Enter point 1 under C0431 X value (setpoint) and Y value (output frequency) 3. Enter point 2 under C0432 X value (setpoint) and Y value (output frequency) 4. Calculated values are automatically entered under C0413 (offset) and C0414 (gain)	🕮 10.8-3
C0431* ENTER (A)	Coordinates point 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* ENTER (A)	Coordinates point 2		-100.0 {0.1 %} 100.0		
1	X (P2)	100.0	Analog setpoint of P2 100 % = max. input value (5 V, 10 V or 20 mA)		
2	Y (P2)	100.0	Output frequency of P2 100 % = C0011		

Adjustment

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

> **Note!**
>
> In addition to the free configuration under C0412 it is also possible to select a fixed configuration under C0005.

2. Select the setpoint range under C0034.
3. Set the switch and jumper at the function module for the same range. Otherwise the setpoint signal cannot be interpreted correctly.
   – The setpoint signal is only evaluated in the setpoint range set (C0034), independently of the gain.
   – The minimum 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.
4. If necessary, adjust the gain (C0414)
   – The gain always affects setpoint signal and offset.
   – 100 % equals gain factor = 1.
   – Calculate the gain on the basis of two points of the setpoint characteristic and observe the signs of the coordinates:

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

5. If necessary, adjust the offset (C0413).
   – The offset shifts the characteristic.
   – A dead band can be set through the offset and if necessary via C0239 (lower frequency limit).
   – Calculate the offset from the calculated gain and one point of the setpoint characteristic and observe the signs of the coordinates:

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

> **Note!**
>
> - C0026, C0027, C0413 and C0414 are identical in all parameter sets.
> - At operation with application I/O the setpoint inputs can be adjusted automatically via C0430, C0431 and C0432:
>   – Select a setpoint input under C0430.
>   – Enter the coordinates of two points of the setpoint characteristic under C0431 and C0432.
>   – The calculated values are entered automatically as offset (C0413) and gain (C0414).

Unipolar setpoint selection

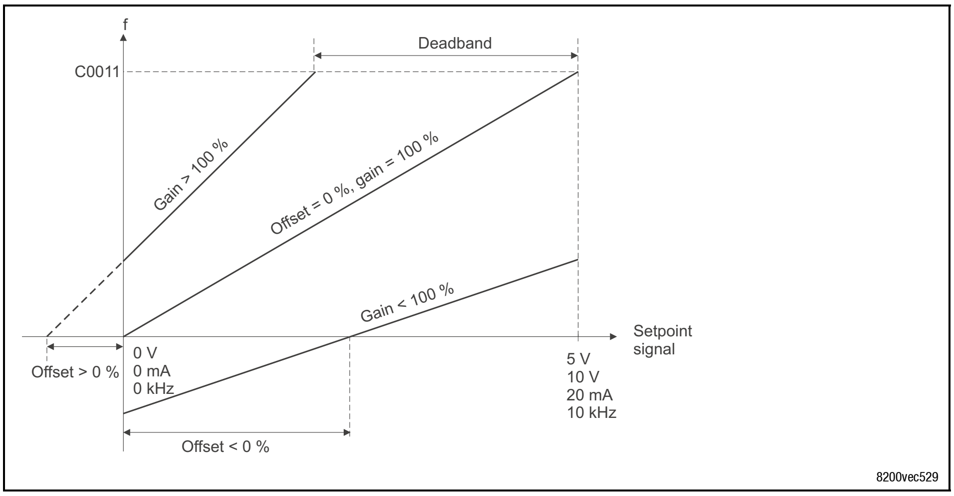


Fig. 10.8-1 Gain and offset at unipolar setpoint selection

Bipolar setpoint selection

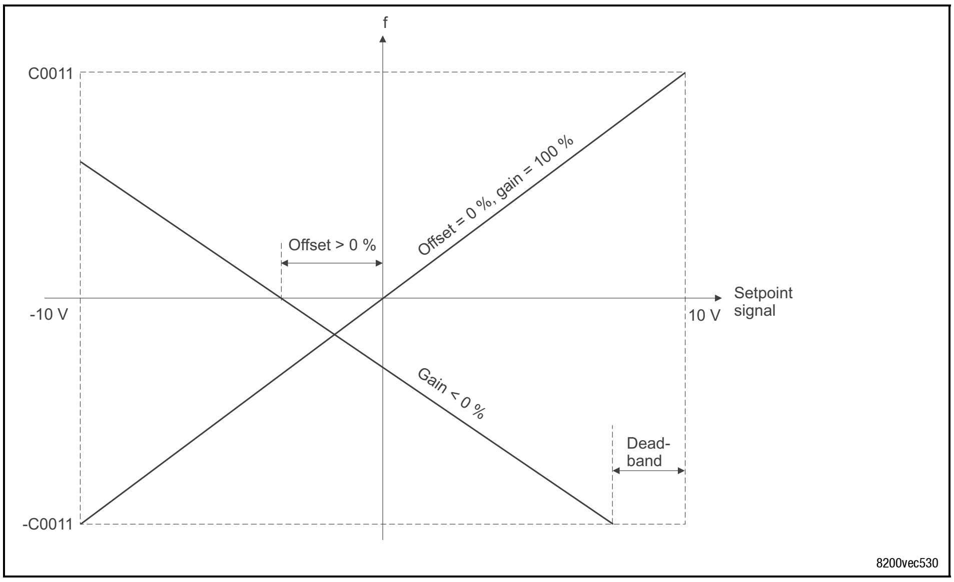


Fig. 10.8-2 Gain and offset at bipolar setpoint selection

Inverse setpoint selection

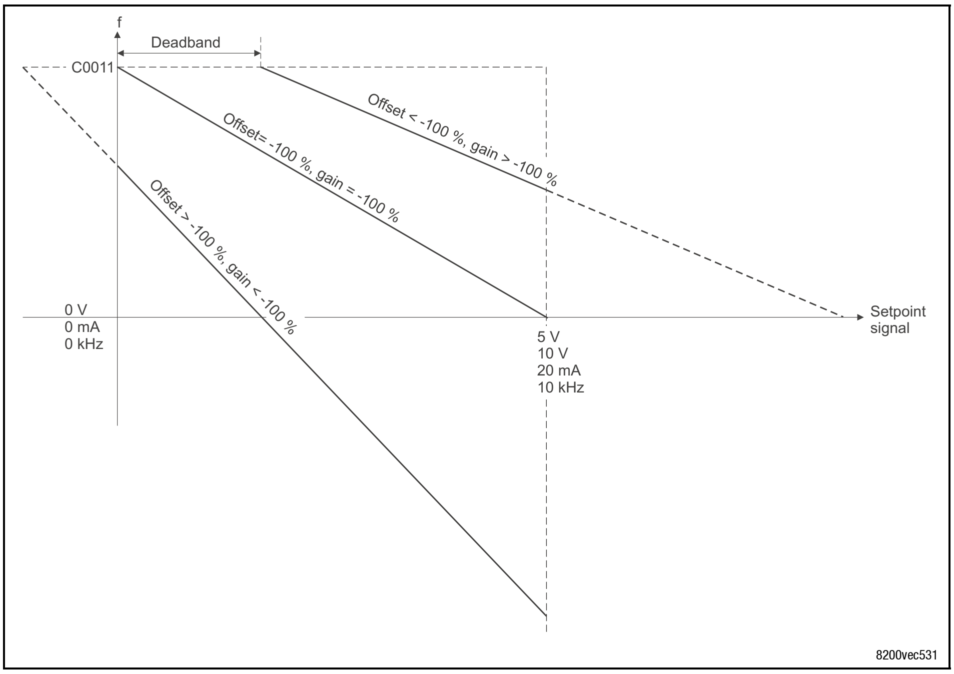


Fig. 10.8-3 Gain and offset at inverse setpoint selection

Example for inverse setpoint selection

Example for inverse setpoint selection

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

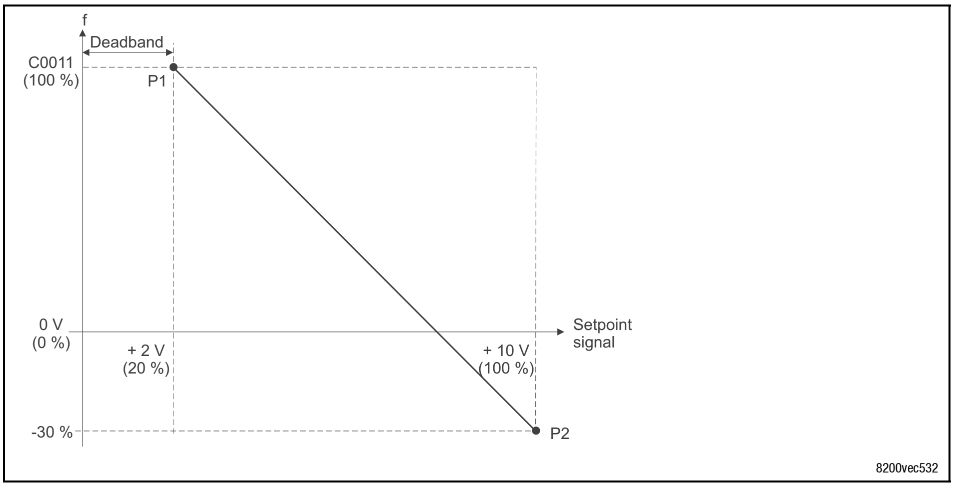


Fig. 10.8-4 Calculation example for gain and offset

Gain calculation

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

Offset calculation

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

Example: Calibration when using a process controller

Example for pressure control

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

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

$$\mathrm{C0414/1} = \frac{P_1}{P_N} \cdot 100\ \% = \frac{120\ \mathrm{mbar}}{200\ \mathrm{mbar}} \cdot 100\ \% = 60\ \%$$

10.8.3 Digital setpoints via frequency input

Description

It is possible to configure the digital inputs E1 and E2 of the standard I/O or application I/O as frequency input. This enables you to select a digital frequency as setpoint or actual value:

- For operation with standard I/O
  – single-tracked: 0 ... 10 kHz at X3/E1
  – two-tracked: 0 ... 1 kHz at X3/E1 and X3/E2
- For operation with application I/O
  – single-tracked: 0 ... 100 kHz at X3/E1
  – two-tracked: 0 ...100 kHz at X3/E1 and X3/E2

Codes for parameter setting

Code No.	Name	Possible settings Lenze	Selection	f_r	Δf_{min}	t	f_{max}	IMPORTANT	
C0425* ENTER	Configuration frequency input single track X3/E1 (DFIN1)	2	0	100 Hz	1/200	1 s	300 Hz	• f_r = Normalisation frequency – f_r corresponds to C0011 • Δf_{min} = Resolution • t = Scanning rate – The lower the scanning rate the higher the dynamic response. • f_{max} = Maximum frequency which can be processed independently of C0425 – Set C0425 that the frequency coming from the encoder is lower than f_{max} • Activate frequency input with C0410/24 = 1 • Adjust frequency input under C0426 and C0427	10.8-9
			1	1 kHz	1/200	100 msec	3 kHz		
			2	10 kHz	1/200	10 msec	10 kHz		
			3	10 kHz	1/1000	50 msec	10 kHz		
			4	10 kHz	1/10000	500 ms	10 kHz		
			5 (A)	102.4 kHz	1/400	2 msec	102.4 kHz		
			6 (A)	102.4 kHz	1/1000	5 msec	102.4 kHz		
			7 (A)	102.4 kHz	1/2000	10 msec	102.4 kHz		
	Configuration frequency input two tracks X3/E1, X3/E2 (DFIN1)		10	100 Hz	1/200	1 s	300 Hz		
			11	1 kHz	1/200	100 msec	3 kHz		
			12 (A)	10 kHz	1/200	10 msec	10 kHz		
			13 (A)	10 kHz	1/1000	50 msec	10 kHz		
			14 (A)	10 kHz	1/10000	500 ms	10 kHz		
			15 (A)	102.4 kHz	1/400	2 msec	102.4 kHz		
			16 (A)	102.4 kHz	1/1000	5 msec	102.4 kHz		
			17 (A)	102.4 kHz	1/2000	10 msec	102.4 kHz		
C0426*	Gain frequency input X3/E1, X3/E2 (A) (DFIN1-GAIN)	100	-1500.0		{0.1 %}		1500.0	$C0426 = \frac{f_N \cdot p}{z \cdot C0011} \cdot 100\ \%$ • f_r = Normalisation frequency from C0425 • p = Number of pole pairs of the motor • z = Number of increments per revolution of the encoder • C0011 = Maximum output frequency (corresponds to maximum process speed of the motor)	
C0427*	Offset frequency input X3/E1, X3/E2 (A) (DFIN1-OFFSET)	0.0	-100.0		{0.1 %}		100.0		

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0428* (A)	Gain frequency output (DFOUT1-OUT)	100	0.0 {0.1 %} 1500.0	
C0435* ENTER (A)	Automatic frequency input adjustment	0	0 {1} 4096 = not active	• Only require for speed control with digital feedback via HTL encoder • Calculates the gain C0426, depending on C0425 and C0011 • C0426 will be recalculated after every change of C0011 or C0425. • **Always enter number of increments divided by number of pole pairs of the motor!** – Example: Encoder increments = 4096, motor 4-pole ⇒ C0435 = 2048

Activation

1. If you use X3/E1 or X3/E1 and X3/E2 as frequency inputs, you must ensure that the inputs are not connected to other digital signals:
   – These connections must be removed under C0410
   – Otherwise the controller will evaluate the digital setpoint signal in a wrong way! (📖 16.1-1 ff)
2. Assign the signal source "frequency input" to the required setpoint or actual value under C0412 (C0412/x = 2).
3. Activation of frequency input with C0410/24 = 1.

Note!

- In addition to the free configuration under C0412 you can also use the fixed assignment under C0007 and C0005:
- Use C0007 to link the function with a digital input.
- Use C005 to select a configuration which evaluates the frequency input.

Adjustment

1. Enter frequency, resolution, scanning time and type (single-tracked, two-tracked) of the setpoint signal (C0425).
2. Set the gain and ensure that the input frequency corresponds to the normalisation frequency at maximum process speed of the motor (C0426).
   – The gain always affects setpoint signal and offset.
   – 100 % equals gain factor = 1.

$$C0426 = \frac{f_N \cdot p}{z \cdot C0011} \cdot 100\ \%$$

f_r	Normalisation frequency from C0425
p	Pole pair number of the motor
z	Number of increments of the encoder
C0011	Maximum output frequency (corresponds to maximum process speed of the motor)

3. If necessary, adjust the offset (C0427).
   – The offset shifts the characteristic.

Tip

- For higher accuracy requirements, select a higher resolution under C0425.
- The direction of rotation of the motor can be evaluated with a two-tracked frequency signal.

Note!

The setting for the minimum output frequency (C0010) is not effective.

10.8.4 Setpoints via function ”motor potentiometer”

Description

Setpoint selection via two digital signals (UP/DOWN), which are controlled by means of, for instance, simple pushbuttons.

The output frequency in changed via the acceleration and deceleration times set for the main setpoint (C0012/C0013) or for the additional setpoint (C0220/C0221).

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	**Name**	**Lenze**	**Selection**			
C0265 ENTER	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”: Minimum output frequency from C0010. The setpoint must have exceeded C0010 before. – ”0” = output frequency 0 Hz • C0265 = 3, 4, 5: – QSP reduces the motor potentiometer along the QSP ramp (C0105)	10.8-11
			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		

Activation

1. Link UP and DOWN with external signal sources: C04110/7 UP and C0410/8 DOWN

> **Note!**
> In addition to the free configuration under C0410 you can also use the fixed assignment under C0007 to combine the function with digital inputs.

2. Assign the signal source "Motor potentiometer" to the required setpoint under C0412 (C0412/x = 3). (📖 10.12-1)

Function	UP	DOWN
Decelerate setpoint to 0 Hz along QSP ramp	LOW	LOW
Decelerate the setpoint along the main setpoint ramp (C0013) to minimum output frequency (C0010) (Setpoint must have been higher than value set under C0010)	LOW	HIGH
Accelerate the setpoint along the main setpoint acceleration ramp (C0012) to maximum output frequency (C0011)	HIGH	LOW
Setpoint remains constant	HIGH	HIGH

Example

Example: Activation of the function "Motor potentiometer" via NC contacts

Configuration

E1 = "UP": C0410/7 = 1

E2 = "DOWN": C0410/8 = 2

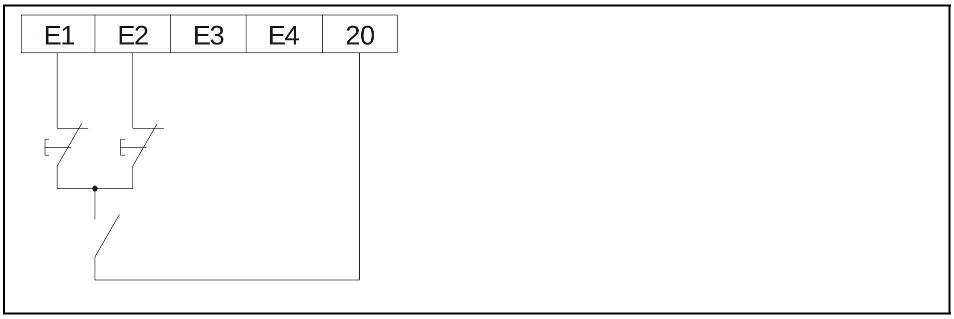


Fig. 10.8-5 Motor potentiometer with NC contacts

Important

Note!

- Proceed as follows if the setpoint selection via motor potentiometer is used together with the standard I/O function module:
  - Link the output signal MPOT1-OUT only with the signals NSET1-N1, NSET1-N2 or PCTRL1-NADD under C0412.
  - The linkage with other signals results in a step change in the setpoint!
- 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 error messages occur
  - If C0265 = 3, 4, 5:
  - If quick stop is activated, the motor potentiometer will be reset to 0 Hz along the QSP ramp (C0105).
- The additional setpoint is added when using the motor potentiometer function.

10.8.5 Setpoints via fixed setpoints (JOG)

Description

You can store up to three fixed setpoints per parameter set and retrieve them using digital input signals.

At operation with application I/O 7 fixed setpoints are available per parameter set.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	**Name**	**Lenze**	**Selection**				
C0037	JOG1	20.00	-650.00	{0.02 Hz}	650.00	JOG = Setpoint Additional JOG frequencies ⇨ C0440	🕮 10.8-13
C0038	JOG2	30.00	-650.00	{0.02 Hz}	650.00		
C0039	JOG3	40.00	-650.00	{0.02 Hz}	650.00		
C0440 (A)	Additional JOG values					JOG = Setpoint Activation via configuration under C0410	🕮 10.8-13
1	JOG 1	20.00	-650.00	{0.02 Hz}	650.00	C04401/1 and C0037 are the same	
2	JOG 2	30.00				C04401/2 and C0038 are the same	
3	JOG 3	40.00				C04401/3 and C0039 are the same	
4	JOG 4	15.00					
5	JOG 5	25.00					
6	JOG 6	35.00					
7	JOG 7	45.00					

Activation

Operation without application I/O

- The signal NSET1-JOG1/3 must be combined with a digital input signal under C0410/1.
- The signal NSET1-JOG2/3 must be combined with a digital input signal under C0410/2.

Active setpoint	Level at	
	NSET1-JOG1/3	NSET1-JOG2/3
other setpoint source	LOW	LOW
JOG 1	HIGH	LOW
JOG 2	LOW	HIGH
JOG 3	HIGH	HIGH

Note!

In addition to the free configuration under C0410 you can also use the fixed assignment under C0007 to combine the function with digital inputs.

Operation with application I/O

- The signal NSET1-JOG1/3/5 must be combined with a digital input signal under C0410/1.
- The signal NSET1-JOG2/3/6/7 must be combined with a digital input signal under C0410/2.
- The signal NSET1-JOG4/5/6/7 must be combined with a digital input signal under C0410/33.

Active setpoint	Level at		
	NSET1-JOG1/3/5/7	NSET1-JOG2/3/6/7	NSET1-JOG4/5/6/7
other setpoint source	LOW	LOW	LOW
JOG 1	HIGH	LOW	LOW
JOG 2	LOW	HIGH	LOW
JOG 3	HIGH	HIGH	LOW
JOG 4	LOW	LOW	HIGH
JOG 5	HIGH	LOW	HIGH
JOG 6	LOW	HIGH	HIGH
JOG 7	HIGH	HIGH	HIGH

Influence on other setpoints

- The maximum output frequency (C0011) also limits the fixed setpoints (JOG).
- The minimum output frequency (C0010) does not limit the fixed setpoints (JOG).
- Fixed setpoints (JOG) have priority over the analog setpoint 1 (NSET1-N1) and over the analog setpoint 2 (NSET1-N2).
- The additional setpoint (PCTRL1-NADD) is added to the fixed setpoints.

Tip

The display of the parameter can be related to a process variable. (10.16-1)

10.8.6 Setpoints via keypad

Description

The setpoint can be selected via the keypad.

The keypad setpoint is added to the main setpoint.

Note!

- Setpoints selected by means of the keypad are stored when the controller is disconnected from the mains or operation is interrupted.
- The drive can start again after controller enable!

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0044*	Setpoint 2 (NSET1-N2)		-650.00	{0.02 Hz}	650.00	**The value set will be lost when switching the mains!** • Selection, if C0412/2 = FIXED-FREE (not assigned) • Display if C0412/2 is linked with a signal source	10.8-15
C0046*	Setpoint 1 (NSET1-N1)		-650.00	{0.02 Hz}	650.00	**The value set will be lost when switching the mains!** • Selection, if C0412/1 = FIXED-FREE (not assigned) • Display if C0412/1 is linked with a signal source	10.8-15
C0140*	Additive frequency setpoint (NSET1-NADD)	0.00	-650.00	{0.02 Hz}	650.00	• Selection via function Set of the keypad or the parameter channel • Is added to main setpoint • Value is stored when switching the mains or removing the keypad	10.8-15

Setpoint selection with keypad E82ZBC

With keypad E82ZBC

The setpoint can be easily set via the function Set:

1. Select with ◐ or ◑ to activate the function Set .
2. Set the setpoint using ▼ 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 setpoint set last.

Note!

Set writes the setpoint under C0140. The setpoint can also be selected directly under C0140.

Setpoint selection with keypad XT EMZ9371BC

With keypad XT EMZ9371BC

The setpoint can be directly selected under C0140:

1. Select C0140 in the menus.
2. Set the setpoint using ▼ or ▲

Drive performance when selecting the setpoints via keypad

Drive performance

- 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 saved value.

Tip

- The setpoint selected via keypad has an effect on setpoint 1 (NSET1-N1) and setpoint 2 (NSET1-N2). If you want to select different setpoints via keypad:
  – Separate the linkage of NSET1-N1 and NSET1-N2 with analog input signals (C0412/1 = 0 and C0412/2 = 0).
  – Now you can set NSET1-N1 in C0046 and NSET-N2 in C0044 with the keypad.
- Set C0140 = 0, if the setpoint is not given under C0140, otherwise the drive may start immediately when the controller is released.

10.8.7 Setpoints via a bus system

Setpoints or actual values can be preselected for FIF by means of a bus function module or AIF by means of a bus module.

A detailed description can be found in the documentation for the modules.

10.8.8 Setpoint changeover (hand/remote changeover)

Description

Changeover between the setpoints NSET1-N1 and NSET1-N2.

- With manual/remote changeover it is possible to e.g. change from remote operation to manual operation in the event of setting or service at the drive.
  - For manual operation the setpoint source for remote operation must not be changed.
  - In manual operation the setpoint is selected via potentiometer, motor potentiometer or keypad/PC.
- Examples for setpoint changeovers:
  - Bus operation ⇔ Keypad or PC
  - Bus operation ⇔ analog setpoint via analog input
  - Keypad or PC ⇔ analog setpoint via analog input
  - Function “Motor potentiometer” ⇔ analog setpoint via analog input
  - Analog setpoint via analog input ⇔ setpoint via frequency input
  - Analog input 1 ⇔ analog input 2 (application I/O only)

Note!

The safety functions controller inhibit and quick stop (QSP) set in remote operation will be reset when manual operation is being activated. Check whether the master system reactivates these functions after a changeover.

Activation

Analog setpoint changeover via analog input

- The setpoint source for remote operation must be linked with NSET1-N1 under C0412/1.
- The setpoint source for manual operation must be linked with NSET1-N2 under C0412/2.
- A digital input signal must be linked with the manual/remote changeover (DCTRL1-H/Re) under C0410/17.
- HIGH active inputs:
  - Manual operation active if signal source for DCTRL1-H/Re = HIGH

Activation of ”bus operation ⇔ keypad or PC”

1. Internally invert a digital input (X3/E5 or X3/E6) not used in the Lenze setting under C0411.
2. Assign this input C0410/17 (DCTRL1-H/Re) to activate manual operation.
3. If the inversion of the digital input reset (C0411 = 0), remote operation will be active again.

Example

- Invert X3/E6 with C0411 = 32.
- Assign X3/E6 to the subcode C0410/17 with C0410/17 = 6.
- The setpoint can be selected under C0044 using the keypad or PC.
- If C0411 = 0 is set, the remote operation is active again.

Influence on other setpoints

- JOG frequency are not effected by a manual/remote changeover.
- Function Set of the keypad E82ZBC simultaneously acts on NSET1-N1 and NSET-N2.
  - Use C0046 (NSET1-N1) and C0044 (NSET1-N2) for separated setpoint selection.

Note!

The keypad key STOP is not active in manual operation!

10.9 Automatic detection of motor data

Description

This function serves to detect the required motor data and the motor cable influences.

Must be done before the first commissioning of vector control (C0014 = 4) or sensorless torque control (C0014 = 5). Otherwise commissioning is not possible.

Note!

The motor parameter identification influences the smooth running behaviour in the control mode "V/f characteristic control with constant U_{min} boost" (C0014 = 2 or 3). If you identify the motor parameters for this control mode, you can optimise the smooth running behaviour for low speeds.

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0084	Motor stator resistance	0.000	0.000	{0.001 Ω}	64.000		10.9-1
		0.0	0.0	{0.1 m Ω}	6500.0	Only 8200 vector 15 ... 90 kW	
C0087	Rated motor speed	→	300	{1 rpm}	16000	→ Depending on the controller	10.9-1
C0088	Rated motor current	→	0.0	{0.1 A}	650.0	→ Depending on the controller 0.0 ... 2.0 x rated output current of the controller	10.9-1
C0089	Rated motor frequency	50	10	{1 Hz}	960		10.9-1
C0090	Rated motor voltage	→	50	{1 V}	500	→ 230 V with 230 V controllers, 400 V with 400 V controllers	10.9-1
C0091	Motor cos φ	→	0.40	{0.1}	1.0	→ Depending on the controller	10.9-1
C0092	Motor stator inductance	0.0	0.000	{0.1 mH}	200.0		10.9-1
		0.00	0.00	{0.01 mH}	200.00	Only 8200 vector 15 ... 90 kW	
C0148* STOP	Motor parameter identification	0	0	Ready		**Only when the motor is cold!** 1. Inhibit controller, wait until drive is in standstill 2. Enter the correct motor data under C0087, C0088, C0089, C0090, C0091 (see motor nameplate). 3. C0148 = set 1 by ENTER 4. Enable controller The identification – starts, IMP gets out – the motor makes a high-pitched tone, but does not rotate! – takes approx. 30 s – is completed when IMP is on again 5. Controller inhibit	10.9-1
			1	Start identification • V/f-rated frequency (C0015), slip compensation (C0021) and motor stator inductivity (C0092) are calculated and saved. • The motor stator resistance (C0084) = total resistance of motor cable and motor is measured and saved			

Activation

> **Note!**
>
> **Ensure that the motor is cold when the identification is started!**
> - During identification current flow via the controller outputs U, V.
> - The load machine can remain connected. Holding brakes can remain in their braking position.
> - With idling motors a small angle shift can occur at the motor shaft.

1. Inhibit the controller. And wait until the drive is in standstill.
2. Enter C0087, C0088, C0089, C0090 and C0091 of your motor (see nameplate):
   – It is absolutely necessary to enter correct data since important parameters such as slip compensation, idle running current and I^2t monitoring are based on these values.
   – Enter rated motor current (C0088) and rated motor voltage (C0090) according to the connection type (star or delta).
3. Select C0148 = 1, confirm with ENTER.
4. Enable controller. Identification starts (green controller LED blinking quickly).
   – The motor stator resistance is measured and stored under C0084.
   – The motor stator inductance is calculated from the data entered and stored under C0092.
   – The V/f rated frequency is calculated and stored under C0015.
   – The slip is calculated and stored under C0021.
   – The identification takes approx. 30 s.
   – Identification is completed when the green controller LED comes on (keypad, GDC: IMP is active).
5. Inhibit the controller.

> **Note!**
>
> Only the parameter set activated via the digital input signals will be identified.
>
> **If you want to detect motor data for any other parameter set, this parameter set must be activated via digital input signals before it can be identified.**

Motor data correction during operation

- The motor data are corrected automatically during operation (max. ±25 %) to compensate for temperature fluctuations.
  – The values under C0084 and C0092 calculated by C0148 become active after mains switching.
- The values under C0084 and C0092 can be manually entered or corrected.

10.10 Process controller

10.10.1 Setting of control characteristics

Description

The process controller serves to put up control loops for controlling e.g. speed, pressure, temperature, flow rate, humidity, level or dancer position.

The process controller requires a setpoint and an actual value (e.g. from a sensor). If setpoint and 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.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	**Name**	**Lenze**	**Selection**		
C0070	Process controller gain	1.00	0.00 {0.01} 300.00 = P component not active		📖 10.10-1
C0071	Process controller readjustment time	100	10 {1} 9999 = I component not active		📖 10.10-1
C0072	Differential component of process controller	0.0	0.0 {0.1} 5.0 = D component not active		📖 10.10-1
C0074	Process controller influence	0.0	0.0 {0.1 %} 100.0		📖 10.10-1
C0238 ENTER	Frequency precontrol	2	0 No precontrol (only process controller)	Process controller has full influence	📖 10.10-1 📖 10.10-5
			1 Precontrol (total setpoint + process controller)	Process controller has limited influence	
			2 No precontrol (only total setpoint)	Process controller has no influence (not active)	
				Total setpoint (PCTRL1-SET3) = Main setpoint + additional setpoint	

Adjustment

1. Control features must be coarsely adjusted according to the guide values in the following tables.
2. Fine adjustment:
   – Set C0070, C0071, and C0072 so that in the event of setpoint and actual value changes the target value can be reached quickly and with minimum overshooting.

Scaling C0071

Value in C0071	Resulting readjustment 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

Pressure control and flow rate control

Pressure control and flow rate control

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

Code	Setting for	
	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

Speed control

Speed control

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

Setting of process controller influence

- Activate frequency precontrol (C0238 = 1). Now the process controller has only a limited influence:
  - The control factor determines the influence of the process controller (C0074).
  - Control factor = C0050 (output frequency) - C0051 (actual process controller value)
- C0074 refers to the maximum output frequency C0011.
- C0074 influences the control circuit stability:
  - Set C0074 as low as possible.
  - If C0074 is set too high, the control loop can get instable.

Calculating the process controller influence

Calculate C0074	Example
$C0074\ [\%] = \frac{C0050 - C0051}{C0011} \cdot 100\ \%$	C0011 = 50 Hz, C0050 = 53 Hz, C0051 = 50 Hz: $C0074\ [\%] = \frac{53\ Hz - 50\ Hz}{50\ Hz} \cdot 100\ \% = 6\ \%$

Set the influence so that the process controller output covers the calculated value in every operating point.

Set C0074 = 10 % as guide value for the example (C0074 = 6 %). The guide value includes tolerances which must always be considered.

Example for additive influence

Example: Additive influence of the process controller

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

Settings

Settings:

- C0051 = Positive actual value
- C0181 = Select positive setpoint
- C0238 = 1 (with frequency precontrol)
- Potentiometer connections of the dancer
  – End (E) = +10 V
  – Beginning (A) = GND

Function

Function:

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

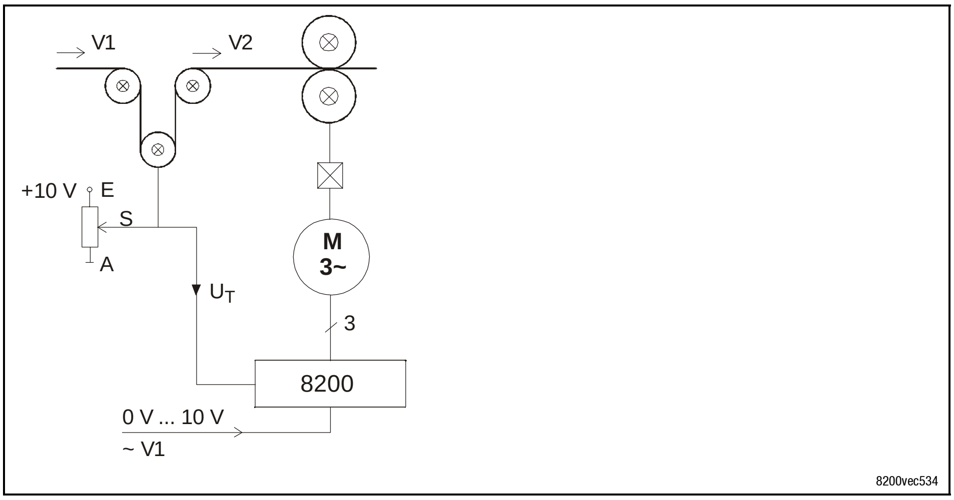


Fig. 10.10-1 Example: Dancer control with adding influence of the process controller

Example for subtractive influence

Example: Subtractive influence of the process controller

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

Settings

Settings:

- C0051 = Positive actual value
- C0181 = Select positive setpoint
- C0238 = 1 (with frequency precontrol)
- Potentiometer connections of the dancer
  – Stop (E) = +10 V
  – Start (A) = GND

Function

Function:

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

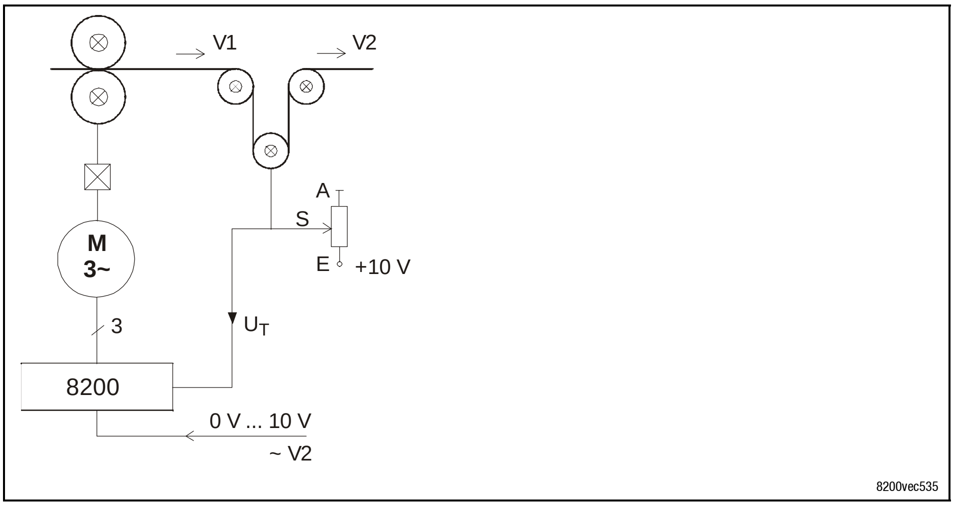


Fig. 10.10-2 Example: Dancer control with subtractive influence of the process controller

10.10.2 Setpoint selection for the process controller

Description

Selection of a frequency setpoint for the process controller, e.g. for

- the dancer position for a dancer position control in a line drive.
- the pressure setpoint for a pressure control.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	**Name**	**Lenze**	**Selection**			
C0138*	Process controller setpoint 1 (PCTRL1-SET1)	0.00	-650.00 {0.02 Hz} 650.00		**The value set will be lost when switching the mains!** • Selection if C0412/4 = FIXED-FREE • Display if C0412/4 ≠ FIXED-FREE	10.10-5
C0181*	Process controller setpoint 2 (PCTRL1-SET2)	0.00	-650.00 {0.02 Hz} 650.00			10.10-5
C0145* ENTER	Process controller setpoint source	0	0	Total setpoint (PCTRL1-SET3)	Main setpoint + additional setpoint	10.10-5
			1	C0181 (PCTRL1-SET2)	• Setpoint selection not possible via – JOG values – Set function of the keypad – C0044, C0046 and C0049 – in connection with manual/remote changeover, skip frequencies, ramp function generator, additional setpoint • Activate the automatic DC-injection brake (auto DCB) with C0019 = 0 or C0106 = 0	
			2	C0412/4 (PCTRL1-SET1)		

Selection

Process controller setpoint = Total setpoint

C0145 = 0

Process controller setpoint = Total setpoint (PCTRL1-SET3)

Select C0145 = 0 if the setpoint is to be selected

- via JOG values,
- via keypad (C0140, function Set),
- for operation with manual/remote changeover, skip frequencies, ramp function generator or additional setpoint,
- via parameter channel (C0044, C0046, C0049).

Process controller setpoint = C0181

C0145 = 1

Process controller setpoint = Value under C0181.

- Applications are e.g. dancer controls, pressure controls and flow rate controls
- Activate the automatic DC-injection brake (auto DCB) with C0019 = 0 or C0106 = 0
- C0181 is the same in all parameter sets.

C0145 = 2

Process controller setpoint = Freely configured signal via C0412/4.

- The process controller setpoint (PCTRL1-SET1) must be linked with an analog input signal under C0412/4.
- Use C0138 to display the current process controller setpoint.
- The setpoint acts directly on the process controller.

Note!

If you do not link an analog input signal with the process controller setpoint under C0412/4, the process controller setpoint can be directly selected under C0051.

10.10.3 Actual value selection for the process controller

Description

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

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0051*	Output frequency with slip compensation (MCTRL1-NOUT +SLIP) or act. process controller value (PCTRL1-ACT)		-650.00	{0.02 Hz}	650.00	**The value set will be lost when switching the mains!** Operation without process controller (C0238 = 2): • Display only: Output frequency with slip compensation (MCTRL1-NOUT+SLIP) Operation with process controller (C0238 = 0, 1): • Selection, if C0412/5 = FIXED-FREE (not assigned) • Display if C0412/5 is linked with a signal source	10.10-6

Activation

The actual process controller value (PCTRL1-ACT) must be linked with an analog input signal under C0412/5.

Use C0051 to display the current actual process controller value.

Note!

If you do not link an analog input signal with the actual process controller value under C0412/5, the actual process controller value can be directly selected under C0051.

10.10.4 Switching off process controller functions

Process controller switch-off

Process controller switch-off (PCTRL1-OFF)

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

Activation

The function must be linked with a digital input signal under C0410/19.

HIGH level at C0410/19 activates the function.

Note!

In addition to the free configuration under C0410 you can also use the fixed assignment under C0007 to combine the function with a digital input.

Process controller stop

Process controller stop (PCTRL1-STOP)

The process controller output value is frozen when the function is activated. The value remains unchanged as long as the function is not active.

Activation

The function must be linked with a digital input signal under C0410/21.

HIGH level at C0410/21 activates the function.

Integral action component switch-off

Integral action component switch-off (PCTRL1-I-OFF)

The process controller output sends the difference between setpoint and actual value, if necessary use gain V_P

- Thus overcontrolled starting and stopping can be avoided. When the controller is operating normally, the integral action component K_I can be connected.
- Application: e.g. dancer position control

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0184*	Frequency threshold PCTRL1-I-OFF	0.0	0.0	{0.1 Hz}	25.0	• If the output frequency < C0184, the I component of the process controller will be switched off • 0.0 Hz = Function not active	10.10-5

Activation

Link the function with a digital input signal in C0410/18.

HIGH level at C0410/18 activates the function.

Note!

In addition to the free configuration under C0410 you can also use the fixed assignment under C0007 to combine the function with a digital input.

Activation via frequency threshold

Use C0184 to set the required frequency.

If the output frequency falls below the value in C0184, the integral-action component will be switched off.

10.11 Current-limit controller

Description

For controlling high moments of inertia the current limiting controller (I_{max} controller) can be set.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0077*	Gain I_{max} controller	0.25	0.00 = P component not active {0.01} 16.00		📖 10.11-1
C0078*	Integral action time I_{max} controller	65 → 130	12 {1 ms} 9990 = I component not active	→ Only 8200 vector 15 ... 90 kW	📖 10.11-1

Adjustment

The current limiting controller is factory-set so that the drive is stable.

Setting notes for power control

The current limiting controller must only be adapted in case of a power control with high moments of inertia:

- V/f characteristic control (C0014 = 2 or 3)
- V_P (C0077): ≈ 0.06
- T_i (C0078): ≈ 750 ms

Note!

C0077 and C0078 are the same for all parameter sets.

10.12 Free connection of analog signals

10.12.1 Free configuration of analog input signals

Description

- 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
- A signal source can be assigned to several targets.

Note!
Use C0005 to configure some of the signal sources for analog inputs. The corresponding subcodes of C0412 will be adapted automatically.

Codes for parameter setting

Code		Possible settings		IMPORTANT		
No.	**Name**	**Lenze**	**Selection**			
C0412 ENTER	Free configuration of analog input signals		Link between analog signal sources and internal analog signals	**A selection under C0005 or C0007 will be copied to the corresponding subcode of C0412. A change of C0412 sets C0005 = 255, C0007 = 255!**		📖 10.12-1
1	Setpoint 1 (NSET1–N1)	1	Analog input 1 (AIN1-OUT): X3/8 (Standard-I/O) X3/1U or X3/1I (Application-I/O)	Either NSET1-N1 or NSET1-N2 active Changeover with C0410/17	Parameter channel: C0046	
2	Setpoint 2 (NSET1-N2)	1			Parameter channel: C0044	
3	Additional setpoint (PCTRL1-NADD)	255	Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module	Is added to NSET1-N1, NSET1-N2, JOG values and the function Set of the keypad	Parameter channel: C0049	
4	Process controller setpoint 1 (PCTRL1-SET1)	255	Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module			
5	Act. process controller value (PCTRL1-ACT)	255	Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module		Parameter channel: C0051, if C0238 = 1, 2	
6	Torque setpoint or torque limit value (MCTRL1-MSET)	255	Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module	• Observe C0014! • Actual torque values not required. • 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 [%]	Parameter channel: C0047	
7	Reserved	255	Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module			
8	MCTRL1-VOLT-ADD	255	Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module	Only for special applications. Modifications only when agreed on by Lenze!		
9	MCTRL1-PHI-ADD	255	Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module			

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0412 ENTER (cont.)				**Analog signal source possible for C0412**		10.12-1
			0	Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module		
			1	Analog input 1 (AIN1-OUT) X3/8 (Standard-I/O) X3/1U or X3/1I (Application-I/O)		
			2	Frequency input (DFIN1-OUT)	Observe C0410/24, C0425, C0426, C0427	
			3	Motor potentiometer (MPOT1-OUT)		
			4 (A)	Analog input 2 (AIN2-OUT) X3/2U or X3/2I		
			5 ... 9	Input signal is constantly 0 (FIXED0)		
			10	AIF input word 1 (AIF-IN.W1)	Only evaluated if C0001 = 3!	
			11	AIF input word 2 (AIF-IN.W2)		
			20	CAN-IN1.W1 or FIF-IN.W1	± 24000 ≡ ±480 Hz 2^{14} ≡ 100 % rated motor torque	
			21	CAN-IN1.W2 or FIF-IN.W2		
			22	CAN-IN1.W3 or FIF-IN.W3		
			23	CAN-IN1.W4 or FIF-IN.W4		
			30	CAN-IN2.W1		
			31	CAN-IN2.W2		
			32	CAN-IN2.W3		
			33	CAN-IN2.W4		
			200	Signals are assigned word by word from fieldbus function module to FIF (e.g. INTERBUS or PROFIBUS-DP)	See C0005	
			228 (A)	PCTRL1-ACT		
			229 (A)	PCTRL1-SET		
			230 (A)	PCTRL1-OUT		
			231 (A)	NSET1-RFG1-IN		
			232 (A)	NSET1-NOUT		
			233 (A)	PCTRL1-PID-OUT		
			234 (A)	PCTRL1-NOUT		
			255	Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module	Either NSET1-N1 or NSET1-N2 active	

Signal linkage

The internal analog signals are linked with an external signal source by entering the selection figure of the external signal in the corresponding subcode of C0412. C0412 can be different for the parameter sets.

Examples

- C0412/1 = 2 ⇨ The frequency input is the signal source for setpoint 1 (NSET1-N1)
- C0412/5 = 23 ⇨ CAN-IN1/word 4 is the signal source for the actual process controller value (PCTRL-ACT)

Note!

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). If you link them with internal analog signals (C0412/x = 20, 21 or 30, 31), they must be defined as analog input words. Otherwise the controller cannot interpret the signal correctly.

10.12.2 Free configuration of analog outputs

Description

- The analog outputs (X3/62, X3/63) and the frequency output (X3/A4) can be freely assigned to internal analog process signals or monitoring signals. The controller outputs a voltage proportional to the internal signal at the analog outputs.
- Currents can also be output when using the application I/O.
  - Range: 0 ... 20 mA, as of software version 1.1 also 4 ... 20 mA
  - Setting via jumper at module and C0424
- A signal source can be assigned to several targets.

Note!

Use C0111 to permanently assign the analog output X3/62 to some internal signal sources. C0419/1 is automatically adapted.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	**Name**	**Lenze**	**Selection**		
C0419 ENTER	Free configuration of analog outputs		Analog signal output to terminal		📖 10.12-4
1	X3/62 (AOUT1-IN)	0	Output frequency (MCTRL1-NOUT+SLIP)	**The selection made under C0111 is copied to C0419/1. A change of C0419/1 sets C0111 = 255!**	
2 (A)	X3/63 (AOUT2-IN)	2	Apparent motor current (MCTRL1-IMOT)		
3 (A)	X3/A4 (DFOUT1-IN)	3	DC-bus voltage (MCTRL1-DCVOLT)	Frequency output: 50 Hz ... 10 kHz	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0419 ENTER (cont.)				**Possible analog signals for C0419**		10.12-4
			0	Output frequency (MCTRL1-NOUT+SLIP)	6 V/12 mA/5.85 kHz ≡C0011	
			1	Device utilisation (MCTRL1-MOUT) at V/f characteristic control (C0014 = 2 or 3)	3 V/6 mA/2.925 kHz ≡ Rated active inverter current (active current/C0091)	
				Actual motor torque (MCTRL1-MACT) at vector control (C0014 = 4) or sensorless torque control (C0014 = 5)	3 V/6 mA/2.925 kHz ≡ Rated motor torque	
			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 (230 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 ≡ 0.5 × C0011	
			7	Output frequency with limits (DCTRL1-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	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0419 ENTER (cont.)				**Possible analog signals for C0419**	Selection 9 ... 25 correspond 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	📖 10.12-4
			9	Ready for operation (DCTRL1-RDY)		
			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 (DCTRL1-RFG1=NOUT)		
			16	Value has fallen below frequency threshold Q_{min} (f < C0017) (PCTRL1-QMIN)	LOW active	
			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 Frequency threshold Q_{min} = C0017	
			22	Apparent motor current < current threshold and output frequency > frequency threshold Q_{min} (DCTRL1-(IMOT<ILIM)-QMIN)		
			23	Apparent motor current < current threshold and RFG 1: Input = output (DCTRL1-(IMOT<ILIM)-RFG-I=0)		
			24	Warning motor phase failure (DCTRL1-LP1-WARN)		
			25	Minimum output frequency reached (f ≤ C0010) (PCTRL1-NMIN)	LOW active	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0419 ENTER (cont.)				**Possible analog signals for C0419**			📖 10.12-4
			26	Output frequency normalised without slip (MCTRL1-NOUT-NORM)			
			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 without precontrol (PCTRL1-OUT)			
			31	Ramp function generator input (NSET1-RFG1-IN)			
			32	Ramp function generator output (NSET1-NOUT)			
			33 (A)	PID controller output (PCTRL1-PID-OUT)			
			34 (A)	Process controller output (PCTRL1-NOUT)			
			35	Input signal at X3/8 (Standard-I/O) or X3/1U or X3/1I (Application-I/O), evaluated with gain (C0414/1 or C0027) and offset (C0413/1 or C0026) (AIN1-OUT)		6 V/12 mA/5.85 kHz ≡ Maximum value analog input signal (5 V, 10 V, 20 mA, 10 kHz) Condition: Gain of analog input or frequency input set to: C0414/x, C0426 = 100 %	
			36	Input signal at frequency input X3/E1, evaluated with gain (C0426) and offset (C0427) (DFIN1-OUT)			
			37	Motor potentiometer output·(MPOT1-OUT)			
			38 (A)	Input signal at X3/2U or X3/2I, evaluated with gain (C0414/2) and offset (C0413/2) (AIN2-OUT)			
			40	AIF input word 1 (AIF-IN.W1)		Setpoint to drive from communication module to AIF 10 V/20 mA/10 kHz ≡ 1000	
			41	AIF input word 2 (AIF-IN.W2)			
			50	CAN-IN1.W1 or FIF-IN.W1		Setpoints to drive from function module to FIF 10 V/20 mA/10 kHz ≡ 1000	
			51	CAN-IN1.W2 or FIF-IN.W2			
			52	CAN-IN1.W3 or FIF-IN.W3			
			53	CAN-IN1.W4 or FIF-IN.W4			
			60	CAN-IN2.W1			
			61	CAN-IN2.W2			
			62	CAN-IN2.W3			
			63	CAN-IN2.W4			
			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	📖 10.12-4
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 and C0422/1 are the same	📖 10.12-4
C0420*	Gain analog output X3/62 (AOUT1-GAIN) Standard I/O	128	0	{1}	255	128 ≡ Gain 1 C0420 and C0108 are the same	📖 10.12-4
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	📖 10.12-4

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0420* (A)	Gain analog outputs Application I/O			128 ≡ Gain 1	📖 10.12-4
1	X3/62 (AOUT1-GAIN)	128	0 {1} 255	C0420/1 and C0108 are the same	
2	X3/63 (AOUT2-GAIN)				
C0422* (A)	Offset analog outputs Application-I/O				📖 10.12-4
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* ENTER (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)	📖 10.12-4
1	X3/62 (AOUT1)	0	0 0 ... 10 V / 0 ... 20 mA		
2	X3/63 (AOUT2)	0	1 4 ... 20 mA		

Signal linkage

The analog outputs are linked with internal analog signals by entering the selection figure of the internal signal into the corresponding subcode of C0419. C0419 can be different for the parameter sets.

Examples

- C0419/1 ⇨ 51: The process data word CAN-IN2/word 2 is the signal source for X3/62.
- C0419/2 ⇨ 5: The monitoring signal “Motor voltage” is the signal source for X3/63.

Note!

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 digital word (16 bit). If you link them with analog outputs (C0419/x = 50, 51 or 60, 61), they must be defined as analog input words. Otherwise the output signal would be incorrect.

Adjustment

Set gain (C0420) and offset (C0422) to adapt the output signal to the application.

The normalisation of the output signal indicated under C0419 refer to gain 1 (C0420 = 128).

Output signal at selection 7

The output signal at selection 7 is proportional to the output frequency with slip compensation.

$U_{out}\,[V] = 6{,}00\,V \cdot \frac{f - C0011}{C0011 - C0010}$	V_{out}	Output signal
	f	Output frequency
	C0010	Minimum output frequency
	C0011	Maximum output frequency

Output signal at selection 8

When using no process controller the output signal at selection 8 is proportional to the output frequency without slip compensation.

Application example for selection 6

The output signal is reciprocal to the output frequency. This signal can be used for the time indication (e.g. machining time of a product).

Example: Output signal = 0 ... 10 V

$U_{out}\,[V] = 1.00\,V \cdot \frac{C0011}{f} \cdot \frac{C0420}{128}$	V_{out}	Output signal
	f	Output frequency
	C0011	Maximum output frequency
	C0420	Gain of analog output

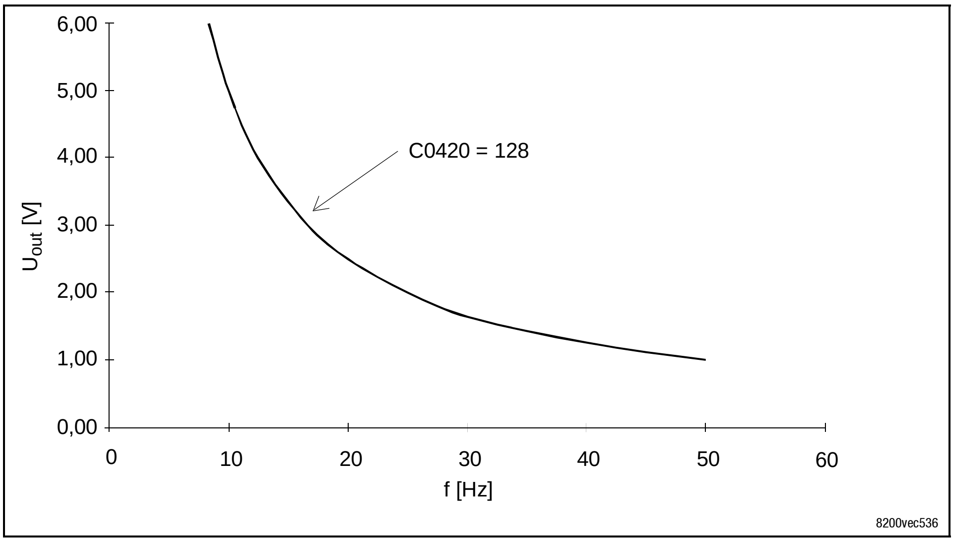


Fig. 10.12-1 Output signal of the function "1/output frequency"

10.12.3 Free configuration analog process data output words

Description

- The analog process data output words can be freely assigned to internal analog process signals or monitoring signals. The controller outputs a value proportional to the internal signal on the bus. The normalisation is indicated under C0421.
- A signal source can be assigned to several targets.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	**Name**	**Lenze**	**Selection**		
C0421* ENTER	Free configuration analog process data output words		Output of analog signals on bus		10.12-10
1	AIF-OUT.W1	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)		
2	AIF-OUT.W2	0	Output frequency (MCTRL1-NOUT+SLIP)		
3	CAN-OUT1.W1 / FIF-OUT.W1	255	Not assigned (FIXED-FREE)	• **With Lenze setting, CAN-OUT1.W1 and FIF-OUT.W1 are defined as digital outputs and the 16-bit controller status word 1 (C0417) is assigned to them.** • **Before you assign an analog signal source (C0421/3 $\neq$ 255), the digital assignment must be deleted (C0417/x = 255)! Otherwise the output signal would be incorrect.**	
4	CAN-OUT1.W2 / FIF-OUT.W2	255	Not assigned (FIXED-FREE)		
5	CAN-OUT1.W3 / FIF-OUT.W3	255	Not assigned (FIXED-FREE)		
6	CAN-OUT1.W4 / FIF-OUT.W4	255	Not assigned (FIXED-FREE)		
7	CAN-OUT2.W1	255	Not assigned (FIXED-FREE)		
8	CAN-OUT2.W2	255	Not assigned (FIXED-FREE)		
9	CAN-OUT2.W3	255	Not assigned (FIXED-FREE)		
10	CAN-OUT2.W4	255	Not assigned (FIXED-FREE)		

Code No.	Name	Possible settings Lenze	Selection		IMPORTANT	
C0421* ENTER (cont.)				**Possible analog signals for C0421**		10.12-10
			0	Output frequency (MCTRL1-NOUT+SLIP)	24000 ≡ 480 Hz	
			1	Device utilisation (MCTRL1-MOUT) at V/f characteristic control (C0014 = 2 or 3)	16383 ≡ Rated active inverter current (active current/C0091)	
				Actual motor torque (MCTRL1-MACT) at vector control (C0014 = 4) or sensorless torque control (C0014 = 5)	16383 ≡ Rated motor torque	
			2	Apparent motor current (MCTRL1-IMOT)	16383 ≡ Rated inverter current	
			3	DC-bus voltage (MCTRL1-DCVOLT)	16383 ≡ 565 VDC at 400 V mains 16383 ≡ 325 VDC at 230 V mains	
			4	Motor power	285 ≡ Rated motor power	
			5	Motor voltage (MCTRL1-VOLT)	16383 ≡ Rated motor voltage	
			6	1/output frequency (1/C0050) (MCTRL1-1/NOUT)	195 ≡ 0.5 × C0011	
			7	Output frequency with limits (DCTRL1-C0010...C0011)	24000 ≡ 480 Hz 0 ≡ f < C0010 $\frac{24000 \cdot (f - C0010)}{480\ Hz}$ ≡ f ≥ C0010	
			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)	24000 ≡ 480 Hz	
C0421* ENTER (cont.)				**Possible analog signals for C0421**	Selection 9 ... 25 correspond to the digital functions of the relay output K1 (C0008) or the digital output A1 (C0117): LOW = 0 HIGH = 1023	10.12-10
			9	Ready for operation (DCTRL1-RDY)		
			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 (DCTRL1-RFG1=NOUT)		
			16	Value has fallen below frequency threshold Q_{min} (f < C0017) (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 Frequency threshold Q_{min} = C0017	
			22	Apparent motor current < current threshold and output frequency > frequency threshold Q_{min} (DCTRL1-(IMOT<ILIM)-QMIN)		
			23	Apparent motor current < current threshold and RFG 1: Input = output (DCTRL1-(IMOT<ILIM)-RFG-I=0)		
			24	Warning motor phase failure (DCTRL1-LP1-WARN)		
			25	Minimum output frequency reached (f ≤ C0010) (PCTRL1-NMIN)		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0421* ENTER (cont.)				**Possible analog signals for C0421**		📖 10.12-10
			26	Output frequency normalised without slip (MCTRL1-NOUT-NORM)	$2^{14} \equiv$ C0011	
			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 without precontrol (PCTRL1-OUT)		
			31	Ramp function generator input (NSET1-RFG1-IN)		
			32	Ramp function generator output (NSET1-NOUT)		
			33 (A)	PID controller output (PCTRL1-PID-OUT)		
			34 (A)	Process controller output (PCTRL1-NOUT)		
			35	Input signal at X3/8 (Standard-I/O) or X3/1U or X3/1I (Application-I/O), evaluated with gain (C0414/1 or C0027) and offset (C0413/1 or C0026) (AIN1-OUT)	1000 ≡ Maximum value analog input signal (5 V, 10 V, 20 mA, 10 kHz) Condition: Gain of analog input or frequency input 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 (A)	Input signal at X3/2U or X3/2I, evaluated with gain (C0414/2) and offset (C0413/2) (AIN2-OUT)		
			40	AIF input word 1 (AIF-IN.W1)	Setpoint to drive from communication module to AIF Normalisation via AIF	
			41	AIF input word 2 (AIF-IN.W2)		
			50	CAN-IN1.W1 or FIF-IN.W1	Setpoints to drive from function module to FIF Normalisation via CAN or FIF	
			51	CAN-IN1.W2 or FIF-IN.W2		
			52	CAN-IN1.W3 or FIF-IN.W3		
			53	CAN-IN1.W4 or FIF-IN.W4		
			60	CAN-IN2.W1		
			61	CAN-IN2.W2		
			62	CAN-IN2.W3		
			63	CAN-IN2.W4		
			255	Not assigned (FIXED-FREE)		

Signal linkage

The process data output words are linked with internal analog signals by entering the selection figure of the internal signal in the corresponding subcode of C0421. C0421 can be different for the parameter sets.

Examples

- C0421/3 ⇨ 5: The monitoring signal “Motor voltage” is the signal source for CAN-OUT1/word1.
- C0421/8 ⇨ 61: The process data input wordCAN-IN2/word2 is the signal source for CAN-OUT2/word 2.

Note!

- The process data output words CAN-OUT1.W1/FIF-OUT.W1, CAN-OUT2.W1 and FIF-OUT.W2 can also be assigned to C0417 and C0418 with 16-bit status information each:
  - With digital configuration under C0417 or C0418 no simultaneous analog assignment with C0421 (C0421/x = 255)!
  - With analog configuration under C0421 no simultaneous digital assignment with C0417 and C0418 (C0417/x = 255, C0418/x = 255)!
  - Otherwise the output signal would be incorrect.
- 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 digital word (16 bit). If you link them with analog process data output words (C0421/x = 50, 51 or 60, 61), they must be defined as analog input words. Otherwise the output signal would be incorrect.

10.13 Free connection of digital signals

10.13.1 Free configuration of digital input signals

Description

- Internal digital signals can be freely assigned to external digital signal sources. It is thus possible to achieve a freely configured control of the controller
  – Digital inputs X3/E1 ... X3/E6
  – Digital process data input words
- A signal source can be assigned to several targets. Please ensure reasonable assignments. Otherwise it is possible to activate functions which cannot be operated together (e.g. a digital signal linked with quick stop and DC braking at the same time).

Note!

Use C0007 to configure some internal digital signals with the digital inputs X3/E1 ... X3/E4 block by block. The corresponding subcodes of C0410 will be adapted automatically.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0410 ENTER	Free configuration of digital input signals		Link between digital signal sources and internal digital signals	**A selection made under C0007 is copied to the corresponding subcode of C0410. A change of C0410 sets C0007 = 255!**	10.13-1
1	NSET1-JOG1/3 NSET1-JOG1/3/5/7 (A)	1	Digital input X3/E1	Selection of fixed setpoints C0410/1 C0410/2 active C0410/33 C0046 LOW LOW LOW JOG1 HIGH LOW LOW JOG2 LOW HIGH LOW ... ... JOG7 HIGH HIGH HIGH	
2	NSET1-JOG2/3 NSET1-JOG2/3/6/7 (A)	2	Digital input X3/E2		
3	DCTRL1-CW/CCW	4	Digital input X3/E4	CW = CW rotation LOW CCW = CCW rotation HIGH	
4	DCTRL1-QSP	255	Not assigned (FIXED-FREE)	Quick stop (via terminal LOW active)	
5	NSET1-RFG1-STOP	255	Not assigned (FIXED-FREE)	Ramp function generator main setpoint stop	
6	NSET1-RFG1-0	255	Not assigned (FIXED-FREE)	Ramp function generator input must be set to "0" for mains setpoint	
7	MPOT1-UP	255	Not assigned (FIXED-FREE)	Motor potentiometer functions	
8	MPOT1-DOWN	255	Not assigned (FIXED-FREE)		
9	Reserved	255	Not assigned (FIXED-FREE)	Do not change 255!	
10	DCTRL1-CINH	255	Not assigned (FIXED-FREE)	Controller inhibit (via terminal LOW active)	
11	DCTRL1-TRIP-SET	255	Not assigned (FIXED-FREE)	External error (via terminal LOW active)	
12	DCTRL1-TRIP-RESET	255	Not assigned (FIXED-FREE)	Error reset	
13	DCTRL1-PAR2/4	255	Not assigned (FIXED-FREE)	Parameter set changeover (only possible if C0988 = 0) **C0410/13 and C0410/14 must have the same source in every parameter sets used. Otherwise it is not possible to change between the parameter sets (error message CE5 or CE7).**	
14	DCTRL1-PAR3/4	255	Not assigned (FIXED-FREE)	C0410/13 C0410/14 active LOW LOW PAR1 HIGH LOW PAR2 LOW HIGH PAR3 HIGH HIGH PAR4	
15	MCTRL1-DCB	3	Digital input X3/E3	DC-injection brake	
16 (A)	PCTRL1-RFG2-LOADI	255	Not assigned (FIXED-FREE)	Actual process controller value (PCTRL1-ACT) must be connected to process controller ramp function generator (PCTRL1-RFG2)	
17	DCTRL1-H/Re	255	Not assigned (FIXED-FREE)	Manual/remote changeover	
18	PCTRL1-I-OFF	255	Not assigned (FIXED-FREE)	Switch off I-component of the process controller	
19	PCTRL1-OFF	255	Not assigned (FIXED-FREE)	Process controller switch off	
20	Reserved	255	Not assigned (FIXED-FREE)	Do not change 255!	
21	PCTRL1-STOP	255	Not assigned (FIXED-FREE)	Process controller stop (value "frozen")	
22	DCTRL1-CW/QSP	255	Not assigned (FIXED-FREE)	Failsafe change of the direction of rotation	
23	DCTRL1-CCW/QSP	255	Not assigned (FIXED-FREE)		
24	DFIN1-ON	255	Not assigned (FIXED-FREE)	0 = Frequency input not active 1 = Frequency input active Frequency input configuration under C0425 and C0426	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0410 ENTER (cont.)					📖 10.13-1
25 (A)	PCTRL1-FOLL1-0	255	Not assigned (FIXED-FREE)	Compensator at reset ramp C0193 to ”0”	
26 (A)	Reserved	255	Not assigned (FIXED-FREE)		
27 (A)	NSET1-TI1/3	255	Not assigned (FIXED-FREE)	Activate acceleration times	
28 (A)	NSET1-TI2/3	255	Not assigned (FIXED-FREE)	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	Not assigned (FIXED-FREE)	Process controller output on (LOW)/ off (HIGH)	
30 (A)	PCTRL1-INV-ON	255	Not assigned (FIXED-FREE)	Process controller output inversion	
31 (A)	PCTRL1-NADD-OFF	255	Not assigned (FIXED-FREE)	Switch off additional setpoint	
32 (A)	PCTRL1-RFG2-0	255	Not assigned (FIXED-FREE)	Decelerate process controller ramp function generator input to ”0” along ramp C0226	
33 (A)	NSET1-JOG4/5/6/7	255	Not assigned (FIXED-FREE)		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0410 ENTER (cont.)				**Digital signal sources for C0410**		📖 10.13-1
			0	Not assigned (FIXED-FREE)		
			1	Digital input X3/E1 (DIGIN1)		
			2	Digital input X3/E2 (DIGIN2)		
			3	Digital input X3/E3 (DIGIN3)		
			4	Digital input X3/E4 (DIGIN4)		
			5 (A)	Digital input X3/E5 (DIGIN5)		
			6 (A)	Digital input X3/E6 (DIGIN6)		
			7	PTC input (X2.2/T1, X2.2/T2)	T1/T2 can only be connected to potential-free switches! T1/T2 is active ("HIGH") when the switch is closed	
				AIF control word (AIF-CTRL)		
			10	Bit 0		
			...	...		
			25	Bit 15		
				CAN-IN1.W1 or FIF-IN.W1		
			30	Bit 0		
			...	...		
			45	Bit 15		
				CAN-IN1.W2 or FIF-IN.W2		
			50	Bit 0		
			...	...		
			65	Bit 15		
				CAN-IN2.W1		
			70	Bit 0		
			...	...		
			85	Bit 15		
				CAN-IN2.W2		
			90	Bit 0		
			...	...		
			105	Bit 15		
				Status application I/O	Only active when using application I/O	
			140	Torque threshold 1 reached (MSET1=MOUT)		
			141	Torque threshold 2 reached (MSET2=MOUT)		
			142	Process controller output limit reached (PCTRL1-LIM)		
			143...172	Reserved		
			200	Control words are assigned bit by bit from the fieldbus function module to FIF (e.g. INTERBUS or PROFIBUS-DP)	See C0005	
				Digital output signals		
			201	as C0415, selection 1		
			...	...		
			231	as C0415, selection 31		
			255	Not assigned (FIXED-FREE)		

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0411 ENTER	Level inversion of digital inputs	0	0	Level inversion is switched off	• By entering the sum of the selected values you can invert several inputs • C0114 and C0411 are identical • The function "Parameter set changeover" cannot be inverted!
			1	E1 inverted	
			2	E2 inverted	
			4	E3 inverted	
			8	E4 inverted	
			16	E5 inverted	only application I/O
			32	E6 inverted	only application I/O
			64	T1/T2 inverted	T1/T2 can only be connected to potential-free switches. T1/T2 is active, if the switch is open.

Signal linkage

The internal digital signals are linked with an external signal source by entering the selection figure of the external signal in the corresponding subcode of C0410. C0410 can be different for the parameter sets.

Examples

- C0410/10 = 2 ⇨ Terminal X3/E2 is the signal source for controller inhibit (CINH)
- C0410/15 = 32 ⇨ CAN-IN1/word1, Bit 3 is the signal source for the DC injection brake (DCB)

Note!

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). If you link internal digital signals (C0410/x = 30 ... 105), they must be defined as digital input words. Otherwise the controller would interpret the bit control information incorrectly.

Signal level

- Terminals (X3/E1 ... X3/E6):
  – HIGH = +12 V ... +30 V
  – LOW = 0 V ... +3 V
- Process data input words:
  – HIGH = bit logic 1
  – LOW = bit logic 0
- Response times: 1.5 ... 2.5 ms

10.13.2 Free configuration of digital outputs

Description

- The digital outputs (X3/A1, X3/A2, relay output K1, relay output K2) can be freely assigned to internal digital signals.
- A signal source can be assigned to several targets.

Note!

- Use C0008 to assign some internal signal sources to the relay output D1. C0415/1 is automatically adapted.
- Use C0117 to assign some internal signal sources to the digital output X3/A1. C0415/2 is automatically adapted.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	**Name**	**Lenze**	**Selection**		
C0415 ENTER	Free configuration of digital outputs		Output of digital signals to terminals		📖 10.13-6
1	Relay output K1 (RELAY)	25	TRIP fault message (DCTRL1-TRIP)	**A selection under C0008 will be copied to C0415/1. A change of C0415/1 sets C0008 = 255!**	
2	Digital output X3/A1 (DIGOUT1)	16	Ready for operation (DCTRL1-RDY)	**A selection under C0117 will be copied to C0415/2. A change of C0415/2 sets C0117 = 255!**	
3 (A)	Digital output X3/A2 (DIGOUT2)	255	Not assigned (FIXED-FREE)		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0415 ENTER (cont.)				**Possible digital signals for C0415**		📖 10.13-6
			0	Not assigned (FIXED-FREE)		
			1	Parameter set 2 or parameter set 4 is active (DCTRL1-PAR-B0)	PAR-B1 PAR-B0 active LOW LOW PAR1 LOW HIGH PAR2 HIGH LOW PAR3 HIGH HIGH PAR4	
			2	Pulse inhibit active (DCTRL1-IMP)		
			3	I_{max} limit reached (MCTRL1-IMAX) (C0014 = -5-: Torque setpoint reached)		
			4	Frequency setpoint reached (DCTRL1-RFG1=NOUT)		
			5	Ramp function generator 1: Input = output (NSET1-RFG1-I=0)	RFG1 = Ramp function generator main setpoint	
			6	Value has fallen below frequency threshold Q_{min} (f < C0017) (PCTRL1-QMIN)	LOW active	
			7	Output frequency = 0 (DCTRL1-NOUT=0)		
			8	Controller inhibit active (DCTRL1-CINH)		
			9...12	Reserved		
			13	Collective message (DCTRL1-OH-PTC-LP1-FAN1-WARN): Overtemperature warning (ϑ_{max} -5 °C) (DCTRL1-OH-WARN) or Motor overtemperature warning (DCTRL1-LP1-PTC-WARN) or Motor phase failure warning (DCTRL1-LP1-WARN) or Fan failure warning (only active with 8200 motec)	 set C0119 = 2 or C0119 = 5 set C0597 = 2 Set C0608 = 0 for 8200 vector	
			14	DC-bus overvoltage (DCTRL1-OV)		
			15	CCW rotation (DCTRL1-CCW)		
			16	Ready for operation (DCTRL1-RDY)		
			17	Parameter set 3 or parameter set 4 is active (DCTRL1-PAR-B1)	PAR-B1 PAR-B0 active LOW LOW PAR1 LOW HIGH PAR2 HIGH LOW PAR3 HIGH HIGH PAR4	
			18	Value has fallen below TRIP or Q_{min} or pulse inhibit (IMP) is active (DCTRL1-TRIP-QMIN-IMP)		
			19	PTC warning (DCTRL1-PTC-WARN)	set C0119 = 2 or C0119 = 5	
				Status relay K_{SR}	Only with 8200 vector 15 ...90 kW, variant "Safe standstill": HIGH = pulse inhibit active through "Safe standstill" LOW = no pulse inhibit through "Safe standstill"	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0415 ENTER (cont.)				**Possible digital signals for C0415**		📖 10.13-6
			20	Apparent motor current < current threshold (DCTRL1-IMOT<ILIM)	Belt monitoring Apparent motor current = C0054 Current threshold = C0156 Frequency threshold Q_{min} = C0017	
			21	Apparent motor current < current threshold and output frequency > frequency threshold Q_{min} (DCTRL1-(IMOT<ILIM)-QMIN)		
			22	Apparent motor current < current threshold and RFG 1: Input = output (DCTRL1-(IMOT<ILIM)-RFG-I=0)		
			23	Motor phase failure warning (DCTRL1-LP1-WARN)	Set C0597 = 2	
			24	Minimum output frequency reached (f ≤ C0010) (PCTRL1-NMIN)	LOW active	
			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	Digital input X3/E1	Digital inputs	
			33	Digital input X3/E2		
			34	Digital input X3/E3		
			35	Digital input X3/E4		
			36 (A)	Digital input X3/E5		
			37 (A)	Digital input X3/E6		
			38	PTC input X2.2/T1, X2.2/T2	T1/T2 can only be connected to potential-free switches! T1/T2 is active ("HIGH") when the switch is closed	

Code		Possible settings			IMPORTANT	
No.	**Name**	**Lenze**	**Selection**			
C0415 ENTER (cont.)				**Possible digital signals for C0415**		10.13-1
				AIF control word (AIF-CTRL)	Assigned bits of AIF-CTRL: Bit 3: QSP Bit 7: CINH Bit 10: TRIP-SET Bit 11: TRIP-RESET	
			40	Bit 0		
			...	...		
			55	Bit 15		
				CAN-IN1.W1 or FIF-IN.W1		
			60	Bit 0		
			...	...		
			75	Bit 15		
				CAN-IN1.W2 or FIF-IN.W2		
			80	Bit 0		
			...	...		
			95	Bit 15		
				CAN-IN2.W1		
			100	Bit 0		
			...	...		
			115	Bit 15		
				CAN-IN2.W2		
			120	Bit 0		
			...	...		
			135	Bit 15		
				Status application I/O	Only active when using application I/O	
			140	Torque threshold 1 reached (MSET1=MOUT)		
			141	Torque threshold 2 reached (MSET2=MOUT)		
			142	Process controller output limit reached (PCTRL1-LIM)		
			143...172	Reserved		
			255	Not assigned (FIXED-FREE)		
C0409 ENTER	Configuration relay output K2		Output of digital signals to relay K2		• Relay output K2 only with 8200 vector 15 ... 90 kW • For operation with Application-I/O only active as of version E82ZAFA...XXVx2x	10.13-6
		255	255	Not assigned (FIXED-FREE)		
			Digital signals possible for C0409 see C0415			
C0416 ENTER	Level inversion of digital outputs	0	0	Level inversion is switched off	By entering the sum of the selected values you can invert several outputs	10.13-6
			1	Relay K1		
			2	X3/A1		
			4	X3/A2	only application I/O	
			8	Relay K2	Relay output K2 only with 8200 vector 15 ... 90 kW	
C0423* (A)	Digital output delay		0.000	{0.001 s} 65.000	"Debouncing" of 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. • Digital output reset without delay	10.13-6
1	Relay output K1 (RELAY)	0.000				
2	Digital output X3/A1 (DIGOUT1)	0.000				
3	Digital output X3/A2 (DIGOUT2)	0.000				

Signal linkage

The digital outputs are linked with the internal digital signals by entering the selection figure of the internal signal in the corresponding subcode of C0415. C0415 can be different for the parameter sets.

Examples

- C0415/2 ⇨ 15: The status message ”CCW rotation” is the signal source for X3/A1
- C0415/1 ⇨ 60: The status of bit 1 of the process data word CAN-IN1/word is the signal source for K1

Note!

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 digital word (16 bit). If you link digital outputs (C0415/x = 60 ... 135), they must be defined as digital input words. Otherwise the output signal would be incorrect.

Signal level for V-belt monitoring

Please consider the way the signals are mapped with the current threshold C0156 when monitoring a V-belt (monitoring signals 20, 21, 22):

- The display value (C0054) is smoothened with a ring memory with 500 ms.
- The value set under C0156 corresponds to a percentage of the rated controller current I_r .
- If you use the control mode “V/f characteristic control with square characteristic” (C0014 = 3) C0156 will be internally adapted via the output frequency:

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

Switching conditions

Selection under C0415/x		Relays/digital output (not inverted)
1	Parameter set 2 or parameter set 4 is active (DCTRL1-PAR-B0)	Picks up/HIGH, if parameter set 2 or parameter set 4 is active
2	Pulse inhibit active (DCTRL1-IMP)	Picks up/HIGH if STOP, controller inhibit (CINH), overvoltage or undervoltage
3	I_{max} limit reached (MCTRL1-IMAX) (C0014 = -5-: Torque setpoint reached)	Picks up/HIGH if motor current = C0022 or motor current = C0023
4	Frequency setpoint reached (DCTRL1-RFG1=NOUT)	Picks up/HIGH if output frequency = frequency setpoint
5	Ramp function generator 1: Input = output (NSET1-RFG1-I=0)	Picks up/HIGH, if the condition is met
6	Value has fallen below frequency threshold Q_{min} (f < C0017) (PCTRL1-QMIN)	Picks up/HIGH if output frequency > C0017 (related to setpoint)
7	Output frequency = 0 (DCTRL1-NOUT=0)	Picks up/HIGH, because • frequency setpoint = 0 Hz, t_{if} over • DC injection brake (DCB) is active • controller inhibited (CINH)
8	Controller inhibit active (DCTRL1-CINH)	Picks up/HIGH, if controller is inhibited by • X3/28 = LOW • C0410/10 = active • STOP
13	Collective message (DCTRL1-OH-PTC-LP1-FAN1-WARN) Overtemperature (ϑ_{max} - 5 °C) (DCTRL1-OH-WARN) or motor overtemperature (DCTRL1-LP1-PTC-WARN) or motor phase failure (DCTRL1-LP1-WARN) or fan failure (only active when using 8200 motec)	Picks up/HIGH, if one message is active
14	DC-bus overvoltage (DCTRL1-OV)	Picks up/HIGH, when the permissible voltage threshold is reached
15	CCW rotation (DCTRL1-CCW)	Picks up/HIGH with CCW rotation
16	Ready for operation (DCTRL1-RDY)	Picks up/HIGH, if the controller is ready for operation Drops out/LOW if • TRIP fault message • Undervoltage or overvoltage
17	Parameter set 3 or parameter set 4 is active (DCTRL1-PAR-B1)	Picks up/HIGH, if parameter set 3 or parameter set 4 is active
18	Value has fallen below TRIP or Q_{min} or pulse inhibit (IMP)is active (DCTRL1-TRIP-QMIN-IMP)	Drops out/LOW, if at least one of the three conditions (selection 25 or 6 or 2) is met
19	PTC warning (DCTRL1-PTC-WARN)	Drops out/LOW, if motor overtemperature is indicated by thermostat or PTC
20	Apparent motor current < current threshold (DCTRL1-IMOT<ILIM)	Picks up/HIGH, if the condition is met
21	Apparent motor current < current threshold and output frequency > frequency threshold Q_{min} (DCTRL1-(IMOT<ILIM)-QMIN)	
22	Apparent motor current < current threshold and RFG 1: Input = output (DCTRL1-(IMOT<ILIM)-RFG-I=0)	
23	Motor phase failure warning (DCTRL1-LP1-WARN)	
24	Minimum output frequency reached (f ≤ C0010) (PCTRL1-NMIN)	Picks up/HIGH if output frequency > C0010
25	TRIP fault message (DCTRL1-TRIP)	Picks up/HIGH with TRIP error message
26	Motor is running (DCTRL1-RUN)	Picks up/HIGH if output frequency ≠ 0 Hz
27	Motor is running/CW rotation (DCTRL1-RUN-CW)	Picks up/HIGH if output frequency > 0 Hz
28	Motor is running/CCW rotation (DCTRL1-RUN-CCW)	Picks up/HIGH if output frequency < 0 Hz
29	Process controller input = process controller output (PCTRL1-SET=ACT)	Picks up/HIGH, if the condition is met
31	Apparent motor current> current threshold and ramp function generator 1: Input = output (DCTRL1-(IMOT>ILIM)-RFG-I=0)	

Selection under C0415/x		Relays/digital output (not inverted)
32	Digital input X3/E1	Picks up/HIGH, if HIGH level is applied to the corresponding digital input
33	Digital input X3/E2	
34	Digital input X3/E3	
35	Digital input X3/E4	
36 (A)	Digital input X3/E5	
37 (A)	Digital input X3/E6	
38	PTC input X2.2/T1, X2.2/T2	Picks up/HIGH, if the potential-free switch is connected to X2.2/T1, X2.2/T2
40 ... 55	AIF control word (AIF-CTRL) Bit 0 ... Bit 15	Picks up/HIGH, if the corresponding bit is set
60 ... 75	CAN-IN1.W1 or FIF-IN.W1 bit 0 ... bit 15	
80 ... 95	CAN-IN1.W2 or FIF-IN.W2 bit 0 ... bit 15	
100 ... 115	CAN-IN2.W1 bit 0 ... bit 15	
120 ... 135	CAN-IN2.W2 bit 0 ... bit 15	
140	Torque threshold 1 reached (MSET1=MOUT)	Picks up/HIGH, if the condition is met
141	Torque threshold 2 reached (MSET2=MOUT)	
142	Process controller output limit reached (PCTRL1-LIM)	

10.13.3 Free configuration of digital process data output words

Description

- The digital process data output words can be freely assigned to internal digital signals. With this you can summarise status information which will be automatically assigned to status word bits:
  - The configuration under C0417 is mapped to the AIF status word 1 (C0150), FIF output word 1 (FIF-OUT.W1) and output word 1 of the CAN object 1 (CAN-OUT1.W1).
  - The configuration under C0418 is mapped to the AIF status word 2 (C0151), FIF output word 2 (FIF-OUT.W2) and output word 1 of the CAN object 2 (CAN-OUT2.W1).
- A signal source can be assigned to several targets.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0417* ENTER	Free configuration of controller status messages (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 CAN object 1 (CAN-OUT1.W1)	10.13-12
1	Bit 0	1	Active parameter set PAR-B0 active (DCTRL1-PAR-B0)	→ **Fixed assignment to AIF when operating with communication modules INTERBUS 211x, PROFIBUS-DP 213x or LECOM-A/B/LI 2102. Modifications are not allowed!** If you use function modules system bus (CAN), INTERBUS, PROFIBUS-DP to FIF, all bits are freely configurable.	
2	Bit 1	2 →	Pulse inhibit active (DCTRL1-IMP)		
3	Bit 2	3	I_{max} limit reached (MCTRL1-IMAX) (C0014 = -5-: Torque setpoint reached)		
4	Bit 3	4	Frequency setpoint reached (DCTRL1-RFG1=NOUT)		
5	Bit 4	5	Ramp function generator 1: Input = output (NSET1-RFG1-I=0)		
6	Bit 5	6	Value below frequency threshold Q_{min} (f < C0017) (PCTRL1-QMIN)		
7	Bit 6	7 →	Output frequency = 0 (DCTRL1-NOUT=0)		
8	Bit 7	8 →	Controller inhibit active (DCTRL1-CINH)		
9	Bit 8	9 →	11|10|9|8 Controller status 0000 Controller initialization 0001 Mains voltage off (at external supply of the control section ofthe drive controller)		
10	Bit 9	10 →	0010 Switch-on inhibit 0011 Operation inhibited		
11	Bit 10	11 →	0100 Flying restart circuit active 0101 DC-injection brake active		
12	Bit 11	12 →	0110 Operation enabled 0111 Message active 1000 Active error		
13	Bit 12	13 →	Collective message: (DCTRL1-OH-PTC-LP1-FAN1-WARN)		
14	Bit 13	14 →	DC-bus overvoltage (DCTRL1-OV)		
15	Bit 14	15	CCW rotation (DCTRL1-CCW)		
16	Bit 15	16	Ready for operation (DCTRL1-RDY)		
			Digital signals possible for C0417 see C0415		
C0418* ENTER	Free configuration of controller status messages (2)		Output of digital signals to bus	All bits can be freely configured 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)	10.13-12
1	Bit 0	255	Not assigned (FIXED-FREE)		
...	...	...			
16	Bit 15	255	Not assigned (FIXED-FREE)		
			Digital signals possible for C0418 see C0415		

Signal linkage

The process data output words are linked with internal signals by entering the selection figure of the internal signal in the corresponding subcode C0417 and C0418. C0417 and C0418 can be different for the parameter sets.

Examples

- C0417/4 ⇨ 16: The status message “Ready for operation” is the signal source for bit 3.
- C0418/5 ⇨ 101: Bit 2 of CAN-IN2.W1 is the signal source for bit 4.

Note!

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:

- If digitally configured under C0417 or C0418 not simultaneous analog assignment with C0421 (C0421/x = 255)!
- With analog configuration under C0421 no simultaneous digital assignment with C0417 and C0418 (C0417/x = 255, C0418/x = 255)!
- Otherwise the status information would be incorrect.

10.14 Thermal motor monitoring

10.14.1 I^2t monitoring

Description

With I^2t monitoring, self-ventilated three-phase AC motors can be thermally monitored without using sensor.

STOP

Stop!

- I^2t monitoring does not fully protect the motor since the calculated motor temperature is reset after every mains disconnection!
- After renewed mains connection the connected motor can be overheated, if
  – it is already hot and is still overloaded.
  – the cooling air supply is interrupted.
  – the air is too hot.
- Full motor protection can be achieved by using a PTC thermistor or thermostat in the motor. (📖 10.14-3)

Codes for parameter setting

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0120	I^2t switch-off	0	0 = not active	{1 %}	200	Reference: Apparent motor current (C0054) Ref. to active motor current (C0056) possible, see C0310	📖 10.14-1

Adjustment

1. Calculate C0120. This value corresponds to a motor load of 100 % :

$C0120\ [\%] = \frac{I_r}{I_N} \cdot 100\ \%$	I_r	Rated motor current
	I_r	Rated controller current at a chopper frequency of 8 kHz

2. If you reduce C0120 based on the calculated value, the monitoring already starts at a motor load of < 100 %.
3. If you increase C0120 based on the calculated value, the monitoring only starts at a motor load > 100 %.

The controller switches off with fault OC6, if the apparent motor current is higher than the rated motor current over a longer period of time.

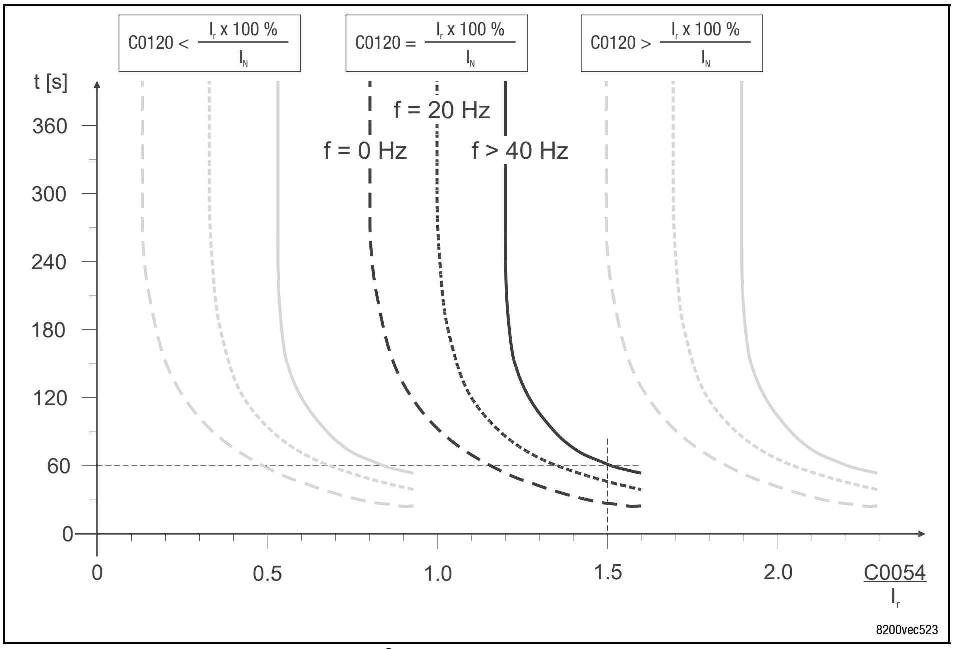


Fig. 10.14-1 Tripping characteristic of I^2t monitoring

f	Output frequency
t	Time to trip
I_r	Rated controller current at a chopper frequency of 8 kHz
I_r	Rated motor current
C0054	Apparent motor current

Example:

$C0120 = \frac{I_r}{I_N} \cdot 100\ \%$

C0054 = 1.5 x rated motor current

The controller switches off at output frequencies f > 40 Hz after approx. 60 s with fault OC6.

Tip

- To prevent motors with forced ventilation from starting too early, this function can be deactivated.
- The current limits C0022 and C0023 only have indirect influence on the I^2t calculation. It is possible to prevent motor operation with a maximum of possible load with settings under C0022 and C0023.

Note!

If the controller operates at increased rated power, the I^2t monitoring starts if C0120 is set lower than 100 %.

10.14.2 Temperature monitoring of the motor with PTC and earth-fault detection

Description

You can connect PTC resistors via the inputs X2/T1 and X2/T2 according to DIN 44081 and DIN 44082. The motor temperature is detected and integrated into the drive monitoring.

It is also possible to connect a thermostat (NC contact) to X2/T1 and X2/T2. Lenze AC three-phase motors are equipped with these components as standard.

We recommend to always activate the PTC input for operation with motors equipped with PTC resistors or thermostats. By this you prevent the motor from overheating.

Stop!

- The controller can only detect one PTC resistor! Do not connect several PTC resistors in series or in parallel:
  – The motor temperature would be measured incorrectly.
  – The motors could be destroyed by overheating.
- If you connect several motors to one controller, use thermostats (NC contacts) connected in parallel to monitor the motor temperature.
- To achieve a total motor protection you must install an additional temperature monitoring with a separate evaluation.

Codes for parameter setting

Code No.	Code Name	Possible settings Lenze	Selection			IMPORTANT	
C0119 ENTER	Configuration of motor temperature monitoring (PTC input) / earth fault detection	0	0	PTC input not active	Earth fault detection active	• Signal output configuration under C0415 • If several parameter sets are used, the monitoring must be separately adjusted for each parameter set. • Deactivate the earth fault detection, if it has been activated unintentionally. • If the earth fault detection is active, the motor starts after controller enable with a delay of approx.40 ms.	10.14-3
			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			

Activation

Note!
- In the Lenze setting, the temperature monitoring of the motor is switched off!
- If you are dealing with several parameter sets, you must activate the monitoring in each parameter set!

1. Connect the monitoring circuit of the motor to X2/T1 and X2/T2.
   – If 1.6 kΩ < R < 4 kΩ the monitoring is activated.
2. Set the reaction of the controller:
   – C0119 = 0 or 3: Temperature monitoring of the motor is switched off
   – C0119 = 1 or 4: TRIP fault message (keypad display: OH3 Trip)
   – C0119 = 2 or 5: Warning signal (keypad display: OH51 Warn)

Verification

Connect the PTC input to a fixed resistor:

- R > 4 kΩ: A fault message OH3 or OH51 must be initiated.
- R < 1 kΩ: A fault message must not be initiated.

10.15 External fault evaluation

10.15.1 External fault detection

Description

Use the internal digital signal DCTRL1-TRIP-SET to evaluate external disturbances and integrate them into the monitoring of the system. If an external disturbance is recognised, the controller indicates the fault EEr and sets controller inhibit.

Note!
The function is LOW active.

Activation

- C0410/11 (DCTRL1-TRIP-SET) must be combined with digital signal source.
- LOW level at the signal source for DCTRL1-TRIP-SET sets fault message EEr and activates the controller inhibit.

Note!
Use C0007 to carry out a fixed configuration of DCTRL1-TRIP-SET with the digital inputs X3/E1 ... X3/E4. C0410/11 will be automatically adapted.

10.15.2 Reset of external faults

Description

You can reset a fault message with the internal digital signal DCTRL1-TRIP-RESET, when the cause of disturbance has been removed.

Note!
A LOW-HIGH signal resets the fault message.

Activation

- C0410/12 (DCTRL1-TRIP-RESET) must be combined with digital signal source.
- LOW-HIGH signal at the signal source for DCTRL1-TRIP-RESET resets the fault message.

Note!
Further options to reset fault messages: (📖 11.5-1)

10.16 Display of operating data, diagnostics

10.16.1 Display of operating data

Description

Important operating parameters are measured by the controller. They can be displayed with the keypad or PC.

Some operating data can be calibrated to be directly displayed or selected in the process variable unit (e.g. pressure, temperature, speed).

Note!
The calibration always effects all selected codes.

Codes for parameter setting

Code		Possible settings		IMPORTANT	
No.	**Name**	**Lenze**	**Selection**		
C0004*	Bar-graph display	56	1 {Code No.} 989 56 = controller load (C0056)	• Bargraph display indicates the selected value in % after power on • Range -180 % ... +180 %	
C0044*	Setpoint 2 (NSET1-N2)		-650.00 {0.02 Hz} 650.00	**The value set will be lost when switching the mains!** • Selection, if C0412/2 = FIXED-FREE (not assigned) • Display if C0412/2 is linked with a signal source	10.8-15
C0046*	Setpoint 1 (NSET1-N1)		-650.00 {0.02 Hz} 650.00	**The value set will be lost when switching the mains!** • Selection, if C0412/1 = FIXED-FREE (not assigned) • Display if C0412/1 is linked with a signal source	10.8-15
C0047*	Torque setpoint or torque limit value (MCTRL1-MSET)	400	0 {1 %} 400 Ref.: Rated motor torque detected by motor parameter identification	**The value set will be lost when switching the mains!** Control mode "Sensorless torque control" (C0014 = 5): • Torque setpoint selection if C0412/6 = FIXED-FREE (not assigned) • Torque setpoint display if C0412/6 is linked with a signal source Control mode "V/f characteristic control" or "Vector control" (C0014 = 2, 3, 4): • Torque limit value is displayed if C0412/6 is linked with a signal source • C0047 = 400 is displayed if C0412/6 = FIXED-FREE (not assigned)	10.3-11
C0049*	Additional setpoint (PCTRL1-NADD)		-650.00 {0.02 Hz} 650.00	**The value set will be lost when switching the mains!** • Selection, if C0412/3 = FIXED-FREE (not assigned) • Display if C0412/3 is linked with a signal source	
C0050* uSEr	Output frequency (MCTRL1-NOUT)		-650.00 {Hz} 650.00	Only display: Output frequency without slip compensation	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0051*	Output frequency with slip compensation (MCTRL1-NOUT +SLIP) or act. process controller value (PCTRL1-ACT)		-650.00	{0.02 Hz}	650.00	**The value set will be lost when switching the mains!** Operation without process controller (C0238 = 2): • Display only: Output frequency with slip compensation (MCTRL1-NOUT+SLIP) Operation with process controller (C0238 = 0, 1): • Selection, if C0412/5 = FIXED-FREE (not assigned) • Display if C0412/5 is linked with a signal source	🕮 10.10-6
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)		0.0	{A}	2000.0	Only display	
C0056*	Controller load (MCTRL1-MOUT)		-255	{%}	255	Only display	
C0061*	Heatsink temperature		0	{°C}	255	Only display • If the heatsink temperature is > ϑ_{max} - 5 °C: – The warning OH will be sent. – The chopper frequency will be reduced to 4 kHz, if C0144 = 1 • If the heatsink temperature is > ϑ_{max}: – Controller sets TRIP OH	
C0138*	Process controller setpoint 1 (PCTRL1-SET1)	0.00	-650.00	{0.02 Hz}	650.00	**The value set will be lost when switching the mains!** • Selection if C0412/4 = FIXED-FREE • Display if C0412/4 ≠ FIXED-FREE	🕮 10.10-5
C0189* (A)	Output signal compensator (PCTRL1-FOLL1-OUT)		-650.00	{0.02 Hz}	650.00	Only display Compensator = PCTRL1-FOLL1	
C0320 (A)	Actual process controller value (PCTRL1-ACT)		-650.00	{0.02 Hz}	650.00	Only display	
C0321 (A)	Process controller setpoint (PCTRL1-SET)		-650.00	{0.02 Hz}	650.00	Only display	
C0322 (A)	Process controller output without precontrol (PCTRL1-OUT)		-650.00	{0.02 Hz}	650.00	Only display	
C0323 (A)	Ramp function generator input (NSET1-RFG1-IN)		-650.00	{0.02 Hz}	650.00	Only display	
C0324 (A)	Ramp function generator output (NSET1-NOUT)		-650.00	{0.02 Hz}	650.00	Only display	
C0325 (A)	PID controller output (PCTRL1-PID-OUT)		-650.00	{0.02 Hz}	650.00	Only display	
C0326 (A)	Process controller output (PCTRL1-NOUT)		-650.00	{0.02 Hz}	650.00	Only display	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0500*	Calibration of numerator variable	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 in a way that the keypad indicates a process variable. • If C0500/C0501 remain unchanged, the unit "Hz" will no longer be displayed.	📖 10.16-1
C0501*	Calibration of denominator process variable	10	1 {1} 25000		
C0500* (A)	Calibration of numerator variable	2000	1 {1} 25000	• The codes C0037, C0038, C0039, C0044, C0046, C0049, C0051, C0138, C0139, C0140, C0181 can be calibrated in a way that the keypad indicates a process variable with the unit selected under C0502. • Frequency-related codes (C0010, C0011, C0017, C0019, C0050, C0239, C0625, C0626, C0627) are always indicated in "Hz".	📖 10.16-1
C0501* (A)	Calibration of denominator process variable	10	1 {1} 25000		
C0502* (A)	Process variable unit	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		

Calibration

Calibrated values are calculated from:

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

Calibration example

The pressure setpoint is to be selected in bar.

The maximum pressure of 5 bars (100 %) is reached at C0011 = 50 Hz.

Relative calibration in %

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

E.g. C0500 = 4000, C0501 = 10

Absolute calibration in bar

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

E.g. C0500 = 200, C0501 = 10

Note!

At standard I/O operation the frequency-related codes C0010, C0011, C0017, C0019, C0050, C0239, C0625, C0626 and C0627 are also displayed in the unit defined by calibration.

10.16.2 Diagnostics

Description

Display codes for diagnostics

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0093*	Controller type		xxxy		Only display • xxx = Power taken from nameplate (e. g. 551 = 550 W) • y = Voltage class (2 = 240 V, 4 = 400 V)	
C0099*	Software version		x.y		Only display x = Main version, y = Index	
C0161*	Active error				Display history buffer contents • Keypad: three-digit, alpha numerical fault detection • 9371BB keypad: LECOM fault number	🕮 11.1-1
C0162*	Last fault					
C0163*	Last but one fault					
C0164*	Last but two fault					
C0168*	Actual fault				History buffer displays "active error" • Keypad: three-digit, alpha numerical fault detection • 9371BB keypad: LECOM fault number	🕮 11.1-1
C0179*	Power-on time		{h}		Only display Total time mains on	
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 ID number				Only PC display x = Main version, y = Subversion	
			82S8212V_xy000		8200 vector 0.25 ... 11 kW	
			82S8212V_xy010		8200 vector 15 ... 90 kW	
C0201*	Software generation date				Only PC display	
C0202*	Software ID number		Output to keypad as string in 4 parts à 4 characters		Only keypad display	
1			82S8			
2			212V			
3			_xy0		x = Main version, y = Subversion	
4			zz		00 = 8200 vector 0.25 ... 11 kW 10 = 8200 vector 15 ... 90 kW	
C0304 ... C0309	Service codes				**Modifications only by Lenze Service!**	
C0372*	Function module identification		0	No function module	Only display	
			1	Standard I/O or AS-i		
			2	System bus (CAN)		
			6	Other function module on FIF e.g. application I/O, INTERBUS, ...		
			10	No valid recognition		

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0518 C0519 C0520	Service codes			**Modifications only by Lenze Service!**	
C1500* (A)	Software number application I/O		82SAFA0B_xy000	Only PC display x = main version y = subversion	
C1501* (A)	Software creation date application I/O			Only PC display	
C1502* (A)	Software number application I/O		Output to keypad as string in 4 parts à 4 characters	Only keypad display x = main version y = subversion	
1			82SA		
2			FA0B		
3			_xy0		
4			00		
C1504 (A) ... C1507 (A)	Service codes application I/O			**Modifications only by Lenze Service!**	
C1550 (A)	Service code application I/O			**Modifications only by Lenze Service!**	

10.17 Parameter set management

10.17.1 Saving and copying parameter sets

Description

Management of the controller parameter sets. It is possible to

- restore the Lenze setting and put the controller into the delivery state again.
- save your own basic setting, e.g. the delivery state of the machine.
- transfer parameter sets from the keypad to the controller or vice versa. The settings can thus be easily copied between controllers.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	**Name**	**Lenze**	**Selection**			
C0002* STOP uSEr	Parameter set management	0	0	Ready	**PAR1 ... PAR4:** • Parameter sets of the controller • PAR1 ... PAR4 also contain parameters for Standard-I/O, Application-I/O, AS interface or system bus (CAN) **FPAR1:** • Module-specific parameter set of the fieldbus function modules INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen • FPAR1 is saved in the function module	📖 10.17-1
	Restorage of default setting		1	Lenze setting ⇨ PAR1	Restorage of factory setting in the selected parameter set	
			2	Lenze setting ⇨ PAR2		
			3	Lenze setting ⇨ PAR3		
			4	Lenze setting ⇨ PAR4		
			31	Lenze setting ⇨ FPAR1	Restorage of default setting in the fieldbus function module	
			61	Lenze setting ⇨ PAR1 + FPAR1	Restorage of default setting in the selected parameter set of the controller and the fieldbus function module	
			62	Lenze setting ⇨ PAR2 + FPAR1		
			63	Lenze setting ⇨ PAR3 + FPAR1		
			64	Lenze setting ⇨ PAR4 + FPAR1		
C0002* STOP uSEr (cont.)	Parameter set transfer using the keypad				Use the keypad to transfer parameter sets to other controllers. **During transfer the parameters cannot be accessed via other channels!**	
				Keypad ⇨ Controller	All available parameter sets (PAR1 ... PAR4, and FPAR1) are overwritten with the corresponding keypad data	
			70	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen		
			10	With all other function modules		

Code		Possible settings			IMPORTANT
No.	**Name**	**Lenze**	**Selection**		
C0002* STOP uSEr (cont.)	Parameter set transfer using the keypad			Keypad ⇨ PAR1 (+ FPAR1)	Overwrite selected parameter set and, if necessary, FPAR1 with the corresponding keypad data
			71	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
			11	With all other function modules	
				Keypad ⇨ PAR2 (+ FPAR1)	
			72	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
			12	With all other function modules	
				Keypad ⇨ PAR3 (+ FPAR1)	
			73	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
			13	With all other function modules	
				Keypad ⇨ PAR4 (+ FPAR1)	
			74	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
			14	With all other function modules	
				Controller ⇨ Keypad	All available parameter sets (PAR1 ... PAR4, and FPAR1) are copied to the keypad
			80	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
			20	With all other function modules	
				Keypad ⇨ Function module	Overwrite the module-specific parameter set FPAR1 only
			40	Only with function module INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
				Function module ⇨ Keypad	Copy the module-specific parameter set FPAR1 only
			50	Only with function module INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen	
C0002* STOP uSEr (cont.)	Saving of own settings		9	PAR1 ⇨ Own settings	You can save your own basic settings for a controller (e.g. machine delivery status): 1. Ensure that parameter set 1 is active 2. Controller inhibit 3. Set C0003 = 3, acknowledge with ENTER 4. Set C0002 = 9, acknowledge with ENTER, to save your own basic settings 5. Set C0003 = 1, acknowledge with ENTER 6. Enable the controller.
C0002* STOP uSEr (cont.)	Loading/copying of your own basic settings				Using this function, PAR1 can be copied to parameter sets PAR2 ... PAR4
			5	Own settings ⇨ PAR1	Restorage of own basic setting in the selected parameter set
			6	Own settings ⇨ PAR2	
			7	Own settings ⇨ PAR3	
			8	Own settings ⇨ PAR4	

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0003* ENTER	Non-volatile parameter saving	1	0	Parameter not saved in EEPROM	Data loss after mains disconnection
			1	Parameter always saved in EEPROM	• Active after every mains connection • Cyclic parameter changes via bus module are not allowed.
			3	Own settings saved in EEPROM	The parameter set 1 saved as own basic setting with C0002 = 9

Note!

- Do not disconnect the keypad during the parameter transfer! If the keypad is removed during transfer, the controller will indicate the errors ”Prx” or ”PT5”.
- A detailed description of the keypads is included in the chapter ”Parameter setting”.

Restoration of default setting

Loading of Lenze settings

1. Plug in the keypad.
2. Inhibit the controller with STOP or via terminal (X3/28 = LOW).
3. Use C0002 to set the correct selection figure from the category ”Restoration of default setting” and confirm with ENTER .
   – E.g. C0002 = 1: Parameter set 1 of the controller is overwritten with the Lenze setting.

Transfer parameter sets to the keypad

Parameter set transfer from the controller to the keypad

1. Plug in the keypad.
2. Inhibit the controller with STOP or via terminal (X3/28 = LOW).
3. Set C0002 = 20 or 50 or 80 and confirm with ENTER .

Parameter set transfer to the controller

Transfer of parameter sets from the keypad to the controller

1. Plug in the keypad.
2. Inhibit the controller with STOP or via terminal (X3/28 = LOW).
3. Use C0002 to set the correct selection figure from the category ”Parameter set transfer with keypad” and confirm with ENTER .
   – E.g. C0002 = 10: All parameter sets of the controller are overwritten with the settings in the keypad.
   – E.g. C0002 = 11: Parameter set 1 of the controller is overwritten with the settings in the keypad.

Saving your own basic settings

Saving your own basic settings

1. Plug in the keypad.
2. Parameter set 1 must be active!
3. Inhibit the controller with STOP or via terminal (X3/28 = LOW).
4. Set parameters in parameter set 1
5. Set C0003 = 3 and confirm with ENTER .
6. Set C0002 = 9 and confirm with ENTER . Your own basic setting is saved.
7. Set C0003 = 1 and confirm with ENTER .

Copying your own basic setting

Copying your own basic setting into the parameter sets

1. Plug in the keypad.
2. Inhibit the controller with STOP or via terminal (X3/28 = LOW).
3. Use C0002 to set the correct selection figure from the category ”Loading/copying your own basic setting” and confirm with ENTER.
   – E.g. C0002 = 5: Parameter set 1 is overwritten with your own basic setting.
   – E.g. C0002 = 8: Parameter set 4 is overwritten with your own basic setting.

10.17.2 Parameter set changeover

Description

During operation you can change between the four parameter sets of the controller via digital signals. Thus 9 additional JOG values or additional acceleration and deceleration times are available.

The parameter set changeover via digital signals is not possible if the automatic changeover via DC-bus voltage is active!

Activation

Link C0410/13 (DCTRL1-PAR2/4) and C0410/14 (DCTRL1-PAR3/4) with a digital signal source.

After being initialised, the controller always operates with parameter set 1. Only when a signal for parameter set changeover is active, the controller changes the parameter set.

Note!

- C0410/13 and C0410/14 must be linked with the same signals in all parameter sets!
- Start the parameter setting with the highest parameter set. Parameterise the parameter set 1 at the end. In this way undefined states can be prevented
- If the control mode (C0014) is different for the parameter sets, you should only switch between the parameter sets when the controller is inhibited (CINH).

Signal source		**Active parameter set**
Level at C0410/13	**Level at C0410/14**	
LOW	LOW	Parameter set 1 (PAR1)
HIGH	LOW	Parameter set 2 (PAR2)
LOW	HIGH	Parameter set 3 (PAR3)
HIGH	HIGH	Parameter set 4 (PAR4)

Note!

Use C0007 to link the changeover between parameter set 1 and parameter set 2 with the digital inputs X3/E2 or X3/E3.

10.18 Individual summary of drive parameters in the user menu

Description

- Fast access to 10 codes
- Individual combination of 10 codes most important for your application.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0517* ENTER	User menu				• After mains switching or when using the function Disp the code from C0517/1 will be displayed. • In Lenze setting, the user menu contains the most important codes for setting up 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. **Codes, which are only active when being used together with an Application-I/O, cannot be entered!**	10.18-1
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	U_{min} boost		
10	Memory 10	2	C0002	Parameter set transfer		

User menu adaptation

Enter the required code number or subcode number into the subcodes under C0517.

Note!

Use the user menu to select "tailored" codes for your application to be used by your personnel if the password protection is activated additionally. Your personnel can only change codes listed in the user menu.

Example: Select speed via keypad

The personnel operating a transportation system shall be able to change the speed of the conveyor using the keypad. The speed is set and indicated in "rpm":

User menu configuration

1. Assign C0140 to memory 1 of the user menu (C0517/1 = 140)
2. Delete all other entries from the user menu (C0517/2 ... C0517/10 = 0)
3. Convert the value indicated under C0140 into "rpm" using C0500/C0501 (10.16-1)
4. Activate the password protection (C0094 > 0)
5. The current conveyor speed will be indicated after the keypad has been attached or power on.
6. Use to activate the function Para and to change the speed during operation using the keys. The speed set last will be stored when the mains is switched off.

10.19 Networking

For networking with bus systems the controller has two interfaces:

- the automation interface (AIF) for communication modules
- the function interface (FIF) for function modules

A detailed description for networking with different bus system can be found in the corresponding communication manuals.

10.19.1 Networking with E82ZAFCC system bus function module (CAN)

Description

Codes required for configuring a system bus network with the E82ZAFCC function module are integrated into the controller.

A detailed description can be found the the CAN communication manual.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	**Name**	**Lenze**	**Selection**			
C0350* ENTER	System bus node address	1	1 {1} 63		• Only for the E82ZAFCC system bus function module on the FIF interface. • Changes will become effective after the command "reset node" **During operation with 217x communication modules the node address must be set under C0009.**	10.19-1
C0351* ENTER	System bus baud rate	0	0	500 kbit/s	• Only for the E82ZAFCC system bus function module on the FIF interface. • Changes will become effective after the command "reset node" **During operation with 217x communication modules the baud rate must be set under C0125.**	10.19-1
			1	250 kbits/s		
			2	125 kbits/s		
			3	50 kbits/s		
			4	1000 kbits/s (only E82ZAFCC100 function module)		
			5	20 kbits/s		
C0352* ENTER	Configuration of system bus devices	0	0	slave	• Only for the E82ZAFCC system bus function module on the FIF interface. • Changes will become effective after the command "reset node"	10.19-1
			1	Master		
C0353* ENTER	System bus address source				• Only for the E82ZAFCC system bus function module on the FIF interface. • Address source for system bus process data channels	10.19-1
1	CAN1 (sync)	0	0	C0350 is source	Effective with sync control (C0360 = 1)	
2	CAN2	0	1	C0354 is the source		
3	CAN1 (time)	0			Effective with event and time control (C0360 = 0)	

Code No.	Name	Possible settings: Lenze	Possible settings: Selection	IMPORTANT	
C0354* ENTER	Selective system bus address		0 {1} 513	• Only for the E82ZAFCC system bus function module on the FIF interface. • Individual addressing of system bus process data objects	10.19-1
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 and time control (C0360 = 0)	
6	CAN-OUT1 (time)	386			
C0355* ENTER	System bus identifier		0 {1} 2047	• Only for the E82ZAFCC system bus function module on the FIF interface. • Only display	10.19-1
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* ENTER	System bus time settings			Only for the E82ZAFCC system bus function module on the FIF interface.	10.19-1
1	Boot up	3000	0 {1 msec} 65000	Required for CAN network without master	
2	Cycle time CAN-OUT2	0		0 = event-controlled process data transfer > 0 = cyclic process data transfer	
3	Cycle time CAN-OUT1	0		0 and C0360 = 0: event-controlled process data transfer > 0 and C0360 = 1: cyclic process data transfer	
4	CAN delay	20		Waiting time until cyclic sending after boot-up	
C0357* ENTER	System bus monitoring times			Only for the E82ZAFCC system bus function module on the FIF interface.	10.19-1
1	CAN-IN1 (sync)	0	0 {1 msec} 65000 0 = monitoring not active	active, if C0360 = 1 TRIP CE1 at communication abort	
2	CAN-IN2	0		TRIP CE2 at communication abort	
3	CAN-IN1 (time)	0		active, if C0360 = 0 TRIP CE3 at communication abort	
C0358* ENTER	Reset node	0	0 Without function 1 System bus reset	• Only for the E82ZAFCC system bus function module on the FIF interface. • System bus reset node set-up	10.19-1
C0359* ENTER	System bus status		0 Operational 1 Pre-operational 2 Warning 3 Bus off	• Only for the E82ZAFCC system bus function module on the FIF interface. • Only display	10.19-1
C0360* ENTER	Control of process data channel CAN1	1	0 Event or time control 1 Sync control	Only for the E82ZAFCC system bus function module on the FIF interface.	

10.19.2 Parallel operation of AIF and FIF interfaces

Note!

Please observe the permissible combinations at parallel operation of AIF and FIF interfaces. A trouble-free operation can only be guaranteed when using permissible combinations.

Further information on parallel operation are included in the CAN communication manual.

Possible combinations		Communication module on AIF							
Function module in FIF (Design: Standard or PT)		Keypad E82ZBC 1) Keypad XT EMZ9371BC 1)	LECOM -A/B 2102.V001 -LI 2102.V003 -A 2102.V004 1)	LECOM-B (RS485) 2102.V002	INTERBUS 2111/2113 INTERBUS-Loop 2112	PROFIBUS-DP 2131/2133	System bus (CAN) 2171/2172	CANopen / DeviceNet 2175	LON 2141
Standard I/O	E82ZAFSC	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Application I/O	E82ZAFAC	✓✓	✓	✓	✓	✓	✓	✓	✓
INTERBUS	E82ZAFIC	✓✓	(✓)	⊠	⊠	⊠	⊠	⊠	⊠
PROFIBUS-DP	E82ZAFPC	✓✓	(✓)	⊠	⊠	⊠	⊠	⊠	⊠
LECOM-B (RS485)	E82ZAFLC	✓✓	(✓)	⊠	⊠	⊠	⊠	⊠	⊠
System bus (CAN) System bus I/O-RS System bus I/O	E82ZAFCC E82ZAFCC100 E82ZAFCC200	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
CANopen / DeviceNet 2)	E82ZAFD	✓✓	✓✓	⊠	⊠	⊠	⊠	⊠	⊠
AS-i	E82ZAFFC	✓✓	✓✓	⊠	⊠	⊠	⊠	⊠	⊠

1) Independently of the jumper position always supplied internally.
2) In preparation
✓✓ Combination possible, internal or external supply of the communication module
✓ Combination possible, external voltage supply!
(✓) Combination possible, communication module can only be used for parameter setting.
⊠ Combination not possible

10.20 Code table

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. • Parameter value accepted immediately (ONLINE)
	1		Subcode 1 of Cxxxx	
	2		Subcode 2 of Cxxxx	
	*		Parameter value of the code is the same in all parameter sets	
	ENTER		Keypad E82ZBC	Changed parameters will be accepted after pressing ENTER
			Keypad XT EMZ9371BC	Changed parameters will be accepted after pressing SHIFT PRG
	STOP		Keypad E82ZBC	Changed parameters will be accepted after pressing ENTER if the controller is inhibited
			Keypad XT EMZ9371BC	Changed parameters will be accepted after pressing SHIFT PRG if the controller is inhibited
	(A)		Code, subcode or selection are only available when using an Application-I/O	
	uSEr		With Lenze setting the code is available in the USER-menu	
Name			Name of the code	
Lenze			Lenze setting (default setting/value set under C0002)	
	→		Further information can be obtained from "IMPORTANT"	
Selection	1 {%} 99		Min. value {unit} Max. value	
IMPORTANT	-		Brief, important explanations	

Code		Possible settings			IMPORTANT	
No.	**Name**	**Lenze**	**Selection**			
C0001 ENTER	Selection of setpoint entry (operating mode)	0			• Changing C0001 will cause the changes mentioned below under C0412 and C0410, if no free configuration under C0412 was made before. • In the event that a free configuration was made under C0412 (verification = C0005 = 255), C0001 does not influence C0412 and C0410. The signals must be linked manually. • Free configuration under C0412 or C0410 does not change C0001! • The control can be realised via terminals or PC/keypad	🕮 10.8-1
			0	Setpoint entry via AIN1 (X3/8 or X3/1U, X3/1I)	• C0412/1 and C0412/2 are linked with the analog input 1(C0412/1 = 1, C0412/2 = 1). • C0410 is not changed.	
			1	Setpoint entry via keypad or parameter channel of an AIF bus module	• Under C0412 the linkage with the analog input is separated (C0412/1 = 255, C0412/2 = 255). • Setpoint selection via C0044 or C0046. • C0410 is not changed.	
			2	Setpoint selection via AIN1 (X3/8 or X3/1U, X3/1I)	• C0412/1 and C0412/2 are linked with the analog input 1 (C0412/1 = 1, C0412/2 = 1) • C0410 is not changed.	
			3	Setpoint selection via process channel of an AIF bus module	• C0001 = 3 must be set to select a setpoint via a process data channel of an AIF bus module (types 210x, 211x, 213x, 217x)! Otherwise the process data will not be evaluated. • C0412/1 and C0412/2 are linked with the analog input words AIF-IN.W1 and AIF-IN.W2 (C0412/1 = 10, C0412/2 = 11). • C0410/1 ... C0410/16 are linked with the single bit of the AIF control word (AIF-CTRL) (C0410/1 = 10 ... C0410/16 = 25)	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0002* STOP uSEr	Parameter set management	0	0	Ready	**PAR1 ... PAR4:** • Parameter sets of the controller • PAR1 ... PAR4 also contain parameters for Standard-I/O, Application-I/O, AS interface or system bus (CAN) **FPAR1:** • Module-specific parameter set of the fieldbus function modules INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen • FPAR1 is saved in the function module	10.17-1
	Restorage of default setting		1	Lenze setting ⇨ PAR1	Restorage of factory setting in the selected parameter set	
			2	Lenze setting ⇨ PAR2		
			3	Lenze setting ⇨ PAR3		
			4	Lenze setting ⇨ PAR4		
			31	Lenze setting ⇨ FPAR1	Restorage of default setting in the fieldbus function module	
			61	Lenze setting ⇨ PAR1 + FPAR1	Restorage of default setting in the selected parameter set of the controller and the fieldbus function module	
			62	Lenze setting ⇨ PAR2 + FPAR1		
			63	Lenze setting ⇨ PAR3 + FPAR1		
			64	Lenze setting ⇨ PAR4 + FPAR1		
C0002* STOP uSEr (cont.)	Parameter set transfer using the keypad				Use the keypad to transfer parameter sets to other controllers. **During transfer the parameters cannot be accessed via other channels!**	
				Keypad ⇨ Controller	All available parameter sets (PAR1 ... PAR4, and FPAR1) are overwritten with the corresponding keypad data	
			70	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen		
			10	With all other function modules		
C0002* STOP uSEr (cont.)	Parameter set transfer using the keypad			Keypad ⇨ PAR1 (+ FPAR1)	Overwrite selected parameter set and, if necessary, FPAR1 with the corresponding keypad data	
			71	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen		
			11	With all other function modules		
				Keypad ⇨ PAR2 (+ FPAR1)		
			72	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen		
			12	With all other function modules		
				Keypad ⇨ PAR3 (+ FPAR1)		
			73	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen		
			13	With all other function modules		
				Keypad ⇨ PAR4 (+ FPAR1)		
			74	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen		
			14	With all other function modules		
				Controller ⇨ Keypad	All available parameter sets (PAR1 ... PAR4, and FPAR1) are copied to the keypad	
			80	With function module Application-I/O, INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen		
			20	With all other function modules		
				Keypad ⇨ Function module	Overwrite the module-specific parameter set FPAR1 only	
			40	Only with function module INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen		
				Function module ⇨ Keypad	Copy the module-specific parameter set FPAR1 only	
			50	Only with function module INTERBUS, PROFIBUS-DP, LECOM-B, DeviceNet/CANopen		

Code		Possible settings		IMPORTANT
No.	Name	Lenze	Selection	
C0002* STOP uSEr (cont.)	Saving of own settings		9 PAR1 ⇨ Own settings	You can save your own basic settings for a controller (e.g. machine delivery status): 1. Ensure that parameter set 1 is active 2. Controller inhibit 3. Set C0003 = 3, acknowledge with ENTER 4. Set C0002 = 9, acknowledge with ENTER, to save your own basic settings 5. Set C0003 = 1, acknowledge with ENTER 6. Enable the controller.
C0002* STOP uSEr (cont.)	Loading/copying of your own basic settings			Using this function, PAR1 can be copied to parameter sets PAR2 ... PAR4
			5 Own settings ⇨ PAR1	Restorage of own basic setting in the selected parameter set
			6 Own settings ⇨ PAR2	
			7 Own settings ⇨ PAR3	
			8 Own settings ⇨ PAR4	
C0003* ENTER	Non-volatile parameter saving	1	0 Parameter not saved in EEPROM	Data loss after mains disconnection
			1 Parameter always saved in EEPROM	• Active after every mains connection • Cyclic parameter changes via bus module are not allowed.
			3 Own settings saved in EEPROM	The parameter set 1 saved as own basic setting with C0002 = 9
C0004*	Bar-graph display	56	1 {Code No.} 989 56 = controller load (C0056)	• Bargraph display indicates the selected value in % after power on • Range -180 % ... +180 %

Code		Possible settings			IMPORTANT	
No.	**Name**	**Lenze**	**Selection**			
C0005 ENTER	Fixed configuration analog input signals	0			**Change under C0005 will be copied to the corresponding subcode of C0412. Free configuration under C0412 sets C0005 = 255!** Please observe for configurations with frequency input: • Activate the frequency input X3/E1, X3/E2 with C0410/24 = 1. • Delete all existing signal connections of digital inputs used by the frequency input in C0410. • Frequency input configuration under C0425 and C0426	🕮 10.12-1
			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		
			2	Setpoint for speed control via frequency input with setpoint summation via X3/8		
			3	Setpoint for speed control via frequency input, 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 selection)	
			5	Setpoint for sensorless torque control via X3/8, speed limitation via freqency input		
			6	Controlled operation; setpoint via X3/8 with digital feedback via frequency input		
			7	Controlled operation; setpoint via frequency input X3/E1 with analog feedback via X3/8		
			200	All digital and analog input signals are sent via the fieldbus module to FIF (e. g. INTERBUS oder PROFIBUS-DP)	Sets C0410/x = 200 and C0412/x = 200	
			255	Free configuration under C0412	Only display Do not change C0005 since settings under C0412 can be lost	
C0007 ENTER uSEr	Fixed configuration of digital inputs				**Change under C0007 will be copied to the corresponding subcode of C0410. Free configuration under C0410 sets C0007 = 255!**	🕮 10.13-1
		0	(see selection table below)		• CW/CCW = CW rotation/CCW rotation • DCB = DC-injection brake • QSP = Quick stop • PAR = Parameter set changeover (PAR1 ⇔ PAR2) – PAR1 = LOW, PAR2 = HIGH – The terminal must be assigned to the function "PAR" in PAR1 and PAR2. – Configurations with "PAR" are only allowed if C0988 = 0 • TRIP set = external fault	

Selection	E4	E3	E2	E1
0	CW/CCW	DCB	JOG2/3	JOG1/3
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
j6	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

Code No.	Name	Possible settings Lenze	Selection	E4	E3	E2	E1	IMPORTANT
C0007 ENTER uSEr (cont.)				E4	E3	E2	E1	• Selection of fixed setpoints
			11	CW/CCW	DCB	UP	DOWN	JOG1/3 JOG2/3 active C0046
			12	CW/CCW	PAR	UP	DOWN	LOW LOW JOG1
			13	CW/CCW	QSP	UP	DOWN	HIGH LOW JOG2
			14	CCW/QSP	CW/QSP	DCB	JOG1/3	LOW HIGH JOG3
			15	CCW/QSP	CW/QSP	PAR	JOG1/3	HIGH HIGH
			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	
C0007 ENTER uSEr (cont.)				E4	E3	E2	E1	• UP/DOWN = Motor potentiometer functions
			20	CCW/QSP	CW/QSP	TRIP set	JOG1/3	• H/Re = Hand/remote changeover
			21	CCW/QSP	CW/QSP	UP	DOWN	• PCTRL1-I-OFF = Switch-off process controller I component
			22	CCW/QSP	CW/QSP	UP	JOG1/3	• DFIN1-ON = Digital frequency input 0 ... 10 kHz
			23	M/Re	CW/CCW	UP	DOWN	• PCTRL1-OFF = Switch off process controller
			24	M/Re	PAR	UP	DOWN	
			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	
C0007 ENTER uSEr (cont.)				E4	E3	E2	E1	
			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	
C0007 ENTER uSEr (cont.)				E4	E3	E2	E1	
			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	Free configuration under C0410				Only display Do not change C0007 since settings under C0410 can be lost

Code		Possible settings			IMPORTANT	
No.	**Name**	**Lenze**	**Selection**			
C0008 ENTER	Fixed configuration of relay output K1 (relay)	1			**Change under C0008 will be copied to C0415/1. Free configuration under C0415/1 sets C0008 = 255!**	📖 10.13-6
			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 (DCTRL1-RFG1=NOUT)		
			7	Value below frequency threshold Q_{min} (f < C0017) (PCTRL1-QMIN)	LOW active	
			8	I_{max} limit reached (MCTRL1-IMAX) C0014 = 5: Torque setpoint reached		
			9	Overtemperature (ϑ_{max} -5 °C) (DCTRL1-OH-WARN)		
			10	Value below TRIP or Q_{min} or pulse inhibit (IMP) (DCTRL1-TRIP-QMIN-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 Frequency threshold Q_{min} = C0017	
			13	Apparent motor current < current threshold and output frequency > frequency threshold Q_{min} (DCTRL1-(IMOT<ILIM)-QMIN)		
			14	Apparent motor current < current threshold and RFG 1: Input = output (DCTRL1-(IMOT<ILIM)-RFG1=0)		
			15	Warning motor phase failure (DCTRL1-LP1-WARN)		
			16	Minimum output frequency reached (f ≤ C0010) (PCTRL1-NMIN)	LOW active	
			255	Free configuration under C0415/1	Only display Do not change C0008 since settings under C0415/1 can be lost	
C0009* ENTER	Controller address	1	1	{1} 99	Only for communication modules on the AIF interface: • LECOM-A (RS232) E82ZBL • LECOM-A/B/LI 2102 • PROFIBUS-DP 213x, • System bus (CAN) 217x **During operation with the E82ZAFCC system bus function module the node address must be set under C0350.**	
C0010 uSEr	Minimum output frequency	0.00	0.00 → **14.5 Hz**	{0.02 Hz} 650.00	• C0010 is not effective with bipolar setpoint selection (-10 V ... + 10 V) • C0010 only defines the analog input 1 → **Speed setting range 1 : 6 for Lenze geared motors:** Setting absolutely required for operation with Lenze geared motors.	📖 10.6-1
C0011 uSEr	Maximum output frequency	50.00	7.50 → **87 Hz**	{0.02 Hz} 650.00		
C0012 uSEr	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	📖 10.7-1

Code No.	Code Name	Lenze	Selection		IMPORTANT	
C0013 uSEr	Deceleration time main setpoint	5.00	0.00 {0.02 s} 1300.00		Reference: frequency change C0011 ... 0 Hz • Additional setpoint ⇨ C0221 • Deceleration times to be activated via digital signals ⇨ C0103	10.7-1
C0014 ENTER	Operating mode	2	2	V/f characteristic control V ~ f (Linear characteristic with constant V_{min} boost)	• Commissioning without motor parameter identification possible • Benefit of identification with C0148: – Improved smooth running at low speed – V/f rated frequency (C0015) and slip (C0021) are calculated and stored. They do not have to be entered	10.3-1
			3	V/f characteristic control V ~ f^2 (Square-law characteristic with constant V_{min} boost)		
			4	Vector control	**For initial selection enter the motor data and identify the motor parameters with C0148** **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 uSEr	V/f rated frequency	50.00	7.50 {0.02 Hz} 960.00		• C0015 is calculated and stored under C0148 when the motor parameters are identified • Settings applies to all possible mains voltages	10.3-3 10.3-8
C0016 uSEr	V_{min} boost	→	0.00 {0.01 %} 40.00		→ Depending on the controller Setting applies to all mains voltages permitted	10.3-3
C0017	Frequency threshold Q_{min}	0.00	0.00 {0.02 Hz} 650.00		Programmable frequency threshold • Reference: Setpoint • Signal output configuration under C0415	
C0018 ENTER	Chopper frequency	2	0	2 kHz sin	General rule: The lower the chopper frequency • the lower the power loss • the higher the noise generation • the better the smooth running quality **Medium-frequency motors are only allowed to be operated at 8 kHz sin or 16 kHz sin (C0018 = 2 or 3)!**	10.4-3
			1	4 kHz sin		
			2	8 kHz sin		
			3	16 kHz sin (0 ... 3: low noise generation)		
C0018 ENTER	Chopper frequency (only 8200 vector 15 ... 90 kW)	6	0	2 kHz sin	General rule: The lower the chopper frequency • the lower the power loss • the higher the noise generation • the better the smooth running quality **Medium-frequency motors are only allowed to be operated at 8 kHz sin or 16 kHz sin (C0018 = 2 or 3)!**	10.4-3
			1	4 kHz sin		
			2	8 kHz sin		
			3	16 kHz sin (0 ... 3: low noise generation)		
			4	2 kHz		
			5	4 kHz		
			6	8 kHz		
			7	16 kHz (4 ... 7: low power loss)		
			8	1 kHz sin		
			9 ... 11	Reserved		
			12	1 kHz f_top — low power loss		
C0019	Threshold for automatic DC-injection brake (Auto DCB)	0.10	0.00 {0.02 Hz} 650.00 = not active		Holding time ⇨ C0106 Deactivate the automatic DC injection brake when the minimum frequency limit C0239 is active	10.7-6
C0021	Slip compensation	0.0	-50.0 {0.1 %} 50.0		C0021 is calculated and stored under C0148 when the motor parameters are identified	10.4-1

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0022	I_{max} limit (motor mode)	150	30	{1 %}	150	Only 8200 vector 15 ... 90 kW: If C0022 = 150 %, 180 % I_r are available for max. 3 s. after controller enable	10.6-3
C0023	I_{max}-limit in the generator mode	150	30	{1 %}	150	C0023 = 30 %: function is inactive, if C0014 = 2, 3:	10.6-3
C0026*	Offset analog input 1 (AIN1–OFFSET)	0.0	-200.0	{0.1 %}	200.0	• Settings for X3/8 and X3/1U, X3/1I • The max. limit of the setpoint value range of C0034 equals 100 % • C0026 and C0413/1 are identical	10.8-3
C0027*	Gain analog input 1 (AIN1-GAIN)	100.0	-1500.0	{0.1 %}	1500.0	• Settings for X3/8 and X3/1U, X3/1I • 100.0 % = Gain 1 • Inverse setpoint selection by negative gain and negative offset • C0027 and C0414/1 are identical	10.8-3
C0034* ENTER uSEr	Setpoint selection range Standard–I/O (X3/8)					Observe the switch position of the function module!	10.8-3
		0	0	Unipolar voltage 0 ... 5 V / 0 ... 10 V Current 0 ... 20 mA			
			1	Current 4 ... 20 mA		Changing the direction of rotation is only possible with a digital signal.	
			2	Bipolar voltage -10 V ... +10 V		• Minimum output frequency (C0010) not effective • Individual adjustment of offset and gain	
			3	Current 4 ... 20 mA open-circuit monitored		TRIP Sd5, if I < 4 mA Changing the direction of rotation is only possible with a digital signal.	
C0034* ENTER (A) uSEr	Setpoint selection range Application I/O					Observe the jumper setting of the function module!	10.8-3
1	X3/1U, X3/1I	0	0	Unipolar voltage 0 ... 5 V / 0 ... 10 V			
2	X3/2U, X3/2I		1	Bipolar voltage -10 V ... +10 V		Minimum output frequency (C0010) not effective	
			2	Current 0 ... 20 mA			
			3	Current 4 ... 20 mA		Changing the direction of rotation is only possible with a digital signal.	
			4	Current 4 ... 20 mA open-circuit monitored		Changing the direction of rotation is only possible with a digital signal. TRIP Sd5 if I < 4 mA	
C0035* ENTER	DC injection brake (DCB) control mode	0	0	Brake voltage selection under C0036		Holding time ⇨ C0107	10.7-6
			1	Brake current selection under C0036			
C0036	Voltage/current DC injection brake (DCB)	→	0.00	{0.01 %}	150.00 %	→ Depending on the controller • Reference M_r, I_r • Setting applies to all mains voltages permitted	10.7-6
C0037	JOG1	20.00	-650.00	{0.02 Hz}	650.00	JOG = Setpoint Additional JOG frequencies ⇨ C0440	10.8-13
C0038	JOG2	30.00	-650.00	{0.02 Hz}	650.00		
C0039	JOG3	40.00	-650.00	{0.02 Hz}	650.00		
C0040* ENTER	Controller inhibit (CINH)		-0-	controller inhibited (CINH)		Controller can only be enabled if X3/28 = HIGH	10.5-3
			-1-	Controller enabled ($\overline{\text{CINH}}$)			
C0043* ENTER	TRIP reset		0	No current error		Reset active error with C0043 = 0	
			1	Active fault			

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0044*	Setpoint 2 (NSET1-N2)		-650.00	{0.02 Hz}	650.00	**The value set will be lost when switching the mains!** • Selection, if C0412/2 = FIXED-FREE (not assigned) • Display if C0412/2 is linked with a signal source	🕮 10.8-15
C0046*	Setpoint 1 (NSET1-N1)		-650.00	{0.02 Hz}	650.00	**The value set will be lost when switching the mains!** • Selection, if C0412/1 = FIXED-FREE (not assigned) • Display if C0412/1 is linked with a signal source	🕮 10.8-15
C0047*	Torque setpoint or torque limit value (MCTRL1-MSET)	400	0 Ref.: Rated motor torque detected by motor parameter identification	{1 %}	400	**The value set will be lost when switching the mains!** Control mode "Sensorless torque control" (C0014 = 5): • Torque setpoint selection if C0412/6 = FIXED-FREE (not assigned) • Torque setpoint display if C0412/6 is linked with a signal source Control mode "V/f characteristic control" or "Vector control" (C0014 = 2, 3, 4): • Torque limit value is displayed if C0412/6 is linked with a signal source • C0047 = 400 is displayed if C0412/6 = FIXED-FREE (not assigned)	🕮 10.3-11
C0049*	Additional setpoint (PCTRL1-NADD)		-650.00	{0.02 Hz}	650.00	**The value set will be lost when switching the mains!** • Selection, if C0412/3 = FIXED-FREE (not assigned) • Display if C0412/3 is linked with a signal source	
C0050* uSEr	Output frequency (MCTRL1-NOUT)		-650.00	{Hz}	650.00	Only display: Output frequency without slip compensation	
C0051*	Output frequency with slip compensation (MCTRL1-NOUT +SLIP) or act. process controller value (PCTRL1-ACT)		-650.00	{0.02 Hz}	650.00	**The value set will be lost when switching the mains!** Operation without process controller (C0238 = 2): • Display only: Output frequency with slip compensation (MCTRL1-NOUT+SLIP) Operation with process controller (C0238 = 0, 1): • Selection, if C0412/5 = FIXED-FREE (not assigned) • Display if C0412/5 is linked with a signal source	🕮 10.10-6
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)		0.0	{A}	2000.0	Only display	
C0056*	Controller load (MCTRL1-MOUT)		-255	{%}	255	Only display	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0061*	Heatsink temperature		0	{°C}	255	Only display • If the heatsink temperature is > ϑ_{max} - 5 °C: – The warning OH will be sent. – The chopper frequency will be reduced to 4 kHz, if C0144 = 1 • If the heatsink temperature is > ϑ_{max}: – Controller sets TRIP OH	
C0070	Process controller gain	1.00	0.00 = P component not active	{0.01}	300.00		📖 10.10-1
C0071	Process controller readjustment time	100	10	{1}	9999 = I component not active		📖 10.10-1
C0072	Differential component of process controller	0.0	0.0 = D component not active	{0.1}	5.0		📖 10.10-1
C0074	Process controller influence	0.0	0.0	{0.1 %}	100.0		📖 10.10-1
C0077*	Gain I_{max} controller	0.25	0.00 = P component not active	{0.01}	16.00		📖 10.11-1
C0078*	Integral action time I_{max} controller	65 → 130	12	{1 ms}	9990 = I component not active	→ Only 8200 vector 15 ... 90 kW	📖 10.11-1
C0079	Oscillation damping	2	0	{1}	140		📖 10.4-4
C0080	Service code					**Modifications only by Lenze service!**	
C0084	Motor stator resistance	0.000	0.000	{0.001 Ω}	64.000		📖 10.9-1
		0.0	0.0	{0.1 m Ω}	6500.0	Only 8200 vector 15 ... 90 kW	
C0087	Rated motor speed	→	300	{1 rpm}	16000	→ Depending on the controller	📖 10.9-1
C0088	Rated motor current	→	0.0	{0.1 A}	650.0	→ Depending on the controller 0.0 ... 2.0 x rated output current of the controller	📖 10.9-1
C0089	Rated motor frequency	50	10	{1 Hz}	960		📖 10.9-1
C0090	Rated motor voltage	→	50	{1 V}	500	→ 230 V with 230 V controllers, 400 V with 400 V controllers	📖 10.9-1
C0091	Motor cos φ	→	0.40	{0.1}	1.0	→ Depending on the controller	📖 10.9-1
C0092	Motor stator inductance	0.0	0.000	{0.1 mH}	200.0		📖 10.9-1
		0.00	0.00	{0.01 mH}	200.00	Only 8200 vector 15 ... 90 kW	
C0093*	Controller type		xxxy			Only display • xxx = Power taken from nameplate (e. g. 551 = 550 W) • y = Voltage class (2 = 240 V, 4 = 400 V)	
C0094*	User password		0 = no password protection	{1}	9999	1 ... 9999 = Free access to user menu only	📖 9.3-8
C0099*	Software version		x.y			Only display x = Main version, y = Index	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0101 (A)	Main setpoint acceleration times						📖 10.7-1
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 active time pair	
2	T_{ir} 1	2.50					
3	T_{ir} 2	0.50					
4	T_{ir} 3	10.00					
C0103 (A)	Main setpoint deceleration times					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 quick stop (QSP)	5.00	0.00	{0.02 s}	1300.00	• Quick stop (QSP) decelerates the drive to standstill according to the ramp set under C0105. • If the output frequency falls below the threshold C0019, the DC-injection brake (DCB) will be activated. • The S-shaped ramp (C0182) has also an effect on quick stop! – Reduce the time setting under C0105 to reach the desired deceleration time for quick stop. – The S-shaped ramp for the quick stop can be switched off under C0311 (as of software 3.1).	📖 10.7-4
C0106	Holding time for automatic DC-injection brake (Auto DCB)	0.50	0.00 = auto DCB not active	{0.01 s}	999.00 = ∞	Holding time, if DC-injection brake is activated because the value falls below the setting under C0019.	📖 10.7-6
C0107	Holding time DC injection brake (DCB)	999.00	1.00	{0.01 s}	999.00 = ∞	Holding time, if DC-injection brakes are activated via an external terminal or control word.	📖 10.7-6
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	📖 10.12-4
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 and C0422/1 are the same	📖 10.12-4

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0111 ENTER	Configuration analog output X3/62 (AOUT1-IN)			Analog signal output to terminal	**Change of C0111 is copied to C0419/1.Free configuration in C0419/1 sets C0111 = -255-!**	📖 10.12-4
		0	0	Output frequency with slip (MCTRL1-NOUT+SLIP)	6 V/12 mA ≡ C0011	
			1	Device utilisation (MCTRL1-MOUT) at V/f characteristic control (C0014 = 2 or 3)	3 V/6 mA ≡ Rated active inverter current (active current/C0091)	
				Actual motor torque (MCTRL1-MACT) at vector control (C0014 = 4) or sensorless torque control (C0014 = 5)	3 V/6 mA ≡ Rated motor torque	
			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 ≡ 0.5 × C0011	
			7	Output frequency with limits (DCTRL1-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 correspond 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	Value has fallen below frequency threshold Q_{min} (f < C0017) (PCTRL1-QMIN)	LOW active	
			17	I_{max} limit reached (MCTRL1-IMAX) C0014 = -5-: Torque setpoint reached		
			18	Overtemperature (ϑ_{max} - 5 °C) (DCTRL1-OH-WARN)		
			19	Value has fallen below TRIP or Q_{min} or pulse inhibit (IMP)is 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 Frequency threshold Q_{min} = C0017	
			22	Apparent motor current < current threshold and output frequency > frequency threshold Q_{min} (DCTRL1-(IMOT<ILIM)-QMIN)		
			23	Apparent motor current < current threshold and RFG 1: Input = output (DCTRL1-(IMOT<ILIM)-RFG-I=0)		
			24	Warning motor phase failure (DCTRL1-LP1-WARN)		
			25	Minimum output frequency reached (f ≤ C0010) (PCTRL1-NMIN)	LOW active	
			255	Freely configured under C0419/1	Only display Do not change C0111 since settings under C0419/1 can be lost	

Code No.	Name	Possible settings: Lenze	Selection			IMPORTANT	
C114 ENTER	Level inversion of digital inputs	0	0	Level inversion is switched off		• By entering the sum of the selected values you can invert several inputs • C0114 and C0411 are identical • The function ”Parameter set changeover” cannot be inverted!	
			1	E1 inverted			
			2	E2 inverted			
			4	E3 inverted			
			8	E4 inverted			
			16	E5 inverted		only application I/O	
			32	E6 inverted		only application I/O	
			64	T1/T2 inverted		T1/T2 can only be connected to potential-free switches. T1/T2 is active, if the switch is open.	
C0117 ENTER	Fixed configuration of digital output A1 (DIGOUT1)	0				**Changes of C0117 will be copied to C0415/2. Free configuration under C0415/2 sets C0117 =255!**	10.13-6
			0 ... 16	see C0008			
			255	Free configuration under C0415/2		Only display Do not change C0117 since settings under C0415/2 can be lost	
C0119 ENTER	Configuration of motor temperature monitoring (PTC input) / earth fault detection	0	0	PTC input not active	Earth fault detection active	• Signal output configuration under C0415 • If several parameter sets are used, the monitoring must be separately adjusted for each parameter set. • Deactivate the earth fault detection, if it has been activated unintentionally. • If the earth fault detection is active, the motor starts after controller enable with a delay of approx.40 ms.	10.14-3
			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 = not active	{1 %}	200	Reference: Apparent motor current (C0054) Ref. to active motor current (C0056) possible, see C0310	10.14-1
C0125* ENTER	Baud rate	0		LECOM	System bus (CAN) 217x	Only for communication modules on the AIF interface: • LECOM-A (RS232) E82ZBL • LECOM-A/B/LI 2102 • System bus (CAN) 217x **During operation with the E82ZAFCC system bus function module the baud rate must be set under C0351.**	
			0	9600 baud	500 kbaud		
			1	4800 baud	250 kbaud		
			2	2400 baud	125 kbaud		
			3	1200 baud	50 kbaud		
			4	19200 baud	1000 kbaud		
C0126* ENTER	Response in the event of a communication error	10		Monitored communication channel		By entering the sum of the selected values you can activate a monitoring combination	
			0	All monitoring is deactivated			
			1	Process channel of the AIF interface		Communication abort at active monitoring activates TRIP CE0	
			2	Internal communication between function module on FIF and controller		Communication abort at active monitoring activates TRIP CE5	
			4	Communication (bus OFF) at operation with system bus function module (CAN) on FIF		Communication abort at active monitoring activates TRIP CE6	
			8	Remote parameter setting via C0370 at operation with function module system bus (CAN) on FIF		Communication abort at active monitoring activates TRIP CE7	

Code		Possible settings			IMPORTANT
No.	Name	Lenze	Selection		
C0127 ENTER	Setpoint selection	0	0	Absolute setpoint selection in Hz via C0046 or process data channel	
			1	Setpoint selection normalised via C0141 (0... 100 %) or process data channel (±16384 = C0011)	
C0128	Service code				**Modifications only by Lenze Service!**
C0135*	Controller control word (parameter channel)		Bit	Assignment	• Control via parameter channel. The most important control commands are grouped as bit commands. • C0135 cannot be changed using the keypad
			1|0	JOG1, JOG2, JOG3 or C0046 (NSET1-JOG1/3, NSET1-JOG2/3) 00 C0046 active 01 JOG1 (C0037) active 10 JOG2 (C0038) active 11 JOG3 (C0039) active	
			2	Current 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 (NSET1-RFG1-STOP) 0 not active 1 active	
			5	Ramp function generator input = 0 (NSET1-RFG1-0) 0 not active 1 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 (MPOT1-DOWN) 0 not active 1 active	
			8	Reserved	
			9	Controller inhibit (DCTRL1-CINH) 0 Controller enabled 1 Controller inhibited	
			10	TRIP set (DCTRL1-TRIP-SET)	Sets ”external error” in the controller (*EEr*, LECOM No. 91)
			11	TRIP reset (DCTRL1-TRIP-RESET) 0 ⇒ 1 Edge causes TRIP reset	
			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	

Code		Possible settings		IMPORTANT	
No.	**Name**	**Lenze**	**Selection**		
C0138*	Process controller setpoint 1 (PCTRL1-SET1)	0.00	-650.00 {0.02 Hz} 650.00	**The value set will be lost when switching the mains!** • Selection if C0412/4 = FIXED-FREE • Display if C0412/4 ≠ FIXED-FREE	🕮 10.10-5
C0140*	Additive frequency setpoint (NSET1-NADD)	0.00	-650.00 {0.02 Hz} 650.00	• Selection via function Set of the keypad or the parameter channel • Is added to main setpoint • Value is stored when switching the mains or removing the keypad	🕮 10.8-15
C0141*	Setpoint normalisation	0.00	-100.00 {0.01 %} 100.00	**The value set will be lost when switching the mains!** Only effective if C0127 = 1 Reference: C0011	
C0142 ENTER	Start condition	1	0 Automatic restart after mains connection inhibited Flying restart not active	Start after HIGH-LOW-HIGH changes at X3/28	🕮 10.5-1
			1 Automatic start, if X3/28 = HIGH Flying restart circuit not active		
			2 Automatic restart after mains connection inhibited Flying-restart circuit active	Start after HIGH-LOW-HIGH changes at X3/28	
			3 Automatic start, if X3/28 = HIGH Flying restart circuit active		
C0143* ENTER	Selection of flying-restart	0	0 Max. output frequency (C0011) ... 0 Hz	Motor speed selected for the indicated range	🕮 10.5-1
			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 ENTER	No temperature depending chopper frequency derating	1	0 No temperature-depending chopper frequency derating	When operating with a chopper frequency of 16 kHz it is also possible to derate it to 4 kHz. The behaviour can be changed under C0310.	🕮 10.4-3
C0144 ENTER	No temperature depending chopper frequency derating		1 Automatic chopper frequency derating to 4 kHz, if $\vartheta_{\text{max reaches}}$ - 5 °C		🕮 10.4-3
C0145* ENTER	Process controller setpoint source	0	0 Total setpoint (PCTRL1-SET3)	Main setpoint + additional setpoint	🕮 10.10-5
			1 C0181 (PCTRL1-SET2) 2 C0412/4 (PCTRL1-SET1)	• Setpoint selection not possible via – JOG values – Set function of the keypad – C0044, C0046 and C0049 – in connection with manual/remote changeover, skip frequencies, ramp function generator, additional setpoint • Activate the automatic DC-injection brake (auto DCB) with C0019 = 0 or C0106 = 0	

Code No.	Name	Lenze	Selection		IMPORTANT	
C0148* STOP	Motor parameter identification	0	0	Ready	**Only when the motor is cold!** 1. Inhibit controller, wait until drive is in standstill 2. Enter the correct motor data under C0087, C0088, C0089, C0090, C0091 (see motor nameplate). 3. C0148 = set 1 by ENTER 4. Enable controller The identification – starts, IMP gets out – the motor makes a high-pitched tone, but does not rotate! – takes approx. 30 s – is completed when IMP is on again 5. Controller inhibit	10.9-1
			1	Start identification • V/f-rated frequency (C0015), slip compensation (C0021) and motor stator inductivity (C0092) are calculated and saved. • The motor stator resistance (C0084) = total resistance of motor cable and motor is measured and saved		
C0150*	Controller status word 1 (parameter channel)		Bit	Assignment	• Scan of the controller status via parameter channel. The most important status information are grouped as bit pattern. • Some bits can be freely assigned to internal digital signals • Configuration in C0417 • In keypad: display only (hexadecimal)	
			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 false 1 true		
			7	Controller inhibit (DCTRL1-CINH) 0 Controller enabled 1 Controller inhibited		
			11|10|9|8	Controller status 0000 Controller initialization 0001 Mains voltage off (at external supply of the control section ofthe drive controller) 0010 Switch-on inhibit 0011 Operation inhibited 0100 Flying-restart circuit active 0101 DC-injection brake active 0110 Operation enabled 0111 Message active 1000 Active error		
			12	Overheat 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		
C0151*	Controller status word 2 (parameter channel)		Bit	Assignment	• The bits can be freely assigned to internal digital signals • Configuration in C0418 • In keypad: display only (hexadecimal)	
			0 ... 15	Mapping of C0418/1 ... C0418/16		
C0152 (A)	Service code				**Modifications only by Lenze Service!**	

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0155*	Extended status word		Bit	Assignment			
			0	not ready for operation (NOT DCTRL-RDY)			
			1	not assigned			
			2	I_{max} (MCTRL1-IMAX)			
			3	Pulse inhibit (DCTRL1-IMP)			
			4	not assigned			
			5	Controller inhibit (DCTRL1-CINH)			
			6	TRIP (DCTRL1-TRIP)			
			7	not assigned			
			8	Collective message (DCTRL1-OH-PTC-LP1-FAN1-WARN)			
			9	PAR B0 (DCTRL1-PAR-B0)			
			10	PAR B1 (DCTRL1-PAR-B1)			
			11 ... 15	Reserved			
C0156*	Current threshold	0	0	{1 %}	150	Programmable current threshold • Reference: Rated controller current • Signal output configuration under C0008 or C0415 • The reference values for vector control and sensorless speed control can be changed under C0311 (as of software version 3.1).	
C0161*	Active error					Display history buffer contents • Keypad: three-digit, alpha numerical fault detection • 9371BB keypad: LECOM fault number	11.1-1
C0162*	Last fault						
C0163*	Last but one fault						
C0164*	Last but two fault						
C0165	Service code LECOM					**Modifications only by Lenze Service!**	
C0168*	Actual fault					History buffer displays "active error" • Keypad: three-digit, alpha numerical fault detection • 9371BB keypad: LECOM fault number	11.1-1
C0170 ENTER	Configuration TRIP reset	0	0	TRIP reset by mains switching, STOP, LOW–signal at X3/28, via function module 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.	11.5-1
			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			
C0171	Delay for auto-TRIP reset	0.00	0.00	{0.01 sec}	60.00		
C0174* STOP	Brake transistor threshold	100	78	{1 %}	110	**Only active with 8200 vector 0.55 ... 11 kW, variant for 400/500 V mains voltage** • 100 % = Threshold DC 790 V • 110 % = Brake transistor switched off • U_{DC} = Threshold in V DC • The recommended setting allows max. 10 % mains overvoltage	13.4-1
				Recommended setting			
			U_{mains} [3/PE AC xxx V]	C0174 [%]	U_{DC} [V DC]		
			380	78	618		
			400	81	642		
			415	84	665		
			440	89	704		
			460	93	735		
			480	97	767		
			500	100	790		
C0178*	Operating time			{h}		Only display Total duration terminal 28 (CINH) = HIGH	
C0179*	Power-on time			{h}		Only display Total time mains on	

Code		Possible settings				IMPORTANT	
No.	**Name**	**Lenze**	**Selection**				
C0181*	Process controller setpoint 2 (PCTRL1-SET2)	0.00	-650.00	{0.02 Hz}	650.00		10.10-5
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)	10.7-1
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	• If the output frequency < C0184, the I component of the process controller will be switched off • 0.0 Hz = Function not active	10.10-5
C0185*	Switching 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 in C0185 = 0%: ± 0,5 % ref. to C0011 • Window in C0185 > 0%: ± C0185 ref. to NSET1-RFG1-IN	
C0189* (A)	Output signal compensator (PCTRL1-FOLL1-OUT)		-650.00	{0.02 Hz}	650.00	Only display Compensator = PCTRL1-FOLL1	
C0190* ENTER (A)	Main and additional setpoint (PCTRL1-ARITH1)	1	0	X + 0		Mathematical addition of mains setpoint (NSET1-NOUT) and additional setpoint (PCTRL1-NADD) The result is in Hz X = NSET1-NOUT Y = PCTRL1-NADD	
			1	X + Y			
			2	X - Y			
			3	$\frac{X \cdot Y}{C0011}$			
			4	$\frac{X}{Y} \cdot \frac{C0011}{100}$			
			5	$\frac{X \cdot C0011}{C0011 - Y}$			
C0191 (A)	Compensator acceleration time	5.00	0.00	{0.02 s}	1300.00	Ref. to change 0 Hz ... C0011	
C0192 (A)	Compensator deceleration time	5.00	0.00	{0.02 s}	1300.00	Ref. to change C0011 ... 0 Hz	
C0193 (A)	Compensator reset	5.00	0.00	{0.02 s}	1300.00	Ref. to change C0011 ... 0 Hz Decelerate compensator to "0"	
C0194 (A)	Min. compensator activation threshold	-200.00	-200.00	{0.01 %}	200.00	Ref. to C0011 If the value falls below C0194: Compensator "runs" at C0191 or C0192 direction -C0011	
C0195 (A)	Max. compensator activation threshold	200.00	-200.00	{0.01 %}	200.00	Ref. to C0011 If C0195 is exceeded: Compensator "runs" at C0191 or C0192 direction +C0011	
C0196* ENTER	Activation of auto–DCB	0	0	Auto-DCB active, if PCTRL1-SET3 < C0019			10.7-6
			1	Auto-DCB active, if PCTRL1-SET3 < C0019 **and** NSET1-RFG1-IN < C0019			

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0200*	Software ID number			Only PC display x = Main version, y = Subversion	
			82S8212V_xy000	8200 vector 0.25 ... 11 kW	
			82S8212V_xy010	8200 vector 15 ... 90 kW	
C0201*	Software generation date			Only PC display	
C0202*	Software ID number		Output to keypad as string in 4 parts à 4 characters	Only keypad display	
1			82S8		
2			212V		
3			_xy0	x = Main version, y = Subversion	
4			zz	00 = 8200 vector 0.25 ... 11 kW 10 = 8200 vector 15 ... 90 kW	
C0220*	Acceleration time - additional setpoint (PCTRL1-NADD)	5.00	0.00 {0.02 s} 1300.00	Main setpoint ⇨ C0012	🕮 10.7-1
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	Acceleration encoder 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)	Unhide time - process controller	0.000	0.000 {0.001 s} 32.000	0.000 = Process controller output is transferred without unhiding	
C0229 (A)	Hide time - process controller	0.000	0.000 {0.001 s} 32.000	0.000 = “Fading-off” switched off (C0241)	
C0230 (A)	Min. limit process controller output	-100.0	-200.0 {0.1 %} 200.0	Asymmetric limit of process controller output ref. to C0011 • If value falls below C0230 or exceeds C0231: – Output signal PCTRL1-LIM = HIGH after time set under C0233 • Set C0231 > C0230	
C0231 (A)	Max. limit process controller output	100.0	-200.0 {0.1 %} 200.0		
C0232 (A)	Offset inverse characteristic 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 digital output signal PCTRL1-LIM (limit for process controller output exceeded) • Sets PCTRL1-LIM = HIGH if the following still applies after time set: – Value below C0230 or higher than C0231 • Transition HIGH ⇨ LOW without delay	
C0234* (A)	Delay PCTRL1-SET=ACT	0.000	0.000 {0.001 s} 65.000	”Debouncing” of digital output signal PCTRL1-SET=ACT (process controller setpoint = process controller actual value) • Sets PCTRL1-SET=ACT = HIGH if the following still applies after time set: – Difference between PCTRL1-SET and PCTRL1-ACT is below threshold under C0235 • Transition HIGH ⇨ LOW without delay	

Code No.	Name	Lenze	Selection			IMPORTANT	
C0235* (A)	Difference threshold PCTRL1-SET=ACT	0.00	0.00	{0.01 Hz}	650.00	Threshold for the digital output signal PCTRL1-SET=ACT (process controller setpoint = process controller actual value) • Difference between PCTRL1-SET and PCTRL1-ACT is within limits under C0235: – PCTRL1-SET=ACT = HIGH after time set under C0234	
C0236 (A)	Acceleration time - minimum frequency limitation	0.00	0.00	{0.02 s}	1300.00	Ref. to C0011 Minimum frequency limitation = C0239	📖 10.6-1
C0238 ENTER	Frequency precontrol	2	0	No precontrol (only process controller)		Process controller has full influence	📖 10.10-1 📖 10.10-5
			1	Precontrol (total setpoint + process controller)		Process controller has limited influence	
			2	No precontrol (only total setpoint)		Process controller has no influence (not active)	
						Total setpoint (PCTRL1-SET3) = Main setpoint + additional setpoint	
C0239	Lowest frequency limit	-650.00	-650.00	{0.02 Hz}	650.00	• The value does not fall below limit independently of the setpoint. • If the minimum frequency limitation is active, the automatic DC-injection brake (auto DCB) must be deactivated (C0019 = 0 or C0106 = 0).	📖 10.6-1
C0240 ENTER (A)	Process controller output inversion (PCTRL1-INV-ON) (parameter channel)	0	0	Not inverted		Set digital signal PCTRL1-INV-ON (process controller output inversion) via keypad/PC or parameter channel	
			1	Inverted			
C0241 ENTER (A)	Process controller not hidden/hidden (PCTRL1-FADING) (parameter channel)	0	0	Process controller unhiding		Set digital signal PCTRL1-FADING (process controller hiding/unhiding) via keypad/PC or parameter channel	
			1	Process controller hiding			
C0242 ENTER (A)	Activation of process controller inverse control	0	0	Normal control		Act. value increases ⇨ Output frequency increases	
			1	Inverse control		Act. value increases ⇨ Output frequency decreases	
C0243 ENTER (A)	Deactivation of additional setpoint (PCTRL1-NADD-OFF) (parameter channel)	0	0	PCTRL1-NADD active		Set digital signal PCTRL1-NADD-OFF (deactivation of additional setpoint) via keypad/PC or parameter channel	
			1	PCTRL1-NADD not active			
C0244 ENTER (A)	Root function actual process controller value	0	0	not active			
			1	$\pm\sqrt{\lvert \text{PCTRL1-ACT} \rvert}$		Internal calculation 1. Storing sign of PCTRL1-ACT 2. Extraction of the root of the absolute value 3. Multiply the result with the sign	
C0245* ENTER (A)	Comparison value for MSET1=MACT	0	0	MCTRL1-MSET (C0412/6 or C0047)		Selection of a comparison value for setting the digital output signal MSET1=MACT (torque threshold 1 = actual torque value) • If the difference between MCTRL1-MSET1 and MCTRL1-MACT or C0250 is within C0252: – MSET1=MACT = HIGH after time set under C0254	
			1	Value under C0250			

Code		Possible settings				IMPORTANT	
No.	Name	Lenze	Selection				
C0250* (A)	Torque threshold 1 (MCTRL1-MSET1)	0.0	-200.0	{0.1 %}	200.0	Related to rated motor torque	
C0251* (A)	Torque threshold 2 (MCTRL1-MSET2)	0.0	-200.0	{0.1 %}	200.0	Related to rated motor torque Comparison value for setting the digital output signal MSET2=MACT (torque threshold 2 = actual torque value) • If the difference between MCTRL1-MSET2 and MCTRL1-MACT is within C0253: – MSET2=MACT = HIGH after 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 digital output signals MSET1=MACT • Sets MSET1=MACT = HIGH if the following still applies after time set: – Difference between MCTRL1-MSET1 and MCTRL1-MACT or C0250 is within the threshold under C0252 • Transition HIGH ⇨ LOW without delay	
C0255* (A)	Delay MSET2=MACT	0.000	0.000	{0.001 s}	65.000	"Debouncing" of digital output signals MSET2=MACT • Sets MSET2=MACT = HIGH if the following still applies after time set: – Difference between MCTRL1-MSET2 and MCTRL1-MACT is within values set under C0253 • Transition HIGH ⇨ LOW without delay	
C0265 ENTER	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": Minimum output frequency from C0010. The setpoint must have exceeded C0010 before. – "0" = output frequency 0 Hz • C0265 = 3, 4, 5: – QSP reduces the motor potentiometer along the QSP ramp (C0105)	10.8-11
			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			
C310* ENTER	Functions for special applications 1	0	0	Function is switched off		By entering the sum of the selected values you can activate a combination of the functions.
			1	TRIP "OUE" (Lecom No. 22) in case of overvoltage in the DC bus		Standard: Message "OU"
			2	Threshold "Undervoltage in the DC bus" = 400 VDC (only for 400V controllers)		Standard: 285 VDC
			4	Reference for I2t monitoring is the device utilisation (C0056)		Standard: Reference to apparent current (C0054)
			8	Limitation to maximum frequency (C0011) is inactive		Standard: Limitation to C0011 is active Only for applications with parameter set changeover if C0011 is set differently in the parameter sets.
			32	Power-dependent chopper frequency derating first switches from 16 kHz to 8 kHz and after one second of operation with 8 kHz it is switched to 4 kHz.		Standard: Chopper frequency is immediately reduced to 4 kHz.
			64	• When operating with a chopper frequency of 16 kHz and C0144 = 0 no temperature-dependent chopper frequency derating to 4 kHz occurs • When operating with application I/O only the process controller output is reset, but not the integral component		Standard: • When operating with a chopper frequency of 16 kHz it is also possible with C0144 = 0 to derate it to 4 kHz • When operating with application I/O the process controller output and the integral component are reset.
			128	Demagnetising time before activating the DC injection brake Up to the power of 2.2 kW = 1000 ms From a power of 3 kW = 250 ms		Standard: Up to a power of 2.2 kW = 250 ms From a power of 3 kW = 1000 ms
C311* ENTER	Functions for special applications 2 (as of software version 3.1)	1	0	Functions are switched off		By entering the sum of the selected values you can activate a combination of the functions.
			1	Selection of the reference value for the current threshold C0156: • In the operating mode V/f characteristic control: Rated controller current • In the operating mode vector control or sensorless torque control: Rated controller current		Function is switched off: • In the operating mode V/f characteristic control: Rated controller current • In the operating mode vector control or sensorless torque control: Rated motor torque
			2	The S-shaped ramp (C0182) has no effect on the quick stop ramp (C0105).		Standard: The S-shaped ramp (C0182) has also an effect on quick stop.
C0320 (A)	Actual process controller value (PCTRL1-ACT)		-650.00	{0.02 Hz}	650.00	Only display
C0321 (A)	Process controller setpoint (PCTRL1-SET)		-650.00	{0.02 Hz}	650.00	Only display
C0322 (A)	Process controller output without precontrol (PCTRL1-OUT)		-650.00	{0.02 Hz}	650.00	Only display
C0323 (A)	Ramp function generator input (NSET1-RFG1-IN)		-650.00	{0.02 Hz}	650.00	Only display
C0324 (A)	Ramp function generator output (NSET1-NOUT)		-650.00	{0.02 Hz}	650.00	Only display

Code No.	Name	Lenze	Selection			IMPORTANT	
C0325 (A)	PID controller output (PCTRL1-PID-OUT)		-650.00	{0.02 Hz}	650.00	Only display	
C0326 (A)	Process controller output (PCTRL1-NOUT)		-650.00	{0.02 Hz}	650.00	Only display	
C0350* ENTER	System bus node address	1	1	{1}	63	• Only for the E82ZAFCC system bus function module on the FIF interface. • Changes will become effective after the command "reset node" **During operation with 217x communication modules the node address must be set under C0009.**	📖 10.19-1
C0351* ENTER	System bus baud rate	0	0	500 kbit/s		• Only for the E82ZAFCC system bus function module on the FIF interface. • Changes will become effective after the command "reset node" **During operation with 217x communication modules the baud rate must be set under C0125.**	📖 10.19-1
			1	250 kbits/s			
			2	125 kbits/s			
			3	50 kbits/s			
			4	1000 kbits/s (only E82ZAFCC100 function module)			
			5	20 kbits/s			
C0352* ENTER	Configuration of system bus devices	0	0	slave		• Only for the E82ZAFCC system bus function module on the FIF interface. • Changes will become effective after the command "reset node"	📖 10.19-1
			1	Master			
C0353* ENTER	System bus address source					• Only for the E82ZAFCC system bus function module on the FIF interface. • Address source for system bus process data channels	📖 10.19-1
1	CAN1 (sync)	0	0	C0350 is source		Effective with sync control (C0360 = 1)	
2	CAN2	0	1	C0354 is the source			
3	CAN1 (time)	0				Effective with event and time control (C0360 = 0)	
C0354* ENTER	Selective system bus address		0	{1}	513	• Only for the E82ZAFCC system bus function module on the FIF interface. • Individual addressing of system bus process data objects	📖 10.19-1
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 and time control (C0360 = 0)	
6	CAN-OUT1 (time)	386					
C0355* ENTER	System bus identifier		0	{1}	2047	• Only for the E82ZAFCC system bus function module on the FIF interface. • Only display	📖 10.19-1
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						

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0356* ENTER	System bus time settings				Only for the E82ZAFCC system bus function module on the FIF interface.	📖 10.19-1
1	Boot up	3000	0 {1 msec} 65000		Required for CAN network without master	
2	Cycle time CAN-OUT2	0			0 = event-controlled process data transfer > 0 = cyclic process data transfer	
3	Cycle time CAN-OUT1	0			0 and C0360 = 0: event-controlled process data transfer > 0 and C0360 = 1: cyclic process data transfer	
4	CAN delay	20			Waiting time until cyclic sending after boot-up	
C0357* ENTER	System bus monitoring times				Only for the E82ZAFCC system bus function module on the FIF interface.	📖 10.19-1
1	CAN-IN1 (sync)	0	0 {1 msec} 65000 = monitoring not active		active, if C0360 = 1 TRIP CE1 at communication abort	
2	CAN-IN2	0			TRIP CE2 at communication abort	
3	CAN-IN1 (time)	0			active, if C0360 = 0 TRIP CE3 at communication abort	
C0358* ENTER	Reset node	0	0	Without function	• Only for the E82ZAFCC system bus function module on the FIF interface. • System bus reset node set-up	📖 10.19-1
			1	System bus reset		
C0359* ENTER	System bus status		0	Operational	• Only for the E82ZAFCC system bus function module on the FIF interface. • Only display	📖 10.19-1
			1	Pre-operational		
			2	Warning		
			3	Bus off		
C0360* ENTER	Control of process data channel CAN1	1	0	Event or time control	Only for the E82ZAFCC system bus function module on the FIF interface.	
			1	Sync control		
C0370* ENTER	Activate remote parameter setting via system bus (CAN)		0	Deactivated	• Only for the E82ZAFCC system bus function module on the FIF interface. • Can only be read when using all other bus function modules on FIF.	📖 9.3-10 📖 9.4-9
			1 ... 63	Activates corresponding CAN address	1 = CAN address 1 63 = CAN address 63	
			255	No system bus (CAN)	Only display	
C0372*	Function module identification		0	No function module	Only display	
			1	Standard I/O or AS-i		
			2	System bus (CAN)		
			6	Other function module on FIF e.g. application I/O, INTERBUS, ...		
			10	No valid recognition		
C0395*	LONGWORD process input data		Bit 0..15	Controller word (mapping to C0135)	For bus operation only • Sending of control word and main setpoint in a telegram to controller • In keypad: display only (hexadecimal)	
			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)	For bus operation only • Reading of status word and output frequency in a telegram from controller • In keypad: display only (hexadecimal)	
			Bit 16...31	Output frequency (MCTRL1-NOUT) (mapping of C0050)		
C0409 ENTER	Configuration relay output K2		Output of digital signals to relay K2		• Relay output K2 only with 8200 vector 15 ... 90 kW • For operation with Application-I/O only active as of version E82ZAFA...XXVx2x	📖 10.13-6
		255	255	Not assigned (FIXED-FREE)		
			Digital signals possible for C0409 see C0415			

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0410 ENTER	Free configuration of digital input signals		Link between digital signal sources and internal digital signals	**A selection made under C0007 is copied to the corresponding subcode of C0410. A change of C0410 sets C0007 = 255!**	📖 10.13-1
1	NSET1-JOG1/3 NSET1-JOG1/3/5/7 (A)	1	Digital input X3/E1	Selection of fixed setpoints C0410/1 C0410/2 active C0410/33 C0046 LOW LOW LOW JOG1 HIGH LOW LOW JOG2 LOW HIGH LOW ... ... JOG7 HIGH HIGH HIGH	
2	NSET1-JOG2/3 NSET1-JOG2/3/6/7 (A)	2	Digital input X3/E2		
3	DCTRL1-CW/CCW	4	Digital input X3/E4	CW = CW rotation LOW CCW = CCW rotation HIGH	
4	DCTRL1-QSP	255	Not assigned (FIXED-FREE)	Quick stop (via terminal LOW active)	
5	NSET1-RFG1-STOP	255	Not assigned (FIXED-FREE)	Ramp function generator main setpoint stop	
6	NSET1-RFG1-0	255	Not assigned (FIXED-FREE)	Ramp function generator input must be set to ”0” for mains setpoint	
7	MPOT1-UP	255	Not assigned (FIXED-FREE)	Motor potentiometer functions	
8	MPOT1-DOWN	255	Not assigned (FIXED-FREE)		
9	Reserved	255	Not assigned (FIXED-FREE)	Do not change 255!	
10	DCTRL1-CINH	255	Not assigned (FIXED-FREE)	Controller inhibit (via terminal LOW active)	
11	DCTRL1-TRIP-SET	255	Not assigned (FIXED-FREE)	External error (via terminal LOW active)	
12	DCTRL1-TRIP-RESE T	255	Not assigned (FIXED-FREE)	Error reset	
13	DCTRL1-PAR2/4	255	Not assigned (FIXED-FREE)	Parameter set changeover (only possible if C0988 = 0) **C0410/13 and C0410/14 must have the same source in every parameter sets used. Otherwise it is not possible to change between the parameter sets (error message CE5 or CE7).**	
14	DCTRL1-PAR3/4	255	Not assigned (FIXED-FREE)	C0410/13 C0410/14 active LOW LOW PAR1 HIGH LOW PAR2 LOW HIGH PAR3 HIGH HIGH PAR4	
15	MCTRL1-DCB	3	Digital input X3/E3	DC-injection brake	
16 (A)	PCTRL1-RFG2-LOADI	255	Not assigned (FIXED-FREE)	Actual process controller value (PCTRL1-ACT) must be connected to process controller ramp function generator (PCTRL1-RFG2)	
17	DCTRL1-H/Re	255	Not assigned (FIXED-FREE)	Manual/remote changeover	
18	PCTRL1-I-OFF	255	Not assigned (FIXED-FREE)	Switch off I-component of the process controller	
19	PCTRL1-OFF	255	Not assigned (FIXED-FREE)	Process controller switch off	
20	Reserved	255	Not assigned (FIXED-FREE)	Do not change 255!	
21	PCTRL1-STOP	255	Not assigned (FIXED-FREE)	Process controller stop (value ”frozen”)	
22	DCTRL1-CW/QSP	255	Not assigned (FIXED-FREE)	Failsafe change of the direction of rotation	
23	DCTRL1-CCW/QSP	255	Not assigned (FIXED-FREE)		
24	DFIN1-ON	255	Not assigned (FIXED-FREE)	0 = Frequency input not active 1 = Frequency input active Frequency input configuration under C0425 and C0426	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0410 ENTER (cont.)					📖 10.13-1
25 (A)	PCTRL1-FOLL1-0	255	Not assigned (FIXED-FREE)	Compensator at reset ramp C0193 to "0"	
26 (A)	Reserved	255	Not assigned (FIXED-FREE)		
27 (A)	NSET1-TI1/3	255	Not assigned (FIXED-FREE)	Activate acceleration times	
28 (A)	NSET1-TI2/3	255	Not assigned (FIXED-FREE)	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	Not assigned (FIXED-FREE)	Process controller output on (LOW)/ off (HIGH)	
30 (A)	PCTRL1-INV-ON	255	Not assigned (FIXED-FREE)	Process controller output inversion	
31 (A)	PCTRL1-NADD-OFF	255	Not assigned (FIXED-FREE)	Switch off additional setpoint	
32 (A)	PCTRL1-RFG2-0	255	Not assigned (FIXED-FREE)	Decelerate process controller ramp function generator input to "0" along ramp C0226	
33 (A)	NSET1-JOG4/5/6/7	255	Not assigned (FIXED-FREE)		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0410 ENTER (cont.)				**Digital signal sources for C0410**		📖 10.13-1
			0	Not assigned (FIXED-FREE)		
			1	Digital input X3/E1 (DIGIN1)		
			2	Digital input X3/E2 (DIGIN2)		
			3	Digital input X3/E3 (DIGIN3)		
			4	Digital input X3/E4 (DIGIN4)		
			5 (A)	Digital input X3/E5 (DIGIN5)		
			6 (A)	Digital input X3/E6 (DIGIN6)		
			7	PTC input (X2.2/T1, X2.2/T2)	T1/T2 can only be connected to potential-free switches! T1/T2 is active ("HIGH") when the switch is closed	
			 10 ... 25	AIF control word (AIF-CTRL) Bit 0 ... Bit 15		
			 30 ... 45	CAN-IN1.W1 or FIF-IN.W1 Bit 0 ... Bit 15		
			 50 ... 65	CAN-IN1.W2 or FIF-IN.W2 Bit 0 ... Bit 15		
			 70 ... 85	CAN-IN2.W1 Bit 0 ... Bit 15		
			 90 ... 105	CAN-IN2.W2 Bit 0 ... Bit 15		
			 140 141 142 143...172	Status application I/O Torque threshold 1 reached (MSET1=MOUT) Torque threshold 2 reached (MSET2=MOUT) Process controller output limit reached (PCTRL1-LIM) Reserved	Only active when using application I/O	
			200	Control words are assigned bit by bit from the fieldbus function module to FIF (e.g. INTERBUS or PROFIBUS-DP)	See C0005	
			 201 ... 231	Digital output signals as C0415, selection 1 ... as C0415, selection 31		
			255	Not assigned (FIXED-FREE)		

Code		Possible settings			IMPORTANT		
No.	Name	Lenze	Selection				
C0411 ENTER	Level inversion of digital inputs	0	0	Level inversion is switched off	• By entering the sum of the selected values you can invert several inputs • C0114 and C0411 are identical • The function ”Parameter set changeover” cannot be inverted!		
			1	E1 inverted			
			2	E2 inverted			
			4	E3 inverted			
			8	E4 inverted			
			16	E5 inverted	only application I/O		
			32	E6 inverted	only application I/O		
			64	T1/T2 inverted	T1/T2 can only be connected to potential-free switches. T1/T2 is active, if the switch is open.		
C0412 ENTER	Free configuration of analog input signals		Link between analog signal sources and internal analog signals		**A selection under C0005 or C0007 will be copied to the corresponding subcode of C0412. A change of C0412 sets C0005 = 255, C0007 = 255!**		10.12-1
1	Setpoint 1 (NSET1–N1)	1		Analog input 1 (AIN1-OUT): X3/8 (Standard-I/O) X3/1U or X3/1I (Application-I/O)	Either NSET1-N1 or NSET1-N2 active Changeover with C0410/17	Parameter channel: C0046	
2	Setpoint 2 (NSET1-N2)	1				Parameter channel: C0044	
3	Additional setpoint (PCTRL1-NADD)	255		Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module	Is added to NSET1-N1, NSET1-N2, JOG values and the function Set of the keypad	Parameter channel: C0049	
4	Process controller setpoint 1 (PCTRL1-SET1)	255		Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module			
5	Act. process controller value (PCTRL1-ACT)	255		Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module		Parameter channel: C0051, if C0238 = 1, 2	
6	Torque setpoint or torque limit value (MCTRL1-MSET)	255		Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module	• Observe C0014! • Actual torque values not required. • 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 [%]	Parameter channel: C0047	
7	Reserved	255		Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module			
8	MCTRL1-VOLT-ADD	255		Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module	Only for special applications. Modifications only when agreed on by Lenze!		
9	MCTRL1-PHI-ADD	255		Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module			

Code No.	Name	Lenze	Selection		IMPORTANT	
C0412 ENTER (cont.)				**Analog signal source possible for C0412**		10.12-1
			0	Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module		
			1	Analog input 1 (AIN1-OUT) X3/8 (Standard-I/O) X3/1U or X3/1I (Application-I/O)		
			2	Frequency input (DFIN1-OUT)	Observe C0410/24, C0425, C0426, C0427	
			3	Motor potentiometer (MPOT1-OUT)		
			4 (A)	Analog input 2 (AIN2-OUT) X3/2U or X3/2I		
			5 ... 9	Input signal is constantly 0 (FIXED0)		
			10	AIF input word 1 (AIF-IN.W1)	Only evaluated if C0001 = 3!	
			11	AIF input word 2 (AIF-IN.W2)		
			20	CAN-IN1.W1 or FIF-IN.W1	± 24000 ≡ ±480 Hz 2^{14} ≡ 100 % rated motor torque	
			21	CAN-IN1.W2 or FIF-IN.W2		
			22	CAN-IN1.W3 or FIF-IN.W3		
			23	CAN-IN1.W4 or FIF-IN.W4		
			30	CAN-IN2.W1		
			31	CAN-IN2.W2		
			32	CAN-IN2.W3		
			33	CAN-IN2.W4		
			200	Signals are assigned word by word from fieldbus function module to FIF (e.g. INTERBUS or PROFIBUS-DP)	See C0005	
			228 (A)	PCTRL1-ACT		
			229 (A)	PCTRL1-SET		
			230 (A)	PCTRL1-OUT		
			231 (A)	NSET1-RFG1-IN		
			232 (A)	NSET1-NOUT		
			233 (A)	PCTRL1-PID-OUT		
			234 (A)	PCTRL1-NOUT		
			255	Not assigned (FIXED-FREE) or selected via keypad or parameter channel of an AIF bus module	Either NSET1-N1 or NSET1-N2 active	
C0413*	Offset analog inputs				The max. limit of the setpoint value range of C0034 equals 100 %	10.8-3
1	AIN1-OFFSET	0.0	-200.0 {0.1 %} 200.0		Settings for X3/8 and X3/1U, X3/1I C0413/1 and C0026 are identical	
2	AIN2-OFFSET	0.0			Setting for X3/2U, X3/2I (application I/O only)	
C0414*	Analog input gain				• 100.0 % = Gain 1 • Inverse setpoint selection by negative gain and negative offset	
1	AIN1-GAIN	100.0	-1500.0 {0.1 %} 1500.0		Settings for X3/8 and X3/1U, X3/1I C0414/1 and C0027 are identical	
2	AIN2-GAIN	100.0			Setting for X3/2U, X3/2I (application I/O only)	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0415 ENTER	Free configuration of digital outputs		Output of digital signals to terminals		10.13-6
1	Relay output K1 (RELAY)	25	TRIP fault message (DCTRL1-TRIP)	**A selection under C0008 will be copied to C0415/1. A change of C0415/1 sets C0008 = 255!**	
2	Digital output X3/A1 (DIGOUT1)	16	Ready for operation (DCTRL1-RDY)	**A selection under C0117 will be copied to C0415/2. A change of C0415/2 sets C0117 = 255!**	
3 (A)	Digital output X3/A2 (DIGOUT2)	255	Not assigned (FIXED-FREE)		

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0415 ENTER (cont.)				**Possible digital signals for C0415**		10.13-6
			0	Not assigned (FIXED-FREE)		
			1	Parameter set 2 or parameter set 4 is active (DCTRL1-PAR-B0)	PAR-B1 PAR-B0 active LOW LOW PAR1 LOW HIGH PAR2 HIGH LOW PAR3 HIGH HIGH PAR4	
			2	Pulse inhibit active (DCTRL1-IMP)		
			3	I_{max} limit reached (MCTRL1-IMAX) (C0014 = -5-: Torque setpoint reached)		
			4	Frequency setpoint reached (DCTRL1-RFG1=NOUT)		
			5	Ramp function generator 1: Input = output (NSET1-RFG1-I=0)	RFG1 = Ramp function generator main setpoint	
			6	Value has fallen below frequency threshold Q_{min} (f < C0017) (PCTRL1-QMIN)	LOW active	
			7	Output frequency = 0 (DCTRL1-NOUT=0)		
			8	Controller inhibit active (DCTRL1-CINH)		
			9...12	Reserved		
			13	Collective message (DCTRL1-OH-PTC-LP1-FAN1-WARN): Overtemperature warning (ϑ_{max} -5 °C) (DCTRL1-OH-WARN) or Motor overtemperature warning (DCTRL1-LP1-PTC-WARN) or Motor phase failure warning (DCTRL1-LP1-WARN) or Fan failure warning (only active with 8200 motec)	 set C0119 = 2 or C0119 = 5 set C0597 = 2 Set C0608 = 0 for 8200 vector	
			14	DC-bus overvoltage (DCTRL1-OV)		
			15	CCW rotation (DCTRL1-CCW)		
			16	Ready for operation (DCTRL1-RDY)		
			17	Parameter set 3 or parameter set 4 is active (DCTRL1-PAR-B1)	PAR-B1 PAR-B0 active LOW LOW PAR1 LOW HIGH PAR2 HIGH LOW PAR3 HIGH HIGH PAR4	
			18	Value has fallen below TRIP or Q_{min} or pulse inhibit (IMP) is active (DCTRL1-TRIP-QMIN-IMP)		
			19	PTC warning (DCTRL1-PTC-WARN)	set C0119 = 2 or C0119 = 5	
				Status relay K_{SR}	Only with 8200 vector 15 ...90 kW, variant "Safe standstill": HIGH = pulse inhibit active through "Safe standstill" LOW = no pulse inhibit through "Safe standstill"	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0415 ENTER (cont.)				**Possible digital signals for C0415**		🕮 10.13-6
			20	Apparent motor current < current threshold (DCTRL1-IMOT<ILIM)	Belt monitoring Apparent motor current = C0054 Current threshold = C0156 Frequency threshold Q_{min} = C0017	
			21	Apparent motor current < current threshold and output frequency > frequency threshold Q_{min} (DCTRL1-(IMOT<ILIM)-QMIN)		
			22	Apparent motor current < current threshold and RFG 1: Input = output (DCTRL1-(IMOT<ILIM)-RFG-I=0)		
			23	Motor phase failure warning (DCTRL1-LP1-WARN)	Set C0597 = 2	
			24	Minimum output frequency reached (f ≤ C0010) (PCTRL1-NMIN)	LOW active	
			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	Digital input X3/E1	Digital inputs	
			33	Digital input X3/E2		
			34	Digital input X3/E3		
			35	Digital input X3/E4		
			36 (A)	Digital input X3/E5		
			37 (A)	Digital input X3/E6		
			38	PTC input X2.2/T1, X2.2/T2	T1/T2 can only be connected to potential-free switches! T1/T2 is active ("HIGH") when the switch is closed	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0415 ENTER (cont.)				**Possible digital signals for C0415**		📖 10.13-1
				AIF control word (AIF-CTRL)	Assigned bits of AIF-CTRL: Bit 3: QSP Bit 7: CINH Bit 10: TRIP-SET Bit 11: TRIP-RESET	
			40	Bit 0		
			...	...		
			55	Bit 15		
				CAN-IN1.W1 or FIF-IN.W1		
			60	Bit 0		
			...	...		
			75	Bit 15		
				CAN-IN1.W2 or FIF-IN.W2		
			80	Bit 0		
			...	...		
			95	Bit 15		
				CAN-IN2.W1		
			100	Bit 0		
			...	...		
			115	Bit 15		
				CAN-IN2.W2		
			120	Bit 0		
			...	...		
			135	Bit 15		
				Status application I/O	Only active when using application I/O	
			140	Torque threshold 1 reached (MSET1=MOUT)		
			141	Torque threshold 2 reached (MSET2=MOUT)		
			142	Process controller output limit reached (PCTRL1-LIM)		
			143...172	Reserved		
			255	Not assigned (FIXED-FREE)		
C0416 ENTER	Level inversion of digital outputs	0	0	Level inversion is switched off	By entering the sum of the selected values you can invert several outputs	📖 10.13-6
			1	Relay K1		
			2	X3/A1		
			4	X3/A2	only application I/O	
			8	Relay K2	Relay output K2 only with 8200 vector 15 ... 90 kW	

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0417* ENTER	Free configuration of controller status messages (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 CAN object 1 (CAN-OUT1.W1)	10.13-12
1	Bit 0	1	Active parameter set PAR-B0 active (DCTRL1-PAR-B0)	→ **Fixed assignment to AIF when operating with communication modules INTERBUS 211x, PROFIBUS-DP 213x or LECOM-A/B/LI 2102. Modifications are not allowed!** If you use function modules system bus (CAN), INTERBUS, PROFIBUS-DP to FIF, all bits are freely configurable.	
2	Bit 1	2 →	Pulse inhibit active (DCTRL1-IMP)		
3	Bit 2	3	I_{max} limit reached (MCTRL1-IMAX) (C0014 = -5-: Torque setpoint reached)		
4	Bit 3	4	Frequency setpoint reached (DCTRL1-RFG1=NOUT)		
5	Bit 4	5	Ramp function generator 1: Input = output (NSET1-RFG1-I=0)		
6	Bit 5	6	Value below frequency threshold Q_{min} (f < C0017) (PCTRL1-QMIN)		
7	Bit 6	7 →	Output frequency = 0 (DCTRL1-NOUT=0)		
8	Bit 7	8 →	Controller inhibit active (DCTRL1-CINH)		
9	Bit 8	9 →	11|10|9|8 Controller status 0000 Controller initialization 0001 Mains voltage off (at external supply of the control section ofthe drive controller)		
10	Bit 9	10 →	0010 Switch-on inhibit 0011 Operation inhibited		
11	Bit 10	11 →	0100 Flying restart circuit active 0101 DC-injection brake active		
12	Bit 11	12 →	0110 Operation enabled 0111 Message active 1000 Active error		
13	Bit 12	13 →	Collective message: (DCTRL1-OH-PTC-LP1-FAN1-WARN)		
14	Bit 13	14 →	DC-bus overvoltage (DCTRL1-OV)		
15	Bit 14	15	CCW rotation (DCTRL1-CCW)		
16	Bit 15	16	Ready for operation (DCTRL1-RDY)		
			Digital signals possible for C0417 see C0415		
C0418* ENTER	Free configuration of controller status messages (2)		Output of digital signals to bus	All bits can be freely configured 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)	10.13-12
1	Bit 0	255	Not assigned (FIXED-FREE)		
...	...	...			
16	Bit 15	255	Not assigned (FIXED-FREE)		
			Digital signals possible for C0418 see C0415		
C0419 ENTER	Free configuration of analog outputs		Analog signal output to terminal		10.12-4
1	X3/62 (AOUT1-IN)	0	Output frequency (MCTRL1-NOUT+SLIP)	**The selection made under C0111 is copied to C0419/1. A change of C0419/1 sets C0111 = 255!**	
2 (A)	X3/63 (AOUT2-IN)	2	Apparent motor current (MCTRL1-IMOT)		
3 (A)	X3/A4 (DFOUT1-IN)	3	DC-bus voltage (MCTRL1-DCVOLT)	Frequency output: 50 Hz ... 10 kHz	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0419 ENTER (cont.)				**Possible analog signals for C0419**		📖 10.12-4
			0	Output frequency (MCTRL1-NOUT+SLIP)	6 V/12 mA/5.85 kHz ≡C0011	
			1	Device utilisation (MCTRL1-MOUT) at V/f characteristic control (C0014 = 2 or 3)	3 V/6 mA/2.925 kHz ≡ Rated active inverter current (active current/C0091)	
				Actual motor torque (MCTRL1-MACT) at vector control (C0014 = 4) or sensorless torque control (C0014 = 5)	3 V/6 mA/2.925 kHz ≡ Rated motor torque	
			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 (230 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 ≡ 0.5 × C0011	
			7	Output frequency with limits (DCTRL1-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	

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0419 ENTER (cont.)				**Possible analog signals for C0419**	Selection 9 ... 25 correspond 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	📖 10.12-4
			9	Ready for operation (DCTRL1-RDY)		
			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 (DCTRL1-RFG1=NOUT)		
			16	Value has fallen below frequency threshold Q_{min} (f < C0017) (PCTRL1-QMIN)	LOW active	
			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 Frequency threshold Q_{min} = C0017	
			22	Apparent motor current < current threshold and output frequency > frequency threshold Q_{min} (DCTRL1-(IMOT<ILIM)-QMIN)		
			23	Apparent motor current < current threshold and RFG 1: Input = output (DCTRL1-(IMOT<ILIM)-RFG-I=0)		
			24	Warning motor phase failure (DCTRL1-LP1-WARN)		
			25	Minimum output frequency reached (f ≤ C0010) (PCTRL1-NMIN)	LOW active	

Code No.	Name	Lenze	Selection		IMPORTANT	
C0419 ENTER (cont.)				**Possible analog signals for C0419**		📖 10.12-4
			26	Output frequency normalised without slip (MCTRL1-NOUT-NORM)		
			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 without precontrol (PCTRL1-OUT)		
			31	Ramp function generator input (NSET1-RFG1-IN)		
			32	Ramp function generator output (NSET1-NOUT)		
			33 (A)	PID controller output (PCTRL1-PID-OUT)		
			34 (A)	Process controller output (PCTRL1-NOUT)		
			35	Input signal at X3/8 (Standard-I/O) or X3/1U or X3/1I (Application-I/O), evaluated with gain (C0414/1 or C0027) and offset (C0413/1 or C0026) (AIN1-OUT)	6 V/12 mA/5.85 kHz ≡ Maximum value analog input signal (5 V, 10 V, 20 mA, 10 kHz) Condition: Gain of analog input or frequency input set to: C0414/x, C0426 = 100 %	
			36	Input signal at frequency input X3/E1, evaluated with gain (C0426) and offset (C0427) (DFIN1-OUT)		
			37	Motor potentiometer output·(MPOT1-OUT)		
			38 (A)	Input signal at X3/2U or X3/2I, evaluated with gain (C0414/2) and offset (C0413/2) (AIN2-OUT)		
			40	AIF input word 1 (AIF-IN.W1)	Setpoint to drive from communication module to AIF 10 V/20 mA/10 kHz ≡ 1000	
			41	AIF input word 2 (AIF-IN.W2)		
			50	CAN-IN1.W1 or FIF-IN.W1	Setpoints to drive from function module to FIF 10 V/20 mA/10 kHz ≡ 1000	
			51	CAN-IN1.W2 or FIF-IN.W2		
			52	CAN-IN1.W3 or FIF-IN.W3		
			53	CAN-IN1.W4 or FIF-IN.W4		
			60	CAN-IN2.W1		
			61	CAN-IN2.W2		
			62	CAN-IN2.W3		
			63	CAN-IN2.W4		
			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	📖 10.12-4
C0420* (A)	Gain analog outputs Application I/O				128 ≡ Gain 1	📖 10.12-4
1	X3/62 (AOUT1-GAIN)	128	0	{1} 255	C0420/1 and C0108 are the same	
2	X3/63 (AOUT2-GAIN)					

Code No.	Name	Lenze	Selection		IMPORTANT	
C0421* ENTER	Free configuration analog process data output words		Output of analog signals on bus			10.12-10
1	AIF-OUT.W1	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)		
2	AIF-OUT.W2	0		Output frequency (MCTRL1-NOUT+SLIP)		
3	CAN-OUT1.W1 / FIF-OUT.W1	255		Not assigned (FIXED-FREE)	• **With Lenze setting, CAN-OUT1.W1 and FIF-OUT.W1 are defined as digital outputs and the 16-bit controller status word 1 (C0417) is assigned to them.** • **Before you assign an analog signal source (C0421/3 ≠ 255), the digital assignment must be deleted (C0417/x = 255)! Otherwise the output signal would be incorrect.**	
4	CAN-OUT1.W2 / FIF-OUT.W2	255		Not assigned (FIXED-FREE)		
5	CAN-OUT1.W3 / FIF-OUT.W3	255		Not assigned (FIXED-FREE)		
6	CAN-OUT1.W4 / FIF-OUT.W4	255		Not assigned (FIXED-FREE)		
7	CAN-OUT2.W1	255		Not assigned (FIXED-FREE)		
8	CAN-OUT2.W2	255		Not assigned (FIXED-FREE)		
9	CAN-OUT2.W3	255		Not assigned (FIXED-FREE)		
10	CAN-OUT2.W4	255		Not assigned (FIXED-FREE)		
C0421* ENTER (cont.)				**Possible analog signals for C0421**		10.12-10
			0	Output frequency (MCTRL1-NOUT+SLIP)	24000 ≡ 480 Hz	
			1	Device utilisation (MCTRL1-MOUT) at V/f characteristic control (C0014 = 2 or 3)	16383 ≡ Rated active inverter current (active current/C0091)	
				Actual motor torque (MCTRL1-MACT) at vector control (C0014 = 4) or sensorless torque control (C0014 = 5)	16383 ≡ Rated motor torque	
			2	Apparent motor current (MCTRL1-IMOT)	16383 ≡ Rated inverter current	
			3	DC-bus voltage (MCTRL1-DCVOLT)	16383 ≡ 565 VDC at 400 V mains 16383 ≡ 325 VDC at 230 V mains	
			4	Motor power	285 ≡ Rated motor power	
			5	Motor voltage (MCTRL1-VOLT)	16383 ≡ Rated motor voltage	
			6	1/output frequency (1/C0050) (MCTRL1-1/NOUT)	195 ≡ 0.5 × C0011	
			7	Output frequency with limits (DCTRL1-C0010...C0011)	24000 ≡ 480 Hz $0 \equiv f < C0010$ $\frac{24000 \cdot (f - C0010)}{480\ Hz} \equiv f \geq C0010$	
			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)	24000 ≡ 480 Hz	

Code No.	Name	Lenze	Selection		IMPORTANT	
C0421* ENTER (cont.)				**Possible analog signals for C0421**	Selection 9 ... 25 correspond to the digital functions of the relay output K1 (C0008) or the digital output A1 (C0117): LOW = 0 HIGH = 1023	10.12-10
			9	Ready for operation (DCTRL1-RDY)		
			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 (DCTRL1-RFG1=NOUT)		
			16	Value has fallen below frequency threshold Q_{min} (f < C0017) (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 Frequency threshold Q_{min} = C0017	
			22	Apparent motor current < current threshold and output frequency > frequency threshold Q_{min} (DCTRL1-(IMOT<ILIM)-QMIN)		
			23	Apparent motor current < current threshold and RFG 1: Input = output (DCTRL1-(IMOT<ILIM)-RFG-I=0)		
			24	Warning motor phase failure (DCTRL1-LP1-WARN)		
			25	Minimum output frequency reached (f ≤ C0010) (PCTRL1-NMIN)		

Code No.	Name	Possible settings Lenze	Selection		IMPORTANT	
C0421* ENTER (cont.)				**Possible analog signals for C0421**		📖 10.12-10
			26	Output frequency normalised without slip (MCTRL1-NOUT-NORM)	2^{14} ≡ C0011	
			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 without precontrol (PCTRL1-OUT)		
			31	Ramp function generator input (NSET1-RFG1-IN)		
			32	Ramp function generator output (NSET1-NOUT)		
			33 (A)	PID controller output (PCTRL1-PID-OUT)		
			34 (A)	Process controller output (PCTRL1-NOUT)		
			35	Input signal at X3/8 (Standard-I/O) or X3/1U or X3/1I (Application-I/O), evaluated with gain (C0414/1 or C0027) and offset (C0413/1 or C0026) (AIN1-OUT)	1000 ≡ Maximum value analog input signal (5 V, 10 V, 20 mA, 10 kHz) Condition: Gain of analog input or frequency input 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 (A)	Input signal at X3/2U or X3/2I, evaluated with gain (C0414/2) and offset (C0413/2) (AIN2-OUT)		
			40	AIF input word 1 (AIF-IN.W1)	Setpoint to drive from communication module to AIF Normalisation via AIF	
			41	AIF input word 2 (AIF-IN.W2)		
			50	CAN-IN1.W1 or FIF-IN.W1	Setpoints to drive from function module to FIF Normalisation via CAN or FIF	
			51	CAN-IN1.W2 or FIF-IN.W2		
			52	CAN-IN1.W3 or FIF-IN.W3		
			53	CAN-IN1.W4 or FIF-IN.W4		
			60	CAN-IN2.W1		
			61	CAN-IN2.W2		
			62	CAN-IN2.W3		
			63	CAN-IN2.W4		
			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	📖 10.12-4
C0422* (A)	Offset analog outputs Application-I/O					📖 10.12-4
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)	Digital output delay		0.000 {0.001 s} 65.000		"Debouncing" of 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. • Digital output reset without delay	📖 10.13-6
1	Relay output K1 (RELAY)	0.000				
2	Digital output X3/A1 (DIGOUT1)	0.000				
3	Digital output X3/A2 (DIGOUT2)	0.000				

Code No.	Name	Lenze	Selection					IMPORTANT	
C0424* ENTER (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)	📖 10.12-4
1	X3/62 (AOUT1)	0	0	0 ... 10 V / 0 ... 20 mA					
2	X3/63 (AOUT2)	0	1	4 ... 20 mA					
C0425* ENTER	Configuration frequency input single track X3/E1 (DFIN1)	2		f_r	Δf_{min}	t	f_{max}	• f_r = Normalisation frequency – f_r corresponds to C0011 • Δf_{min} = Resolution • t = Scanning rate – The lower the scanning rate the higher the dynamic response. • f_{max} = Maximum frequency which can be processed independently of C0425 – Set C0425 that the frequency coming from the encoder is lower than f_{max} • Activate frequency input with C0410/24 = 1 • Adjust frequency input under C0426 and C0427	📖 10.8-9
			0	100 Hz	1/200	1 s	300 Hz		
			1	1 kHz	1/200	100 msec	3 kHz		
			2	10 kHz	1/200	10 msec	10 kHz		
			3	10 kHz	1/1000	50 msec	10 kHz		
			4	10 kHz	1/10000	500 ms	10 kHz		
			5 (A)	102.4 kHz	1/400	2 msec	102.4 kHz		
			6 (A)	102.4 kHz	1/1000	5 msec	102.4 kHz		
			7 (A)	102.4 kHz	1/2000	10 msec	102.4 kHz		
	Configuration frequency input two tracks X3/E1, X3/E2 (DFIN1)		10	100 Hz	1/200	1 s	300 Hz		
			11	1 kHz	1/200	100 msec	3 kHz		
			12 (A)	10 kHz	1/200	10 msec	10 kHz		
			13 (A)	10 kHz	1/1000	50 msec	10 kHz		
			14 (A)	10 kHz	1/10000	500 ms	10 kHz		
			15 (A)	102.4 kHz	1/400	2 msec	102.4 kHz		
			16 (A)	102.4 kHz	1/1000	5 msec	102.4 kHz		
			17 (A)	102.4 kHz	1/2000	10 msec	102.4 kHz		
C0426*	Gain frequency input X3/E1, X3/E2 (A) (DFIN1-GAIN)	100	-1500.0		{0.1 %}		1500.0	$C0426 = \frac{f_N \cdot p}{z \cdot C0011} \cdot 100\ \%$ • f_r = Normalisation frequency from C0425 • p = Number of pole pairs of the motor • z = Number of increments per revolution of the encoder • C0011 = Maximum output frequency (corresponds to maximum process speed of the motor)	
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		

Code		Possible settings		IMPORTANT	
No.	Name	Lenze	Selection		
C0430* ENTER (A)	Automatic analog input adjustment	0	0 not active 1 Input point for X3/1U, X3/1I 2 Input points for X3/2U, X3/2I	Gain and offset are calculated by two points from the setpoint characteristic. Choose two points distant from each other to increase the calculation accuracy. 1. Select and input under C0430 which you want to calculate gain and offset for 2. Enter point 1 under C0431 X value (setpoint) and Y value (output frequency) 3. Enter point 2 under C0432 X value (setpoint) and Y value (output frequency) 4. Calculated values are automatically entered under C0413 (offset) and C0414 (gain)	10.8-3
C0431* ENTER (A)	Coordinates point 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* ENTER (A)	Coordinates point 2		-100.0 {0.1 %} 100.0		
1	X (P2)	100.0	Analog setpoint of P2 100 % = max. input value (5 V, 10 V or 20 mA)		
2	Y (P2)	100.0	Output frequency of P2 100 % = C0011		
C0435* ENTER (A)	Automatic frequency input adjustment	0	0 {1} 4096 = not active	• Only require for speed control with digital feedback via HTL encoder • Calculates the gain C0426, depending on C0425 and C0011 • C0426 will be recalculated after every change of C0011 or C0425. • **Always enter number of increments divided by number of pole pairs of the motor!** – Example: Encoder increments = 4096, motor 4-pole ⇒ C0435 = 2048	
C0440 (A)	Additional JOG values			JOG = Setpoint Activation via configuration under C0410	10.8-13
1	JOG 1	20.00	-650.00 {0.02 Hz} 650.00	C04401/1 and C0037 are the same	
2	JOG 2	30.00		C04401/2 and C0038 are the same	
3	JOG 3	40.00		C04401/3 and C0039 are the same	
4	JOG 4	15.00			
5	JOG 5	25.00			
6	JOG 6	35.00			
7	JOG 7	45.00			
C0469* STOP	Function of key STOP of the keypad	1	0 not active 1 CINH (controller inhibit) 2 QSP (quick stop)	Determines the function which is activated when pressing STOP . **Changes will only be active after mains switching!**	
C0500*	Calibration of numerator variable	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 in a way that the keypad indicates a process variable. • If C0500/C0501 remain unchanged, the unit ”Hz” will no longer be displayed.	10.16-1

Code		Possible settings					IMPORTANT	
No.	Name	Lenze	Selection					
C0501*	Calibration of denominator process variable	10	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 in a way that the keypad indicates a process variable. • If C0500/C0501 remain unchanged, the unit "Hz" will no longer be displayed.	🕮 10.16-1
C0500* (A)	Calibration of numerator variable	2000	1	{1}		25000	• The codes C0037, C0038, C0039, C0044, C0046, C0049, C0051, C0138, C0139, C0140, C0181 can be calibrated in a way that the keypad indicates a process variable with the unit selected under C0502. • Frequency-related codes (C0010, C0011, C0017, C0019, C0050, C0239, C0625, C0626, C0627) are always indicated in "Hz".	🕮 10.16-1
C0501* (A)	Calibration of denominator process variable	10	1	{1}		25000		
C0502* (A)	Process variable unit	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* ENTER	User menu						• After mains switching or when using the function Disp the code from C0517/1 will be displayed. • In Lenze setting, the user menu contains the most important codes for setting up 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. **Codes, which are only active when being used together with an Application-I/O, cannot be entered!**	🕮 10.18-1
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	U_{min} boost				
10	Memory 10	2	C0002	Parameter set transfer				
C0518 C0519 C0520	Service codes						**Modifications only by Lenze Service!**	
C0597* ENTER	Configuration of motor phase failure detection	0	0	not active				
			1	TRIP fault message			Keypad: LP1, bus: 32	
			2	Warning			Keypad: LP1, bus: 182	
C0599* ENTER	Current limit value for motor phase failure detection	5	1	{1 %}		50	• Threshold for C0597 • Reference: Rated controller current	
C0608*	Monitoring of external fan	0	0	not active			Function only active with 8200 motec 3 ... 7.5 kW With all other controller it is absolutely necessary to set C0608 = 0	
			1	TRIP fault message Keypad: Err95 Bus: 95				
			2	Warning				
C0625*	Skip frequency 1	0.00	0.00	{0.02 Hz}		650.00		🕮 10.4-6
C0626*	Skip frequency 2	0.00	0.00	{0.02 Hz}		650.00		
C0627*	Skip frequency 3	0.00	0.00	{0.02 Hz}		650.00		
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 Parameter set changeover via DC-bus voltage deactivated	{1 %}		200	• Changeover always between PAR1 nd PAR2 • Parameter set changeover is not possible via terminal, bus or PC if C988 > 0!	🕮 10.5-4 🕮 10.7-8

Code		Possible settings		IMPORTANT	
No.	**Name**	**Lenze**	**Selection**		
C1500* (A)	Software number application I/O		82SAFA0B_xy000	Only PC display x = main version y = subversion	
C1501* (A)	Software creation date application I/O			Only PC display	
C1502* (A)	Software number application I/O		Output to keypad as string in 4 parts à 4 characters	Only keypad display x = main version y = subversion	
1			82SA		
2			FA0B		
3			_xy0		
4			00		
C1504 (A) ... C1507 (A)	Service codes application I/O			**Modifications only by Lenze Service!**	
C1550 (A)	Service code application I/O			**Modifications only by Lenze Service!**	

11 Troubleshooting and fault elimination

11.1 Contents

11.2 Troubleshooting

Detecting failures

The controller LED's and the status information at the keypad immediately indicate errors or operation problems.

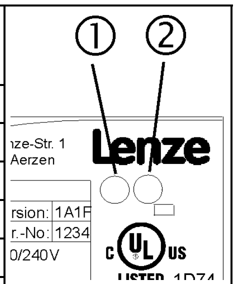
Analysing errors

You can analyse an error using the history buffer. The list "Error messages" helps you to eliminate the error. (🕮 11.4-1)

11.2.1 Status display (LED's on the controller)

During operation, the operating status of the controller is indicated by means of two LED's.

LED red ①	LED green ②	Operating status
off	on	Controller enabled
on	on	Mains switched on and automatic start inhibited
off	slowly blinking	Controller inhibited
off	fast blinking	Motor parameter identification
fast blinking	off	Undervoltage or overvoltage
slowly blinking	off	Error active, check under C0161



11.2.2 Error analysis with the history buffer

Tracing back failures

Failures can be traced back via the history buffer. Error 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 unit	Entry	Comment
C0161	History buffer location 1	Active error	If the error is no longer active or has been acknowledged: • The contents of the memory locations 1 ... 3 are 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 error	
C0163	Memory location 3	Last but one error	
C0164	Memory location 4	Third last error	

11.3 Drive performance in case of errors

The controller reacts differently to the three possible error types: TRIP, message and warning:

TRIP

TRIP (keypad display: Trip)

- Switches the power outputs U, V, W to a high resistance until TRIP is reset
- Entry into the history buffer as "current error" under C0161.
- The drive coasts to standstill without being controlled!
- After TRIP reset (11.5-1):
  – The drive accelerates to its setpoint along a set ramp.
  – The error is entered into C0162 as "last error" and deleted from C0161.

Messages

Signal (keypad display: IMP)

- Applies high resistance to the power outputs U, V, W.
- Signals are not entered into the history buffer.
- The drive coasts without being controlled as long as the signal is active!
- After the signal has been deactivated, the drive automatically restarts.

Warnings

"Heatsink overtemperature" (keypad: OH Warn)

- The drive continues controlled operation!
- The warning message comes off as soon as the error has been eliminated.

"Error in motor phase" (keypad: LP1)

"PTC monitoring" (keypad: OH51)

- The drive continues controlled operation!
- Entry into the history buffer as "current error" under C0161.
- After TRIP reset the error is entered into C0162 as "last error" and deleted from C0161.

11.4 Error elimination

11.4.1 Maloperation of the drive

Fault	**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
	Automatic start inhibited (C0142 = 0 or 2)	LOW-HIGH signal at X3/28 If necessary, correct start condition (C0142)
	DC injection brake active (DCB)	Deactivate DC injection brake
	Mechanical motor brake is not released	Manual or electrical release of mechanical motor brake
	Quick stop (QSP) active (keypad display: IMP)	Remove quick stop
	Setpoint = 0	Setpoint selection
	JOG setpoint activated and JOG frequency = 0	JOG setpoint selection (C0037 ... C0039)
	Active fault	Eliminate fault
	Wrong parameter set active	Change to correct parameter set via terminal
	Control mode C0014 = -4-, -5-, but no motor parameter identification	Motor parameter identification (C0148)
	Under C0410 several functions, which exclude each other, are assigned to the same signal source.	Correct configuration in C0410
	Use internal voltage source X3/20 for 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 set too low (C0022, C0023)	Adaptation to the application
	Motor underexcited or overexcited	Check parameter setting (C0015, C0016, C0014)
	C0084, C0087, C0088, C0089, C0090, C0091 and/or C0092 are not adapted to the motor data	Manual adaptation or identification of motor parameters (C0148)
Current consumption of motor too high	Setting of C0016 too high	Correct setting
	Setting of C0015 too low	Correct setting
	C0084, C0087, C0088, C0089, C0090, C0091 and/or C0092 are not adapted to the motor data	Manual adaptation or identification of motor parameters (C0148)
Motor rotates, setpoints are "0"	With the function Set of the keypad a setpoint has been selected.	Set the setpoint to "0" by C0140 = 0
Motor parameter identification stops with error LP1	Motor too small compared with rated power	
	DC brake active via terminal	
Unacceptable drive response with vector control	various	Vector control optimisation (📖 8.4-4)
Torque dip in the field weakening range	various	Contact Lenze
Stalling of the motor when operating in the field weakening range		

11.4.2 Error messages at the keypad or in the parameter setting program Global Drive Control

Keypad	PC 1)	Error	Cause	Remedy
nOEr	0	No fault	-	-
CCr Trip	71	System fault	Strong interferences on control cables	Shield control cables
			Ground or earth loops in the wiring	
CE0 Trip	61	Communication fault to AIF (configurable in C0126)	Faulty transmission of control commands via AIF	Insert the communication module into the hand terminal
CE1 Trip	62	Communication fault 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 Trip	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 Trip	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 Trip	65	BUS-OFF (many communication faults occurred)	Controller has received too many incorrect telegrams via the system bus and has been disconnected	• Check whether bus terminator available • Check screen contact of the cables • Check PE connection • Check bus load, if necessary, reduce the baud rate
CE5 Trip	66	CAN Time-Out (configurable in C0126)	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 application I/O: Faulty parameter setting of parameter set changeover	In all parameter sets the signal "parameter set changeover" (C0410/13, C0410/14) must be combined with the same source
			For operation with module in FIF: Internal fault	Contact Lenze
CE6 Trip	67	Function module system bus (CAN) on FIF has set "Warning" or "BUS-OFF" (configurable in C0126)	CAN controller sets "Warning" or "BUS OFF"	• Check whether bus terminator available • Check screen contact of the cables • Check PE connection • Check bus load, if necessary, reduce the baud rate
CE7 Trip	68	Communication fault during remote parameter setting via system bus (C0370) (configurable in C0126)	Participant does respond or is not available	• Check whether bus terminator available • Check screen contact of the cables • Check PE connection • Check bus load, if necessary, reduce the baud rate
			For operation with application I/O: Faulty parameter setting of parameter set changeover	In all parameter sets the signal "parameter set changeover" (C0410/13, C0410/14) must be combined with the same source
EEr Trip	91	External fault (TRIP-SET)	A digital input assigned to the TRIP-Set function has been activated.	Check external encoder
H05 Trip	105	Internal fault		Contact Lenze
Id1 Trip	140	Faulty parameter identification	Motor not connected	Connect motor
LP1 Trip	32	Fault in motor phase (is displayed if C0597 = 1)	• 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.
LP1	182	Fault in motor phase (is displayed if C0597 = 2)		
LU IMP	-	DC-bus undervoltage	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 Trip	11	Short circuit	Short circuit	• Find reason for short circuit; check motor cable • Check braking resistor and cable for braking resistor
			Excessive capacitive charging current of the motor cable	Use shorter motor cables with lower charging current

Troubleshooting and fault elimination

Error elimination

Error messages at the keypad or in the parameter setting program Global Drive Control

Keypad	PC 1)	Error	Cause	Remedy
OC2 Trip	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
				Deactivate earth-fault detection for testing purposes
OC3 Trip	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 Trip	14	Overload controller during deceleration	Deceleration time set too short (C0013)	• Increase deceleration time • Check size of external brake resistor
OC5 Trip	15	Controller overload in stationary operation	Frequent and long overload	Check drive selection
OC6 Trip	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
OH Trip	50	Heatsink temperature > +85 °C	Ambient temperature too high	Allow controller to cool and ensure better ventilation
OH Warn	-	Heatsink temperature > +80 °C	Heatsink very dirty	Clean heatsink
			Impermissibly high currents or too frequent and too long acceleration	• Check drive selection • Check load, if necessary, replace defective bearings
OH3 Trip	53	PTC monitoring (TRIP) (is displayed if C0119 = 1 or 4)	Motor too hot because of excessive currents or frequent and too long accelerations	Check drive selection
			PTC not connected	Connect PTC or switch off monitoring
OH4 Trip	54	Controller overtemperature	Controller too hot inside	• Reduce controller load • Improve cooling • Check fan in the controller
OH51	203	PTC monitoring (is displayed if C0119 = 2 or 5)	Motor too hot because of excessive currents or frequent and too long accelerations	Check drive selection
			PTC not connected	Connect PTC or switch off monitoring
OU IMP	-	DC-bus overvoltage	Mains voltage too high	Check voltage supply
			Braking operation	• Prolong deceleration times. • Operation with external brake resistor: – Check dimensioning, connection and cable of the brake resistor. – Increase the deceleration times
			Earth leakage on the motor side	Check motor cable and motor for earth fault (disconnect motor from inverter)
Pr Trip	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 Trip	72	Wrong PAR1 transfer when using the keypad.	PAR1 is defective.	
Pr2 Trip	73	Wrong PAR2 transfer when using the keypad.	PAR2 is defective.	
Pr3 Trip	77	Wrong PAR3 transfer when using the keypad.	PAR3 is defective	
Pr4 Trip	78	Wrong PAR4 transfer when using the keypad.	PAR4 is defective	
Pr5 Trip	79	Internal fault		Contact Lenze

11.4.2 Error messages at the keypad or in the parameter setting program Global Drive Control

Keypad	PC 1)	Error	Cause	Remedy
PT5 Trip	81	Time fault during parameter set transfer	Data flow from keypad or PC interrupted, e. g. keypad was disconnected during transfer	It is absolutely necessary to repeat the data transfer or load the Lenze setting before enabling the controller.
rST Trip	76	Faulty auto-TRIP reset	More than 8 fault messages in 10 minutes	Depends on the error message
Sd5 Trip	85	Wire breakage analog input 1	Current at analog input < 4 mA at setpoint range 4 ... 20 mA	Close circuit at analog input
Sd7 Trip	87	Wire breakage analog input 2		

1) LECOM-fault number, display in parameter setting program Global Drive Control (GDC)

11.5 Resetting error messages

Eliminating the cause for TRIP error message

After eliminating the cause for a TRIP error message the error message must be reset with the "TRIP reset" order. Only then the drive will start again.

Note!

A TRIP error message can have several causes. The TRIP reset can only be carried out after all causes for the TRIP have been eliminated.

Manual or automatic TRIP reset

You can select whether errors occurred are to be reset manually or automatically. Mains disconnection always carries out a TRIP reset independent of the settings under C0170.

Note!

If the controller carries out more than eight automatic TRIP resets within ten minutes, the controller will set TRIP rST (Counter exceeded).

TRIP reset also resets the auto TRIP counter.

Codes for parameter setting

Code		Possible settings			IMPORTANT	
No.	Name	Lenze	Selection			
C0043* ENTER	TRIP reset		-0-	No current error	Reset active error with C0043 = 0	
			-1-	Active error		
C0170 ENTER	Configuration TRIP reset	0	0	TRIP reset by mains switching, STOP, LOW–signal at X3/28, via function module 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.	11.5-1
			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		
C0171	Delay for auto-TRIP reset	0.00	0.00	{0.01 sec} 60.00		

12 Network of several drives

12.1 Contents

12.2 General information

This chapter describes DC-bus connections of frequency inverters of the series 8200 vector and 8220 and servo inverters of the series 9300 (including all technology variants: “Position controller”, “Register controller”, “Cam profiler”, “vector”).

12.3 Function

DC-bus connections of drive systems enable the exchange of energy between connected controllers on the DC voltage level.

Energy exchange in the DC bus

If one or more controllers operate in generator mode (braking), the recovered energy will be fed into the shared DC bus or the DC source. The energy will then be available to the network of controllers which operate in motor mode.

The energy from the three-phase AC mains can be supplied via the following devices:

- 934X regenerative power supply unit
- 936X power supply unit
- One or several controllers
- A combination of 934X regenerative power supply units and controller

Advantages of a network of several drives

The use of brake units, supply units and the energy consumption from the three-phase AC mains can be reduced.

The number of mains supply terminals and the related expenses (e.g. for wiring) can be perfectly adapted to your application.

12.4 Conditions for a trouble-free network of several drives

Stop!

Only connect controllers with the same mains voltage ranges or DC-bus voltage ranges (see table below).

Adapt the thresholds for brake units and brake transistors.

All supply terminals must only be operated with the prescribed mains choke/mains filter! (📖 12.5-2)

12.4.1 Possible combinations of Lenze controllers in a network of several drives

Combinations in the 230 V mains

Type	Data	E82EVXXXK2C
E82EVXXXK2C	①	1 / N / PE / AC / 180 V - 0 % ... 264 V + 0% 45 Hz - 0 % ... 65 Hz + 0 %
	②	DC 140 V ... 370 V
	③	DC 380 V

Combinations in the 400 V mains

Type	Data	E82EVXXXK4C	822X	93XX
E82EVXXXK4C	①	3 / PE / AC / 320 V - 0 % ... 550 V + 0 % 45 Hz - 0 % ... 65 Hz + 0 %		
	②	DC 450 V ... 775 V		
	③	DC 725 V/765 V		
822X 824X	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		
821X	①	3 / PE / AC / 320 V - 0 % ... 510 V + 0 % 45 Hz - 0 % ... 65 Hz + 0 %		
	②	DC 450 V ... 715 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 external brake unit (option)

Note!

If the requirements stated above are met, the Lenze controllers type 821X and type 824X can also be integrated into the network.

12.4.2 Mains connection

Cable protection and cable cross-section

Mains fuses and and cable cross-section must be selected according to the mains current which results from the input power $P_{DC100\%}$. Observe national standards, temperatures and other conditions. (📖 12.4-6)

Note!

Asymmetries in the network can cause a dimensioning raised by a factor between 1.35 and 1.5.

Mains current

Formula for the mains current in networks:

$$I_{mains}\,[A] \approx \frac{P_{DC100\%}\,[W]}{1.6 \cdot U_{mains}\,[V]}$$

Mains chokes, mains filters, EMC

Only use those mains chokes and mains filters which are permissible for DC-bus connection. (📖 12.5-2)

Function:

- Mains-current limitation
- Current/power symmetry of the mains input circuits of the controllers with decentralised supply.

Select mains chokes/mains filters for mains current.

Note!

Please observe that network operation requires different mains chokes/mains filters than stand-alone operations.

Compliance with the EMC regulations must be checked. Also check the use of a central interference suppressor in the AC supply.

Controller protection

Ensure simultaneous mains connection of all controllers connected to the network.

Network of several drives

Conditions for a trouble-free network of several drives

Mains connection

Switch-on conditions

Use central mains contactor (📖 12.7-2)

Decentralised switching of the mains supply is possible if the single mains contactors are monitored when switching on (feedback to PLC) and the connection of the contactors follows the same cycle.

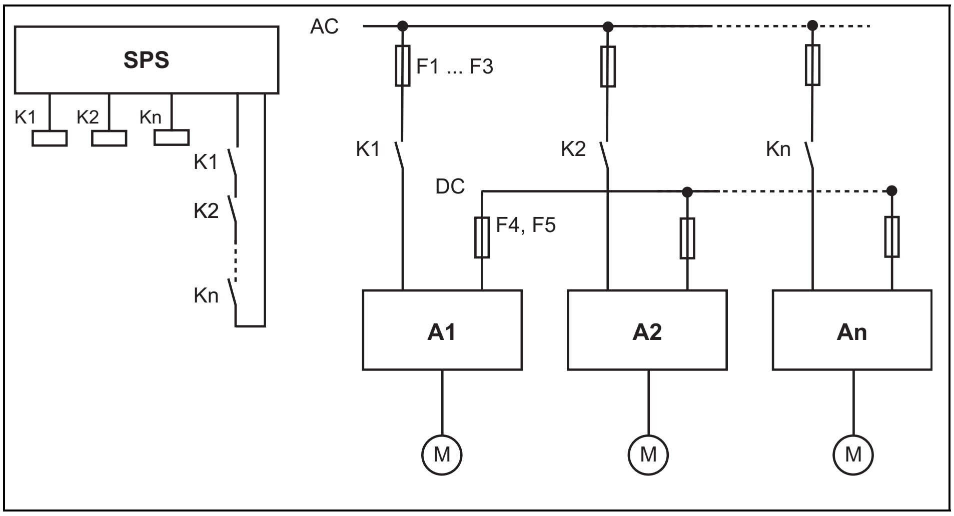


Fig. 12.4-1 Decentralised switching of the mains supply in network operation

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

Adaptation to the mains voltage

C0173 must be set to the same value for all 93XX controllers connected to the network.

Mains failure detection with decentralised supply

The mains supply for each controller must be monitored, because it is possible that all mains input circuits still active in the network may be overloaded when the mains fails.

Note!

Switch off the entire network if the mains supply or mains phase fails. (📖 12.7-2)

Use switching elements for mains failure detection and warning:

- Thermal overcurrent releases (bimetal relay) connected after the mains fuses
- Cable protection through power switch with thermal and magnetic releases and with integrated alarm contact

Additional capacities in the DC-bus

If additional capacities are connected to the DC bus, the input rectifier of the controllers or the 934X supply unit can be overloaded.

Therefore ensure appropriate resistors.

12.4.3 DC-bus connection

Ensure short cable connections to the common DC-bus star point.

Selection of cable cross-section

Select the cable cross-section for the DC bus according to the sum of mains supplies:

Example

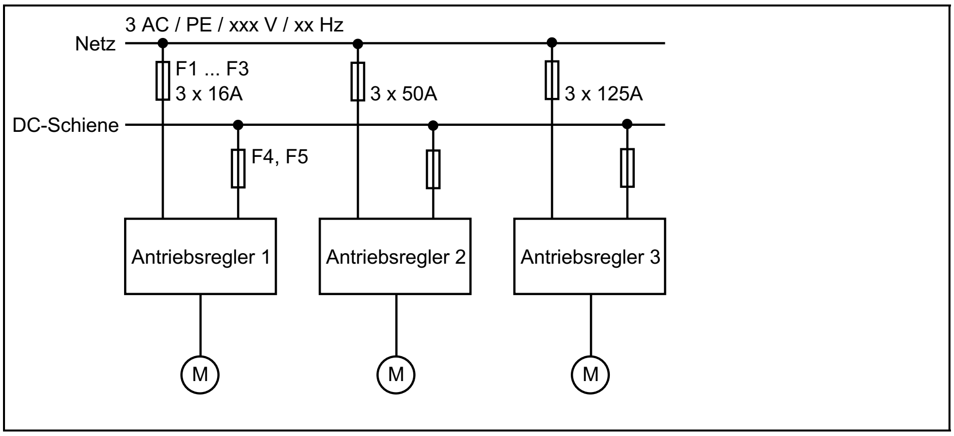


Fig. 12.4-2 Example: DC connection of three controllers

Sum of the possible permanent r.m.s. currents of the parallel mains supplies:

16 A + 50 A + 125 A = 191 A

The cable cross-section is selected according to the resulting current of 191 A and the local conditions, as for instance, ambient temperature, conductor material, conductor type, type of laying, expansion, standards and regulations.

Reducing cable inductance

Ensure low cable inductance by means of the following measures:

- DC-bus star point in control cabinet above parallel busbar
- Cables between controller ($+U_{DC}$, $-U_{DC}$) and DC-bus star point must be laid in parallel and, if necessary, twisted

Use shielded cables.

Fuses

Protect the controller (with reference to the DC bus) via assigned DC bus fuses F4, F5. The fuse protects the controller in case of:

- Internal short-circuit
- Internal earth fault
- Short-circuit in the DC-bus $+U_{DC} \rightarrow -U_{DC}$,
- Earth fault in the DC-bus $+U_{DC} \rightarrow$ PE or $-U_{DC} \rightarrow$ PE.

Note!

When two controllers are connected to the network:
- One fuse pair F4/F5 is sufficient.
- The fusing must be rated according to the controller with poorer performance.

When more than two controllers are connected to the network:
- A fuse pair F4/F5 must be connected in series with each controller.

More information about fuses: (🕮 12.4-8)

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

The values in the table apply to operation of controllers connected to the DC-bus network with P_{DC} = 100%, i.e. max. rated controller power on the DC-bus level.
(📖 12.5-4)

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

Mains input L1, L2, L3 Operation with mains filter/mains choke

Type	Fuse F1, F2, F3		E.l.c.b.	Cable cross-section [1)]	
	VDE	UL	VDE	mm^2	AWG
E82EV551K2B	M 6A	5A	B 6A	1	18
E82EV751K2B	M 6A	5A	B 6A	1.5	16
E82EV152K2B	M 10A	10A	B 10A	1.5	16
E82EV222K2B	M 16A	15A	B16 A	2.5	14
E82EV551K4B	M 6A	5A	B 6A	1	18
E82EV751K4B	M 6A	5A	B 6A	1	18
E82EV152K4B	M 10A	10A	B 10A	1.5	16
E82EV222K4B	M 10A	10A	B 10A	1.5	16
9341	M 16A	15A		2.5	14
9342	M 32A	30A		j6	10
9343	M 63A	60A		25	4
9364	M 100A	100A		50	1
9365	M 200A	200A		95	3 / 0
9321, 8241	M 6A	5A	C 6A	1	18
E82EV551K4B, E82EV751K4B	M 6A	5A	B 6A	1	18
9322, 8242, 8211	M 6A	5A	C 6A	1	18
8212	M 6A	5A	B 6A	1	18
9323, 8243	M 10A	10A	B 10A	1.5	16
E82EV152K4B, E82EV222K4B	M 10A	10A	B 10A	1.5	16
8213, 8214	M 10A	10A	B 10A	1.5	16
9324, 8244	M 10A	10A	B 10A	1.5	16
E82EV302K4B	M 16A	15A	B 16 A	2.5	14
8215, E82EV402K4B	M 16A	15A	B 16 A	2.5	14
9325, 8245, 8216	M 20A	20A	B 20A	4	12
E82EV552K4B	M 20A	20A	B 20A	4	12
E82EV752K4B	M 25A	25A	B25 A	4	10
9326, 8246, 8217, 8218, E82EV113K4B	M 32A	30A	B 32A	j6	10
9327, 8221, E82EV153K4B	M 63A	60A		25	4
9328, 8222, E82EV223K4B	M 80A	70A		25	4
9329, 8223, E82EV303K4B	M 80A	80A		25	3
9330, 8224, E82EV453K4B	M 125A	125A		50	0
9331, 8225, E82EV553K4B	M 160A	150A		70	0
9332, 9333, 8226, 8227, E82EV753K4B, E82EV903K4B	M 200A	200A		95	3 / 0

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

DC input +UG, -UG

Type	Fuses F4, F5	Cable cross-section [1]	
		mm²	AWG
E82EV551K2B	CC6A	1	18
E82EV751K2B	CC8A	1	18
E82EV152K2B	CC12A	1.5	16
E82EV222K2B	CC16A	2.5	14
E82EV551K4B	CC6A	1	18
E82EV751K4B	CC6A	1	18
E82EV152K4B	CC8A	1	18
E82EV222K4B	CC10A	1	18
9341	20A	4	12
9342	40A	10	8
9343	80A	25	3
9364			
9365			
9321, 8241	6A	1	18
E82EV551K4B, E82EV751K4B	6A	1	18
9322, 8242, 8211	6A	1	18
8212	6A	1	18
9323, 8243	12A	1.5	14
E82EV152K4B, E82EV222K4B	10A	1.5	16
8213, 8214	10A	1.5	16
9324, 8244	12A	1.5	14
E82EV302K4B	16A	2.5	12
8215, E82EV402K4B	16A	2.5	12
9325, 8245, 8216	20A	4	12
E82EV552K4B	25A	4	10
E82EV752K4B	40A	10	8
9326, 8246, 8217, 8218, E82EV113K4B	40A	10	8
9327, 8221, E82EV153K4B	80A	25	3
9328, 8222, E82EV223K4B	80A	25	3
9329, 8223, E82EV303K4B	100A	50	1
9330, 8224, E82EV453K4B	2*80A	2*25	2*3
9331, 8225, E82EV553K4B	2*100A	2*50	2*1
9332, 9333, 8226, 8227, E82EV753K4B, E82EV903K4B	3*80A	3*25	3*3

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

Note!

We recommend to use fuse holders with alarm contact when the network is supplied decentrally. This serves to switch off the entire network of drives if one fuse blows.

12.4.5 Protection in DC-bus operation

Protection concept and damage risk

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

Note!

On the motor side the current limitation of the controller is an additional cable protection. For this, the set current limitation for the controller must correspond to the rated current of the connected motor.

For group drives we recommend additional individual protection.

Definition "Internal error"

Controllers:

- The error is located between the connection at the DC bus and in the controller before the terminals U, V, W.

Supply units:

- The error is located between the mains input (terminals L1, L2, L3) and the farthest point of the DC bus.

Fuses

With mains fuses without monitoring function (F1 ... F3)

	Cable protection	No unit protection
Protection of	• on the mains side • on the DC-bus • on the motor side	
Possible faults	One/several controllers with • internal short circuit ($+U_{DC} \rightarrow -U_{DC}$) • internal earth fault ($+U_{DC} \rightarrow PE/-U_{DC} \rightarrow PE$) • motor-side earth fault on phase W	Mains failure of a controller with decentralised supply.
Risk	Several parallel controllers supply the error location(s) via the DC bus. This may lead to an overload of the intact controllers, as the faulty controller is not selectively activated on the DC bus. Possible damage with central and decentralised supply • Destruction of the faulty controller • Destruction of the controllers still intact • Destruction of the supply unit	If a mains-side supply terminal fails because F1...F3 blow, the active controllers in the network can be overloaded.
Comment	The extent of destruction depends on the ratio "DC-bus power of the whole system / rated power of the controller concerned".	

Network of several drives

Conditions for a trouble-free network of several drives

Protection in DC-bus operation

With mains fuses with monitoring function (F1 ... F3)

	Cable protection	Unit protection in the event of overload	No device protection in the event of short circuit
Protection of	• on the mains side • on the DC bus • on the motor side	If a supply terminal fails because F1...F3 blow the remaining controllers in the network will not be overloaded. The alarm contact switches off the mains for the entire network.	
Possible faults	One/several controllers with • internal short circuit ($+U_{DC} \rightarrow -U_{DC}$) • internal earth fault ($+U_{DC} \rightarrow PE/-U_{DC} \rightarrow PE$) • motor-side earth fault on phase W		
Risk	Several parallel controllers supply the error location(s) via the DC bus. This may lead to an overload of the intact controllers, as the faulty controller is not selectively activated on the DC bus. Possible damage with central and decentralised supply • Destruction of the faulty controller • Destruction of the controllers still intact • Destruction of the supply unit		
Comment	The extent of destruction depends on the ratio ”DC-bus power of the whole system / rated power of the controller concerned”.		

With mains fuses with monitoring function (F1 ... F3) and with DC fuses F4 ... F5

	Cable protection	Unit protection in the event of overload	Unit protection in the event of short circuit
Protection of	• on the mains side • on the DC-bus • on the motor side	If a supply terminal fails because F1...F3 blow the remaining controllers in the network will not be overloaded. The alarm contact switches off the mains for the entire network.	
Possible faults	One or more controllers with – internal short circuit ($+U_{DC} \rightarrow -U_{DC}$) – internal earth fault ($+U_{DC} \rightarrow PE/-U_{DC} \rightarrow PE$) – motor-side earth fault on phase W		
Risk	Possible damage with central and decentralised supply • Destruction of the faulty controller		
Comment	The selective activation of the mains and DC side reduces the extent of destruction.		

12.5 Selection

In the following table you will find some basic data to select a drive network. Two examples show you how to work with the tables.

12.5.1 Conditions

The supply powers indicated in tables only apply if the following conditions are met by the DC-bus connection:

	Condition	
All supply terminals	Connection to the three-phase AC mains only with prescribed mains filters/mains chokes. 📖 12.5-2	
Mains voltage	a_{mains} = 230 V / 50 Hz (📖 12.5-3)	a_{mains} = 400 V / 50 Hz (📖 12.5-4)
Chopper frequencies	8200 8200 vector — 4 kHz or 8 kHz.	93XX — 8 kHz 8200 vector 822X 824X 821X — 4 kHz or 8 kHz.
Ambient temperature	max. +40 °C	
Motors (three-phase AC asynchronous motors, asynchronous servo motors, synchronous servo motors)	Simultaneity factor F_g = 1 (All motors operate simultaneously with 100 % motor load)	

12.5.2 Required mains filters or mains chokes

Prescribed mains chokes for supply terminals in the network operation:

Controller/supply unit/feedback unit		Mains choke		
Type	**Rated mains current [A]**	**Rated current [A]**	**Inductance [mH]**	**Order no.**
9341	12.0	12.0	1,20	EZN3A0120H012
9342	24.0	24.0	0.88	EZN3A0088H024
9343	45.0	45.0	0.55	EZN3A0055H045
9364	74.0	85.0	0.38	ELN3-0038H085
9365	148.0	170.0	0.17	ELN3-0017H170
9321, 8241	4.2	4.5	9.00	EZN3A0900H004
E82EV551K4B, E82EV751K4B	2.3	3.0	15.00	EZN3A1500H003
9322, 8242, 8211	3.3	4.5	9.00	EZN3A0900H004
8212	3.5	4.5	9.00	EZN3A0900H004
9323, 8243	7.0	7.0	5.00	EZN3A0500H007
E82EV152K4B, E82EV222K4B	5.8	6.1	6.80	E82ZL22234B
8213, 8214	6.5	7.0	5.00	EZN3A0500H007
9324, 8244	7.6	9.0	4.00	EZN3A0400H009
E82EVK302K4B	9.2	13.0	3.00	EZN3A0300H013
8215, E82EV402K4B	10.0	13.0	3.00	EZN3A0300H013
9325, 8245, 8216	12.0	13.0	3.00	EZN3A0300H013
E82EV552K4B	13.6	13.0	3.00	EZN3A0300H013
E82EV752K4B	17.6	24.0	1.50	ELN3-0150H024
9326, 8246, 8217, 8218, E82EV113K4B	21.8	24.0	1.50	EZN3A0150H024
9327, 8221, E82EV153K4B	45.0	45.0	0.75	ELN3-0075H045
9328, 8222, E82EV223K4B	50.0	55.0	0.88	ELN3-0088H055
9329, 8223, E82EV303K4B	55.2	60.0	0.55	EZN3A0055H060
9330, 8224, E82EV453K4B	91.7	105.0	0.27	ELN3-0027H105
9331, 8225, E82EV553K4B	103.8	105.0	0.27	ELN3-0027H105
9332, 9333, 8226, 8227, E82EV753K4B, E82EV903K4B	161.7	170.0	0.17	ELN3-0017H170

12.5.3 Supplies - 230 V controller

Supply power in the network of 230 V controller, three-phase

Supply terminal 1	402K2C	752K2C	9365	9364	152K2C, 222K2C	551K2C, 751K2C	552K2C	302K2C
P_{DC} [kW]	**6.5**	**10.1**	**57.5**	**28.8**	**3.7**	**1.4**	**9.0**	**5.1**
P_V [kW]	0.2	0.3	0.4	0.2	0.1	0.1	0.3	0.2
Supply 2...n								
402K2C	5.3							
752K2C	7.2	8.3						
9365	39.5	45.1	47.0					
9364	17.2	19.6	20.4	23.5				
152K2C, 222K2C	2.1	2.4	2.5	2.9	3.0			
551K2C, 751K2C	0.7	0.8	0.8	1.0	1.0	1.1		
552K2C	4.3	4.8	5.1	5.8	6.1	6.9	7.4	
302K2C	2.1	2.4	2.5	2.9	3.1	3.5	3.7	4.2

Supply power in the network of 230 V controllers, single-phase

Supply terminal 1	8201, 8202, 551K2C, 751K2C	8204	152K2C, 222K2C	8203
P_{DC} [kW]	**1.3**	**3.2**	**3.3**	**2.4**
P_V [kW]	0.1	0.1	0.1	0.1
Supply 2...n				
8201, 8202, 551K2C, 751K2C	1.1			
8204	2.1	2.6		
152K2C, 222K2C	2.1	2.6	2.7	
8203	1.5	1.9	1.9	2.0

How to use the table:	1. Look under ”supply 1” from left to right until you find a controller connected to the network 2. Look for more devices in the same column for the corresponding power P_{DC} and add the powers until the required sum power is reached. Every added devices must be supplied.
Empty fields	Supply combinations not possible

12.5.4 Supplies - 400 V controllers

Supplies in DC-bus connection - 400 V controllers

Supply terminal 1	9341	9342	9365	9343	9330, 8224, 453K4B	752K4B	9332, 9333, 8226, 8227, 753K4B, 903K4B	9328, 8222, 223K4B	8244, 9324, 302K4B	9331, 8225, 553K4B	9364	9322, 8242, 8211, 8212	8215, 402K4B	9329, 8223, 303K4B	8213, 8214	9326, 8246, 8217, 8218, 113K4B	9327, 8221, 153K4B	551K4B, 751K4B	9323, 8243	9325, 8245, 8216	9321, 8241	152K4B, 222K4B	552K4B
P_{DC} [kW]	**7.2**	**14.4**	**100**	**27.0**	**60.5**	**11.6**	**106.7**	**33.0**	**6.1**	**68.5**	**50.0**	**2.2**	**6.6**	**36.4**	**4.3**	**14.4**	**29.7**	**1.5**	**4.6**	**7.9**	**2.8**	**3.8**	**9.0**
P_V [kW]	0.1	0.2	0.4	0.4	1.1	0.3	2.4	0.6	0.1	1.5	0.2	0.1	0.2	0.8	0.1	0.4	0.4	0.1	0.1	0.3	0.1	0.1	0.2
Supply 2...n																							
9341	X																						
9342	X	X																					
9365	48.2	70.8	81.8																				
9343	X	X	21.8	X																			
9330, 8224, 453K4B	28.8	42.2	48.8	49.5	49.5																		
752K4B	5.2	7.6	8.8	8.9	8.9	9.5																	
9332, 9333, 8226, 8227, 753K4B, 903K4B	47.1	69.1	79.9	81.0	81.0	86.4	87.3																
9328, 8222, 223K4B	14.1	20.7	24.0	24.3	24.3	25.9	26.2	27.0															
9324, 8244, 302K4B	2.6	3.8	4.4	4.5	4.5	4.8	4.8	5.0	5.0														
9331, 8225, 553K4B	28.8	42.2	48.8	49.5	49.5	52.8	53.4	55.0	55.2	56.0													
9364	20.9	30.7	35.5	36.0	36.0	38.4	38.8	40.0	40.2	40.8	40.9												
9322, 8242, 8211, 8212	0.9	1.3	1.5	1.5	1.5	1.6	1.6	1.7	1.7	1.7	1.7	1.8											
8215, 402K4B	2.6	3.8	4.4	4.5	4.5	4.8	4.8	5.0	5.0	5.0	5.1	5.3	5.4										
9329, 8223, 303K4B	14.1	20.7	24.0	24.3	24.3	25.9	26.2	27.0	27.1	27.5	27.6	29.1	29.4	29.8									
8213, 8214	1.6	2.3	2.6	2.7	2.7	2.9	2.9	3.0	3.0	3.0	3.0	3.2	3.2	3.3	3.5								
9326, 8246, 8217, 8218, 113K4B	5.2	7.6	8.8	8.9	8.9	9.5	9.6	9.9	9.9	10.1	10.1	10.7	10.8	10.9	11.7	11.8							
9327, 8221, 153K4B	10.4	15.2	17.6	17.8	17.8	19.0	19.2	19.8	19.9	20.2	20.2	21.4	21.6	21.9	23.4	23.5	24.3						
551K4B, 751K4B	0.5	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2					
9323, 8243	1.5	2.3	2.6	2.7	2.7	2.8	2,9	3.0	3.0	3.0	3.0	3.2	3.2	3.3	3.5	3.5	3.6	3.7	3.8				
9325, 8245, 8216	2.6	3.8	4.4	4.4	4.4	4.7	4.8	4.9	5.0	5.0	5.0	5.3	5.4	5.5	5.8	5.9	6.1	6.2	6.3	6.5			
9321, 8241	0.9	1.3	1.5	1.5	1.5	1.6	1.6	1.7	1.7	1.7	1.7	1.8	1.8	1.8	2.0	2.0	2.0	2.1	2.1	2.2	2.3		
152K4B, 222K4B	1.1	1.7	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.3	2.4	2.4	2.6	2.6	2.7	2.7	2.8	2.8	3.0	3.1	
552K4B	2.6	3.8	4.4	4.5	4.5	4.8	4.8	5.0	5.0	5.1	5.1	5.4	5.4	5.5	5.9	5.9	6.1	6.2	6.3	6.5	6.8	7.1	7.4

How to use the table:	1. Look under "supply 1" from left to right until you find a controller connected to the network. 2. Look for more devices in the same column for the corresponding power P_{DC} and add the powers until the required sum power is reached. Every added devices must be supplied.
Empty fields	Supply combinations not possible
X	Parallel connection of regenerative power supply units not possible

12.5.5 Selection examples

Four drives supplied via controllers (static power)

Drive data			
Controller		Motor	
Drive	**Type**	**Power**	**Efficiency** η
Drive 1	9330	22 kW	0.91
Drive 2	9325	5.5 kW	0.83
Drive 3	E82EV302K4B	3.0 kW	0.81
Drive 4	E82EV152K4B	1.5 kW	0.78

1. Determining DC-power requirements:
   Power loss P_V from the table "supply power". (12.5-4)

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

$$P_{DC} = \frac{45\ \text{kW}}{0.9} + 1.1\ \text{kW} + \frac{5.5\ \text{kW}}{0.83} + 0.261\ \text{kW} + \frac{3.0\ \text{kW}}{0.81} + 0.15\ \text{kW} + \frac{1.5\ \text{kW}}{0.78} + 0.1\ \text{kW} = 63.3\ \text{kW}$$

2. Determine first supply terminal:
   – $P_{DC100\%}$ from the table "supply power". (12.5-4)

	9330	E82EV302K4B	9325	E82EV152K4B
$P_{DC100\%}$	60.5 kW	6.1 kW	7.9 kW	3.5 kW

   – First supply terminal is 9300 (first controller in line 1).
   – I.e. additional supply power required: 63.3 kW - 60.5 kW = 2.8 kW

3. Determine the second supply terminal:
   – Find supply power for 9325, E82EV302K4B, E82EV152K4B in column "9330" in the table "supply power". (12.5-4)

	E82EV302K4B	9325	E82EV152K4B
P_{DC2}	4.5 kW	4.4 kW	2.0 kW

   – The power of 9325 is sufficient.

4. Result:
   – The network of drives must be connected to the three-phase AC mains via the 9330 and 9325 controllers.

Four drives supplied via 934X regenerative power supply unit (static power)

The preceding example now uses the 934X supply unit:

Drive data			
Controller		Motor	
Drive	Type	Power	Efficiency η
Drive 1	9330	22 kW	0.91
Drive 2	9325	5.5 kW	0.83
Drive 3	E82EV302K4B	3.0 kW	0.81
Drive 4	E82EV152K4B	1.5 kW	0.78

1. Determining DC-power requirements:
   Power loss P_V from the table "supply power". (12.5-4)

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

$$P_{DC} = \frac{45\ \text{kW}}{0.9} + 1.1\ \text{kW} + \frac{5.5\ \text{kW}}{0.83} + 0.261\ \text{kW} + \frac{3.0\ \text{kW}}{0.81} + 0.15\ \text{kW} + \frac{1.5\ \text{kW}}{0.78} + 0.1\ \text{kW} = 63.3\ \text{kW}$$

2. Determining the required supply unit:

	Powers	9341	9342	9343
	P_{DC} P_{V934X} $P_{DCtotal}$	63.3 kW 0.1 kW 63.4 kW	63.3 kW 0.2 kW 63.5 kW	63.3 kW 0.4 kW 63.7 kW
1. supply	P_{DC934X}	7.2 kW	14.4 kW	27.0 kW
2. supply	P_{DC9330} $P_{DC302K4B}$ P_{DC9325} $P_{DC152K4B}$	28.8 kW 2.6 kW 2.6 kW 1.1 kW	42.2 kW 3.8 kW 3.8 kW 1.7 kW	49.5 kW 4.5 kW 4.4 kW 2.0 kW
	Max. possible supply power	42.3 kW	65.9 kW	87.4 kW

– 9342 or 9343 supply units can be used for the DC-bus connection. Since $P_{DCtotal}$ is higher than P_{DC934X}, the network requires a second supply. The required feedback power determines the selection of the regenerative power supply unit.

3. Determine the second supply terminal:
   – Network with 9342: Second supply terminal at 9330, third at E82EV302K4B, fourth at 9325
   – Network with 9343: Second supply terminal at 9330 (better, only two supply terminals)

Note!

The supply via regenerative power supply units has advantages compared to the supply via controllers if

- additional braking power is required
- braking power must be dissipated without heat generation
- the number of supply terminals and thus wiring can be minimised.

The best ”mixture” between central and decentralised supply depends on the application.

Example:
With low braking power and high drive power can only be used with the braking power. The missing drive power is decentrally supplied via controllers in the network.

Stop!

Never connect regenerative power supply units in parallel. Otherwise they will be destroyed.

Specifying dynamic processes

Stop!

- All data given in this example only apply to coordinated and rigid motions. For all other applications, the drive network must be selected for static power. (12.5-5, 12.5-6)
- If the controllers are not selected according to their application, they can be damaged during operation.

If you consider dynamic processes in the network (motors operate with changing power), the number of supply terminals can be reduced.

Important for the selection of supply terminals is the continuous power P_{DC} and the peak power P_{max} of the network.

1. Continuous power required:
   - Graphical determination. This method is usually reliable. (12.5-9)
   - Approximate calculation

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

Important

The approximate calculation cannot be used for networks with considerably changing loads or controllers with rest phases.

T [s]: Cycle time

P_i [W]: Motor power during a cycle

t_i [s]: Time of P_i during a cycle

2. Graphical determination of peak power (12.5-9)
3. Consideration of power losses
   Consider the power losses of all controllers connected to the network when detecting the continuous power and peak power. (12.5-4)
4. Selection of supply terminals
   - Selecting a controller and/or regenerative power supply units (12.5-5, 12.5-6)
   - In addition, the maximum overload (max. 60 s) of the supply terminals must be higher than the peak drive power of the network.

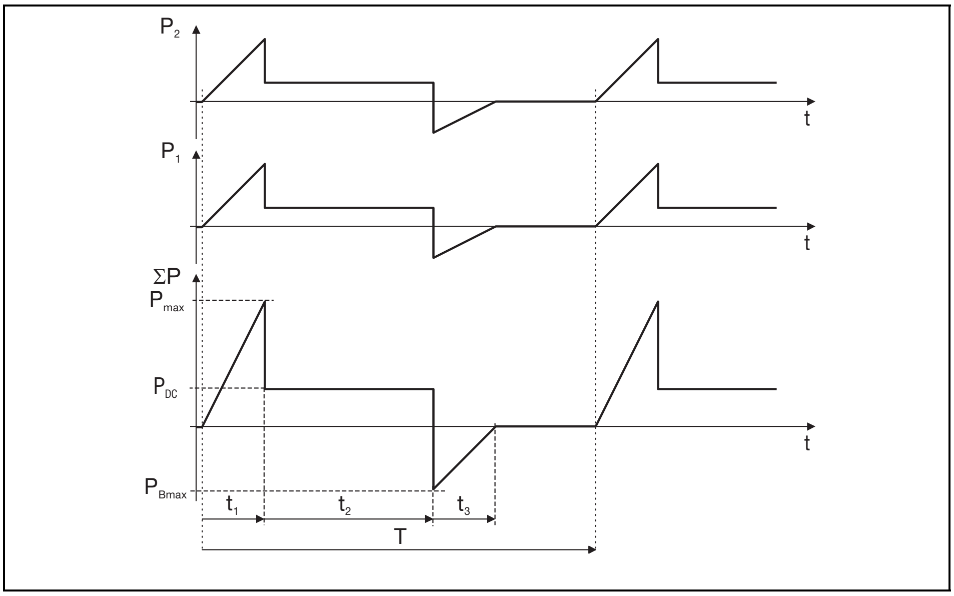


Fig. 12.5-1 Example with two **simultaneously** accelerated and decelerated drives

P1	Power characteristic for the 1st drive
P2	Power characteristic for the 2nd drive
ΣP	Sum power of the network.
P_{Bmax}	Peak brake power in the network
P_{max}	Peak drive power in the network
P_{DC}	Permanent power

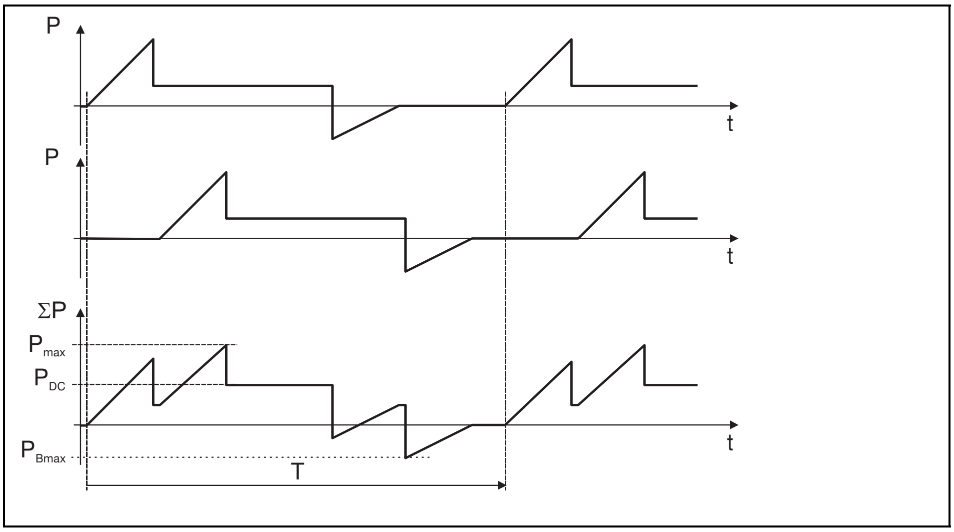


Fig. 12.5-2 Example with two **not simulateneously** accelerated or decelerated drives

P1	Power characteristic for the 1st drive
P2	Power characteristic for the 2nd drive
ΣP	Sum power of the network.
P_{Bmax}	Peak brake power in the network
P_{max}	Peak drive power in the network
P_{DC}	Permanent power

In example Fig. 12.5-2 the required peak power (P_{max} and P_{Bmax}) is higher than in example Fig. 12.5-1.

12.6 Central supply (one supply terminal)

The controller DC bus is supplied through **one** central supply terminal via $+U_{DC}$, $-U_{DC}$.

Network	Possible supply sources
230 V controller	One DC source
400 V controller	• One DC source • One regenerative power supply unit • One controller with reserve power

12.6.1 Central supply via external DC source

Block diagram

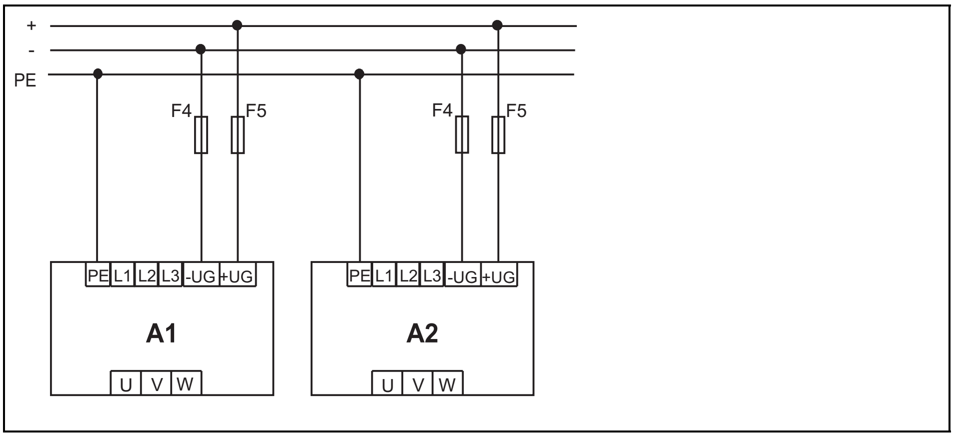


Fig. 12.6-1 Network of 230 V controllers with central supply via external DC source

A1, A2	230 V controller of 8200 vector series
F4, F5	DC fuses (🕮 12.4-6)

Stop!

The following conditions must be met to ensure troublefree operation:

- General measures (🕮 12.4-1)
- The voltage flow $+U_{DC} \rightarrow$ PE / $-U_{DC} \rightarrow$ PE must be symmetrical:
  The controller will be destroyed, if $+U_{DC}$ or $-U_{DC}$ are earthed.

12.6.2 Central supply 400 V with regenerative power supply unit 934X

Block diagram

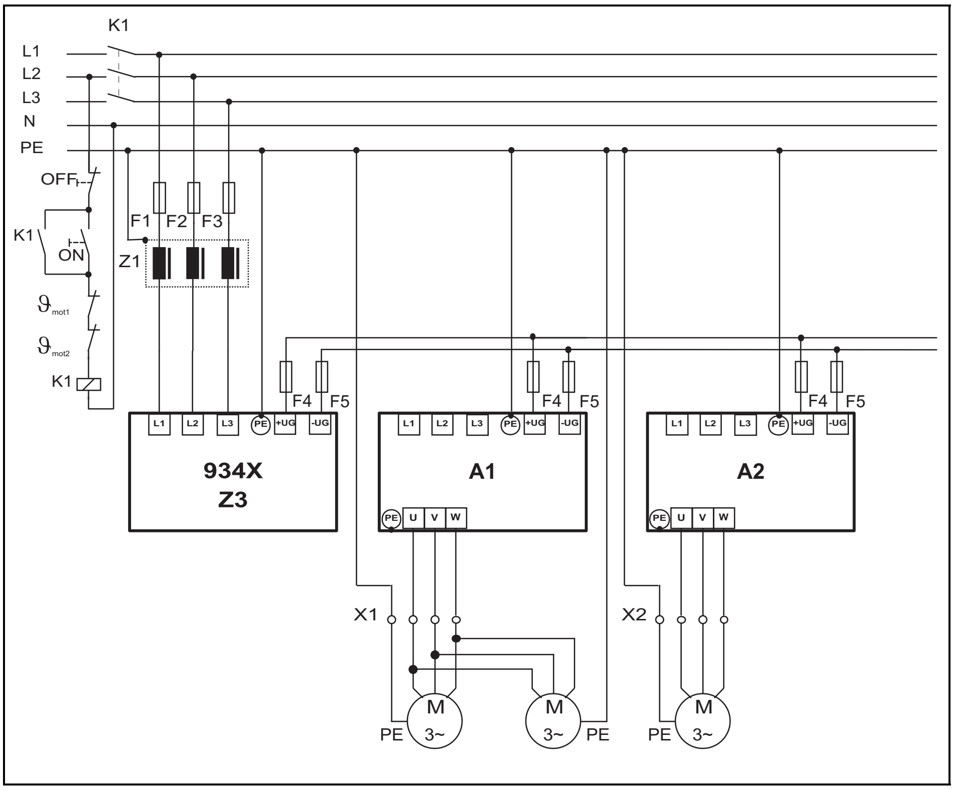


Fig. 12.6-2 Network of 400 V controllers with central supply via 934X regenerative power supply unit

A1, A2	400 V controller of the 8200 vector, 8220 or 9300 series
Z1	Mains filters/mains chokes (📖 12.5-2)
Z3	934X regenerative power supply unit
F1 ... F3	Mains fuses (📖 12.4-6)
F4 ... F5	DC fuses (📖 12.4-6)
K1	Main contactor

12.7 Decentralised supply (several supply terminals)

The controller DC bus is supplied through $+U_{DC}$, $-U_{DC}$ via **several** controllers connected to the mains in parallel. A 400 V mains can use **one** additional regenerative power supply unit.

12.7.1 Decentralised supply with single-phase or two-phase mains connection

Block diagram

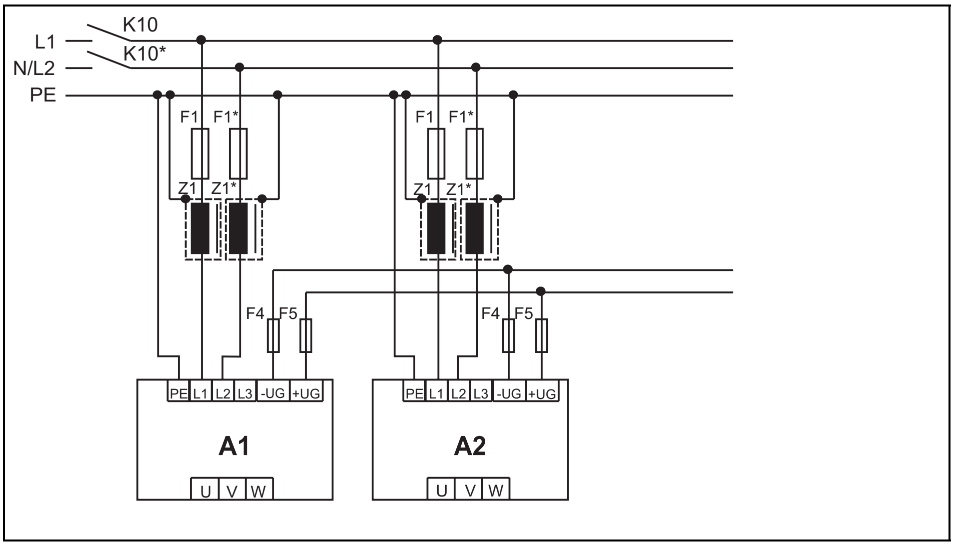


Fig. 12.7-1 Network of 230 V controllers with decentralised supply with single or two-phase mains connection

A1, A2	230 V controller of 8200 vector series
Z1, Z1*	Mains filters/mains chokes (🕮 12.5-2)
F1, F1*	Mains fuses (🕮 12.4-6)
F4, F5	DC fuses (🕮 12.4-6)
K10, K10*	Mains contactor
F1*, K10*, Z1*	Only when connected to 2AC PE 180 V - 0 % ... 264 V +0 %, 48 Hz -0 % ... 62 Hz +0 %

STOP

Stop!

The following conditions must be met to ensure trouble-free operation:

- General measures (🕮 12.4-1)
- In-phase connection on the mains side!
- With two-phase supply
  – Cable/overload protection via a second assigned mains fuse F1*
  – Ensure current and power symmetry by a second mains choke or mains filter Z1*

12.7.2 Decentralised supply with three-phase mains connection

Block diagram

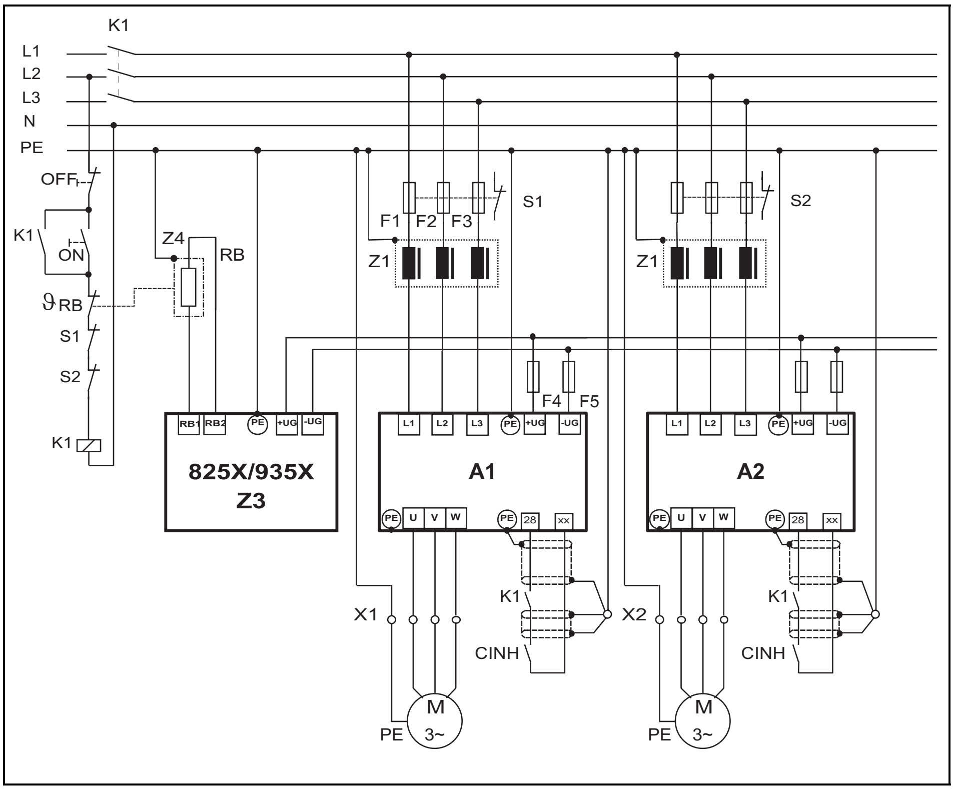


Fig. 12.7-2 Network of three-phase connected controllers with decentralised supply and additional braking unit

A1, A2	230 V controller 8200 vector or 400 V controller 8200 vector, 8220 or 9300
Z1	Mains filters/mains chokes (🕮 12.5-2)
Z3	Brake unit
Z4	Brake resistor
F1, F2, F3	Mains fuses (🕮 12.4-6)
F4, F5	DC fuses (🕮 12.4-6)
K1	Mains contactor

Stop!

825X and 935X brake units must only be operated together with Lenze brake resistors! Otherwise the brake units can be damaged!

Note!

With 400 V mains systems it is also possible to use a regenerative power supply unit 934X instead of a brake unit. Advantage: No heat generation in generator mode.

12.8 Braking operation in a drive system

12.8.1 Possibilities

If the braking energy created in generator operation of the drive network is not dissipated, the voltage will be increased in the entire DC-bus. If the maximum DC-bus voltage is exceeded, the controllers set pulse inhibit (message "overvoltage") and the drives idle to standstill without torque. There are different possibilities to dissipate the generated braking energy:

Possibilities to dissipate braking energy

	Scope of application	Special features
934X regenerative power supply unit	Long braking processes	• Braking energy is fed back into supplying mains • No heat generation
Brake unit 8251, 8252 or 9351	Regular braking at low power Rare braking at medium power	• Brake resistor integrated • No additional switching measures required • Example: (🕮 12.7-2)
Brake chopper 8253 or 9352	Regular braking at high power Long braking processes at high power	• External braking resistor required • Braking resistors can become very hot, if necessary provide special protection measures • Example: (🕮 12.7-2)
Braking resistor at controller	Regular braking at low power Rare braking at medium power	• Only possible with 8200 vector, since the braking transistor is integrated • See also: (🕮 13.4-1)

STOP

Stop!

The network components can be destroyed, if the following is not observed:

- Never combine the different possibilities for dissipating the braking energy generated in the network.
- Each possibility must only be used once (e.g. do not connect two brake modules in parallel).
- Always set the mains voltage at 93XX controllers and 935X brake units to the same value:
  – For 93XX via C0173
  – For 935X via switches S1 and S2

12.8.2 Selection

The selection of components for braking operation depends on the continuous braking power, peak braking power and the application.

The permanent braking power and peak braking power can be determined graphically:

- Example: (📖 12.5-9)
- Please observe possibly available emergency off measures.

Provide a safety shutdown in the event of overheating, if you use a braking resistor or braking unit. Use the thermostat of the braking resistor or braking unit to

- disconnect all controllers from the mains.
- set controller inhibit (CINH) in all controllers (terminal 28 = LOW).
- Example: (📖 12.7-2)

Note!

Subsequently braking of single drives of the network can reduce the permanent and the peak braking power.

Observe the permissible overload capacity of the regenerative power supply unit or the switch-on cycle of the braking resistor.

13 Braking operation

13.1 Contents

13.2 Braking operation without additional measures

Braking smaller loads

For braking smaller loads the functions "DC-injection brake DCB" or "AC- motor brake" can be parameterised.

- DC-injection brake: (📖 10.7-6)
- AC motor brake: (📖 10.7-8)

13.3 Braking operation with three-phase AC brake motor

Operation with spring-operated brake and brake rectifier

Lenze three-phase AC motors and G-motion geared motors can be equipped with spring-operated brakes. Brake rectifiers are required to supply spring-operated brakes with DC voltage (180 V DC, 205 V DC).

The selection of brake rectifiers depends on the input voltage U_{AC} and the rated voltage of the brake coil (V_{coil}):

Brake rectifier selection					
	Type/Order No.	**Max. input voltage V_{AC}**	**Output voltage V_{DC}**	**Max. output current**	**Example**
Bridge rectifier 6-pole	E82ZWBR1	270 V +0 %	$a_{DC} = 0.9 \times V_{AC}$	0.75 A	$a_{coil} = 205\ V_{DC} \equiv a_{DC}$ at $U_{AC} = 230$ V
Half-wave recitifier 6-pole	E82ZWBR3	460 V +0 %	$a_{DC} = 0.45 \times V_{AC}$	0.75 A	$a_{coil} = 180\ V_{DC} \equiv a_{DC}$ at $U_{AC} = 400$ V

Note!

Lenze geared motors with brake motor and Lenze three-phase AC brake motors are delivered with a four-pole brake rectifier. This enables the brake to be switched via the AC side without any additional measures.

How to switch the brake

The brake can be switched on the DC side and on the AC side. The relay output of the controller can be used for brake switching. Alternatively, the brake can be switched via an external control contact (e.g. PLC).

With DC switching the delay times are considerably shorter. Thus it is possible, for instance, to implement a switch-off positioning with reproduceable brake path.

STOP

Stop!

If you control a holding brake at the motor with the relay output a spark suppressor must be used in case of DC switching to protect the switch contacts:

- Universal spark suppressor for 24 V DC brake,
- 6-pole Lenze brake rectifier for 180 V/205 V DC brake.
- The service life of the relay depends on the type of load (ohmic, inductive or capacitive) and the value of the switching capacity.

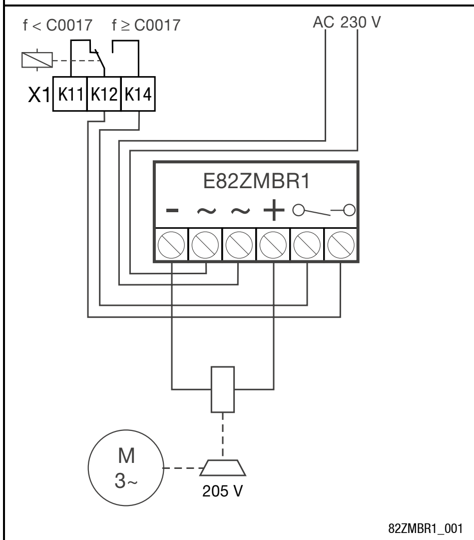
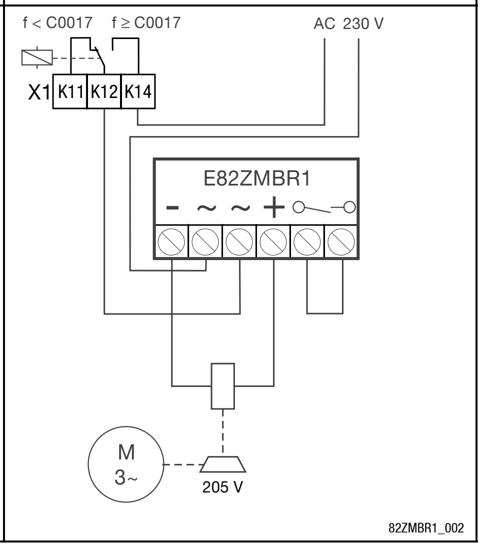
Controlling the brake via the relay output

The following table shows control possibilities for Lenze spring-operated brakes via the relay output of the controller. The indications made refer to a rated mains voltage of 230 V ±10 % or 400 V ±10 %:

		Brake motor							
		Brake size	06	08	10	12	14	16	18
		Brake torque	4 Nm	8 Nm	16 Nm	32 Nm	60 Nm	80 Nm	150 Nm
		Motor frame size	063 071	080 090	090 100	100	112 132	132 160	160
Switching via controller relay output ...	**a_{coil}**	**Rectifier**							
AC switching	180 V	Single-way (E82ZWBR3)		☐		☐		☐	
	205 V	Bridge (E82ZWBR1)		☑		☑		☑	
DC switching	180 V	Single-way (E82ZWBR3)		☐		☐		☐	
	205 V	Bridge (E82ZWBR1)		☑		☑ 1)		☐	
Direct DC switching	180 V	Not necessary		☑ 1)		☑ 1), 2)		☐	
	205 V	Not necessary		☑ 1)		☑ 1), 2)		☐	
	24 V	Not necessary		☑ 1)		☑ 1), 2)		☐	

☑ Permissible
☐ Only permissible with additional relay
1) 8200 vector 0.25 ... 11 kW: Switching is only permissible with additional auxiliary relay
2) Spark suppressor must be used

Wiring

DC switching (quick brake reaction)	**AC switching (delayed brake reaction)**
	

Parameter setting of the relay output

In order to control the brake via the relay output of the controller you must parameterise the relay output accordingly.

Example

The brake is to be released/applied, when a defined output frequency is exceeded/not reached. For this use the signal "Value below Qmin threshold":

- Use C0008 = 7 to assign the signal "Value below Q_{min} threshold" to the relay output.
- Use C0017 to set the frequency threshold Q_{min}

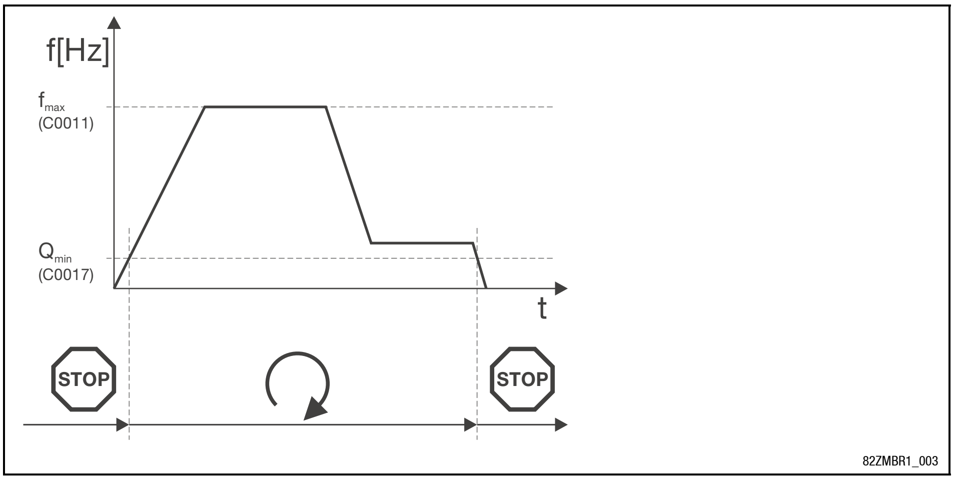
Braking operation

Braking operation with three-phase AC brake motor

Result

The brake is applied when the setpoint falls below Q_{min} .

The brake is released when the setpoint exceeds Q_{min} .



13.4 Braking operation with external brake resistor

Larger moments of inertia or longer generator-mode operation require an external brake resistor. It converts mechanical energy into heat.

The brake resistor is connected when the DC-bus voltage exceeds a threshold. It can thus be avoided that the controller sets pulse inhibit due to the fault "overvoltage" and the drive coasts to standstill. External brake resistors ensure braking operation at any time.

13.4.1 8200 vector 0.25 ... 11 kW

Integrated brake transistor into 8200 vector 0.25 ... 11 kW

The brake transistor integrated into the controller connects the external brake resistor.

The threshold can be adapted to the mains voltage if you are using 400 V controllers (8200 vector).

<table>
<tr><th colspan="2">Code</th><th colspan="2">Possible settings</th><th colspan="2" rowspan="2">IMPORTANT</th></tr>
<tr><th>No.</th><th>Name</th><th>Lenze</th><th>Selection</th></tr>
<tr><td>C0174*
STOP</td><td>Brake transistor threshold</td><td>100</td><td>78 {1 %} 110
Recommended setting
U_{mains} [3/PE AC xxx V] | C0174 [%] | U_{DC} [V DC]
380 | 78 | 618
400 | 81 | 642
415 | 84 | 665
440 | 89 | 704
460 | 93 | 735
480 | 97 | 767
500 | 100 | 790</td><td>Only active with 8200 vector 0.55 ... 11 kW, variant for 400/500 V mains voltage
• 100 % = Threshold DC 790 V
• 110 % = Brake transistor switched off
• U_{DC} = Threshold in V DC
• The recommended setting allows max. 10 % mains overvoltage</td><td>13.4-1</td></tr>
</table>

Integrated brake transistor 8200 vector 0.25 ... 7.5 kW/ 230 V

Brake transistor		8200 vector, 230 V					
		E82EV251K2C	**E82EV371K2C**	**E82EV551K2C**	**E82EV751K2C**	**E82EV152K2C**	**E82EV222K2C**
Threshold V_{DC}	[V DC]	380 (fixed					
Peak brake current Î	[A DC]	0.85		4.0		8.6	
Max. continuous current	[A DC]	0.85		2.0		5.8	
Minimum permissible resistance (U_{DC} = 380 V)	[Ω]	470		90		47	
Current reduction		40 ... 55 °C		Reducing peak brake current by 2.5 %/°C			
		1000 ... 4000 m a.m.s.l.		Reducing peak brake current by 5 %/1000 m			
Switch-on cycle		max. 60 s at peak brake current, then at least 60 s break					
Recommended Lenze brake resistor	Type	ERBM470R020W		ERBM200R100W		ERBM082R150W	ERBM052R200W

Brake transistor		8200 vector, 230 V			
		E82EV302K2C	**E82EV402K2C**	**E82EV552K2C**	**E82EV752K2C**
Threshold V_{DC}	[V DC]	380 (fixed			
Peak brake current Î	[A DC]	13.0	13.0	20.0	20.0
Max. continuous current	[A DC]	8.0	10.7	14.7	20.0
Minimum permissible resistance (V_{DC} = 380 V)	[Ω]	29		19	
Current reduction		40 ... 55 °C	Reducing peak brake current by 2.5 %/°C		
		1000 ... 4000 m a.m.s.l.	Reducing peak brake current by 5 %/1000 m		
Switch-on cycle		max. 60 s at peak brake current, then at least 60 s break			
Recommended Lenze brake resistor	Type	ERBD047R01K2	ERBD047R01K2	ERBD047R01K2	ERBD047R01K2

Braking operation

Braking operation with external brake resistor

8200 vector 0.25 ... 11 kW

Integrated brake transistor 8200 vector 0.55 ... 11 kW/ 400 V

Brake transistor		**8200 vector, 400 V**			
		E82EV551K4C	**E82EV751K4C**	**E82EV152K4C**	**E82EV222K4C**
Threshold V_{DC}	[V DC]	790 (adjustable)			
Peak brake current Î	[A DC]	1.9		3.8	5.6
Max. continuous current	[A DC]	0.96		1.92	2.8
Minimum permissible resistance (U_{DC} = 790 V)	[Ω]	455		230	155
Current reduction		40 ... 55 °C: Reducing peak brake current by 2.5 %/°C 1000 ... 4000 m a.m.s.l.: Reducing peak brake current by 5 %/1000 m			
Switch-on cycle		max. 60 s at peak brake current, then at least 60 s break			
Recommended Lenze brake resistor	Type	ERBM470R100W		ERBM370R150W	ERBM240R200W

Brake transistor		**8200 vector, 400 V**				
		E82EV302K4C	**E82EV402K4C**	**E82EV552K4C**	**E82EV752K4C**	**E82EV113K4C**
Threshold V_{DC}	[V DC]	790 (adjustable)				
Peak brake current Î	[A DC]	7.8	7.8	11.4	16.5	23.5
Max. continuous current	[A DC]	3.9	5.1	7.0	9.6	14.1
Minimum permissible resistance (U_{DC} = 790 V)	[Ω]	100	100	68	47	33
Current reduction		40 ... 55 °C: Reducing peak brake current by 2.5 %/°C 1000 ... 4000 m a.m.s.l.: Reducing peak brake current by 5 %/1000 m				
Switch-on cycle		max. 60 s at peak brake current, then at least 60 s break				
Recommended Lenze brake resistor	Type	ERBD180R300W	ERBD100R600W	ERBD092R600W	ERBD068R800W	ERBD047R01K2

13.4.2 8200 vector 15 ... 90 kW

Additional brake chopper for 8200 vector 15 ... 90 kW

The brake resistor is connected to the frequency inverter 8200 vector 15 ... 90 kW via the EMB9352-E brake chopper (accessories), which is connected to the DC bus of the frequency inverter (terminals +UG, –UG). With low brake power the EMB9351-E module (accessories) with integrated brake resistor can be used. Brake choppers and brake modules can be connected in parallel.

General data and application conditions (EMB9351-E and EMB9352-E)

Conformity	CE	Low-Voltage Directive (73/23/EEC)
Approvals	UL 508C	Underwriter Laboratories (File-No E132659) Power Conversion Equipment
Vibration resistance	Acceleration resistance up to 0.7g (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 ranges	Transport	-25 °C ... +70 °C
	storage	-25 °C ... +70 °C
	Operation	0 °C ... +55 °C Reduce peak braking current by 2.5 %/°C above +40°C
Permissible installation height	0 ... 4000 m a.m.s.l. Reduce peak braking current by 5%/1000 above 1000 m a.m.s.l.	
Mounting position	vertical	
Free space	Above and below	= 100 mm

Rating of the EMB9352-E brake chopper

EMB9352-E brake chopper		8200 vector, 400 V, type E82EV ...						
		153K4B201	223K4B201	303K4B201	453K4B201	553K4B201	753K4B201	903K4B201
Threshold V_{DC}	[V DC]	765 (adjustable)						
Peak braking current	[A DC]	42						
Max. continuous current	[A DC]	25						
Lowest permissible brake resistance	[Ω]	18						
Current reduction		Reduce peak braking current by 2.0 %/°C above 40 °C Reduce peak braking current by 5%/1000 above 1000 m a.m.s.l.						
Switch-on cycle		Max. 60 s braking with peak braking current, then at least 60 s break						
Recommended Lenze brake resistor	Order No.	ERBD033R02K0	ERBD022R03K0	ERBD018R03K0	ERBD022R03K0	ERBD018R03K0	ERBD022R03K0	ERBD018R03K0
Number of brake choppers		1	1	1	2 [1)]	2 [1)]	3 [1)]	3 [1)]

1) Connected in parallel

Rating of the EMB9351-E brake module

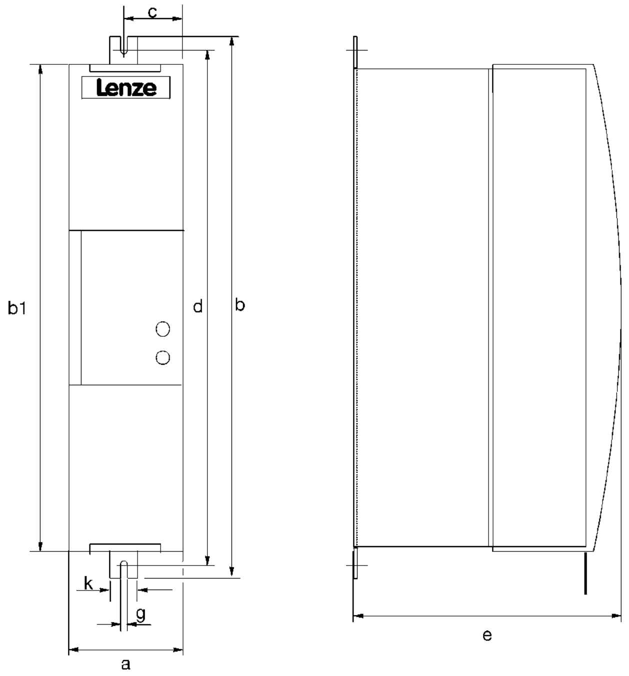
EMB9351-E brake module		
Threshold V_{DC}	[V DC]	765 (adjustable)
Peak braking current	[A DC]	16
Peak braking power	[kW]	12
Permanent braking power	[kW]	0.1
Thermal capacity	[kWs]	50
Current reduction		Reduce peak braking current by 2.0 %/°C above 40 °C Reduce peak braking current by 5%/1000 above 1000 m a.m.s.l.
Switch-on cycle		Max. 4 s braking with peak braking current, then at least 400 s break
Brake resistor integrated	[Ω]	47

Fuses and cable cross-sections (EMB9351-E and EMB9352-E)

Type	DC fuse (F4, F5) [1]		Cable cross-section	
	VDE	UL	mm^2	AWG
EMB9351-E EMB9352-E	50 A	40 A K5	j6	10

[1] Recommended for combinations in which more than two devices (controller or brake chopper/brake module) are connected to +UG, –UG (connection in parallel of brake choppers/brake modules or DC-bus connection)
Observe the national and regional regulations!

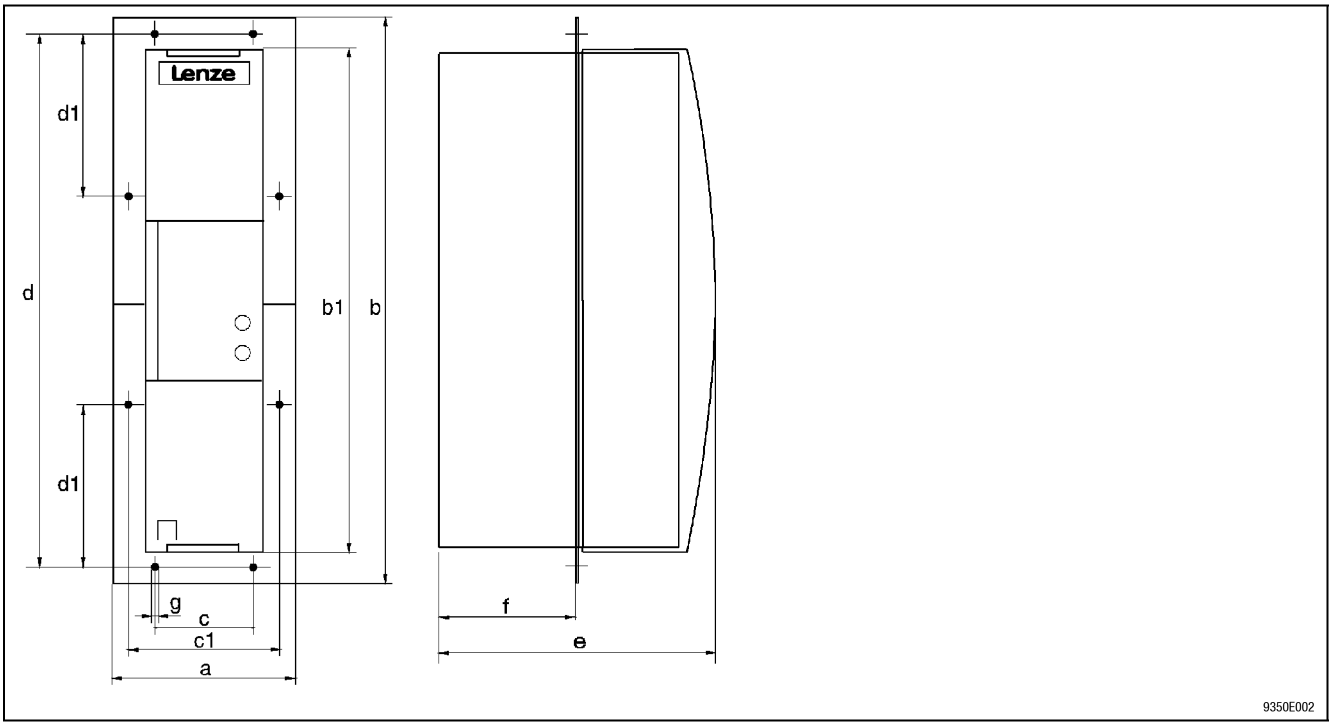
Dimensions for standard mounting (scope of supply)



Type	Dimensions [mm]								Weight [kg]
	a	b	b1	c	d	e	g	k	
EMB9351-E	52	384	350	26	365	186	6.5	30	2.6
EMB9352-E									2.2

Dimensions for mounting in "push-through technique"

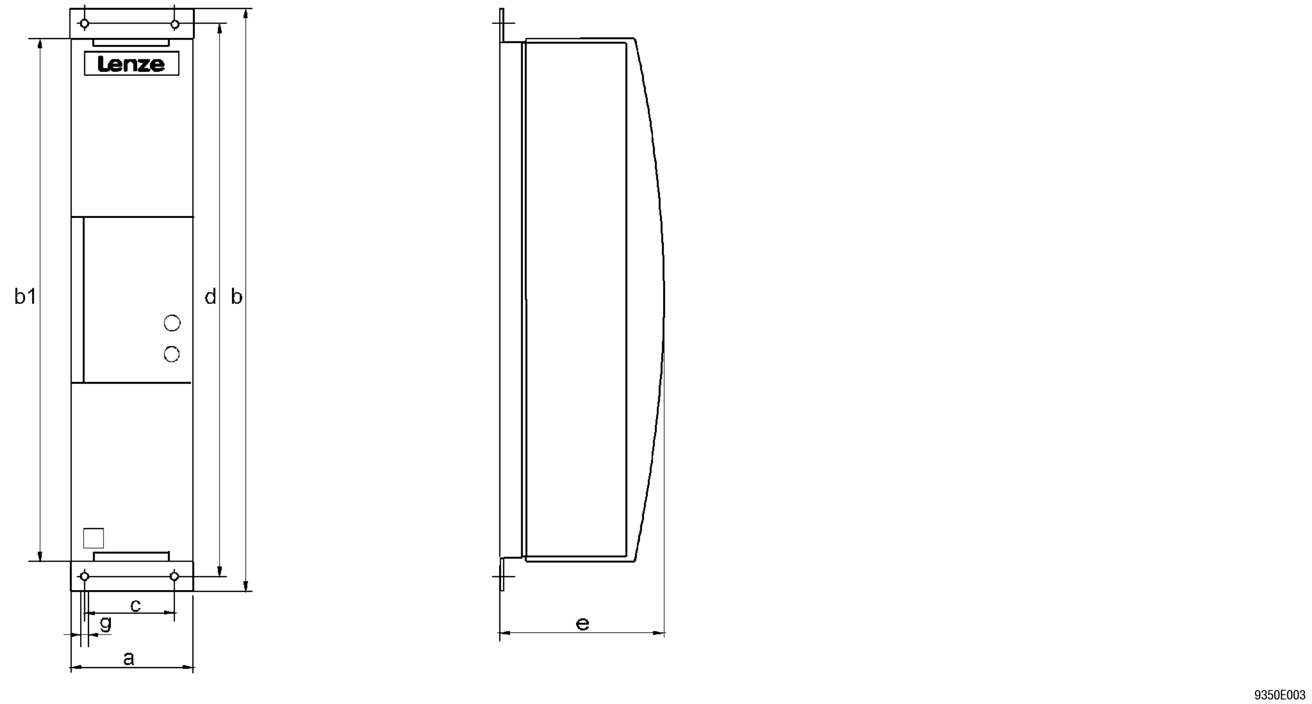
For fixing the brake chopper or brake module in "push-through technique" the EJ0040 mounting set is required. It consists of mounting frame and seal.



Type	Dimensions [mm]												Weight [kg]
											Assembly cutout		
	a	b	b1	c	c1	d	d1	e	f	g	Height	Width	
EMB9351-E	86.5	386	350	34	69.5	367	162.5	186	92	6.5	350 ±3	56	2.6
EMB9352-E													2.2

Mounting/dimensions for “cold plate” technique

Variant V003 is required for mounting the brake chopper or brake module “cold plate” technology.



	Dimensions [mm]							
Type	a	b	b1	c	d	e	g	Weight [kg]
EMB9351-C-V003	52	381	350	34	367	104	6.5	2.6
EMB9352-C-V003								2.2

Thermal resistance R_{th} (transition cooler / cooling medium)		
Type	Power to be dissipated P_V [W]	Cooling path R_{th} [°C/W]
EMB9351-C-V003	100	≤ 0.3
EMB9352-C-V003	63	

13.4.3 Selection of the brake resistors

The Lenze brake resistors recommended in the tables are selected for the corresponding controllers (ref. to 150 % power in generator mode). They are suitable for most applications.

For special applications such as centrifuges, hoists, etc., the brake resistor must meet the following conditions:

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

Active load	Can move without being influenced by the drive (e.g. hoists, unwinders)
Passive load	Decelerates to standstill with being influenced by the drive (e.g. horizontal traversing drives, centrifuges, fans)
a_{DC} [V]	Brake transistor threshold from C0174
P_{max} [W]	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]	Braking time
t_{cycl} [s]	Cycle time = Time between two braking processes (= t1 + break)
R_{min} [Ω]	Smallest permissible brake resistor (see rated data for the integrated brake transistor)

13.4.4 Rating for Lenze brake resistors

Order no.	R	Permanent power [2]	Thermal capacity	Switch-on cycle	Cable cross-section		Weight
	[Ω]	[kW]	[kWs]		[mm²]	AWG	[kg]
ERBM470R020W [1]	470	0.02	3.0 [3]	1 : 10 Braking for max. 15 s, then at least 150 s break	1	18	0.22
ERBM470R050W [1]	470	0.05	7.5		1	18	0.56
ERBM470R100W	470	0.1	15		1	18	0,76
ERBM200R100W [1]	200	0.1	15		1	18	0.6
ERBM370R150W	370	0,15	22.5		1	18	0.93
ERBM100R150W [1]	100	0,15	22.5		1	18	0.93
ERBM082R150W [1]	82	0,15	22.5		1	18	0.93
ERBM240R200W	240	0.2	30		1	18	1.25
ERBM082R200W [1]	82	0.2	30		1	18	1.25
ERBM052R200W [1]	52	0.2	30		1	18	1.25
ERBD180R300W	180	0.3	45		1	18	2.0
ERBD100R600W	100	0.6	90		1	18	3.1
ERBD082R600W	82	0.6	90		1.5	16	3.1
ERBD068R800W	68	0.8	120		1.5	16	4.3
ERBD047R01K2	47	1.2	180		2.5	14	4.9
ERBD033R02K0 [4]	33	2.0	300		j6	10	7.1
ERBD022R03K0 [4]	22	3.0	450		j6	10	10.6
ERBD018R03K0 [4]	18	3.0	450		j6	10	10.6

1) Only for controllers with 230 V rated mains voltage
2) The continuous power is a value important for the selection of brake resistors. Braking at peak power (U_{DC}^2/R).
3) Braking for max. 10 s
4) In connection with EMB9352-E brake module

Note!

- All brake resistors except ERBM470R020W are equipped with a thermostat (isolated NC contact).
- If necessary, several brake resistors can be connected in series or in parallel.
  – The value of the controller must not fall below the minimum permissible threshold.
  – The thermostat of the brake resistors must always be connected in series.

13.4.5 Wiring of brake resistor

Installation

- Brake resistors can become very hot. Therefore brake resistors must be mounted in a way that the high temperatures do not damage anything.
- In order to prevent the brake resistors from being damaged due to overload,
  – Provide a safety switch-off of the brake resistor!
  – Use temperature contacts of the brake resistor (T1/T2) as control contacts to disconnect the controller from the mains!

Note!

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

Braking operation

Braking operation with external brake resistor

Wiring of brake resistor

Schematic diagram: Connection to brake transistor

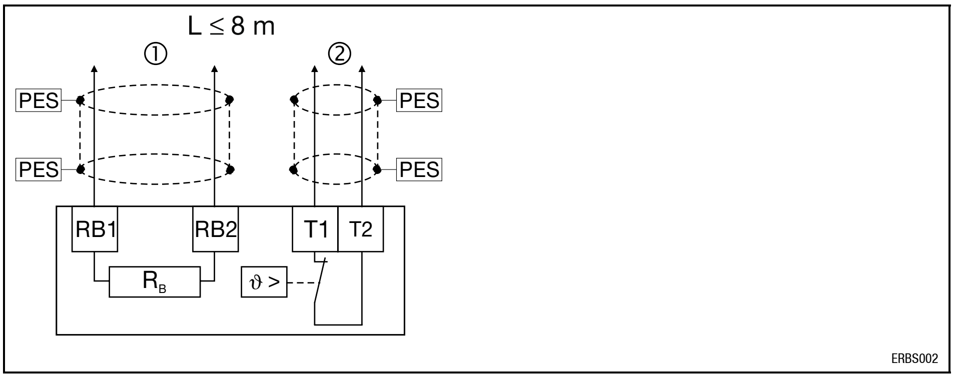


Fig. 13.4-1 Wiring of brake transistor with 8200 vector 0.25 ... 11 kW

PES	HF-shield end by PE connection through shield bracket.
RB1, RB2	Brake resistor terminals
①	Controller supply
T1, T2	Terminals of temperature monitoring of the brake resistor (thermostat/NC contact)
②	Supply for evaluating temperature monitoring (can be integrated e.g. into the lock of the mains contactor lock of the mains supply)

Schematic diagram: Connection to brake module and brake chopper

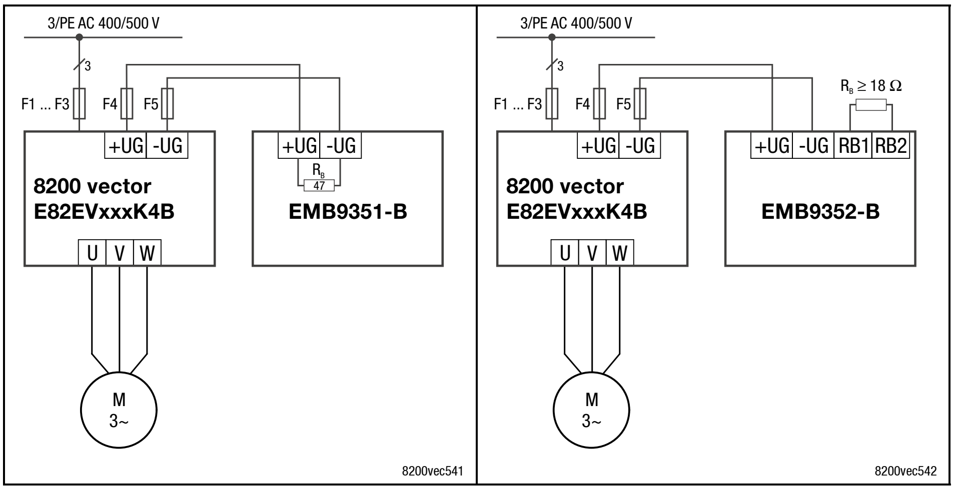


Fig. 13.4-2 Connection of the brake resistor to 8200 vector 15 ... 90 kW

14 Reserved for chapter ”Safe standstill”

15 Application examples

15.1 Contents

15.2 Pressure control

A centrifugal pump (square load characteristic) is to hold the pressure in a pipe system at a constant level (e.g. water supply of households or industrial premises).

Note!

- With this example, the controller must be equipped with an application-I/O, because it required two analog inputs.
- If the pressure setpoint is selected via PC, keypad or JOG value instead of PLC, a standard I/O will be enough.

Conditions

- Operation with a PLC (pressure setpoint selection, night reduction).
- Setting up operation at site possible.
- The pressure is lowered during the night. The pump works in an uncontrolled mode at low and constant speed.
- The output frequency must never fall below 10 kHz (dry running).
- Avoid pressure peaks in the system.
- Avoid mechanical resonances at approx. 30 Hz output frequency.
- Overheat motor protection.
- Error message to PLC.
- At site display of operating status and actual pressure value.
- At site pump stop.

Functions used

- Internal process controller for pressure control
  – Pressure setpoint from PLC (4 ... 20 mA)
  – Actual pressure value from sensor (0 ... 10 V)
- Manual/remote changeover for setting-up operation at site
  – Manual: Pressure setpoint via pushbutton with motor potentiometer function (UP/DOWN)
  – Remote: Pressure setpoint from PLC
- JOG speed for night reduction (activated via PLC).
- Dry-running protection (setpoint-independent min. speed).
- Smooth start along S ramp.
- Suppression of mechanical resonance with a skip frequency.
- PTC motor monitoring.
- Trip error message via digital output.
- Ready for operation via relay output.
- Configurable analog output for actual pressure value.
- Electrical controller inhibit (CINH).

Application-specific configuration

- Motor parameter identification. (📖 10.9-1)

Code		Settings		IMPORTANT
No.	Name	Value	Meaning	
C0014	Operating mode	3	V/f characteristic control V ~ f	Square-law characteristic with constant V_{min} boost
C0410			Digital signals source	
8	DOWN	1	E1 Inputs of pushbuttons “UP” and “DOWN”	
7	UP	2	E2	
1	JOG1/3	3	E3 JOG speed for night reduction	Activation of the JOG speed deactivates the process controller.
19	PCTRL1-OFF	3	E3 Process controller deactivation	
17	M/Re	4	E4 Changeover PLC/setting 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	Actual pressure value
C0145	Process controller setpoint source	0	Total setpoint (PCTRL1-SET3)	Main setpoint + additional setpoint
C0070	Process controller gain	→		If necessary, adapt to process → More information: 📖 10.10-1 ff.
C0071	Process controller readjustment time	→		
C0072	Differential component of process controller	→		
C0074	Process controller influence	100.0	0.0 {0.1 %} 100.0	
C0238	Frequency precontrol	-0-	-0- No precontrol (only process controller)	Process controller has full influence
C0419	Free configuration of analog outputs		Analog signal source	
1	X3/62 (AOUT1-IN)	8	Actual process controller value	
C0037	JOG1	17		Derating to approx. 1/3 of rated motor speed
C0239	Minimum frequency limitation	10.00		Setpoint-independent minimum 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 error message	

Jumper positions at application I/O

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

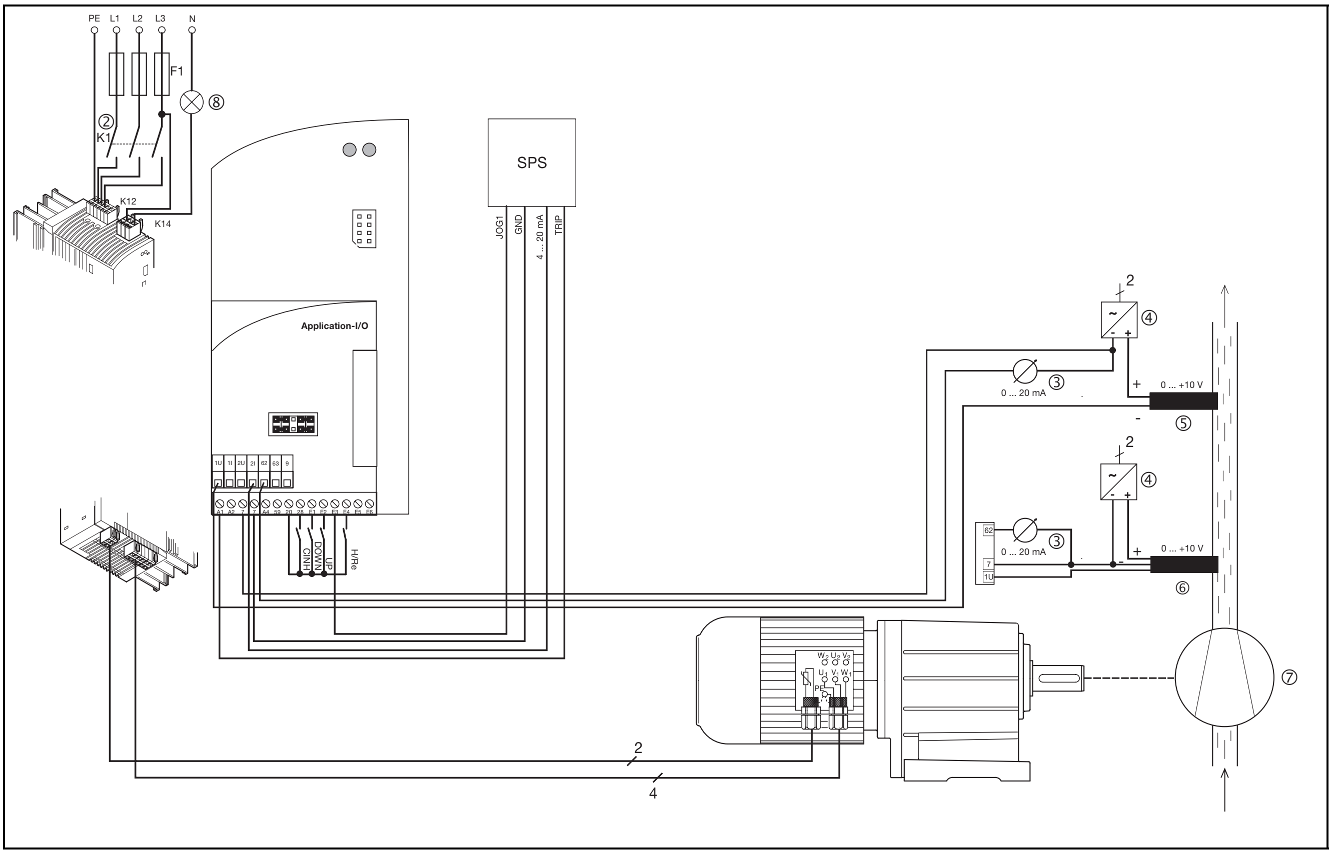


Fig. 15.2-1 Principle wiring of a pressure regulation

② Mains contactor
③ Analog display for actual pressure value
④ External power supply
⑤ 2 conductor pressure sensor
⑥ 3 conductor pressure sensor
⑤, ⑥: use one pressure sensor only
⑦ Pump
⑧ Light on = ready for operation

15.3 Operation with medium-frequency motors

Medium-frequency asynchronous motors are used for high and controllable speeds. Possible applications are hobbing cutters for wood machining, fans, vacuum pumps, concrete machinery, polishing drives.

Selection

- If the motor is to be braked quickly an external brake resistor is required to brake high moments of inertia. (📖 13.4-1)
- Set the speed setting range in a way that motors with self ventilation will always be sufficiently cooled (setting range as load function).

Application-specific configuration

Code	Name	Setting	Comment
C0011	Max. output frequency		Set to the value indicated on the motor nameplate, but not higher than 400 Hz.
C0012	Acceleration time main setpoint		Setting must ensure acceleration below the current limit.
C0013	Deceleration time main setpoint		Setting must ensure that braking is still possible with or without an external brake resistor without getting the error message “Overvoltage (OU)”.
C0014	Operating mode	2	Linear characteristic (best operating behaviour for medium-frequency motors)
C0015	V/f rated frequency		📖 8.4-1
C0016	a_{min} boost		Setting depends on load at low frequencies. Recommendation: 0 %
C0018	Chopper frequency	3	16 kHz (smooth running only at 16 kHz) Observe power derating
C0021	Slip compensation	0 %	Usually not required.
C0022	I_{max} limit (motor mode)		Set to rated motor current. 150 % with short acceleration times and high moments of inertia.
C0023	I_{max}-limit in the generator mode	150 %	Lenze setting
C0106	Holding time for DCB	0 s	DC-injection brake must be off!
C0144	Chopper frequency derating	0	No derating

15.4 Dancer position control (linear drive)

The dancer position controls the material tension while the machine is running. The example describes the synchronisation of material web speed v_2 to 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 value of dancer potentiometer via X3/2U.
- Setting-up speed via X3/E3 as JOG value.
- Dancer position controller switch off via X3/E4 (external) or internally via Q_{min} (C0017) and C0415/1 = 6.

Application-specific configuration

- Basic settings.
- Motor parameter identification. (📖 10.9-1)
- If necessary, calibration of setpoints and actual values to process variables. (📖 10.16-1)

Code		Settings		IMPORTANT
No.	Name	Value	Meaning	
C0410			Digital signals source	
1	JOG1/3	3	X3/E3 Setpoint setting	
4	QSP	2	X3/E2 Quick stop activation	
19	PCTRL1-OFF	4	X3/E4 Dancer position controller switch off	
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 More information: 📖 10.10-1
C0071	Process controller readjustment time	100		
C0072	Differential component of process controller	0.0		
C0074	Process controller influence	10.0 %		
C0105	Deceleration time QSP	approx. 1 s		E.g. as emergency stop function. The settings must ensure braking of the controller to standstill within a very short time. Check whether the application needs an external brake resistor.
C0145	Process controller setpoint source	1	C0181 (PCTRL1-SET2)	
C0181	Process controller setpoint 2 (PCTRL1-SET2)	Value of C0051	Position the dancer as required, C0051 = read actual dancer position value.	C0181 should not be set to “0”, because the position setpoint would be generated from the mains setpoint.
C0239	Lowest frequency limit	0.00 Hz		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	Process controller has limited influence.

Adjustment

Set C0070, C0071, C0072 in a way that if the dancer changes its actual position, its original position can be reached quickly and without excessive overshooting.

1. X3/E4 = HIGH (process controller stop), C0072 = 0 (no influence).
2. Set C0070.
3. X3/E4 = LOW, C0072 = 0 (no influence).
4. Set C0071.
5. Set C0072.

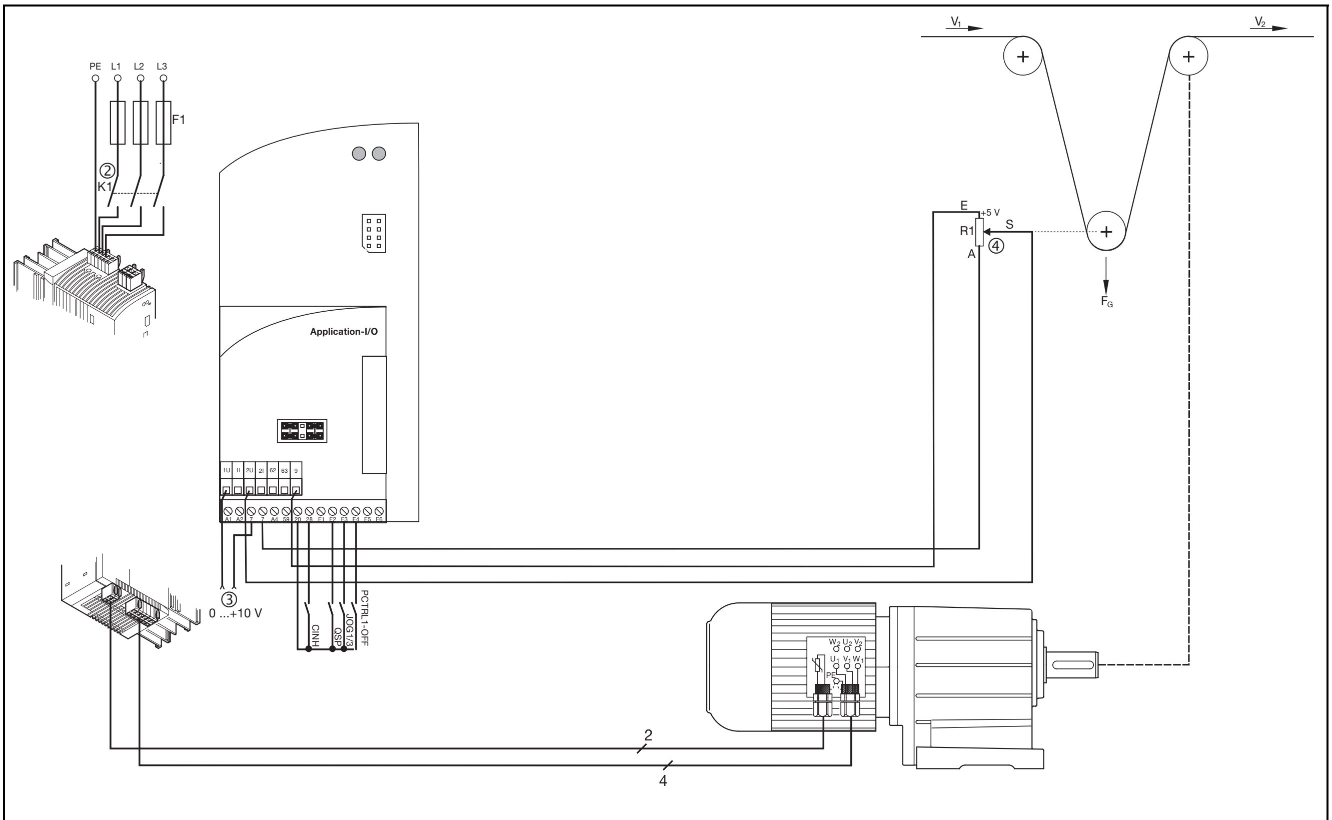


Fig. 15.4-1 Principle wiring of a dancer position control

② Mains contactor

③ Main setpoint ~V1

④ Dancer potentiometer

15.5 Speed control

Note!

Lenze three-phase AC motors and Lenze geared motors are available with Lenze pulse encoder ITD21 (512/2048 increments, HTL output signals). This enables a two-tracked speed feedback (tracks A and B)to be built up:

- With Application I/O function module: 0 ... 100 kHz
- With Standard I/O function module: 0 ... 1 kHz

Example

Speed control with inductive, single-tracked 3-conductor sensor

The speed control is to compensate the difference between actual speed and speed setpoint caused by load (motor and generator mode).

The motor speed is detected by an inductive sensor (e.g. gear, metallic fan wheel, cam). The sensor can detect the speed either directly at the motor or in the machine.

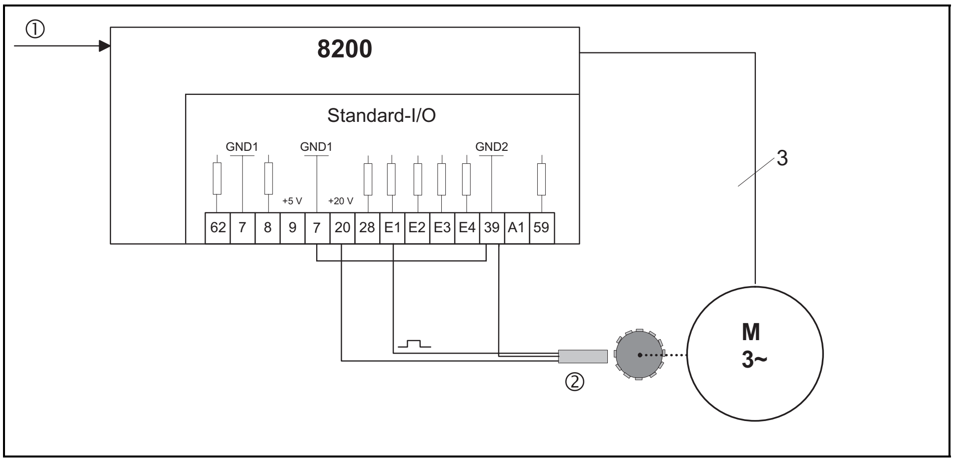


Fig. 15.5-1 Speed control with 3-conductor sensor

① Setpoint

② 3-conductor sensor

8200 8200 motec or 8200 vector

Speed sensor requirements

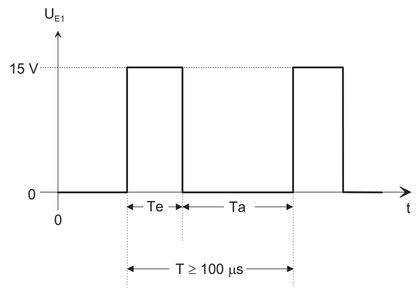
> **Note!**
> Every digital speed sensor which meets the requirements can be used.

- The maximum frequency of inductive sensors is usually between 1 and 6 kHz, depending on its design.
- At the detection point, the number of attenuation cams per revolution must ensure an output frequency of the sensor as high as possible.
- The control dynamics will be sufficient if the output frequency ($f_{act.}$) is > 0.5 kHz at rated speed.
- If the current consumption of the sensor is not higher than the value permitted at X3/20, a 3-conductor sensor can be directly connected to the controller.

Output frequency calculation

$f_{act} = \frac{z \cdot n}{60}$	z = Number of cams per revolution n = Speed at detection point in [min^{-1}] $f_{act.}$ = Output frequency of the sensor in [Hz]

Permissible pulse shapes at X3/E1

	• T_e = On (HIGH) • T_a = Off (LOW) Permissible level range: • LOW: 0 ... +3 V • HIGH: +12 ... +30 V Permissible range of the scanning ratio: • $T_e : T_a$ = 1 : 1 to $T_e : T_a$ = 1 : 5

Application-specific configuration

- Basic settings.

Code		Settings Value	Meaning	IMPORTANT
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	Actual 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 r_{max} = Max. speed [min^{-1}]
C0014	Operating mode	2	V/f-characteristic control	Dynamics in control mode "vector control" to low
C0019	Operating threshold of auto DCB	approx. 0.5 Hz		Adaptation to the application
C0021	Slip compensation	0 %		No slip compensation with controlled 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	Process controller readjustment time	50 ... 500 ms		100 ms = typical
C0072	Differential component of process controller	0		not active
C0074	Process controller influence	2 ... 10 %	$S_{N=}\frac{n_0 - n_N}{n_0}$ Example $S_{N=}\frac{1500 - 1400}{1500} = 6.67\,\%$	• Adaptation to the application • 200% rated motor slip (2 * S_r) adjustment
C0106	Holding time auto DCB	1 s		• Guide value • Afterwards the controller sets controller inhibit
C0181	Process controller setpoint 2 (PCTRL1-SET2)			• Adaptation to the application • Selection with keypad or PC
C0196	Activation of auto–DCB	0	DCB active at C0050 < C0019 and setpoint < C0019	C0196 = -1- is not permissible in this configuration
C0238	Frequency precontrol	1		With frequency precontrol
C0239	Lowest frequency limit	0 Hz		Unipolar, no change of direction of rotation
C0425	Configuration frequency input X3/E1 (DFIN1)			Set C0425 that the frequency coming from the encoder is lower than f_{max}
C0426	Gain frequency input X3/E1, X3/E2 (A) (DFIN1-GAIN)		$C0426 = \frac{f_N \cdot p}{z \cdot (C0011 - f_{s)}} \cdot 100\,\%$	• f_r = Normalisation frequency from C0425 • p = Number of pole pairs of the motor • z = Number of increments per revolution of the encoder • C0011 = Maximum output frequency (corresponds to maximum process speed of the motor) • f_s = Slip frequency

Adjustment (see example in Fig. 15.5-1)

Conditions

- A 4-pole motor is to be operated up to n_{max} = 1500 min^{-1} . The motor has the following data:
  – Rated speed n_r = 1390 min^{-1}
  – Rated frequency f_r = 50 Hz
  – Slip s_r = 7.3 %
  – Slip frequency f_s = 3.7 Hz
- The pulse encoder delivers 6 increments/revolution (inc/rev).
  – The maximum frequency at X3/E1 at maximum speed is:

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

- Process controller influence (C0074) setting to 200 % rated slip:
  – C0074 = 14.6 %
- Calculation of maximum output frequency (C0011):

$$\left(1 + \frac{C0074\ [\%]}{100}\right) \cdot \frac{p}{60} \cdot n_{max}\ [min^{-1}] = 1.15 \cdot \frac{2 \cdot 1500}{60} = 57.5\ Hz$$

Note!

If the number of increments per revolution is not known, you have to find out the gain to be set by experiment:

- Set C0238 = 0 or 1.
- Set the drive to the maximum required output frequency. The output frequency is now determined by the frequency precontrol.
- Use C0426 to set the gain in a way that the actual value (C0051) equals the setpoint (C0050).

Adjustment of frequency input X3/E1

- C0425 = 0
  - Normalisation frequency =100 Hz
  - Maximum frequency = 300 Hz
- Activation of frequency input with C0410/24 = 1.
  - Ensure that no other digital signal is assigned to E1 (no double assignment)!
- Assign the actual process controller value to the frequency input under C0412 (C0412/5 = 2)
- Gain C0426
  - The input frequency at X3/E1 is normalised to the value of the preselected frequency (100 Hz), i.e. internally 100 Hz correspond to the output frequency set under C0011.
  - C0426 must be recalculated after every change of C0011.

$$C0426 = \frac{f_N \cdot p}{z \cdot (C0011 - f_s)} \cdot 100\ \%$$

$$C0426 = \frac{100\ \text{Hz} \cdot 2}{6 \cdot (57.5\ \text{Hz} - 3.7\ \text{Hz})} \cdot 100\ \% = 62\ \%$$

15.6 Group drive (operation with several motors)

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

Installation

- The motor cable is wired in e.g. a terminal box.
- Every motor must be equipped with a thermostat (NC contact). The series connection must be connected to X2/T1 and X2/T2 using a separate cable.
- Used screened cables only. Connect the screen to PE with a surface as large as possible.
- Resulting cable lengths:

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

Application-specific configuration

- Basic settings.
- Control mode C0014 = 2, possibly 4. (📖 10.3-1)
- PTC input C0119 = 1. (📖 10.14-3)

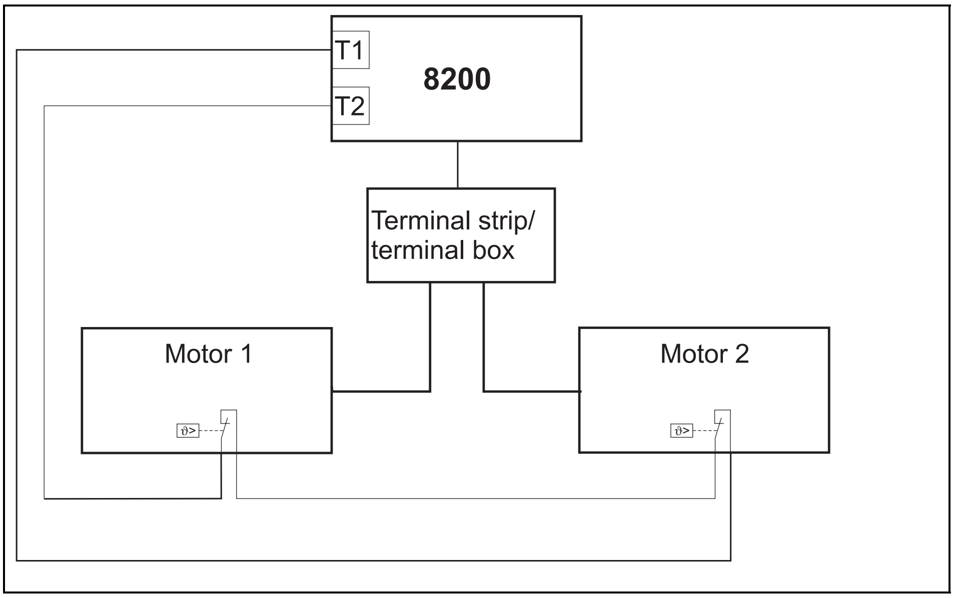


Fig. 15.6-1 Basic structure of a group drive

Note!

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

15.7 Sequential circuit

Two refrigeration compressors supply several refrigeration devices which are switched on and off in irregular intervals.

Note!
With the function module application I/O it is not necessary to use the external time delay element of Fig. 15.7-1. The time delay for the relay output K1 is set under C0423/1. The time delay prevents the compressor 2 from being switched on when the actual value fluctuates just a little bit.

Conditions

- Compressor 1 is controlled by means of a 8200 motec or 8200 vector.
- Compressor 2 is connected to the mains and is switched on and off depending on the consumption.
- The pressure setpoint of the process is selected as fixed value.

Functions used

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

Application-specific configuration

- Basic settings.
- Process controller configuration:
  – Process controller optimisation (10.10-1)
  – Process controller has full influence: C0238 = 0, C0074 = 100 %
  – Process controller setpoint source = Total setpoint: C0145 = 0
  – Process setpoint = JOG frequency JOG1 (in PAR1 and PAR2 continuously active via X3/E1): C0037 = 50 Hz
- Adaptation of parameter set 1 (PAR1) to application:
  – Continuous activation of X3/E1 (LOW active): C0411 = 1
  – Threshold for compressor 2: C0017 = 45 Hz.
  – Connection of compressor 2 via relay: C0415/1 = 6.
- Adaptation of parameter set 2 (PAR2) to application:
  – Continuous activation of X3/E1 (LOW active): C0411 = 1
  – Threshold for disconnection of compressor 2: C0010 = 15 Hz (minimum frequency).
  – Disconnection of compressor 2 via relay: C0415/1 = 24.
  – Relay output inversion: C0416 = 1.
- PAR changeover (PAR1 ⇔ PAR2) via X3/E2: C0410/13 = 2.

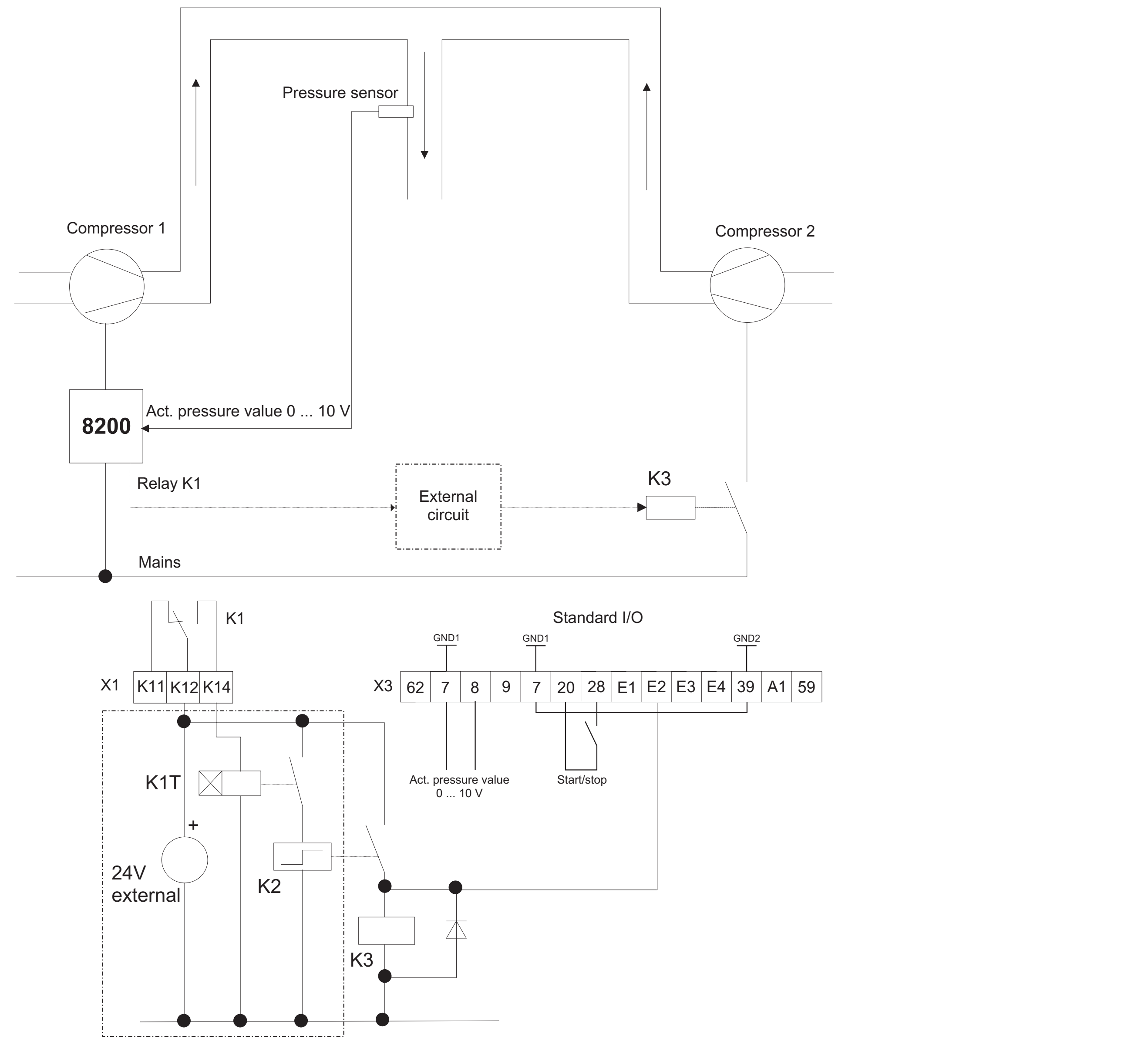


Fig. 15.7-1 Principle of sequential circuits

8200 8200 motec or 8200 vector

Function description for Fig. 15.7-1
1. Activate the threshold 45 Hz K1 in PAR1.
2. If K1 remains picked up, K2 is connected.
3. Compressor 2 is connected via K3. At the same time the parameter set is changed via X3/E2 (process controller is not affected)-
4. K1 picks up when the minimum frequency is reached (depending on load). After time K1T is over, K2 picks up again.
5. Compressor 2 is switched off. The parameter set is changed backed to PAR1.
• K1T debounces the switching point of compressor 2 (adapt delay time to process).

15.8 Setpoint summation (basic and additional load operation)

Conveyors, pumps, etc. are often operated at a speed which is increased if necessary.

The speed is set by selection of a main and additional setpoint. The setpoints can have different sources (e.g. PLC or 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 have a S-shape.

Application-specific configuration

- Basic settings.
- Setpoint summation configuration: Assign the setpoints to be added to C0412/1 and C0412/3. (📖 10.12-1)
- If necessary, adjust the main setpoint ramps under C0182. (📖 10.7-1)

Note!

- Possible ways to select a setpoint: (📖 10.8-1 ff)
- The additional setpoint can be displayed under C0049 (alternatively: C0412/3 = 0).
- With controllers with standard I/O, the main setpoint must be selected via PC, keypad, JOG frequency or the function "Motor potentiometer" because there is only one analog input available.
- If you use an application I/O, the additional setpoint can be switched on and off during operation ((C0410/31 ≠ 0)

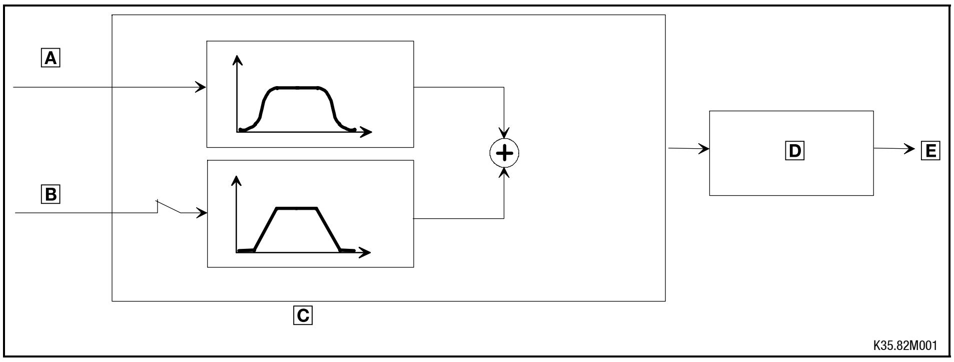


Fig. 15.8-1 Principle of setpoint summation

A Main setpoint
B Additional setpoint
C S-ramps
D motor
E speed

15.9 Power control (torque limitation)

The power control (torque limitation) generates a constant mass flow when moving masses which change their specific weight, usually air exposed to different temperatures.

Torque limit and speed setpoint are selected for the controller. The torque limit will not be exceeded because the speed is automatically adapted if the specific weight changes. The speed setpoint must be set in a way that it does not limit the speed adaptation.

Control mode "Sensorless torque control" (C0014 = 5):

With sensorless torque control, a constant torque is preselected. A defined speed limit must not be exceeded (speed limitation).

Application-specific configuration

- Basic settings.
- Control mode selection: C0014 ≠ 5! (📖 10.3-1)
- Torque limit value configuration: Assign C0412/6.
- Speed setpoint configuration: Assign C0412/1.

Note!

- Set the max. output frequency C0011 for the max. permissible speed. Thus the speed does not have a limiting effect, the drive is constantly running at the set torque limit.
- The torque limit can be indicated under C0047.
- Possibilities to select speed and torque limits: (📖 10.8-1 ff)
- With standard I/O, the speed setpoint must be selected via PC, keypad, JOG frequency or the function "Motor potentiometer" because there is only one analog input available.
- Acceleration time and moment of inertia require a torque reserve.
- Power control should not be used with group drives.

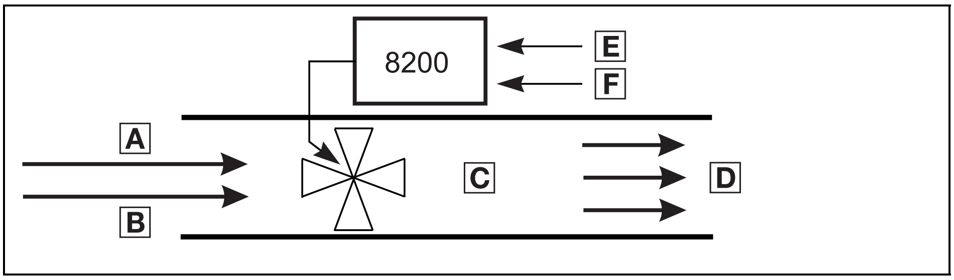


Fig. 15.9-1 Power control principle example: Fan

A Cold, heavy air
B Warm, light air
C Fans
D Mass flow m = constant
E M = Moment
F f = Frequency
8200 8200 motec or 8200 vector

16 Signal-flow charts

16.1 Contents

16.2 Important notes

How to read the signal flow diagrams

Symbol	Meaning
━━▶	Combination of signals in the Lenze setting
●──▶	Fixed signal connection
○──	Analog input can be freely connected with an analog output which has the same labelling.
②──	
──○	Analog output
──②	
●──	Analog input to be used to connect the motor potentiometer output
──●	Motor potentiometer output
□──	Digital input can be freely connected with a digital output which has the same labelling.
[2]──	
──□	Digital output
──[2]	

16.3 Overview of signal processing

16.3.1 Controller with standard I/O

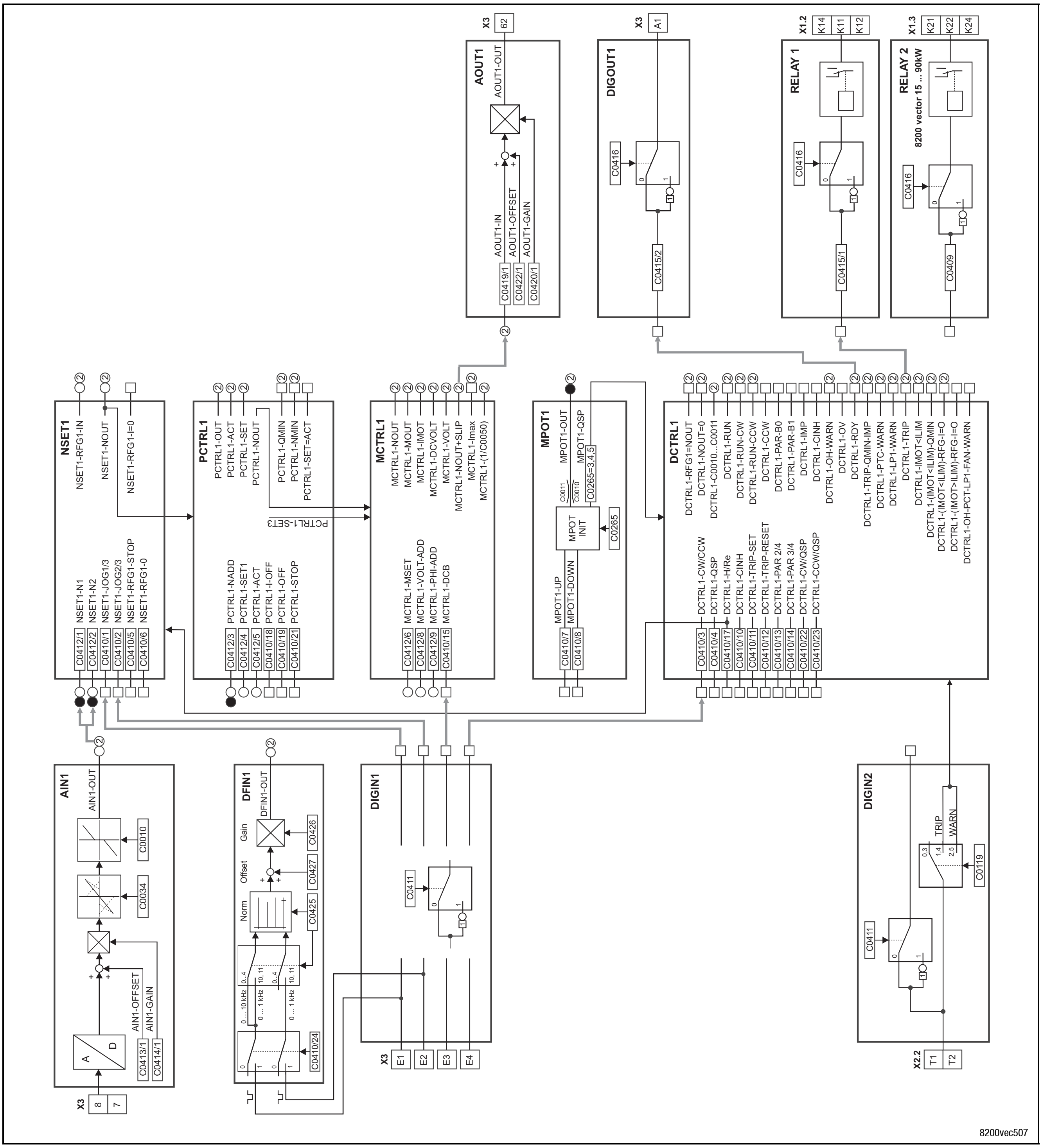


Fig. 16.3-1 Overview of signal flow with Standard I/O

16.3.2 Controller with Standard I/O and communication module

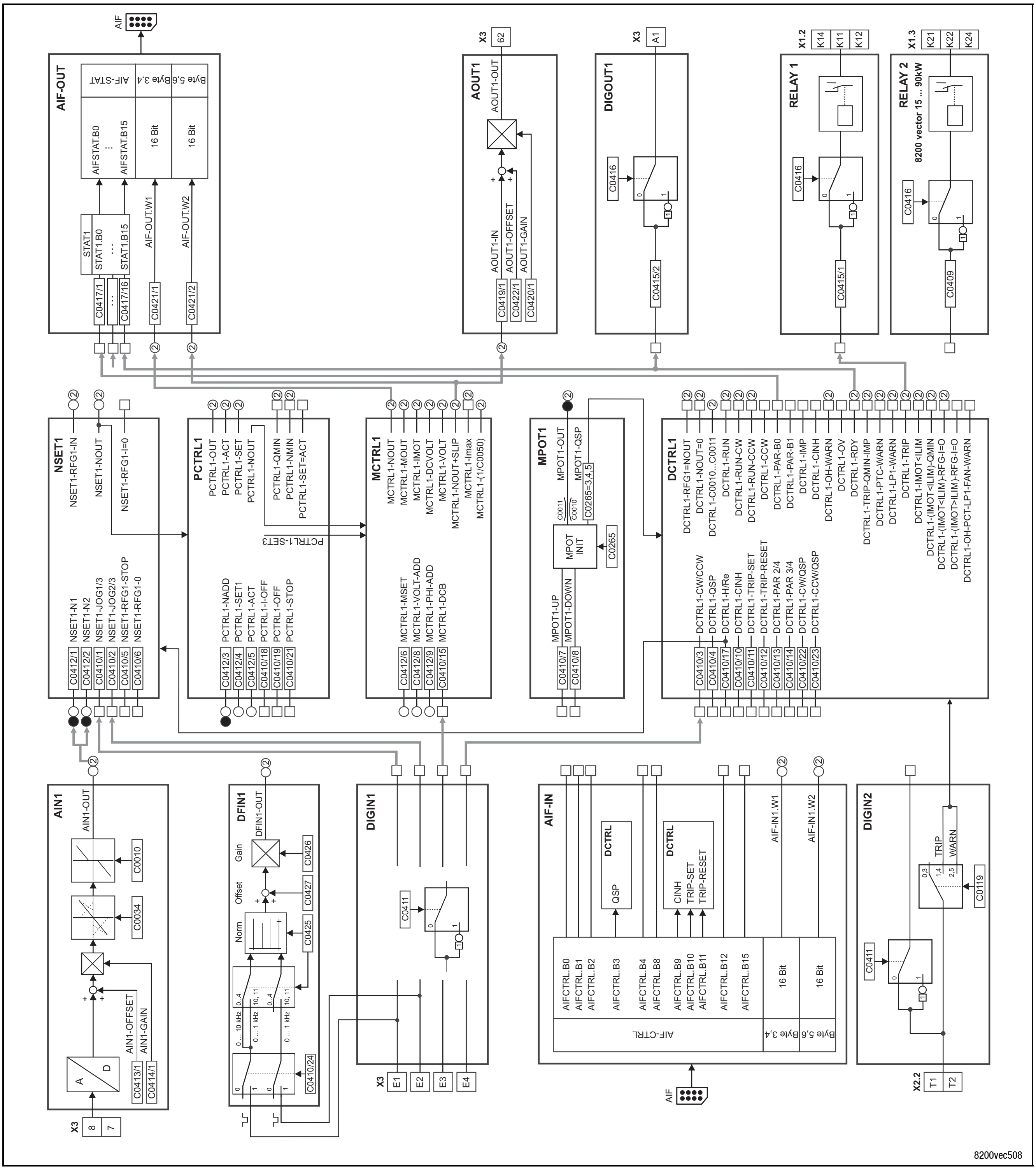


Fig. 16.3-2 Overview of signal flow with Standard I/O and communication module

16.3.3 Controller with application I/O

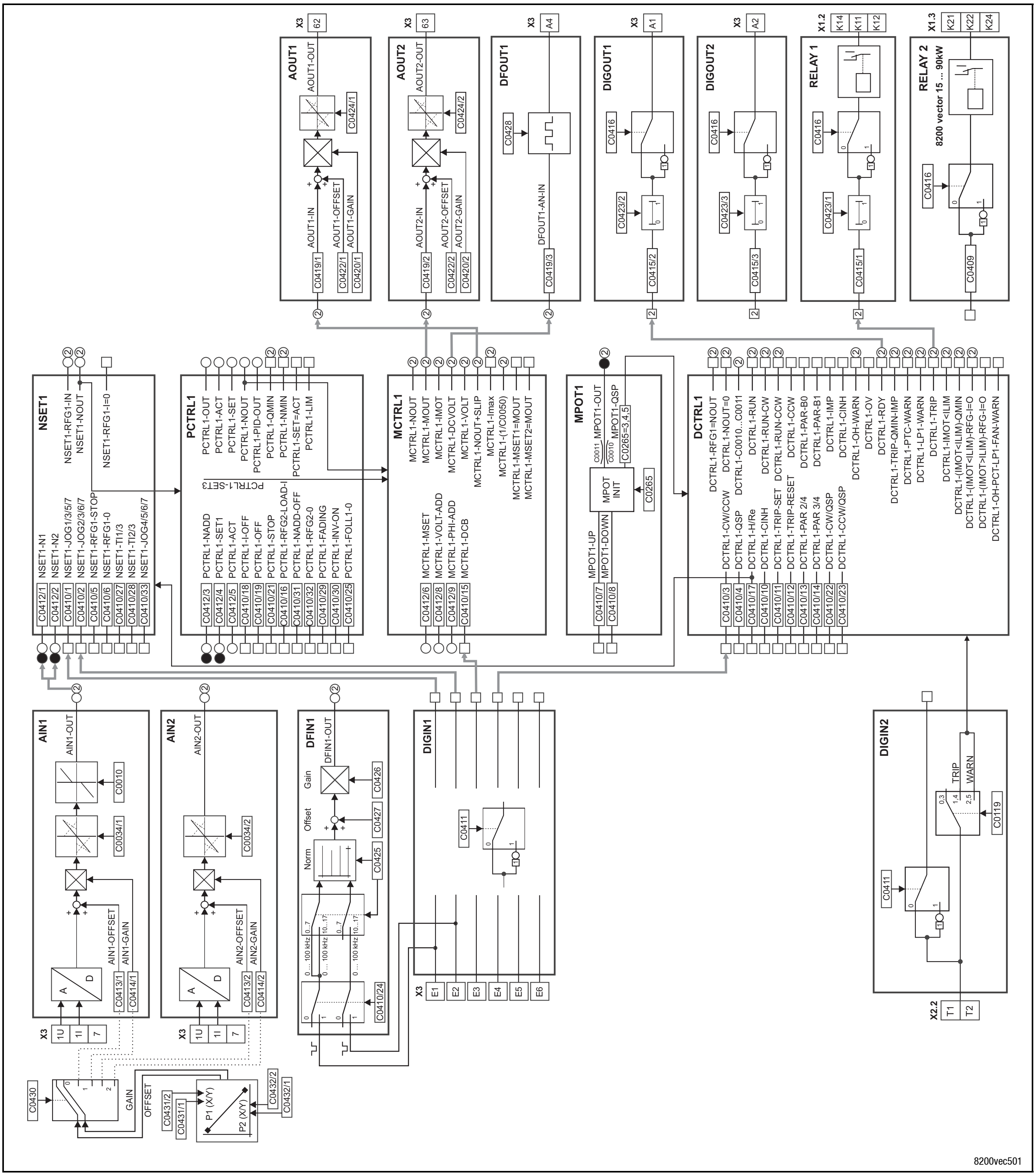


Fig. 16.3-3 Overview of signal flow with Application I/O

16.3.4 Controller with Application I/O and communication module

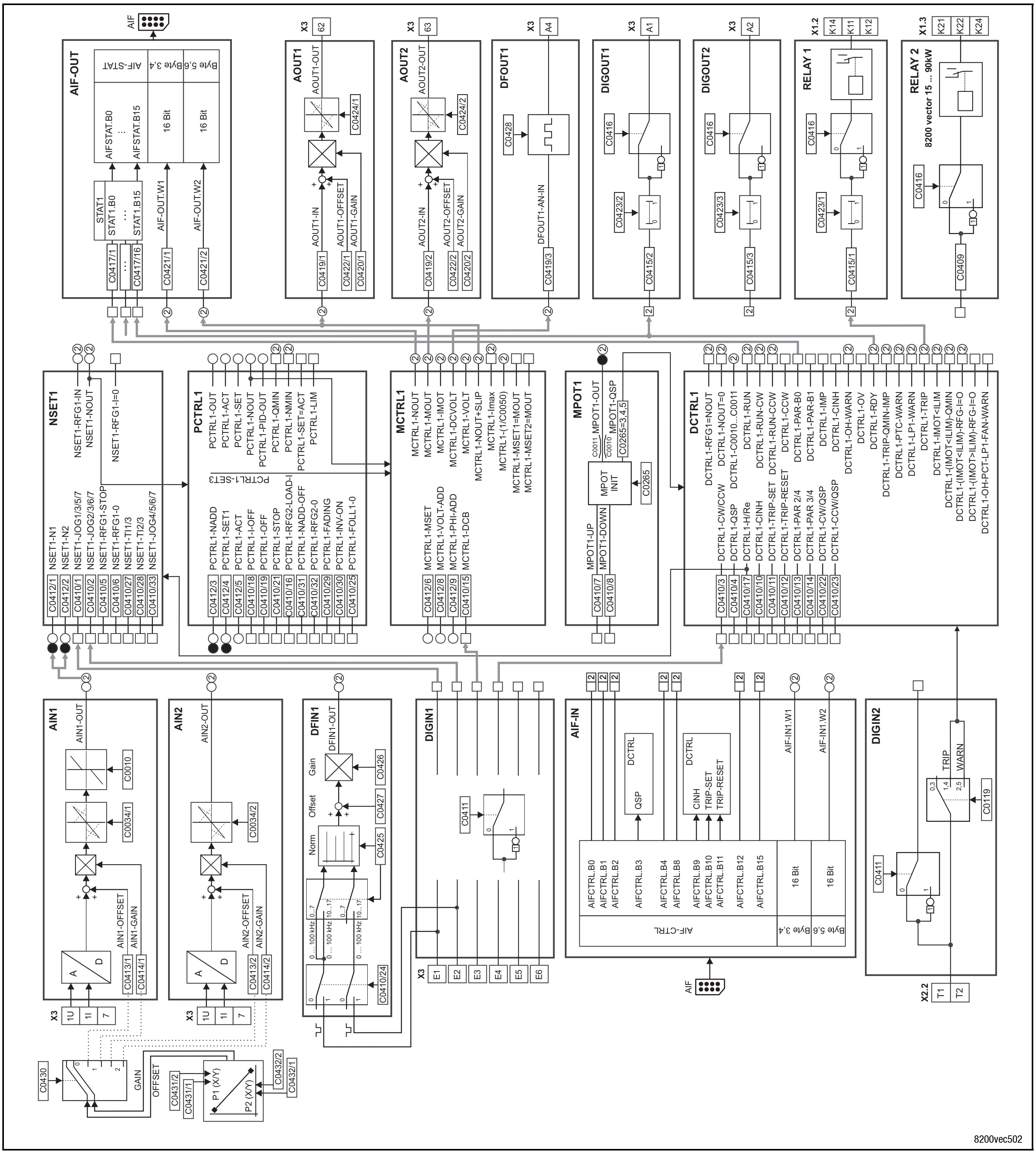


Fig. 16.3-4 Overview of signal flow with Application I/O and communication module

16.3.5 Controller with communication module

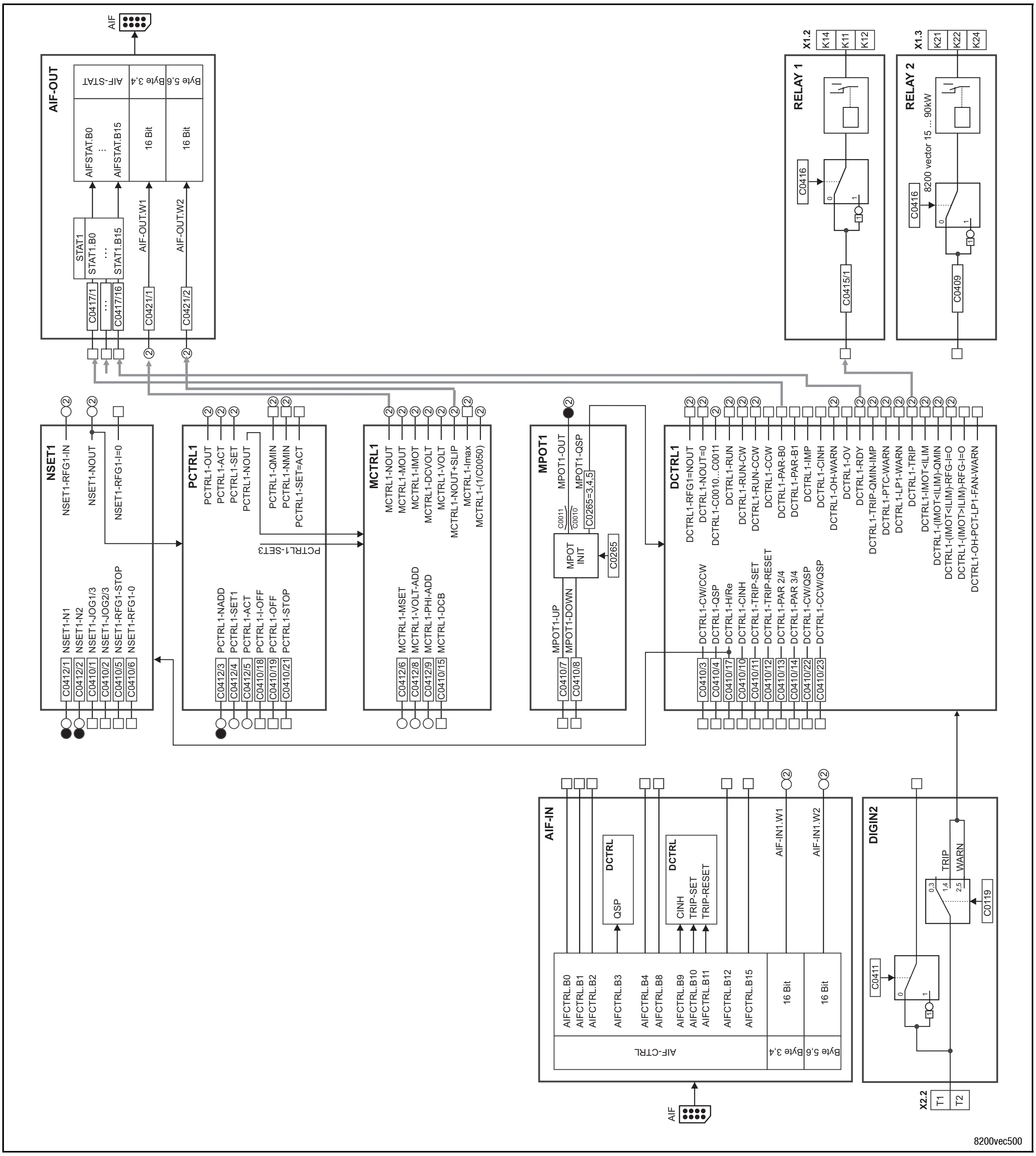


Fig. 16.3-5 Overview of signal flow with communication module

16.3.6 Controller with fieldbus function module

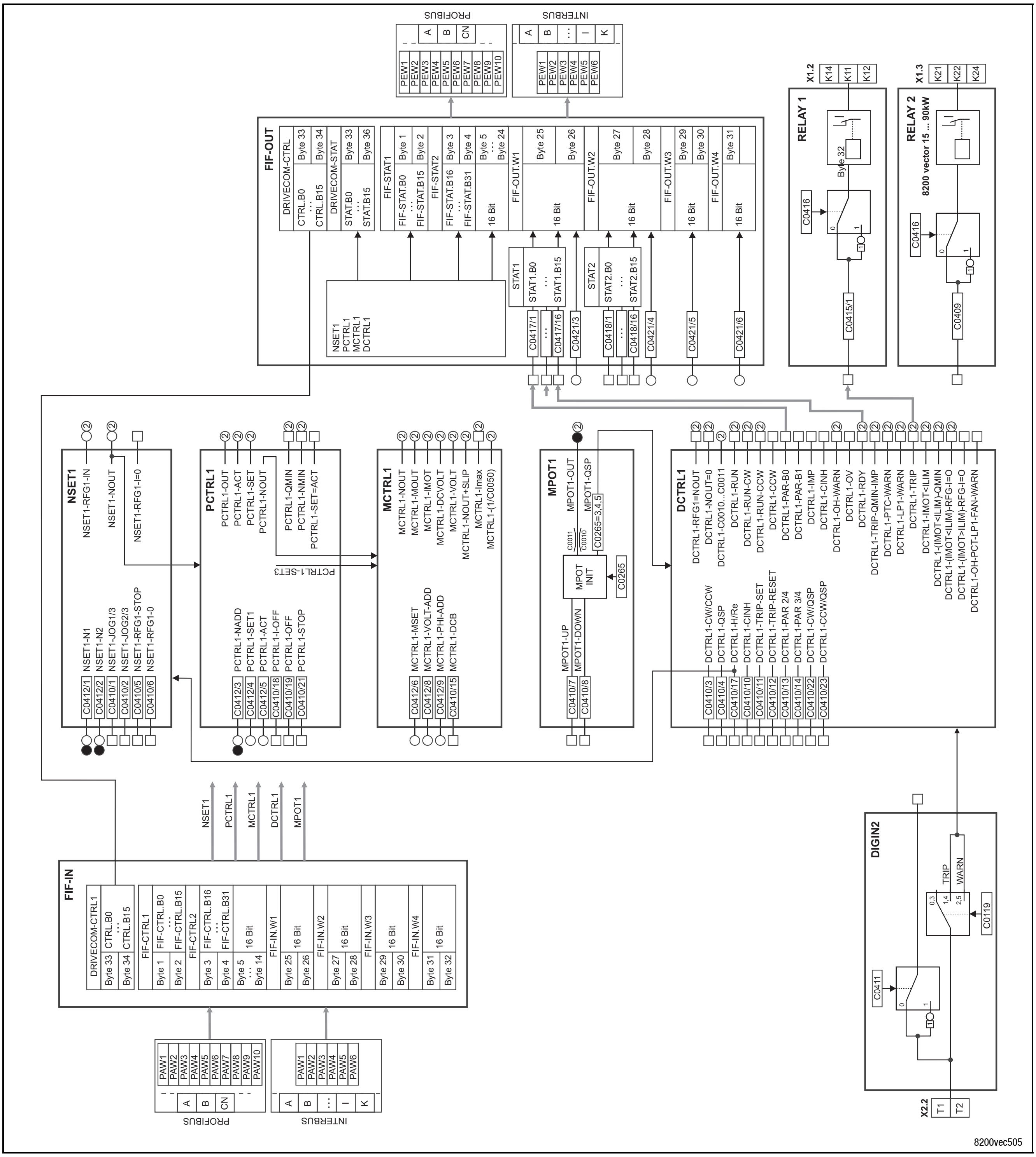


Fig. 16.3-6 Overview of signal flow with fieldbus function module on the FIF interface

16.3.7 Controller with fieldbus function module and communication module

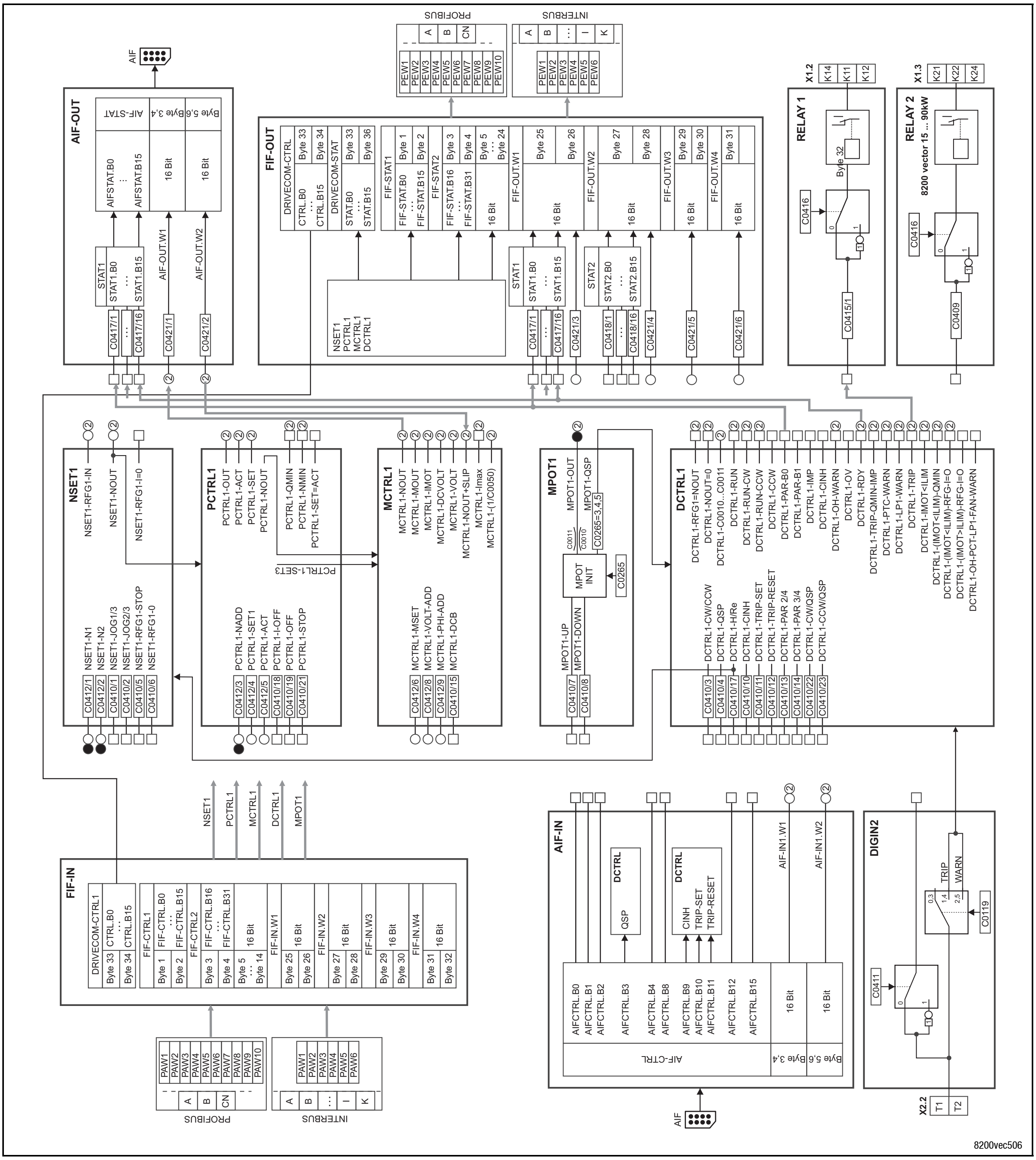


Fig. 16.3-7 Overview of signal flow with fieldbus function module (FIF) and communication module (AIF)

16.3.8 Controller with system bus function module

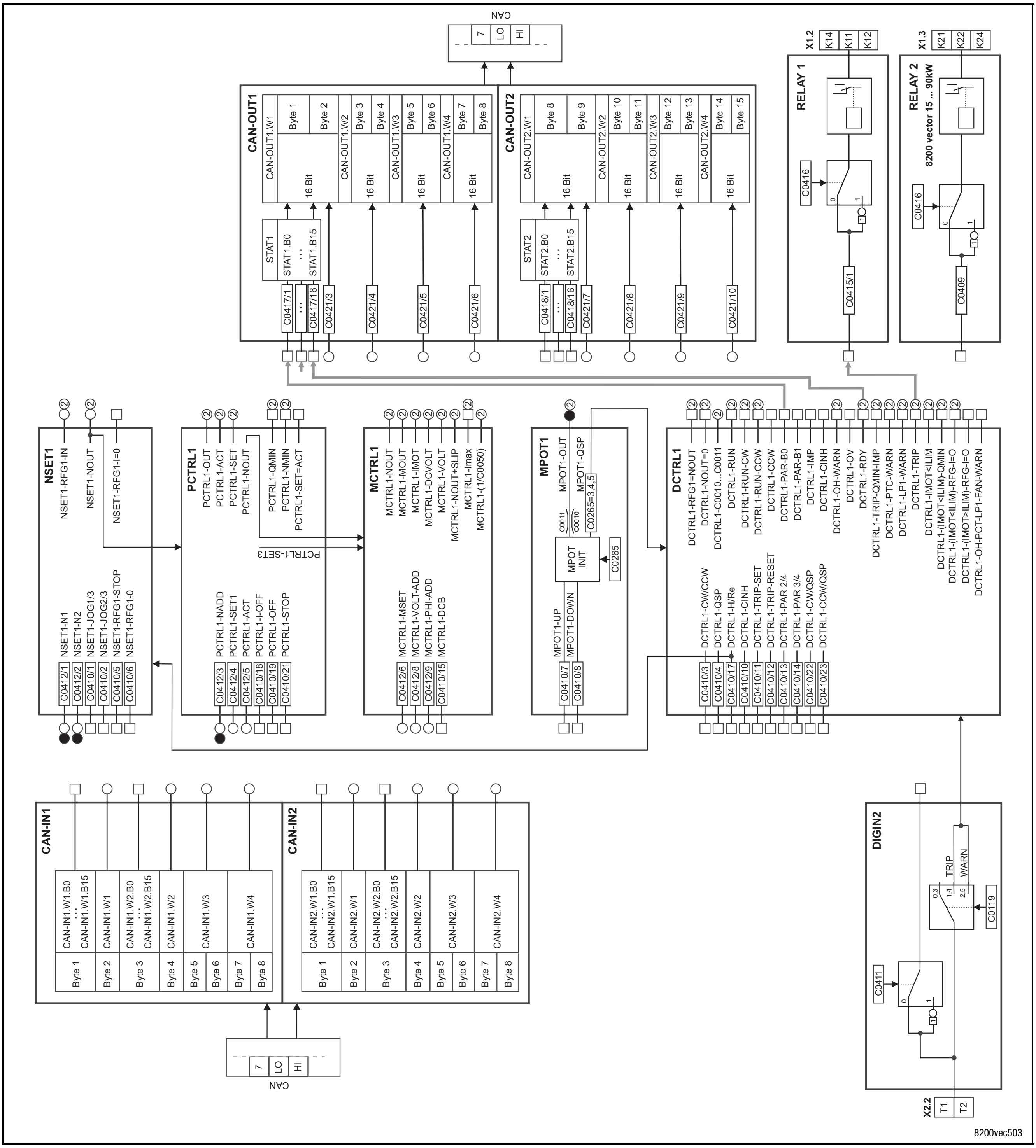


Fig. 16.3-8 Overview of signal flow with system bus function module on the FIF interface

16.3.9 Controller with system bus function module and communication module

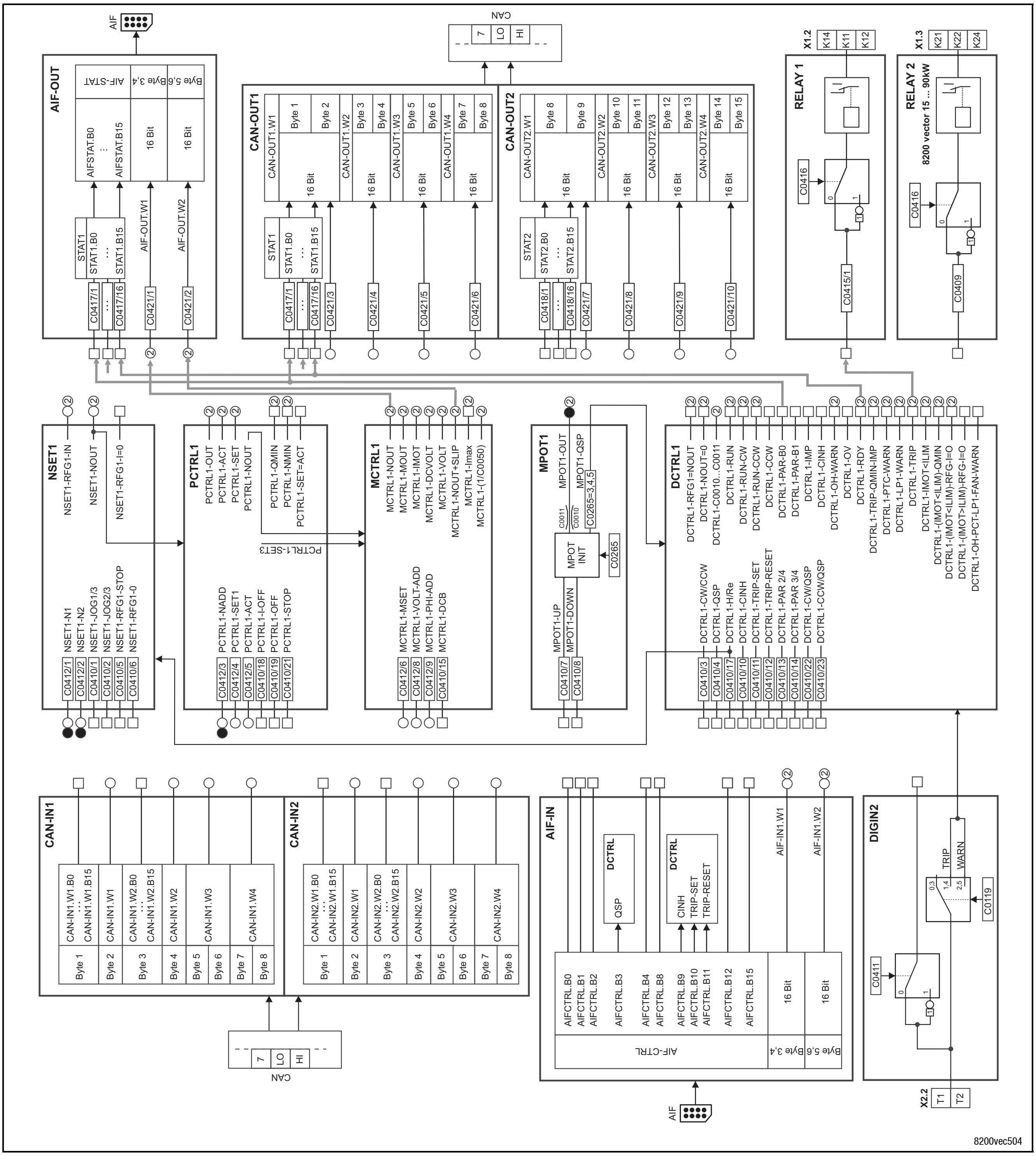


Fig. 16.3-9 Overview of signal flow with system bus function module (FIF) and communication module (AIF)

16.4 Signal processing in the function blocks

16.4.1 Speed setpoint conditioning (NSET1)

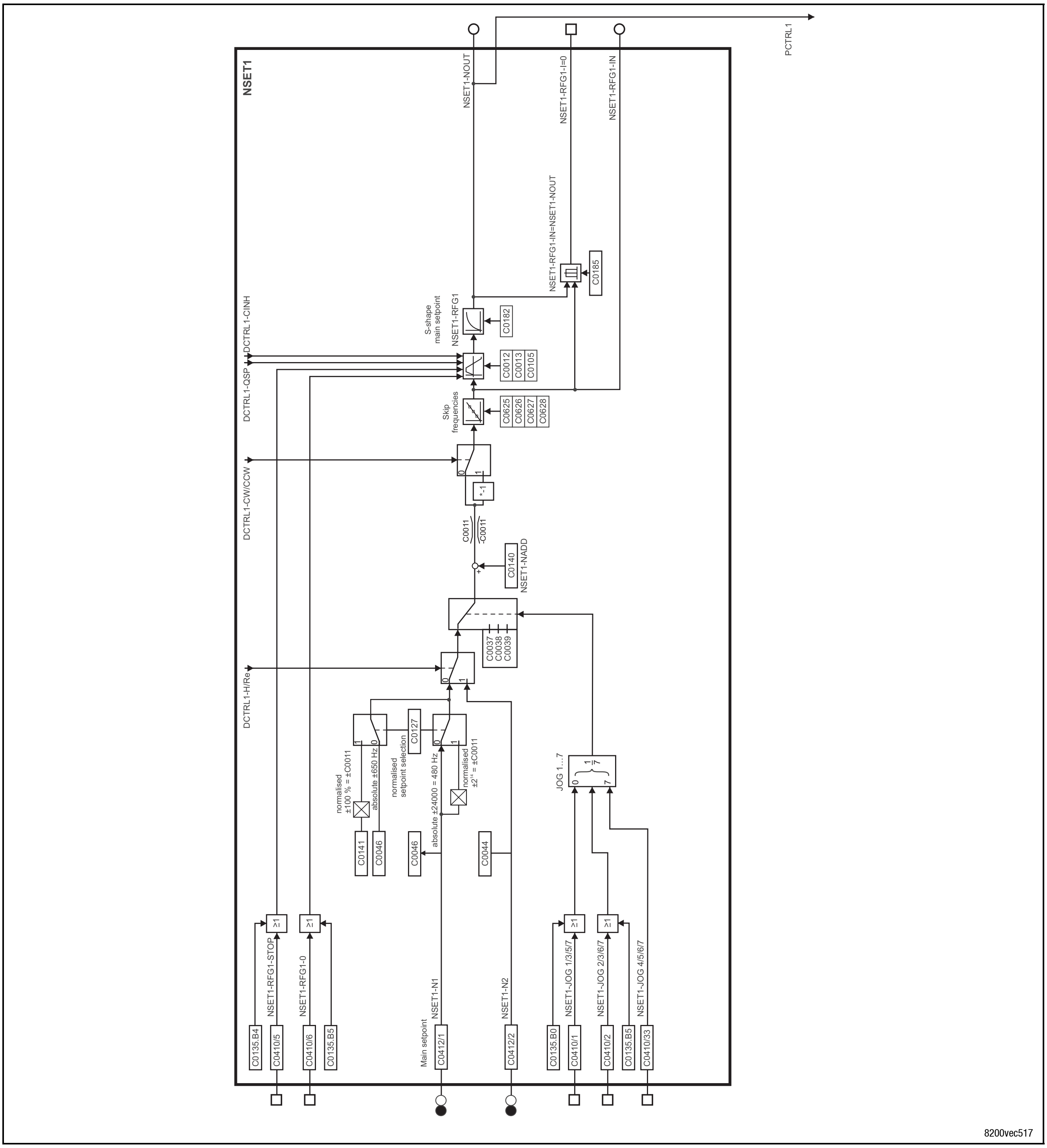


Fig. 16.4-1 Signal flow of speed setpoint conditioning

16.4.2 Speed setpoint conditioning (NSET1) with Application I/O

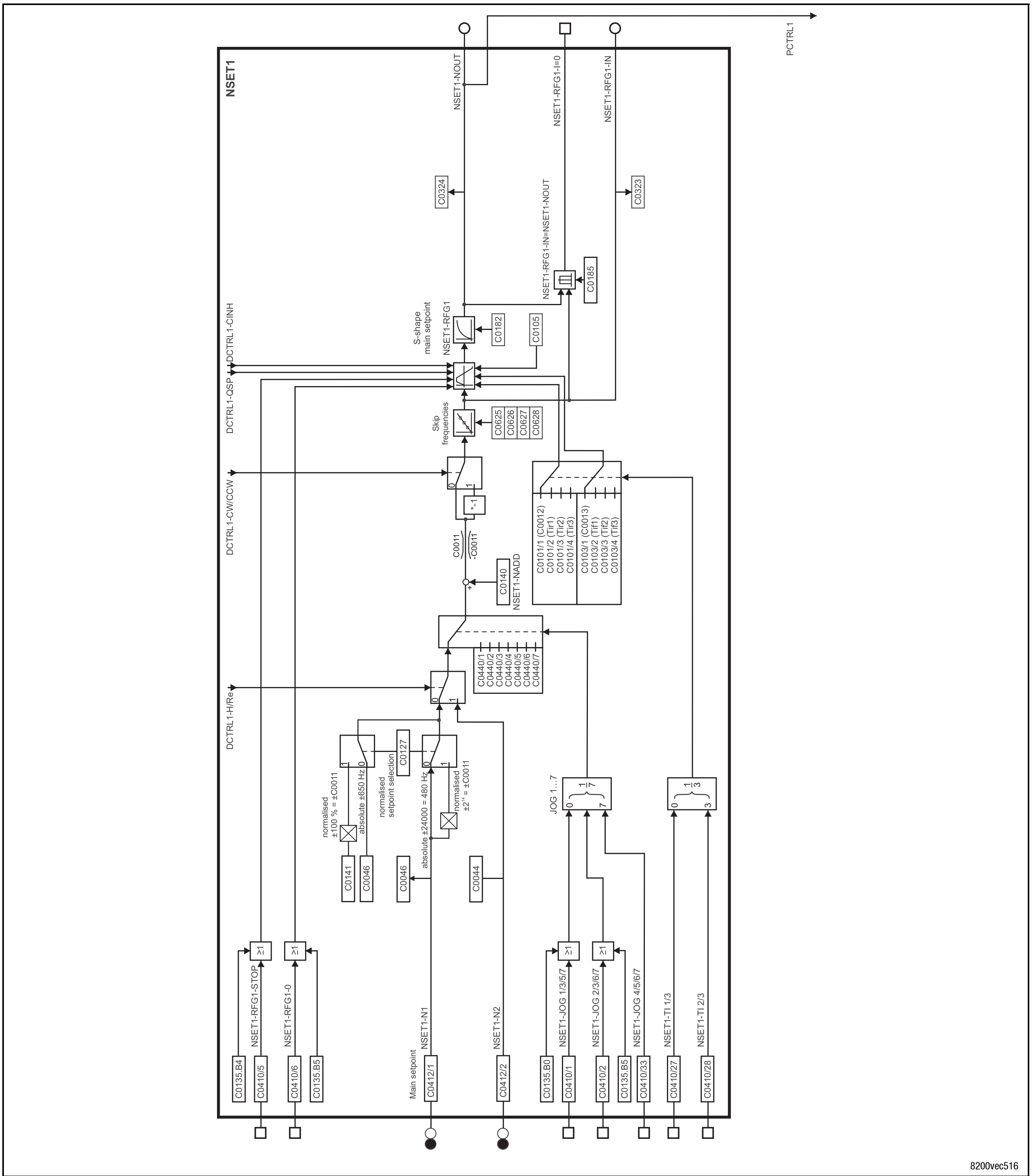


Fig. 16.4-2 Signal flow of speed setpoint conditioning with Application I/O

16.4.3 Process controller and setpoint processing (PCTRL1)

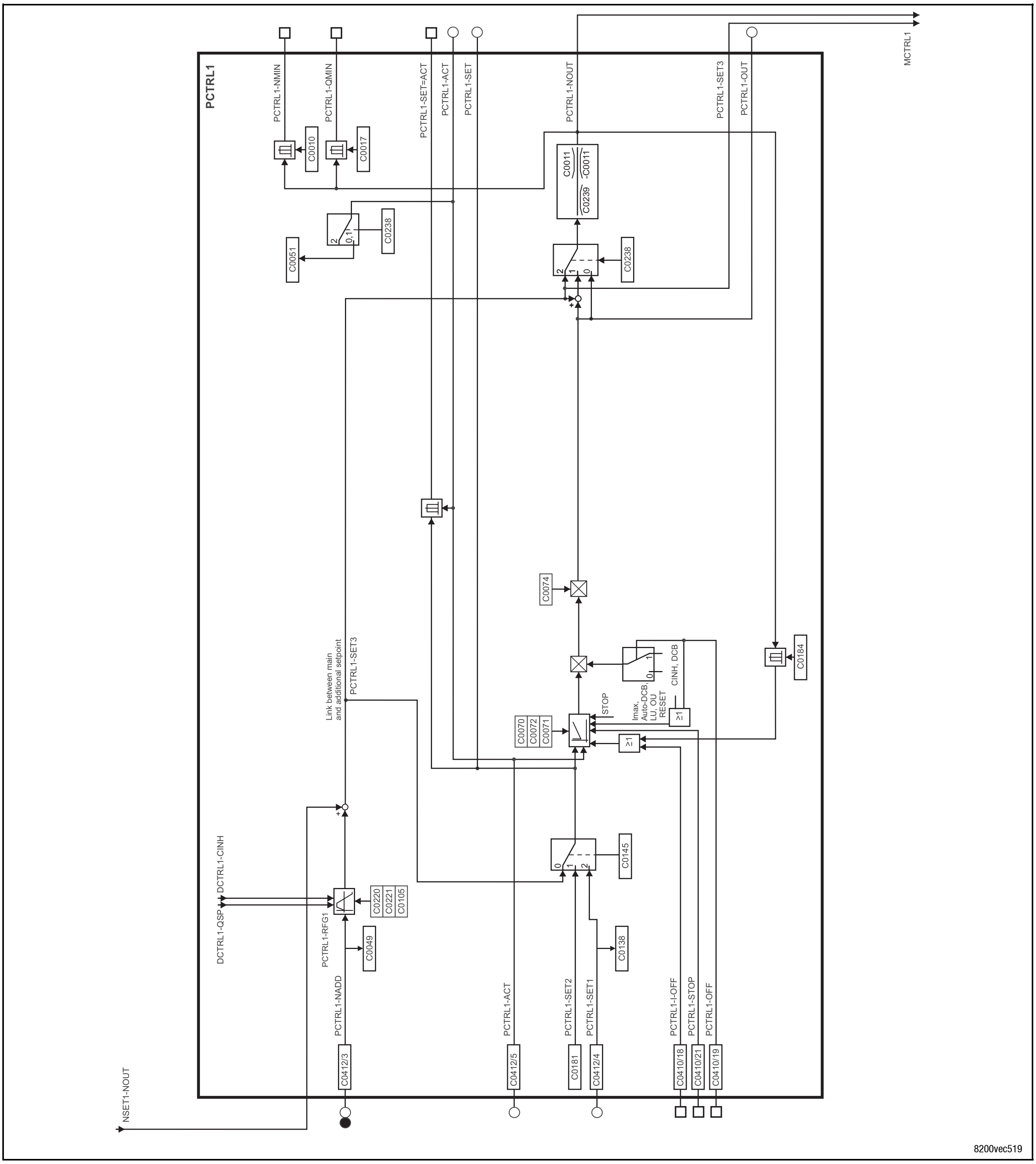


Fig. 16.4-3 Signal flow in the process controller and setpoint processing

16.4.4 Process controller and setpoint processing (PCTRL1) with Application I/O

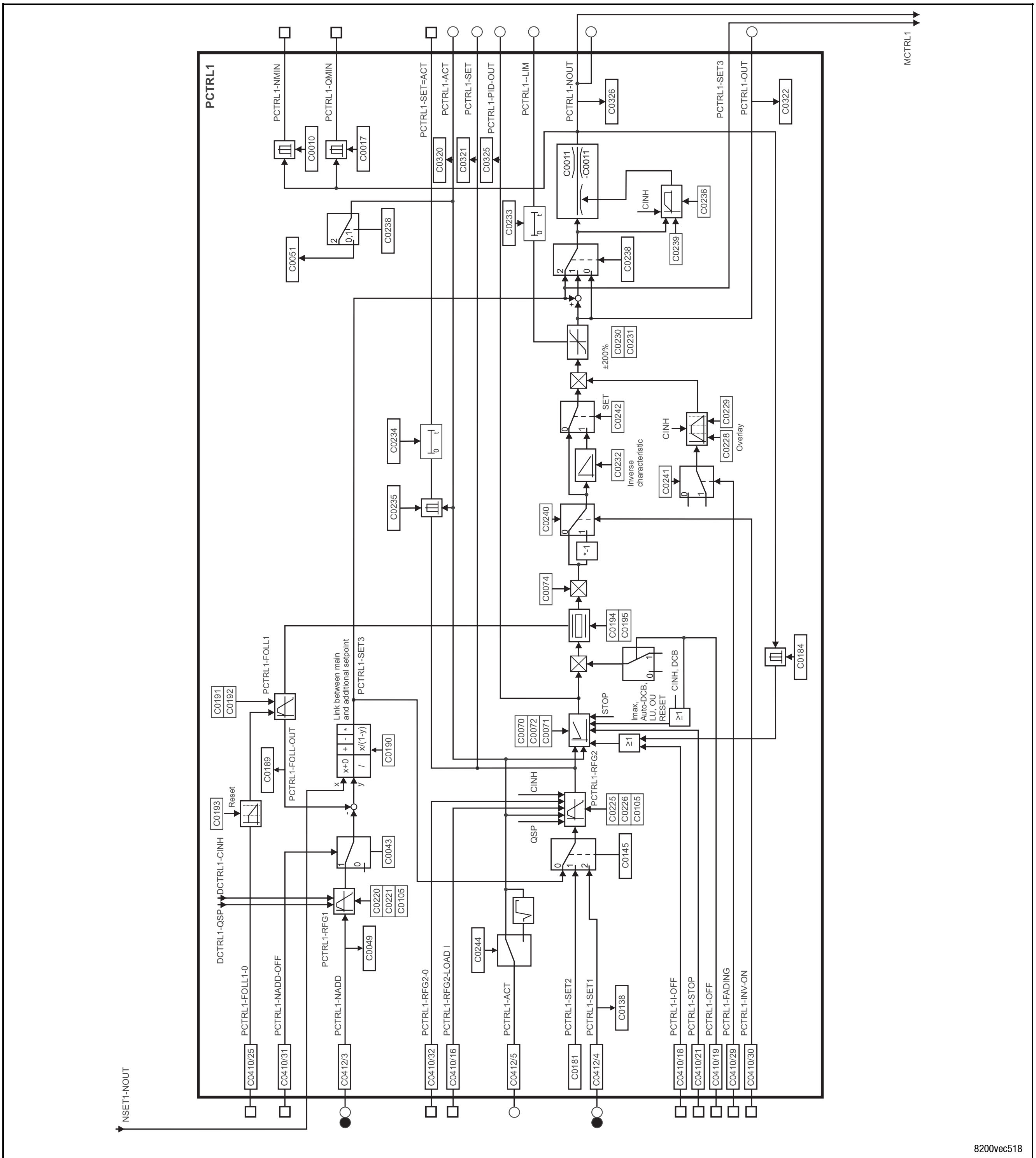


Fig. 16.4-4 Signal flow in the process controller and setpoint processing with Application I/O

16.4.5 Motor control (MCTRL1)

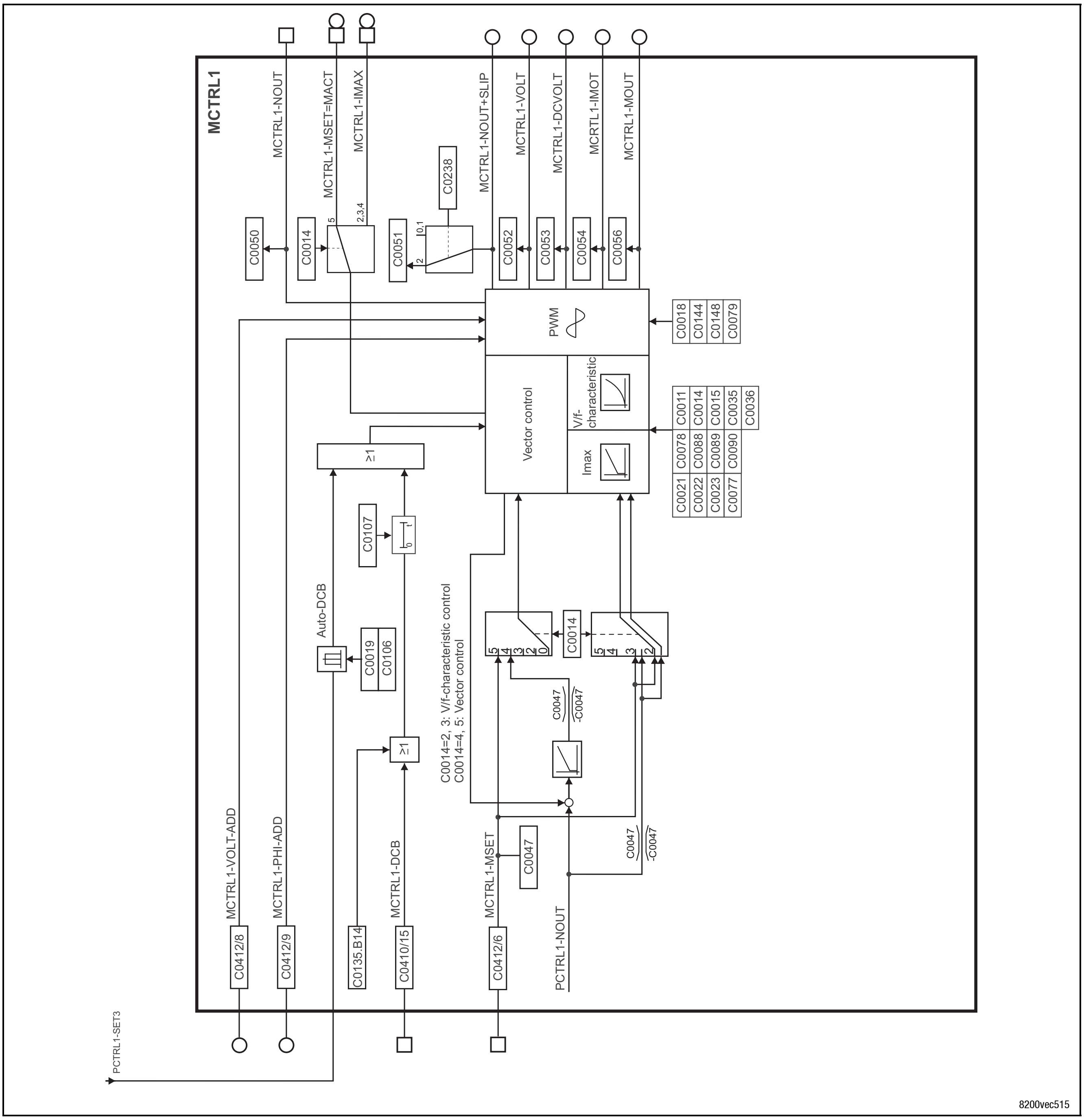


Fig. 16.4-5 Signal flow in the motor control

16.4.6 Motor control (MCTRL1) with Application I/O

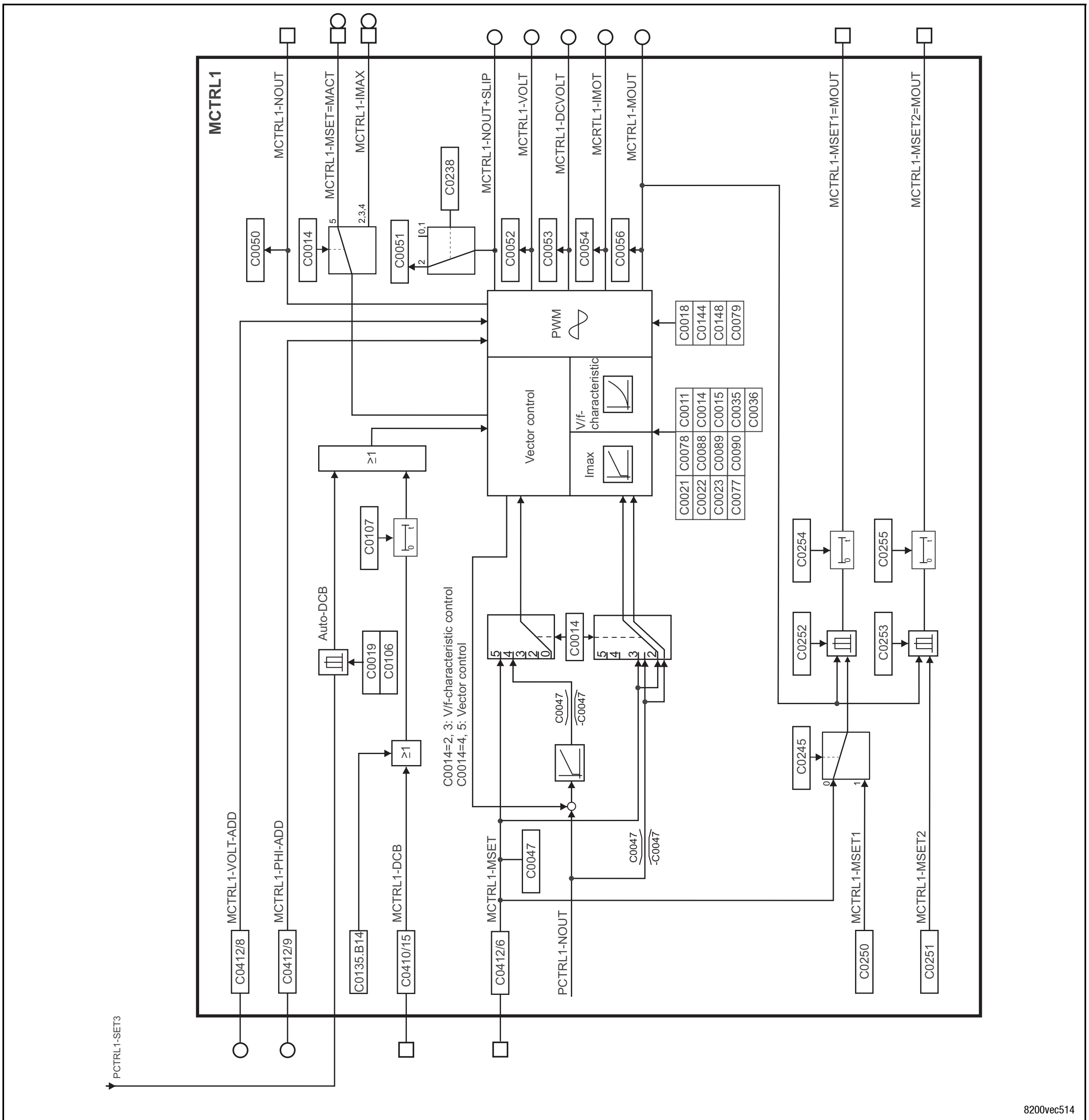


Fig. 16.4-6 Signal flow in the motor control with Application I/O

16.4.7 Device control (DCTRL1)

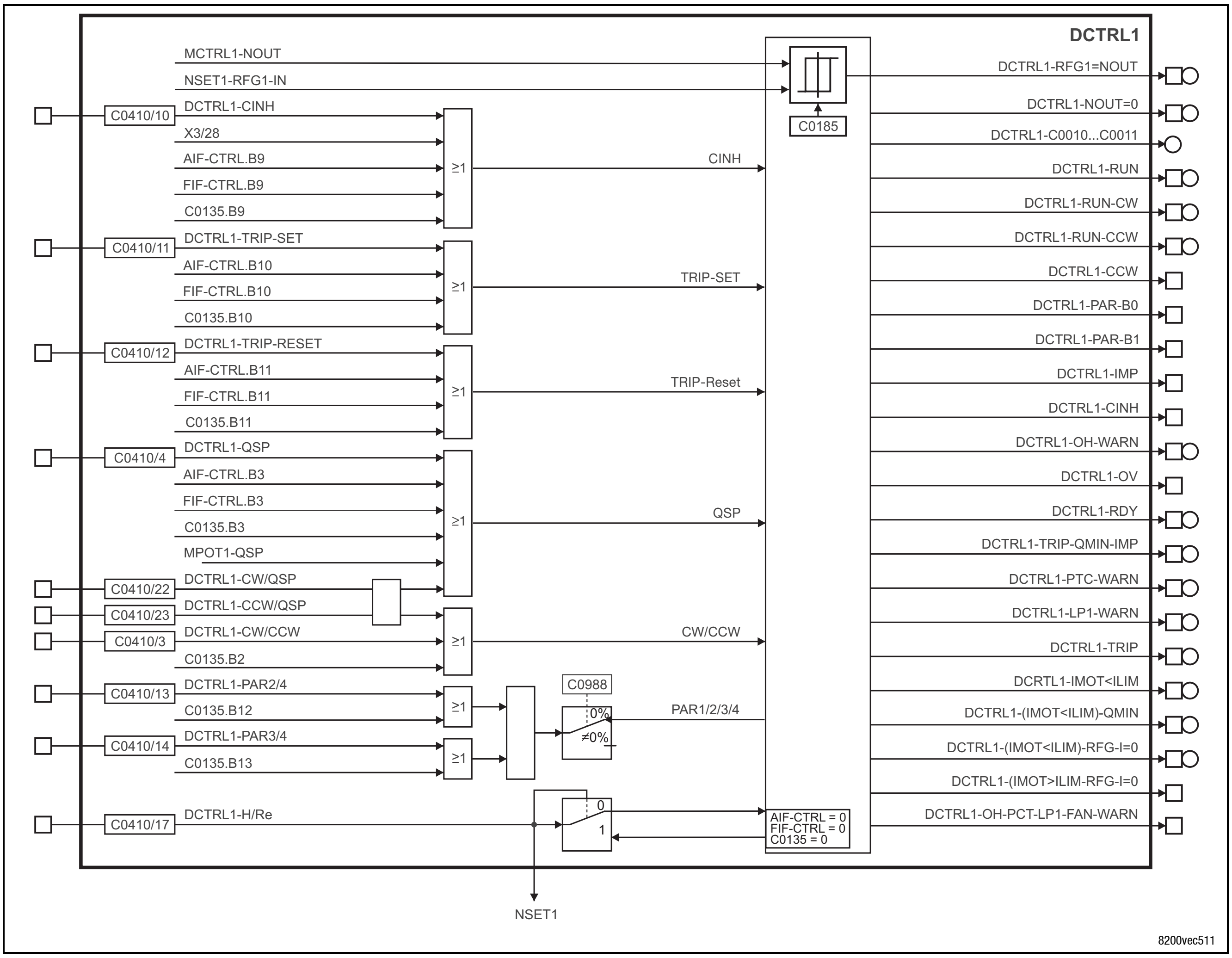


Fig. 16.4-7 Signal flow in device control

16.4.8 Controller state (STAT1, STAT2)

Controller state (STAT1)

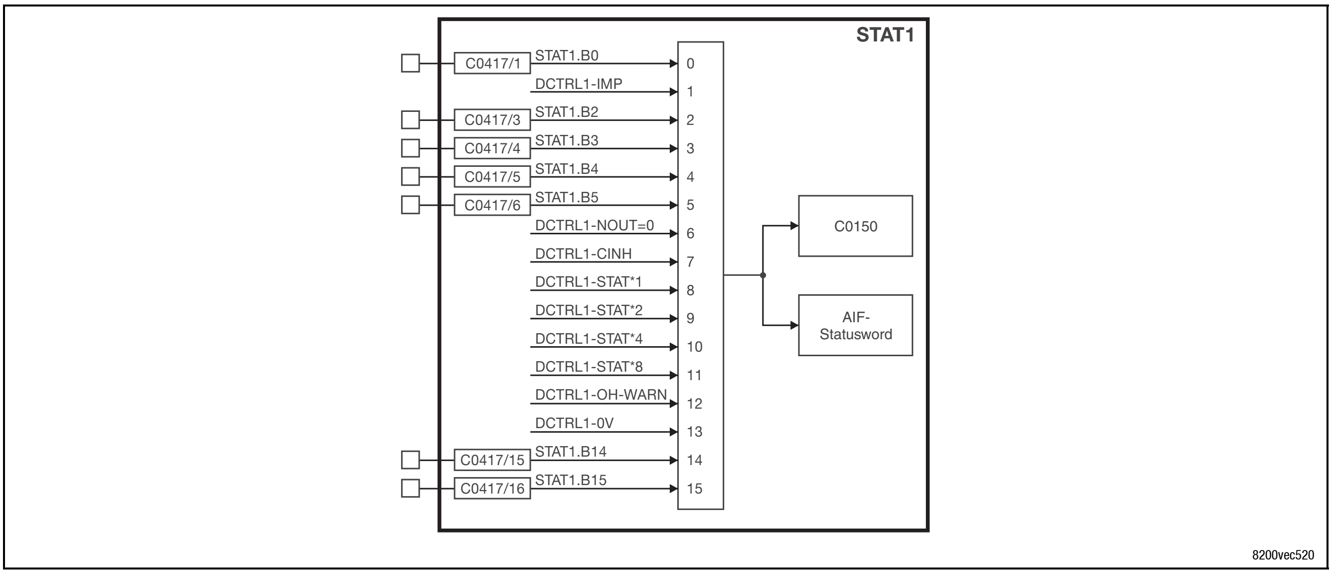


Fig. 16.4-8 Signal flow in the STAT1 controller state

Controller state (STAT1) with FIF module

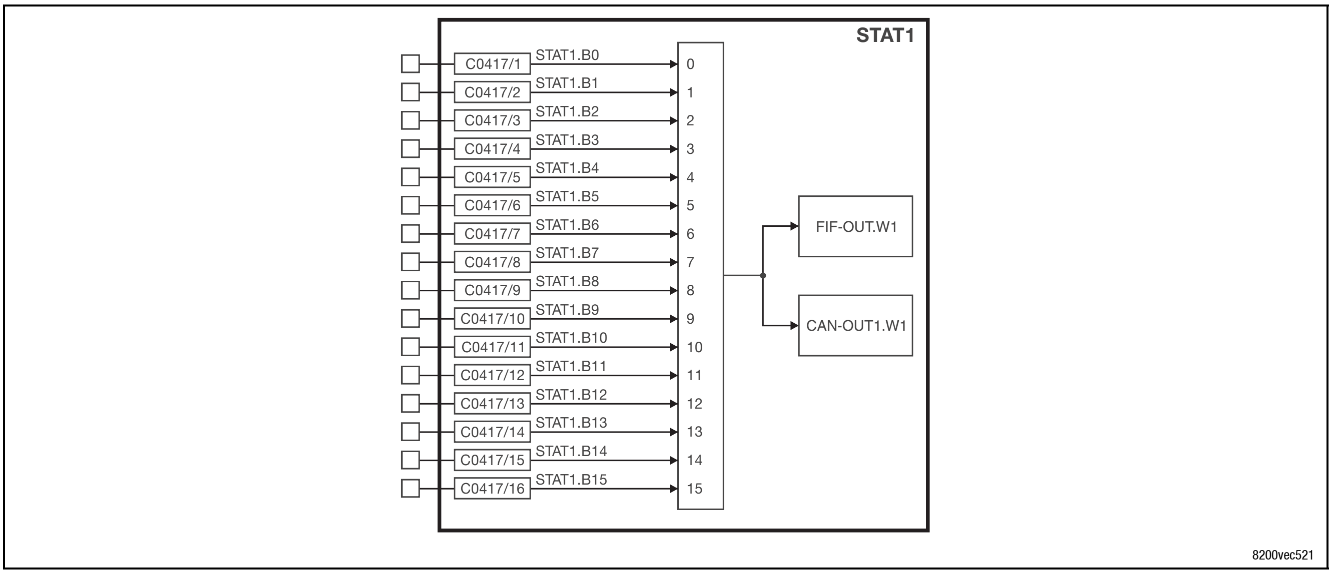


Fig. 16.4-9 Signal flow in the STAT1 device state with FIF module

Controller state (STAT2)

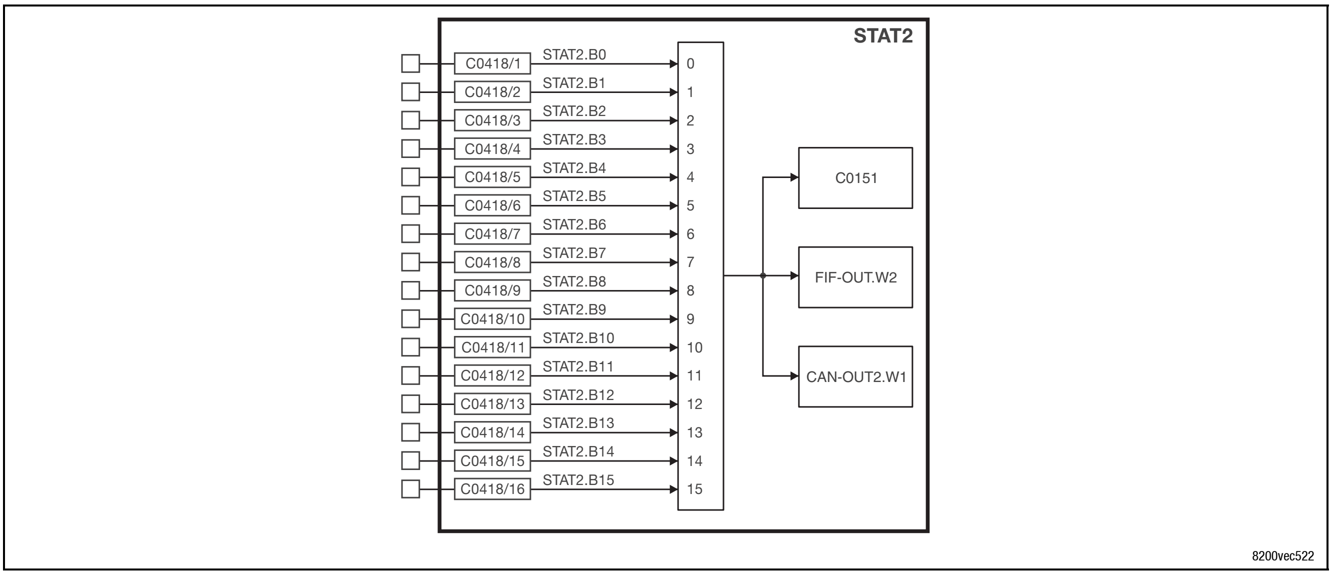


Fig. 16.4-10 Signal flow in the STAT2 controller state

16.4.9 Process data of system bus function module (CAN1, CAN2)

Process data input words

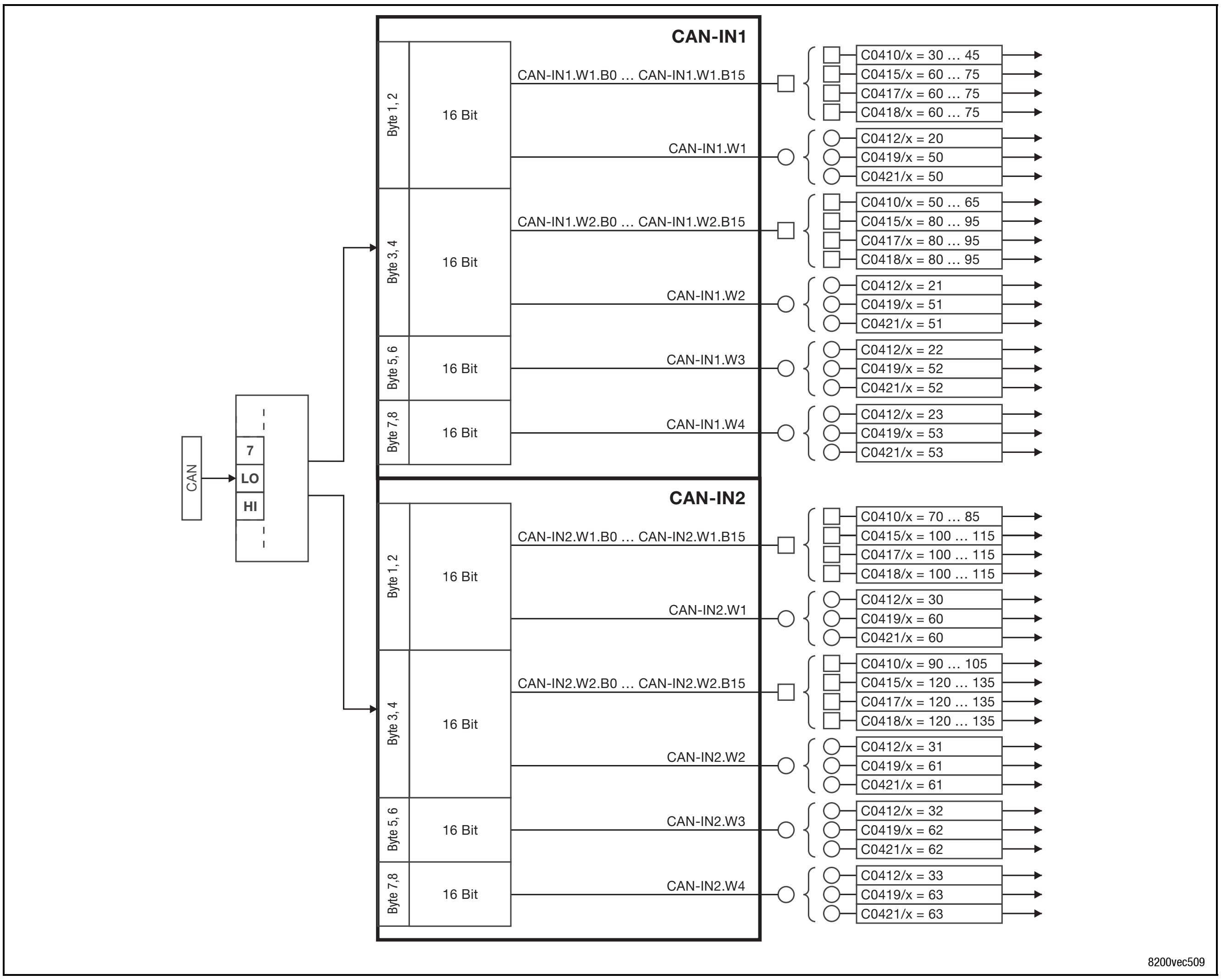


Fig. 16.4-11 Signal flow in CAN objects CAN-IN1 and CAN-IN2

Process data output words

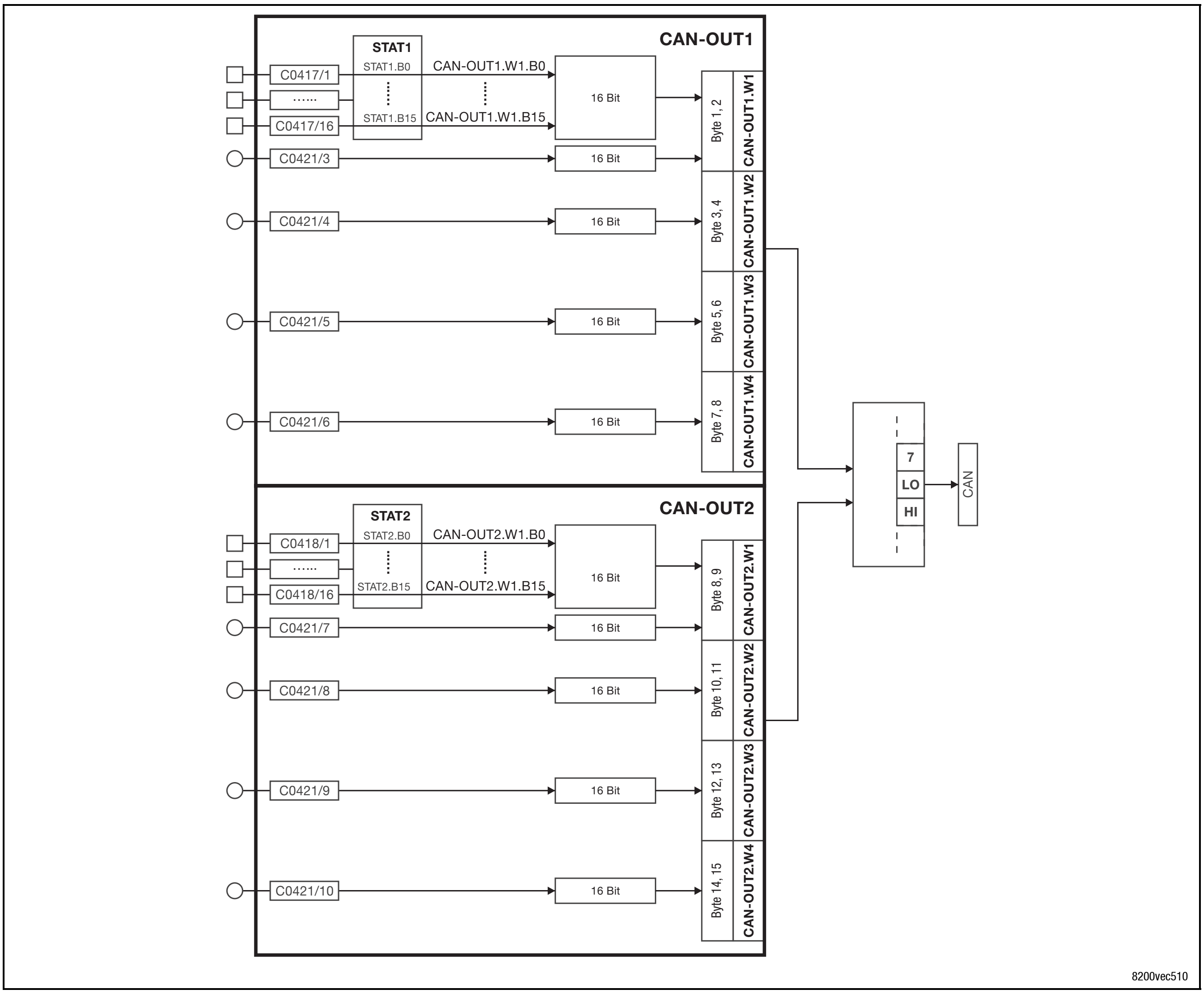


Fig. 16.4-12 Signal flow in CAN objects CAN-OUT1 and CAN-OUT2

16.4.10 Process data of fieldbus function module (FIF-IN, FIF-OUT)

Process data input words

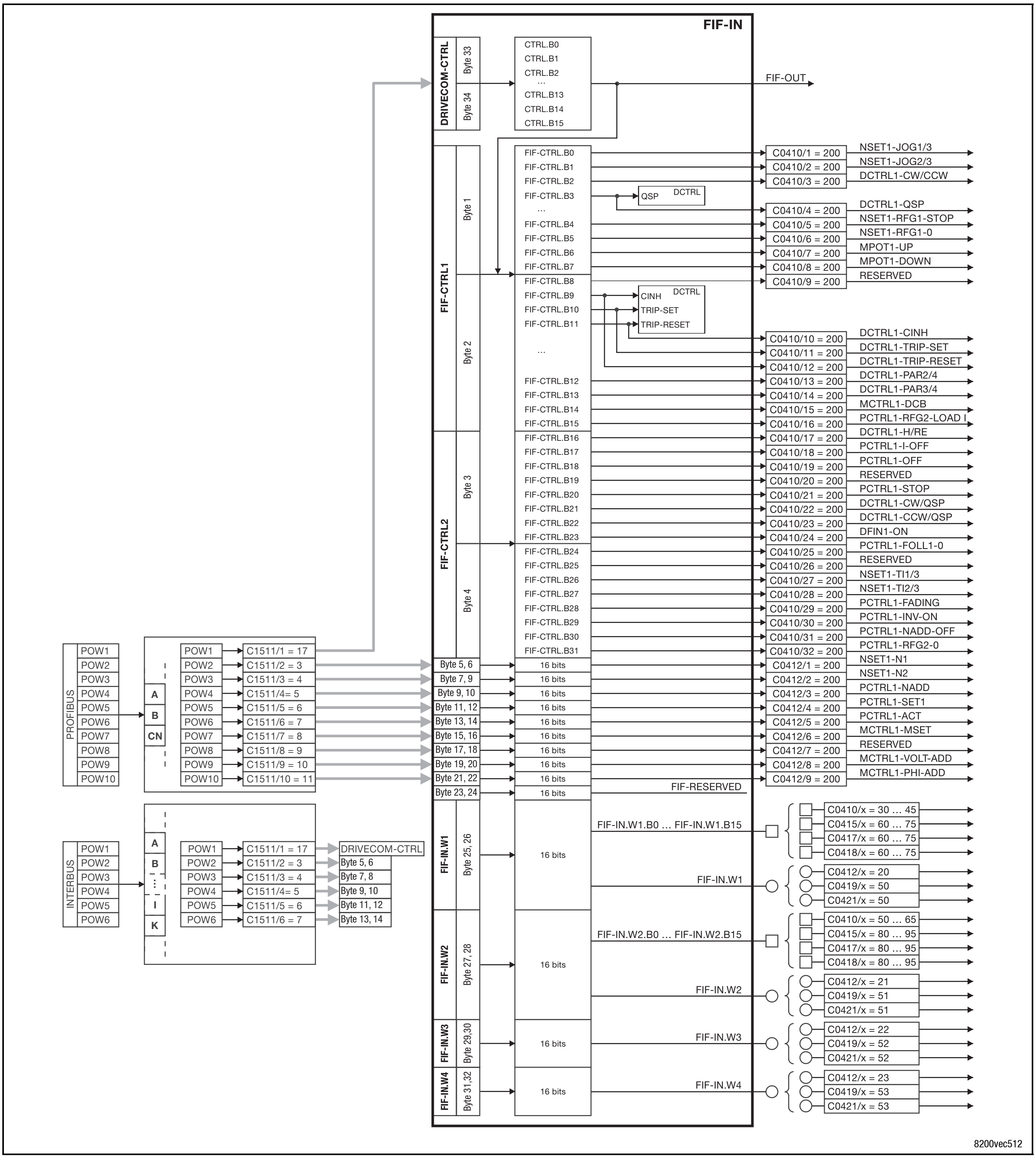


Fig. 16.4-13 Signal flow of input data in the fieldbus FIF module

Process data output words

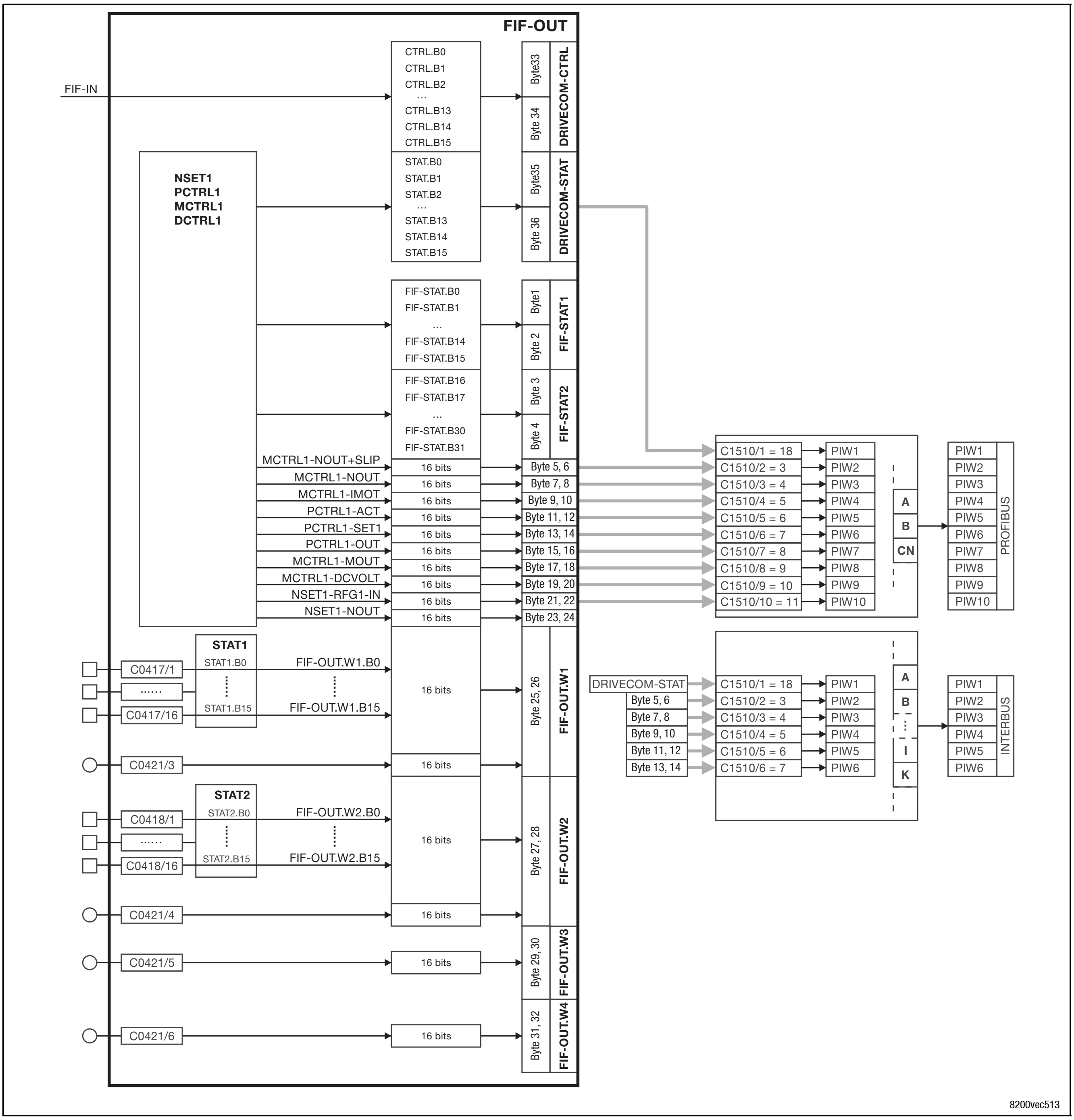


Fig. 16.4-14 Signal flow of output data in the fieldbus FIF module

17 Accessories (Survey)

Note!

Detailed information on accessories can be found in the ”8200 vector frequency inverter” catalogue.

17.1 Contents

17.2 General accessories

Accessories	Name		Order no.
Function modules	Standard I/O		E82ZAFSC
	Standard I/O PT		E82ZAFSC010
	Application I/O		E82ZAFAC
	Application I/O PT		E82ZAFAC010
	CAN (system bus)		E82ZAFCC
	CAN PT (system bus)		E82ZAFCC010
	CAN I/O PT (system bus)		E82ZAFCC210
	LECOM-B (RS485)		E82ZAFLC
	LECOM-B PT (RS485)		E82ZAFLC010
	INTERBUS		E82ZAFIC
	INTERBUS PT		E82ZAFIC010
	PROFIBUS-DP		E82ZAFPC
	PROFIBUS-DP PT		E82ZAFPC010
	AS-Interface		E82ZAFFC
	AS-Interface PT		E82ZAFFC010
Communication modules	LECOM-LI (optical fibre)		EMF2102IB-V003
	Optical fibre adapter for normal sending		EMF2125IB
	Optical fibre adapter for increased sending rates		EMF2126IB
	Power supply for optical fibre adapter		EJ0013
	Optical fibre, 1-core, black PE sheath (simple protection), per meter		EWZ0007
	Optical fibre, 1-core, red PUR sheath (reinforced), per meter		EWZ0006
	LECOM-A/B (RS232/RS485)		EMF2102IB-V001
	LON		EMF2141IB
	CAN (system bus)		EMF2171IB
	CAN (system bus with addressing)		EMF2172IB
	INTERBUS		EMF2111IB
	INTERBUS loop		EMF2112IB
	PROFIBUS-DP		EMF2133IB
	DeviceNet/CANopen		EMF2175IB
	Keypad		E82ZBC
	Mounting kit for control cabinet for E82ZBC keypad (e.g. for mounting into the control cabinet door, an additional connecting cable is required)		E82ZBHT
	Hand terminal = Keypad in hand-held design (additional connecting cable required)		E82ZBB
	Keypad XT		EMZ9371BC
	Hand terminal = Keypad XT in hand-held design (additional connecting cable required)		E82ZBBXC
	Connecting cable	2.5 m	E82ZWL025
		5 m	E82ZWL050
		10 m	E82ZWL100
Braking operation	Half-wave rectifier (14.630.33.016)		E82ZWBR3
	Bridge rectifier (14.630.32.016)		E82ZWBR1
Automation	Drive PLC		EPL-10200
	Extension Board 1 for Drive PLC		EPZ-10201
	Extension Board 2 for Drive PLC		EPZ-10202
	Extension Board 3 for Drive PLC		EPZ-10203
	Drive PLC Developer Studio BASIC		ESP-DDS1-B
	Drive PLC Developer Studio PROFESSIONAL		ESP-DDS1-P
	PC system bus converter (voltage supply via keypad with DIN connection)		EMF2173IB
	PC system bus converter (voltage supply via keypad with PS2 connection)		EMF2173IB-V002
	Terminal extension for system bus (CAN)		EMZ9374IB

Accessories	Name		Order no.
Parameter setting software	"Global Drive Control (GDC)"		ESP-GDC2
	"Global Drive Control Easy (GDCeasy)"		ESP-GDC2-E
	PC system cable RS232	0.5 m	EWL0048
		5 m	EWL0020
		10 m	EWL0021
Others	Setpoint potentiometer		ERPD0001K0001W
	Knob for setpoint potentiometer		ERZ0001
	Scale for setpoint potentiometer		ERZ0002
	Digital display		EPD203
Documentation (When ordering please select a language)	System Manual for 8200 vector German/English/French		EDS82EV903
	Communication Manual CAN German/English/French		EDSCAN
	Communication Manual INTERBUS German/English/French		EDSIBUS
	Communication Manual PROFIBUS German/English/French		EDSPBUS
	Communication Manual LECOM German/English/French		EDSLECOM

17.3 Type-specific accessories

17.3.1 Operation with rated power (mains voltage 1/N/PE AC 230 V)

Mains voltage 1/N/PE AC 230 V	**8200 vector**					
	E82EV251K2C	**E82EV371K2C**	**E82EV551K2C**	**E82EV751K2C**	**E82EV152K2C**	**E82EV222K2C**
Accessories	**Order no.**					
E.l.c.b.	EFA1C10A	EFA1C10A	EFA1B10A	EFA1B16A EFA1B10A 2)	EFA1B20A EFA1B16A 2)	EFA1B20A
Fuse	EFSM-0100AWE	EFSM-0100AWE	EFSM-0100AWE	EFSM-0160AWE EFSM-0100AWE 2)	EFSM-0200AWE EFSM-0160AWE 2)	EFSM-0200AWE
Fuse holder	EFH10001					
Mains choke	ELN1-0900H005		ELN1-0500H009		ELN1-0250H018 3)	
RFI filter LL 1)	E82ZZ37112B220		E82ZZ75112B220		-	
RFI filter SD 1)	E82ZZ37112B200		E82ZZ75112B200		E82ZZ22212B200	
RFI filter LD 1)	E82ZZ37112B210		E82ZZ75112B210		E82ZZ22212B210	
Motor filter	E82ZM22232B					
Brake resistor	ERBM470R020W		ERBM200R100W		ERBM082R150W	ERBM052R200W
Swivel support	E82ZJ001					
DIN rail mounting	E82ZJ002					
EMC shield connection	E82ZWEM1		E82ZWEM2		E82ZWEM2	
PTC kit	E82ZPE1		E82ZPE2		E82ZPE2	
DC fuse without signalling device	–		EFSGR0100AYHN	EFSGR0120AYHN	EFSGR0250AYHN	EFSGR0320AYHN
DC fuse with signalling device	–		EFSGR0100AYHK	EFSGR0120AYHK	EFSGR0250AYHK	EFSGR0320AYHK
Plug connector (function module contact)	E82ZJ011					

1) Only in combination with 8200 vector, types E82EVxxxKxC**200**
2) For operation with mains choke
3) Always use a mains choke

17.3.2 Operation with increased rated power (mains voltage 1/N/PE AC 230 V)

Mains voltage 1/N/PE AC 230 V	**8200 vector**			
	E82EV251K2C	**E82EV551K2C**	**E82EV751K2C**	**E82EV152K2C**
Accessories	**Order no.**			
E.l.c.b.	EFA1C10A	EFA1B10A	EFA1B16A	EFA1B20A
Fuse	EFSM-0100AWE	EFSM-0100AWE	EFSM-0160AWE	EFSM-0200AWE
Fuse holder	EFH10001			
Mains choke	ELN1-0900H005	ELN1-0500H009	ELN1-0500H009 3)	ELN1-0250H018
RFI filter SD 1)	E82ZZ37112B200	E82ZZ75112B200		E82ZZ22212B200
RFI filter LD 1)	E82ZZ37112B210	E82ZZ75112B210		E82ZZ22212B210
Motor filter	E82ZM22232B			
Brake resistor	ERBM470R020W	ERBM200R100W		ERBM082R150W
Swivel support	E82ZJ001			
DIN rail mounting	E82ZJ002			
EMC shield connection	E82ZWEM1	E82ZWEM2		
PTC kit	E82ZPE1	E82ZPE2		
DC fuse without signalling device	–	EFSGR0100AYHN	EFSGR0120AYHN	EFSGR0250AYHN
DC fuse with signalling device	–	EFSGR0100AYHK	EFSGR0120AYHK	EFSGR0250AYHK
Plug connector (function module contact)	E82ZJ011			

1) Only in combination with 8200 vector, types E82EVxxxKxC**200**
2) For operation with mains choke
3) Always use a mains choke

17.3.3 Operation with rated power (mains voltage 3/PE AC 230 V)

<table>
<tr><th rowspan="2">Mains voltage 3//PE AC 230 V</th><th colspan="4">8200 vector</th></tr>
<tr><th>E82EV551K2C</th><th>E82EV751K2C</th><th>E82EV152K2C</th><th>E82EV222K2C</th></tr>
<tr><th>Accessories</th><th colspan="4">Order no.</th></tr>
<tr><td>E.l.c.b.</td><td>EFA3B06A</td><td>EFA3B10A
EFA3B06A 2)</td><td>EFA3B16A
EFA3B10A 2)</td><td>EFA3B16A
EFA3B10A 2)</td></tr>
<tr><td>Fuse</td><td>EFSM-0060AWE</td><td>EFSM-0100AWE
EFSM-0060AWE 2)</td><td>EFSM-0160AWE
EFSM-0100AWE 2)</td><td>EFSM-0160AWE
EFSM-0100AWE 2)</td></tr>
<tr><td>Fuse holder</td><td colspan="4">EFH10001</td></tr>
<tr><td>Mains choke</td><td colspan="2">E82ZL75132B</td><td colspan="2">E82ZL22232B</td></tr>
<tr><td>RFI filter SD 1)</td><td colspan="2">E82ZZ75132B200</td><td colspan="2">E82ZZ22232B200</td></tr>
<tr><td>RFI filter LD 1)</td><td></td><td>E82ZZ75132B210</td><td></td><td>E82ZZ22232B210</td></tr>
<tr><td>Motor filter</td><td colspan="4">E82ZM22232B</td></tr>
<tr><td>Brake resistor</td><td colspan="2">ERBM200R100W</td><td>ERBM082R150W</td><td>ERBM052R200W</td></tr>
<tr><td>Swivel support</td><td colspan="4">E82ZJ001</td></tr>
<tr><td>DIN rail mounting</td><td colspan="4">E82ZJ002</td></tr>
<tr><td>EMC shield connection</td><td colspan="4">E82ZWEM2</td></tr>
<tr><td>PTC kit</td><td colspan="4">E82ZPE2</td></tr>
<tr><td>DC fuse without signalling device</td><td>EFSGR0080AYHN</td><td>EFSGR0100AYHN</td><td>EFSGR0160AYHN</td><td>EFSGR0250AYHN</td></tr>
<tr><td>DC fuse with signalling device</td><td>EFSGR0080AYHK</td><td>EFSGR0100AYHK</td><td>EFSGR0160AYHK</td><td>EFSGR0250AYHK</td></tr>
<tr><td>Plug connector (function module contact)</td><td colspan="4">E82ZJ011</td></tr>
</table>

<table>
<tr><th rowspan="2">Mains voltage 3//PE AC 230 V</th><th colspan="4">8200 vector</th></tr>
<tr><th>E82EV302K2C</th><th>E82EV402K2C</th><th>E82EV552K2C</th><th>E82EV752K2C</th></tr>
<tr><th>Accessories</th><th colspan="4">Order no.</th></tr>
<tr><td>E.l.c.b.</td><td>EFA3B20A
EFA3B16A 2)</td><td>EFA3B25A
EFA3B20A 2)</td><td>EFA3B25A 2)</td><td>–</td></tr>
<tr><td>Fuse</td><td>EFSM-0200AWE
EFSM-0160AWE 2)</td><td>EFSM-0250AXH
EFSM-0200AWE 2)</td><td>EFSM-0320AWH
EFSM-0250AXH 2)</td><td>EFSM-0320AWH</td></tr>
<tr><td>Fuse holder</td><td>EFH10001</td><td>EFH10002
EFH10001 2)</td><td colspan="2">EFH10002</td></tr>
<tr><td>Mains choke</td><td colspan="2">ELN3-0120H017</td><td>ELN3-0120H025</td><td>ELN3-0088H035 3)</td></tr>
<tr><td>RFI filter SD 1)</td><td colspan="2">E82ZZ40232B200</td><td colspan="2">E82ZZ75232B200</td></tr>
<tr><td>RFI filter LD 1)</td><td colspan="2">E82ZZ40232B210</td><td colspan="2">E82ZZ75232B210</td></tr>
<tr><td>Motor filter</td><td colspan="2">E82ZM75234B</td><td colspan="2">E82ZM11334B</td></tr>
<tr><td>Brake resistor</td><td colspan="4">ERBD047R01K2</td></tr>
<tr><td>Swivel support</td><td colspan="2">E82ZJ005</td><td colspan="2">E82ZJ006</td></tr>
<tr><td>EMC shield connection</td><td colspan="4">E82ZWEM3</td></tr>
<tr><td>PTC kit</td><td colspan="4">E82ZPE3</td></tr>
<tr><td>DC fuse without signalling device</td><td>EFSGR0320AYHN</td><td></td><td>EFSGR0400AYHN</td><td>–</td></tr>
<tr><td>DC fuse with signalling device</td><td>EFSGR0320AYHK</td><td colspan="2">EFSGR0400AYHK</td><td>–</td></tr>
<tr><td>Plug connector (function module contact)</td><td colspan="4">E82ZJ011</td></tr>
</table>

1) Only in combination with 8200 vector, types E82EVxxxKxC**200**
2) For operation with mains choke
3) Always use a mains choke

17.3.4 Operation with increased rated power (mains voltage 3/PE AC 230 V)

Mains voltage 3//PE AC 230 V	**8200 vector**				
	E82EV551K2C	**E82EV751K2C**	**E82EV152K2C**	**E82EV302K2C**	**E82EV552K2C**
Accessories	**Order no.**				
E.l.c.b.	EFA3B06A	EFA3B10A	EFA3B16A EFA3B10A 2)	EFA3B25A EFA3B20A2)	EFA3B32A
Fuse	EFSM-0060AWE	EFSM-0100AWE	EFSM-0160AWE EFSM-0100AWE 2)	EFSM-0250AXH EFSM-0200AWE 2)	EFSM-0320AWH
Fuse holder	EFH10001			EFH10002 EFH10001 2)	EFH10002
Mains choke	E82ZL75132B	E82ZL75132B 3)	E82ZL22232B	ELN3-0120H017	ELN3-0088H035 3)
RFI filter SD 1)	E82ZZ75132B200		E82ZZ22232B200	E82ZZ40232B200	E82ZZ75232B200
RFI filter LD 1)	E82ZZ75132B210		E82ZZ22232B210	E82ZZ40232B210	E82ZZ75232B210
Motor filter	E82ZM22232B			E82ZM75234B	E82ZM11334B
Brake resistor	ERBM200R100W		ERBM082R150W	ERBD047R01K2	
Swivel support	E82ZJ001			E82ZJ005	E82ZJ006
DIN rail mounting	E82ZJ002			–	
EMC shield connection	E82ZWEM2			E82ZWEM3	
PTC kit	E82ZPE2			E82ZPE3	
DC fuse without signalling device	EFSGR0080AYHN	EFSGR0100AYHN	EFSGR0160AYHN	EFSGR0320AYHN	EFSGR0400AYHN
DC fuse with signalling device	EFSGR0080AYHK	EFSGR0100AYHK	EFSGR0160AYHK	EFSGR0320AYHK	EFSGR0400AYHK
Plug connector (function module contact)	E82ZJ011			E82ZJ011	

1) Only in combination with 8200 vector, types E82EVxxxKxC**200**
2) For operation with mains choke
3) Always use a mains choke

17.3.5 Operation with rated power (mains voltage 3/PE AC 400 V)

<table>
<tr><th rowspan="2">Mains voltage 3//PE AC 400 V</th><th colspan="4">8200 vector</th></tr>
<tr><th>E82EV551K4C [4]</th><th>E82EV751K4C [4]</th><th>E82EV152K4C [4]</th><th>E82EV222K4C [4]</th></tr>
<tr><th>Accessories</th><th colspan="4">Order no.</th></tr>
<tr><td>E.l.c.b.</td><td>EFA3B06A</td><td>EFA3B06A</td><td>EFA3B10A</td><td>EFA3B10A</td></tr>
<tr><td>Fuse</td><td>EFSM-0060AWE</td><td>EFSM-0060AWE</td><td>EFSM-0100AWE</td><td>EFSM-0100AWE</td></tr>
<tr><td>Fuse holder</td><td colspan="4">EFH10001</td></tr>
<tr><td>Mains choke</td><td colspan="2">EZN3A1500H003</td><td></td><td>E82ZL22234B</td></tr>
<tr><td>RFI filter SD [1]</td><td colspan="2">E82ZZ75134B200</td><td></td><td>E82ZZ22234B200</td></tr>
<tr><td>RFI filter LD [1]</td><td colspan="2">E82ZZ75134B210</td><td></td><td>E82ZZ22234B210</td></tr>
<tr><td>Motor filter</td><td colspan="2">E82ZM75134B</td><td></td><td>E82ZM22234B020</td></tr>
<tr><td>Brake resistor</td><td colspan="2">ERBM470R100W</td><td>ERBM370R150W</td><td>ERBM240R200W</td></tr>
<tr><td>Swivel support</td><td colspan="4">E82ZJ001</td></tr>
<tr><td>DIN rail mounting</td><td colspan="4">E82ZJ002</td></tr>
<tr><td>EMC shield connection</td><td colspan="4">E82ZWEM2</td></tr>
<tr><td>PTC kit</td><td colspan="4">E82ZPE2</td></tr>
<tr><td>DC fuse without signalling device</td><td colspan="2">EFSGR0060AYHN</td><td>EFSGR0100AYHN</td><td>EFSGR0120AYHN</td></tr>
<tr><td>DC fuse with signalling device</td><td colspan="2">EFSGR0060AYHK</td><td>EFSGR0100AYHK</td><td>EFSGR0120AYHK</td></tr>
<tr><td>Plug connector (function module contact)</td><td colspan="4">E82ZJ011</td></tr>
</table>

1) Only in combination with 8200 vector, types E82EVxxxKxC**200**

2) For operation with mains choke

3) Always use a mains choke

4) The following applies to the 8200 vector with EMC filter:

In the mains voltage range of 484 V (-0%)…550 V (+0%) operation is only permissible when using a brake resistor

<table>
<tr><th rowspan="2">Mains voltage 3//PE AC 400 V</th><th colspan="5">8200 vector</th></tr>
<tr><th>E82EV302K4C</th><th>E82EV402K4C</th><th>E82EV552K4C</th><th>E82EV752K4C</th><th>E82EV113K4C</th></tr>
<tr><th>Accessories</th><th colspan="5">Order no.</th></tr>
<tr><td>E.l.c.b.</td><td>EFA3B16A
EFA3B10A [2]</td><td>EFA3B16A</td><td>EFA3B25A
EFA3B20A [2]</td><td>EFA3B32A
EFA3B20A [2]</td><td>EFA3B32A</td></tr>
<tr><td>Fuse</td><td>EFSM-0160AWE
EFSM-0100AWE [2]</td><td>EFSM-0160AWE</td><td>EFSM-0250AXH
EFSM-0200AWE [2]</td><td>EFSM-0320AWH
EFSM-0200AWE [2]</td><td>EFSM-0320AWH</td></tr>
<tr><td>Fuse holder</td><td colspan="2">EFH10001</td><td>EFH10002
EFH10001 [2]</td><td>EFH10002
EFH10001 [2]</td><td>EFH10002</td></tr>
<tr><td>Mains choke</td><td>EZN3A0500H007</td><td colspan="2">EZN3A0300H013</td><td>ELN3-0120H017</td><td>ELN3-0150H024 [3]</td></tr>
<tr><td>RFI filter SD [1]</td><td colspan="3">E82ZZ55234B200</td><td colspan="2">E82ZZ11334B200</td></tr>
<tr><td>RFI filter LD [1]</td><td colspan="3">E82ZZ55234B210</td><td colspan="2">E82ZZ11334B210</td></tr>
<tr><td>Motor filter</td><td colspan="2">E82ZM40234B</td><td colspan="2">E82ZM75234B</td><td>E82ZM11334B</td></tr>
<tr><td>Brake resistor</td><td>ERBD180R300W</td><td>ERBD100R600W</td><td>ERBD082R600W</td><td>ERBD068R800W</td><td>ERBD047R01K2</td></tr>
<tr><td>Swivel support</td><td></td><td>E82ZJ005</td><td></td><td colspan="2">E82ZJ006</td></tr>
<tr><td>EMC shield connection</td><td colspan="5">E82ZWEM3</td></tr>
<tr><td>PTC kit</td><td colspan="5">E82ZPE3</td></tr>
<tr><td>DC fuse without signalling device</td><td>EFSGR0200AYHN</td><td>EFSGR0250AYHN</td><td>EFSGR0320AYHN</td><td colspan="2">EFSGR0400AYHN</td></tr>
<tr><td>DC fuse with signalling device</td><td>EFSGR0200AYHK</td><td>EFSGR0250AYHK</td><td>EFSGR0320AYHK</td><td colspan="2">EFSGR0400AYHK</td></tr>
<tr><td>Plug connector (function module contact)</td><td colspan="5">E82ZJ011</td></tr>
</table>

1) Only in combination with 8200 vector, types E82EVxxxKxC**200**

2) For operation with mains choke

3) Always use a mains choke

Mains voltage 3//PE AC 400 V	8200 vector			
	E82EV153K4B201	E82EV223K4B201 [2)]	E82EV303K4B201 [2)]	E82EV453K4B201 [2)]
Accessories	Order no.			
Built-on mains filter A [1)]	EZN3A0110H030	EZN3A0080H042	EZN3A0055H060	EZN3A0037H090
Built-on mains filter B [1)]	EZN3B0110H030	EZN3B0080H042	EZN3B0055H060	EZN3B0037H090
Footprint RFI filter	E82ZZ15334B230	–	–	–
Footprint mains filter	E82ZN22334B230	E82ZN22334B230	E82ZN30334B230	E82ZN45334B230
Mains choke	ELN3-088H035	ELN3-0075H045	ELN3-0055H055	ELN3-0038H085
Motor filter	ELM3-004H055	ELM3-004H055	on request	
Sinusoidal filter	on request			
Brake module	EMB9351-E			
Brake chopper	EMB9352-E			
Brake resistor	ERBD033R02K0	ERBD022R03K0	ERBD018R03K0	ERBD022R03K0

Mains voltage 3//PE AC 400 V	8200 vector		
	E82EV553K4B201 [2)]	E82EV753K4B201 [2)]	E82EV903K4B201 [2)]
Accessories	Order no.		
Built-on mains filter A [1)]	EZN3A0030H110	EZN3A0022H150	EZN3A0017H200
Built-on mains filter B [1)]	EZN3B0033H110	EZN3B0022H150	EZN3B0017H200
Footprint mains filter	E82ZN55334B230	E82ZN75334B230	E82ZN90334B230
Mains choke[1)]	ELN3-0027H105	ELN3-0022H130	ELN3-0017H170
Motor filter	on request	on request	on request
Sinusoidal filter	on request	on request	on request
Brake module	EMB9351-E	EMB9351-E	EMB9351-E
Brake chopper	EMB9352-E	EMB9352-E	EMB9352-E
Brake resistor	ERBD018R03K0	ERBD022R03K0	ERBD018R03K0

1) Only in combination with 8200 vector, types E82EVxxxKxB**201**

2) Always use a mains choke or mains filter

17.3.6 Operation with increased rated power (mains voltage 3/PE AC 400 V)

Mains voltage 3//PE AC 400 V	8200 vector				
	E82EV551K4C	**E82EV751K4C**	**E82EV222K4C**	**E82EV302K4C**	**E82EV402K4C**
Accessories	**Order no.**				
E.l.c.b.	EFA3B06A	EFA3B06A	EFA3B10A	EFA3B16A EFA3B10A 2)	EFA3B16A
Fuse	EFSM-0060AWE	EFSM-0060AWE	EFSM-0100AWE	EFSM-0160AWE EFSM-0100AWE 2)	EFSM-0160AWE
Fuse holder	EFH10001				
Mains choke	EZN3A1500H003	EZN3A1500H003 3)	EZ82ZL22234B 3)	EZN3A0300H013	EZN3A0300H013 3)
RFI filter SD 1)	E82ZZ75134B200		E82ZZ22234B200	E82ZZ55234B200	
RFI filter LD 1)	E82ZZ75134B210		E82ZZ22234B210	E82ZZ55234B210	
Motor filter	E82ZM75134B		E82ZM22234B020	E82ZM40234B	
Brake resistor	ERBM470R100W		ERBM240R200W	ERBD180R300W	ERBD100R600W
Swivel support	E82ZJ001			E82ZJ005	
DIN rail mounting	E82ZJ002			–	
EMC shield connection	E82ZWEM2			E82ZWEM3	
PTC kit	E82ZPE2			E82ZPE3	
DC fuse without signalling device	EFSGR060AYHN		EFSGR0120AYHN	EFSGR0200AYHN	EFSGR0250AYHN
DC fuse with signalling device	EFSGR060AYHK		EFSGR0120AYHK	EFSGR0200AYHK	EFSGR0250AYHK
Plug connector (function module contact)	E82ZJ011				

1) Only in combination with 8200 vector, types E82EVxxxKxC**200**
2) For operation with mains choke
3) Always use a mains choke

Mains voltage 3//PE AC 400 V	8200 vector			
	E82EV153K4B201 2)	**E82EV223K4B201 2)**	**E82EV303K4B201 2)**	**E82EV453K4B201 2)**
Accessories	**Order no.**			
Built-on mains filter A 1)	EZN3A0080H042	EZN3A0060H054	EZN3A0055H060	EZN3A0030H110
Built-on mains filter B 1)	EZN3B0080H042	EZN3B0060H054	EZN3B0055H060	EZN3B0030H110
Footprint mains filter	E82ZN22334B230	E82ZN30334B230	–	–
Mains choke 1)	ELN3-0075H045	ELN3-0055H055	ELN3-0055H055	ELN3-0027H105
Motor filter	ELM3-004H055	on request		
Sinusoidal filter	on request			
Brake module	EMB9351-E			
Brake chopper	EMB9352-E			
Brake resistor	ERBD033R02K0	ERBD022R03K0	ERBD018R03K0	ERBD022R03K0

Mains voltage 3//PE AC 400 V	8200 vector		
	E82EV153K4B201 2)	**E82EV223K4B201 2)**	**E82EV303K4B201 2)**
Accessories	**Order no.**		
Built-on mains filter A 1)	–	EZN3A0022H150	EZN3A0017H200
Built-on mains filter B 1)	–	EZN3B0022H150	EZN3B0017H200
Footprint mains filter	–	E82ZN90334B230	–
Mains choke 1)	ELN3-0022H130	ELN3-0017H170	ELN3-0014H200
Motor filter	on request		
Sinusoidal filter	on request		
Brake module	EMB9351-E		
Brake chopper	EMB9352-E	EMB9352-E (3 x)	EMB9352-E (3 x)
Brake resistor	ERBD018R03K0 (2 x)	ERBD022R03K0	ERBD018R03K0

1) Only in combination with 8200 vector, types E82EVxxxKxB**201**
2) Always use a mains choke or mains filter