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EDH8200UE
00406193

Lenze

# Manual

s

## Global Drive

*Frequency inverters 8200*

This Manual is valid for 82XX controllers as of version:

| | | | | | |
|---|---|---|---|---|---|
| 33.820X- | E- | 1x. | 1x | | (8201 - 8204) |
| 33.8202- | E- | 1x. | 1x | -V002 | Reduced assembly depth (8202) |
| 33.821X- | E- | 0x. | 1x | | (8211 - 8218) |
| 33.821X- | E- | 1x. | 2x | | (8211 - 8218) |
| 33.821X- | C- | 1x. | 2x | -V003 | Cold plate (8215 - 8218) |
| 33.821X- | E- | 3a. | 3x | -V020 | HVAC (8211 - 8218) |
| 33.822X- | E- | 0x. | 0x | | (8221 - 8227) |
| 33.822X- | C- | 1x. | 2x | -V003 | Cold plate (8221 - 8222) |
| 33.822X- | E- | 3a. | 3x | -V020 | HVAC (8221 - 8227) |
| 33.824X- | E- | 1x. | 1x | | (8241 - 8246) |
| 33.824X- | C- | 1x. | 1x | -V003 | Cold plate (8241 - 8246) |
| 33.824X- | E- | 3a. | 3x | -V020 | HVAC (8241 - 8246) |

Type

Design:
B = Module
C = Cold plate
E = Built-in unit IP20

Hardware version and index

Software version and index

Variant

Explanation

| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

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| | | 402381 | 06/98 | Operating Instructions for fieldbus module 2171/2172 |
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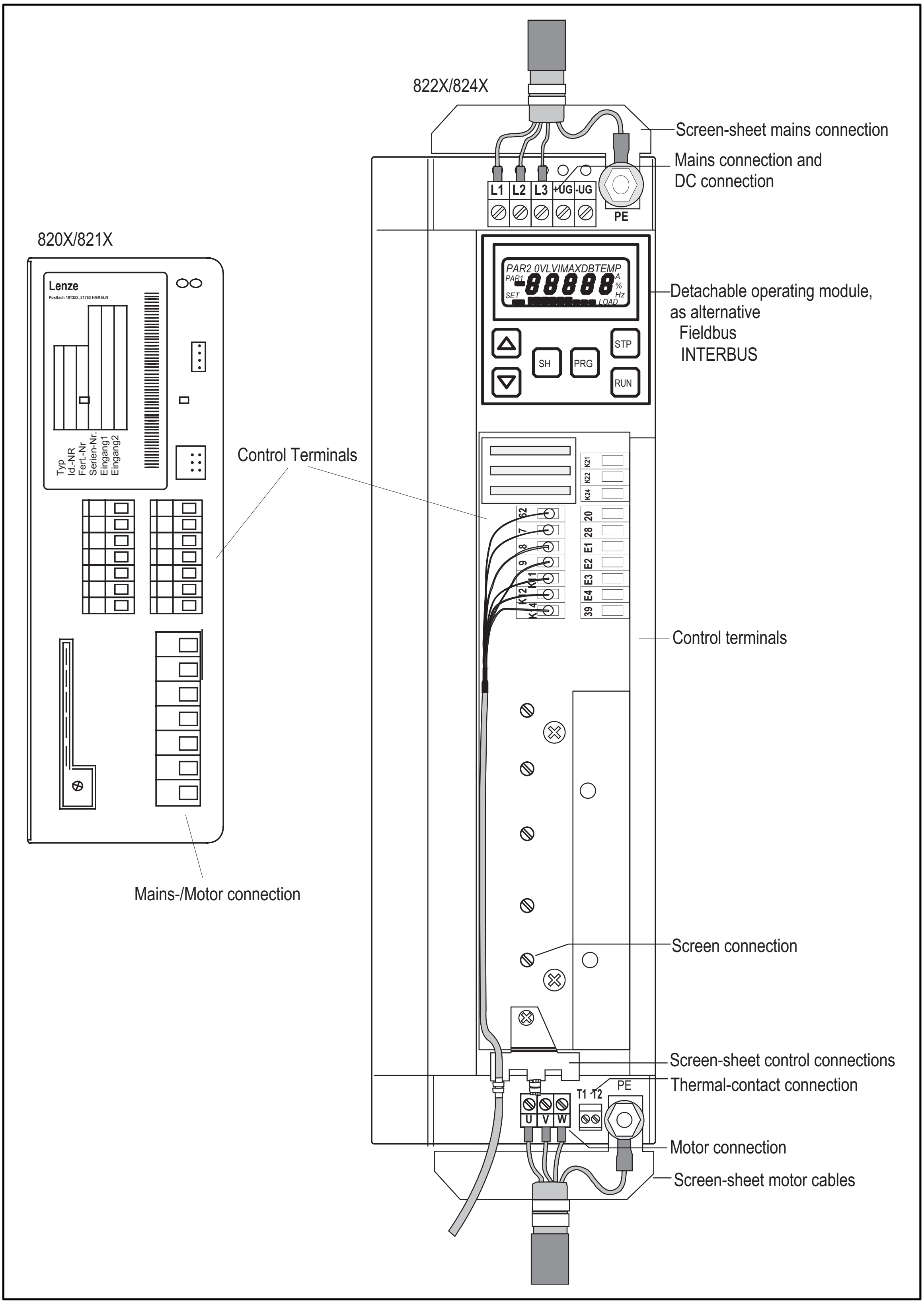

822X/824X
Screen-sheet mains connection
Mains connection and
DC connection
L1 L2 L3 +UG -UG
PE
820X/821X
Lenze
Detachable operating module,
as alternative
Fieldbus
INTERBUS
SH
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Control Terminals
Control terminals
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## Part D1



## Part D2

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00406181

# Manual
# Part A

## Table of contents

## Preface and general information

## Safety information

# Global Drive

## Frequency inverters 8200

This Manual is valid for 82XX controllers as of version:

| Type | Design | Hardware version and index | Software version and index | Variant | Explanation |
|---|---|---|---|---|---|
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| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

# 1 Preface and general information

## 1.1 How to use this Manual

- This Manual completes the Operating Instructions for 82XX frequency inverters.
- It contains the Operating Instructions and additional information on planning, adaptability and the accessories valid at the time of printing.
  - In case of doubt, refer to the Operating Instructions delivered with the 82XX frequency inverters.
- The Manual is a help to select and adapt the 82XX frequency inverters and the accessories to ensure safe and trouble-free operation. It contains safety information which must be observed.
- The Manual must always be in a complete and perfectly readable state.

### 1.1.1 Terminology used

| Term | In the following text used for |
|---|---|
| **82XX** | Any frequency inverter of the series 8200, 8210, 8220, 8240 |
| **Controllers** | 82XX frequency inverter |
| **Drive system** | Drive systems with 82XX frequency inverters and other Lenze drive components |

## 1.2 Scope of delivery

| Scope of delivery | Important |
|---|---|
| • 1 82XX frequency inverter<br>• 1 Operating Instructions<br>• 1 accessory kit (components and pieces for mechanical and electrical installation) | After reception of the delivery, check immediately whether the scope of supply matches the accompanying papers. Lenze does not accept any liability for deficiencies claimed subsequently.<br>Claim<br>• visible transport damage immediately to the forwarder.<br>• visible deficiencies/incompleteness immediately to your Lenze representative. |

# Preface and general information

| | Accessory kit | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 820X | 821X | 821X-V003 | 8221 8222 8223 | 8224 8225 | 8226 8227 | 8221-V003 8222-V003 | 824X | 824X-V003 |
| 7-pole socket connectors for control cables | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 3-pole socket connectors for relay output K2 | - | - | - | 1 | 1 | 1 | 1 | 1 | 1 |
| Fixing rails | 2 | 2 | 2 | - | - | - | - | 2 | - |
| Fixing units incl. screws for fixing the inverter to the housing | - | - | - | 4 | 4 | - | - | - | - |
| PG diaphragm gland 21 | - | - | - | 1 | 1 | 1 | 1 | - | - |
| Screen sheet for control cables incl. fixing screw | - | - | - | 1 | 1 | 1 | 1 | 1 | 1 |
| Screen sheet for motor cable incl. two fixing screws | - | - | - | 1 | 1 | 1 | 1 | 1 | 1 |
| Hexagon nuts incl. washers and spring-lock washers for the electrical connection of the power stage | - | - | - | 8 M6 | 8 M8 | 8 M10 | 8 M6 | - | - |
| Heat-conducting paste | - | - | 1 tube | - | - | - | 1 tube | - | 1 tube |
| Gasket | - | - | 1 | - | - | - | 1 | - | 1 |
| Tightening frame | - | - | 1 | - | - | - | 2 | - | 2 |

## 1.3 Legal regulations

| | | | |
|---|---|---|---|
| **Identification** | **Nameplate** | **CE-identification** | **Manufacturer** |
| | Lenze controllers are unambiguously designated by the contents of the nameplate. | Conforms to the EC Low Voltage Directive | Lenze GmbH & Co KG<br>Postfach 101352<br>D-31763 Hameln |
| **Application as directed** | **82XX frequency inverter**<br>• operate the controller only under the conditions prescribed in these operating instructions.<br>• are components<br>- for open and closed looped control of variable speed drives with asynchronous standard motors, reluctance motors, PM synchronous motors with asynchronous damper cage,<br>- for installation into a machine,<br>- used for assembly together with other components to form a machine.<br>• are electric units for the installation into control cabinets or similar enclosed operating housing.<br>• comply with the requirements of the Low-Voltage Directive.<br>• are not machines for the purpose of the Machinery Directive.<br>• are not to be used as domestic appliances, but only for industrial purposes.<br>**Drive systems with 82XX frequency inverters**<br>• meet the EC Electromagnetic Compatibility Directive if they are installed according to the guidelines of CE-typical drive systems.<br>• can be used<br>- on public and non-public mains,<br>- in industrial as well as residential and commercial premises.<br>• The user is responsible for the compliance of his application with the EC directives.<br>**Any other use shall be deemed inappropriate!** | | |
| **Liability** | • The information, data, and notes in these instructions met the state of the art at the time of printing. Claims on modifications referring to controllers which have already been supplied cannot be derived from the information, illustrations, and descriptions.<br>• The specifications, processes, and circuitry described in these instructions are for guidance only and must be adapted to your own specific application. Lenze does not take responsibility for the suitability of the process and circuit proposals.<br>• The specifications in these instructions describe the product features without guaranteeing them.<br>• Lenze does not accept any liability for damage and operating interference caused by:<br>- disregarding the operating instructions<br>- unauthorised modifications to the controller<br>- operating errors<br>- improper working on and with the controller | | |
| **Warranty** | • Warranty conditions: See Sales and Delivery Conditions of Lenze GmbH & Co KG.<br>• Warranty claims must be made to Lenze immediately after detecting the deficiency or fault.<br>• The warranty is void in all cases where liability claims cannot be made. | | |
| **Disposal** | **Material** | **Recycle** | **Dispose** |
| | Metal | ● | - |
| | Plastic | ● | - |
| | Assembled PCBs | - | ● |

## 1.4 EC Directives/Declaration of Conformity

### 1.4.1 What is the purpose of EC directives?

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

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

### 1.4.2 What does the CE mark imply?

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

The enclosure of a conformity certification is not necessary according to most directives. Therefore, the customer is not able to appreciate which of the 21 EC directives applies to a product and which harmonised standards are considered in the conformity verification.

Controllers on their own with the CE mark exclusively correspond to the Low Voltage Directive. For the compliance with the EMC Directive only general recommendations have been issued so far. The CE conformity of the installed machine remains the responsibility of the user. For the installation of CE-typical drive systems, Lenze has already proved the CE conformity to the EMC Directive.

## 1.4.3 EC Low-Voltage Directive

(73/23/EEC)

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

**General**

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

# EC Declaration of Conformity ’95

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

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

820X/821X/822X/824X controllers are developed, designed, and manufactured in compliance with the above mentioned EC Directive under the sole responsibility of

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

**Standards considered:**

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

Hameln, 01 October, 1995

(i. V. Loy)
Product Manager

### 1.4.4 EC Directive Electromagnetic Compatibility

(89/336/EEC)

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

**General**

- The EC Electromagnetic Compatibility Directive is effective for "devices" which may cause electromagnetic interference or the operation of which may be impaired by such interference.
- The aim is to limit the generation of electromagnetic interference so that an operation without interference to radio and telecommunication systems and other equipment is possible. The devices must also show an appropriate resistance against electromagnetic interference to ensure the application as directed.
- Controllers cannot be driven in stand-alone operation and therefore the controllers cannot be evaluated on their own in terms of EMC. Only after the integration of the controllers into a drive system, can this system be tested concerning the objectives of the EC EMC Directive and the compliance with the "Law about the Electromagnetic Compatibility of Devices".
- Lenze has verified the conformity of controllers integrated into certain defined drive systems. In the following these systems are called "CE-typical drive systems".

  The following configurations can now be selected by the user:
  - The user himself can determine the system components and their integration into the drive system and is then held responsible for the conformity of the drive.
  - The user can select the CE-typcial drive systems for which the manufacturer has already proved the conformity.

## Components of the CE-typical drive system

| System component | Specification |
|---|---|
| Controller | 820X/821X/822X/824X controllers<br>For type designation see inner cover page |
| RFI filter | For data and data assignment, see chapter "Accessories" |
| Mains choke | For data and data assignment, see chapter "Accessories" |
| Mains filters | For data and data assignment, see chapter "Accessories" |
| Motor cable | Screened power cable with tinned E-CU braid with a minimum of 85 % optical coverage |
| Mains cable between RFI filter and controller | As from cable length 300 mm:<br>Screened power cable with tinned E-CU braid with a minimum of 85 % optical coverage |
| Control cables | Screened signal cable type LIYCY |
| Motor | Standard three-phase AC asynchronous motor<br>Lenze type DXRA or similar |
| Accessories | For rated accessories, see inner cover page. |

- Controller, RFI filter and mains choke are mounted on one assembly board.
- The system components are functionally wired according to chapter 4, "Electrical installation".

## Application as directed/Scope of application

- The 820X/821X/822X/824X controllers are intended for the use in control cabinets.
- The 820X/821X/822X/824X controllers are directed as components for the control of variable-speed drives with three-phase AC motors to be assembled together with other components to form a drive system.
  The drive systems are intended for installation into a machine or for the construction together with other components to form a machine or a plant.
- Drive systems with the 820X/821X/822X/824X controllers, which are installed according to the guidelines of CE-typical drive systems, correspond to the EC EMC Directive and the standards mentioned below.
- The CE-typical drive systems are suitable for the operation on public and non-public mains.
- The CE-typical drive systems are provided for the operation in industrial premises as well as in residential and commercial areas.
- Because of the earth-potential reference of the RFI filters, the described CE-typical drive systems are not suitable for the connection to IT-mains (mains without earth-reference potential).
- The controllers are not domestic appliances, but they are intended as a part of drive systems for commercial use.

# EC Declaration of Conformity ’95 for the purpose of the EC Directive

## on Electromagnetic Compatibility (89/336/EEC)

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

820X/821X/822X/824X controllers cannot be driven in stand-alone operation for the purpose of the Regulation about Electromagnetic Compatibility (EMVG of 9/11/92 and 1. EMVGÄndG of 08 August, 1995). The EMC can only be verified when the controller is integrated into a drive system.

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

declares that the described ”CE-typical drive systems” with the controllers of the types 820X/821X/822X/824X comply with the above mentioned EC Directive.

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

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

### Generic standards considered:

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

# Preface and general information

## Considered basic standards for the test of noise emission:

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

Hameln, 01 October, 1995

(i. V. Loy)
Product Manager

## 1.4.5 EC Machinery Directive

(89/392/EEC)

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

**General**

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

## EC Manufacturer's Declaration

### for the purpose of the EC Machinery Directive (98/392/EEC)

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

The 820X/821X/822X/824X controllers were developed, designed, and manufactured under the sole responsibility of

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

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

Hameln, 01 October, 1995

(i. V. Loy)
Product Manager

# 2 Safety information

## 2.1 General safety information

### Safety and application notes for controllers

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

**1. General**

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

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

Further information can be obtained from the documentation.

All operations concerning transport, installation, and commissioning as well as maintenance must be carried out by qualified, skilled personnel (IEC 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 erection, assembly, commissioning, and operation of the product and who have the qualifications necessary for their occupation.

**2. Application as directed**

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

When installing in machines, commissioning of the drive controllers (i.e. the starting of operation as directed) is prohibited until it is proven that the machine corresponds to the regulations of the EC Directive 89/392/EEC (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 EN 50178/ DIN VDE 0160 series together with EN 60439-1/DIN VDE 0660 part 500 and EN 60146/DIN VDE 0558 are applicable to drive controllers.

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

**3. Transport, storage**

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

Climatic conditions must be observed according to EN 50178.

**4. Erection**

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

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

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

**5. Electrical connection**

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

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

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

**6. Operation**

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

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

During operation, all covers and doors must be closed.

**7. Maintenance and servicing**

The manufacturer's documentation must be observed.

**This safety information must be kept!**

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

## 2.2 Layout of the safety information

- All safety information has a uniform layout:
  - The icon characterises the type of danger.
  - The signal word characterises the severity of danger.
  - The note describes the danger and suggests how to avoid the danger.

**Signal word**
Note

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

## 2.3 Residual hazards

| | |
|---|---|
| **Operator's safety** | After mains disconnection, the power terminals U, V, W and $+U_G$, $-U_G$ remain live for at least 3 minutes.<br>• Before working on the controller, check that no voltage is applied to the power terminals. |
| **Protection of devices** | Cyclic connection and disconnection of the controller supply voltage at L1, L2, L3 or $+U_G$, $+U_G$ may overload the internal input current limit.<br>• Allow at least 3 minutes between disconnection and reconnection. |
| **Overspeeds** | Drive systems can reach dangerous overspeeds (e.g. setting high field frequencies for motors and machines which are not suitable):<br>• The controllers do not offer any protection against these operating conditions. Use additional components for this. |

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00406182

# Manual
# Part B

## Technical data

## Installation

**Global Drive**

*Frequency inverters 8200*

This Manual is valid for 82XX controllers as of version:

| | | | | | |
|---|---|---|---|---|---|
| 33.820X- | E- | 1x. | 1x | | (8201 - 8204) |
| 33.8202- | E- | 1x. | 1x | -V002 | Reduced assembly depth (8202) |
| 33.821X- | E- | 0x. | 1x | | (8211 - 8218) |
| 33.821X- | E- | 1x. | 2x | | (8211 - 8218) |
| 33.821X- | C- | 1x. | 2x | -V003 | Cold plate (8215 - 8218) |
| 33.821X- | E- | 3a. | 3x | -V020 | HVAC (8211 - 8218) |
| 33.822X- | E- | 0x. | 0x | | (8221 - 8227) |
| 33.822X- | C- | 1x. | 2x | -V003 | Cold plate (8221 - 8222) |
| 33.822X- | E- | 3a. | 3x | -V020 | HVAC (8221 - 8227) |
| 33.824X- | E- | 1x. | 1x | | (8241 - 8246) |
| 33.824X- | C- | 1x. | 1x | -V003 | Cold plate (8241 - 8246) |
| 33.824X- | E- | 3a. | 3x | -V020 | HVAC (8241 - 8246) |

Type

Design:
B = Module
C = Cold plate
E = Built-in unit IP20

Hardware version and index

Software version and index

Variant

Explanation

| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

# 3 Technical data

## 3.1 Overview of types

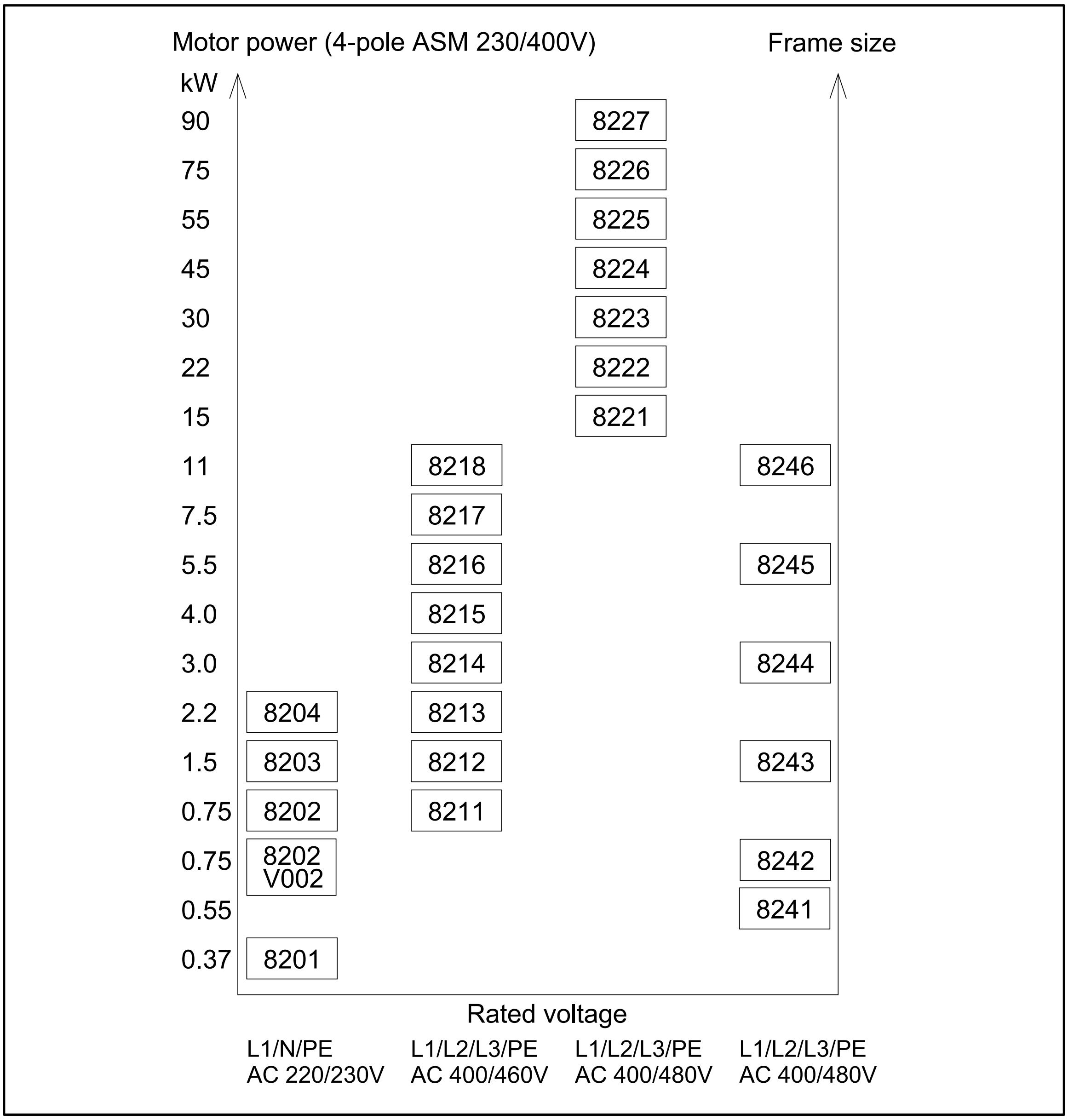



FIG 3-1 Overview of types

## 3.2 Features

| | 820X | 821X | 822X | 824X |
|---|---|---|---|---|
| Compact design | ● | ● | ● | ● |
| Load capacity of up to 150 % $I_r$ for 1 min | ● | ● | ● | ● |
| Inverter outputs are protected against short circuit | ● | ● | ● | ● |
| Earth-fault check at mains connection | ● | ● | ● | ● |
| Chopper frequency 9.2 kHz | ● | | | |
| Chopper frequency selectable: 4 kHz, 8 kHz, 12 kHz, 16 kHz | | ● | ● | ● |
| V/f-characteristic control with constant $V_{min}$ boost or auto boost | ● | | | |
| Motor-current control or V/f-characteristic control selectable | | ● | ● | ● |
| Mains-voltage compensation | ● | ● | ● | ● |
| Slip compensation | ● | ● | ● | ● |
| Adjustable current limitation with V/f-override | ● | ● | ● | ● |
| PWM converter with IGBT-power stages | ● | ● | ● | ● |
| DC-bus connection and brake-chopper connection | ● | ● | ● | ● |
| Isolated analog input and output | ● | ● | ● | ● |
| Relay outputs (change-over contact) | 1 | 1 | 2 | 2 |
| PLC-compatible digital outputs (I/O module 8275) | 3 (option) | 3 (option) | 3 (option) | 3 (option) |
| Isolated digital inputs with programmable functions | 4 | 4 | 4 | 4 |
| Up to 3 JOG frequencies per parameter set | ● | ● | ● | ● |
| DC-injection brake | ● | ● | ● | ● |
| TRIP set and TRIP reset function | ● | ● | ● | ● |
| Motor potentiometer | ● | ● | ● | ● |
| Output frequency up to 240 Hz / 480 Hz | ● | | | |
| Output frequency up to 480 Hz | | ● | ● | ● |
| Flying restart circuit | ● | ● | ● | ● |
| 2 parameter sets | ● | ● | ● | ● |
| Elapsed time meter | ● | ● | ● | ● |
| Assembly with thermal separation of the power stage | | as from 8215E | ● | ● |
| Temperature-dependent blower activation | | | ● | ● |
| PTC monitoring of the motor by integrated evaluation | option | option | ● | ● |
| Process and speed controller | | ●* | ●* | ●* |
| Setpoint summation | | ●* | ●* | ●* |
| Level inversion for digital inputs | | ●* | ●* | ●* |
| Priority for digital inputs | | ●* | ●* | ●* |
| Manual/remote changeover (H/Re) | | ●* | ●* | ●* |
| Belt monitoring | | ●* | ●* | ●* |
| Selection of an inverse analog setpoint | | ●* | ●* | ●* |
| Limit frequencies | | ●* | ●* | ●* |
| Ramp function generator S-shape | | ●* | ●* | ●* |
| Motor phase failure detection | | | ●* | ●* |

| | 820X | 821X | 822X | 824X |
|---|---|---|---|---|
| **Attachable accessories** | | | | |
| 8201BB operating module for control and parameter setting with memory for parameter-set transmission | ● | ● | ● | ● |
| Serial 2102IB LECOM fieldbus module for RS232/485 or optical fibre | ● | ● | ● | ● |
| INTERBUS 2111IB fieldbus module | ● | ● | ● | ● |
| 2171 system bus module (CAN) | ● | ● | ● | ● |
| I/O module 8275 IB | ● | ● | ● | ● |
| PTC module 8274 IB | ● | ● | | |
| Monitor module 8276 IB | ● | ● | ● | ● |
| Bipolar analog input 8278 IB | ● | ● | ● | ● |
| Analog plug-in module 8279IB (2. analog channel) | | ●* | ●* | ●* |

* Only for 821X/2X/4X HVAC (V020) controllers.

## 3.3 General data/application conditions

| Field | Values | | |
|---|---|---|---|
| **Vibration resistance** | Germanischer Lloyd, general conditions | | |
| **Humidity class** | Humidity class F without condensation (average relative humidity 85 %) | | |
| **Permissible temperature range** | During transport of the controller: | -25 °C…+70 °C | |
| | During storage of the controller: | -25 °C…+55 °C | |
| | During operation of the controller: | 0 °C…+40 °C<br>+40 °C…+50 °C | without power derating<br>with power derating |
| **Permissible installation height** | h ≤ 1000 m a.m.s.l.<br>1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l. | | without power derating<br>with power derating |
| **Degree of pollution** | VDE 0110 part 2 pollution degree 2 | | |
| **Noise emission** | Requirements to EN 50081-2, EN 50082-1, IEC 22G-WG4 (Cv) 21<br>Limit value class A to EN 55011 (industry) with mains filter<br>Limit value class B to EN 55022 (residential area) with mains filter and installation into control cabinet | | |
| **Noise immunity** | Limit values maintained with mains filter<br>Requirements to EN 50082-2, IEC 22G-WG4 (Cv) 21 | | |
| | **Requirements** | **Standard** | **Severities** |
| | ESD | EN61000-4-2 | 3, i.e. 8 kV with air discharge,<br>6 kV with contact discharge |
| | RF interference (enclosure) | EN61000-4-3 | 3, i.e. 10 V/m; 27…1000 MHz |
| | Burst | EN61000-4-4 | 3/4, i.e. 2 kV/5 kHz |
| | Surge<br>(Surge on mains cable) | IEC 1000-4-5 | 3, i.e. 1.2/50 µs,<br>1 kV phase-phase,<br>2 kV phase-PE |
| **Insulation strength** | Overvoltage category III to VDE 0110 | | |
| **Packaging to DIN 4180** | Types 820X, 821X, 824X<br>Types 822X,<br>821X/2X/4X HVAC (V020) | Dust packaging<br>Transport packaging | |
| **Enclosure** | Types 82XX, 82XX HVAC (V020) | IP20<br>NEMA 1: Protection against contact | |
| | Types 8215 - 8218, 822X, 824X,<br>8215/16/17/18/2X/4X HVAC (V020) | IP41 on the heat-sink side with thermal separation in push-through technique | |
| **Approvals** | Types 82XX, 82XX HVAC (V020) | CE: | Low-Voltage Directive and Electromagnetic Compatibility |
| | Types 822X, 824X,<br>822X/4X HVAC (V020) | UL 508:<br>UL 508C: | Industrial Control Equipment<br>Power Conversion Equipment |

# 3.4 Rated data (Operation with 150 % overload)

## 3.4.1 Types 8201 to 8204

| **150 % overload** | **Type** | **8201** | **8202** | **8203** | **8204** |
|---|---|---|---|---|---|
| | Order No. | EVF8201-E | EVF8202-E | EVF8203-E | EVF8204-E |
| **Variant "reduced assembly depth"** | **Type** | | **8202-V002** | | |
| | Order No. | | EVF8202-E- V002 | | |
| Mains voltage | $V_r$ [V] | 190 V -0 % ≤ $V_r$ ≤ 260 V +0 %; 45 Hz … 65 Hz ± 0% | | | |
| Alternative DC supply | $V_{DC}$ [V] | 270 V -0 % ≤ $V_{DC}$ ≤ 360 V +0 % | | | |
| Mains current[4] | $I_{mains}$ [A] | | | | |
| with mains filter/mains choke | | 4.2 | 7.5 | 12.5 | 17.0 |
| without mains filter/mains choke | | 5.0 | 9.0 | 15.0 | - |
| **Data for mains operation with 1 AC / 230 V / 50 Hz/60 Hz; 270 V ≤ $V_{DC}$ ≤ 275 V** | | | | | |
| Motor power (4 pole ASM) at 9.2 kHz* | $P_r$ [kW] | 0.37 | 0.75 | 1.5 | 2.2 |
| | $P_r$ [hp] | 0.5 | 1.0 | 2.0 | 2.9 |
| Output power U, V, W at 9.2 kHz* | $S_{r9.2}$ [kVA] | 1.0 | 1.5 | 2.7 | 3.6 |
| Output power $+U_G$, $-U_G$ [1] | $P_{DC}$ [kW] | 0.0 | 0.0 | 0.0 | 0.0 |
| Output current | $I_r$ [A] | 2.6 | 4.0 | 7.0 | 9.5 |
| Max. output current for 60 s[2] | $I_{rmax}$ [A] | 3.9 | 6.0 | 10.5 | 14.2 |
| Motor voltage [3] | $V_M$ [V] | 0 - 3 x $V_{mains}$ / 0 Hz … 50 Hz, if required up to 240 Hz | | | |
| Power loss (operation with $I_r$) | $P_{loss}$ [W] | 30 | 50 | 70 | 100 |
| Power derating | [%/K]<br>[%/m] | 40 °C < $T_V$ < 50 °C: 2.5 %/K<br>1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l.: 5 %/1000 m | | | |
| Field frequency – Resolution | Absolute | 0.05 Hz | | | |
| Field frequency – Digital setpoint selection | Accuracy | ± 0.05 Hz | | | |
| Field frequency – Analog setpoint selection | Linearity | ± 0.5 % (max. selected signal level, 5 V or 10 V) | | | |
| | Temperature sensitivity | 0 … 40 °C: +0.4 % | | | |
| | Offset | ± 0.3 % | | | |
| Weight | m [kg] | 1.0 | 1.3<br>Variant 1.0 | 2.2 | 2.2 |

1) This power can be additionally obtained when operating a matching motor

2) The currents apply to a periodical load cycle with 1 minute overcurrent with the current mentioned here and 2 minutes base load with 75 % $I_r$.

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

4) Observe the N-conduction load when having a symmetrical mains distribution! (See electrical installation)

* Chopper frequency of the inverter

## 3.4.2 Types 8211 to 8214

| 150 % overload | | Type | 8211 | | 8212 | | 8213 | | 8214 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Order No. | EVF8211-E | | EVF8212-E | | EVF8213-E | | EVF8214-E | |
| | Variant “HVAC” | Type | **8211-V020** | | **8212-V020** | | **8213-V020** | | **8214-V020** | |
| | | Order No. | EVF8211-E-V020 | | EVF8212-E-V020 | | EVF8213-E-V020 | | EVF8214-E-V020 | |
| Mains voltage | | $V_r$ [V] | 320 V -0 % $\leq$ $V_r$ $\leq$ 510 V +0 %; 45 Hz … 65 Hz $\pm$0% | | | | | | | |
| Alternative DC supply | | $V_{DC}$ [V] | 450 V -0 % $\leq$ $V_{DC}$ $\leq$ 715 V +0 % | | | | | | | |
| Mains current with mains filter/mains choke | | $I_{mains}$ [A] | **2.5** | | **3.9** | | **5.0** | | **7.0** | |
| Mains current without mains filter/mains choke | | $I_{mains}$ [A] | **3.75** | | **5.85** | | **7.5** | | **--** | |
| Data for mains operation with 3 AC / 400 V / 50 Hz/60 Hz ; 450 V $\leq$ $V_{DC}$ $\leq$ 650 V or 3 AC/460 V/50 Hz/60 Hz; 460 V $\leq$ $V_{DC}$ $\leq$ 725 V | | | 400 V | 460 V | 400 V | 460 V | 400 V | 460 V | 400 V | 460 V |
| Motor power (4 pole ASM) at 4 kHz/8 kHz* | | $P_r$ [kW] | 0.75 | 1.1 | 1.5 | 1.5 | 2.2 | 2.2 | 3.0 | 3.7 |
| | | $P_r$ [hp] | 1.0 | 1.5 | 2.0 | 2.0 | 2.9 | 2.9 | 4.0 | 5.0 |
| Output power U, V, W at 4 kHz/8 kHz* | | $S_{r8}$ [kVA] | 1.6 | 1.9 | 2.7 | 3.1 | 3.8 | 4.3 | 5.2 | 5.8 |
| Output power +$U_G$, -$U_G$ 1) | | $P_{DC}$ [kW] | 0.7 | 0.7 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 |
| Output current | 4 kHz* | $I_{r4}$ [A] | 2.4 | 2.4 | 3.9 | 3.9 | 5.5 | 5.5 | 7.3 | 7.3 |
| | 8 kHz* | $I_{r8}$ [A] | **2.4** | **2.4** | **3.9** | **3.9** | **5.5** | **5.5** | **7.3** | **7.3** |
| | 12 kHz* | $I_{r12}$ [A] | 2.0 | 1.9 | 3.3 | 3.0 | 4.6 | 4.3 | 6.1 | 5.7 |
| | 16 kHz* | $I_{r16}$ [A] | 1.8 | 1.7 | 2.9 | 2.7 | 4.1 | 3.8 | 5.5 | 5.1 |
| | Noise optimised 4 kHz*4) | $I_{r4}$ [A] | 2.4 | 2.3 | 3.9 | 3.7 | 5.5 | 5.2 | 7.3 | 6.9 |
| | Noise optimised 8 kHz*4) | $I_{r8}$ [A] | 2.1 | 2.0 | 3.4 | 3.2 | 4.7 | 4.5 | 6.3 | 6.0 |
| | Noise optimised 12 kHz* | $I_{r12}$ [A] | 1.9 | 1.8 | 3.1 | 2.9 | 4.4 | 4.1 | 5.8 | 5.4 |
| | Noise optimised 16 kHz* | $I_{r16}$ [A] | 1.6 | 1.5 | 2.5 | 2.3 | 3.6 | 3.3 | 4.7 | 4.4 |
| Max. output current for 60 s 2) | 4 kHz* | $I_{rmax4}$ [A] | 3.6 | 3.6 | 5.9 | 5.9 | 8.3 | 8.3 | 11.0 | 11.0 |
| | 8 kHz* | $I_{rmax8}$ [A] | **3.6** | **3.6** | **5.9** | **5.9** | **8.3** | **8.3** | **11.0** | **11.0** |
| | 12 kHz* | $I_{rmax12}$ [A] | 3.0 | 2.8 | 4.9 | 4.6 | 6.9 | 6.6 | 9.2 | 8.7 |
| | 16 kHz* | $I_{rmax16}$ [A] | 2.7 | 2.5 | 4.4 | 4.1 | 6.2 | 5.8 | 8.2 | 7.7 |
| | Noise optimised 4 kHz*4) | $I_{rmax4}$ [A] | 3.6 | 3.7 | 5.9 | 5.6 | 8.3 | 7.8 | 11.0 | 10.4 |
| | Noise optimised 8 kHz*4) | $I_{rmax8}$ [A] | 3.1 | 2.9 | 5.1 | 4.8 | 7.1 | 6.7 | 9.4 | 8.9 |
| | Noise optimised 12 kHz* | $I_{rmax12}$ [A] | 2.9 | 2.7 | 4.7 | 4.4 | 6.6 | 6.2 | 8.8 | 8.2 |
| | Noise optimised 16 kHz* | $I_{rmax16}$ [A] | 2.4 | 2.1 | 3.8 | 3.5 | 5.4 | 5.0 | 7.1 | 6.6 |

| **150 % overload** | | **Type** | **8211** | **8212** | **8213** | **8214** |
|---|---|---|---|---|---|---|
| | | Order No. | EVF8211-E | EVF8212-E | EVF8213-E | EVF8214-E |
| | **Variant "HVAC"** | **Type** | **8211-V020** | **8212-V020** | **8213-V020** | **8214-V020** |
| | | Order No. | EVF8211-E-V020 | EVF8212-E-V020 | EVF8213-E-V020 | EVF8214-E-V020 |
| Motor voltage[3)] | | $V_M$ [V] | 0 - 3 x $V_{mains}$/ 0 Hz … 50 Hz, if required up to 480 Hz | | | |
| Power loss (operation with $I_{rx}$) | | $P_{loss}$ [W] | 55 | 75 | 90 | 100 |
| Power derating | | [%/K]<br>[%/m] | 40 °C < $T_V$ < 50 °C: 2.5 %/K<br>1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l.: 5 %/1000 m | | | |
| Field frequency | Resolution | Absolute | 0.02 Hz | | | |
| | Digital setpoint selection | Accuracy | ± 0.05 Hz | | | |
| | Analog setpoint selection | Linearity | ± 0.5 % (max. selected signal level: 5 V or 10 V) | | | |
| | | Temperature sensitivity | 0 … 40 °C: +0.4 % | | | |
| | | Offset | ± 0 % | | | |
| Weight | | m [kg] | 2.2 | 2.2 | 2.2 | 2.2 |

Printed in bold	Data for the operation with factory setting and a chopper frequency of 8 kHz.

1) This power can be additionally obtained when operating a matching motor

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

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

4) Only with variant "HVAC"

* Chopper frequency of the inverter

### 3.4.3 Types 8215 to 8218

| **150 % overload** | | **Type** | **8215** | | **8216** | | **8217** | | **8218** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Order No. | EVF8215-E | | EVF8216-E | | EVF8217-E | | EVF8218-E | |
| | **Variant "Cold Plate"** | **Type** | **8215-V003** | | **8216-V003** | | **8217-V003** | | **8218-V003** | |
| | | Order No. | EVF8215-C-V003 | | EVF8216-C-V003 | | EVF8217-C-V003 | | EVF8218-C-V003 | |
| | **Variant "HVAC"** | **Type** | **8215-V020** | | **8216-V020** | | **8217-V020** | | **8218-V020** | |
| | | Order No. | EVF8215-E-V020 | | EVF8216-E-V020 | | EVF8217-E-V020 | | EVF8218-E-V020 | |
| Mains voltage | | $V_r$ [V] | 320 V -0 % ≤ $V_r$ ≤ 510 V +0 %; 45 Hz … 65 Hz ±0 % | | | | | | | |
| Alternative DC supply | | $V_{DC}$ [V] | 450 V -0 % ≤ $V_{DC}$ ≤ 715 V +0 % | | | | | | | |
| Mains current<br>with mains filter/mains choke<br>without mains filter/mains choke | | <br>$I_{mains}$ [A]<br>$I_{mains}$ [A] | <br>**8.8**<br>**13.2** | | <br>**12.0**<br>**18.0** | | <br>**15.0**<br>**22.5** | | <br>**20.5**<br>**--** | |
| Data for mains operation with 3 AC / 400 V / 50 Hz/60 Hz ; 450 V ≤ $V_{DC}$ ≤ 650 V or | | | | | | | | | | |
| 3 AC/460 V/50 Hz/60 Hz; 460 V≤ $V_{DC}$≤ 725 V | | | 400 V | 460 V | 400 V | 460 V | 400 V | 460 V | 400 V | 460 V |
| Motor power (4 pole ASM)<br>at 4 kHz/8 kHz* | | $P_r$ [kW] | 4.0 | 5.5 | 5.5 | 7.5 | 7.5 | 11.0 | 11.0 | 15.0 |
| | | $P_r$ [hp] | 5.4 | 7.5 | 7.5 | 10.0 | 10.0 | 15.0 | 15.0 | 20.0 |
| Output power U, V, W at 4 kHz/8 kHz* | | $S_{r8}$ [kVA] | 6.5 | 7.5 | 9.0 | 10.3 | 11.4 | 13.7 | 16.3 | 19.5 |
| Output power +$U_G$, -$U_G$ [1] | | $P_{DC}$ [kW] | 1.0 | 1.0 | 0.0 | 0.0 | 3.9 | 3.9 | 0.0 | 0.0 |
| Output current | 4 kHz* | $I_{r4}$ [A] | 9.4 | 9.4 | 13.0 | 13.0 | 16.5 | 16.5 | 23.5 | 23.5 |
| | 8 kHz* | $I_{r8}$ [A] | **9.4** | **9.4** | **13.0** | **13.0** | **16.5** | **16.5** | **23.5** | **23.5** |
| | 12 kHz* | $I_{r12}$ [A] | 7.9 | 7.4 | 10.9 | 10.3 | 13.9 | 13.0 | 19.7 | 18.5 |
| | 16 kHz* | $I_{r16}$ [A] | 7.0 | 6.6 | 9.7 | 9.1 | 12.3 | 11.6 | 17.6 | 16.5 |
| | Noise optimised 4 kHz*[4] | $I_{r4}$ [A] | 9.4 | 8.9 | 13.0 | 12.3 | 16.5 | 15.6 | 23.5 | 22.1 |
| | Noise optimised 8 kHz*[4] | $I_{r8}$ [A] | 8.0 | 7.6 | 11.1 | 10.5 | 14.1 | 13.3 | 20.0 | 18.8 |
| | Noise optimised 12 kHz* | $I_{r12}$ [A] | 7.5 | 7.0 | 10.4 | 9.7 | 13.2 | 12.4 | 18.8 | 17.6 |
| | Noise optimised 16 kHz* | $I_{r16}$ [A] | 6.1 | 5.6 | 8.4 | 7.8 | 10.7 | 9.9 | 15.3 | 14.1 |
| Max. output current for 60 s[2] | 4 kHz* | $I_{rmax4}$ [A] | 14.1 | 14.1 | 19.5 | 19.5 | 24.8 | 24.8 | 35.3 | 35.3 |
| | 8 kHz* | $I_{rmax8}$ [A] | **14.1** | **14.1** | **19.5** | **19.5** | **24.8** | **24.8** | **35.3** | **35.3** |
| | 12 kHz* | $I_{rmax12}$ [A] | 11.9 | 11.1 | 16.4 | 15.4 | 20.8 | 19.6 | 29.6 | 27.9 |
| | 16 kHz* | $I_{rmax16}$ [A] | 10.6 | 9.8 | 14.6 | 13.6 | 18.6 | 17.4 | 26.5 | 24.7 |
| | Noise optimised 4 kHz*[4] | $I_{rmax12}$ [A] | 14.1 | 13.3 | 19.5 | 18.3 | 24.8 | 23.4 | 35.3 | 55.1 |
| | Noise optimised 8 kHz*[4] | $I_{rmax12}$ [A] | 12.0 | 11.3 | 16.6 | 15.6 | 21.1 | 19.9 | 30.0 | 28.2 |
| | Noise optimised 12 kHz* | $I_{rmax12}$ [A] | 11.3 | 10.6 | 15.6 | 14.6 | 19.8 | 18.8 | 28.2 | 26.4 |
| | Noise optimised 16 kHz* | $I_{rmax16}$ [A] | 9.1 | 8.5 | 12.7 | 11.7 | 16.1 | 14.9 | 22.9 | 21.1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **150 % overload** | | **Type** | **8215** | **8216** | **8217** | **8218** |
| | | Order No. | EVF8215-E | EVF8216-E | EVF8217-E | EVF8218-E |
| | **Variant ”Cold Plate”** | **Type** | **8215-V003** | **8216-V003** | **8217-V003** | **8218-V003** |
| | | Order No. | EVF8215-C-V003 | EVF8216-C-V003 | EVF8217-C-V003 | EVF8218-C-V003 |
| | **Variant “HVAC”** | **Type** | **8215-V020** | **8216-V020** | **8217-V020** | **8218-V020** |
| | | Order No. | EVF8215-E-V020 | EVF8216-E-V020 | EVF8217-E-V020 | EVF8218-E-V020 |
| Motor voltage[3] | | $V_M$ [V] | 0 - 3 x $V_{mains}$/ 0 Hz … 50 Hz, if required up to 480 Hz | | | |
| Power loss (operation with $I_{rx}$) | | $P_{loss}$ [W] | 150 | 200 | 280 | 400 |
| Power derating | | [%/K]<br>[%/m] | 40 °C < $T_V$ < 50 °C: 2.5 %/K<br>1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l.: 5 %/1000 m | | | |
| Field frequency | Resolution | Absolute | 0.02 Hz | | | |
| | Digital setpoint selection | Accuracy | ± 0.05 Hz | | | |
| | Analog setpoint selection | Linearity | ± 0.5 % (max. selected signal level: 5 V or 10 V) | | | |
| | | Temperature sensitivity | 0 … 40 °C: +0.4 % | | | |
| | | Offset | ± 0 % | | | |
| Weight<br>”Cold Plate” without heat sink<br>”Cold Plate” with heat sink | | m [kg] | 5.3<br>2.8<br>20.8 | 5.3<br>2.8<br>20.8 | 5.3<br>2.8<br>20.8 | 5.3<br>2.8<br>20.8 |

Printed in bold — Data for the operation with factory setting and a chopper frequency of 8 kHz.

1) This power can be additionally obtained when operating a matching motor

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

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

4) Only with variant “HVAC”

* Chopper frequency of the inverter

### 3.4.4 Types 8221 to 8224

| 150 % overload | | Type | 8221 | | 8222 | | 8223 | | 8224 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Order No. | EVF8221-E | | EVF8222-E | | EVF8223-E | | EVF8224-E | |
| | **Variant "Cold Plate"** | **Type** | **8221-V003** | | **8222-V003** | | | | | |
| | | Order No. | EVF8221-C-V003 | | EVF8222-C-V003 | | | | | |
| | **Variant "HVAC"** | **Type** | **8221-V020** | | **8222-V020** | | **8223-V020** | | **8224-V020** | |
| | | Order No. | EVF8221-E-V020 | | EVF8222-E-V020 | | EVF8223-E-V020 | | EVF8224-E-V020 | |
| Mains voltage | | $V_r$ [V] | 320 V -0 % ≤ $V_r$ ≤ 528 V +0 %; 45 Hz … 65 Hz ± 0 % | | | | | | | |
| Alternative DC supply | | $V_{DC}$ [V] | 460 V -0 % ≤ $V_{DC}$ ≤ 740 V +0 % | | | | | | | |
| Mains current<br>with mains filter/mains choke<br>without mains filter/mains choke | | $I_{mains}$ [A]<br>$I_{mains}$ [A] | **29.0**<br>**43.5** | | **42.0**<br>**--** | | **55.0**<br>**--** | | **80.0**<br>**--** | |
| Data for mains operation with 3 AC / 400 V / 50 Hz/60 Hz ; 460 V ≤ $V_{DC}$ ≤ 620 V or | | | | | | | | | | |
| 3 AC / 480 V / 50 Hz/60 Hz; 460 V ≤ $V_{DC}$ ≤ 740 V | | | 400 V | 480 V | 400 V | 480 V | 400 V | 480 V | 400 V | 480 V |
| Motor power (4 pole ASM) at 4 kHz/8 kHz* | | $P_r$ [kW] | 15 | 18.5 | 22 | 30 | 30 | 37 | 45 | 55 |
| | | $P_r$ [hp] | 20 | 25 | 30 | 40 | 40 | 49.5 | 60 | 74 |
| Output power U, V, W at 4 kHz/8 kHz* | | $S_{r8}$ [kVA] | 22.2 | 26.6 | 32.6 | 39.1 | 41.6 | 49.9 | 61.7 | 73.9 |
| Output power + $U_G$, -$U_G$ [1] | | $P_{DC}$ [kW] | 10.2 | 11.8 | 4.0 | 4.6 | 0 | 0 | 5.1 | 5.9 |
| Output current | 4 kHz* | $I_{r4}$ [A] | 32 | 32 | 47 | 47 | 59 | 56 | 89 | 84 |
| | 8 kHz* | $I_{r8}$ [A] | **32** | **32** | **47** | **47** | **59** | **56** | **89** | **84** |
| | 12 kHz* | $I_{r12}$ [A] | 27 | 25 | 40 | 37 | 50 | 47 | 71 | 67 |
| | 16 kHz* | $I_{r16}$ [A] | 24 | 22 | 35 | 33 | 44 | 41 | 62 | 58 |
| | Noise optimised 4 kHz*[4] | $I_{r4}$ [A] | 32 | 30.5 | 47 | 45 | 59 | 56 | 89 | 84 |
| | Noise optimised 8 kHz*[4] | $I_{r8}$ [A] | 29 | 27 | 43 | 41 | 47 [5] | 44 [5] | 59 [5] | 55 [5] |
| | Noise optimised 12 kHz* | $I_{r12}$ [A] | 25 | 24 | 37 | 35 | 44 | 38 | 62 | 58 |
| | Noise optimised 16 kHz* | $I_{r16}$ [A] | 21 | 19 | 30 | 28 | 35 | 30 | 53 | 49 |
| Max. output current for 60 s[2] | 4 kHz* | $I_{rmax4}$ [A] | 48 | 48 | 70.5 | 70.5 | 89 | 84 | 134 | 126 |
| | 8 kHz* | $I_{rmax8}$ [A] | **48** | **48** | **70.5** | **70.5** | **89** | **84** | **134** | **126** |
| | 12 kHz* | $I_{rmax12}$ [A] | 40 | 38 | 59 | 56 | 75 | 70 | 92 | 87 |
| | 16 kHz* | $I_{rmax16}$ [A] | 36 | 33 | 53 | 49 | 66 | 61 | 81 | 75 |
| | Noise optimised 4 kHz*[4] | $I_{rmax4}$ [A] | 48 | 46 | 70.5 | 66.5 | 89 | 56 | 134 | 126 |
| | Noise optimised 8 kHz*[4] | $I_{rmax8}$ [A] | 43 | 41 | 64 | 61 | 70 [5] | 65 [5] | 88 [5] | 82 [5] |
| | Noise optimised 12 kHz* | $I_{rmax12}$ [A] | 38 | 36 | 56 | 53 | 66 | 57 | 81 | 75 |
| | Noise optimised 16 kHz* | $I_{rmax16}$ [A] | 31 | 29 | 46 | 42 | 53 | 45 | 69 | 63 |
| Motor voltage[3] | | $V_M$ [V] | 0 - 3 x $V_{mains}$/ 0 Hz … 50 Hz, if required up to 480 Hz | | | | | | | |
| Power loss (operation with $I_{rx}$) | | $P_{loss}$ [W] | 430 | | 640 | | 810 | | 1100 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **150 % overload** | | **Type** | **8221** | **8222** | **8223** | **8224** |
| | | Order No. | EVF8221-E | EVF8222-E | EVF8223-E | EVF8224-E |
| | **Variant "Cold Plate"** | **Type** | **8221-V003** | **8222-V003** | | |
| | | Order No. | EVF8221-C-V003 | EVF8222-C-V003 | | |
| | **Variant "HVAC"** | **Type** | **8221-V020** | **8222-V020** | **8223-V020** | **8224-V020** |
| | | Order No. | EVF8221-E-V020 | EVF8222-E-V020 | EVF8223-E-V020 | EVF8224-E-V020 |
| Power derating | | [%/K]<br>[%/m] | 40 °C < $T_V$ < 50 °C: 2.5 %/K<br>1000 m a.m.s.l. $<$ h $\leq$ 4000 m a.m.s.l.: 5 %/1000 m | | | |
| Field frequency | Resolution | Absolute | 0.02 Hz | | | |
| | Digital setpoint selection | Accuracy | ± 0.05 Hz | | | |
| | Analog setpoint selection | Linearity | ± 0.5 % (max. selected signal level: 5 V or 10 V) | | | |
| | | Temperature sensitivity | 0 ... 40 °C: +0.4 % | | | |
| | | Offset | ± 0 % | | | |
| Weight<br>"Cold Plate" without heat sink | | m [kg] | 15<br>11 | 15<br>11 | 15<br>- | 33.5<br>- |

Printed in bold — Data for the operation with factory setting and a chopper frequency of 8 kHz.

1) This power can be additionally obtained when operating a matching motor

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

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

4) Only with variant "HVAC"

5) Must only be operated with C144 = -1- (automatic chopper frequency derating at $\vartheta_{max}$ = +5 °C). Ensure not to exceed the currents.

* Chopper frequency of the inverter

## 3.4.5 Types 8225 to 8227

| 150 % overload | | Type | 8225 | | 8226 | | 8227 | |
|---|---|---|---|---|---|---|---|---|
| | | Order No. | EVF8225-E | | EVF8226-E | | EVF8227-E | |
| | Variant “HVAC” | Type | **8225-V020** | | **8226-V020** | | **8227-V020** | |
| | | Order No. | EVF8225-E-V020 | | EVF8226-E-V020 | | EVF8227-E-V020 | |
| Mains voltage | | $V_r$ [V] | $320\ V\ -0\ \% \le V_r \le 528\ V\ +0\ \%$; 45 Hz ... 65 Hz $\pm 0\ \%$ | | | | | |
| Alternative DC supply | | $V_{DC}$ [V] | $460\ V\ -0\ \% \le V_{DC} \le 740\ V\ +0\ \%$ | | | | | |
| Mains current<br>with mains filter/mains choke<br>without mains filter/mains choke | | $I_{mains}$ [A]<br>$I_{mains}$ [A] | **100**<br>**--** | | **135**<br>**--** | | **165**<br>**--** | |
| Data for mains operation with 3 AC / 400 V / 50 Hz/60 Hz ; $460\ V \le V_{DC} \le 620\ V$ or 3 AC / 480 V / 50 Hz/60 Hz ; $460\ V \le V_{DC} \le 740\ V$ | | | 400 V | 480 V | 400 V | 480 V | 400 V | 480 V |
| Motor power (4 pole ASM) at 4 kHz/8 kHz* | | $P_r$ [kW] | 55 | 75 | 75 | 90 | 90 | 110 |
| | | $P_r$ [hp] | 74 | 100 | 100 | 120 | 120 | 148 |
| Output power U, V, W at 4 kHz/8 kHz* | | $S_{r8}$ [kVA] | 76.2 | 91.4 | 103.9 | 124 | 124.7 | 149 |
| Output power $+U_G$, $-U_G$ 1) | | $P_{DC}$ [kW] | 0 | 0 | 28.1 | 32.4 | 40.8 | 47.1 |
| Output current | 4 kHz* | $I_{r4}$ [A] | 110 | 105 | 150 | 142 | 180 | 171 |
| | 8 kHz* | $I_{r8}$ [A] | **110** | **105** | **150** | **142** | **171** | **162** |
| | 12 kHz* | $I_{r12}$ [A] | 88 | 83 | 120 | 112 | 126 | 117 |
| | 16 kHz* | $I_{r16}$ [A] | 77 | 72 | 105 | 98 | 108 | 99 |
| | Noise optimised 4 kHz* 4) | $I_{r4}$ [A] | 110 | 104 | 150 | 141 | 159 5) | 149 5) |
| | Noise optimised 8 kHz* 4) | $I_{r8}$ [A] | 76 5) | 71 5) | 92 5) | 86 5) | 100 5) | 94 5) |
| | Noise optimised 12 kHz* | $I_{r12}$ [A] | 66 | 60 | 82 | 75 | 90 | 81 |
| | Noise optimised 16 kHz* | $I_{r16}$ [A] | 60 | 55 | 67 | 60 | 72 | 63 |
| Max. output current for 60 s 2) | 4 kHz* | $I_{rmax4}$ [A] | 165 | 157 | 225 | 213 | 270 | 256 |
| | 8 kHz* | $I_{rmax8}$ [A] | **165** | **157** | **225** | **213** | **221** | **211** |
| | 12 kHz* | $I_{rmax12}$ [A] | 114 | 108 | 156 | 147 | 164 | 153 |
| | 16 kHz* | $I_{rmax16}$ [A] | 100 | 94 | 136 | 128 | 140 | 130 |
| | Noise optimised 4 kHz* 4) | $I_{rmax4}$ [A] | 165 | 156 | 225 | 212 | 238 5) | 223 5) |
| | Noise optimised 8 kHz* 4) | $I_{rmax8}$ [A] | 114 5) | 107 5) | 138 5) | 169 5) | 150 5) | 141 5) |
| | Noise optimised 12 kHz* | $I_{rmax12}$ [A] | 85 | 78 | 107 | 98 | 117 | 106 |
| | Noise optimised 16 kHz* | $I_{rmax16}$ [A] | 78 | 72 | 87 | 78 | 94 | 83 |
| Motor voltage 3) | | $V_M$ [V] | 0 - 3 x $V_{mains}$/ 0 Hz ... 50 Hz, if required up to 480 Hz | | | | | |
| Power loss (operation with $I_{rx}$) | | $P_{loss}$ [W] | 1470 | | 1960 | | 2400 | |

| **150 % overload** | | **Type** | **8225** | **8226** | **8227** |
|---|---|---|---|---|---|
| | | Order No. | EVF8225-E | EVF8226-E | EVF8227-E |
| | **Variant “HVAC”** | **Type** | **8225-V020** | **8226-V020** | **8227-V020** |
| | | Order No. | EVF8225-E-V020 | EVF8226-E-V020 | EVF8227-E-V020 |
| Power derating | | [%/K]<br>[%/m] | 40 °C < $T_V$ < 50 °C: 2.5 %/K<br>1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l.: 5 %/1000 m | | |
| Field frequency | Resolution | Absolute | 0.02 Hz | | |
| | Digital setpoint selection | Accuracy | ± 0.05 Hz | | |
| | Analog setpoint selection | Linearity | ± 0.5 % (max. selected signal level: 5 V or 10 V) | | |
| | | Temperature sensitivity | 0 … 40 °C: +0.4 % | | |
| | | Offset | ± 0 % | | |
| Weight | | m [kg] | 36.5 | 59 | 59 |

Printed in bold — Data for the operation with factory setting and a chopper frequency of 8 kHz.

1) This power can be additionally obtained when operating a matching motor

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

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

4) Only with variant “HVAC”

5) Must only be operated with C144 = -1- (automatic chopper frequency derating at $\vartheta_{max}$ = +5 °C). Ensure not to exceed the currents.

* Chopper frequency of the inverter

## 3.4.6 Types 8241 to 8243

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **150 % overload** | | **Typ** | **8241** | | **8242** | | **8243** | |
| | | Order No. | EVF8241-E | | EVF8242-E | | EVF8243-E | |
| | **Variant "Cold Plate"** | **Type** | **8241-V003** | | **8242-V003** | | **8243-V003** | |
| | | Order No. | EVF8241-C-V003 | | EVF8242-C-V003 | | EVF8243-C-V003 | |
| | **Variant "HVAC"** | **Type** | **8241-V020** | | **8242-V020** | | **8243-V020** | |
| | | Order No. | EVF8241-E-V020 | | EVF8242-E-V020 | | EVF8243-E-V020 | |
| Mains voltage | | $V_r$ [V] | $320\ V\ -0\ \% \leq V_r \leq 528\ V +0\ \%$; 45 Hz … 65 Hz ± 0 % | | | | | |
| Alternative DC supply | | $V_{DC}$ [V] | $460\ V\ -0\ \% \leq V_{DC} \leq 740\ V +0\ \%$ | | | | | |
| Mains current<br>with mains filter/mains choke<br>without mains filter/mains choke | | <br>$I_{mains}$ [A]<br>$I_{mains}$ [A] | <br>**1.5**<br>**2.1** | | <br>**2.5**<br>**3.5** | | <br>**3.9**<br>**5.5** | |
| Data for mains operation with 3 AC / 400 V / 50 Hz/60 Hz ; $460\ V \leq V_{DC} \leq 620\ V$ or 3 AC / 480 V / 50 Hz/60 Hz ; $460\ V \leq V_{DC} \leq 740\ V$ | | | 400 V | 480 V | 400 V | 480 V | 400 V | 480 V |
| Motor power (4 pole ASM) at 4 kHz/8 kHz* | | $P_r$ [kW] | 0.37 | 0.37 | 0.75 | 0.75 | 1.5 | 1.5 |
| | | $P_r$ [hp] | 0.5 | 0.5 | 1.0 | 1.0 | 2.0 | 2.0 |
| Output power U, V, W at 4 kHz/8 kHz* | | $S_{r8}$ [kVA] | 1.0 | 1.2 | 1.7 | 2.1 | 2.7 | 3.2 |
| Output power $+U_G$, $-U_G$ [1)] | | $P_{DC}$ [kW] | 1.9 | 2.3 | 0.7 | 0.9 | 0 | 0 |
| Output current | 4 kHz* | $I_{r8}$ [A] | 1.5 | 1.5 | 2.5 | 2.5 | 3.9 | 3.9 |
| | 8 kHz* | $I_{r8}$ [A] | **1.5** | **1.5** | **2.5** | **2.5** | **3.9** | **3.9** |
| | 12kHz* | $I_{r12}$ [A] | 1.35 | 1.35 | 2.2 | 2.2 | 3.5 | 3.5 |
| | 16 kHz* | $I_{r16}$ [A] | 1.2 | 1.2 | 2.0 | 2.0 | 3.1 | 3.1 |
| | Noise optimised 4 kHz*[4)] | $I_{r4}$ [A] | 1.5 | 1.5 | 2.5 | 2.4 | 3.9 | 3.7 |
| | Noise optimised 8 kHz*[4)] | $I_{r8}$ [A] | 1.3 | 1.3 | 2.2 | 2.1 | 2.9 | 2.8 |
| | Noise optimised 12 kHz* | $I_{r12}$ [A] | 1.3 | 1.3 | 2.1 | 2.1 | 3.4 | 3.4 |
| | Noise optimised 16 kHz* | $I_{r16}$ [A] | 1.1 | 1.1 | 1.8 | 1.8 | 2.9 | 2.9 |
| Max. output current for 60 s[2)] | 4 kHz* | $I_{rmax8}$ [A] | 2.2 | 2.25 | 3.7 | 3.75 | 5.8 | 5.85 |
| | 8 kHz* | $I_{rmax8}$ [A] | **2.2** | **2.25** | **3.7** | **3.75** | **5.8** | **5.85** |
| | 12 kHz* | $I_{rmax12}$ [A] | 2.0 | 2.0 | 3.3 | 3.3 | 5.2 | 5.2 |
| | 16 kHz* | $I_{rmax16}$ [A] | 1.8 | 1.8 | 3.0 | 3.0 | 4.7 | 4.7 |
| | Noise optimised 4 kHz*[4)] | $I_{rmax4}$ [A] | 2.3 | 2.2 | 3.8 | 3.6 | 5.8 | 5.5 |
| | Noise optimised 8 kHz*[4)] | $I_{rmax8}$ [A] | 2.0 | 1.8 | 3.2 | 3.0 | 5.0 | 4.7 |
| | Noise optimised 12 kHz* | $I_{rmax12}$ [A] | 1.9 | 1.9 | 3.2 | 3.2 | 5.1 | 5.1 |
| | Noise optimised 16 kHz* | $I_{rmax16}$ [A] | 1.6 | 1.6 | 2.7 | 2.7 | 4.3 | 4.3 |
| Motor voltage[3)] | | $V_M$ [V] | 0 - 3 x $V_{mains}$/ 0 Hz … 50 Hz, if required up to 480 Hz | | | | | |
| Power loss (operation with $I_{rx}$) | | $P_{loss}$ [W] | 50 | | 65 | | 100 | |

| **150 % overload** | | **Type** | **8241** | **8242** | **8243** |
|---|---|---|---|---|---|
| | | Order No. | EVF8241-E | EVF8242-E | EVF8243-E |
| | **Variant "Cold Plate"** | **Type** | **8241-V003** | **8242-V003** | **8243-V003** |
| | | Order No. | EVF8241-C-V003 | EVF8242-C-V003 | EVF8243-C-V003 |
| | **Variant "HVAC"** | **Type** | **8241-V020** | **8242-V020** | **8243-V020** |
| | | Order No. | EVF8241-E-V020 | EVF8242-E-V020 | EVF8243-E-V020 |
| Power derating | | [%/K]<br>[%/m] | 40 °C < $T_V$ < 50 °C: 2.5 %/K<br>1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l.: 5 %/1000 m | | |
| Field frequency | Resolution | Absolute | 0.02 Hz | | |
| | Digital setpoint selection | Accuracy | ± 0.05 Hz | | |
| | Analog setpoint selection | Linearity | ± 0.5 % (max. selected signal level: 5 V or 10 V) | | |
| | | Temperature sensitivity | 0 ... 40 °C: +0.4 % | | |
| | | Offset | ± 0 % | | |
| Weight<br>"Cold Plate" without heat sink | | m [kg] | 3.5 | 3.5 | 5.0 |

Printed in bold — Data for the operation with factory setting and a chopper frequency of 8 kHz.

1) This power can be additionally obtained when operating a matching motor

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

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

4) Only with variant "HVAC"

* Chopper frequency of the inverter

## 3.4.7 Types 8244 to 8246

| 150 % overload | | Type | 8244 | | 8245 | | 8246 | |
|---|---|---|---|---|---|---|---|---|
| | | Order No. | EVF8244-E | | EVF8245-E | | EVF8246-E | |
| | **Variant "Cold Plate"** | **Type** | **8244-V003** | | **8245-V003** | | **8246-V003** | |
| | | Order No. | EVF8244-C-V003 | | EVF8245-C-V003 | | EVF8246-C-V003 | |
| | **Variant "HVAC"** | **Type** | **8244-V020** | | **8245-V020** | | **8246-V020** | |
| | | Order No. | EVF8244-E-V020 | | EVF8245-E-V020 | | EVF8246-E-V020 | |
| Mains voltage | | $V_r$ [V] | 320 V -0 % $\leq$ $V_r$ $\leq$ 528 V +0 %; 45 Hz … 65 Hz ±0 % | | | | | |
| Alternative DC supply | | $V_{DC}$ [V] | 460 V -0% $\leq$ $V_{DC}$ $\leq$ 740 V +0 % | | | | | |
| Mains current<br>with mains filter/mains choke<br>without mains filter/mains choke | | $I_{mains}$ [A]<br>$I_{mains}$ [A] | **7.0**<br>**-** | | **12.0**<br>**16.8** | | **20.5**<br>**-** | |
| Data for mains operation with 3 AC / 400 V / 50 Hz/60 Hz ; 460 V $\leq$ $V_{DC}$ $\leq$ 620 V or<br>3 AC / 480 V / 50 Hz/60 Hz ; 460 V $\leq$ $V_{DC}$ $\leq$ 740 V | | | 400 V | 480 V | 400 V | 480 V | 400 V | 480 V |
| Motor power (4 pole ASM) at 4 kHz/8 kHz* | | $P_r$ [kW] | 3.0 | 3.0 | 5.5 | 5.5 | 11.0 | 11.0 |
| | | $P_r$ [hp] | 4.0 | 4.0 | 7.5 | 7.5 | 15.0 | 15.0 |
| Output power U, V, W at 4 kHz/8 kHz* | | $S_{r8}$ [kVA] | 4.8 | 5.8 | 9.0 | 10.8 | 16.3 | 10.8 |
| Output power $+U_G$, $-U_G$ 1) | | $P_{DC}$ [kW] | 2.0 | 2.5 | 0 | 0 | 0 | 0 |
| Output current | 4 kHz* | $I_{r4}$ [A] | 7.0 | 7.0 | 13.0 | 13.0 | 23.5 | 23.5 |
| | 8 kHz* | $I_{r8}$ [A] | **7.0** | **7.0** | **13.0** | **13.0** | **23.5** | **23.5** |
| | 12 kHz* | $I_{r12}$ [A] | 6.3 | 6.3 | 11.7 | 11.7 | 20.0 | 19.1 |
| | 16 kHz* | $I_{r16}$ [A] | 5.6 | 5.6 | 10.4 | 10.4 | 16.5 | 15.7 |
| | Noise optimised 4 kHz* 4) | $I_{r4}$ [A] | 7.0 | 6.6 | 13.0 | 12.3 | 23.5 | 22.1 |
| | Noise optimised 8 kHz* 4) | $I_{r8}$ [A] | 6.0 | 5.6 | 11.1 | 10.4 | 20.0 | 18.8 |
| | Noise optimised 12 kHz* | $I_{r12}$ [A] | 6.1 | 6.1 | 11.3 | 11.3 | 19.4 | 18.4 |
| | Noise optimised 16 kHz* | $I_{r16}$ [A] | 5.2 | 5.2 | 9.7 | 9.7 | 15.2 | 14.6 |
| Max. output current for 60 s 2) | 4 kHz* | $I_{rmax8}$ [A] | **10.5** | **10.5** | **19.5** | **19.5** | **35.0** | **33.5** |
| | 8 kHz* | $I_{rmax8}$ [A] | 10.5 | 10.5 | 19.5 | 19.5 | 35.0 | 33.5 |
| | 12 kHz* | $I_{rmax12}$ [A] | 9.5 | 9.5 | 17.5 | 17.5 | 30.0 | 28.7 |
| | 16 kHz* | $I_{rmax16}$ [A] | 8.4 | 8.4 | 15.6 | 15.6 | 24.6 | 23.6 |
| | Noise optimised 4 kHz* 4) | $I_{rmax4}$ [A] | 10.5 | 8.4 | 19.5 | 15.6 | 35.5 | 28.2 |
| | Noise optimised 8 kHz* 4) | $I_{rmax8}$ [A] | 7.8 | 7.8 | 14.5 | 14.5 | 22.9 | 21.8 |
| | Noise optimised 12 kHz* | $I_{rmax12}$ [A] | 9.1 | 9.1 | 16.5 | 16.5 | 29.0 | 27.6 |
| | Noise optimised 16 kHz* | $I_{rmax16}$ [A] | 7.8 | 7.8 | 14.5 | 14.5 | 22.9 | 21.8 |
| Motor voltage 3) | | $V_M$ [V] | 0 - 3 x $V_{mains}$/ 0 Hz … 50 Hz, if required up to 480 Hz | | | | | |
| Power loss (operation with $I_{rx}$) | | $P_{loss}$ [W] | 150 | | 210 | | 360 | |
| Power derating | | [%/K]<br>[%/m] | 40 °C < $T_V$ < 50 °C: 2.5 %/K<br>1000 m a.m.s.l. < h $\leq$ 4000 m a.m.s.l.: 5 %/1000 m | | | | | |

| 150 % overload | | Type | 8244 | 8245 | 8246 |
|---|---|---|---|---|---|
| | | Order No. | EVF8244-E | EVF8245-E | EVF8246-E |
| | **Variant "Cold Plate"** | **Type** | **8244-V003** | **8245-V003** | **8246-V003** |
| | | Order No. | EVF8244-C-V003 | EVF8245-C-V003 | EVF8246-C-V003 |
| | **Variant "HVAC"** | **Type** | **8244-V020** | **8245-V020** | **8246-V020** |
| | | Order No. | EVF8244-E-V020 | EVF8245-E-V020 | EVF8246-E-V020 |
| Field frequency | Resolution | Absolute | 0.02 Hz | | |
| | Digital setpoint selection | Accuracy | ± 0.05 Hz | | |
| | Analog setpoint selection | Linearity | ± 0.5 % (max. selected signal level: 5 V or 10 V) | | |
| | | Temperature sensitivity | 0 … 40 °C: +0.4 % | | |
| | | Offset | ± 0 % | | |
| Weight "Cold Plate" without heat sink | | m [kg] | 5.0 | 7.5 | 7.5 |

Printed in bold Data for the operation with factory setting and a chopper frequency of 8 kHz.

1) This power can be additionally obtained when operating a matching motor

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

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

4) Only with variant "HVAC"

* Chopper frequency of the inverter

# 3.5 Rated data (Operation with 120 % overload)

## 3.5.1 Operating conditions

- Applications:
  - Pumps with square characteristic
  - Fans
- Operation only
  - with mains filter or mains choke,
  - with mains voltage 3 AC / 400 V / 50 Hz/60 Hz,
  - 821X with chopper frequencies $\leq$ 8 kHz,
  - 822X/824X with chopper frequencies = 4 kHz (chopper frequencies $\leq$ 16 kHz possible, load-dependent derating).
- Automatic chopper-frequency reduction to 4 kHz.
- Adapt mains-side accessories to the increased mains current:
  - Fuses and cable cross-sections, see chapter 3.6.3.
  - For data of other components, see "Accessories".

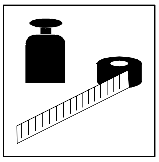
## 3.5.2 Types 821X

| 120 % overload | | Type | 8211 | 8212 | 8213 | 8214 | 8215 | 8216 | 8217 | 8218 |
|---|---|---|---|---|---|---|---|---|---|---|
| Rated mains current with mains filter/mains choke | | $I_r$ [A] | 3.0 | 3.9 | 7.0 | 7.0 | 12.0 | 12.0 | 20.5 | 20.5 |
| Data for mains operation with 3 AC / 400 V / 50 Hz/60 Hz ; 450 V $\leq V_{DC} \leq$ 650 V | | | | | | | | | | |
| Motor power (4 pole ASM) | | $P_r$ [kW] | 1.1 | 1.5 | 3.0 | 3.0 | 5.5 | 5.5 | 11.0 | 11.0 |
| | | $P_r$ [hp] | 1.5 | 2.0 | 4.0 | 4.0 | 7.5 | 7.5 | 15.0 | 15.0 |
| Output power U, V, W | | $S_r$ [kVA] | 2.1 | 2.7 | 5.2 | 5.2 | 9.0 | 9.0 | 16.3 | 16.3 |
| Output current | 4 kHz | $I_r$ [A] | 3.0 | 3.9 | 7.3 | 7.3 | 13.0 | 13.0 | 23.5 | 23.5 |
| | 8 kHz* 1) | $I_r$ [A] | 3.0 | 3.9 | 7.3 | 7.3 | 13.0 | 13.0 | 23.5 | 23.5 |
| Max. output current for 60 s 2) | 4 kHz | $I_{Nm}$ [A] | 3.6 | 5.9 | 8.3 | 11.0 | 14.1 | 19.5 | 24.8 | 35.3 |
| | 8 kHz* 1) | $I_{Nm}$ [A] | 3.6 | 5.9 | 8.3 | 11.0 | 14.1 | 19.5 | 24.8 | 35.3 |
| Power loss | | $P_{loss}$ [W] | 65 | 75 | 100 | 100 | 200 | 200 | 400 | 400 |

1) Only with variant "HVAC"

* No dyn. chopper frequency derating of the inverter

All other data, see chapter 3.4.2 and chapter 3.4.3.



## 3.5.3 Types 822X

| **120 % overload** | | **Type** | **8221** | **8222** | **8223 [1]** | **8224** | **8225 [1]** | **8226** | **8227 [1]** |
|---|---|---|---|---|---|---|---|---|---|
| Mains current with mains filter/mains choke | | $I_{mains}$ [A] | 39.0 | 50.0 | 60.0 | 97.0 | 119 | 145 | 185 |
| Data for mains operation with 3 AC / 400 V / 50 Hz/60 Hz ; 460 V $\leq V_{DC} \leq$ 620 V | | | | | | | | | |
| Motor power (4 pole ASM) at 4 kHz/8 kHz* | | $P_r$ [kW] | 22 | 30 | 37.5 | 55 | 75 | 90 | 110 |
| | | $P_r$ [hp] | 30 | 40 | 50 | 74 | 100 | 120 | 148 |
| Output power U, V, W at 4 kHz/8 kHz* | | $S_{r4}$ [kVA]<br>$S_{r8}$ [kVA] | 29.8<br>22.2 | 39.5<br>32.6 | 46.4<br>41.6 | 74.8<br>61.7 | 91.5<br>76.2 | 110<br>103.9 | 142<br>124.7 |
| Output current | 4 kHz* | $I_{r4}$ [A] | 43 | 56 | 66 | 100 | 135 | 159 | 205 |
| | 8 kHz* | $I_{r8}$ [A] | 32 | 47 | 59 | 89 | 110 | 150 | 171 |
| | 12 kHz* | $I_{r12}$ [A] | 27 | 40 | 50 | 62 | 88 | 120 | 126 |
| | 16 kHz* | $I_{r16}$ [A] | 24 | 35 | 44 | 54 | 77 | 105 | 108 |
| | Noise optimised 4 kHz* [3] | $I_{r4}$ [A] | 32 | 47 | 59 | 89 | 110 | 150 | 159 [4] |
| | Noise optimised 8 kHz* [3] | $I_{r8}$ [A] | 29 | 43 | 47 [4] | 59 [4] | 76 [4] | 92 [4] | 100 [4] |
| | Noise optimised 12 kHz* | $I_{r12}$ [A] | 25 | 37 | 44 | 54 | 66 | 82 | 90 |
| | Noise optimised 16 kHz* | $I_{r16}$ [A] | 21 | 30 | 35 | 46 | 60 | 67 | 72 |
| Max. output current for 60 s [2] | 4 kHz* | $I_{rmax4}$ [A] | 48 | 70.5 | 89 | 134 | 165 | 225 | 270 |
| | 8 kHz* | $I_{rmax8}$ [A] | 48 | 70.5 | 89 | 134 | 165 | 225 | 221 |
| | 12 kHz* | $I_{rmax12}$ [A] | 40 | 59 | 75 | 92 | 114 | 156 | 164 |
| | 16 kHz* | $I_{rmax16}$ [A] | 36 | 53 | 66 | 81 | 100 | 136 | 140 |
| | Noise optimised 4 kHz* [3] | $I_{rmax4}$ [A] | 48 | 70.5 | 89 | 134 | 165 | 225 | 238 [4] |
| | Noise optimised 8 kHz* [3] | $I_{rmax8}$ [A] | 43 | 64 | 70 [4] | 88 [4] | 114 [4] | 138 [4] | 150 [4] |
| | Noise optimised 12 kHz* | $I_{rmax12}$ [A] | 38 | 56 | 66 | 81 | 85 | 107 | 117 |
| | Noise optimised 16 kHz* | $I_{rmax16}$ [A] | 31 | 46 | 53 | 69 | 78 | 87 | 94 |
| Power loss (operation with $I_{r4}$) | | $P_{loss}$ [W] | 640 | 810 | 810 | 1350 | 1470 | 2100 | 2400 |

1) Max. permissible ambient operating temperature +35 °C

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

3) Only with variant “HVAC”

4) Must only be operated with C144 = -1- (automatic chopper frequency derating at $\vartheta_{max}$ = +5 °C). Ensure not to exceed the currents.

* Chopper frequency of the inverter

For more data, see chapter 3.4.4 and chapter 3.4.5.

## 3.5.4 Types 824X

| 120 % overload | | Type | 8241 | 8242 | 8243 | 8244 | 8245 | 8246 |
|---|---|---|---|---|---|---|---|---|
| Mains current with mains filter/mains choke | | $I_{mains}$ [A] | 1.7 | 2.8 | 5.0 | 8.8 | 15.0 | 20.5 |
| Data for mains operation with 3 AC / 400 V / 50 Hz/60 Hz ; 460 V $\leq$ $V_{DC}$ $\leq$ 620 V | | | | | | | | |
| Motor power (4 pole ASM) at 4 kHz/8 kHz* | | $P_r$ [kW] | 0.55 | 1.1 | 2.2 | 4.0 | 7.5 | 11.0 |
| | | $P_r$ [hp] | 0.75 | 1.5 | 2.9 | 5.4 | 10.0 | 15.0 |
| Output power U, V, W at 4 kHz/8 kHz* | | $S_{r4}$ [kVA] | 1.3 | 2.1 | 3.8 | 6.5 | 11.1 | 16.3 |
| | | $S_{r8}$ [kVA] | 1.0 | 1.7 | 2.7 | 4.8 | 9.0 | 16.3 |
| Output current | 4 kHz* | $I_{r4}$ [A] | 1.8 | 3.1 | 5.5 | 9.2 | 16.0 | 23.5 |
| | 8 kHz* | $I_{r8}$ [A] | 1.5 | 2.5 | 3.9 | 7.0 | 13.0 | 23.5 |
| | 12 kHz* | $I_{r12}$ [A] | 1.35 | 2.2 | 3.5 | 6.3 | 11.7 | 20.0 |
| | 16 kHz* | $I_{r16}$ [A] | 1.2 | 2.0 | 3.1 | 5.6 | 10.4 | 16.5 |
| | Noise optimised 4 kHz* 2) | $I_{r4}$ [A] | 1.5 | 2.5 | 3.9 | 7.0 | 13.0 | 23.5 |
| | Noise optimised 8 kHz* 2) | $I_{r8}$ [A] | 1.3 | 2.2 | 2.9 | 6.0 | 11.1 | 20.0 |
| | Noise optimised 12 kHz* | $I_{r12}$ [A] | 1.3 | 2.1 | 3.4 | 6.1 | 11.3 | 19.4 |
| | Noise optimised 16 kHz* | $I_{r16}$ [A] | 1.1 | 1.8 | 2.9 | 5.2 | 9.7 | 15.2 |
| Max. output current for 60 s 1) | | $I_{max4}$ [A] | 2.25 | 3.6 | 6.6 | 11.0 | 19.5 | 35.3 |
| | 8 kHz* | $I_{r8}$ [A] | 2.2 | 3.7 | 5.8 | 10.5 | 19.5 | 35 |
| | 12 kHz* | $I_{r12}$ [A] | 2.0 | 3.3 | 5.2 | 9.5 | 17.5 | 30.0 |
| | 16 kHz* | $I_{r16}$ [A] | 1.8 | 3.0 | 4.7 | 8.4 | 15.6 | 24.6 |
| | Noise optimised 4 kHz* 2) | $I_{r4}$ [A] | 2.3 | 3.8 | 5.8 | 10.5 | 19.5 | 35.5 |
| | Noise optimised 8 kHz* 2) | $I_{r8}$ [A] | 2.0 | 3.2 | 5.0 | 7.8 | 14.5 | 22.9 |
| | Noise optimised 12 kHz* | $I_{r12}$ [A] | 1.9 | 3.2 | 5.1 | 9.1 | 16.5 | 29.0 |
| | Noise optimised 16 kHz* | $I_{r16}$ [A] | 1.6 | 2.7 | 4.3 | 7.8 | 14.5 | 22.9 |
| Power loss (operation with $I_{rx}$) | | $P_{loss}$ [W] | 50 | 65 | 115 | 165 | 260 | 360 |

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

2) Only with variant “HVAC”

* Chopper frequency of the inverter

For more data see chapter 3.4.6 and chapter 3.4.7.

# 3.6 Fuses and cable cross-sections

## 3.6.1 Operation of controllers in UL-approved systems

- Use only UL-approved fuses and fuse holders:
  - 500 V to 600 V in the mains input (AC, F1 ... F3),
  - 700 V in the voltage DC bus (DC, F4/F5),
  - Activation characteristic ”H” or ”K5”.
- Only use UL-approved cables

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**Note!**

- UL-approved fuses and fuse holder are produced and sold by e.g. Gemballa Electronics GmbH in Kaltenkirchen, Germany.
- DC fuses as part of the Lenze accessories are UL approved.

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### 3.6.1.1 Protection of the motor cables

- For functional reasons, the motor cables need not to be protected by fuses if you only connect a motor per controller.
- If you want to drive several motors in parallel connected to a controller, an individual cable protection is required when reducing the cable cross-section.
- Refer to the data listed in ”Operation with mains filter/mains choke”

## 3.6.2 Single drives with 150 % overload

The table values are valid for the operation of 82XX controllers as single drives with a matching motor and 150 % overload.

| Type | Mains input L1, N, PE / motor connection U, V, W, PE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Operation without mains filter/mains choke | | | | | Operation with mains filter/mains choke | | | | |
| | Fuse F1, F2, F3 | | E.l.c.b. | Cable cross-section[1)] | | Fuse F1, F2, F3 | | E.l.c.b. | Cable cross-section[1)] | |
| | VDE | UL | VDE | $mm^2$ | AWG | VDE | UL | VDE | $mm^2$ | AWG |
| **8201** | M 10A | - | C 10A | 1.5 | 15 | M 10A | - | C 10A | 1.5 | 15 |
| **8202** | M 15A | - | C 16A | 2.5 | 13 | M 15A | - | C 16A | 2.5 [1.5] | 13 [15] |
| **8203** | M 20A | - | C 20A | 4 | 11 | M 15A | - | C 16A | 2.5 [1.5] | 13 [15] |
| **8204** | - | - | - | - | - | M 20A | - | C 20A | 4 [2.5] | 11 [13] |

Values in square brackets are valid for motor connection

| Type | Mains input L1, L2, L3, PE / motor connection U, V, W, PE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Operation without mains filter/mains choke | | | | | Operation with mains filter/mains choke | | | | |
| | Fuse F1, F2, F3 | | E.l.c.b. | Cable cross-section[1)] | | Fuse F1, F2, F3 | | E.l.c.b. | Cable cross-section[1)] | |
| | VDE | UL | VDE | $mm^2$ | AWG | VDE | UL | VDE | $mm^2$ | AWG |
| **8211** | M 6A | - | B 6A | 1 | 17 | M 6A | - | B 6A | 1 | 17 |
| **8212** | M 10A | - | B 6A | 1.5 | 15 | M 6A | - | B 6A | 1 | 17 |
| **8213** | M 10A | - | B 10A | 1.5 | 15 | M 10A | - | B 10A | 1.5 | 15 |
| **8214** | - | - | - | - | - | M 10A | - | B 10A | 1.5 | 15 |
| **8215** | M 16A | - | B 16A | 2.5 | 13 | M 16A | - | B 13A | 2.5 | 13 |
| **8216** | M 25A | - | B 25A | 6 | 10 | M 20A | - | B 20A | 4 | 11 |
| **8217** | M 32A | - | B 32A | 6 | 10 | M 25A | - | B 25A | 6 | 10 |
| **8218** | - | - | - | - | - | M 32A | - | B 32A | 6 | 10 |

| Type | Mains input L1, L2, L3, PE / motor connection U, V, W, PE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Operation without mains filter/mains choke | | | | | Operation with mains filter/mains choke | | | | |
| | Fuse F1, F2, F3 | | E.l.c.b. | Cable cross-section[1)] | | Fuse F1, F2, F3 | | E.l.c.b. | Cable cross-section[1)] | |
| | VDE | UL | VDE | $mm^2$ | AWG | VDE | UL | VDE | $mm^2$ | AWG |
| **8221** | 63A | -- | -- | 16 | 5 | M 35A | 35A | -- | 10 | 7 |
| **8222** | -- | -- | -- | -- | -- | M 50A | 50A | -- | 16 | 5 |
| **8223** | -- | -- | -- | -- | -- | M 80A | 80A | -- | 25 | 3 |
| **8224** | -- | -- | -- | -- | -- | M 100A | 100A | -- | 50 | 0 |
| **8225** | -- | -- | -- | -- | -- | M 125A | 125A | -- | 70 | 2 / 0 |
| **8226** | -- | -- | -- | -- | -- | M 160A | 175A | -- | 95 | 3 / 0 |
| **8227** | -- | -- | -- | -- | -- | M 200A | 200A | -- | 120 | 4 / 0 |
| **8241** | M 6A | 5A | B 6A | 1 | 17 | M 6A | 5A | B 6A | 1 | 17 |
| **8242** | M 6A | 5A | B 6A | 1 | 17 | M 6A | 5A | B 6A | 1 | 17 |
| **8243** | M 10A | 10A | B 10A | 1.5 | 15 | M 10A | 10A | B 10A | 1.5 | 15 |
| **8244** | -- | -- | -- | -- | -- | M 10A | 10A | B 10A | 1.5 | 15 |
| **8245** | M 25A | 25A | B 25A | 6 | 10 | M 20A | 20A | B 20A | 4 | 11 |
| **8246** | -- | -- | -- | -- | -- | M 32A | 25A | B 32A | 6 | 10 |

1) Observe national and regional regulations (e.g. VDE/EVU)!

### 3.6.3 Single drives with 120 % overload

The table values are valid for operation of 82XX controllers with matching motor and 120 % overload in pump and fan drives.

| Type | Mains input L1, L2, L3, PE / motor connection U, V, W, PE | | | | |
|---|---|---|---|---|---|
| | Operation with mains filter/mains choke | | | | |
| | Fuse F1, F2, F3 | | E.l.c.b. | Cable cross-section[1)] | |
| | VDE | UL | VDE | $mm^2$ | AWG |
| **8211** | M 6A | - | B 6A | 1 | 17 |
| **8212** | M 6A | - | B 6A | 1 | 17 |
| **8213** | M 10A | - | B 10A | 1.5 | 15 |
| **8214** | M 10A | - | B 10A | 1.5 | 15 |
| **8215** | M 20A | - | B 20A | 4 | 11 |
| **8216** | M 20A | - | B 20A | 4 | 11 |
| **8217** | M 32A | - | B 32A | 6 | 10 |
| **8218** | M 32A | - | B 32A | 6 | 10 |

| Type | Mains input L1, L2, L3, PE / motor connection U, V, W, PE | | | | |
|---|---|---|---|---|---|
| | **Operation only with mains filter/mains choke** | | | | |
| | Fuse F1, F2, F3 | | E.l.c.b. | Cable cross-section[1)] | |
| | VDE | UL | VDE | $mm^2$ | AWG |
| **8221** | M 50A | 50A | -- | 16 | 5 |
| **8222** | M 63A | 63A | -- | 25 | 3 |
| **8223** | M 80A | 80A | -- | 25 | 3 |
| **8224** | M 125A | 125A | -- | 70 | 2 / 0 |
| **8225** | M 160A | 175A | -- | 95 | 3 / 0 |
| **8226** | M 160A | 175A | -- | 95 | 3 / 0 |
| **8227** | M 200A | 200A | -- | 120 | 4 / 0 |
| **8241** | M 6A | 5A | B 6A | 1 | 17 |
| **8242** | M 6A | 5A | B 6A | 1 | 17 |
| **8243** | M 10A | 10A | B 10A | 1.5 | 15 |
| **8244** | M 10A | 10A | B 10A | 1.5 | 15 |
| **8245** | M 20A | 20A | B 20A | 4 | 11 |
| **8246** | M 32A | 25A | B 32A | 6 | 10 |

1) Observe national and regional regulations (e.g. VDE/EVU)!

## 3.7 Analog plug-in module 8279IB

Order No. EMZ8279IB

**Note!**
Only controllers of the 8210, 8220 and 8240 HVAC (V020) series can be equipped with an analog plug-in module 8278IB, because they provide the required software.

### 3.7.1 Features

The analog plug-in module 8279IB provides a second analog input. It converts an analog input signal (0 ... 10 V or 0 ... 20 mA) into a digital signal (pulse frequency 0 ... 10 kHz) with the following levels:

- LOW level = 0 V ... 3 V
- HIGH level = 12 V ... 30 V

For operation with 4 ... 20 mA, the following codes must be parameterised:

- C426 = 125 %
- C427 = -12.5 %

Further notes can be obtained from the code table.

Controllers of the 8210, 8220 and 8240 series equipped with an analog plug-in module, can be used for the following process controller applications:

- Pressure regulation
- Temperature or volume control
- Setpoint summation
- Speed or dancer-position control

To operate the analog plug-in module, the terminal configuration C007 has to be set to -28-...-45- or -48- ... -51-.

The inverters with plug-in module are subject to the technical data and application conditions of the controllers.

## 3.8 Dimensions

The controller dimensions depend on the mechanical installation (see chapter 4.1).

### 3.8.1 Analog plug-in module

**Note!**
Only controller of the series 8210, 8220 and 8240 HVAC (V020) can be equipped with the analog plug-in module.

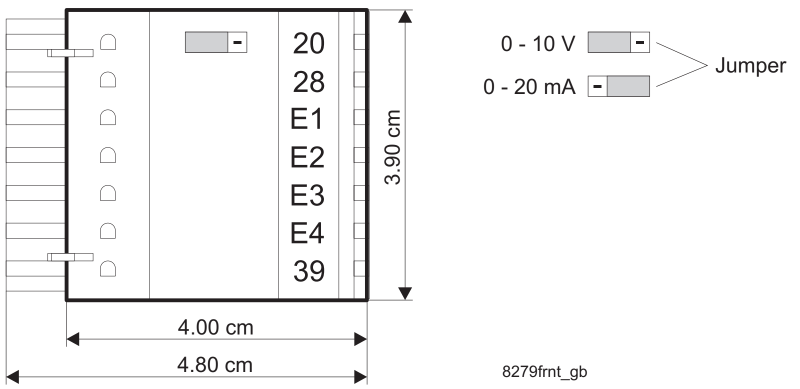



FIG 3-2 Dimensions of analog plug-in module

The changeover of the analog input between 0 V ... 10 V (factory setting) or 0 mA ... 20 mA (internal 500 Ω load) is carried out via a jumper on the PCB.

The jumper can be accessed when removing the cover from the internal PCB.

# 4 Installation

## 4.1 Mechanical installation

### 4.1.1 Important notes

- Use the controllers only as built-in devices!
- If the cooling air contains pollutants (dust, fluff, grease, aggressive gases):
  - Take suitable preventive measures, e.g. separate air duct, installation of filters, regular cleaning, etc.
- Ensure free space!
  - You can install several controllers next to each other without free space in a control cabinet.
  - Ensure unimpeded ventilation of cooling air and outlet of exhaust air!
  - Allow a free space of 100 mm at the top and at the bottom.
- Do not exceed the ambient temperature permitted during operation (see chapter 3.3).
- With continuous oscillations or vibrations:
  - Check the use of shock absorbers.

**Possible mounting positions for types 8201 to 8214**

- In vertical position at the back of the control cabinet, terminals point to the front:
  - With attached fixing rails.
  - With special fixing unit on one or two DIN rails.
- Turned by 90° (flast assembly on the backside of the control cabinet):
  - Insert the attached fixing rail into the guides at the heat sink.
- Horizontally with an additional fan.
- On a pivoting frame for assembly depths < 198 mm:
  - Therefore easy handling and installation of the front interfaces possible.

**Possible mounting positions for types 8215 to 8218**

- In vertical position at the back of the control cabinet, terminals point to the front:
  - With attached fixing rails.
  - Thermally separated with external heat sink ("push-through technique").
  - Variant V003 thermally separated with external cooler in "Cold plate" technique (e.g. with convection cooler).

**Possible mounting positions types 822X/824X**

- In vertical position at the back of the control cabinet, terminals point to the front:
  - With attached fixing brackets.
  - Thermally separated with external heat sink ("push-through technique").
  - Variant V003 thermally separated with external cooler in "Cold plate" technique (e.g. with convection cooler).

## 4.1.2 Standard assembly with fixing rails or fixing brackets

### 4.1.2.1 Types 8201 to 8204

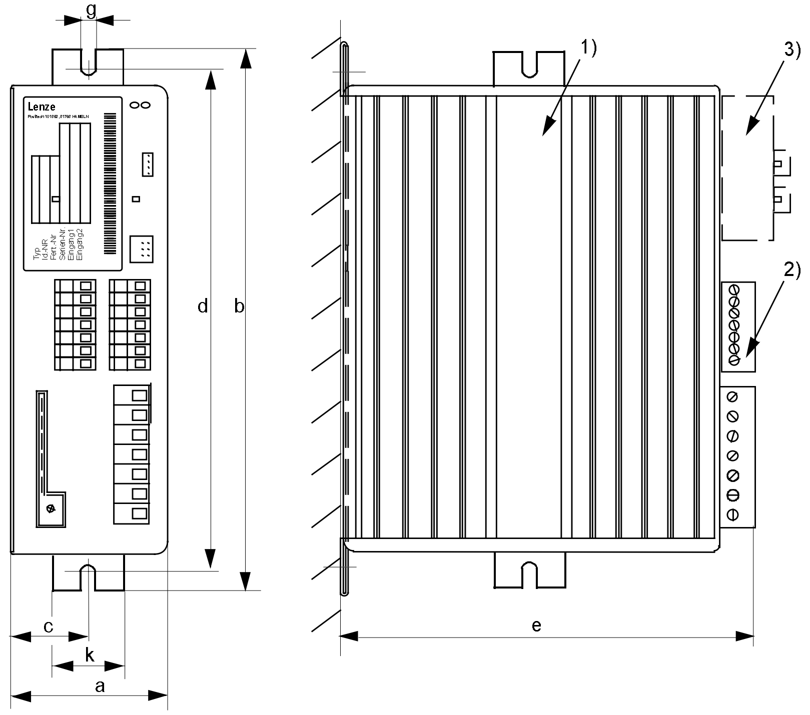



FIG 4-1 Dimensions 8201 - 8204: Standard assembly

1) Insert the fixing rail here for side assembly

2) Observe the free space required for the connection cables

3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| [mm] | a | b | c | d | e 3) | g | k |
|---|---|---|---|---|---|---|---|
| **8201** | 64 | 210 | 29 | 190 | 158 | 6.5 | 30 |
| **8202** | 64 | 210 | 29 | 190 | 198 | 6.5 | 30 |
| **8202-V002** | 64 | 210 | 29 | 190 | 158 | 6.5 | 30 |
| **8203 / 8204** | 83 | 283 | 38 | 263 | 211 | 6.5 | 30 |

### 4.1.2.2 Type 8202-V002 (reduced assembly depth)

This variant is equipped with a heat sink with a smaller surface. Observe the following points to comply with the technical data:

- Assembly on an unpainted, metallic assembly board.
- Area > 0.15 $m^2$.
- Sheet thickness at least 2 mm.

### 4.1.2.3 Types 8211 to 8214

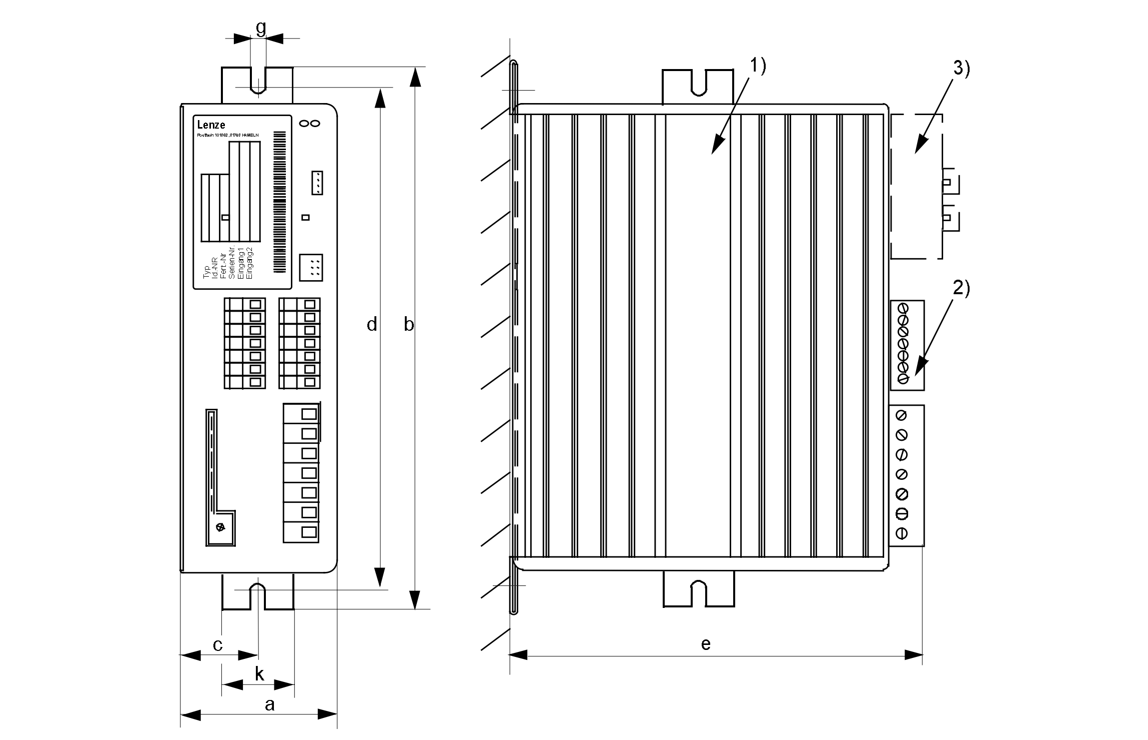



FIG 4-2 Dimensions 8211 - 8214: Standard assembly

1) Insert the fixing rail here for side assembly

2) Observe the free space required for the connection cables

3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| [mm] | a | b | c | d | e 3) | g | k |
|---|---|---|---|---|---|---|---|
| 8211 / 8212 / 8213 / 8214 | 83 | 283 | 38 | 263 | 211 | 6.5 | 30 |

### 4.1.2.4 Types 8215 to 8218

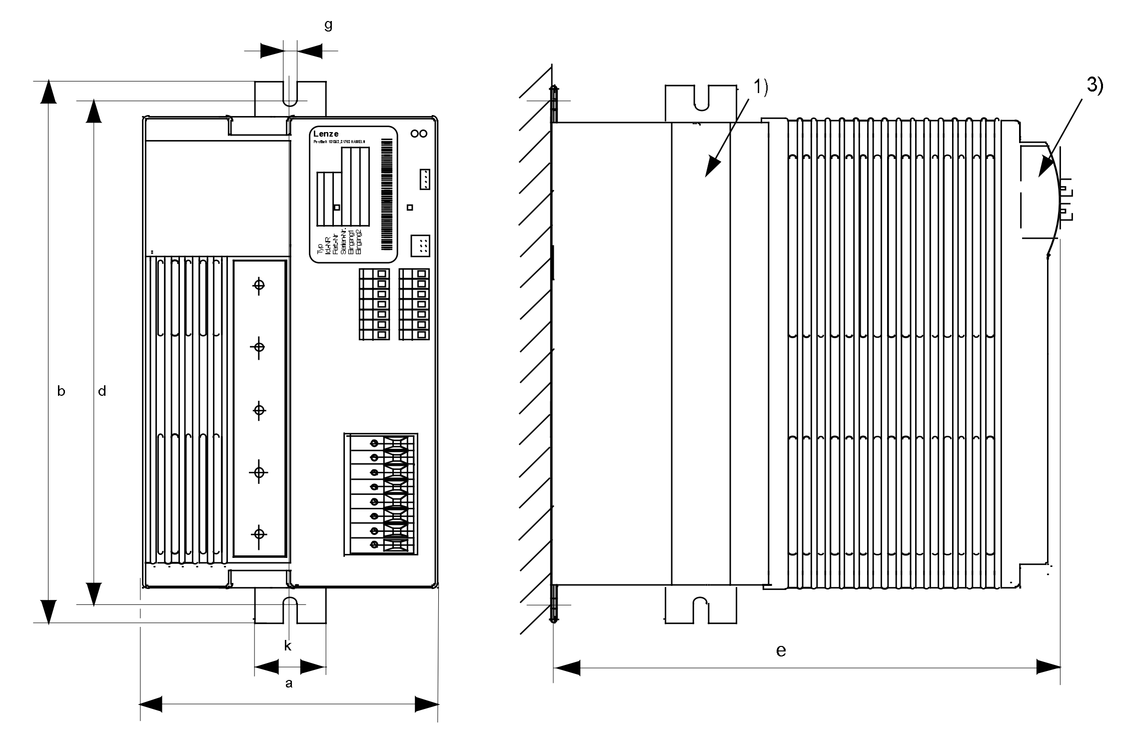



FIG 4-3 Dimensions 8215 - 8218: Standard assembly

1) Insert the fixing rail here for side assembly
2) Observe the free space required for the connection cables
3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| [mm] | a | b | d | e 3) | g | k |
|---|---|---|---|---|---|---|
| **8215 / 8216 / 8217 / 8218** | 125 | 283 | 263 | 218 | 6.5 | 30 |

## 4.1.2.5 Types 8221 to 8227

| **Assembly preparation** (see FIG 4-4) | |
|---|---|
| To assemble and install the controller it is necessary to remove the unit cover. The accessory kit inside the controller contains the parts required for assembly and installation. | 1. Loosen screws (x).<br>2. Swing cover to the top and detach.<br>3. Screw fixing brackets onto the housing. |

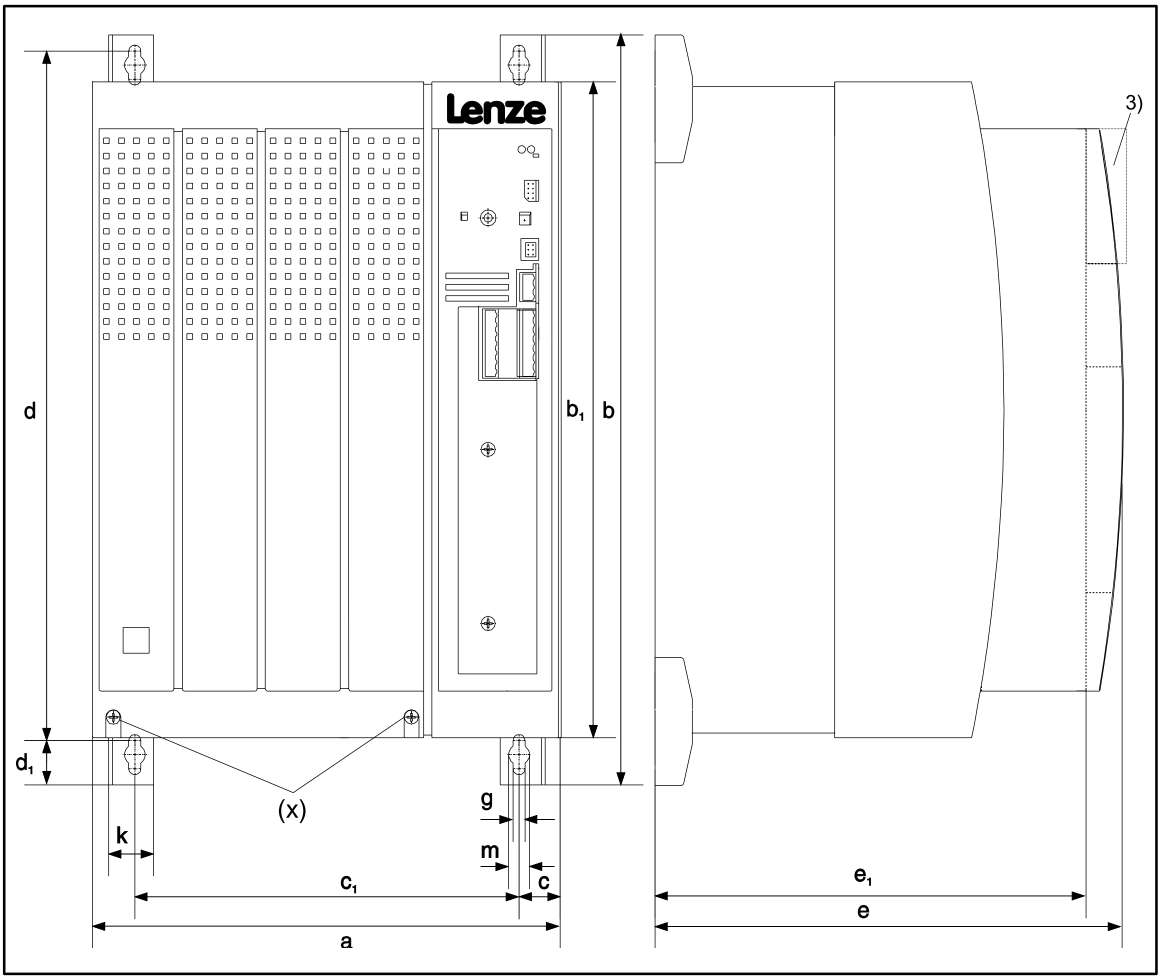



FIG 4-4 Dimensions 8221 - 8227: Standard assembly

3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| [mm] | a | b | b1 | c | c1 | d | d1 | e 3) | e1 | g | k | m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **8221 / 8222 / 8223** | 250 | 402 | 350 | 22 | 206 | 370 | 24 | 250 | 230 | 6.5 | 24 | 11 |
| **8224** | 340 | 580 | 510 | 28.5 | 283 | 532 | 38 | 285 | 265 | 11 | 24 | 18 |
| **8225** | 340 | 672 | 591 | 28.5 | 283 | 624 | 38 | 285 | 265 | 11 | 28 | 18 |
| **8226 / 8227** | 450 | 748.5 | 680 | 30.5 | 389 | 702 | 38 | 285 | 265 | 11 | 28 | 18 |

### 4.1.2.6 Types 8241 to 8246

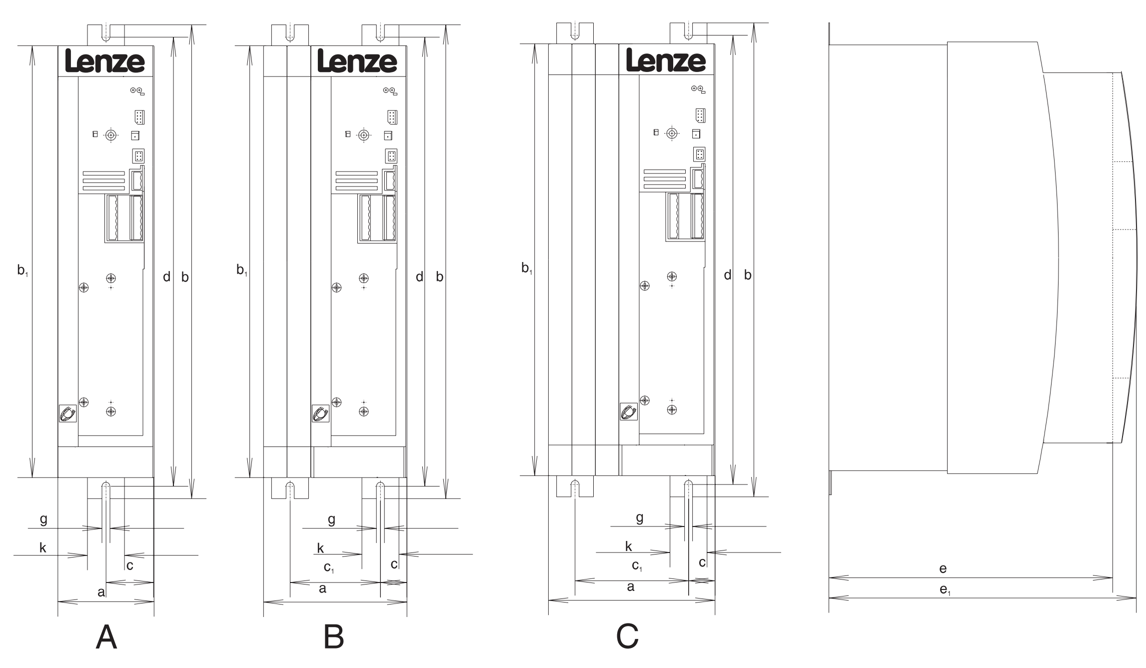



FIG 4-5 Dimensions 8241 - 8246: Standard assembly

3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| [mm] | Fig. | a | b | b1 | c | c1 | d | d1 | e 3) | e1 | g | k | m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **8241 / 8242** | A | 78 | 384 | 350 | 39 | - | 365 | - | 230 | 250 | 6.5 | 30 | - |
| **8243 / 8244** | B | 97 | 384 | 350 | 48.5 | - | 365 | - | 230 | 250 | 6.5 | 30 | - |
| **8245 / 8246** | C | 135 | 384 | 350 | 21.5 | 92 | 365 | - | 230 | 250 | 6.5 | 30 | - |

## 4.1.3 DIN-rail assembly

### 4.1.3.1 Types 8201 to 8204

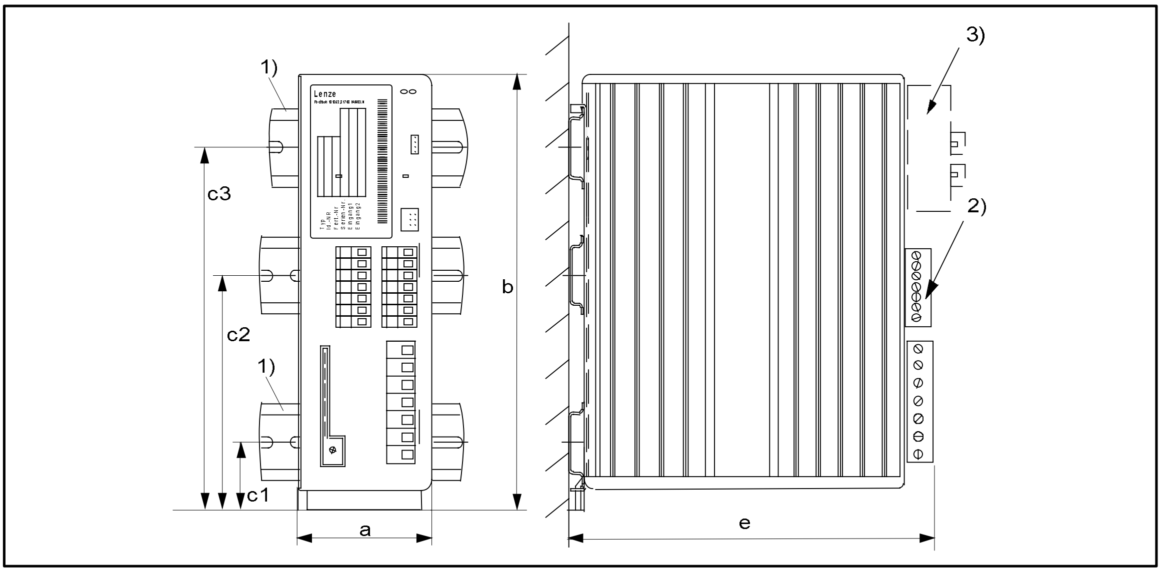



FIG 4-6 Dimensions 8201 - 8204: DIN rail assembly

1) 8201/8202: Assembly on a DIN rail (middle) or two DIN rails (top and bottom) possible)
8203 - 8204: Assembly on two DIN rails required

2) Observe the free space required for the connection cables

3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| [mm] | a | b | c1 | c2 | c3 | e 3) |
|---|---|---|---|---|---|---|
| **8201** | 64 | 188 | 16 | 98 | 149 | 173 |
| **8202** | 64 | 188 | 16 | 98 | 149 | 213 |
| **8203 / 8204** | 83 | 258 | 16 | - | 149 | 237 |

## 4.1.3.2 Types 8211 to 8214

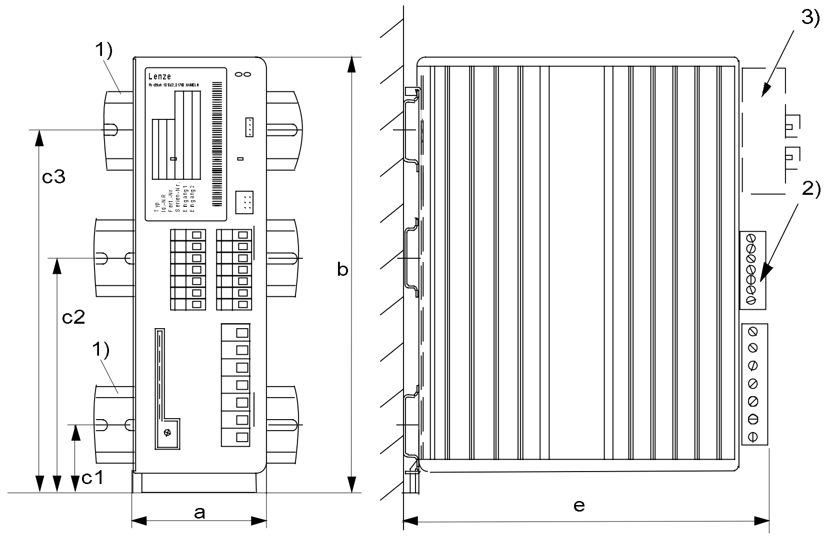



FIG 4-7 Dimensions 8211 - 8214: DIN-rail assembly

1) Assembly on two DIN rails required

2) Observe the free space required for the connection cables

3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| [mm] | a | b | c1 | c2 | c3 | e 3) |
|---|---|---|---|---|---|---|
| 8211 / 8212 / 8213 / 8214 | 83 | 258 | 16 | - | 149 | 226 |

### 4.1.4 Assembly with thermally separated power stage ("push-through technique")

The heat sink of the controllers

- 8215 to 8218
- 8221 to 8227
- 8241 to 8246

can also be externally mounted to reduce the heat generated in the control cabinet. You need an assembly frame with seal (see Accessories).

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

#### Assembly preparation

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

### 4.1.4.1 Types 8215 to 8218

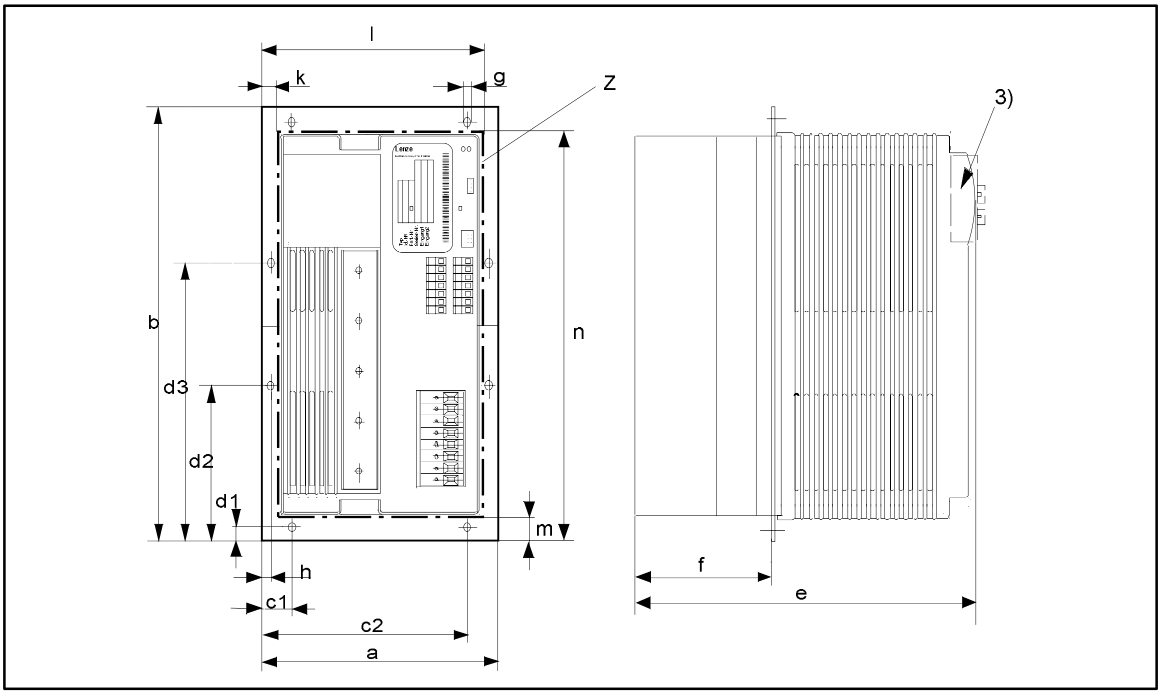



FIG 4-8 Dimensions 8215 - 8218: Assembly with thermally separated power stage

3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| [mm] | a | b | c1 | c2 | d1 | d2 | d3 | e [3)] | f | g | h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **8215 / 8216 / 8217 / 8218** | 162 | 283 | 31 | 132 | 10 | 90.5 | 192.5 | 218 | 88 | 6.5 | 8.5 |

| Assembly cut-out [mm] | Height | Width | k | l | m | n |
|---|---|---|---|---|---|---|
| Line Z | 250 ±5 | 132 ±5 | 16 ±2 | 147 ±2 | 19 ±2 | 266 ±2 |

## 4.1.4.2 Types 8221 to 8227

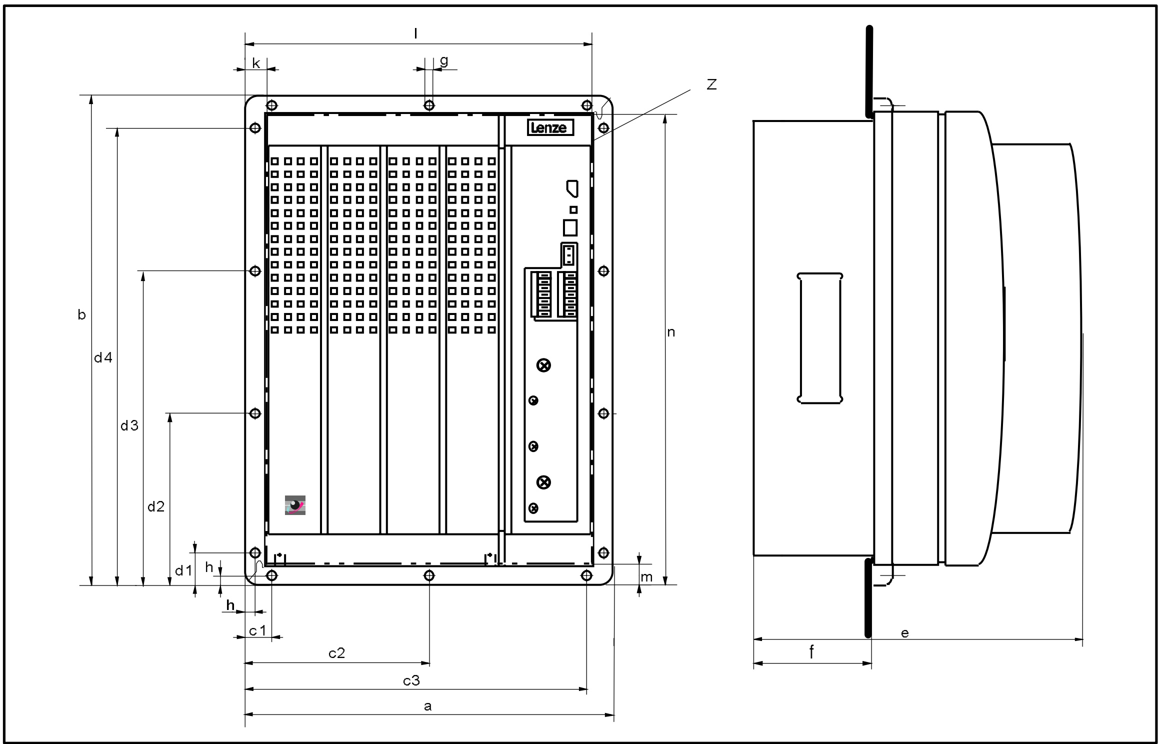



FIG 4-9 Dimensions 8221 - 8227: Assembly with thermally separated power stage

3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| [mm] | a | b | c1 | c2 | c3 | d1 | d2 | d3 | d4 | e 3) | f | g | h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8221 / 8222 / 8223 | 280 | 379 | 28 | 140 | 252 | 41 | 141 | 238 | 338 | 250 | 90 | 6 | 9 |
| 8224 / 8225 | | | | | | | | | | | | | |
| 8226 / 8227 | | | | | | | | | | | | | |

| Assembly cut-out Z [mm] | Height | Width | k | l | m | n |
|---|---|---|---|---|---|---|
| 8221 / 8222 / 8223 | 338 ±1 | 238 ±1 | 20 ±2 | 259 ±2 | 20 ±2 | 359 ±2 |
| 8224 / 8225 | | | | | | |
| 8226 / 8227 | | | | | | |

### 4.1.4.3 Types 8241 to 8246

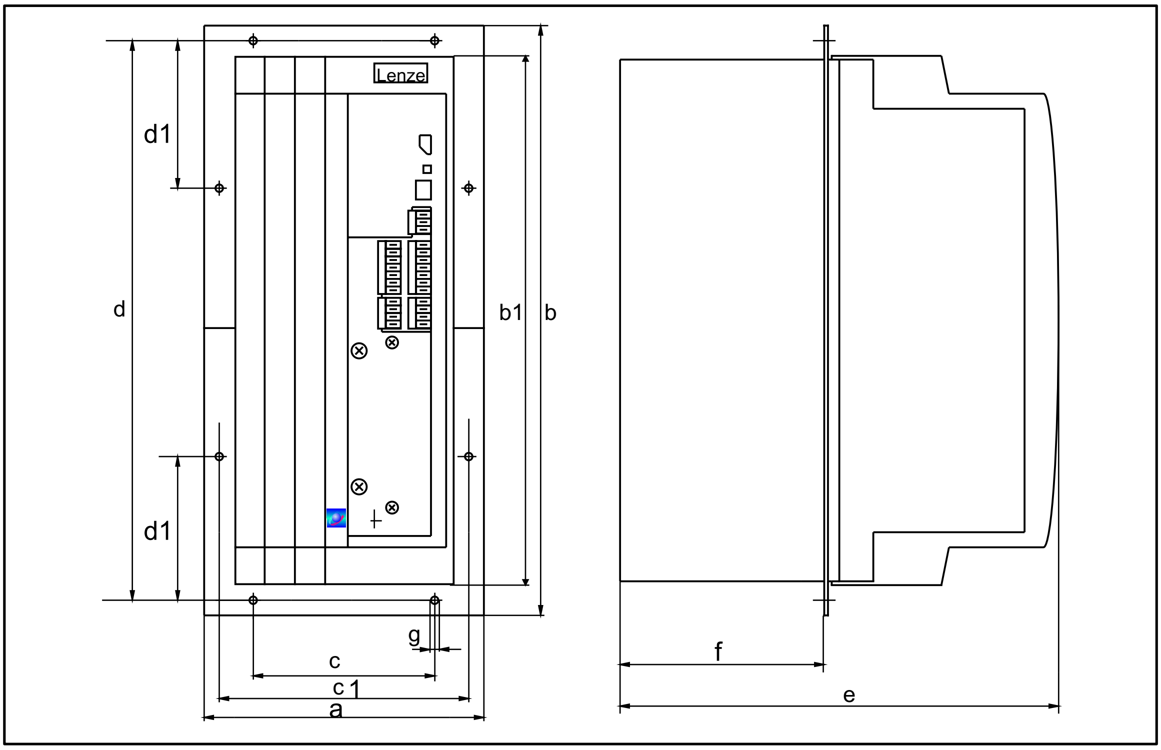



FIG 4-10 Dimensions 8241 - 8246: Assembly with thermally separated power stage

3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| [mm] | a | b | b1 | c | c1 | d | d1 | e 3) | f | g |
|---|---|---|---|---|---|---|---|---|---|---|
| **8241 / 8242** | 112.5 | 385.5 | 350 | 60 | 95.5 | 365.5 | 105.5 | 250 | 92 | 6.5 |
| **8243 / 8244** | 131.5 | 385.5 | 350 | 79 | 114.5 | 365.5 | 105.5 | 250 | 92 | 6.5 |
| **8245 / 8246** | 135 | 385.5 | 350 | 117 | 137.5 | 365.5 | 105.5 | 250 | 92 | 6.5 |

| Assembly cut-out [mm] | Height | Width |
|---|---|---|
| **8241 / 8242** | 350 ±3 | 82 ±3 |
| **8243 / 8244** | 350 ±3 | 101 ±3 |
| **8245 / 8246** | 350 ±3 | 139 ±3 |

### 4.1.5 Assembly of the variant 82XX-V003 ”cold plate”

#### 4.1.5.1 General

**Fields of application**

- Application of coolers without separately driven fan:
  - If e.g. the cooling air is so contaminated that it is not possible to use separately driven fans. The performance as well as the service life of the fan would be reduced.
- High enclosure with thermal separation:
  - If thermal separation is required because of the heat generation in the control cabinet and if the enclosure class of the cooling unit must be higher than IP41.
- Application of controllers directly in the machine with reduced assembly depth:
  - Machine components adopt the cooling function.
- The drive concept provides common cooling units (water cooler, forced-air cooler, etc.) for all controllers.
- Because of technical reasons, the convection cooling is not suitable for continuous powers > 22 kW. Here, forced cooling (e.g. water cooling) is required.

### 4.1.5.2 Demands on the cooler

Coolers, which can be operated with different coolants (air, water, oil, etc.), can dissipate the power loss of the controller.

In addition to the features required by the user, the following features are important for safe operation:

- Good thermal connection with the cooler
  - The contact surface between cooler and controller must be at least as large as the cold plate of the controller.
  - Smooth contact surface: approx. 0.05 mm
  - Connect cooler and cold plate by means of the provided screws.
  - For further information see chapter 4.1.5.4 ff.
- Observe the thermal resistance $R_{thmin\ heat\ sink}$ (transition cooler - coolant) according to the table. The values are valid for
  - the operation of controllers under rated conditions (see chapter 3.4),
  - a max. temperature of the cold plate of 75 °C, measuring point: see FIG 4-11, FIG 4-13, FIG 4-14.

| Controller / brake units | Cooling path | |
|---|---|---|
| | Power to be dissipated $P_{loss\ crtl}$ [W] | $R_{thmin\ heat\ sink}$ [K/W] |
| 8215-V003 | 135 | 0.25 |
| 8216-V003 | 180 | 0.19 |
| 8217-V003 | 250 | 0.14 |
| 8218-V003 | 360 | 0.10 |
| 8221-V003 | 410 | 0.085 |
| 8222-V003 | 610 | 0.057 |
| 8241-V003 | 24 | 1.45 |
| 8242-V003 | 42 | 0.85 |
| 8243-V003 | 61 | 0.57 |
| 8244-V003 | 105 | 0.33 |
| 8245-V003 | 180 | 0.19 |
| 8246-V003 | 360 | 0.10 |
| 9351-V003 | 100 | 0.3 |
| 9352-V003 | 63 | 0.3 |

## 4.1.5.3 Thermal performance of the system

The thermal conditions of a system are influenced by several factors. Take the following into account for the selection of a control cabinet/system:

### Ambient temperature of the controller

The rated data and the corresponding derating factors for higher temperatures are still valid for the ambient temperature of the controller.

### Heat generation inside control cabinets

In addition to the unit losses, which are to be dissipated via the external heat sink, further losses must be taken into account:

- Losses inside the controller
  - These losses are generated by the electronics supply, fans, DC-bus capacitors, etc.
- Losses of the mains and motor components:
  - You find detailed information about the losses of these components in the corresponding technical data (Part 1) of the catalogs.
- Heat radiation from the external cooler into the unit:
  - This portion of the thermal energy depends, among others, on the type of cooling unit and assembly.
  - 821X-V003:
    Lenze convection coolers dissipate approx. 65 % of the total power loss of the controller via the cooler, approx. 35 % must be dissipated via the control-cabinet cooling.
  - 822X-V003/824X-V003:
    No details at present.

### Thermal distribution to common cooling units/in the control cabinet

If several components (controller, brake units, etc.) are mounted onto a common cooler, it must be ensured that the cold plate temperature at the controller does not exceed 75 °C.

Measures:

- 821X-V003 with Lenze convection coolers
  - Min. free space required for the convection coolers:
    200 mm left and right / 500 mm top and bottom.
  - Do not install one controller on top of the other.
  - If necessary, use integral fans to avoid heat concentration inside the control cabinet.
- 82XX-V003 with other coolers:
  - No details at present, empirical testing required.

### 4.1.5.4 Assembly preparations

- Apply the heat-conducting paste before you bolt the cooler onto the cold plate of the controller to reduce the heat-transfer resistance to a minimum.
- The heat-conducting paste, which you will find in the accessory kit, will be enough for an area of approx. 1000 $cm^2$.

**Application of heat-conducting paste**

1. Clean the contact surfaces of the cooler and cold plate with ethanol.
2. Apply the heat-conducting paste thinly with a scraper or a brush.

### 4.1.5.5 Assembly of 821X-C-V003

**Note!**
With 821X-C-V003, the cooler is screwed to the back of the controller cold plate. Provide enough free space for the dismantling of the controller.

**Control-cabinet assembly of Lenze convection coolers**

The fixing screws are included in the delivery package of the convection cooler.

1. Use the 8 fixing screws M5 x 20 to screw the convection cooler onto the cold plate.
   - For other screws observe the insertion depth t into the cold plate: 8 mm $\leq$ t $\leq$ 10 mm
   - Tightening torque: 3.4 Nm.
2. Push the gasket over the front onto the convection cooler.
3. Push the controller from behind through the cut-out at the back of the control cabinet.
4. Screw the fixing screws 8 x M6 x 12 from inside the control cabinet through the back and the gasket in the tapped holes of the heat sink.
   - Tighten screws crosswise.
   - Tightening torque: 5.4 Nm.

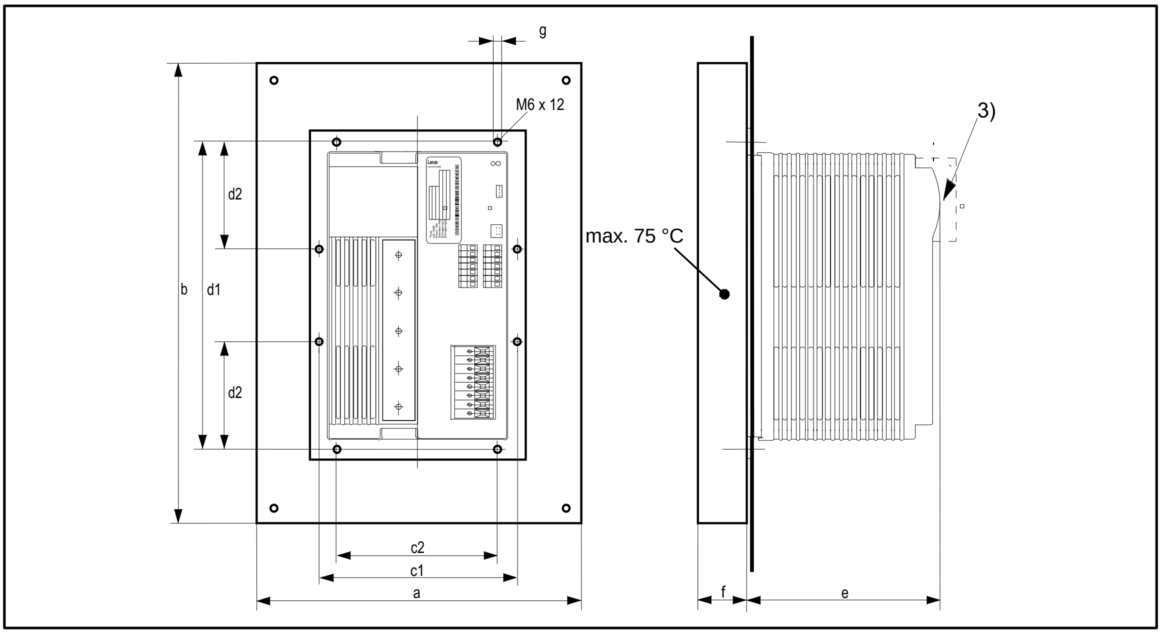



FIG 4-11 Dimensions 821X-V003: Control-cabinet assembly of Lenze convection coolers

3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| **[mm]** | **a** | **b** | **c1** | **c2** | **d1** | **d2** | **e** 3) | **f** | **g** |
|---|---|---|---|---|---|---|---|---|---|
| **8215-V003** | 300 | 400 | 145 | 100 | 263 | 80.5 | 138 | 83 | 6.5 |
| **8216-V003** | 300 | 500 | 145 | 100 | 263 | 80.5 | 138 | 83 | 6.5 |
| **8217-V003** | 300 | 600 | 145 | 100 | 263 | 80.5 | 138 | 83 | 6.5 |
| **8218-V003** | 300 | 750 | 145 | 100 | 263 | 80.5 | 138 | 83 | 6.5 |

| **Assembly cut-out [mm]** | **Height** | **Width** |
|---|---|---|
| | 250 ±5 | 132 ±5 |

### Wall mounting of Lenze convection coolers

1. Use the 8 fixing screws M5 x 20 to screw the convection cooler onto the cold plate.
   - The fixing screws are included in the delivery package of the convection cooler.
   - For other screws observe the insertion depth t in the cold plate: $8\text{ mm} \leq t \leq 10\text{ mm}$
   - Tightening torque: 3.4 Nm.
2. Fix the unit at the wall by screwing the 4 screws (max. diameter 8 mm) through the bores provided.

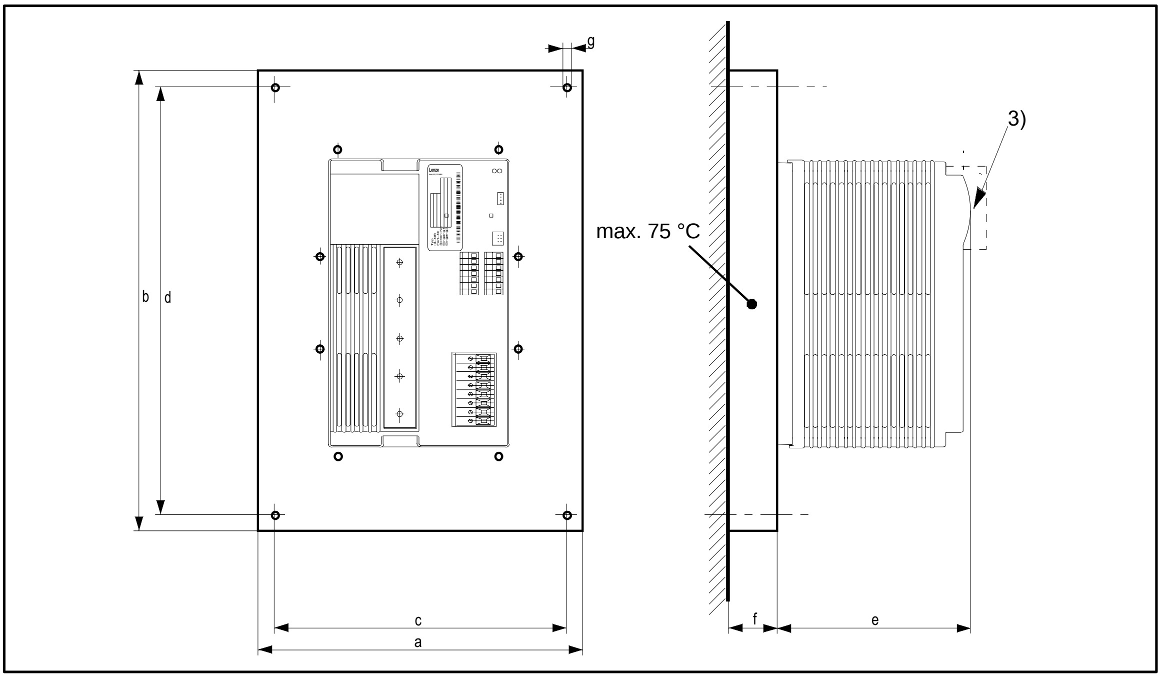



FIG 4-12 Dimensions 821X-V003: Wall mounting of Lenze convection coolers

3) With of attachable fieldbus or I/O modules: Observe the assembly depth and the space required for connection cables.

| [mm] | a | b | c | d | e 3) | f | g |
|---|---|---|---|---|---|---|---|
| **8215-V003** | 300 | 400 | 230 | 320 | 138 | 83 | 9 |
| **8216-V003** | 300 | 500 | 230 | 320 | 138 | 83 | 9 |
| **8217-V003** | 300 | 600 | 230 | 320 | 138 | 83 | 9 |
| **8218-V003** | 300 | 750 | 230 | 320 | 138 | 83 | 9 |

## 4.1.5.6 Assembly of 822X-C-V003

- Fix the controller to the heat sink using the fixing screws M5 x 25.
- Tightening torque: 3.4 Nm.

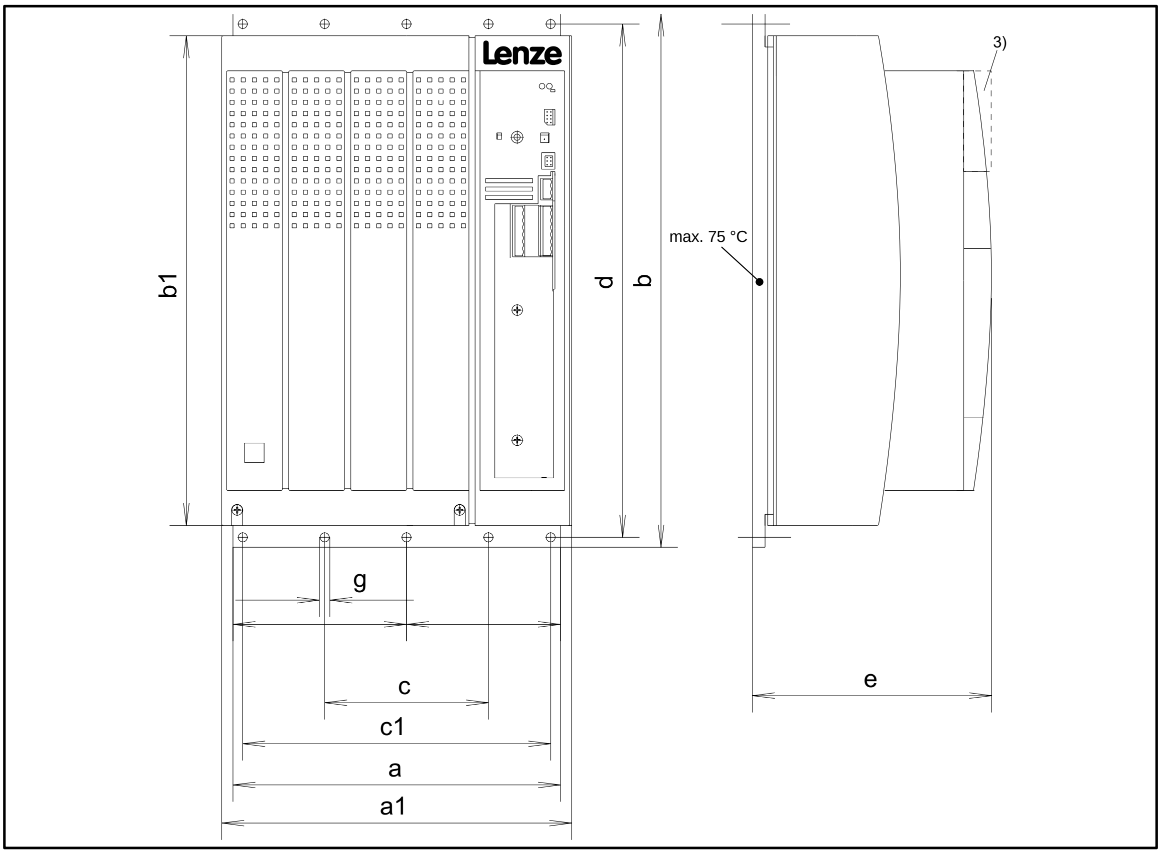



FIG 4-13 Dimensions 822X-C-V003: Control-cabinet assembly

3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| [mm] | a | a1 | b | b1 | c | c1 | d | e 3) | g |
|---|---|---|---|---|---|---|---|---|---|
| 8221-V003<br>8222-V003 | 234 | 250 | 381 | 350 | 110 | 220 | 367 | 171 | 6.5 |

### 4.1.5.7 Assembly of 824X-C-V003

- Fix the controller to the heat sink using the fixing brackets and the fixing screws M5x20.
- Tightening torque: 3.4 Nm.

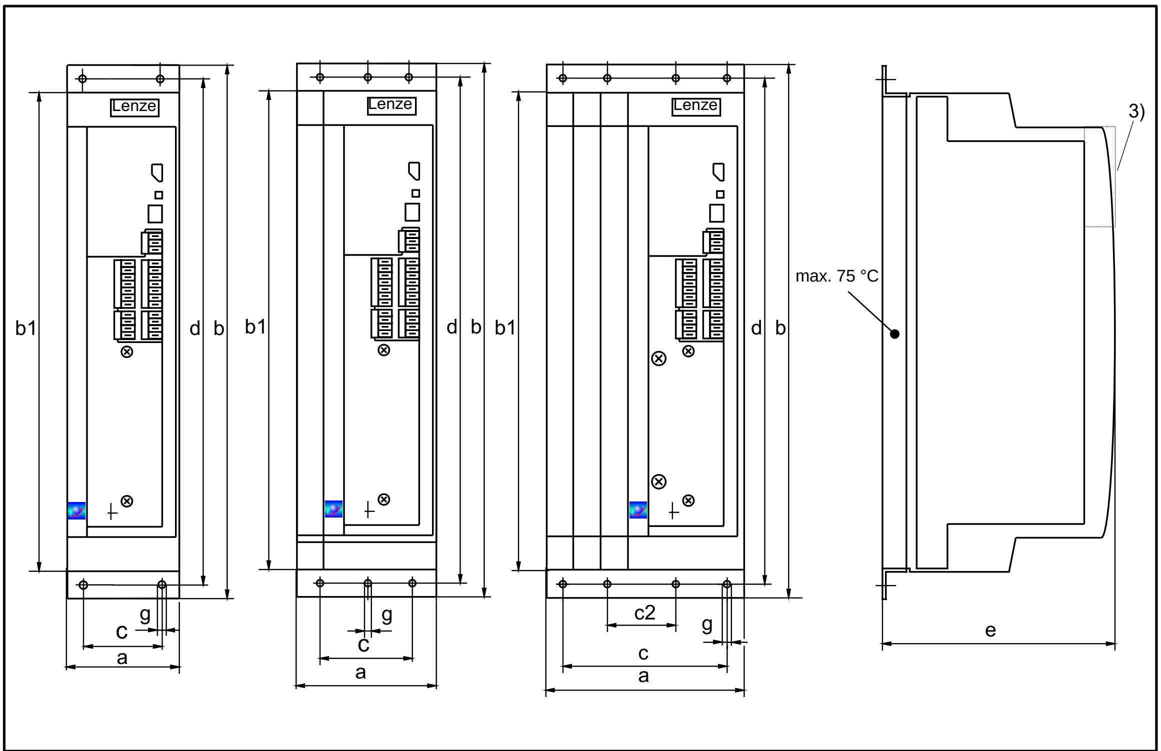



FIG 4-14 Dimensions 824X-C-V003: Control-cabinet assembly

3) With attachable fieldbus or I/O module:
Observe assembly depth and assembly space required for connection cables

| [mm] | a | b | b1 | c | c2 | d | e 3) | g |
|---|---|---|---|---|---|---|---|---|
| **8241-V003**<br>**8242-V003** | 78 | 381 | 350 | 48 | - | 367 | 168 | 6.5 |
| **8243-V003**<br>**8244-V003** | 97 | 381 | 350 | 67 | - | 367 | 168 | 6.5 |
| **8245-V003**<br>**8246-V003** | 135 | 381 | 350 | 105 | 38 | 367 | 168 | 6.5 |

### 4.1.6 Assembly with mains filter

**Note!**
More information about dimensions, installation and selection of the appropriate mains filter can be obtained from the catalog Global Drive 8200 Frequency Inverters.

**Standard assembly**

1. Screw the fixing brackets to the housing of the controller and the mains filter.
2. Connect the ready-to-use output cables (unit/load) of the filter to the mains input of the controller (L1, L2, L3, PE).
3. Use all fixing brackets to mount the unit to the assembly wall.

**Assembly with thermally separated power stage**

1. For assembly preparations, see chapter 4.1.4.
2. Dismantle the housing of the mains filter.
3. Mount the controller into the assembly cut-out.
4. Connect the ready-to-use output cables of the filter (unit/load) to the mains input of the controller (L1, L2, L3, PE).

**Assembly of the variant “Cold plate”**

1. For assembly preparations, see chapter 4.1.5.
2. Dismantle the housing of the mains filter.
3. Mount the controller into the assembly cut-out.
4. Connect the ready-to-use output cables of the filter (unit/load) to the mains input of the controller (L1, L2, L3, PE).

**Assembly, if the assembly space is not deep enough**

1. Mount the mains filter next to the controller.
2. Refer to the dimensions for assembly with thermally separated power stage.

### 4.1.7 Assembly of the analog plug-in module 8279IB

**Note!**
Only controllers of the series 8210, 8220 and 8240 HVAC (V020) can be equipped with the analog plug-in module 8279IB.

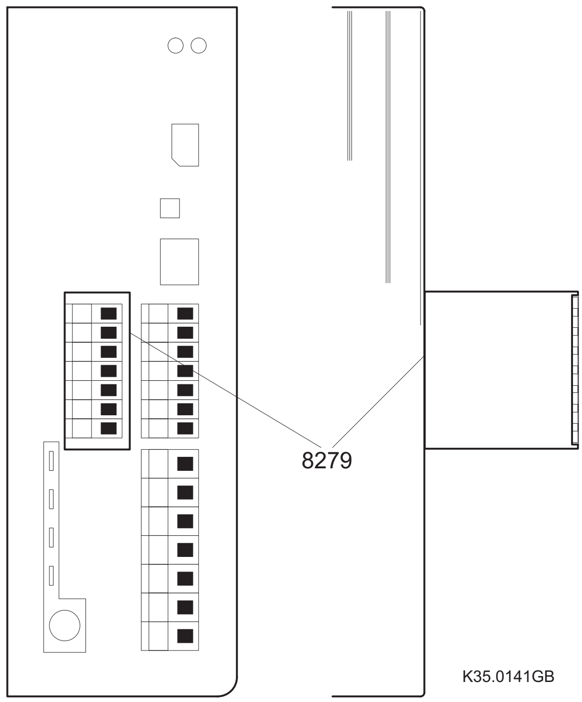


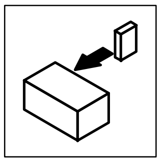

FIG 4-15 Analog plug-in module directly mounted onto the controller

**Assembly**

- The analog plug-in module is plugged onto the right terminal strip (terminals 20 ... 39).
- The assembly depth of the controller is thus increased by 40 mm.

| Step | What to do |
|---|---|
| 1. | If mounted, remove the socket connector mounted to terminals 20 ... 39. |
| 2. | Connect the plug-in module to the terminals 20 ... 39. |
| 3. | Plug the socket connector in the terminals strip of the analog plug-in module (the plug-in module serves as intermediate adapter). |
| 4. | Connect the analog input to the terminals E1 and 39 of the socket connector. |

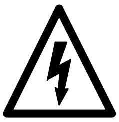
**Note!**
Because of the mechanical instability, the installation of an analog plug-in module **and** a PTC input module should be avoided.



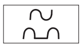
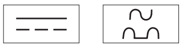
## 4.2 Electrical installation

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

### 4.2.1 Operator’s safety



**Danger!**
All power terminals remain live up to 3 minutes after mains disconnection.

| Labelling of the r.c.c.b. | Meaning |
|---|---|
|  | AC-sensitive residual-current circuit breaker (RCCB, type AC) |
|  | Pulse-current sensitive residual-current circuit breaker (RCCB, type A) |
|  | All-current sensitive residual-current circuit breaker (RCCB, type B) |

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

**Protection of persons and animals**
DIN VDE 0100 with residual-current operated protective devices (RCCB):
- The controllers are internally equipped with a mains rectifier. In the event of a short circuit to frame a smooth DC fault current can block the activation of the AC sensitive or pulse-current sensitive r.c.c.b. and thus eliminate the protective function for all units connected to this r.c.c.b. We therefore recommend:
  - ”Pulse-current sensitive r.c.c.b.” in systems with 820X controllers (L1/N).
  - ”All-current sensitive r.c.c.b.” in systems with 821X/822X/824X controllers (L1/L2/L3).

**Rated fault current**
Please observe the rated fault current for the selection of the r.c.c.b.
The r.c.c.b. may be activated unintentionally by
- capacitive leakage currents between the cable screens (especially with long screened motor cables),
- simultaneous connection of several controllers to the mains,
- using RFI filters.

**Installation**
The r.c.c.b. must only be installed between the supplying mains and the controller.

**Note about the use of all-current sensitive r.c.c.b.**
- All-current sensitive r.c.c.b. are described for the first time in the European standard EN 50178 (version October 1997). The EN 50178 has been harmonised and has been effective since October 1997. It replaces the national standard VDE 0160. The r.c.c.b. are also described in the IEC 755.
- R.c.c.b. with a rated fault current of
  - 30 mA are only suitable for systems with 820X controllers,
  - 300 mA are only suitable for systems with 821X/822X/824X controllers.

**Electrical isolation / protection against contact**
The control inputs and outputs of all controllers are mains isolated. Please observe the terminal description of the different controllers.

**Replacement of defective fuses**
Replace defective fuses with the prescribed type only when no voltage is applied.
- For single drives, the controller carries a hazardous voltage up to three minutes after mains disconnection.
- In DC-bus operation, all controllers must be inhibited and separated from the mains.

**Separate controller from the mains**
Make a safety disconnection between the controller and mains only via a contactor at the input side.
- Ensure that all controllers connected to the DC-bus are inhibited.

## 4.2.2 Protection of the controllers

**Stop!**

The controllers contain electrostatically sensitive components:

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

---

- The controller is protected by external fuses.
- Unused control inputs and outputs should be covered with plugs.
- Frequent mains switching can overload the internal switch-on current limitation. For cyclic mains switching, the controller can be switched on every three minutes as a maximum.
- The controllers 8204, 8214, 8218, 8222 - 8227, 8224, 8246 must only be operated together with appropriate mains filter/mains choke.
- In case of condensation, connect the controller to the mains voltage only after the visible humidity has evaporated.

## 4.2.3 Motor protection

- Total motor protection according to VDE:
  - By overcurrent relays or temperature monitoring
  - Required for group drives
    (motors connected in parallel to a controller)
  - We recommend the use of PTC thermistors or thermostats with PTC characteristic for monitoring the motor temperature.
    (As standard, Lenze three-phase AC motors are equipped with PTCs.)
  - The PTC or thermostat can be directly connected to the units 822X/824X. With the units 820X/821X, they are connected by means of the PTC module 8274 or the I/O module 8275 (see Accessories).
- When using motors with insulation which is not suitable for inverter operation:
  - Please contact your motor supplier.
    Lenze-three-phase AC motors are designed for inverter operation.
  - In general, operation with the assigned motor filters is possible.
- With the corresponding parameter setting, the controllers reach field frequencies up to 240 Hz/480 Hz:
  - When operating inappropriate motors, dangerous overspeeds may occur and result in the destruction of the drive.

## 4.2.4 Mains types/mains conditions

Please observe the restrictions of each mains type!

| Mains | Operation of the controllers | Notes |
|---|---|---|
| With grounded neutral (TT/TN mains) | No restrictions | Observe controller ratings. |
| | Operation of several 820X controllers connected to a mains 3AC / N / PE and symmetrical distribution to the three outer conductors excepted | • Observe the load of the common N conductor.<br>- For r.m.s. current see chapter 3.4<br>• Possibly enlarge the cross-section of the N conductor. |
| With isolated neutral (IT mains) | Possible, if the controller is protected from an earth fault in the supplying mains<br>• by corresponding equipment which detects the earth fault and<br>• immediately separates the controller from the mains. | Safe operation in the event of an earth fault in the output of the controller cannot be guaranteed. |
| With grounded phase | Operation is only possible with one variant. | Contact Lenze. |
| DC-supply via $+U_G/-U_G$ | The DC voltage must be symmetrical to PE. | The controller will be destroyed when grounding $+U_G$-conductor or $-U_G$-conductor. |

## 4.2.5 Combination with compensation equipment

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

## 4.2.6 Specification of the cables used

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

### 4.2.7 Power connections

#### 4.2.7.1 Mains connection

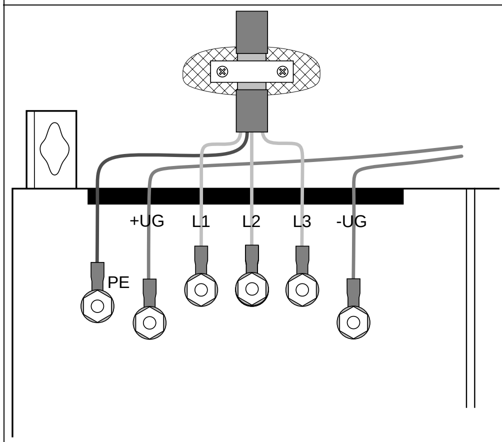
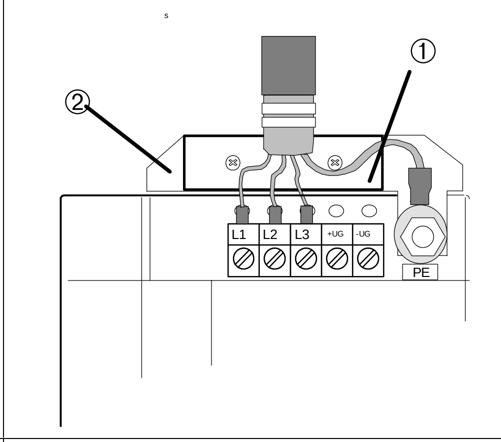
| Types 8221 to 8227 | Types 8241 to 8246 |
| --- | --- |
|  |  |
| Correct screen connection with screened cables:<br>• Connect the screen with suitable clamp to the conducting control cabinet mounting plate.<br>• To improve the screen connection: Connect screen additionally to the stud next to the power connections. | Correct screen connection with screened cables (required parts in the accessory kit):<br>• Screw sreen plate ① on fixing bracket ②.<br>• Fix screen using cable lugs. Do not use as a strain relief!<br>• To improve the screen connection: Connect the screen additionally to the stud next to the power connections. |

FIG 4-16 Proposal for mains connection 822X/824X

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

| Type | Terminals | | |
| --- | --- | --- | --- |
| | **Max. permissible cable cross-sections** | **L1, L2, L3, $+U_G$, $-U_G$** | **PE connection** |
| **8201 - 8214** | 2.5 mm² | 0.5 ... 0.6 Nm (4.4 ... 5.3 lbin) | 1.7 Nm (15 lbin) |
| **8215 - 8218** | 4 mm² 1) | 0.5 ... 0.6 Nm (4.4 ... 5.3 lbin) | 1.7 Nm (15 lbin) |
| **8221 - 8223** | 25 mm² 2) | 4 Nm (35 lbin) | |
| **8224 - 8225** | 95 mm² 2) | 7 Nm (62 lbin) | |
| **8226 - 8227** | 120 mm² 2) | 12 Nm (106.2 lbin) | |
| **8241 - 8246** | 4 mm² 1) | 0.5 ... 0.6 Nm (4.4 ... 5.3 lbin) | 3.4 Nm (30 lbin) |

1) With pin-end connector: 6 mm²
With wire crimp cap: 4 mm²
2) With ring cable lug: The cross-section is only limited by the cable cut-out in the housing.

| Protection | |
|---|---|
| **Fuses and cable cross-sections** | The specifications in chapter 3.6 are recommendations and refer to the application<br>• in control cabinets and machines,<br>• installation in the cable duct,<br>• max. ambient temperature +40 °C,<br>• as single drive with matching motor. |
| **Selection of the cable cross-section** | For selection take into account the voltage drop when being loaded<br>(to DIN 18015 part 1: ≤ 3 %). |
| **Protection of cables and controller on the AC side (L1, L2, L3)** | • By standard commercial fuses.<br>• Fuses in UL-conform plants must have UL approval.<br>• The rated voltages of the fuses must be dimensioned according to the mains voltage at the site. The activation characteristic is defined by "H" or "K5". |
| **Protection of cables and controller on the DC side (+$U_G$, -$U_G$)** | • By means of recommended DC fuses.<br>• The fuses/fuse holders recommended by Lenze are all UL-approved. |
| **For DC group drives or supply via DC source** | Observe notes in Part F. |
| **Connection of a brake unit** | If the unit is connected to the terminals +$U_G$ / -$U_G$, the fuses and cross-sections indicated in chapter 3.6 are not valid. These unit-specific data can be obtained from the technical documentation for the brake unit. |
| **Further information** | For protection of cables and controllers, see chapter "Accessories". |
| **Further standards** | The compliance with other standards (e.g. VDE 0113, VDE 0289, etc.) remains in the responsibility of the user. |

### 4.2.7.2 Motor connection

For EMC safety reasons we recommend the use of screened motor cables.

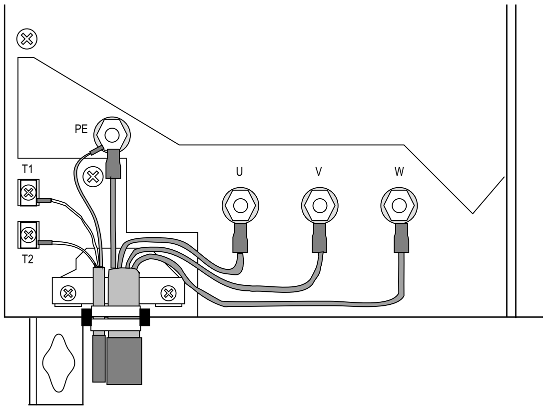
**Note!**
The screening of the motor cable is only required to comply with existing standards (e.g. VDE 0160, EN 50178).

Screen connection

- 820X: On the front FAST-ON connector.
- 8211 - 8214: On the front FAST-ON connector.
- 8215 - 8218: On the front metal surface.

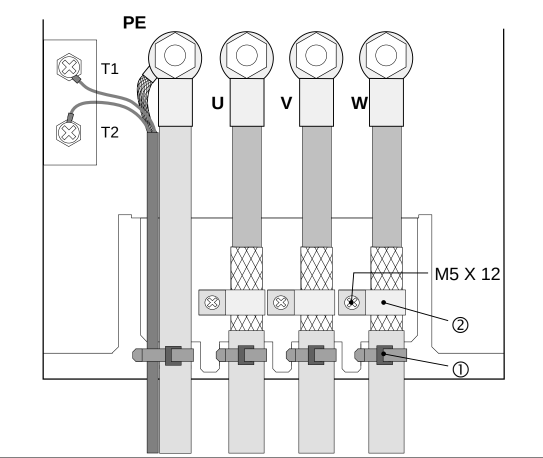
# Installation

**Types 8221/8222/8223**



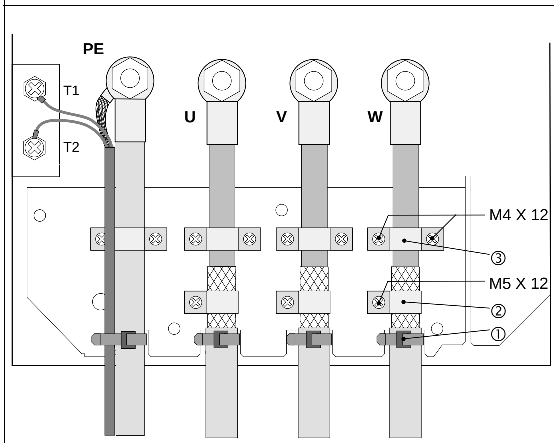

Correct screen connection with screened cables:
- Fix the screen of the motor cable and thermal contact. Do not use as a strain relief!
- To improve the screen connection: Connect the screen additionally to the stud PE next to the controller.

**Types 8224/8225**




- Strain relief by using cable binders ①.
- Correct screen connection with screened cables:
  - Apply motor cable screen to the screening plate using clamp and screws M5x12 ②.
  - Connect thermal contact screen to the stud PE next to the motor connection over a large surface.

**Types 8226/8227**




- Strain relief by using cable clamps and screws M4x12 ③.
  - An additional strain relief/fixing is possible with cable binders ①.
- Correct screen connection with screened cables:
  - Apply motor cable screen to the screening plate using clamp and screws M5x12 ②.
  - Connect thermal contact screen to the stud PE next to the motor connection over a large surface.

FIG 4-17 Proposal for motor connection with 822X

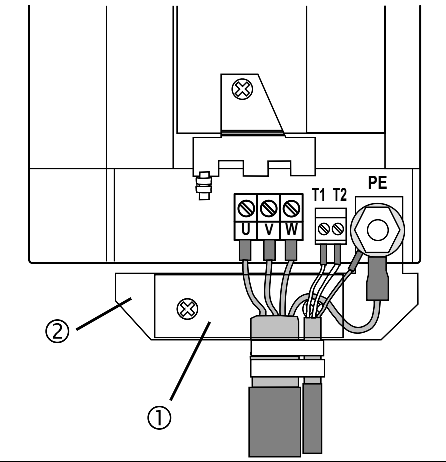
| Types 824X | |
|---|---|
|  | Correct screen connection with screened cables (required parts in the accessory kit):<br>• Screw sreen plate ① on fixing bracket ②.<br>• Fix the screen of the motor cable and thermal contact. Do not use as a strain relief!<br>• To improve the screen connection: Connect the screen additionally to the stud PE next to the motor connections. |

FIG 4-18 Proposal for motor connection with 824X

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

| Type | Max. permissible cable cross-sections | Terminals U, V, W | PE connection | Screen/ strain relief | T1, T2 |
|---|---|---|---|---|---|
| 8201 - 8214 | 2.5 mm$^2$ | 0.5 ... 0.6 Nm (4.4 ... 5.3 lbin) | 1.7 Nm (15 lbin) | - | - |
| 8215 - 8218 | 4 mm$^2$ 1) | 0.5 ... 0.6 Nm (4.4 ... 5.3 lbin) | 1.7 Nm (15 lbin) | - | - |
| 8221 - 8223 | 25 mm$^2$ 2) | 4 Nm (35 lbin) | | - | 0.5 ... 0.6 Nm (4.4 ... 5.3 lbin) |
| 8224 - 8225 | 95 mm$^2$ 2) | 7 Nm (62 lbin) | | 3.4 Nm (30 lbin) | |
| 8226 - 8227 | 120 mm$^2$ 2) | 12 Nm (106.2 lbin) | | M4: 1.7 Nm (15 lbin)<br>M5: 3.4 Nm (30 lbin) | |
| 8241 - 8246 | 4 mm$^2$ 1) | 0.5 ... 0.6 Nm (4.4 ... 5.3 lbin) | 3.4 Nm (30 lbin) | - | |

1) With pin-end connector: 6 mm$^2$
With wire crimp cap: 4 mm$^2$
2) With ring cable lug: The cross-section is only limited by the cable cut-out in the housing.

## Note!

- Switching on the motor side of the controller is permitted
  - for safety switch-off (emergency switch-off),
  - under load.

# Installation

- The motor cable should be as short as possible because of the positive effect on the drive characteristic.
  - FIG 4-19 shows the relation between the motor cable length and the possibly required output filters.
  - For group drives (several motors connected to one controller) it is necessary to calculate the resulting cable length $l_{res}$ :

$$l_{res} = \text{sum of all motor cable lengths} \cdot \sqrt{\text{No. of motor cables}}$$

  - The components stated in FIG 4-19 are valid for chopper frequencies $\leq$ 8 kHz (C018 = -0-, -1-). When using controllers with chopper frequencies > 8 kHz, different measures may be required. Please contact Lenze.
  - When using unscreened motor cables, the data indicated in FIG 4-19 are valid for the double motor cable length.
  - Please contact Lenze when the absolute or resulting motor cable lengths are > 200 m.

<table>
<tr><th>Type</th><th colspan="4">Permissible control mode C014</th></tr>
<tr><td>8201<br>8202<br>8203<br>8204</td><td>-0-, -1-,<br>-2-, -3-</td><td>-2-, -3-</td><td>-2-, -3-<br>+ motor filter/</td><td>-2-, -3-<br>+ sine filter</td></tr>
</table>

0 15 25 50 100 200

Motor cable length (resulting), screened in m

<table>
<tr><th>Type</th><th colspan="5">Permissible control mode C014</th></tr>
<tr><td>8211</td><td>-2-,<br>-3-,<br>-4-</td><td colspan="2">-2-, -3-</td><td rowspan="3">-2-, -3-<br>+ motor filter/<br>motor choke</td><td rowspan="3">-2-, -3-<br>+ sine filter</td></tr>
<tr><td>8212</td><td colspan="2">-2-, -3-, -4-</td><td>-2-, -3-</td></tr>
<tr><td>8213/8214<br>8215/8216<br>8217/8218</td><td colspan="3">-2-, -3-, -4-</td></tr>
</table>

0 15 25 50 100 200

Motor cable length (resulting), screened in m

<table>
<tr><th>Type</th><th colspan="3">Additionally required output filters in the motor cable</th></tr>
<tr><td>8221/8222</td><td rowspan="2">none</td><td>motor filter/motor choke</td><td rowspan="2">motor choke<br>(contact Lenze)</td></tr>
<tr><td>8223/8224/8225<br>8226/8227</td><td>none</td></tr>
<tr><td>8241/8242/8243<br>8244/8245/8246</td><td>none</td><td>motor filter/motor choke</td><td>sine filter</td></tr>
</table>

0 50 100 200

Motor-cable length (resulting), screened in m

FIG 4-19 Output filters additionally required in the motor cable

- When switching on the motor side, the switching units must be rated for DC voltages.
  - 820X: $V_{DC}$ max ≤ 400 V
  - 821X, 822X, 824X: $V_{DC}$ max ≤ 800 V
  - If you only switch when no voltage is applied, e.g. electrical latching via controller inhibit, you can also use standard AC switching units.

---

**Note!**

- When switching with controller enabled, the fault indication ”OCx” (short-circuit/earth fault during operation x) can be activated.
- When using long motor cables and controllers with low output power, leakage currents via parasitic cable capacities can activate the fault indication ”OCx”.
  - In such a case, motor filters or sine filters should be used.
  - Further information on long motor cables for stand-alone and group drives can be obtained from the corresponding application reports.

---

### 4.2.7.3 Connection of a brake unit

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

---

STOP

**Stop!**

- Design the circuit so that, if the temperature monitoring of the brake unit is activated,
  - the controllers are inhibited (X5/28 = LOW),
  - the mains is disconnected.

---

## 4.2.7.4 Connection plan 820X

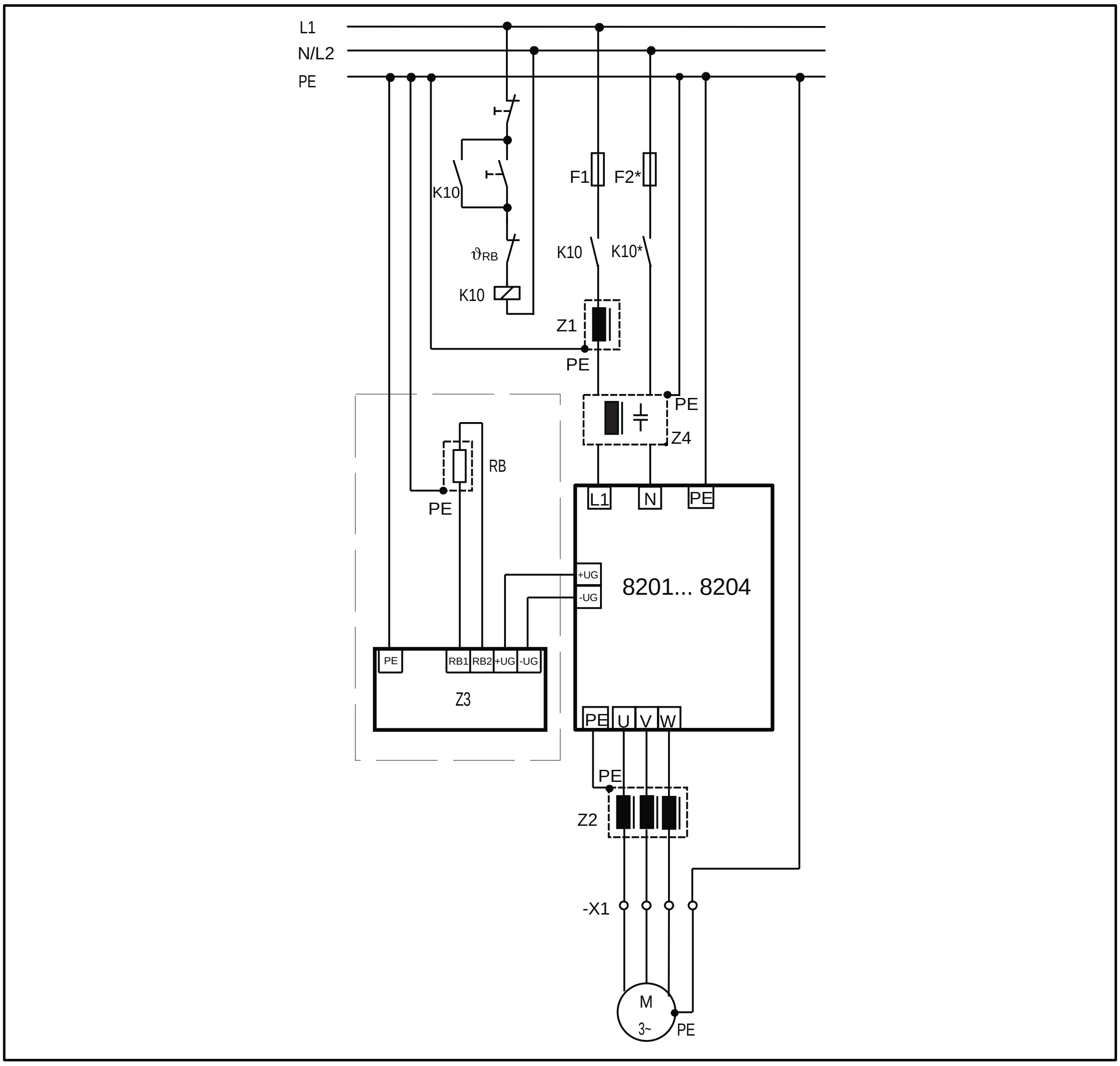



FIG 4-20 820X power connections

| | |
|---|---|
| F1, F2* | Fuses, F2* only for supply with 2AC / PE / 190 - 260 V |
| K10, K10* | Mains contactor, K10* only for supply with 2AC / PE / 190 - 260 V |
| Z1 | Mains choke, see Accessories (not required when using mains filters) |
| | **8204 operation only with assigned mains choke/mains filter** |
| Z2 | Motor filter/sine filter, see Accessories |
| Z3 | Brake chopper/brake module, see Accessories |
| Z4 | RFI filter/mains filter (symmetrically designed filters for L1/N (L2) |
| RB | Brake resistor, see Accessories |
| $\vartheta_{RB}$ | Temperature monitoring brake resistor |
| X1 | Terminal strip in control cabinet |

### 4.2.7.5 Connection plan 821X

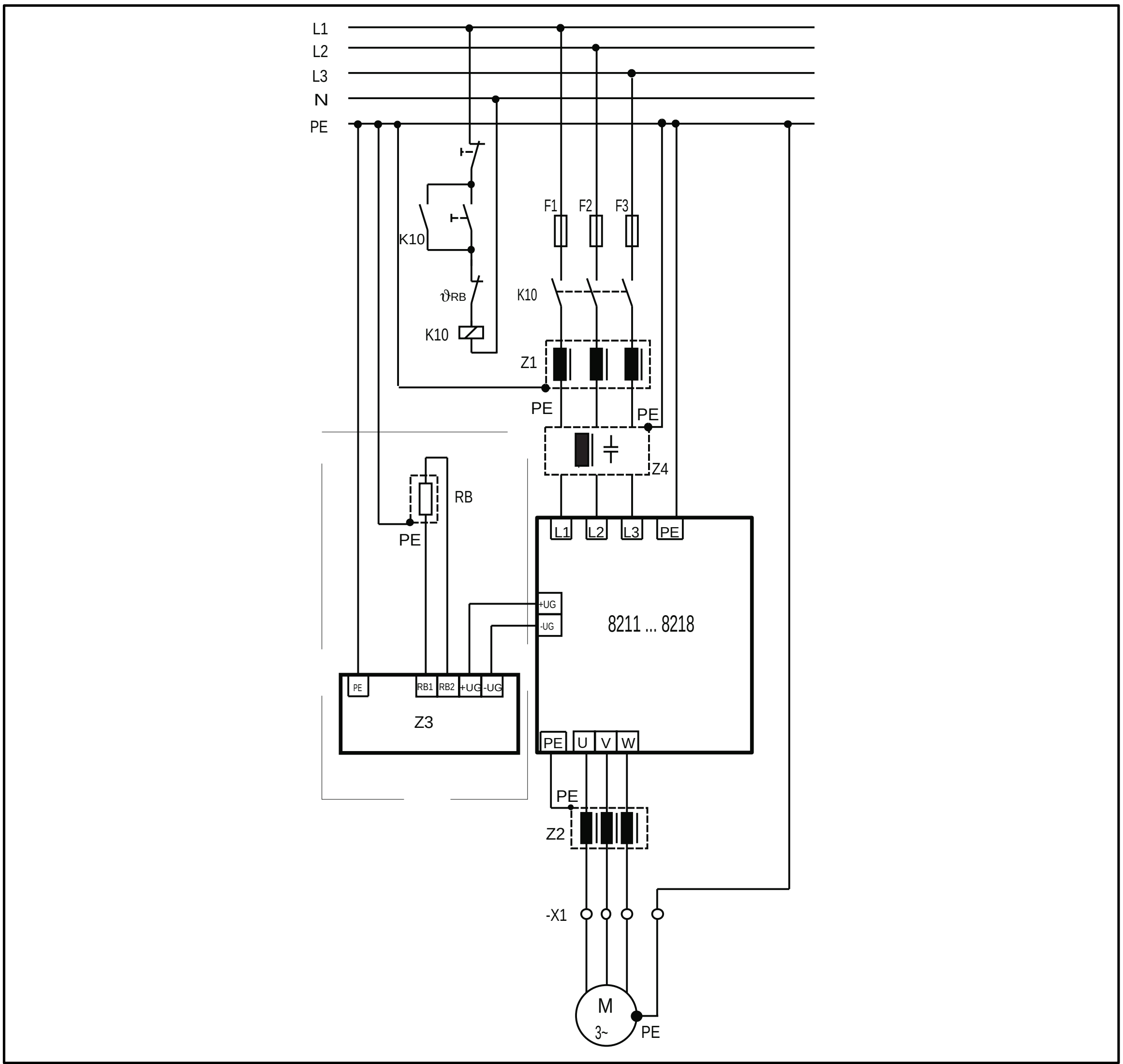



FIG 4-21 821X power connections

| | |
|---|---|
| F1, F2, F3 | Fuses |
| K10 | Mains contactor |
| Z1 | Mains choke, see Accessories (not required when using mains filters) |
| | **Types 8214/8218 should only be operated with assigned mains choke/mains filter** |
| Z2 | Motor filter/sine filter, see Accessories |
| Z3 | Brake chopper/brake module, see Accessories |
| Z4 | RFI filter/mains filter |
| RB | Brake resistor, see Accessories |
| $\vartheta_{RB}$ | Temperature monitoring brake resistor |
| X1 | Terminal strip in control cabinet |

## 4.2.7.6 Connection plan 822X/824X

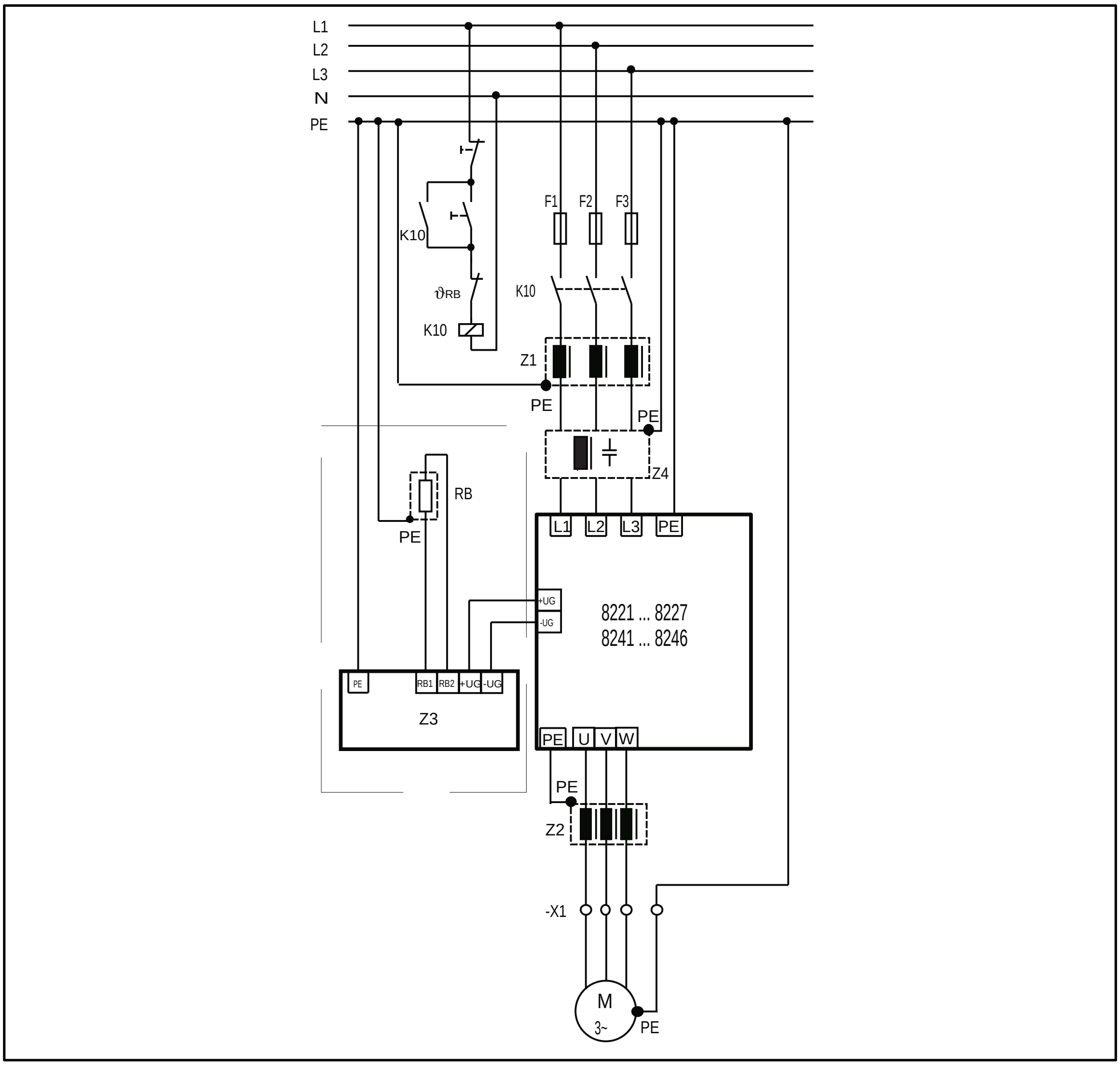



FIG 4-22 822X/824X power connections

| | |
|---|---|
| F1, F2, F3 | Fuses |
| K10 | Mains contactor |
| Z1 | Mains choke, see Accessories (not required when using mains filters) |
| | **Operate types 8222-8227, 8244/8246 only with assigned mains choke/mains filter** |
| Z2 | Motor filter/sine filter, see Accessories |
| Z3 | Brake chopper/brake module, see Accessories |
| Z4 | RFI filter/mains filter |
| RB | Brake resistor, see Accessories |
| $\vartheta_{RB}$ | Temperature monitoring brake resistor |
| X1 | Terminal strip in control cabinet |

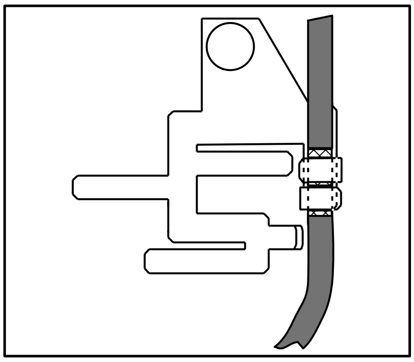
## 4.2.8 Control connections

### 4.2.8.1 Control cables

- Connect the control cables to the screw terminals:

| Max. permissible cable cross-section | Tightening torques |
|---|---|
| 2.5 mm$^2$ | 0.5 ... 0.6 Nm (4.4 ... 5.3 lbin) |

- We recommend the unilateral screening of all cables for analog signals to avoid signal distortion.
- Connect the screens of the control cables
  - 820X:
    To the front FAST-ON connector
  - 8211 - 8214:
    To the front FAST-ON connector
  - 8215 - 8218:
    To the front metal surface (screw length max. 12 mm).
  - 822X, 824X
    With the screen sheet to the front metal surface
    (screw length max. 12 mm).



- If the control cables are interrupted (terminal strips, relays), the screens must be reconnected over the shortest possible distance.
- Connect the fixing screw of the setpoint potentiometer to PE.
- Motor-temperature monitoring
  (Optionally for 820X/821X, as standard for 822X/824X)
  - If possible, separate the cables from the motor cable.

### 4.2.8.2 Assignment of the control terminals

**Protection against contact - 820X/821X**

- The control terminals have a basic isolation (single insulating distance).
- If protection against contact is required,
  - a double insulating distance must be provided,
  - the components to be connected must have a second insulating distance.

**Protection against contact - 822X/824X**

- The control terminals are separated (VDE 0160, EN50178), the protection against contact is ensured without additional measures.

### Protection against polarity reversal

- The protection against polarity reversal prevents the wrong connection of the internal control inputs. It is however possible to overcome the protection against polarity reversal by applying great force.

### Overview

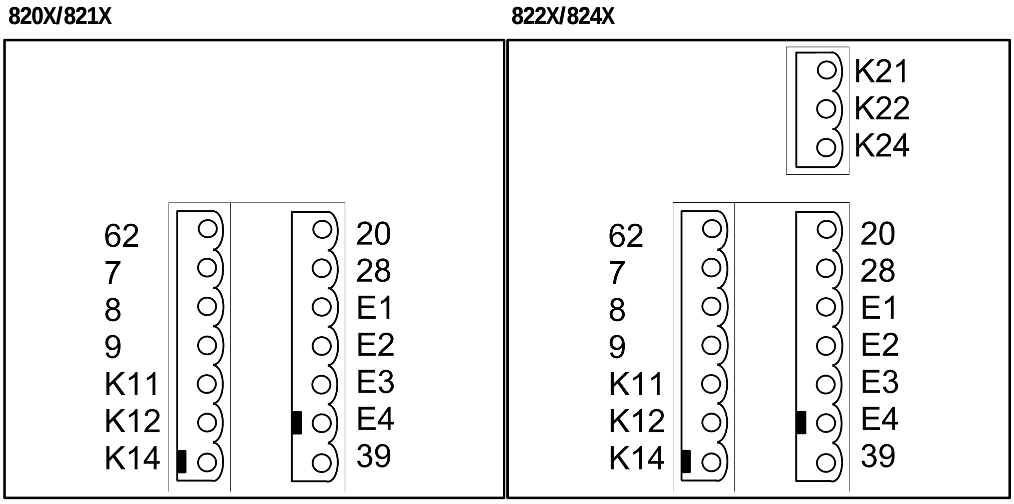
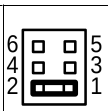



FIG 4-23 Layout of the control terminals

# Installation

| | Terminal | Use<br>**(Factory setting is printed in bold)** | Level | Data |
|---|---|---|---|---|
| Analog inputs | 7 | GND 1 | | |
| | 8 | Setpoint input, reference: Terminal 7<br>**(0 to 10 V)**<br><br><br>Jumper<br>5 - 6<br>5 - 6<br>3 - 4<br>**1 - 2** | 0 to 20 mA<br>4 to 20 mA<br>0 to 5 V<br>0 to 10 V | Resolution: 820X: 9 bit,<br>821X/822X/824X: 10 bit<br>Linearity fault: ±0.5 %<br>Temperature fault: 0.3 % (0 ... +40 °C)<br>Input resistance<br>Voltage signal: > 100 kΩ<br>Current signal: 250 Ω |
| | 9 | Supply for setpoint potentiometer | 5.2 V / 6 mA | |
| Analog output | 62 | Analog output, reference: Terminal 7<br>**(Field frequency)** | 0 ... 6 V / 2 mA<br>0 ... 10 V / 2 mA[1)] | Resolution: 820X: 8 bit<br>821X/822X/824X: 10 bit |
| Digital inputs | 20 | Voltage supply for digital inputs<br>820X: 12 V / 20 mA<br>821X/822X/824X: 15 V / 20 mA | | |
| | 28 | Controller enable | HIGH | HIGH: 12 V ... 30 V<br>LOW: 0 V ... 3 V |
| | E4 | **CW/<br>CCW rotation (CW/CCW)** | CW: LOW<br>CCW: HIGH | |
| | E3 | **DC-injection brake** | HIGH | |
| | E2 | **JOG frequencies** | Binary code | |
| | E1 | **20 Hz, 30 Hz, 40 Hz** | | |
| | 39 | GND 2 (reference for external voltages) | | |
| Monitoring | T1 | Motor-temperature monitoring<br>(PTC thermistor/thermal contact) | | If not used: Set parameter C119 = -0-! |
| | T2 | Motor-temperature monitoring<br>(PTC thermistor/thermal contact) | | |

| | Terminal | Use<br>**(Factory setting is printed in bold)** | Relay position (switched) | Data |
|---|---|---|---|---|
| Relay output K1 | K 11 | Relay output normally-closed contact<br>**(TRIP)** | Opened | 24 V AC / 3.0 A or<br>60 V DC / 0.5 A |
| | K 22 | Relay mid-position contact | | |
| | K 24 | Relay output normally-open contact<br>**(TRIP)** | Closed | |
| Relay output K2 | K 21 | Relay output normally-closed contact<br>**(Ready for operation)** | Opened | 250 V AC / 3.0 A or<br>60 V DC / 0.5 A |
| | K 22 | Relay mid-position contact | | 250 V AC / 3.0 A or<br>60 V DC / 0.5 A |
| | K 24 | Relay output normally-open contact<br>**(Ready for operation)** | Closed | 250 V AC / 3.0 A or<br>60 V DC / 0.5 A |

1) With 821X/822X/824X HVAC (V020)

## 4.2.8.3 Connection diagrams

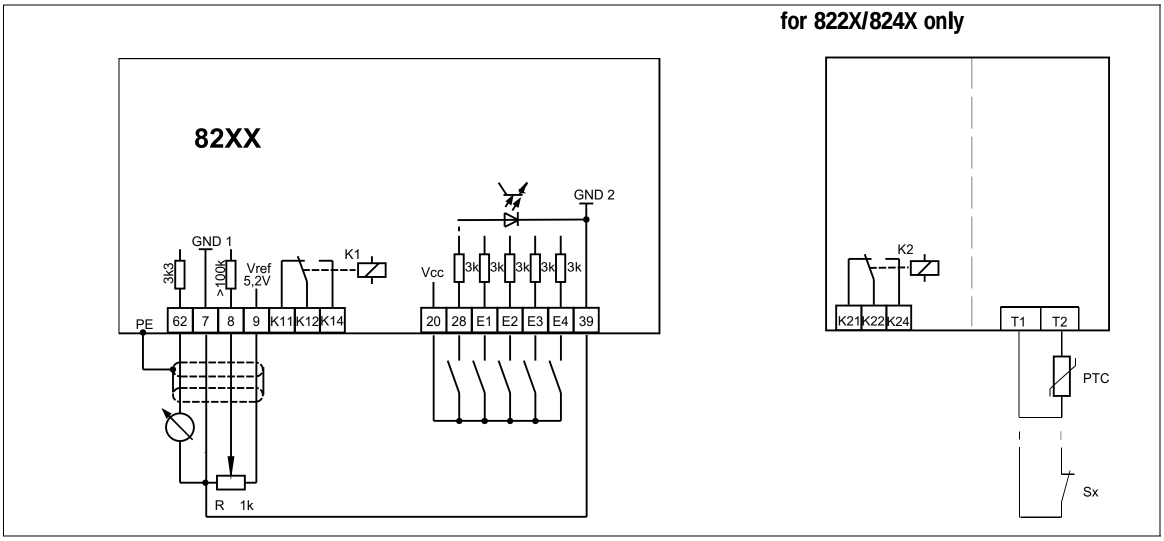



FIG 4-24 Control connections: Supply with internal control voltage

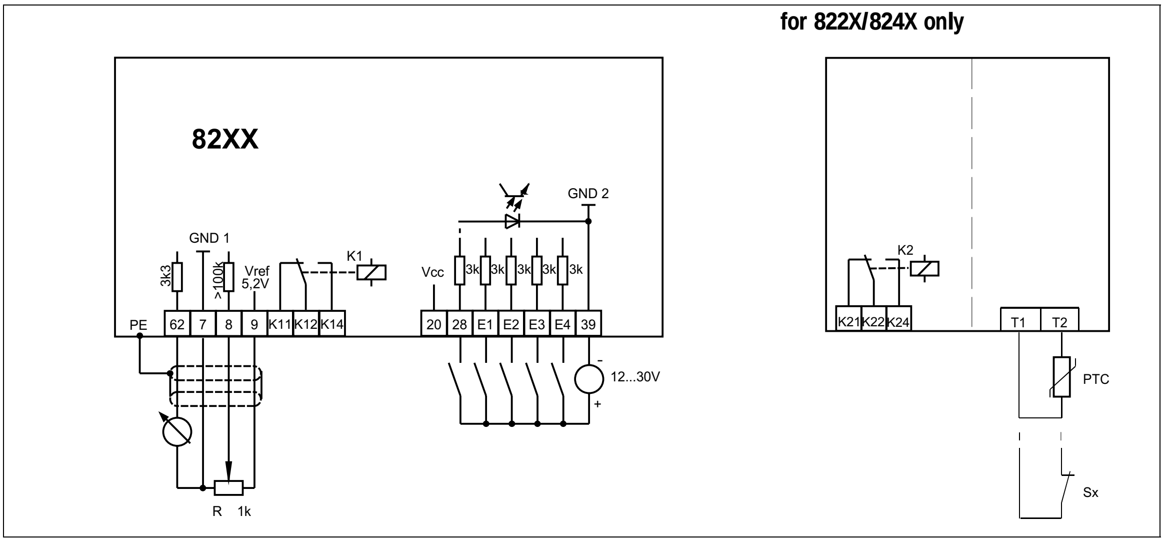



FIG 4-25 Control connections: External voltage supply (+12 V ... +30 V)

GND1 Reference for internal voltages

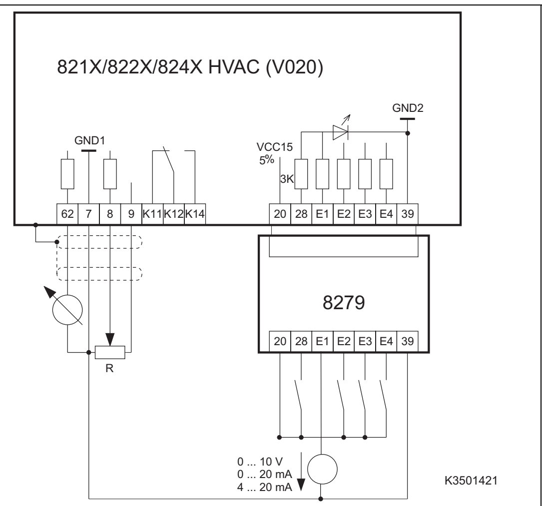
GND2 Reference for external voltages

GND1 and GND2 have a potential isolation inside the unit.

The connections for the motor temperature monitoring (T1, T2) are next to the connection terminals U, V, W.

## 4.2.8.4 Connection diagrams: Analog plug-in module

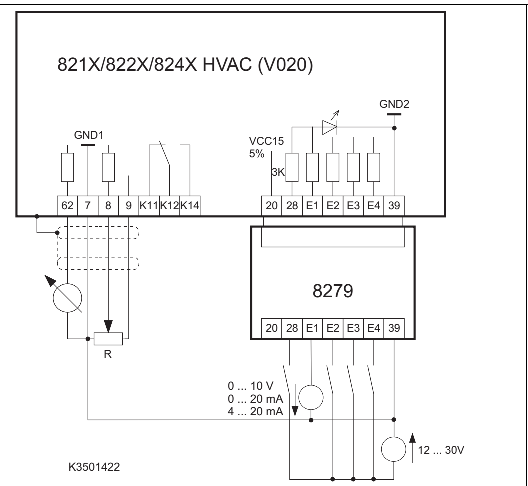
**Note!**
Only controllers of the series 8210, 8220 and 8240 HVAC can be equipped with an analog plug-in module.




**Connection**
Voltage supply for the 8279 plug-in module:
- Plug the module on the controller.
- Bridge terminals 7 and 39.

**Note:**
With this type of wiring there are 2 or more wires connected to one terminal. To avoid this, provide an external connection facility.

FIG 4-26 Control connections: Supply with internal control voltage




**Danger!**
There is no mains isolation between external supply and unit mass.
There is no double mains isolation between the mains and the terminals.
Therefore, the unit is not electrically isolated, i.e. not protected against contact.

**Connection**
Voltage supply for the 8279 plug-in module:
- Plug the module on the controller.
- Bridge terminals 7 and 39.

**Note**
With this type of wiring there are 2 or more wires connected to one terminal. To avoid this, provide an external connection facility.

FIG 4-27 Control connections: Supply with external control voltage (+12 V ... +30 V)

GND1 Reference for internal voltages
GND2 Reference for external voltages
GND1 and GND2 have a potential isolation inside the unit.

## 4.3 Installation of a CE-typical drive system

| | |
|---|---|
| **General notes** | • The electromagnetic compatibility of a machine depends on the type of installation and care taken. Please observe:<br>- Assembly<br>- Filters<br>- Screening<br>- Grounding<br>• For diverging installations, the conformity to the CE EMC Directive requires a check of the machine or system regarding the EMC limit values. This is for instance valid for<br>- the use of unscreened cables,<br>- the use of group RFI filters instead of assigned RFI filters,<br>- the operation without mains filter.<br>• **The compliance of the machine application with the EMC Directive is in the responsibility of the user.**<br>- If you observe the following measures, you can assume that the machine will operate without any EMC problems caused by the drive system, and that compliance with the EMC Directive and the EMC law is achieved.<br>- If devices which do not comply with the CE requirement concerning noise immunity EN 50082-2 are operated close to the controller, these devices may be disturbed electromagnetically by the controllers. |
| **Assembly** | • Connect controller, mains choke, and mains filter to the grounded mounting plate with a wire of large a cross-section as possible:<br>- Mounting plates with conductive surfaces (zinc-coated, stainless steel) allow permanent contact.<br>- Painted plates are not suitable for the installation in accordance with the EMC.<br>• If you use several mounting plates:<br>- Connect as much surface as possible of the mounting plates (e.g. with copper bands).<br>• Ensure the separation of motor cable and signal or mains cable.<br>• Do not use the same terminal strip for mains input and motor output.<br>• Cable guides as close as possible to the reference potential. Unguided cables have the same effect as aerials. |
| **Filters** | • Use mains filters or RFI filters and mains chokes which are assigned to the controller:<br>- RFI filters reduce impermissible high-frequency interference to a permissible value.<br>- Mains chokes reduce low-frequency interferences which depend on the motor cable and its length.<br>- Mains filters combine the functions of mains choke and RFI filter. |

# Installation

| | |
|---|---|
| **Screening** | • Connect the screen of the motor cable to the controller<br>- to the screen connection of the controller,<br>- additionally to the mounting plate with a surface as large as possible.<br>- Recommendation: For the connection, use ground clamps on bare metal mounting surfaces.<br>• If contactors, motor-protecting switches or terminals are located in the motor cable:<br>- Connect the screens of the connected cables also to the mounting plate, with a surface as large as possible.<br>• Connect the screen in the motor terminal box or on the motor housing to PE:<br>- Metal glands at the motor terminal box ensure a connection of the screen and the motor housing.<br>• If the mains cable between mains filter and controller is longer than 300 mm:<br>- Screen mains cables.<br>- Connect the screen of the mains cable directly to the inverter and to the mains filter and connect it to the mounting plate with as large a surface as possible.<br>• Use of a brake chopper:<br>- Connect the screen of the brake resistor cable directly to the mounting plate, at the brake chopper and the brake resistor with as large a surface as possible.<br>- Connect the screen of the cable between controller and brake chopper directly to the mounting plate, at the inverter and the brake chopper with a surface as large as possible.<br>• Screen the control cables:<br>- Connect both screen ends of the digital control cables.<br>- Connect one screen end of the analog control cables.<br>- Always connect the screens to the screen connection at the controller over the shortest possible distance.<br>• Application of the controllers 821X/822X/824X in residential areas:<br>- Use an additional screen damping ≥ 10 dB to limit the radio interference. This is usually achieved by installation in enclosed and grounded control cabinets made of metal. |
| **Grounding** | • Ground all metallically conductive components (controller, mains filter, motor filter, mains choke) using suitable cables connected to a central point (PE bar).<br>• Maintain the minimum cross-sections prescribed in the safety regulations:<br>- For EMC not the cable cross-section but the surface and the contact with a cross-section as large as possible, are important. |

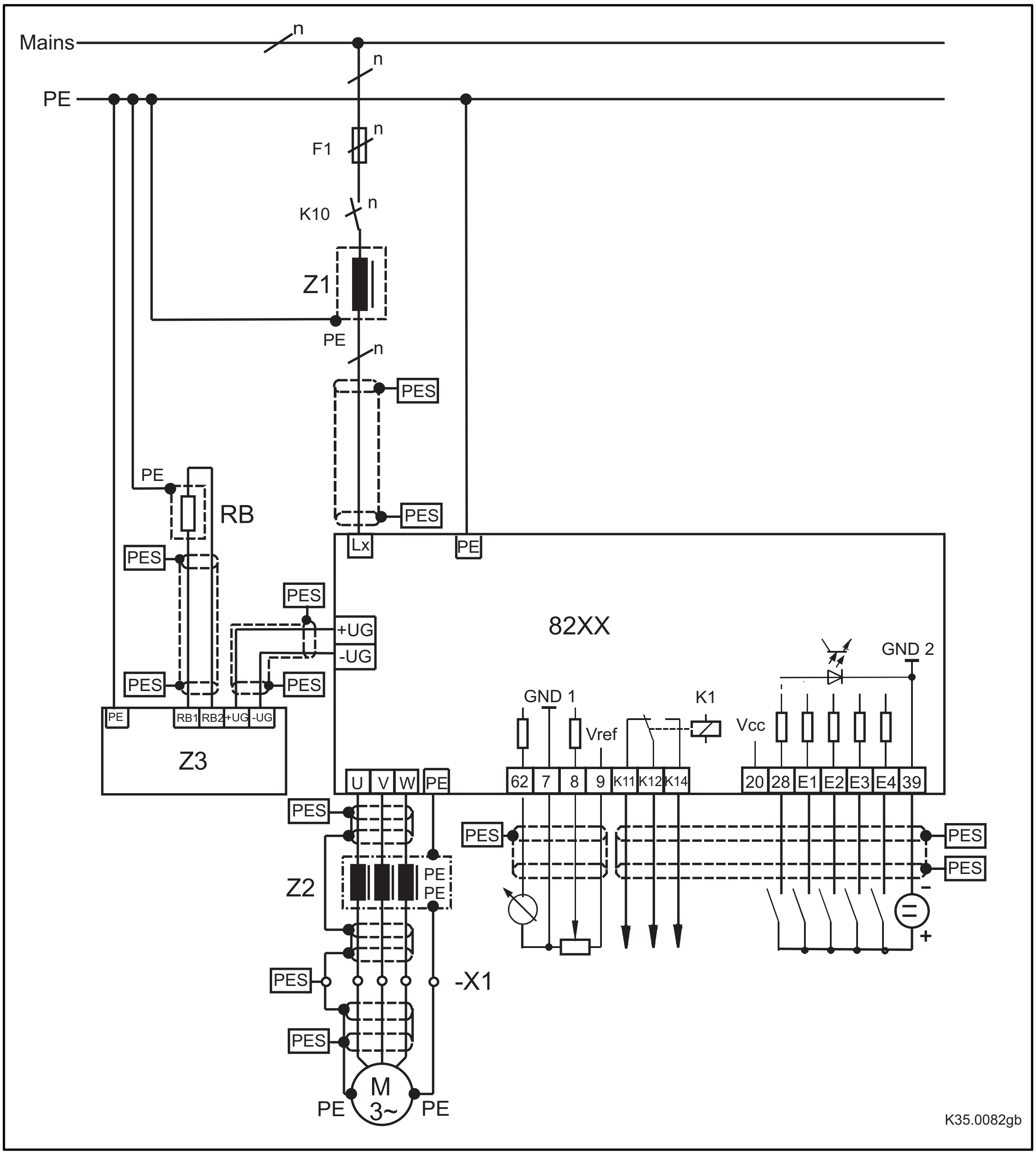



FIG 4-28 Example for an installation in accordance with the EMC regulations:

| | |
|---|---|
| F1 | Fuse |
| K10 | Mains contactor |
| Z1 | Mains filter ”A” or ”B”, see Accessories |
| Z2 | Motor filter/sine filter, see Accessories |
| Z3 | Brake module/brake chopper, see Accessories |
| -X1 | Terminal strip in control cabinet |
| RB | Brake resistor |
| PES | HF screen because auf PE connection with a surface as large as possible (see ”Screening” in this chapter) |
| n | Number of phases |

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EDS8200U--C
00406183

# *Manual*
# *Part C*

## *Commissioning*

## *During operation*

*Global Drive*

*Frequency inverters 8200*

This Manual is valid for 82XX controllers as of version:

| | | | | | |
|---|---|---|---|---|---|
| 33.820X- | E- | 1x. | 1x | | (8201 - 8204) |
| 33.8202- | E- | 1x. | 1x | -V002 | Reduced assembly depth (8202) |
| 33.821X- | E- | 0x. | 1x | | (8211 - 8218) |
| 33.821X- | E- | 1x. | 2x | | (8211 - 8218) |
| 33.821X- | C- | 1x. | 2x | -V003 | Cold plate (8215 - 8218) |
| 33.821X- | E- | 3a. | 3x | -V020 | HVAC (8211 - 8218) |
| 33.822X- | E- | 0x. | 0x | | (8221 - 8227) |
| 33.822X- | C- | 1x. | 2x | -V003 | Cold plate (8221 - 8222) |
| 33.822X- | E- | 3a. | 3x | -V020 | HVAC (8221 - 8227) |
| 33.824X- | E- | 1x. | 1x | | (8241 - 8246) |
| 33.824X- | C- | 1x. | 1x | -V003 | Cold plate (8241 - 8246) |
| 33.824X- | E- | 3a. | 3x | -V020 | HVAC (8241 - 8246) |

Type

Design:
B = Module
C = Cold plate
E = Built-in unit IP20

Hardware version and index

Software version and index

Variant

Explanation

| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

# 5 Commissioning

**820X**

The controllers are factory-set to drive a corresponding four-pole standard motor with 230/400 V, 50 Hz. Further settings are not necessary.

**821X/822X/824X**

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

- 230/400 V, 50 Hz
- 265/460 V, 60 Hz
- 280/480 V, 60 Hz

Only a few settings via the 8201BB operating module or a fieldbus module are necessary to adapt your drive to your application. The required steps are summarised in chapter 5.3 and chapter 5.4.

Further information about the optimisation of the controller can be obtained from part D, “Configuration”.

## 5.1 Before switching on

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

- Power connection:
  - Via terminals L1/N - 820X
  - Via L1, L2 and L3 - 821X
  - Via L1, L2 and L3 - 822X/824X
  - Alternatively via terminals $+U_G$, $-U_G$ (DC-group drive)
- Control terminals:
  - Reference potential for the control terminals is terminal 39.
  - Controller enable: Terminal 28
  - Selection of direction of rotation: Terminal E3 or E4
  - External setpoint selection: Terminals 7, 8
  - Check jumper position! Factory setting: 0 - 10 V (see chapter 4.2.8.2).
  - During operation with an internal voltage supply via terminal 20, bridge the terminals 7 and 39.
- In case of condensation, connect the controller to the mains voltage only after the visible humidity has evaporated.
- The plug-in power terminals of the 820X controller must only be connected or disconnected when no voltage is applied.

Keep to the switch-on sequence!

## 5.2 Short commissioning (factory setting)

### 5.2.1 Switch-on sequence

| **Step** | |
|---|---|
| 1. Connect to the mains. | The controller is ready for operation after approx. 2 seconds. |
| 2. Enter the direction of rotation. | • CW rotation:<br>- Apply a LOW signal to terminal E4 (0 ... +3 V).<br>• CCW rotation:<br>- Apply a HIGH signal to terminal E4 (+12 ... +30 V). |
| 3. Enter the setpoint. | Apply a voltage 0 ... +10 V to terminal 8. |
| 4. Enable controller. | Apply a HIGH signal (+12 ... +30 V) to terminal 28. |
| 5. The drive is now running with factory setting. | |

### 5.2.2 Factory setting of the most important drive parameters

| **Setting** | | | **Code** | **Factory setting** | | **Adaptation to the application** |
|---|---|---|---|---|---|---|
| Operating mode | | | C001 | -0- | Setpoint selection via terminal 8<br>Control via terminals<br>Parameter setting via 8201BB | See code table, chapter 7.8 for “Standard”<br>See code table, chapter 7.9 for “HVAC” |
| Terminal configuration | | | C007 | -0- | E4 E3 E2 E1<br>CW/CCW DC injection brake JOG1/2/3 | See code table, chapter 7.8 for “Standard”<br>See code table, chapter 7.9 for “HVAC” |
| **Machine data** | | | | | | Chapter 5.3 ff. |
| Speed range | Min. field frequency | | C010 | 0.00 Hz | | Chapter 5.3.1 |
| | Max. field frequency | | C011 | 50.00 Hz | | |
| Acceleration and deceleration times | Acceleration time | | C012 | 5.00 s | | Chapter 5.3.2 |
| | Deceleration time | | C013 | 5.00 s | | |
| Current limit values | Motor mode | | C022 | 150 % | | Chapter 5.3.3 |
| | Generator mode | | C023 | 80 % | | |
| **Drive performance** | | | | | | Chapter 5.4 ff. |
| Current / torque/power/ performance | Operating mode | | C014 | | | Motor-current control, see chapter 5.4.2.1<br>V/f-characteristic control<br>• with auto boost, chapter 5.4.2.2<br>• with $V_{min}$ boost, chapter 5.4.2.3 |
| | | 820X | | -0- | Linear characteristic $V \sim f_d$ with auto boost | |
| | | 821X/822X/ 824X | | -4- | Motor-current control | |
| | V/f-rated frequency | | C015 | 50.0 Hz | | |
| | $V_{min}$-setting | | C016 | | | |
| | | 820X | | type-dependent | | |
| | | 821X/822X/ 824X | | 0 % | | |
| | Slip compensation | | C021 | 0 % | | |

# 5.3 Adapt machine data

## 5.3.1 Determine speed range ($f_{dmin}$, $f_{dmax}$)

| Code | Name | | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | | Lenze | Choice | | Info | |
| C010 | Minimum field frequency | | | | | | |
| | | 820X | 0.00 | 0.00 | {0.05 Hz} | 480.00 | |
| | | 821X/822X/824X | 0.00 | 0.00 | {0.02 Hz} | 480.00 | |
| C011 | Maximum field frequency | | | | | | |
| | | 820X | 50.00 | 30.00 | {0.05 Hz} | 480.00 | |
| | | 821X/822X/824X | 50.00 | 7.50 | {0.02 Hz} | 480.00 | |

**Function**

The speed range required for the application can be selected via the input of field frequencies $f_{dmin}$ and $f_{dmax}$:
- $f_{dmin}$ corresponds to the speed at 0 % speed setpoint selection.
- $f_{dmax}$ corresponds to the speed at 100 % speed setpoint selection.

**Adjustment**

Relation between field frequency and synchronous motor speed:

$$n_{Nsyn} = \frac{f_{dmax} \cdot 60}{p}$$

$n_{Nsyn}$ Synchronous motor speed [$min^{-1}$]
$f_{dmax}$ Max. field frequency [Hz]
p No. of pole pairs (1, 2, 3, ...)

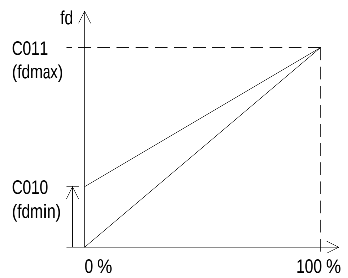
Example: 4 pole asynchronous motor:
p = 2, $f_{dmax}$ = 50 Hz

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

**Important**

- With the setting of $f_{dmin} > f_{dmax}$, the field frequency is limited to $f_{dmax}$.
- With setpoint selection via JOG values, $f_{dmax}$ acts as limitation.
- $f_{dmax}$ is an internal normalisation variable:
  - Use the LECOM interface only for important modifications, when the controller is inhibited.
- Observe the maximum speed of the motor!
- $f_{dmin}$ is only effective:
  - With analog setpoint input.
  - With the motor potentiometer function "DOWN".

**Special features**



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

| Code | Name | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | Info | |
| C012 | Acceleration time | | | | | | Variant “Standard” |
| | 820X | 5.00 | 0.00 | {0.05 s} | 999.00 | $T_{ir}$ | |
| | 821X/822X/ 824X | 5.00 | 0.00 | {0.02 s} | 999.00 | | |
| C013 | Deceleration time | | | | | | Variant “Standard” |
| | 820X | 5.00 | 0.00 | {0.05 s} | 999.00 | $T_{ir}$ | |
| | 821X/822X/ 824X | 5.00 | 0.00 | {0.02 s} | 999.00 | | |
| C012 | Acceleration time | 5.00 | 0.00 | {0.02 s} | 1300.00 | $T_{ir}$ | Variant “HVAC” |
| C013 | Deceleration time | 5.00 | 0.00 | {0.02 s} | 1300.00 | $T_{if}$ | |

**Function**

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

**Adjustment**

- The acceleration and deceleration times refer to a change of the field frequency from 0 Hz to the max. field frequency set under C011.
- Calculate the times $T_{ir}$ and $T_{if}$, which must be set under C012 and C013.
  - $t_{ir}$ and $t_{if}$ are the times desired for the change between $f_{d1}$ and $f_{d2}$.

$$T_{ir} = t_{ir} \cdot \frac{f_{dmax}}{f_{d2} - f_{d1}} \qquad T_{if} = t_{if} \cdot \frac{f_{dmax}}{f_{d2} - f_{d1}}$$

**Important**

Under unfavourable operating conditions, too short acceleration and deceleration times can lead to the deactivation of the controller under overload with the indication of TRIP OC5. In these cases, the acceleration and deceleration times should be set such that the drive can follow the speed profile without reaching $I_{max}$ of the controller.

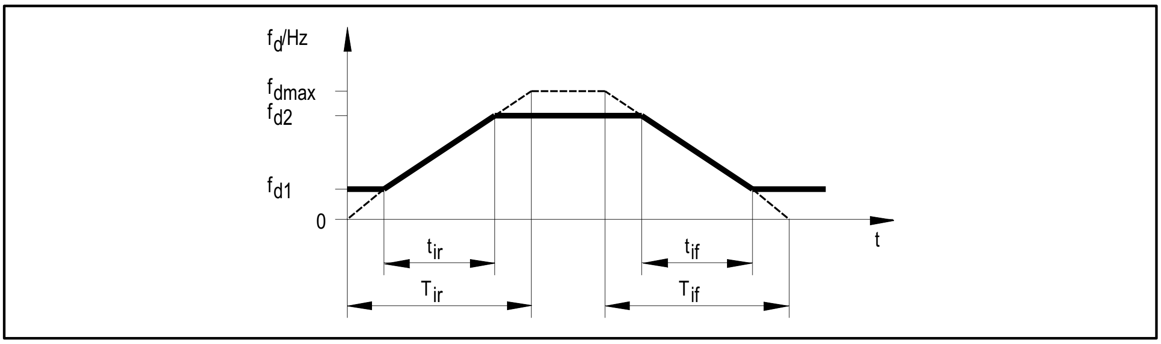



FIG 5-1 Acceleration and deceleration times

## 5.3.3 Setting of current limit values ($I_{max}$ limits)

| Code | Name | | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|---|
| | | | Lenze | Choice | | | Info | |
| C022 | $I_{max}$ limit (motor mode) | | 150 | 30 | {1 %} | 150 | | |
| C023 | $I_{max}$ limit (generator mode) | | 80 | 30 | {1 %} | 110 | | Standard controllers |
| | | 822X/824X | 80 | 30 | {1 %} | 150 | As of software 1.6 | |
| C023 | $I_{max}$ limit (generator mode) | | 80 | 30 | {1 %} | 150 | | Variant “HVAC” |

**Function**

The controllers are equipped with a current-limit control which determines the dynamic response under load. The measured load is compared with the limit values set under C022 for motor load and under C023 for generator load. If the current limits are exceeded, the controller changes its dynamic behaviour.

**Adjustment**

Set the acceleration and deceleration times so that the drive can follow the speed profile without reaching $I_{max}$.

**Controller behaviour when a limit value is reached**

- During acceleration:
  - Increasing the acceleration ramp
- During deceleration:
  - Increasing the deceleration ramp
- With increasing load and constant speed:
  - When reaching the generator-current limit value:
    Increase of the field frequency to the max. frequency (C011).
  - When reaching the motor-current limit value:
    Lower the field frequency until the drive load is reduced.
  - Stop the field frequency change if the load falls below the limit value.

**Important**

821X/822X/824X

- A correct current control in the generator mode is possible only with a connected brake unit or in the DC-bus connection with energy exchange.
- For operation with chopper frequencies > 8 kHz, the current limit values should be set to the currents "$I_{max}$ for 60 s" (see chapter 3.4).
  (Derating at higher chopper frequencies.)

## 5.4 Optimisation of the operating behaviour

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

Choose between the control modes ”Motor current control” and ”V/f-characteristic control”. Information to help you with the selection can be obtained from chapter 5.4.1.

### 5.4.1 Select control mode

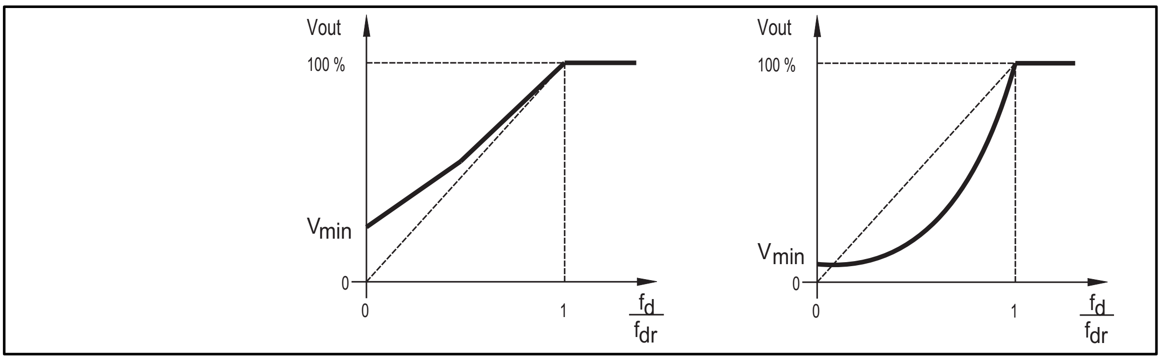
| Code | Name | | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | | Lenze | Choice | | Info | |
| C014↲ | Control mode | | | | | Control modes of the voltage characteristic | |
| | | 820X | -0- | -0- | Linear characteristic $V \sim f_d$ with auto boost | | |
| | | | | -1- | Square characteristic $V \sim f_d^2$ with auto boost | | |
| | | | | -2- | Linear characteristic $V \sim f_d$ with constant $V_{min}$ boost | | |
| | | | | -3- | Square characteristic $V \sim f_d^2$ with constant $V_{min}$ boost | | |
| | | 821X/822X/824X | -4- | -4- | Motor-current control | | |

**Function**

- Under C014 you can set the control mode and the voltage characteristic.
- The V/f-characteristic control with auto boost enables a low-loss operation of stand-alone drives with standard three-phase AC motors with load-dependent $V_{min}$ boost.
- The motor-current control enables a ”Sensorless Speed Control”. Compared to the V/f-characteristic control, the drive can operate with a considerably higher torque and less current consumption during idle running.

C014 = -2-
Linear characteristic

C014 = -3-
Square characteristic (e.g. for pumps, fans)



| Help for the selection of 820X | Motor cable | | | |
|---|---|---|---|---|
| | shielded ≤ 25 m<br>unshielded ≤ 50 m | | shielded > 25 m<br>unshielded > 50 m | |
| | C014 | | | |
| **Stand-alone drives** | **recommended** | **alternatively** | **recommended** | **alternatively** |
| with constant load | -0- | -2- | -2- | - |
| with extremely alternating loads | -0- | -2- | -2- | - |
| with heavy start conditions | -0- | -2- | -2- | - |
| positioning and infeed drives with high dynamic response | -0- | - | -2- | - |
| hoists | -0- | -2- | -2- | - |
| pumps and blowers | -1- | -3- | -3- | -2- |
| three-phase AC reluctance motors | -2- | - | -2- | - |
| three-phase sliding rotor motors | -2- | - | -2- | - |
| three-phase motors with fixed frequency-voltage characteristic | -2- | - | -2- | - |
| **Group drives** (depending on the resulting motor-cable length) | $I_{res} = \sqrt{i} \cdot (I_1 + I_2 + ... + I_i)$ | | | |
| identical motors and identical loads | -2- | - | -2- | - |
| different motors and/or changing loads | -2- | - | -2- | - |

| Help to decide for 821X/822X/824X | Motor cable* | | | |
|---|---|---|---|---|
| | shielded ≤ 50 m<br>unshielded ≤ 100 m | | shielded > 50 m<br>unshielded > 100 m | |
| | C014 | | | |
| **Single drives** | **recommended** | **alternatively** | **recommended** | **alternatively** |
| with constant load | -4- | -2- | -2- | - |
| with extremely alternating loads | -4- | -2- | -2- | - |
| with heavy start conditions | -4- | -2- | -2- | - |
| positioning and infeed drives with high dynamic response | -2- | - | -2- | - |
| hoists | -4- | -2-/-4- | -2- | - |
| pumps and blowers | -3- | -2- | -3- | -2- |
| three-phase AC reluctance motors | -2- | - | -2- | - |
| three-phase sliding rotor motors | -2- | - | -2- | - |
| three-phase motors with fixed frequency-voltage characteristic | -2- | - | -2- | - |
| **Group drives** (depending on the resulting motor-cable length) | $I_{res} = \sqrt{i} \cdot (I_1 + I_2 + ... + I_i)$ | | | |
| identical motors and identical loads | -4- | -2- | -2- | - |
| different motors and/or changing loads | -2- | - | -2- | |

* 8211: shielded ≤ 15 m, unshielded ≤ 30 m
8212: shielded ≤ 25 m, unshielded ≤ 50 m

## 5.4.2 Optimising operating modes

### 5.4.2.1 Optimising motor-current control (C014 = -4-)

820X setting range: Function is not available

821X/822X/824X setting range:

#### Required codes

| Code | Name | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|
| | | Lenze | Choice | | Info | |
| C015 | V/f rated frequency | 50.00 | 7.50 | {0.02 Hz} 960.00 | | |
| C021 | Slip compensation | 0.0 | 0.0 | {0.1 %} 20.0 | | |
| C088 | Rated motor current | * | 0.0 ... 2.0 · rated output current | | * depends on the unit | Input only necessary when motors not adapted |
| C091 | Motor cos φ | * | 0.40 | {0.01} 1.00 | | |

**Setting sequence**

- Drives with matching 4-pole standard motors 230/400 V in star connection must not be connected. After having started the drive, the controller itself detects all further motor data.
- The following drives can be optimised by entering the nameplate data "rated motor current" and "cos φ" under C088 or C091:
  - Motor, one power class smaller than the motor assigned to the controller.
  - Motor, one or two power classes smaller than the motor assigned to the controller.
  - Drives with 2, 6, 8, 10 and 12 pole standard motors.
  - Drives with special motors.
- The sensorless speed control can be optimised for your application with the "sensorless speed control".

1. If necessary, select C014 = -4-.

(Factory setting)

2. Select V/f-rated frequency (C015).

**Adjustment**
Calculate the frequency to be set under C015:

$$C015\ [Hz] = \frac{400\ V}{V_{rmotor}\ [V]} \cdot f_r\ [Hz]$$

$V_{rmotor}$ Rated voltage to motor nameplate [V]
$f_{dr}$ Rated frequency to motor nameplate [Hz]

For standard motors with $f_{dr}$ = 50 Hz, the following settings result for C015:

| Motor voltage | Motor connection | C015 |
|---|---|---|
| 230/400 V | Y | 50 Hz |
| 230/400 V | Δ | 87 Hz |

3. If necessary, parameterise C088, C091.

These motor data must only be entered for non-matching motors.

4. Set slip compensation (C021):

**Rough setting according to motor data:**

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

$$n_{Nsyn} = \frac{f_{dr} \cdot 60}{p}$$

| | |
|---|---|
| $s$ | Slip constant (C021) |
| $n_{Nsyn}$ | Synchronous motor speed [min$^{-1}$] |
| $n_r$ | Rated speed to motor nameplate [min$^{-1}$] |
| $f_{dr}$ | Rated frequency to motor nameplate [Hz] |
| $p$ | No. of pole pairs (1, 2, 3, ...) |

**Precise setting:**

- Correct C021 until no load-dependent speed drop occurs in the required speed range between idle running and max. motor load.
- If the values under C021 are too high, the drive may become instable (overcompensation).
- In the field frequency range between 5 Hz ... 50 Hz (87 Hz) the deviation of the rated speed is $\leq$ 1 % (guide value). In field-weakening operation, the fault increases.

**Important**

- The change from V/f-characteristic control to motor-current control should only be carried out when the controller is inhibited.
- The idle current of the motor (magnetising current) must not exceed the rated current of the controller.
- With very small friction values, it is possible that a phase offset of up to 180° occurs at the motor shaft when enabling the controller.

## 5.4.2.2 Optimise V/f-characteristic control with auto boost (C014 = -0-/-1-)

821X/822X/824X setting range: Function is not available

820X setting range:

### Required codes

| Code | Name | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | Info | |
| C015 | V/f-rated frequency | 50.00 | 30.00 | {0.05 Hz} | 960.00 | | |
| C016 | $V_{min}$ setting | * | 0.00 | {0.02 %} | 40.00 | | * depends on the unit |
| C021 | Slip compensation | 0.0 | 0.0 | {0.1 %} | 12.0 | | |

**Setting sequence**

1. If necessary, select V/f characteristic with auto boost (C014 = -0- or -1-).

2. Select V/f-rated frequency (C015).
   - 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.
   - An internal mains voltage compensation compensates deviations in the mains during operation. Therefore, they do not have to be considered for the setting of C015.
   - Use standard motors with 230/400 V with Δ connection, since with an input voltage of 230 V a max. of 3AC 230 V is at the output.

**Adjustment**

Calculate the frequency to be set under C015:

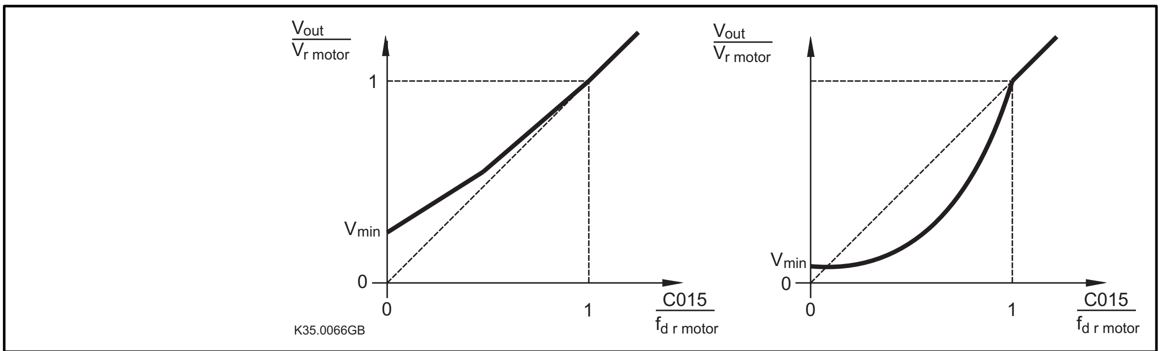
$$C015\ [\mathrm{Hz}] = \frac{230\ \mathrm{V}}{V_{rmotor}\ [\mathrm{V}]} \cdot f_{dr}\ [\mathrm{Hz}]$$

$V_{rmotor}$ Rated voltage to motor nameplate [V]
Observe the connection mode (e.g. with a motor voltage to nameplate 230/400 V / Δ $V_{rmotor}$ = 230 V AC.

$f_{dr}$ Rated frequency to motor nameplate [Hz]

C014 = -0-
Linear characteristic

C014 = -1-
Square characteristic (e.g. for pumps, fans)



3. Set $V_{min}$ boost (C016).

**Load-dependent** boost of the motor voltage in the field frequency range below the V/f-rated frequency. C016 acts as gain factor of the auto-boost function.

**Adjustment**

In general, an adjustment is not necessary. An optimisation can be advantageous:

**For drives with very high starting torques:**

A Operate the motor under load.

B Select the frequency setpoint.

C Increase $V_{min}$ until the required motor current (torque) occurs.
If the setting of $V_{min}$ is too high, a positive-feedback effect can occur and activate the TRIP "overcurrent" (OCx).

**For drives with square load torques (fans, pumps):**

A Operate the motor under load.

B Select the frequency setpoint.

C Adapt $V_{min}$ until the motor is running steadily and smoothly over the whole frequency range.
If the setting of $V_{min}$ is too high, the TRIP "overcurrent" (OCx) can be activated and lead to an excessive motor temperature.

**For drives with special motors:**

A Operate the motor under load.

B Select the frequency setpoint.

C Increase $V_{min}$ until the required motor current (torque) occurs.
If the setting of $V_{min}$ is too high, a positive-feedback effect can occur and activate the TRIP "overcurrent" (OCx).

D Check the current consumption during idle running when no load is applied.

4. Set the slip compensation (C021).

**Rough setting according to motor data:**

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

$$n_{Nsyn} = \frac{f_{dr} \cdot 60}{p}$$

| | |
|---|---|
| s | Slip constant (C021) |
| $n_{Nsyn}$ | Synchronous motor speed [$min^{-1}$] |
| $n_r$ | Rated speed to motor nameplate [$min^{-1}$] |
| $f_{dr}$ | Rated frequency to motor nameplate [Hz] |
| p | No. of pole pairs (1, 2, 3, ...) |

**Precise setting:**

- Correct C021 until no load-dependent speed drop occurs in the required speed range between idle running and max. motor load.
- If the values under C021 are too high, the drive may become instable (overcompensation).
- In the field frequency range between 5 Hz ... 50 Hz (87 Hz) the deviation of the rated speed is $\leq$ 1 % (guide value). In field-weakening operation, the fault increases.

## 5.4.2.3 Optimise V/f-characteristic control with constant $V_{min}$ boost (C014 = -2-/-3-)

### Required codes

| Code | Name | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | Info | |
| C015 | V/f-rated frequency | | | | | | Standard controllers |
| | 820X | 50.00 | 30.0 | {0.05 Hz} | 960.00 | | |
| | 821X/822X/ 824X | 50.00 | 7.50 | {0.02 Hz} | 960.00 | | |
| C015 | V/f-rated frequency | 50.00 | 7.50 | {0.02 Hz} | 960.00 | | Variant “HVAC” |
| C016 | $V_{min}$ setting | | | | | | |
| | 820X | * | 0.0 | {0.2 %} | 40.0 | | * depends on the unit |
| | 821X/822X/ 824X | 0.0 | 0.0 | {0.2 %} | 40.0 | | |
| C021 | Slip compensation | | | | | | Standard controllers |
| | 820X | 0.0 | 0.0 | {0.1 %} | 12.0 | | |
| | 821X/822X/ 824X | 0.0 | 0.0 | {0.1 %} | 20.0 | | |
| C021 | Slip compensation | 0.0 | -50.0 | {0.1 %} | 50.0 | * depends on the unit | Variant “HVAC” |
| C077* | Gain $I_{max}$ controller | 0.25 | 0.00 | {0.01} | 1.00 | | Variant “HVAC” (see chapter 7.5.4) |
| C078* | Integral action time $I_{max}$ controller | 65 | 12 | {1 ms} | 9990 | | |

**Setting sequence**

1. If necessary, select V/f characteristic (C014).

2. Select V/f-rated frequency (C015).
   - 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.
   - An internal mains voltage compensation compensates deviations in the mains during operation. Therefore, they do not have to be considered for the setting of C015.

   **Adjustment**

   Calculate the frequency to be set under C015:

$$C015\ [\mathrm{Hz}] = \frac{400\ \mathrm{V}}{V_{rmotor}\ [\mathrm{V}]} \cdot f_{dr}\ [\mathrm{Hz}]$$

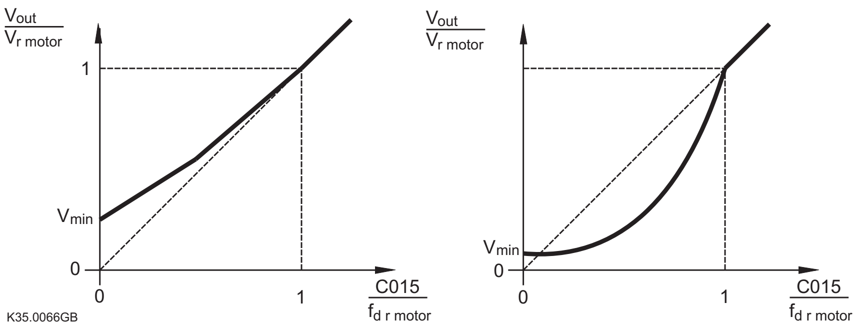
$V_{rmotor}$ Rated voltage to motor nameplate [V]
$f_{dr}$ Rated frequency to motor nameplate [Hz]

For standard motors with $f_{dr}$ = 50 Hz, the following settings result for C015:

| Motor voltage | Motor connection | C015 |
|---|---|---|
| 230/400 V | Y | 50 Hz |
| 230/400 V | Δ | 87 Hz |

C014 = -2-
Linear characteristic

C014 = -3-
Square characteristic (e.g. for pumps, fans)




3. Set $V_{min}$ boost (C016).

- **Load-independent** boost of the motor voltage for field frequencies below the V/f-rated frequency. It is thus possible to optimise the torque performance of the inverter drive.
- It is absolutely necessary to adapt C016 to the asynchronous motor used. Otherwise the motor may be overheated or the inverter may be operated with overcurrent.

**Adjustment**

Observe the thermal performance of the connected asynchronous motor at low field frequencies when adjusting it:

- Usually, self-ventilated standard asynchronous motors with insulation class B can be driven for a short time with rated frequency with the frequency range between 0 Hz $\leq f_d \leq$ 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.

A Operate the motor in idle running with $f_d \approx$ slip frequency:
- $P_{mot} \leq 7.5$ kW: $f_d \approx 5$ Hz
- $P_{mot} > 7.5$ kW: $f_d \approx 2$ Hz

Detect the slip frequency:

$$f_s = f_{dr} \cdot \frac{n_{Nsyn} - n_r}{n_{Nsyn}}$$

$$n_{Nsyn} = \frac{f_{dr} \cdot 60}{p}$$

| | |
|---|---|
| $f_s$ | Slip frequency [Hz] |
| $f_{dr}$ | Rated frequency to motor nameplate [Hz] |
| $n_{Nsyn}$ | Synchronous motor speed [min$^{-1}$] |
| $n_r$ | Rated speed to motor nameplate [min$^{-1}$] |
| p | No. of pole pairs (1, 2, 3, ...) |

B Increase $V_{min}$ until the following motor current is reached:
- Motor in short-term operation at 0 Hz $\leq f_d \leq$ 25 Hz:
  Self-ventilated motors: $I_{motor} \leq I_{r\ motor}$
  Forced-ventilated motors: $I_{motor} \leq I_{r\ motor}$
- Motor in continuous operation at 0 Hz $\leq f_d \leq$ 25 Hz:
  Self-ventilated motors: $I_{motor} \leq 0.8 \cdot I_{r\ motor}$
  Forced-ventilated motors: $I_{motor} \leq I_{r\ motor}$

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4. Set the slip compensation (C021).

**Rough setting according to motor data:**

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

$$n_{Nsyn} = \frac{f_{dr} \cdot 60}{p}$$

| | |
|---|---|
| $s$ | Slip constant (C021) [%] |
| $n_{Nsyn}$ | Synchronous motor speed [$min^{-1}$] |
| $n_r$ | Rated speed to motor nameplate [$min^{-1}$] |
| $f_{dr}$ | Rated frequency to motor nameplate [Hz] |
| $p$ | No. of pole pairs (1, 2, 3, ...) |

**Precise setting:**
- Correct C021 until no load-dependent speed drop occurs in the required speed range between idle running and max. motor load.
- If the values under C021 are too high, the drive may become instable (overcompensation).
- In the field frequency range between 5 Hz ... 50 Hz (87 Hz) the deviation of the rated speed is $\leq$ 1 % (guide value). In field-weakening operation, the fault increases.

**Important**

- The change from V/f-characteristic control and motor-current control should only be carried out when the controller is inhibited.

## 5.4.2.4 Normalisation of an application datum

820X setting range: Function not available.

Setting range 821X/822X/824X:

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C500* | Display factor Application datum - numerator | 2000 | 1 {1} 25000 | | |
| C501* | Display factor Application datum - denominator | 10 | 1 {1} 25000 | | |

**Function**

Adaptation of field-frequency related parameters
- C010, C011, C017, C019, C037, C038, C039, C046, C049, C050 and
- for controllers of the "HVAC" series C051, C181, C625, C626, C627 additionally

to an application datum to be controlled, e.g. pressure, temperature, flow rate, humidity or speed.
The normalisation
- implements an absolute or relative selection or display of an application datum,
- is always carried out simultaneously for all codes indicated.

**Adjustment**

The display value is calculated from:

$$\mathrm{CXXX} = \frac{\mathrm{C011}}{200} \cdot \frac{\mathrm{C500}}{\mathrm{C501}}$$

Example

The speed setpoint is to be input and displayed as relative or absolute value.
Values: $P_{set}$ = 5 bar, if $f_{dmax}$ = 50 Hz (C011)

a) Relative normalisation in %

$$100.00\ (\%) = \frac{50}{200} \cdot \frac{4000}{10}$$

e.g. C500 = 4000, C501 = 10

b) Absolute normalisation in physical units

$$5.00\ (\mathrm{bar}) = \frac{50}{200} \cdot \frac{200}{10}$$

e.g. C500 = 200; C501 = 10

**Important**

- All codes indicated above are normalised at the same time.
- After a normalisation, the output frequency [Hz] (C050) can only be recalculated with the display factors C500 and C501.

## 5.4.3 Operation with PID controller

The following controls can be implemented with the internal PID controller:

- pressure,
- temperature,
- flow rate,
- speed,
- dancer-position controls.

### Functions

**Configuration**

Set C005 = -6- or -7- for controlled operation with a PID controller

**Variables**

- C070 = gain
- C071 = integral action time
- C072 = differential component
- The I component of the controller can be reset when reaching the $Q_{min}$ threshold (C017), to suppress the initial conditions because of the missing actual value.

**Influence and setpoint precontrol**

- Set the PID controller influence under C074.
- Select whether setpoint precontrol is to be used under C238.
  - The setpoint precontrol is advantageous for applications which provide an actual value signal which is directly proportional to the speed of the drive. The influence of the PID controller can then be limited that only the maximum expectable slip of the machine will be controlled.
- For application where the PID controller is used as process controller, the settings C238 = -0- (without setpoint precontrol) and C074 = 100 % are required.

**Setpoint input**

- Enter a fixed setpoint under C181:
  - For instance, for dancer position control to select the dancer position.

Via terminal 8 or terminal E1.

- The setpoint can be selected either via terminal 8 or terminal E1. The terminal not used for setpoint selection is used for the feedback.
- **With** the analog plug-in module 8279IB terminal E1 is used as 2nd analog input (0 ... 10 V / 0/4 ... 20 mA).
- **Without** the analog plug-in module 8279IB terminal E1 can be used as digital input (pulse frequency 0 kHz ... 10 kHz, LOW level = 0 V ... 3 V, HIGH level = 12 V ... 30 V).

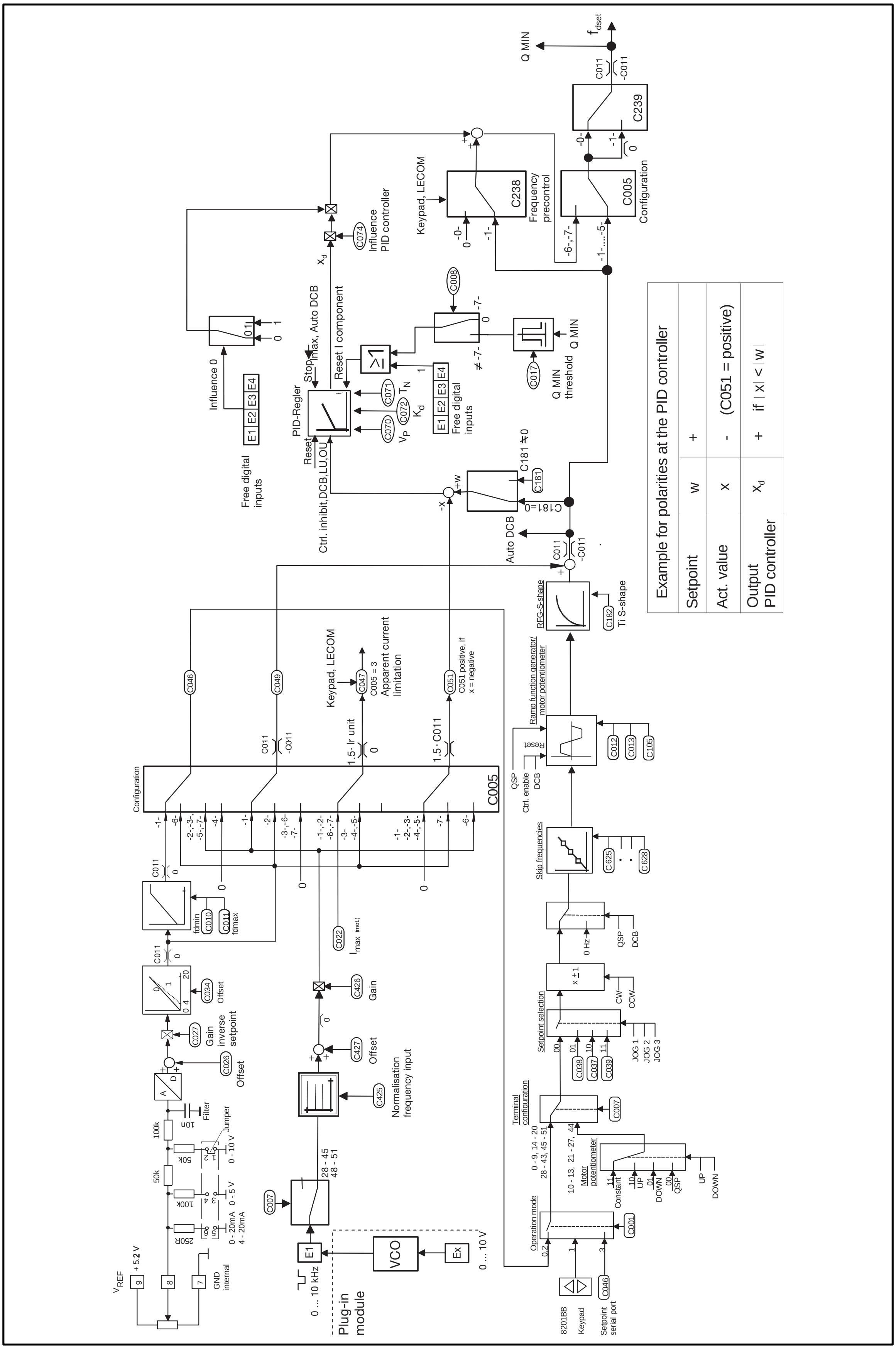
Adjustment

The adjustment of the analog inputs limits the control range.

- C026 and C027:
  - Adjustment terminal 8.
- C426 and C427:
  - Adapt C426 and C427 if a 4 ... 20 mA signal is assigned via terminal E1 (8279IB).

**Actual value**

C051 indicates the actual value of the PID controller.




Example for polarities at the PID controller

| | | |
|---|---|---|
| Setpoint | w | + |
| Act. value | x | - (C051 = positive) |
| Output PID controller | $x_d$ | + if \| x \| < \| w \| |

## 5.5 Application examples for PID controllers

### 5.5.1 Pump application with pressure control

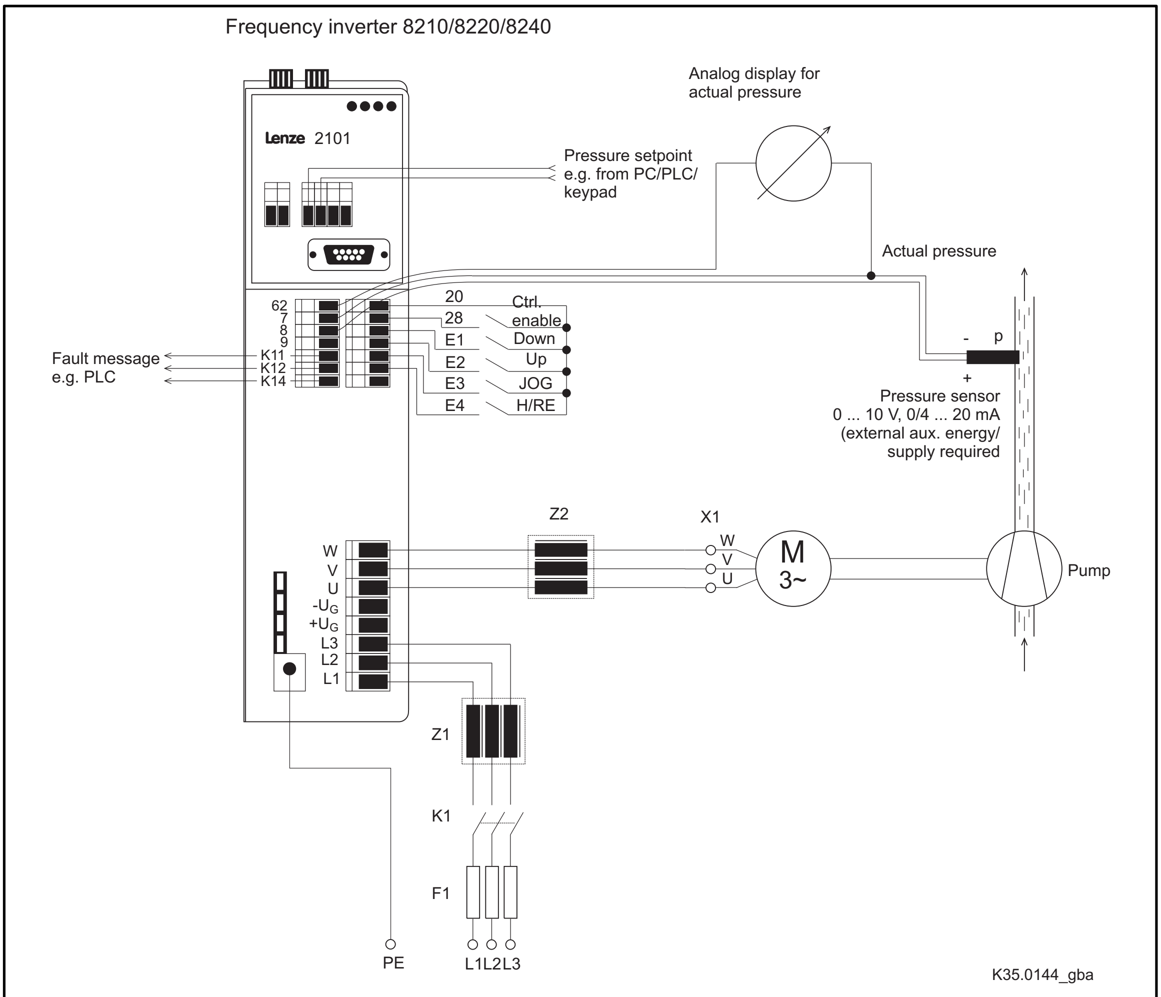
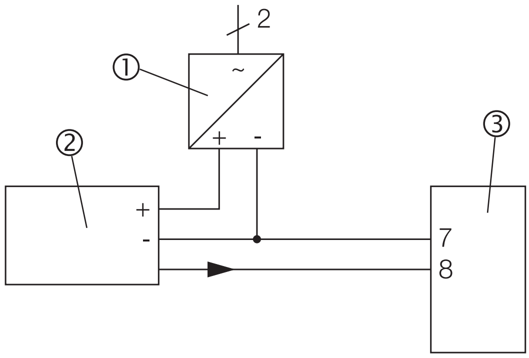
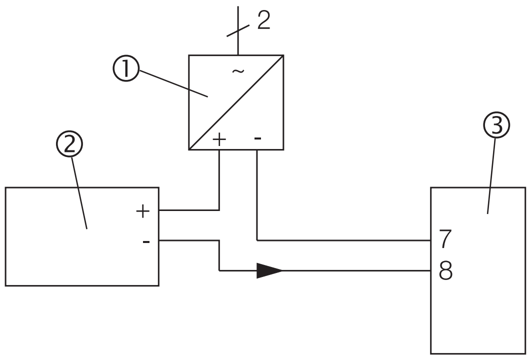
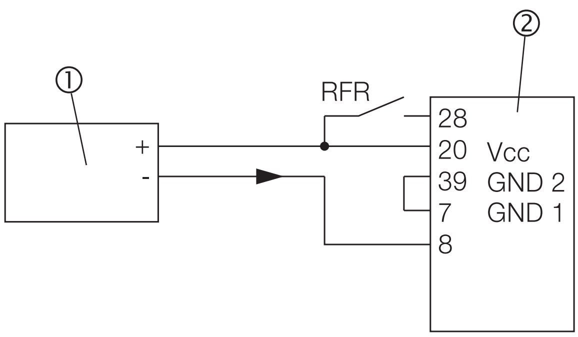



FIG 5-2 Application of a pump with pressure control

| | |
|---|---|
| Z1 | Mains filter required for radio interference level A or B. For mains chokes see chapter 3.4 ff. |
| Z2 | Motor filter/sine filter required for long motor cables or motors not designed for inverter operation (see chapter 4.2.7.2). |

Shield all signal and motor cables. Please observe the corresponding installation instructions in chapters 4.2 and 4.3.

## Sensor connection

<table>
<tr><th colspan="2">3-phase pressure sensor</th></tr>
<tr><td>
</td><td>1. DC mains supply, e.g. 24 V<br>2. Pressure sensor<br>0 - 10 V (jumper 1-2)<br>0 - 20 mA (jumper 5-6)<br>4 - 20 mA (jumper 5-6, C034 = 1)<br>3. Controller</td></tr>
<tr><th colspan="2">2-phase pressure sensor</th></tr>
<tr><td>
</td><td>1. DC mains supply, e.g. 24 V<br>2. Pressure sensor<br>4 - 20 mA (jumper 5-6, C034 = 1)<br>250 R load<br>3. Controller</td></tr>
<tr><th colspan="2">3-phase pressure sensor with supply via controller</th></tr>
<tr><td>
</td><td>1. Pressure sensor<br>4 - 20 mA (jumper 5-6, C034 = 1)<br>250 R load<br>2. Controller<br><br>Note:<br>Since terminal 20 can be loaded with max. 20 mA, the digital inputs E1 ... E4 must not be addressed.</td></tr>
</table>

### Application FIG 5-2:

A centrifugal pump is used to ensure constant pressure in a pipeline system (e.g. for water supply of residential and industrial premises).

The application does not only require remote control from a central operating panel but also setting possibilities at site. The pressure is to be reduced to a fixed value during times when only few water is required. Thus, indirectly possible burst pipes can be detected by monitoring the actual pressure.

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Functions used

- Internal PID controller for pressure control.
  - Regular control, setpoint selection via fieldbus with feedback via analog channel terminal 8.
- Networking via fieldbus (e.g. via plug-in module 2102).
- Manual/remote changeover (H/Re).
  - Setpoint selection change via key ( E1 = DOWN / E2 = UP).
- Process setpoint selection (e.g. pressure [p]) via inverter JOG value.
- Electrical controller inhibit (Ctrl. enable).

*Code settings:*

| Code | Name | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|
| | | Lenze | Choice | | Info | |
| C001 | Operating mode | -0- | -3- | Setpoint selection - control, parameter setting via LECOM | | |
| C005 | Configuration | -0- | -7- | Controlled operation, with analog feedback via term. 8 | | |
| C007 | Terminal configuration | -0- | -26- | Motor potentiometer, JOG, H/Re | | |
| C037 | JOG value 1 | 20.00 | 16.67 Hz | Fixed reduction to 1/3 of the rated pressure | | |
| C051 | Actual PID controller value | | | | | Only display of actual pressure |
| C070 | Gain PID controller | 1.00 | 0.02 ... 0.1 | | | Adaptation to process |
| C071 | Integral action time PID controller | 100 | 0.2 ... 1 s | | | |
| C072 | Differential component PID controller | 0.0 | 0.0 | | | Inactive |
| C074 | Influence PID controller | 0.0 | 100.0 % | | | |
| C111↲ | Monitor signal | -0- | -8- | Actual PID controller value | | |
| C238 | Frequency precontrol | -1- | -0- | No precontrol | | |
| C239 | Frequency setting range | -0- | -1- | Unipolar | | Direction of rotation cannot be changed via the process controller |

- All other parameters are based on the factory setting.
- Set the rated motor data under C088 (rated motor current) and C091 (motor cos φ) depending on the motor connected.
- In addition to the setpoint input via fieldbus, the pressure setpoint can also be selected via the 8201BB keypad (installation up to max. 10 m away from the controller) or via an analog input signal (using the 8274 plug-in module).

## Note!

- For more detailed information on the process controller see chapter 7.5.10.
- Calibration of the setpoints and actual values to the application datum under C500 and C501.
  (See chapter 5.4.2.4).

## 5.5.2 Pump application with level control

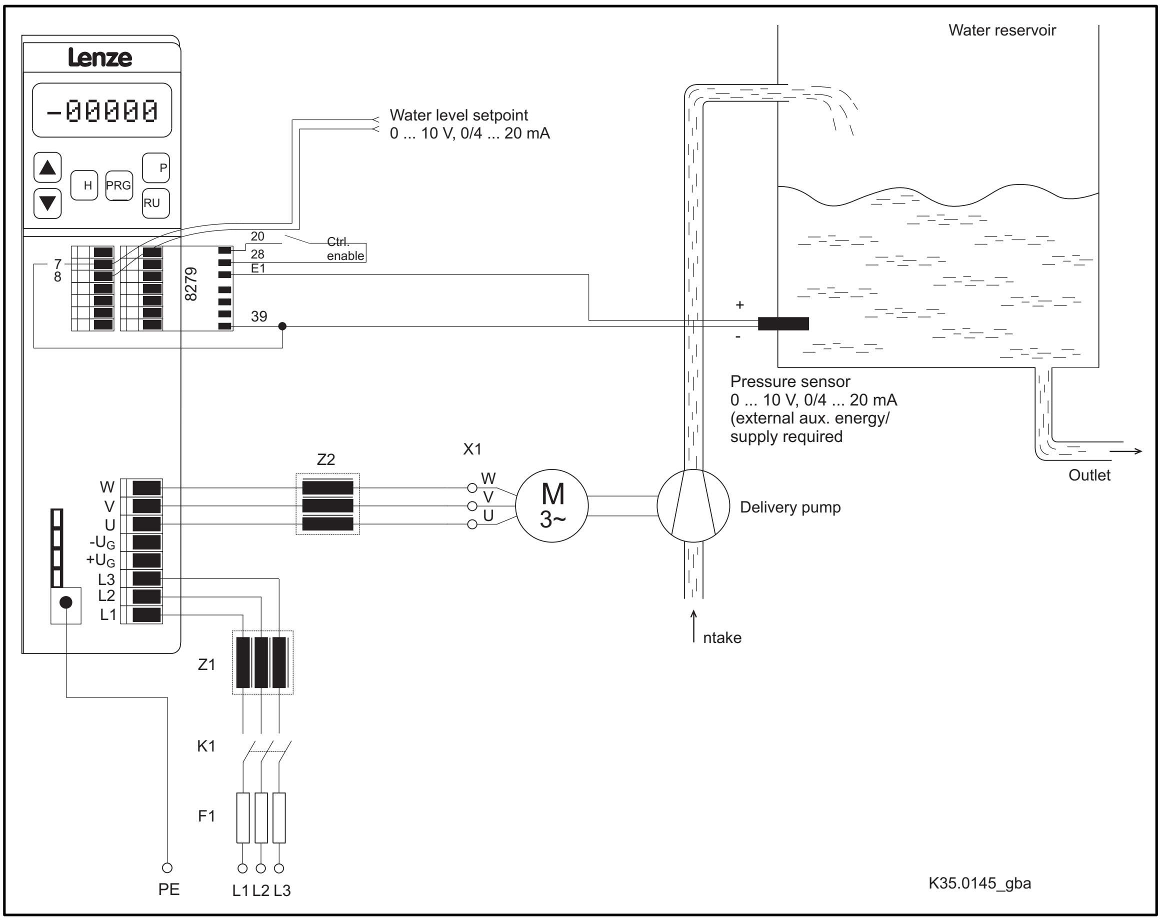



FIG 5-3 Application of a pump with level control

| | |
|---|---|
| Z1 | Mains filter required for radio interference level A or B. For mains chokes see chapter 3.4 ff. |
| Z2 | Motor filter/sine filter required for long motor cables or motors not designed for inverter operation (see chapter 4.2.7.2). |

Shield all signal and motor cables. Please observe the corresponding installation instructions given in chapters 4.2 and 4.3.

**Application FIG 5-3:**

In a tank the water is to be held at a constant level. The speed of the pump must be controlled depending on the amount of water delivered.

Functions used

- Internal PID controller for level control.
  - Regular control, analog setpoint selection via terminal 8 with feedback via analog channel E1 with plug-in module 8279IB.

*Code settings:*

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C005 | Configuration | -0- | -6- Operation with closed-loop control; setpoint via terminal 8 with digital frequency feedback via terminal E1 | | |
| C007↲ | Terminal configuration | -0- | -28- ... -45- or -48- ... -51- | | Act. level value via terminal E1 |
| C070 | Gain PID controller | 1.00 | 0.02 ... 0.1 | | Adaptation to process |
| C071 | Integral action time PID controller | 100 | 0.2 ... 1 s | | |
| C072 | Differential component of PID controller | 0.0 | 0 | | Inactive |
| C074 | Influence PID controller | 0.0 | 100.0 % | | |
| C238↲ | Frequency precontrol | -1- | -0- No precontrol | | |
| C239↲ | Frequency setting range | -0- | -1- Unipolar | | Direction of rotation cannot be changed via the process controller |

- All other parameters are based on the factory setting.
- For the level setpoint observe the jumper setting at terminal 8 (see chapter 5.5.1).
  Set 4 - 20 mA code C034 = 1.
- Set the rated motor data under C088 (rated motor current) and C091 (motor cos $\varphi$) depending on the motor connected.

**Note!**

- Adapt C426 and C427 if the actual value input is 4 mA ... 20 mA.
  (See chapter 3.7.1 and chapter 7.5.14.9).
- Calibration of the setpoints and actual values to the application datum under C500 and C501.
  (See chapter 5.4.2.4).

## 5.5.3 Dancer-position control (line drive)

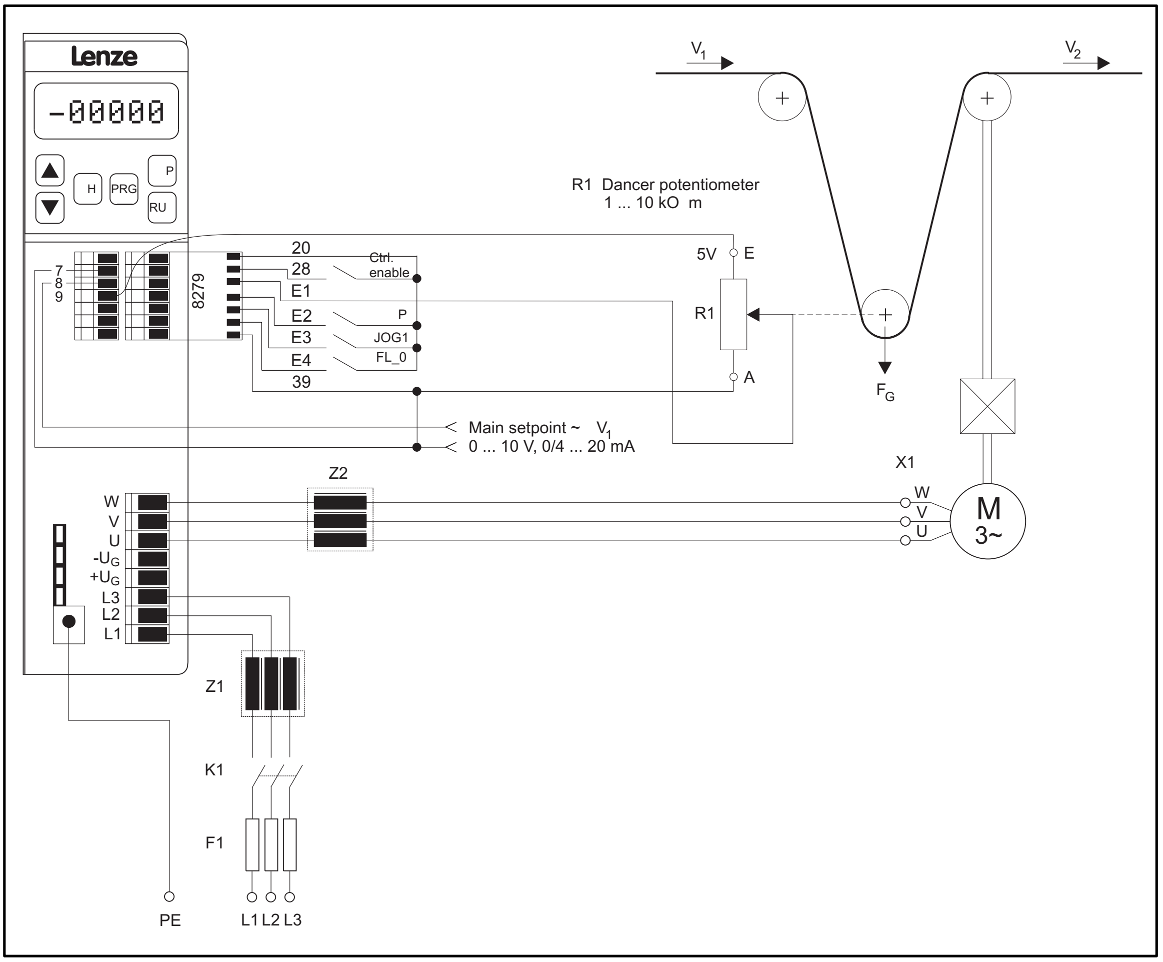



FIG 5-4 Application of a dancer-position control

Z1 Mains filter required for radio interference level A or B. For mains chokes see chapter 3.4 ff.

Z2 Motor filter/sine filter required for long motor cables or motors not designed for inverter operation (see chapter 4.2.7.2).

Shield all signal and motor cables. Please observe the corresponding installation instructions given in chapters 4.2 and 4.3.

### Application FIG 5-4:

The material speed $v_2$ is to be synchronised to the line speed $v_1$ by means of a dancer-position control. The dancer-position setpoint is internally set.

Functions used

- Internal PID controller as position controller.
- Selection of the line speed $v_1$ via terminal 8.
- Actual dancer-position value from the dancer potentiometer via the analog plug-in module 8279IB.
- Set-up speed via terminal Klemme E3 (JOG1).
- Switch-off of the influence of the dancer controller via terminal E4 (externally) or internally via $Q_{min}$ (C017) and C008 = 7.

*Code settings:*

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C005 | Configuration | -0- | -6- Controlled operation; setpoint via terminal 8 with digital frequency feedback via terminal E1 | | Jumper setting for terminal 8 must be adapted to 5 V (see chapter 4.2.8.2). |
| C007 | Terminal configuration | -0- | -49- | | Actual dancer position via terminal E1 |
| C037 | JOG value 1 | 20.00 | Fixed set-up speed $v_1$ for material guidance, individually adjustable | | |
| C070 | Gain PID controller | 1.00 | | | Adaptation to process |
| C071 | Integral action time PID controller | 100 | | | |
| C072 | Differential component PID controller | 0.0 | | | |
| C074 | Influence PID controller | 0.0 | 10.0 % | | |
| C105 | Deceleration time QSP | 5.00 | Enter approx. 1 s | | E.g. emergency-off function:<br>• The drive geometry must be adjusted so that it is possible to brake the controller to standstill within a very short time. A brake chopper might be required. |
| C181 | Setpoint PID controller | 0.0 | Set the dancer to the position required, C051 = read the actual dancer value and store it under C181. | | C181 must not be 0, because here the position setpoint is generated by the main setpoint. |
| C239 | Frequency setting range | -0- | -1- Unipolar | | Direction of rotation cannot be changed via the process controller. |

- All other parameters are based on the factory setting.
- Adapt the jumper setting to the main setpoint signal (see chapter 5.5.1).
- Set the rated motor data under C088 (rated motor current) and C091 (motor cos $\varphi$) depending to the motor connected.

**Note!**

- For more detailed information on the process controller, see chapter 7.5.10.
- Calibration of the setpoints and actual values to the application datum under C500 and C501.
  (See chapter 5.4.2.4).

**Notes for the adjustment of the dancer controller:**

Set the gain Vp (C070), the integral action time $T_N$ (C071) and the differential component (C072) so that the original position can be reached quickly with only minimum overshooting, if the dancer is adjusted manually (change of the act. value).

For the adjustment start with code C070, then set C071 and C072. C071 must be deactivated (via terminal E4) when setting C070. C072 must be deactivated (via 0) for setting C071.

## 5.5.4 Air conditioning system

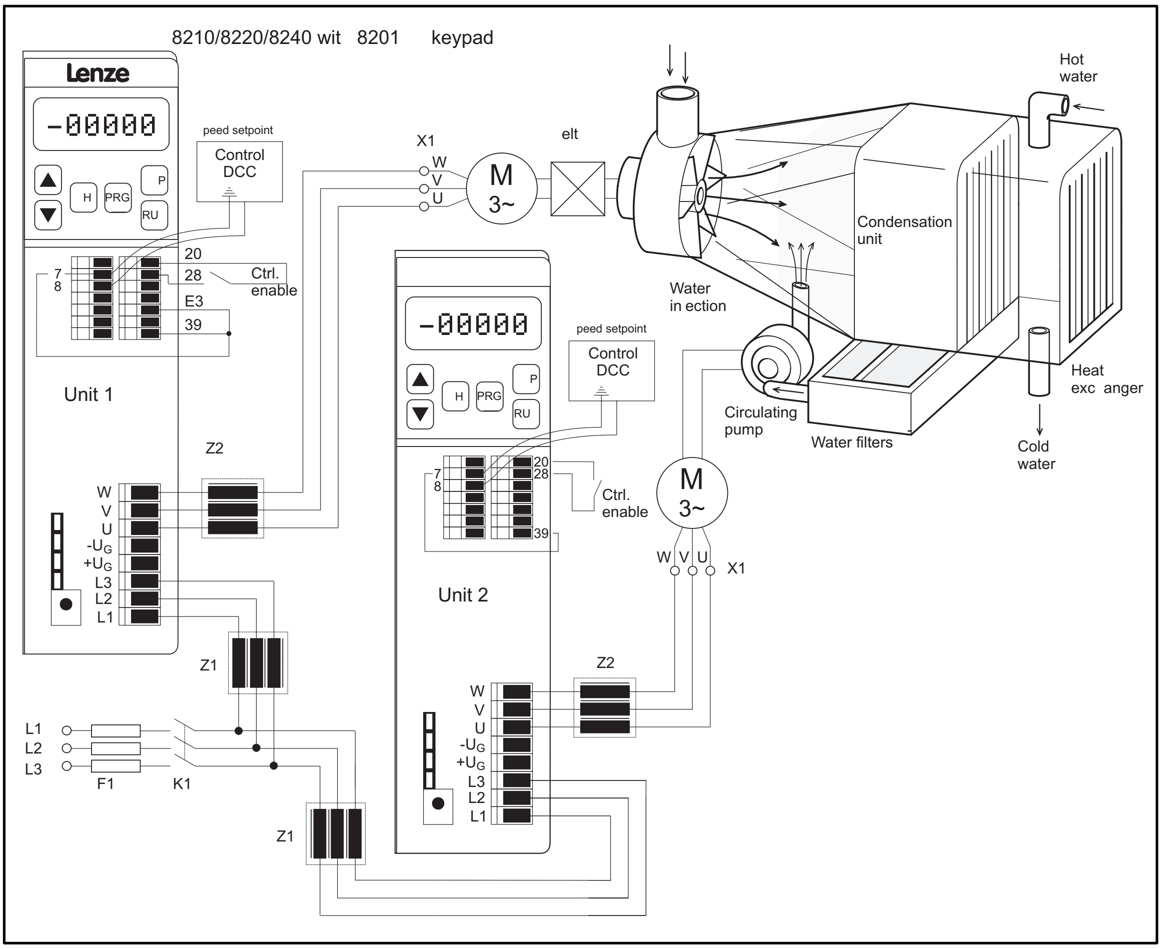



FIG 5-5 Application example of an air conditioning system

| | |
|---|---|
| Z1 | Mains filter required for radio interference level A or B. For mains chokes see chapter 3.4 ff. |
| Z2 | Motor filter/sine filter required for long motor cables or motors not designed for inverter operation (see chapter 4.2.7.2). |

Shield all signal and motor cables. Please observe the corresponding installation instructions in chapters 4.2 and 4.3.

**Application FIG 5-5:**

The air conditioning system of a department store is to be controlled according to the number of persons present. The fans must circulate an amount of air that depends on the number of people (e.g. data provided by a person counter).

Functions used
- Belt monitoring
- Flying-restart circuit on coasting motor
- Suppression of mechanical resonances
- Smooth start and stop with S-ramps

*Code settings for unit 1:*

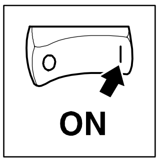
| Code | Name | Possible settings | | | |
|---|---|---|---|---|---|
| | | Lenze | Choice | | Info |
| C001 | Operating mode | -0- | -0- | Setpoint selection via term. 8 (jumper setting, se chapter 4.2.8.2)<br>Control via terminals parameter setting with 8201BB | |
| C005 | Configuration | -0- | -0- | Operation with open-loop control via terminal 8 | |
| C008 | Function relay K1 | -1- | -14- | Apparent motor current (C054) < Current threshold C156 and acceleration finished (Belt monitoring) | |
| C014 | Control mode | -0- | -3- | Square characteristic $V \sim f_d^2$ with constant $V_{min}$ boost | |
| C142 | Start condition | -1- | -3- | Automatic start, if term. 28 HIGH, flying-restart circuit active | |
| C156 | Current threshold | 0 | 50 % | | |
| C182 | $t_{integration}$ RFG S-shape | 0.00 | 0.50 s | Smooth start / stop | |
| C625 | Skip frequency 1 | 480.00 | 30.00 Hz | Removal of mechanical resonances | |
| C628 | Skipping bandwidth, $f_{skip}$ | 0.00 | 10.00 % | | |

*Procedure for setting skip frequencies*

**Stop!**
If the mechanical resonance points are approached, the mechanics may be damaged.

1. Remain C625 to C628 in factory setting.
2. Detect mechanical resonances (if not already known).
3. Detect the bandwidth of the mechanical resonances.
4. Set C625 to C628 according to the data available.

**Note!**
Terminal E3 must always be at L level (PAR2: normal operation; PAR1: QSP).

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*Code settings for unit 2:*

| Code | Name | Possible settings | | | |
|---|---|---|---|---|---|
| | | Lenze | Choice | | Info |
| C001 | Operating mode | -0- | -0- | Setpoint selection via term. 8 (jumper setting, see chapter 4.2.8.2)<br>Control via terminals parameter setting with 8201BB | |
| C005 | Configuration | -0- | -0- | Operation with open-loop control via terminal 8 | |
| C014 | Control mode | -0- | -3- | Square characteristic $V \sim f_d^2$ with constant $V_{min}$ boost | |

According to the information given in both tables (code setting for unit 1 and 2):

- All other parameters are based on the factory setting.

# 6 During operation

## 6.1 Operating information

### 6.1.1 General

- Replace defective fuses with the prescribed type only when no voltage is applied.
  There are no fuses in the controller.
- With cyclic mains connection and disconnection:
  - Do not switch on the controller more than every three minutes, otherwise the internal initial-current limitation can be overloaded.
- Switching on the motor side:
  - Permissible for emergency switch-off.
  - Monitoring messages can be activated when switching the motor when the controller is enabled.
- The plug-in connection terminals of the 820X controllers must only be connected or disconnected when no voltage is applied.
- Depending on the controller settings, the connected motor can be overheated:
  - For instance, longer DC-braking operations.
  - Longer operation of self-ventilated motors at low speed.
- With the corresponding parameter setting, the controllers reach an output frequency of up to 480 Hz:
  - If an inappropriate motor is connected, a hazardous overspeed may occur.
  - With frequencies > 240 Hz, the overcurrent switch-off of the 820X controllers can be activated.
- With the function CW/CCW (selection of the direction of rotation) in configuration C007 = -0- ... -13-, -23 ... -45-:
  - The drive can reverse the direction of rotation in the event of a control-voltage failure or a cable break.
- If the function ”flying-restart circuit” (C142 = -2-, -3-) is used with machines with low inertia torque and friction:
  - After the controller has been enabled in standstill, the motor can start for a short time or reverse the direction of rotation.

### 6.1.2 822X/824X

- The controllers 822X/824X have a temperature-dependent fan circuit:
  - The fans are only activated when the heat sink temperature, which is a fixed factory setting, is exceeded.

### 6.1.3 8218-V003

- For use of the variant 8218-V003 with the Lenze convection cooling system:
  - Depending on the application conditions, the temperature monitoring (message ”OH”) can be activated during low-noise operation with a 16 kHz chopper frequency (C018=-5-).

## 6.2 Display of the controller status

During operation without an operating module, the operating state of the controller is displayed on two LEDs at the front of the unit.

| LED | | Operating status |
|---|---|---|
| **green** | **red** | |
| on | off | Controller enabled |
| on | on | Mains switched on and automatic start inhibited (AS_LC) |
| blinking | off | Controller inhibited |
| off | blinking every second | Fault message |
| off | blinking every 0.4 seconds | Undervoltage switch-off |
| off | off | Programming mode (only 820X) |

EDS8200U--D
00406184

# Manual
# Part D

## Configuration

**Global Drive**

*Frequency inverters 8200*

This Manual is valid for 82XX controllers as of version:

| Type | Design | Hardware version and index | Software version and index | Variant | Explanation |
|---|---|---|---|---|---|
| 33.820X- | E- | 1x. | 1x | | (8201 - 8204) |
| 33.8202- | E- | 1x. | 1x | -V002 | Reduced assembly depth (8202) |
| 33.821X- | E- | 0x. | 1x | | (8211 - 8218) |
| 33.821X- | E- | 1x. | 2x | | (8211 - 8218) |
| 33.821X- | C- | 1x. | 2x | -V003 | Cold plate (8215 - 8218) |
| 33.821X- | E- | 3a. | 3x | -V020 | HVAC (8211 - 8218) |
| 33.822X- | E- | 0x. | 0x | | (8221 - 8227) |
| 33.822X- | C- | 1x. | 2x | -V003 | Cold plate (8221 - 8222) |
| 33.822X- | E- | 3a. | 3x | -V020 | HVAC (8221 - 8227) |
| 33.824X- | E- | 1x. | 1x | | (8241 - 8246) |
| 33.824X- | C- | 1x. | 1x | -V003 | Cold plate (8241 - 8246) |
| 33.824X- | E- | 3a. | 3x | -V020 | HVAC (8241 - 8246) |

Type

Design:
B = Module
C = Cold plate
E = Built-in unit IP20

Hardware version and index

Software version and index

Variant

Explanation

| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

# 7 Configuration

- The configuration of the controller is used to adapt the drive to your applications.
- For this, you have the following functions available:
  - Operating functions
  - Control functions
  - Display functions
  - Monitoring functions
- The possible settings for the functions are organised in codes:
  - Codes are numerically sorted, starting from the code with the smallest number to the one with the highest number. All codes start with a ”C”.
  - They are listed in the code table.
  - Each codes provides parameters, which can be used to adjust and optimise your drive.
- The configuration of the controller can be entered by means of the keypad of the 8201BB operating module or by means of a fieldbus via the serial interface.
  - The operating module and fieldbus modules are available as accessories.

## 7.1 8201BB operating module

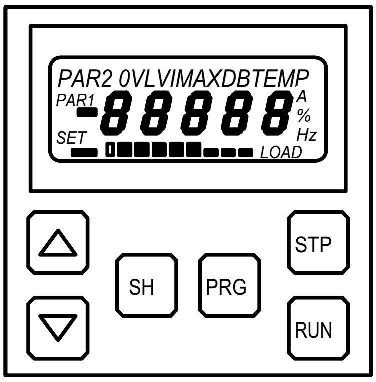
(Not included in the delivery package, see Accessories).

The 8201BB operating module is equipped with a 5-digit LCD and 6 function keys.

**Functions:**

- Parameter setting
- Display
- Setpoint selection via keypad
- Controller inhibit and enable via keypad
- Parameter transfer with other controllers of the **same** type series.
  - The parameter transfer with other type series is not possible because of the different code sets!

The operating module can be attached or detached during operation.




**Key functions**
"SH + " means:
1. Press and hold key SH.
2. Press second key indicated.

| Key | Function |
|---|---|
| PRG | Change between operating and code level |
| SH | Change between code and parameter level |
| ▲ | Increase display value |
| ▼ | Decrease display value |
| SH + ▲ | Increase display value rapidly |
| SH + ▼ | Decrease display value rapidly |
| SH + PRG | Store changes (each parameter can be stored individually before mains disconnection) |
| STP | Inhibit controller |
| RUN | Enable controller |

**Status display**
(For fault messages see chapter 8)

| Display | Meaning |
|---|---|
| OV | Overvoltage |
| LV | Undervoltage |
| IMAX | Current limit exceeded |
| TEMP | Heat sink temperature near switch-off ($\vartheta_{max}$-10 °C) |
| PAR1 | Parameter set 1 active, PAR1 blinking: Programming possible |
| PAR2 | Parameter set 2 active, PAR2 blinking: Programming possible |
| SET | Setpoint input via keypad |

**5-digit, 7-segment display**

| Display | Meaning |
|---|---|
| OFF | Controller inhibited by a LOW signal at terminal 28 |
| STOP | Controller inhibited (by STP key or quick stop function or field frequency $f_d$ = 0 Hz) |
| AS_LC | Autostart-Lockout, controller will only be enabled after a low-high edge at terminal 28. |
| STO | The parameter will be stored. |
| dC_b | DC injection brake active |
| LU | Undervoltage |
| SET1 | Parameter set 1 will be overwritten with the factory setting. |
| SET2 | Parameter set 2 will be overwritten with the factory setting. |
| rEAd1 | Parameter set 1 will be overwritten with the data of the operating module. |
| rEAd2 | Parameter set 2 will be overwritten with the data of the operating module. |
| STOE | The parameter sets PAR1 and PAR2 will be transferred to the operating module. |

**Bar-graph display**
The bottom line of the LCD shows the controller load:

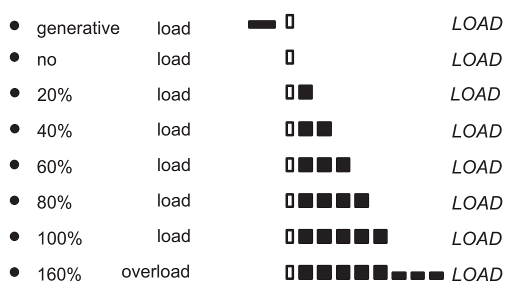



FIG 7-1 8201BB operating modules - functions, displays

## 7.2 Structure of the operating program

The operating program has three program levels: operating level, code level, and parameter level. The controller parameters are set in the code level and the parameter level.

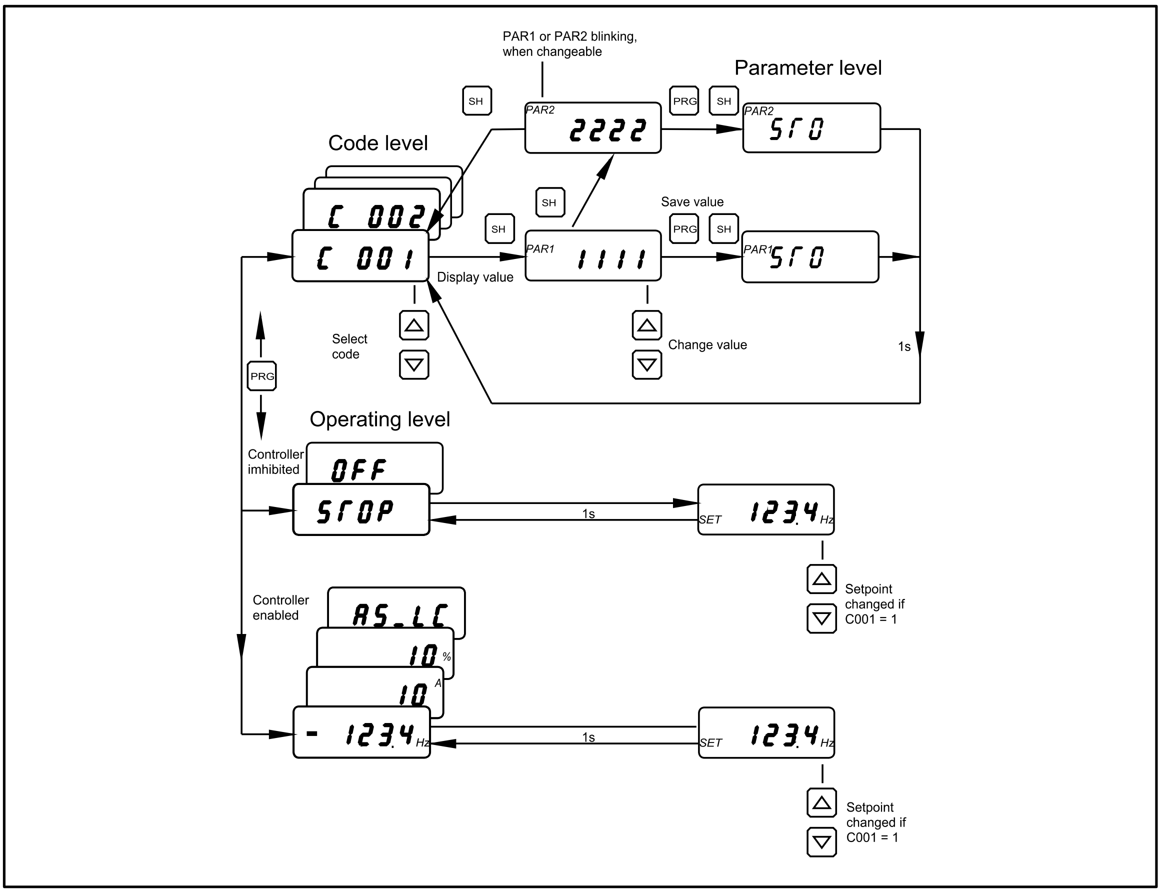



FIG 7-2 Flow chart for parameter setting

### 7.2.1 Operating level

- The controller is in the operating level after mains connection.
- You can see the switch-on display (C004).
- You can change to the code level by pressing the key PRG.

### 7.2.2 Code level

- In the code level you select a code by pressing ▲ or ▼.
- Change to the parameter level by pressing the key SH.

### 7.2.3 Parameter level

- The parameter level contains two parameter sets, PAR1 and PAR2. Press the key SH to change from PAR1 to PAR2.
- Each code provides parameters which can be used for drive adjustment.
  - The blinking of PAR1 or PAR2 indicates in which parameter set you are.
- There are four different parameter types:
  - Absolute physical values
    (e.g. 400 V, 10 s)
  - Relative physical values
    (e.g. 50 % setpoint)
  - Numbers for certain states
    (e.g. -0- = controller inhibited, -1- = controller enabled)
  - Display values
    These values can be displayed but not changed.
    (e.g. motor-current).
- Absolute and relative values can be modified in discrete steps. The steps can change in the parameter-setting range.
  Example: Acceleration time $T_{ir}$ (C012):
  3 steps in the whole parameter setting range
  - $T_{ir}$ of 0.0 2 s ... 1 s (step 0.02 s, with 820X step 0.05 s)
  - $T_{ir}$ of 1 s ... 10 s (step 0.1 s)
  - $T_{ir}$ of 10 s ... 100 s (step 1 s)

## 7.3 Change and store parameters

Each code with parameters which can be changed is factory set. There are three possibilities, depending on the code, to change a parameter:

| | **Labelling in code table** |
|---|---|
| Acceptance and storage without acknowledgement | Cxxx |
| Acceptance and storage acknowledged with SH + PRG | Cxxx↲ |
| Acceptance and storage acknowledged with SH + PRG at controller inhibit | [Cxxx] |

- Parameters can be changed when the controller is enabled.
- Changes of the operating parameters are accepted ONLINE.
- Parameters, which influence the initialisation of the controller, must be acknowledged with SH+PRG.

**Note!**
Overwriting of the parameter sets (C002) is only possible when the controller is inhibited.

## 7.3.1 Change and store parameters with the 8201BB operating module

**Acceptance without acknowledgement (ONLINE)**

The controller accepts the changed parameter immediately.

1. Change from the operating level to the code level by pressing PRG.
2. Select a code with ▲ or ▼.
3. Change to parameter set PAR1 by pressing SH.
   - If necessary, press SH again to change to parameter set PAR 2.
4. If PAR1 or PAR2 is blinking, change the parameter with ▲ or ▼.
   - The controller accepts the changed parameter immediately.
   - This is also possible during operation of the drive.
5. Change to the code level by pressing SH.
6. Change to the operating level by pressing PRG.

The changed parameter is now stored permanently.

**Acceptance acknowledged with SH + PRG**

(Labelled with ”↲” in the code table.)

The controller accepts the changed parameter only after pressing SH+PRG.

1. Change from the operating level to the code level by pressing PRG.
2. Select a code with ▲ or ▼.
3. Change to parameter set PAR1 by pressing SH.
   - If necessary, press SH again to change to parameter set PAR 2.
4. If PAR1 or PAR2 is blinking, change the parameter with▲ or ▼.
   - This is also possible during operation of the drive.
5. Press SH + PRG.
   - STO is displayed for approx. 1 s.
   - The program jumps back to the code level.
   - The controller now works with the new parameter.
6. Change to the operating level by pressing PRG.

The changed parameter is now stored permanently.

**Acceptance acknowledged with SH + PRG when the controller is inhibited.**

(Labelled with "[Cxxx]" in the code table.)

The controller only accepts the changed parameter when the controller is inhibited and after pressing SH + PRG.

1. In the operating level you inhibit the controller by pressing STP.
2. Change from the operating level to the code level by pressing PRG.
3. Select a code with ▲ or ▼.
4. Change to parameter set PAR1 by pressing SH.
   - If necessary, press SH again to change to parameter set PAR 2.
5. If PAR1 or PAR2 is blinking, change the parameter with ▲ or ▼.
6. Press SH + PRG.
   - STO is displayed for approx. 1 s.
   - The program jumps back to the code level.
7. Change to the operating level by pressing PRG.
   - The changed parameter is now stored permanently.
8. Enable the controller again using RUN.
   - The controller now works with the new parameter.

**Note!**
Fast loading of the factory setting for 820X:
Press the keys ▲ and ▼ at the same time in the parameter level to load the factory setting of the selected code.

## 7.3.2 Change and store parameters with fieldbus modules.

### RS232/485 fieldbus module 2102IB

- Parameter setting via the serial LECOM interface is supported by the PC programs "Global Drive Control" and "LEMOC2" (see Accessories).
- The codes of parameters set PAR 1 are set via the LECOM interface by entering the code number as address. To address the codes of parameter set PAR 2 it is necessary to add 2000 to the code number.
  - Example: Address of minimum field frequency $f_{dmin}$:
    In the parameter set PAR1: C011.

### INTERBUS fieldbus module 2111IB

The parameter setting for controller with INTERBUS is described in the Operating Instructions for the 2111IB fieldbus module.

### System bus module 2171IB/2172IB

The parameter setting for controllers with the system bus (CAN) is described in the Operating Instructions for the 2171IB/2172IB system bus module.

## 7.3.3 Dynamic parameter change

*Only "HVAC" controllers*

| Code | Name | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|
| | | Lenze | Choice | | Info | |
| C003↵ | Save parameter set | -1- | -0- | Data will not be stored on EEPROM; all data will be lost when switching off the mains | | |
| | | | -1- | Data will be stored on EEPROM; setting when switching on the mains | | |

**Function**

Continuous change of parameters is possible via a bus connection module. The EEPROM is not damaged by exceeding the max. permissible number of write accesses.

**Selection**

- C003 = -0-
  - Continuous parameter change is not permitted because the data is not stored on EEPROM.
- C003 = -1-
  - Changed parameters are immediately stored on EEPROM.

**Important**

C003 = -0- is only valid for C010, C011, C012, C013, C037, C038, C105, C181 and C182.
With C003 -1- the continuous change of parameters is not permitted because the max. permissible write accesses of the EEPROM can be exceeded.

# 7.4 Operating functions

## 7.4.1 Operating mode

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C001↲ | Operating mode | -0- | -0- Setpoint selection via term. 8<br>Control via terminals<br>Parameter setting via 8201BB<br>-1- Setpoint selection via 8201BB or LECOM<br>Control via terminals<br>Parameter setting via 8201BB<br>-2- Setpoint selection via term. 8<br>Control via terminals<br>Parameter setting via LECOM<br>-3- Setpoint selection via LECOM<br>Control via LECOM<br>Parameter setting via LECOM | | |

**Function**

With the selection of the operating mode you determine the control, the setpoint selection and the parameter setting of the drive. This setting should always be made first.

**Important**

When you select the setpoint via the keypad or the motor-potentiometer function, the setpoint will be saved when switching the mains or interrupting the operation.
When changing the operating mode to "setpoint selection via keypad" or "setpoint selection via LECOM", the drive might start after enabling the controller.

## 7.4.2 Working with parameter sets

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| [C002]* | Parameter set | | -0- Function executed | | |
| | | | -1- Overwrite PAR1 with factory setting | | |
| | | | -2- Overwrite PAR2 with factory setting | | |
| | | | -3- Overwrite PAR1 and PAR2 with the data of the operating module | | |
| | | | -4- Overwrite PAR1 with the data of the operating module | | |
| | | | -5- Overwrite PAR2 with the data of the operating module | | |
| | | | -6- Transmit PAR1 and PAR2 to the operating module | | |
| | | | -7- Overwrite PAR1, PAR2 and the unit-dependent data (C016, C036, C088, C091) with the data of the operating module. | HVAC only | |
| [C007]* | Terminal configuration | -0- | E4 E3 E2 E1 | | For parameter-set changeover via terminal, the corresponding terminal must be assigned to PAR in both parameter sets. |
| | | | -1- CW/CCW PAR JOG1/2/3 | | |
| | | | -3- CW/CCW PAR DCB JOG1 | | |
| | | | -4- CW/CCW QSP PAR JOG1 | | |
| | | | -6- CW/CCW PAR TRIP set JOG1 | | |
| | | | -7- CW/CCW PAR DCB TRIP set | | |
| | | | -8- CW/CCW QSP PAR TRIP set | | |
| | | | -12- CW/CCW PAR UP DOWN | | |
| | | | -15- CCW/QSP CW/QSP PAR JOG1 | | |
| | | | -17- CCW/QSP CW/QSP PAR DCB | | |
| | | | -18- CCW/QSP CW/QSP PAR TRIP set | | |
| | | | -24- H/Re PAR UP DOWN | HVAC only | |
| | | | -33- QSP PAR I-OFF D/F | HVAC only | |
| | | | -35- JOG1/2/3 PAR D/F | HVAC only | |
| | | | -36- DCB QSP PAR D/F | HVAC only | |
| | | | -37- JOG1 QSP PAR D/F | HVAC only | |
| | | | -38- JOG1 PAR TRIP set D/F | HVAC only | |
| | | | -44- UP DOWN PAR D/F | HVAC only | |
| | | | -45- CW/CCW QSP PAR D/F | HVAC only | |
| | | | -46- H/Re PAR QSP JOG1 | HVAC only | |
| | | | -51- DCB PAR I-OFF D/F | HVAC only | |

**Function**

The controllers are equipped with two parameter sets: PAR1 and PAR2. You can switch from one parameter set to the other during operation. If the second parameter set is activated, for instance, additional acceleration and deceleration times or three additional JOG frequencies can be activated.

**Selection**

Change to PAR2 via the digital input terminal PAR,
e.g. terminal E3 if C007 = -1- (see table "Terminal configuration").

- Overwrite parameter sets with factory setting.
- Copy the parameter sets to different controllers of the same type using the keypad:
  - 820X→820X
  - 821X→821X
  - 822X/824X→822X/824X

Series "HVAC":

- Copy the parameter sets to different controller using the keypad.
- Overwrite parameter sets with controller-dependent data (C002 = -7-).

**Important**

- The controller works with PAR1 when using the factory setting.
- For copying the data from the keypad (C002 = -3-, -4-, -5-):
  - Parameters C016, C036, C088, C091, C079 will not be transferred.
    Select C002 = -7- to transfer these parameters (only series "HVAC").
- The LCD displays the activated parameter set only in the code level.
  - The codes marked with * in the code table are the same for PAR1 and PAR2.

## 7.4.3 Change parameter set via DC-bus voltage

*Only series "HVAC"*

### 7.4.3.1 AC-motor braking by means of parameter set changeover

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

**Function**

With the parameter set changeover in dependence of the DC-bus voltage, the AC motor braking can be used as alternative for DC braking.

- The AC motor braking is a braking method without external brake resistor for the control mode "V/f-characteristic control with linear characteristic" (C014 = -2-)".
- With mains voltages up to approx. 3 AC 400 V it is possible to achieve braking times shorter than with the DC-brake.
- The braking times for generative braking via external brake resistor are approx. 33 % shorter than for AC motor braking.

**Configuration of the parameter sets**

| Code | PAR1 setting (active in normal operation) | PAR2 setting (active in braking operation) | Note |
|---|---|---|---|
| C013C 105 | Braking time required for AC braking | Deceleration time of the drive with max. inertia load without getting the message OU (overvoltage) during deceleration. | • C0013 for braking along the main setpoint ramp<br>• C0105 for braking along the QSP ramp |
| C015 | Value adapted to the drive,<br>e.g. V/f vertex = 50 Hz | Depending on the drive power up to min. 25 % of the value under C015 in PAR1:<br>• Rule of thumb: 2.2 kW ⇨ 50 %<br>• Decrease for lower drive power, increase for higher drive power. | Thus the energy in the motor is decreased by overexcitation in PAR2. |
| C016 | Value adapted to the drive,<br>e.g. $V_{min}$ = 5 % | Depending on the drive power up to 500 % of the value under C0016 in PAR1:<br>• Rule of thumb: 2.2 kW ⇨ factor 3<br>• For lower drive power increase the factor, for higher power decrease it. | Thus also in the lower speed range, the energy in the motor is decreased by overexcitation in PAR2. |
| C988 | Threshold<br>Setting according to the mains voltage:<br>400 V ⇨ 112 %<br>440 V ⇨ 123 %<br>460 V ⇨ 129 %<br>480 V ⇨ 133 % | | |

**Important**

- AC motor braking can only be used together with the control mode "V/f-characteristic control with linear characteristic" (C014 = -2-).
- Parameter set changeover is not possible via terminal, bus or PC, if C988 > 0!
- The higher the mains voltage, the longer the deceleration time for AC braking must be set in PAR1, to fulfill the requirements stated above. It is therefore possible to achieve shorter deceleration times with the DCB, if the mains voltage is high.
- C988 is the same in all parameter sets.

### 7.4.3.2 Automatic parameter set changeover for controlled deceleration in the event of mains failure

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

**Function**

- Controlled deceleration of the motor to standstill ($f_d$ = 0) when switching the mains or in the event of mains failure.
- If the motor is not standing still when being reconnected to the mains, it is accelerated along the acceleration ramp (C0012) to the preselected setpoint. There is no delay time as it occurs with active flying-restart circuit.

The function can be used with or without external brake resistor:

Without external brake resistor

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

With external brake resistor

- Automatic, fast deceleration of the motor to standstill ($f_d$ = 0).
- The deceleration time is shorter than without external brake resistor.

**Functionality**

1. Mains voltage is interrupted.
2. $U_G$ becomes lower than the value in C0988 ⇒ PAR1 is activated.
3. QSP in PAR1 starts operation in generator mode.
4. $U_G$ becomes higher than the value in C0988.
5. PAR2 is activated ⇒ The motor accelerates with $T_{ir}$ (C012 in PAR2).
6. The rotation energy in the motor keeps $U_G$ at its min. value until the motor speed is approx. 0.

# Configuration

| Adjustment | Code | PAR1 setting<br>(active in the event of mains failure) | PAR2 setting<br>(active in normal operation) | Note |
|---|---|---|---|---|
| Threshold | C988 | Threshold<br>C0988 = 100 % corresponds exactly to the mains voltage 3 AC 400 V.<br>Adapt C0988 to the mains-voltage dependent undervoltage:<br>3 AC 400 V - 10 %<br>⇨ C0988 = 75 % ... 85 % | 3 AC 460 V - 10 %<br>⇨ C0988 = 75 % ... 98 % | Most uniform deceleration can be achieved by setting the upper limit of the bandwidth. |
| Terminal configuration | C007 | Select terminal configuration with terminal for QSP function. | Select terminal configuration for normal operation. | With factory setting, the QSP input is low active. |
| With QSP<br>In normal operation | | • Invert QSP input via C114. | • The QSP input selected in PAR1 must only be used if not inverted. | |
| Without QSP<br>In normal operation | | • Do not assign the QSP input. | • Invert the QSP input selected in PAR1 via C114. | |
| Quick stop without external brake resistor | C105 | Ensure with the setting that the motor decelerates to standstill in a controlled way after mains disconnection:<br>1. Set the same value as in PAR2.<br>2. Switch off the mains voltage.<br>• PAR1 will be activated.<br>• Observe whether the controller indicates “Overvoltage OU” during controlled deceleration.<br>3. Reduce the value and switch the mains until the controller indicates OU during deceleration.<br>4. Increase this value by approx. 20 % as final setting. | Set the deceleration time for QSP required for the application. | |
| Quick stop with external brake resistor | C105 | 1. Set the same value as in PAR2.<br>2. Reduce the value until the required deceleration time after mains switch-off is available. | Set the deceleration time for QSP required for the application. | • Do not exceed the generative current limit during deceleration.<br>• Select the external brake resistor large enough. |

**Important**

- Parameter set changeover via terminal, bus or PC is not possible, if C988 > 0!
- C988 is not the same in all parameter sets.

# 7.5 Control functions

## 7.5.1 Speed range ($f_{dmin}$, $f_{dmax}$)

| Code | Name | | Possible settings: Lenze | Choice | | | Info | IMPORTANT |
|---|---|---|---|---|---|---|---|---|
| C010 | Minimum field frequency | | | | | | | |
| | | 820X | 0.00 | 0.00 | {0.05 Hz} | 480.00 | | |
| | | 821X/822X/ 824X | 0.00 | 0.00 | {0.02 Hz} | 480.00 | | |
| C011 | Maximum field frequency | | | | | | | |
| | | 820X | 50.00 | 30.00 | {0.05 Hz} | 480.00 | | |
| | | 821X/822X/ 824X | 50.00 | 7.50 | {0.02 Hz} | 480.00 | | |

**Function**

The speed range required for the application can be selected via the input of field frequencies $f_{dmin}$ and $f_{dmax}$:

- $f_{dmin}$ corresponds to the speed at 0 % speed setpoint selection.
- $f_{dmax}$ corresponds to the speed at 100 % speed setpoint selection.

**Adjustment**

Relation between field frequency and synchronous motor speed:

$$n_{Nsyn} = \frac{f_{dmax} \cdot 60}{p}$$

$n_{Nsyn}$ Synchronous motor speed [$min^{-1}$]
$f_{dmax}$ Max. field frequency [Hz]
$p$ No. of pole pairs (1, 2, 3, ...)

Example: 4 pole asynchronous motor:
$p = 2$, $f_{dmax} = 50$ Hz

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

**Important**

- With the setting $f_{dmin} > f_{dmax}$ the field frequency is limited to $f_{dmax}$.
- With setpoint selection via JOG values, $f_{dmax}$ acts as limitation.
- $f_{dmax}$ is an internal normalisation variable:
  - Use the LECOM interface only for important modifications, when the controller is inhibited.
- Observe the maximum speed of the motor!
- $f_{dmin}$ is only effective:
  - With analog setpoint input.
  - With the motor potentiometer function "DOWN".

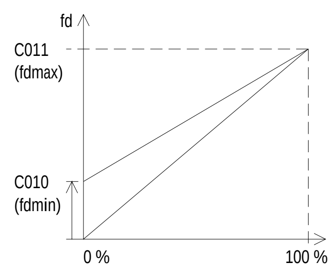
**Special features**

820X

- With field frequencies $f_d > 240$ Hz:
  - The overcurrent switch-off can be activated.

821X/822X/824X

- With field frequencies $f_d > 300$ Hz:
  - Avoid chopper frequencies < 8 kHz.
- The display value of $f_{dmin}$ and $f_{dmax}$ can be related to an application datum using C500 and C501.



## 7.5.2 Acceleration and deceleration times $T_{ir}$, $T_{if}$

| Code | Name | | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|---|
| | | | Lenze | Choice | | | Info | |
| C012 | Acceleration time $T_{ir}$ | | | | | | | |
| | | 820X | 5.00 | 0.00 | {0.05 s} | 999.00 | | |
| | | 821X/822X/ 824X | 5.00 | 0.00 | {0.02 s} | 999.00 | | |
| | | | | 0.00 | {0.02 s} | 1300.00 | HVAC only | |
| C013 | Deceleration time $T_{if}$ | | | | | | | |
| | | 820X | 5.00 | 0.00 | {0.05 s} | 999.00 | | |
| | | 821X/822X/ 824X | 5.00 | 0.00 | {0.02 s} | 999.00 | | |
| | | | | 0.00 | {0.02 s} | 1300.00 | HVAC only | |

**Function**

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

**Adjustment**

- The acceleration and deceleration times refer to a change of the field frequency from 0 Hz to the max. field frequency set under C011.
- Calculate the times $T_{ir}$ and $T_{if}$, which must be set under C012 and C013.
  - $t_{ir}$ and $t_{if}$ are the times desired for the change between $f_{d1}$ and $f_{d2}$:

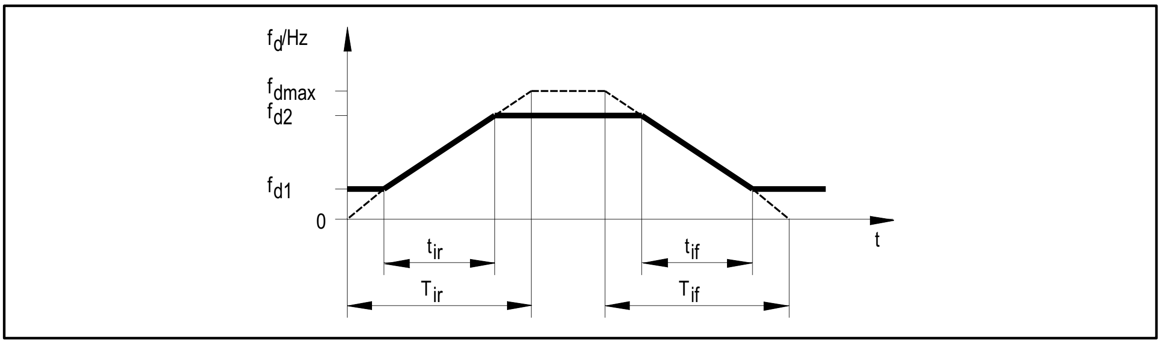
$$T_{ir} = t_{ir} \cdot \frac{f_{dmax}}{f_{d2} - f_{d1}} \qquad T_{if} = t_{if} \cdot \frac{f_{dmax}}{f_{d2} - f_{d1}}$$

**Important**

Under unfavourable operating conditions, too short acceleration and deceleration times can lead to the deactivation of the controller with the indication of TRIP OC5. In these cases, the acceleration and deceleration times should be short enough that the drive can follow the speed profile without reaching $I_{max}$ of the controller.

**Special features**

820X — The slope is adjustable between 0.095 Hz/s and 780 Hz/s.



## 7.5.3 Current limit values ($I_{max}$ limit values)

| Code | Name | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | Info | |
| C022 | $I_{max}$ limit (motor mode) | 150 | 30 | {1 %} | 150 | | |
| C023 | $I_{max}$ limit (generator mode) | 80 | 30 | {1 %} | 110 | | |
| | 822X/824X | 80 | 30 | {1 %} | 150 | as of software 1.6 and HVAC | |

**Function**

The controllers are equipped with a current-limit control which determines the dynamic response under load. The measured load is compared with the limit values set under C022 for motor load and under C023 for generator load. If the current limits are exceeded, the controller changes its dynamic behaviour.

Series “HVAC”:

- C023 = 30 %
  - Current limit controller for generator mode not active (only for applications with special machines running at high field frequencies at the same time).
  - Only possible with control mode V/f-characteristic control (C014 = -2-) (see chapter 7.5.5).
- C023 = 30 % or C023 = 149 %
  - Earth-fault detection not active.

**Adjustment**

Set the acceleration and deceleration times so that the drive can follow the speed profile without reaching $I_{max}$.

**Controller behaviour when reaching the limit value**

- During acceleration:
  - Increase of the acceleration ramp
- During deceleration:
  - Increase of the deceleration ramp
- With increasing load and constant speed:
  - When reaching the motor-current limit value:
    Decrease of the field frequency to
    10 Hz at 820X
    0 Hz at 821X/822X/824X.
  - When reaching the generator-current limit value:
    Increase of the field frequency to the max. frequency (C011).
  - Stop the field-frequency change if the load falls below the limit value.

**Important**

821X/822X/824X

- A correct current control in the generator mode is possible only with a connected brake unit or in the DC-bus connection with energy exchange.
- For operation with chopper frequencies > 8 kHz, the current limit values should be set to the currents "$I_{max}$ for 60 s” indicated in the rated data (see chapter 3.4).
  (Derating at higher chopper frequencies)

## 7.5.4 Current limitation controller ($I_{max}$ controller)

*Only "HVAC" controllers*

| Code | Name | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | Info | |
| C077* | Gain ($V_P$) $I_{max}$ controller | 0.25 | 0.00 | {0.01} | 1.00 | | |
| C078* | Integral action time ($T_i$) $I_{max}$ controller | 65 | 12 | {1 ms} | 9990 | | |

**Function**

For power control, the $I_{max}$ controller can be adjusted under C077 and C078.
The following values for $V_P$ and $T_i$ are internally set if C077 and C078 are factory set:

| Control mode | $I_{max}$ controller works internally with | | Setting for | |
|---|---|---|---|---|
| | $V_P$ | $T_i$ | C077 | C078 |
| C014 = -2-, -3- | 0.25 | 65 ms | 0.25 | 65 ms |
| C014 = -4- | 0.5 * | 87 ms * | 0.25 | 65 ms |

* Internally converted with a factor

**Adjustment**

The $I_{max}$ controller is factory set to stability.
For power control of extreme masses set the following:

- C014 = -2- or C014 = -3- (characteristic control)
- $V_P$ and $T_i$ are to be rated as follows:
  - C077 = 0.06
  - C078 = 750 ms

**Important**

C077 and C078 are only stored in parameter set 1.

## 7.5.5 Control mode

| Code | Name | | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | | Lenze | Choice | | Info | |
| C014 ↲ | Control mode | | | | | | |
| | | 820X | -0- | -0- | Linear characteristic $V \sim f_d$ with auto boost | | |
| | | | | -1- | Square characteristic $V \sim f_d^2$ with auto boost | | |
| | | | | -2- | Linear characteristic $V \sim f_d$ with constant $V_{min}$ boost | | |
| | | | | -3- | Square characteristic $V \sim f_d^2$ with constant $V_{min}$ boost | | |
| | | 821X/822X/ 824X | -4- | -4- | Motor-current control | | |

**Function**

Under C014 you can set the control mode and the voltage characteristic. It is also possible to adapt your drive to different load characteristics:

- Linear characteristic for drives with constantly increasing load torques in relation to the speed
- Square-law characteristics for drives with a load torque squared in relation to the speed

Square-law V/f characteristics are mainly used for centrifugal pump and fan drives. It is however necessary to check whether your individual pump or fan application can be driven with this control mode.

- If your pump or fan drive cannot be operated with a square-law V/f characteristic, you should select the control mode C014 = -0-, -2- or -4-.

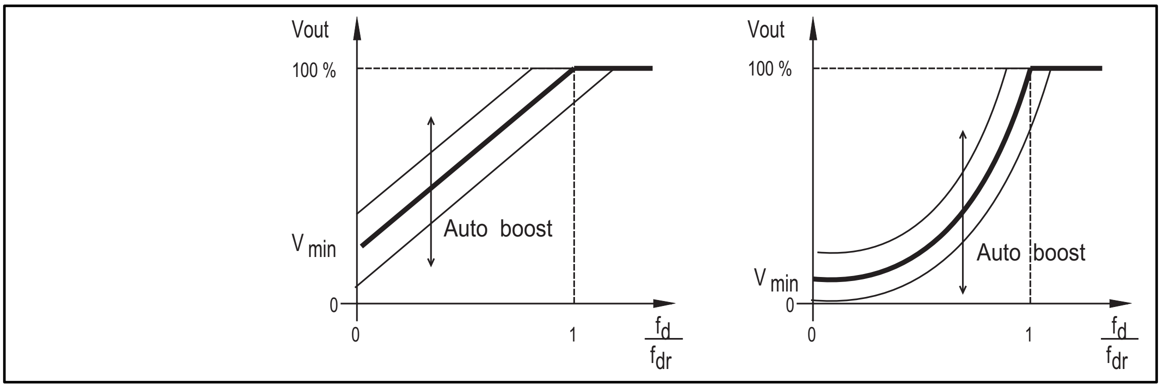
820X

**V/f-characteristic control with auto boost**

The control mode mentioned above enables low-loss operation of stand-alone drives with three-phase AC standard asynchronous motors with load dependent $V_{min}$ boost.

C014 = -0-
Linear characteristic

C014 = -1-
Square characteristic
(e.g. for pumps, fans)



820X
821X
822X
824X

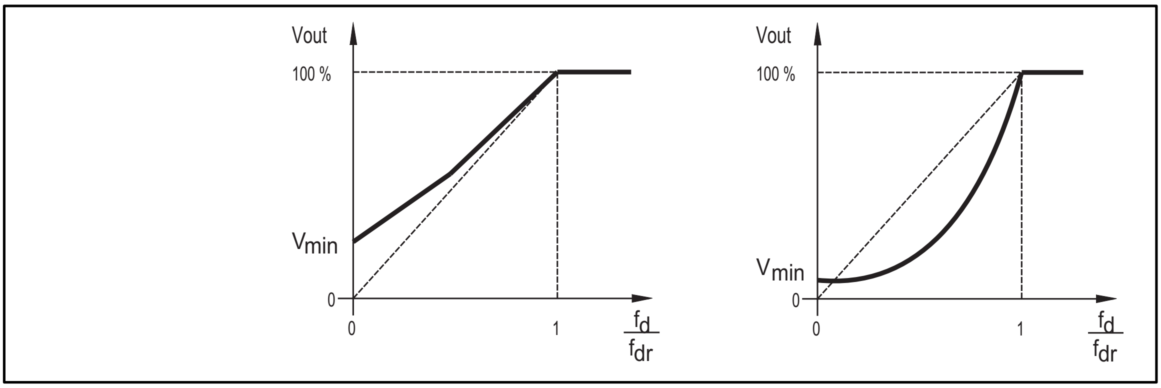
**V/f-characteristic control with $V_{min}$ boost**

Select the classical V/f-control with constant $V_{min}$ boost to operate the following drives:

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

C014 = -2-
Linear characteristic

C014 = -3-
Square characteristic
(e.g. for pumps, fans)




821X
822X
824X

**Motor-current control**

Compared with the V/f-characteristic control the motor-current control offers considerably higher torque and reduced current consumption during idle running. Select the motor-current control for operation with the following drives:

- Single drives with extremely variable loads
- Single drives with heavy start conditions
- Multi-motor applications with the same motors and the same load distribution
- Sensorless speed control of standard three-phase AC motors together with slip compensation (C021)

**Adjustment**

**C014 = -0- or C014 = -1-:**

1. Select V/f-rated frequency C015
2. Select $V_{min}$ boost C016

**C014 = -2- or C014 = -3-:**

1. Select V/f-rated frequency C015
2. Select $V_{min}$ boost (C016)

**C014 = -4-**

- Drives with matching four-pole standard motors need not be adapted. The data are save in the factory setting. After having started the drive, the controller itself detects all further motor data.
- Drives with non matching motors must be optimised. Non-matching motors have the following features.
  - Rated motor power > 1.4 · rated inverter power
  - Rated motor power < 0.6 · rated inverter power
  - Operation with 2, 6, 8, 10 and 12-pole standard motors
  - Operation with special motors

The drive can be optimised by entering motor data under C088/C091.

- The control mode C014 = -4- should only be used with the slip compensation. The "sensorless speed control" is thus optimised for the process.
- The idle current of the motor (magnetising current) must not exceed the rated current of the controller.
- The power code of the connected motor should not be more the two classes lower than the one of the motor assigned to the controller.

**Important**

The change from V/f-characteristic control to motor-current control should only be carried out when the controller is inhibited.

**Special features**

821X/822X/824X

Control mode motor-current control C014 = -4-

- Motor-current control (factory setting) is **not** possible if
  - drives with different loads are connected to an inverter,
  - drives with different rated powers are connected to an inverter,
  - you use motor chokes, motor filters, sine filters or sine-interference suppression filters.
- With very small friction values, a phase offset of up to 180° occurs at the motor shaft when enabling the controller.

Control mode square characteristic $V \sim f_d^2$ (C014 = -3-)

- High inertias result in a reduced acceleration of the drive.
  - This behaviour can be avoided by changing the parameter sets (e.g. acceleration with C014 = -2-).

## 7.5.6 V/f characteristic

### 7.5.6.1 V/f-rated frequency $f_{dr}$

| Code | Name | | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|---|
| | | | Lenze | Choice | | | Info | |
| C015 | V/f-rated frequency | | | | | | | |
| | | 820X | 50.00 | 30.00 | {0.05 Hz} | 960.00 | | |
| | | 821X/822X/824X | 50.00 | 7.50 | {0.02 Hz} | 960.00 | | |

**Function when C014 = -0-, -1-, -2-, -3-**

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

**Adjustment**

Calculate the frequency to be set under C015

820X:

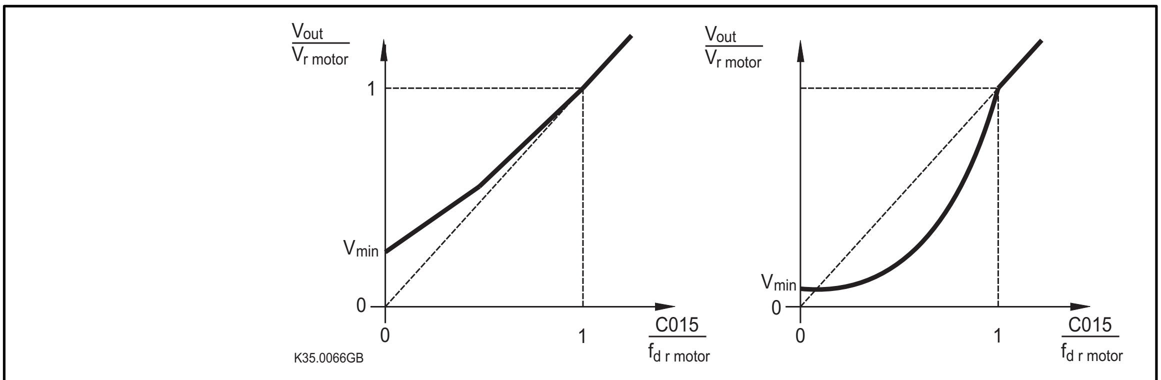
$$C015\ [Hz] = \frac{230\ V}{V_{rmotor}\ [V]} \cdot \text{rated motor frequency [Hz]}$$

821X/822X/824X:

$$C015\ [Hz] = \frac{400\ V}{V_{rmotor}\ [V]} \cdot \text{rated motor frequency [Hz]}$$

C014 = -2-
Linear characteristic

C014 = -3-
Square characteristic
(e.g. for pumps, fans)




**Important**

An internal mains voltage compensation compensates deviation in the mains during operation. Therefore, they do not have to be considered for the setting of C015.

Show/Hide Bookmarks



**Function when C014 = -4-**

The V/f-rated frequency influences the internal parameters of the motor model when using the control mode "motor current control".

**Adjustment**

| Setting of C015 | Motor connection | Motor voltage | Rated motor frequency |
|---|---|---|---|
| 50 Hz | Y | 230/400 V | 50 Hz |
| 52.6 Hz | Y | 220/380 V | 50 Hz |
| 50 Hz | Y | 280/480 V | 60 Hz |
| 50 Hz | Δ | 400/690 V<br>400 V Δ | 50 Hz<br>50 Hz |
| 87 Hz | Δ | 230/400 V<br>280/480 V | 50 Hz<br>60 Hz |
| 90.9 Hz | Δ | 220/380 V | 50 Hz |

## Note!

- 4-pole asynchronous motors, which are designed fro a rated frequency of 50 Hz at 230 V in star connection, can be operated in delta connection when being constantly excited up to 87 Hz at 400 V.
  - The motor current and the motor power are then increased by the factor $\sqrt{3}$ = 1.73.
  - The field weakening range begins above 87 Hz.
- Advantages:
  - Higher speed-setting range
  - 73 % higher power efficiency with standard motors.
  - Improved motor cooling in the lower speed range with self-ventilated motors.
- In principle, this method can also be used with higher-pole motors (6, 8, ...).
  - Observe the mechanical speed limit when using 2-pole asynchronous motors.

## 7.5.6.2 $V_{min}$ setting

| Code | Name | | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|---|
| | | | Lenze | Choice | Info | |
| C016 | $V_{min}$ setting | | | | | |
| | | 820X | * | 0.00 {0.05 %} 40.00 | | * depends on the unit |
| | | 821X/822X/824X | 0.00 | 0.00 {0.02 %} 40.00 | | |

**Function when C014 = -0-, -1-**

Load-dependent boost of the motor voltage in the field frequency range below the V/f-rated frequency. C016 acts as gain factor of the auto-boost function (only with 820xE).

**Adjustment**

As known from experience, an adjustment is not required when having the conditions mentioned above.
An optimisation can be advantageous

**for drives with very high starting torques:**

1. Operate motor under load.
2. Select the frequency setpoint.
3. Increase $V_{min}$ until the required motor current (torque) occurs.
   - If the setting of $V_{min}$ is too high, a positive-feedback effect can occur and activate the TRIP "overcurrent" (OCx).

**for drives with square load torques (fans, pumps):**

1. Operate motor under load.
2. Select the frequency setpoint.
3. Adapt $V_{min}$ until the drive runs steadily and smoothly over the whole frequency range.
   - If the setting of $V_{min}$ is too high, the TRIP "overcurrent" (OCx) can be activated and lead to an excessive motor temperature.

**for drives with special motors:**

1. Operate motor under load.
2. Select the frequency setpoint.
3. Increase $V_{min}$ until the required motor current (torque) occurs.
   - If the setting of $V_{min}$ is too high, a positive-feedback effect can occur and activate the TRIP "overcurrent" (OCx).
4. Check the current consumption during idle running when no load is applied.

**Function when C014 = -2-, -3-**

Load-independent boost of the motor voltage in the field frequency range below the V/f-rated frequency. Thus, the torque performance of the inverter drive can be optimised.

**Adjustment**

It is absolutely necessary to adapt C016 to the asynchronous motor used. Otherwise, the motor might be destroyed by overtemperature or the inverter might be driven with overcurrent.

1. Operate the motor in idle running with a slip frequency of $f_d \approx$ :
   - $P_{mot} \leq$ 7.5 kW: $f_d \approx$ 5 Hz
   - $P_{mot} >$ 7.5 kW: $f_d \approx$ 2 Hz

Slip-frequency calculation

$$f_s = f_{dr} \cdot \frac{n_{Nsyn} - n_r}{n_{Nsyn}}$$

$$n_{Nsyn} = \frac{f_{dr} \cdot 60}{p}$$

| | |
|---|---|
| $f_s$ | Slip frequency |
| $f_{dr}$ | Rated frequency to motor nameplate [Hz] |
| $n_{Nsyn}$ | Synchronous motor speed [min$^{-1}$] |
| $n_r$ | Rated speed to motor nameplate [min$^{-1}$] |
| p | Number of pole pairs |

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

**Important**

The change from V/f-characteristic control to motor-current control should only be carried out when the controller is inhibited.
Observe the thermal performance of the connected asynchronous motor at low field frequencies when adjusting it:

- Usually, standard asynchronous motors with insulation class B can be driven for a short time with rated frequency within the frequency range 0 Hz ≤ $f_d$ ≤ 25 Hz.
- Contact the manufacturer for exact setting values for the max. permissible motor current in the lower frequency range of self-ventilated motors.

**Function when C014 = -4-**

$V_{min}$ is not effective when using the control mode ”motor current control”.

## 7.5.7 Configuration

*Only "HVAC" controllers*

| Code | Name | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|
| | | Lenze | Choice | | Info | |
| C005↵ | Configuration | -0- | -0- | Operation with open-loop control via terminal 8 | | If C005 = -0-<br>• 2 ms cycle time<br>If C005 = -1- ... -7-<br>• 4 ms cycle time |
| | | | -1- | Operation with open-loop control via terminal 8 with setpoint summation via frequency input E1 | | |
| | | | -2- | Operation with open-loop control via frequency input E1 with setpoint summation via terminal 8 | | |
| | | | -3- | Open-loop operation via frequency input E1 with apparent current limitation via terminal 8 | C005 = -3- possible with C014 = -2-, -4- | |
| | | | -6- | Operation with closed-loop control; setpoint via terminal 8 with digital frequency feedback via terminal E1 | | |
| | | | -7- | Closed-loop operation; setpoint via frequency input E1 with analog feedback via terminal 8 | | |

**Function** The signal flow in the controller can be changed under C005. The functionality of the controller will be changed when changing C005. The signal-flow charts in chapter 16.3 show the structure for each configuration.

**Special features** The selection C005 = -4-, -5- cannot be used.

## 7.5.8 Motor data detection

820X setting range: Function not available.

Setting range 821X/822X/824X:

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C088 | Rated motor current | * | | | * depends on the unit |
| | 821X/822X/824X | | 0.0 ... 1.2 · rated output current | | |
| | | | 0.0 ... 2.0 · rated output current | HVAC only | |
| C091 | Motor cos φ | * | | | * depends on the unit |
| | 821X/822X/824X | | 0.4 {0.1} 1.0 | | |

**Function** Is used to adapt not matching motors, special motors, etc.

**Adjustment** Enter the rated currrent and cos φ of your motor.

**Important**

- The motor data detection is only effective with the control mode C014 = -4-.
- Drives with matching 4 pole standard motors 230/400 V in star connection do not need to be adapted. After having started the drive, the controller itself detects all further motor data.
- The following drives can be optimised by entering the nameplate data ”rated motor current” and ”cos φ” under C088 or C091:
  - Motor, one power class smaller than the motor assigned to the controller.
  - Motor, one or two power classes smaller than the motor assigned to the controller.
  - Drives with 2, 6, 8, 10 and 12 pole standard motors.
  - Drives with special motors.

## 7.5.9 Running optimisation

### 7.5.9.1 Slip compensation

| Code | Name | | Possible settings: Lenze | Choice | | | Info | IMPORTANT |
|---|---|---|---|---|---|---|---|---|
| C021 | Slip compensation | | | | | | | |
| | | 820X | 0.0 | 0.0 | {0.1 %} | 12.0 | | |
| | | 821X/822X/ 824X | 0.0 | 0.0 | {0.1 %} | 50.0 | | * With C014 = -2-, -3-, controller dependent |
| | | | | 0.0 | {0.1 %} | 20.0 | | * With C014 = -4- |

**Function**

Under load, the speed of an asynchronous machine is reduced. This load-dependent speed reduction is called slip. The slip can be partly compensated by setting C021 accordingly. The slip compensation is effective with all control modes (C014).

- C021 < 0 (with C014 = -2-, -3-)
  - "Smoother" drive characteristic, if strong load shock occur or application of several motors.
- In the field frequency range between 5 Hz ... 50 Hz (87 Hz), the deviation of the rated speed is $\leq$ 1 % (guide value). In field-weakening operation, the fault increases.

**Adjustment**

1. Rough setting of the slip constants (C021) by using the motor data:

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

$$n_{Nsyn} = \frac{f_{dr} \cdot 60}{p}$$

| | |
|---|---|
| s | Slip constant (C021) [%] |
| $n_{Nsyn}$ | Synchronous motor speed [$min^{-1}$] |
| $n_r$ | Rated speed to motor nameplate [$min^{-1}$] |
| $f_{dr}$ | Rated frequency to motor nameplate [Hz] |
| p | No. of pole pairs (1, 2, 3, ...) |

2. Empirical precise setting of the slip compensation:
   - Correct C021 until no load-dependent speed drop occurs in the required speed range between idle running and max. motor load.

3. Example:
   - Motor data: 4 kW / 1435 $min^{-1}$ / 50 Hz

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

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

Preset C021 = 4.33 %

**Important**

If C021 is set too high, overcompensation can occur and lead to an instability of the drive.

### 7.5.9.2 Chopper frequency

820X setting range: Fixed chopper frequency up to 9.2 kHz. Automatic lowering of the chopper frequency is not possible.

Setting range 821X/822X/824X:

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C018↵ | Chopper frequency | | | | |
| | 821X/822X/824X | -1- | -0- 4 kHz | | |
| | | | -1- 8 kHz | | |
| | | | -2- 12 kHz | | |
| | | | -3- 16 kHz | | |
| | | | -4- 12 kHz reduced noise emission | | |
| | | | -5- 16 kHz reduced noise emission | | |
| | | | -4- 4 kHz reduced noise emission | HVAC only | |
| | | | -5- 8 kHz reduced noise emission | HVAC only | |
| | | | -6- 12 kHz reduced noise emission | HVAC only | |
| | | | -7- 16 kHz reduced noise emission | HVAC only | |
| C144↵ | Chopper-frequency reduction | | | | |
| | 821X/822X/824X | -1- | -0- No chopper-frequency lowering | | |
| | | | -1- Automatic chopper-frequency at $\vartheta_{max}$ - 10 °C | | |

**Function C018**

With this function, you set the chopper frequency of the inverter. With factory setting, the chopper frequency (C018) is set to 8 kHz. Reasons for other parameter settings may be:

- < 8 kHz:
  - Improved running performance with smaller field frequencies
- > 8 kHz:
  - Reduced noise emission in the connected motor
  - Good sine wave of the motor current for applications with field frequencies > 150 Hz, e.g. middle frequency drives (C018 = -4- or -5-)

**Important**

With chopper frequencies > 8 kHz, the unit suffers high power losses, which must be compensated by derating the output current. Please observe the indications in chapter 3.4 and the corresponding parameter setting of the current limit under C022/C023 to "$I_{max}$ for 60 s".

- Filters and chokes in the motor cable must meet the requirements of chopper frequency (e.g. sine interference suppression filter, if C018 = -5-). Please observe the notes of the manufacturers.

# Configuration

**Function C144**

- C144 = -0-
  - With chopper frequencies of 12 kHz or 16 kHz and if the max. permissible heat sink temperature is exceeded ($\vartheta_{max}$) because of higher losses, the inverter will be inhibited, TRIP will be indicated and the motors idles.
- C144 = -1- (automatic chopper frequency derating):
  - With chopper frequencies of 12 kHz or 16 kHz, the inverter reduces the chopper frequency automatically to 8 kHz and thus ensures operation, if a heat-sink temperature of $\vartheta_{max}$ -10 °C is exceeded.
  - After the heat sink has cooled down, the chopper frequency is automatically increased again.

**Important**

- The automatic chopper frequency reduction leads to a higher noise generation compared to the operation with 12 kHz or 16 kHz.
- The current limitation C022/C023 is not automatically influenced by the selected chopper frequency.
- For 822X/824X only if C144 = -1-
  - With chopper frequencies of 8 kHz, 12 kHz or 16 kHz, the controller reduces the chopper frequency automatically to 4 kHz, if the maximum current is exceeded.

### 7.5.9.3 Oscillation damping

Setting range 820X/821X: Function not available.

Setting range 822X/824X:

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C079 | Oscillation damping | | | | Is not transferred when transferring parameters via the operating module. |
| | 822X/824X | 5 | 0 {1} 80 | | |

**Function**

Suppression of idling oscillations when:

- a drive does not match, i.e. rated controller power - motor e.g. operation with high chopper frequency and the related power derating,
- operation of higher-pole motors,
- operation of special motors,
- having a resonance phenomenon in the drive set.

**Adjustment**

1. Approach the area with speed oscillations.
2. Reduce the oscillation by changing C079 step by step.
   - Indicators for smooth running can be a uniform motor current or the reduction of the mechanical vibrations in the bearing seat.

**Important**

- Parameter transfer from C079 **not** possible via keypad.
- Compensate the resonances in speed controlled operation via the parameters of the controller.

### 7.5.9.4 Ramp function generator S-shape

*Only “HVAC” controllers*

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C182* | Integration time ramp function generator S-shape | 0.00 | 0.00 {0.01 s} 50.00 | | |

**Function**

An adjustable transmission element (PT1) is connected behind the ramp function generator. The integration time ($T_i$) is set. It rounds the frequency setpoint.
This function enables absolutely smooth starting of the drive.

**Adjustment**

- C182 = 0.00
  - The ramp function generator work linearly.
- C182 > 0.00
  - The ramp function generator works as S-shape with the time $T_i$ = C182.

**Important**

C182 is only stored in parameter set 1.

## 7.5.9.5 Skip frequencies

*Only "HVAC" controllers*

| Code | Name | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | Info | |
| C625* | Skip frequency 1 | 480.00 | 0.00 | {0.02 Hz} | 480.00 | | |
| C626* | Skip frequency 2 | 480.00 | 0.00 | {0.02 Hz} | 480.00 | | |
| C627* | Skip frequency 3 | 480.00 | 0.00 | {0.02 Hz} | 480.00 | | |
| C628 | Bandwidth of skip frequencies | 0.00 | 0.00 | {0.01 %} | 100.00 | | |

**Function**

With certain output frequencies, mechanical resonances might occur in the drive (e.g. fan). The skip frequencies eliminate these unwanted output frequencies. The bandwidth (Δf) determines the range of skip frequencies.
With skip frequency = 480.00 Hz, the function is not active.
The function is within the frequency setpoint range of the ramp function generator.

**Adjustment**

- Set the required skip frequencies under C625, C626, C627.
- C628 defines the bandwidth of skip frequencies.
  - Calculate the bandwidth (Δf) for the corresponding skip frequency:

$$\Delta f\ [\mathrm{Hz}] = \mathrm{Skip\ frequency}\ [\mathrm{Hz}] \cdot \frac{\mathrm{C628}\ [\%]}{100\ \%}$$

**Important**

- The skip frequencies are only effective in the main setpoint channel (see signal flow chart).
- C625, C626, C627, C628 are only stored in parameter set 1.

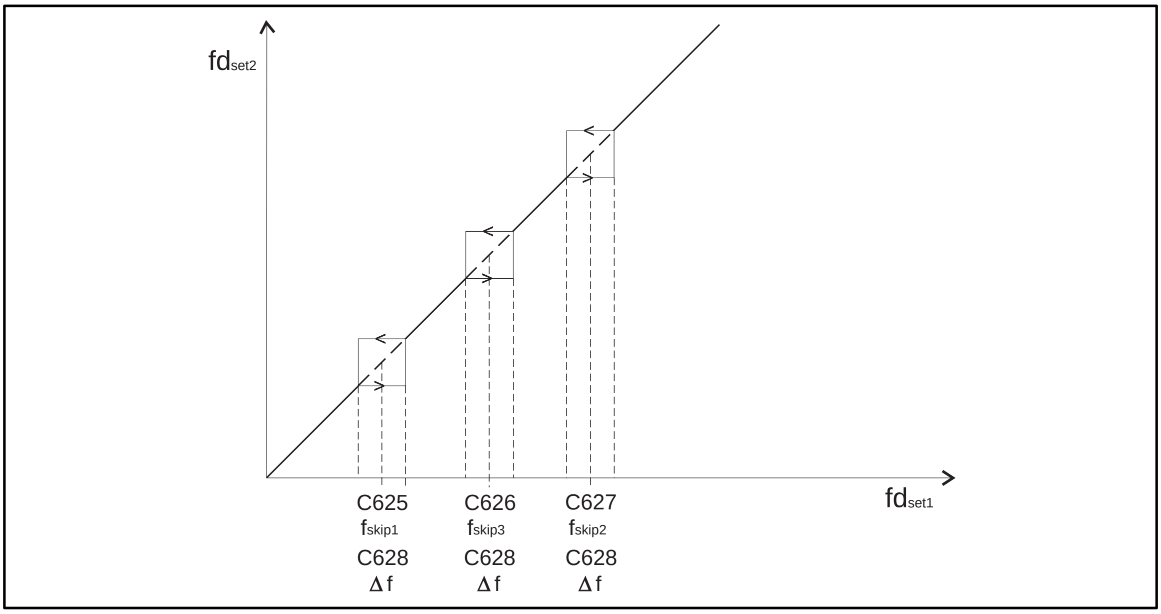



FIG 7-3 Skip frequencies and their bandwidth (Δf)

## 7.5.10 PID controller as process controller

*Only “HVAC” controllers*

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C070 | Gain PID controller | 1.00 | 0.00 {0.01} 300.00 | | 0.0 = P-component not active |
| C071 | Integral action time PID controller | 100 | 10 9999 | See table under “Adjustment” | 9999 = I-component not active |
| C072 | Differential component PID controller | 0.0 | 0.0 {0.1} 5.0 | | 0.0 = D-component not active |
| C074 | Influence PID controller | 0.0 | 0.0 {0.1 %} 100.0 | | ref. to C011 ($f_{dmax}$) |

**Function**

The process controller is active with the following configuration:

| Configuration | Terminal function |
|---|---|
| C005 = -6- | Setpoint via terminal 8 (JOG value, motor potentiometer, fieldbus)<br>Actual value via terminal E1 |
| C005 = -7- | Setpoint via terminal E1 (JOG value, motor potentiometer, fieldbus)<br>Actual value via terminal 8 |

Setpoints

Setpoints can be selected and displayed under the following codes:

| Code | Setpoint selection and display |
|---|---|
| C037 | JOG value1 [Hz] |
| C038 | JOG value2 [Hz] |
| C039 | JOG value3 [Hz] |
| C046 | Frequency setpoint [Hz]<br>(Only with keypad 8201BB or interface) |
| C181 | Setpoint PID controller [Hz] |

Actual value

The actual value can be displayed under the following codes:

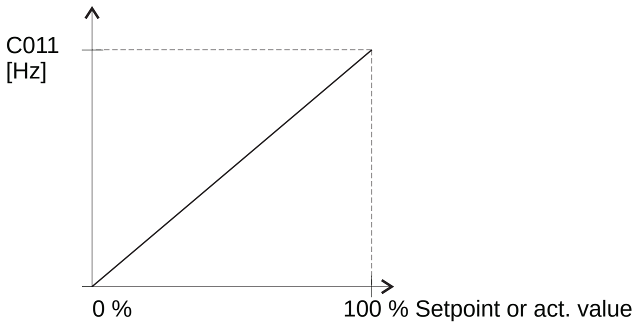
| Code | Actual value display |
|---|---|
| C051 | Actual value PID controller [Hz] |

A digital frequency can be selected as actual value via terminal E1 (see chapter 4.2.8.3).

Normalisation

- Adaptation of a field related parameter to an application datum to be controlled (e.g. pressure, temperature, flow rate, humidity, speed) under C500 and C501.
- The following codes are normalised at the same time:
  - C010, C011 C017, C019, C037, C038, C039, C046, C049, C050, C051, C181, C625, C626, C627
- After a normalisation, the output frequency [Hz] (C050) can only be recalculated with the display factors C500 and C501 (see formulas in chapter 7.6.3).
- In factory setting, all field related parameters refer to the frequency. Input and display in Hz. The values of C037, C038, C039, C046, C051, C181 refer to C011.

Factory setting
A percentage of the input or display values corresponds to the frequency in Hz.




**Adjustment**

The value set under C071 correspond to the following integral action times $T_n$.

| **Values under C071** | **Integral action time $T_n$** |
|---|---|
| 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 ... 9999 | 1000 s ... 9999 s |

Guide values for pressure control and flow rate

The values in the following table are for guidance for pressure and flow-rate controls. A fine adjustment is therefore always necessary.
C070, C071 and C072 must be set so that the target value is

- reached quickly and
- with minimum overshooting

when the setpoints and actual values are changed.
The differential component $K_D$ (C072) is usually not required for pressure and flow-rate controls (set C072 = 0).

Guide values for pressure control and flow rate

| **Code** | **Gases** | **Liquids** |
|---|---|---|
| C070 ($V_P$) | 0.1 | 0.02 ... 0.1 |
| C071<br>($T_n$) | 5000<br>(5 s) | 200 ... 1000<br>(0.2 s ... 1 s) |

# Configuration

Influence PID controller

When using a process control with frequency precontrol (C238 = -1-), the control factor is very important.

- The control factors is calculated from the difference of the values under C050 and C051.
- The control factor determines the influence C074 of the PID controller.
- The influence (C074) refers to $f_{dmax}$ (C011).
- C074 influences the stability of the control circuit. It should be set to a value as low as possible.

The influence C074 [%] is calculated as follows:

$$\text{Influence}\ [\%] = \frac{C050 - C051}{C011} \cdot 100\ \%$$

Example

The influence is to be calculated for the following values:

C011 = 50 Hz, C050 = 53 Hz, C051 = 50 Hz

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

- Set the influence so that the output of the process controller covers the calculated value in every operating point.
  - For this example (influence = 6 %) set for instance C074 = 10 %. This is a guide value and includes tolerances which must always be considered.
- If the influence (C074) is too high, the control circuit may become instable.

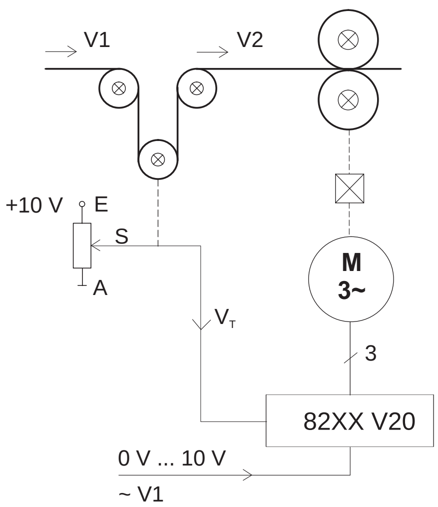
Additive influence of the process controller

Conditions:

- C051 = Positive actual value
- C181 = Select positive setpoint
- C238 = -1- (with frequency precontrol)
- Potentiometer connections of the dancer
  - End (E) = +10 V
  - Beginning (A) = GND

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

Example of a dancer control with additive influence of the process controller




Function:

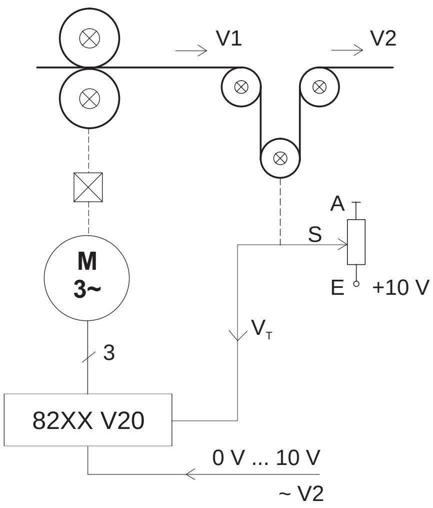
1. The dancer deflects to the bottom. ($V_T$ decreases)
2. V2 increases.

Subtractive influence of the process controller

Conditions:
- C051 = Positive actual value
- C181 = Select positive setpoint
- C238 = -1- (with frequency precontrol)
- Potentiometer connections of the dancer
  - Beginning (A) = +10 V
  - End (E) = GND

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

Example of a dancer control with subtractive influence of the process controller




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

**Important**

**Caution**

The direction of rotation must not be changed, if the process controller is used as speed controller.
- If C070 = 0.0, the proportional component $K_P$ is not active.
- If C071 = 9999, the integral component $K_I$ is not active.
- If C072 = 0.0, the differential component $K_D$ is not active.
- The process controller is not suitable for inverse process control. (Inverse control means that the speed becomes lower, if the actual value is lower than the setpoint.)
  Inverse controls are for instance, vacuum pressure control or humidity controls. Here, the 93XX VECTOR should be used.

## 7.5.10.1 Reset integral component and influence

**Function**

The following functions are possible:
- Reset the integral component $K_I$ of the PID controller via terminal.
- Set the influence of the PID controller to 0.

**Activation**

C007 = -28- ... -34-, -48-, -50-, -51-:
- HIGH level at terminal E2
  - Reset of $K_I$

C007 = -48-, -49-, -50-:
- HIGH level at terminal E4
  - Reset influence

The signal levels are indicated for C114 = -0- (see chapter 7.5.14.1)

## 7.5.10.2 Setpoint selection for the process controller

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C181* | Setpoint PID controller | 0.00 | -480.00 {0.02 Hz} 480.00 | | |

**Function**

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

**Adjustment**

C181 = 0
- The setpoint of the PID controller is
  - selected externally (terminal 8 or E1),
  - set via the keys (▲, ▼) of the operating module 8201BB.

C181 ≠ 0
- Setpoint selection for the PID controller via this code.

**Important**

- The setpoint selection via this code is only active, if C181 ≠ 0.
- C181 is only stored in parameter set 1.

**Special features**

- The setpoint can also be entered as application datum (C500, C501) (see chapter 7.6.3).

## 7.5.10.3 Frequency precontrol

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C238↲ | Frequency precontrol | -1- | -0- No precontrol<br>-1- With setpoint precontrol | | |

**Function**

C238 = -1-
- The process controller has only limited influence on the process.

The following setpoint precontrol is possible:
A The setpoint of the process controller is derived from the precontrol value (C181 = 0).
 - Applications with frequency precontrol are e.g. speed controls.

B The setpoint of the process controller is selected under C181 (C181 ≠ 0).
 - Applications are e.g. dancer controls, pressure and flow-rate controls

## 7.5.10.4 Frequency setting range

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C239↲ | Frequency setting range | -0- | -0- Bipolar<br>-1- Unipolar | | |

**Function**

C239 = -0-
- Allows both directions of rotations for the control process.

C239 = -1-
- Allows only one direction of rotation for the control process.

Application with frequency setting range are, for instance:
- Fan controls
- Dancer controls

**Important**

Only if C005 > -0-, C239 has an influence.

## 7.5.11 Setpoint input

### 7.5.11.1 Analog setpoint input

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C026 | Offset adjustment analog input | 0.00 | -10.00 {0.01 V} 10.00 | HVAC only | Not effective with C005 = -0- |
| C027 | Scaling factor of analog input | 100.0 | -200.0 {0.1 %} 200.0 | HVAC only | Not effective with C005 = -0- |
| C034↵ | Master current | -0- | -0- 0 mA ... 20 mA / 0 V ... 5 V / 0 V ... 10 V<br>-1- 4 mA ... 20 mA | | |

**Function**

An analog setpoint signal can be selected via terminal 8.

- You can select different setpoint ranges by reconnection of the jumper at the front of the controller.
- Inverse setpoint input because of negative terminal adjustment.
- Offset adjustment of the analog channel (only series “HVAC”)

**Adjustment**

| Setpoint range | Jumper position |
|---|---|
| 0 mA ... 20 mA / 4 mA ... 20 mA | 5 - 6 |
| 0 V ... 5 V | 3 - 4 |
| 0 V ... 10 V | 1 - 2 (Factory setting) |

To select the setpoint by means of the master current, you change the ranges under C034:
C034 = -0- 0 mA ... 20 mA
C034 = -1- 4 mA ... 20 mA

**Important**

- With an internal reference voltage of 5 V:
  - Plug in the jumper at position 3-4
- If the setpoint is input by means of a master voltage 0 V ... 5 V / 0 V ... 10 V:
  - Set C034 = -0-
- Analog setpoint input is not possible with setpoint input via the function ”Motor potentiometer” (C007 = -10-, -11-, -12-, -13-, -21-).

*Only series "HVAC":*

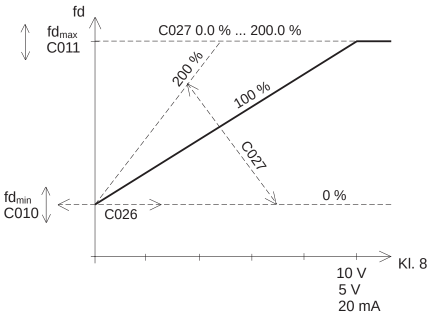
**Adjustment**

Scaling factor of the analog channel via C027:
- C027 = 0.0 % ... 200.0 %
  - Set-value input
- C027 = -200.0 % ... -0.1%
  - Inverse setpoint input

Offset adjustment of the analog channel via C026:
The adjustment of -10.00 V ... +10.00 V refers to an input voltage of 10 V.

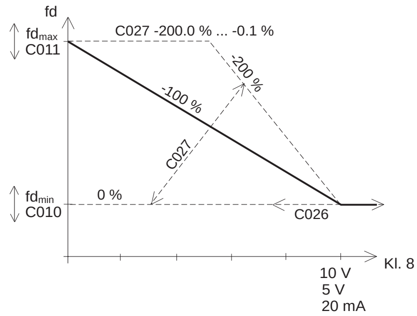
**Setpoint input**

C034 = -0-, C027 > 0 %
Offset adjustment via C026




**Inverse setpoint input**

C034 = -0-, C027 < 0 %
Offset adjustment via C026




**Calibration when using a PID controller**

If, for instance, the control range of a pressure control (C0005 = -6-) is to be limited to a value lower than the rated sensor value, the effective pressure setpoint can be proportionally reduced under C0027.
Example:
- Pressure sensor 0 - 200 mbar (= $P_r$) at E1.
- Analog input of the pressure setpoint via terminal 8.
- The max. pressure is to be limited to 120 mbar under C0027:

$$C0027 = \frac{P_1}{P_r} \cdot 100\ \% = \frac{120\ \text{mbar}}{200\ \text{mbar}} \cdot 100\ \% = 60\ \%$$

**Important**

- With C026 < 0 V, $f_{dmin}$ can fall below the value set under C010.
- With C005 = -0-, C026 and C027 are not active.
- C026 and C027 are only stored in parameter set 1.
- For terminal configurations with manual/remote changeover (C007 = -23- ... -27-):
  - Change between motor potentiometer and manual/remote changeover via terminal (E1 ... E4).
- For terminal configurations with manual/remote changeover (C007 = -23- ... -27-, -46-) and the control mode LECOM (C001 = -3-):
  - Change between setpoint via master current (C046, process setpoint) and setpoint input possible via terminal (E1 ... E4).

### 7.5.11.2 Setpoint input using the keypad

**Function**

If you select the operating mode C001 = -1-, the setpoint can be selected by means of the keypad of the operating module.

**Adjustment**

1. Press key ▲ or ▼.
2. The display changes and indicates the current setpoint together with SET.
3. 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 tothe last setpoint.

**Important**

Setpoints selected by means of the keypad are saved when separating the controller from the mains or interrupting the operation. The drive can start again after controller enable!
Observe the start conditions under C142:
- Series “Standard”: See chapter 7.8, ”Code table”.
- Series “HVAC”: See chapter 7.9, ”Code table”.

## 7.5.11.3 Setpoint input via JOG frequencies

| Code | Name | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | Info | |
| C037 | JOG value 1 | 20.00 | 0.00 | {0.02 Hz} | 480.00 | | |
| | | | -480.00 | {0.02 Hz} | 480.00 | HVAC only | |
| C038 | JOG value 2 | 30.00 | 0.00 | {0.02 Hz} | 480.00 | | |
| | | | -480.00 | {0.02 Hz} | 480.00 | HVAC only | |
| C039 | JOG value 3 | 40.00 | 0.00 | {0.02 Hz} | 480.00 | | |
| | | | -480.00 | {0.02 Hz} | 480.00 | HVAC only | |

**Function**

The setpoint input via JOG frequencies is only active, if C007 is set accordingly (series "Standard": see chapter 7.8, "Code table"; series "HVAC": see chapter 7.9, "Code table").

Activate
- JOG value 1 via control terminal E1 or
- binary coded up to three JOG frequencies via the control terminals E1 and E2.

**Activation**

Series "Standard":

- C007 = -3-, -4-, -5-, -6-, -9-, -14-, -15-, -20-, -22-:

| Function | E1 |
|---|---|
| Other setpoint source | LOW |
| JOG 1 active | HIGH |

- C007 = -0-, -1-, -2-, -16-:

| Function | E1 | E2 |
|---|---|---|
| Other setpoint source | LOW | LOW |
| JOG 1 active | HIGH | LOW |
| JOG 2 active | LOW | HIGH |
| JOG 3 active | HIGH | HIGH |

Series "HVAC":

- C007 = -0-, ... -6-, -9-, -14-, -15-, -16-, -20-, -22-, -28-, -29-,
  -30-, -35-, -37- ... -41-, -46-, -47-, -49-, -50:

| Function | EX |
|---|---|
| Other setpoint source | LOW |
| JOG 1 active | HIGH |

or

| Function | E1 (E3) | E2 (E4) |
|---|---|---|
| Other setpoint source | LOW | LOW |
| JOG 1 active | HIGH | LOW |
| JOG 2 active | LOW | HIGH |
| JOG 3 active | HIGH | HIGH |

**Important**

- The setting of $f_{dmax}$ (C011) limits the field frequency also for JOG values.
- The setting of $f_{dmin}$ (C010) is not effective for setpoint input by means of JOG values.

**Special features**

The display value of the parameter can be related to an application datum (C500, C501) (see chapter 7.6.3).

## 7.5.11.4 Setpoint input via function ”Motor potentiometer”

**Function**

The setpoint input via the function ”Motor potentiometer” is only active, if C007 is set accordingly. (Series “Standard”: see chapter 7.8, “Code table”; series “HVAC”: see chapter 7.9, ”Code table”). The field frequency is changed via the set acceleration and deceleration times.

**Activation**

Series “Standard”:

- C007 = -10-, -11-, -12-, -13-, -21-:

| **Function** | **E1** | **E2** |
|---|---|---|
| Setpoint = 0 Hz | LOW | LOW |
| Reduce setpoint until $f_{dmin}$ | HIGH | LOW |
| Increase setpoint until $f_{dmax}$ | LOW | HIGH |
| Setpoint remains constant | HIGH | HIGH |

Series “HVAC”:

- C007 = -10-, -11-, -12-, -13-, -21-, -23-, -24-, -25-, -26-, -27-, -44-:

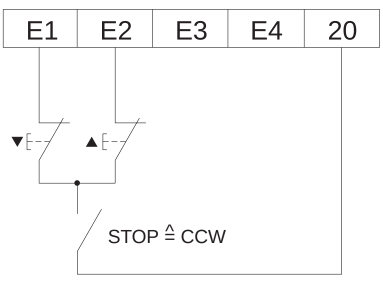
| **Function** | **E1** | **E2** | **E3** [3)] | **E4** [3)] |
|---|---|---|---|---|
| Setpoint = 0 Hz ($T_{iQSP}$, C105) [1)] | LOW | LOW | LOW | LOW |
| Reduce setpoint until $f_{dmin}$ ($T_{if}$, C013) [2)] | HIGH | LOW | HIGH | LOW |
| Increase setpoint until $f_{dmax}$ ($T_{ir}$, C012) | LOW | HIGH | LOW | HIGH |
| Setpoint remains constant | HIGH | HIGH | HIGH | HIGH |

1) LOW level at terminals E1 and E2 reduces the setpoint along the QSP ramp (C105) until $f_d$ = 0 Hz
2) Only possible, if the setpoint has exceeded $f_{dmin}$ before.
3) Only, if C007 = -44-

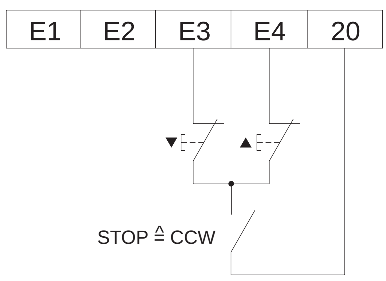
Activation of the function “Motor potentiometer” via normally-closed contacts

Series “Standard”: C007 = -10- ... -13-, -21-

Series “HVAC”: C007 = -10- ... -13-, -21- ... -27-




C007 = -44-




**Important**

The setpoint is saved

- when switching off the mains,
- when inhibiting the controller,
- when having fault messages.

**Exception:**

- If the control terminals are set to LOW in the event of mains failure (e.g. external voltage supply), the setpoint 0 Hz will be stored.
- Activation of the QSP function (C007 = -13-, -21-) resets the motor potentiometer to 0 Hz.

**Special features**

The terminal configuration C007 = -13- provides an open-circuit protection for quick stop.

*Only series “HVAC”:*

Level inversion

The function “Motor potentiometer” can be influenced through level inversion.
Example

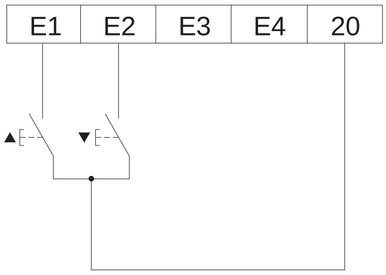
- C114 = -3-
  - Terminals E1 and E2 are level inverted. The function “Motor potentiometer” is then activated according to the following table:

| Function | E1 | E2 |
|---|---|---|
| Setpoint = 0 Hz ($T_{iQSP}$, C105) 1) | HIGH | HIGH |
| Reduce setpoint until $f_{dmin}$ ($T_{if}$, C013) 2) | LOW | HIGH |
| Increase setpoint until $f_{dmax}$ ($T_{ir}$, C012) | HIGH | LOW |
| Setpoint remains constant | LOW | LOW |

1) HIGH level at terminals E1 and E2 reduce the setpoint via the QSP ramp (C105) until $f_d$ = 0 Hz.

2) Only possible, if the setpoint has exceeded $f_{dmin}$ before.

Activation of the function “Motor potentiometer” via normally-open contacts.




- C007 = -26-
  - The JOG value has priority over the function “Motor potentiometer”.

### 7.5.11.5 Setpoint input via function ”Motor potentiometer in combination with JOG value”

**Function**

The setpoint input via the function ”Motor potentiometer in combination with JOG value” is only active, if C007 is set accordingly (see chapter 7.8, ”Code table”).
The field frequency is changed:
- For acceleration over acceleration ramp C012.
- For deceleration:
  - via the deceleration ramp C013 (820X controllers),
  - via the quick-stop ramp C105 (821X/822X/824X controllers).

**Activation**

C007 = -22-:

| Function | Setpoint | K1 | K2 | K3 | K4 |
|---|---|---|---|---|---|
| DOWN | 0 Hz | * | * | 1 | 0 |
| CW rotation | determined by E1/E2 | * | * | 0 | 0 |
| CCW rotation | determined by E1/E2 | * | * | 1 | 1 |
| UP | $f_{dmax}$ (C011) | 0 | 1 | 0 | 0 |
| CONSTANT | constant | 0 | 0 | 0 | 0 |
| JOG | JOG value 1 (C037) | 1 | * | 0 | 0 |
| | | * arbitrary | | | |

**Important**

- In the event of maloperation, i.e. UP = E2 and DOWN = E3 both activated, the controller is set to 0 Hz.
- The field-frequency value activated via the motor-potentiometer function represents the max. limit value for the JOG function E1, i.e. it is not possible to activate a JOG value higher than the last motor-potentiometer value. Smaller values are however possible.
- In the event of mains disconnection (interruption > approx. 10 s) the last motor potentiometer value will not be stored, i.e. the new start value is 0 Hz.
- With CCW rotation (E3 = 1, E4 = 1) the ”DOWN” function changes from E3 = 1 to E4 = 0.

**Special features**

The function can be influenced through level inversion of the terminals (C114).
(Only series “HVAC”)

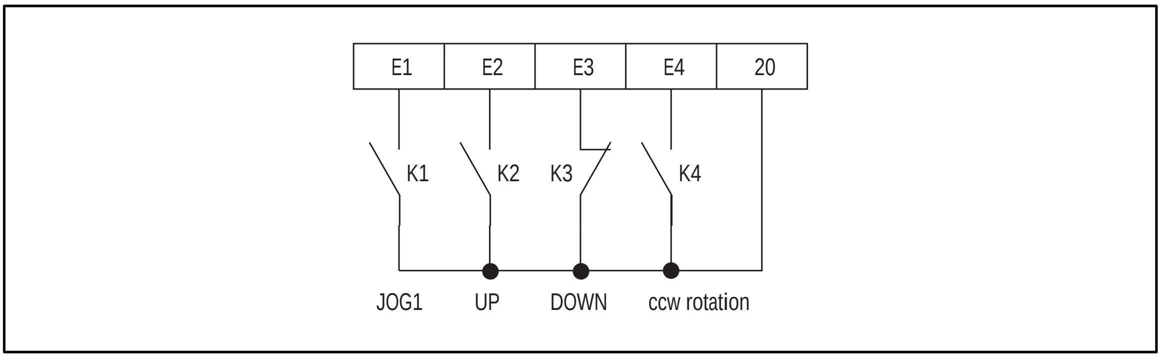



FIG 7-4 Control of the motor-potentiometer function, C007= -22-

## 7.5.11.6 Setpoint sum

*Only “HVAC” controllers*

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C049* | Additional setpoint | | -480.00 {0.02 Hz} 480.00 | | Display only |

**Function**

In controlled operation(C005 = -1-, -2-) the setpoint sum can be generated with
- the signal of the analog input (terminal 8) or
- the digital frequency at terminal E1 or
- the function “Motor potentiometer” or
- the process setpoint C046 (LECOM).

The additional setpoint is indicated under C049.

**Special features**

The display value of the parameter can be related to an application datum (C500, C501).
(see chapter 7.6.3)

### 7.5.12 Controller enable RFR

**Function**

Terminal 28 controls the controller enable.

**Activation**

- LOW level: Controller inhibited
- HIGH level: Controller enabled

**Important**

- During operation with the 8201BB operating module, you can inhibit the controller with the STP key and enable it again by pressing the RUN key. Here control terminal 28 and the keypad of the operating module have the same effect as two separate switches connected in series.
- For control via a fieldbus module, the controller enable via terminal 28 still has priority.

## 7.5.13 Start conditions/flying-restart circuit

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C142↲ | Start condition | -1- | -0- Automatic start inhibited, flying-restart circuit not active<br>-1- Automatic start, if term. 28 HIGH, flying-restart circuit not active<br>-2- Automatic start inhibited, flying-restart circuit active<br>-3- Automatic start, if term. 28 HIGH, flying-restart active | | |

**Function**

Determines the controller performance after mains connection or reconnection. With activated flying-restart circuit, the controller automatically synchronises to a coasting motor after mains disconnection. For this, the controller calculates the output frequency required for the current speed of the coasting motor, the controller is then connected and accelerates the motor to the selected setpoint. Steady and soft deceleration and acceleration is therefore possible.

**Drive performance**

**Start options with flying-restart circuit**

- C142 = -0-
  - After mains disconnection, the drive does not start before LOW/HIGH level change at the input ctrl. enable (term. 28). The operating module displays AS_LC (Autostart-Lockout).
- C142 = -1-
  - After mains disconnection, the drive starts automatically if a HIGH level is assigned to.

**Start options with flying-restart circuit**

- C142 = -2-
  - Start with flying-restart circuit after a LOW/HIGH level change at input ctrl. enable (term. 28). The operating module displays AS_LC.
- C142 = -3-
  - Automatic start with flying-restart circuit, if a HIGH level is assigned to ctrl. enable.

**Important**

- The flying-restart circuit must not be used, if several motors with different inertias are connected to a controller.
- The flying-restart circuit does only search the selected direction of rotation for the synchronisation.
- The flying restart works properly for drives with high moments of inertia.
- Machines with low moments of inertia and small friction:
  - With activated flying-restart circuit, the motor can start briefly or reverse from standstill after enabling the controller.

Series “HVAC”:

- The flying-restart circuit must only be used during operation with a PID controller, if a speed proportional signal is assigned to C0051!
  - With a normalisation to an application datum (see page 7-63), it is absolutely necessary to check whether C0051 contains a speed proportional value.

### Note!

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

- bridge terminal 28 and start the controller with the “QSP” function (C142 = -3- and C106 = 0 s),
- the flying-restart circuit is now only **activated** for the first mains connection.

## 7.5.14 Function of the inputs to be configured block by block

| | C007 | E1 | E2 | E3 | E4 |
|---|---|---|---|---|---|
| | -0- | JOG 1, JOG 2, JOG 3 | | DC injection brake | CW/CCW |
| | -1- | JOG 1, JOG 2, JOG 3 | | PAR | CW/CCW |
| | -2- | JOG 1, JOG 2, JOG 3 | | QSP | CW/CCW |
| | -3- | JOG 1 | DC injection brake | PAR | CW/CCW |
| | -4- | JOG 1 | PAR | QSP | CW/CCW |
| | -5- | JOG 1 | TRIP set | DC injection brake | CW/CCW |
| | -6- | JOG 1 | TRIP set | PAR | CW/CCW |
| | -7- | TRIP set | DC injection brake | PAR | CW/CCW |
| | -8- | TRIP set | PAR | QSP | CW/CCW |
| | -9- | JOG 1 | TRIP set | QSP | CW/CCW |
| | -10- | DOWN | UP | TRIP set | CW/CCW |
| | -11- | DOWN | UP | DC injection brake | CW/CCW |
| | -12- | DOWN | UP | PAR | CW/CCW |
| | -13- | DOWN | UP | QSP | CW/CCW |
| | -14- | JOG 1 | DC injection brake | CW/QSP | CCW/QSP |
| | -15- | JOG 1 | PAR | CW/QSP | CCW/QSP |
| | -16- | JOG 1, JOG 2, JOG 3 | | CW/QSP | CCW/QSP |
| | -17- | DC injection brake | PAR | CW/QSP | CCW/QSP |
| | -18- | TRIP set | PAR | CW/QSP | CCW/QSP |
| | -19- | TRIP set | DC injection brake | CW/QSP | CCW/QSP |
| | -20- | JOG 1 | TRIP set | CW/QSP | CCW/QSP |
| | -21- | DOWN | UP | CW/QSP | CCW/QSP |
| | -22- | JOG 1 | UP | CW/QSP | CCW/QSP |
| only series "HVAC" | -23- | DOWN | UP | CW/CCW | H/RE |
| | -24- | DOWN | UP | PAR | H/RE |
| | -25- | DOWN | UP | DC injection brake | H/RE |
| | -26- | DOWN | UP | JOG1 | H/RE |
| | -27- | DOWN | UP | TRIP set | H/RE |
| | -28- | D/F | I-OFF | JOG 1, JOG 2, JOG 3 | |
| | -29- | D/F | I-OFF | DC injection brake | JOG 1 |
| | -30- | D/F | I-OFF | QSP | JOG 1 |
| | -31- | D/F | I-OFF | QSP | DC injection brake |
| | -32- | D/F | I-OFF | QSP | TRIP set |
| | -33- | D/F | I-OFF | PAR | QSP |
| | -34- | D/F | I-OFF | CW/QSP | CCW/QSP |
| | -35- | D/F | PAR | JOG 1, JOG 2, JOG 3 | |
| | -36- | D/F | PAR | QSP | CCW/QSP |
| | -37- | D/F | PAR | QSP | CCW/QSP |
| | -38- | D/F | TRIP set | PAR | CCW/QSP |
| | -39- | D/F | TRIP set | JOG 1, JOG 2, JOG 3 | |

| | C007 | E1 | E2 | E3 | E4 |
|---|---|---|---|---|---|
| only series "HVAC" | -40- | D/F | TRIP set | QSP | JOG1 |
| | -41- | D/F | TRIP set | DC injection brake | JOG1 |
| | -42- | D/F | TRIP set | DC injection brake | QSP |
| | -43- | D/F | TRIP set | QSP | CW/CCW |
| | -44- | D/F | PAR | DOWN | UP |
| | -45- | D/F | PAR | QSP | CW/CCW |
| | -46- | JOG1 | QSP | PAR | H/Re |
| | -47- | JOG1 | H/Re | CCW/QSP | CW/QSP |
| | -48- | D/F | I-OFF | DC injection brake | INFL_0 |
| | -49- | D/F | QSP | JOG1 | INFL_0 |
| | -50- | D/F | I-OFF | JOG1 | INFL_0 |
| | -51- | D/F | I-OFF | PAR | DCB |

**Function**

Depending on your application you can select a function group under C007. A binary signal code at the digital inputs E1 ... E4 activates the functions.

**Important**

Response time of the inputs E1 ... E4:

820X — 16 ... 24 ms

821X/822X/824X — 2.5 ... 4 ms

**Special features**

820X — The digital inputs E1 ... E4 are without function when using the operating mode "Control via LECOM" (C001 = -3-).

821X/822X/824X — With the operating mode "Control via LECOM" (C001=-3-), the functions "TRIP set" and "QSP" remain effective.

Series "HVAC" — With the operating mode "Control via LECOM" (C001=-3-), the functions "TRIP set" and "QSP" remain effective. They can be switched-off with the priority mask (C115).

- The levels for the input terminals can be inverter under C114.
- Use the following terminal configuration, if terminal E1 is used for the setpoint or the act. value: (see chapter 7.5.14.9)
  - C007 = -28- ... -45, -48- ... -51-

## 7.5.14.1 Level inversion for digital inputs

*Only “HVAC” controllers*

| Code | Name | Possible settings | | | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | | | Info | |
| C114↵ | Signal level digital inputs | -0- | | E4 | E3 | E2 | E1 | | 0: Ex is not inverted<br>1: Ex is inverted |
| | | | -0- | 0 | 0 | 0 | 0 | | |
| | | | -1- | 0 | 0 | 0 | 1 | | |
| | | | -2- | 0 | 0 | 1 | 0 | | |
| | | | -3- | 0 | 0 | 1 | 1 | | |
| | | | -4- | 0 | 1 | 0 | 0 | | |
| | | | -5- | 0 | 1 | 0 | 1 | | |
| | | | -6- | 0 | 1 | 1 | 0 | | |
| | | | -7- | 0 | 1 | 1 | 1 | | |
| | | | -8- | 1 | 0 | 0 | 0 | | |
| | | | -9- | 1 | 0 | 0 | 1 | | |
| | | | -10- | 1 | 0 | 1 | 0 | | |
| | | | -11- | 1 | 0 | 1 | 1 | | |
| | | | -12- | 1 | 1 | 0 | 0 | | |
| | | | -13- | 1 | 1 | 0 | 1 | | |
| | | | -14- | 1 | 1 | 1 | 0 | | |
| | | | -15- | 1 | 1 | 1 | 1 | | |

**Function**

The levels of the digital inputs E1 ... E4 can be adapted according to the available signal levels.

**Adjustment**

Example
Task:
- Terminal configuration C007 = -0- is set.
- The DC-injection brake is to be activated via a LOW level at terminal E3.

Solution:
- Set level inversion C114 = -4-.
  - Terminal E3 reacts on LOW level, the DCB is activated.

Show/Hide Bookmarks



## 7.5.14.2 Priority mask for digital inputs

*Only “HVAC” controllers*

| Code | Name | Possible settings | | | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | | | Info | |
| C115↵ | Priority mask digital inputs | -0- | | E4 | E3 | E2 | E1 | | 0: Function Ex depends on C001<br>1: Function Ex is independent of C001 |
| | | | -0- | 0 | 0 | 0 | 0 | | |
| | | | -1- | 0 | 0 | 0 | 1 | | |
| | | | -2- | 0 | 0 | 1 | 0 | | |
| | | | -3- | 0 | 0 | 1 | 1 | | |
| | | | -4- | 0 | 1 | 0 | 0 | | |
| | | | -5- | 0 | 1 | 0 | 1 | | |
| | | | -6- | 0 | 1 | 1 | 0 | | |
| | | | -7- | 0 | 1 | 1 | 1 | | |
| | | | -8- | 1 | 0 | 0 | 0 | | |
| | | | -9- | 1 | 0 | 0 | 1 | | |
| | | | -10- | 1 | 0 | 1 | 0 | | |
| | | | -11- | 1 | 0 | 1 | 1 | | |
| | | | -12- | 1 | 1 | 0 | 0 | | |
| | | | -13- | 1 | 1 | 0 | 1 | | |
| | | | -14- | 1 | 1 | 1 | 0 | | |
| | | | -15- | 1 | 1 | 1 | 1 | | |

**Function**

- Independently of the operating mode C001 = -3- (control via LECOM), it is possible to activate **additional** digital inputs.
  - It is now possible to use additional control functions via terminals E1 ... E4. The signals are assigned by means of an OR link.
- C115 = -0- is always active with terminal configuration (C007) with manual/remote changeover.

**Adjustment**

Example

The DC injection brake is to be activated via terminal 3:

- Operating mode C001 = -3- (control via LECOM).
- Terminal configuration C007 = -0-.

Solution:

- Set the priority mask C115 = -4-
  - The DC injection brake can now be activated via terminal E3.

**Important**

- Controller inhibit and TRIP reset always have priority.
- With C115 = -0-, also TRIP set and QSP have priority.

## 7.5.14.3 Change of the direction of rotation (CW/CCW)

**Not failsafe change of the direction of rotation**

**Function**

Settings
C007 = -0- ... -13-, or
C007 = -0- ... -13-, -23-, -43-, -45- (only series “HVAC”)
enable the change of the motor direction via terminal E4.
The change depends on
- the set times $T_{ir}$ (C012) and $T_{if}$ (C013),
- the connected ramp function generator S-shape (C182). (Series “HVAC”)

**Adjustment**

When connecting the controller in phase
- a CW field of rotation will occur at LOW signal,
- a CCW field of rotation will occur at HIGH level.

Series “HVAC”: The signal levels are indicated for C114 = -0- (see chapter 7.5.14.1).

**Important**

- In the event of wire breakage or a failure of the external voltage supply, the direction of rotation can be changed.
- CW/CCW changeover only in the main setpoint.

**Failsafe change of the direction of rotation**

**Function**

Settings
C007 = -14- ... -22-, or
C007 = -14- ... -22-, -34-, -47- (only series “HVAC”)
enable the failsafe change of the direction of rotation via terminals E3 and E4.
The change depends on
- the set times $T_{ir}$ (C012) and $T_{if}$ (C013),
- the connected ramp function generator S-shape (C182). (Series “HVAC”)

**Adjustment**

| Function | E3 * | E4 * |
|---|---|---|
| CCW rotation | LOW | HIGH |
| CW rotation | HIGH | LOW |
| Quick stop | LOW | LOW |
| Unchanged | HIGH | HIGH |

*Series “HVAC”: The signal levels are indicated for C114 = -0- (see chapter 7.5.14.1).

**Important**

- If a HIGH signal is assigned to terminals E3 and E4, the terminal signal which was activated first determines the direction of rotation.
- If a HIGH signal is assigned to terminals E3 and E4 when connecting the mains, the controller will activate the quick stop function.
- CW/CCW changeover only in the main setpoint.
- For speed control with actual value feedback, the CW/CCW changeover is not possible.

## 7.5.14.4 Quick stop QSP

Setting range 820X

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C013 | Deceleration time $T_{if}$ 820X | 5.00 | 0.00 {0.05 s} 999.00 | | |

Setting range 821X/822X/824X

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C105 | Deceleration time quick stop 821X/822X/824X | 5.00 | 0.00 {0.02 s} 999.00 | | |
| | | | 0.00 {0.02 s} 1300.00 | HVAC only | |

**Function**

820X

If you activate the function quick stop, the drive will be decelerated to standstill over the set deceleration time (C013). If the value falls below $f_d$ = 0.1Hz, the DC-injection brake (DCB) will be activated.

821X/822X/824X

The activation of quick stop decelerates the drive to standstill according to the deceleration time set und C105. If $f_d$ falls below the threshold C019, the DC-injection brake (DCB) will be activated.

**Activation**

Series “Standard”:

- C007 = -14- ... -22-:
  - LOW level at terminals E3 and E4
  - HIGH level at terminals E3 and E4 when switching on the mains
- C007 = -2-, -4-, -8-, -9-, -13-:
  - LOW level at terminal E3

Series “HVAC”:

- C007 = -14- ... -22-, -34-, -47-:
  - LOW level at terminals E3 and E4
  - HIGH level at terminals E3 and E4 when switching on the mains
- C007 = -46-, -49-:
  - LOW level at terminal E2
- C007 = -2-, -4-, -8-, -9-, -13-, -30-, -31-, -32-, -36-, -37-, -40-, -43-, -45-:
  - LOW level at terminal E3
- C007 = -33-, -42-:
  - LOW level at terminal E4

The signal levels are indicated for C114 = -0- (see chapter 7.5.14.1).

**Special features**

821X/822X/824X

- Independently of the operating mode C001, quick stop can always be activated via terminals.

Series “HVAC”:

- The activation of quick stop via terminals can be switched-off with the priority mask (C115).
- Quick stop acts on the main setpoint only. Quick stop does not have an effect on the additional setpoint (C049) and the correction value of the process controller (software level 3.0).

## 7.5.14.5 DC-injection brake (DCB)

| Code | Name | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | Info | |
| C019 | Threshold auto DC brake | | | | | | |
| | 821X/822X/824X | 0.10 | 0.10 | {0.02 Hz} | 5.00 | | |
| | | | 0.00 | {0.02 Hz} | 5.00 | HVAC only | |
| C035*↲ | Selection DC brake | -0- | -0- | Selection of brake voltage under C036 | | HVAC only | |
| | | | -1- | Selection of brake current under C036 | | | |
| C036 | Voltage for DC brake | * | 0.00 | {0.02 %} | 40.00 | | * depends on the unit |
| | Voltage/current for DCB | | 0.00 | {0.02 %} | 150.00 | HVAC only | |
| C106 | Holding time for autom. DC injection brake | | | | | | |
| | 820X | 0.00 | 0.00 | {0.01s} | 50.00 | | |
| | 821X/822X 824X | 0.02 | 0.00 | {0.01s} | 999.00 | | |
| C196*↲ | Input condition autom. DC injection brake | -0- | -0- | DC brake active at C050 < C019 | | HVAC only | |
| | | | -1- | DC brake active at C050 < C019 **and** Setpoint < C019 | | | |

*Series "Standard":*

**Function**

- DC braking enables fast deceleration of the drive to standstill without using a brake unit.

**Activation**

- Via terminal
  - C007 = -3-, -7-, -14-, 19:
    HIGH level at terminal E2
    The DC-injection brake remains active until a LOW signal is reassigned to terminal E2.
  - C007 = -0-, -5-, -11-:
    HIGH level at terminal E3
    The DC-injection brake remains active until a LOW signal is reassigned to terminal E3.
- Automatically
  - If the field-frequency setpoint falls below the operating threshold, the DC-injection brake will be activated for the holding time set under C106. Afterwards, the drive will set controller inhibit.

**Important**

The DC-motor current is directly set under code C036 (voltage for DC brake). Please observe, that the connected motor can be overheated by overlong operation and excessive DC-motor current.

**Special features**

820X
Fixed operating threshold for DCB $f_d$ = 0.1 Hz.

821X/822X/824X
Operating threshold for DC brake adjustable under C019.
The display value of the parameter can be related to an application datum.

*Series "HVAC":*

**Function**

- DC braking enables fast deceleration of the drive to standstill without using a brake unit.
- The brake torque is lower as for braking in generator mode (via chopper or DC-bus operation).
  - The possible brake torque is approx. 20 % ... 30 % of the rated motor torque.
- A brake voltage or a brake current can be selected.
- C196 enables an improved motor start when the automatic DC-injection brake is activated (e.g. for hoists).
- The DCB function is activated either automatically when falling below the threshold set under C019 or via dig. input terminals E1 ... E4 (depending on C007).
- With the auto-DCB function, also a dead band in the setpoint can be set via C019. If DC braking is not required here, set C106 = 0.

**Adjustment**

1. Select, whether a brake voltage (C035 = -0-) or a brake current is to be entered.
2. Select the brake voltage or brake current in per cent under C036.
   - With C035 = -0-, the indication refers to the rated controller voltage [$V_r$].
   - With C035 = -1-, the indication refers to the rated controller current [$I_r$].
3. Select how to activate the DC-injection brake (DCB):
   - Via terminals E1 ... E4
   - Automatically

**Activation via terminals E1 ... E4**

| Setting C007 | High level at | Function |
|---|---|---|
| -17- | Terminal E1 * | DCB remains active until a LOW signal is assigned to terminal E1. |
| -3-, -7-, -14-, 19 | Terminal E2* | DCB remains active until a LOW signal is assigned to terminal E2. |
| -0-, -5-, -11-, -25-, -29-, -41-, -42-, -48- | Terminal E3* | DCB remains active until a LOW signal is assigned to terminal E3. |
| -31-, -36-, -51- | Terminal E4* | DCB remains active until a LOW signal is assigned to terminal E4. |

* The signal levels are indicated for C114 = -0- (see chapter 7.5.14.1).

**Automatic activation**

1. Select under C106:
   - C106 = 0,00 - auto DCB is not active (no reaction on $f_d$ < C019).
   - C106 > 0.00 - the DC injection brake is active for the time set. Afterwards, the drive will set controller inhibit.
2. Select the input conditions for the automatic DC injection braking under C196.
   - C196 = -0- DCB active, if C050 < C019
   - C196 = -1- GSB active, if C050 < C019 **and** setpoint < C019
3. Set the operating threshold under C019.
   - The operating threshold indicates, when the DC injection brake is activated (see step 2.).

**Important**

- C035 = -1-
  - The DC motor current is directly set under C036 (ref. to rated controller current).
- C035 = -0-
  - The DC motor current is indirectly set under C036 (ref. to rated controller voltage).
- Please observe, that the connected motor can be overheated by overlong operation and excessive DC-motor current.

**Special features**

- Set the operating threshold for auto DCB under C019. The display value of the parameter can be related to an application datum (C500, C501) (see chapter 7.6.3.)
- With C106 = 0.00, the automatic DC-injection brake is not active.
- C035 and C196 are only stored in parameter set 1.

### 7.5.14.6 Parameter set changeover PAR

| | |
|---|---|
| **Function** | Switches between the two parameter sets (ONLINE) during controller operation. |
| **Activation** | C007 = -4-, -8-, -15-, -17, -18-, or<br>C007 = -4-, -8-, -15-, -17-, -18-, -35-, -36-, -37-, -44-, -45- (only series "HVAC")<br>- LOW level at terminal E2 activates PAR1<br>- HIGH level at terminal E2 activates PAR2<br>C007 = -1-, -3-, -6-, -7-, -12-, or<br>C007 = -1-, -3-, -6-, -7-, -12-, -24-, -33-, -38-, -46-, -51- (only series "HVAC")<br>- LOW level at terminal E3 activates PAR1<br>- HIGH level at terminal E3 activates PAR2 |
| Series "HVAC": | The signal levels are indicated for C114 = -0- (see chapter 7.5.14.1) |
| **Important** | • In the code level the active code set is indicated by blinking of "PAR1" or "PAR2".<br>• The codes marked with * in the code table are similar for PAR1 and PAR2. The active parameter set is only displayed on the operating module in the code level.<br>• For changeover between the parameter sets via terminal, the same terminal of both parameter sets must be assigned with PAR. |
| **Special features** | |
| 821X/822X/824X | If the control mode (C014) is set differently in the parameter sets, the parameter sets should only be changed when the controller is inhibited. |

### 7.5.14.7 TRIP set

| | |
|---|---|
| **Function** | If the function TRIP set is activated, the unit detects external faults that can thus be taken into account. The controller indicates the fault EEr and sets controller inhibit. |
| **Activation** | • C007 = -7-, -8-, -18-, -19-:<br>- LOW level at terminal E1<br>• C007 = -5-, -6-, -9-, -20-, or<br>C007 = -5-, -6-, -9-, -20-, -38-...-43- (only series "HVAC"):<br>- LOW level at terminal E2<br>• C007 = -10-, or<br>C007 = -10-, -27- (only series "HVAC"):<br>- LOW level at terminal E3<br>• C007 = -32-:<br>- LOW level at terminal E4 (only series "HVAC") |
| Series "HVAC": | The signal levels are indicated for C114 = -0- (see chapter 7.5.14.1) |
| **Important** | For fault reset, see chapter 8.4, "Reset of fault messages". |
| **Special features** | |
| 820X | With the operating mode "control via LECOM" (C001 = -3-), the function TRIP set cannot be activated via terminals. |
| 821X/822X/824X<br>Series "HVAC": | • Independently of the operating mode C001, TRIP set can always be activated via terminals.<br>• The activation of TRIP set via terminals can be switched-off with the priority mask (C115). |

## 7.5.14.8 Manual/remote changeover

*Only "HVAC" controllers*

**Function**

- With manual/remote changeover (H/Re), it is for instance possible to change from remote operation to manual operation in the event of setting-up the drive or service.
  - For manual operation, the remote operation must not be changed (e. g. LECOM).
  - In manual operation, the setpoint is entered via potentiometer or motor potentiometer.
- The function "Motor potentiometer" is activated via terminal E1 ... E4.
  - If the function "Motor potentiometer" is activated, the operating mode is set to C001-internal = -0-.
- The change between manual and remote operation can only be carried out through terminals E1 ... E4. The following changeover is possible:
  - Fieldbus ↔ Function "Motor potentiometer"
  - Fieldbus ↔ Analog terminal setpoint (terminal 8, terminal E1, additional setpoint)
  - Function "Motor potentiometer" ↔ Analog terminal setpoint (terminal 8, terminal E1, additional setpoint)

**Activation**

C007 = -47-:
- HIGH level at terminal E2
  - Manual operation, function "Motor potentiometer" is active, C001-internal = -0-
  - Setpoint selection via analog channel

C007 = -23-, -24-, -25-, -26-, -27-:
- HIGH level at terminal E4
  - Manual operation, function "Motor potentiometer" is active, C001-internal = -0-
  - Setpoint selection via UP (term. E2), DOWN (term. E1)

C007 = -46:
- HIGH level at terminal E4
  - Manual operation, function "Motor potentiometer" is active, C001-internal = -0-
  - Setpoint selection via analog channel

C007 = -23-, -24-, -25-, -26-, -27-, -46-, -47-:
- LOW level at terminal E2 (if C007 = -47-) or terminal E4
  - Remote operation, function "Motor potentiometer" is not active, C001-internal = C001
  - Setpoint selection via C046, analog channel or JOG frequency

The signal level is indicated for C114 = -0- (see chapter 7.5.14.1).

**Important**

Safety functions ctrl. inhibit and QSP activated in remote operation are reset when changing to manual operation. Check, whether the master sets these safety functions again when changing from manual operation to remote operation.

## 7.5.14.9 Digital frequency input

*Only “HVAC” controllers*

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C425↵* | Adjustment of digital frequency | -2- | Dig.-freq. Resolution Scanning Max.-freq.<br>-0- 100 Hz 1/200 1 s 300 Hz<br>-1- 1 kHz 1/200 100 ms 3 kHz<br>-2- 10 kHz 1/200 10 ms 10 kHz<br>-3- 10 kHz 1/1000 50 ms 10 kHz<br>-4- 10 kHz 1/10000 500 ms 10 kHz | | |
| C426* | Gain adjustment frequency input E1 | 100.0 | -200.0 {0.1 %} 200.0 | | |
| C427 | Offset adjustment frequency input E1 | 0.0 | -12.5 {0.1 %} 12.5 | | |

**Function**

Select a digital frequency of 0 Hz ... 10 kHz as setpoint or as actual value using terminal E1.
With C007 = -28- ... -45-, -48-, -49-, -50-, -51-, the terminal E1 is configured for this function.

**Adjustment**

- C425
  - Selection of the frequency to be assigned to terminal E1.
  - Resolution and scanning time for reading the frequency.
- C426
  - Sets the gain of the input signal. 100 % corresponds to a gain factor = 1.
  - If E1 is used as actual value, C426 must be set as positive value, e.g. for pressure control, if the motor speed is to increase when the pressure falls.
- C427
  - Sets the offset of the input signal.
  - If C427 = -12.5 %, an offset of -20 % is internally set for the input.
- Select input E1 for master current 4 mA ... 20 mA:
  - Use an analog plug-in module 8279.
  - Set C426 = 125 %.
  - Set C427 = -12.5 %.

**Important**

- When using the analog input module 8279 for the frequency input E1:
  - Set C425 = -2-, -3- or -4-.
- With C005 = -0-, C425 and C426 are not active.
- C425, C426, C427 are only stored in parameter set 1.

**Special features**

- For higher accuracy requirements at 10 kHz digital frequency, select a higher resolution under C425 taking into account the scanning time.
- After addition to the signal at terminal E1, the offset (C427) is only effective as positive value (see signal flow-chart in chapter 16.3.2, as of software version 3.0).
- The digital frequency refers to internal normalisation (e.g. C011 etc.)
- The maximum frequency is the maximum to be processed by the input E1. If the value is exceeded, it must be adapted proportionally under C426.

## 7.5.15 Indirect torque limitation

*Only “HVAC” controllers*

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C005 | | | -3- Open loop operation via frequency input E1 with limitation of the apparent motor current via terminal 8 | C005 = -3- possible with C014 = -2-, -4- | |

**Function**

With C005 = -3-, the apparent motor current (indirect torque limitation) can be limited with an external signal via the analog input terminal 8. Enter a motor current limit.

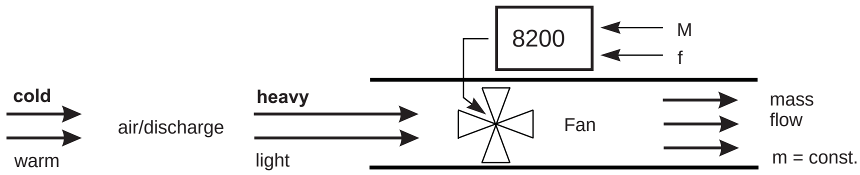
**Adjustment**

The influence of the torque limitation is adjusted via the analog input terminal 8 (see chapter 7.5.11.1).

- The effective current limit is indicated in % in C047.
- C022 has no influence. The external signal via terminal 8 selects the current limit.
- C023 remains effective.

**Example**

Constant mass flow control:



# 7.6 Display functions

## 7.6.1 Display values

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C040 | Controller enable | * | -0- Controller inhibited<br>-1- Controller enabled | HVAC only | * see Operating Instructions 2102 |
| C046 | Frequency setpoint | * | -480.00 {0.02 %} 480.00 | [Hz]<br>HVAC only | |
| C047* | Current setpoint<br>$I_{max}$ limit value | | | [%]<br>HVAC only | Display only<br>150 % for rated value at term. 8 and factory setting |
| C049* | Additional setpoint | | | [Hz]<br>HVAC only | Display only<br>• Only if C005 = -1-, -2- |
| C050* | Output frequency | | | [Hz] | Display only |
| C051* | Actual PID controller value | | | [Hz]<br>HVAC only | Display only |
| C052* | Motor voltage | | | [V] | Display only |
| C053* | DC-bus voltage | | | [V]<br>HVAC only | Display only |
| C054* | Motor current | | | [A] | Display only |
| C056* | Unit load | | | [%] | Display only |
| C061* | Temperature<br>Heat sink | | | [°C] | Display only |

**Function**

Some parameters, which are measured by the controller during operation, can be displayed on the 8201BB operating module.

**Important**

- Display under C050 corresponds to the setpoint without slip compensation (C021).

Series "HVAC":

- Display under C047:
  - If C005 = -0-, -1-, -2-, -6-, -7-, → $I_{max}$ limit value (C022).
- Display under C049, only if C005 = -1- and -2-.

**Special features**

821X/822X/824

- The display value of a parameter can be related to an application datum (see chapter 7.6.3).

Series "HVAC":

- Codes C046, C049, C050, C051:
  Hz display only in factory setting (C500 = 2000; C501 = 10)
  (see chapter 7.6.3).

## 7.6.2 Switch-on display

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C004↲ | Switch-on display | -0- | -0- Field frequency $f_d$ (C050)<br>-1- Unit load (C056)<br>-2- Motor current (C054) | | |

**Function**

The here selected display is active after mains connection, if the 8201BB operating module is plugged on.

### 7.6.3 Normalisation of an application datum

820X setting range: This function is not available.

Setting range 821X/822X/824X:

| Code | Name | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|
| | | Lenze | Choice | | Info | |
| C500* | Display factor Application datum numerator<br>821X/822X/824X | 2000 | 1 {1} 25000 | | | |
| C501* | Display factor for process variable denominator<br>821X/822X/824X | 10 | 1 {1} 25000 | | | |

**Function**

- Adaptation of field-frequency related parameters C010, C011, C017, C019, C037, C038, C039, C050, or C010, C011, C017, C019, C037, C038, C039, C046, C049, C050, C051, C181, C625, C626, C627 (series "HVAC") to an application datum to be controlled, e.g. pressure, temperature, flow rate, humidity or speed.
- The normalisation implements an absolute or relative selection of an application datum.
- All codes indicated are normalised at the same time.

**Adjustment**

The display value is calculated from:

$$\text{CXXX} = \frac{\text{C011}}{200} \cdot \frac{\text{C500}}{\text{C501}}$$

Example

The speed setpoint is to be input and displayed as relative or absolute value.
Values: $P_{set}$ = 5 bar, if $f_{dmax}$ = 50 Hz (C011)

a) Relative normalisation in %

$$100.00\ (\%) = \frac{50}{200} \cdot \frac{4000}{10}$$

e.g. C500 = 4000, C501 = 10

b) Absolute normalisation in physical units

$$5.00\ (\text{bar}) = \frac{50}{200} \cdot \frac{200}{10}$$

e.g. C500 = 200; C501 = 10

**Important**

- All codes indicated above are normalised at the same time.
- After a normalisation, the output frequency [Hz] (C050) can only be recalculated with the display factors C500 and C501.

## 7.6.4 Elapsed operating time meter

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C178* | Operating time | | | [h] | Display only |
| C179* | Mains connection time | | | [h] | Display only |

**Function** The following times can be displayed:
- Operating time: Time during which the controller is enabled.
- Mains connection time: Time during which the controller is connected to the mains.

## 7.6.5 Software version and controller type

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C093* | Type | | 82xx | | Display only |
| C099* | Software version | | 82 x.x | | Display only |

**Function** Reading of type and software version of the controller.

# 7.7 Monitoring functions

## 7.7.1 Relay outputs

### Relay output K1

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | **Lenze** | **Choice** | **Info** | |
| C008↲ | Function relay K1 | -1- | -0- Ready for operation<br>-1- TRIP fault message<br>-2- Motor is running<br>-3- Motor is running / CW rotation<br>-4- Motor is running / CCW rotation<br>-5- Field frequency $f_d$ = 0<br>-6- $f_{dset}$ reached<br>-7- $Q_{min}$ reached<br>-8- $I_{max}$ reached<br>-9- Overtemperature ($\vartheta_{max}$ -10 °C)<br>-10- TRIP or $Q_{min}$ or IMP | | |
| | 822X/824X | | -11- PTC warning | HVAC only | |
| | | | -12- Apparent motor current (C054) < threshold C156<br>-13- Apparent motor current (C054) < current threshold C156 and $f_d$ > $Q_{min}$ threshold (C017)<br>-14- Apparent motor current (C054) < threshold C156 and input of ramp function generator = output of ramp function generator | HVAC only<br>HVAC only<br>HVAC only | |
| | 822X/824X | | -15- Warning motor phase failure | HVAC only | |
| | | | -16- $f_d$ (C050) < $f_{dmin}$ (C010) | HVAC only | |
| C054* | Motor current | | | HVAC only | Display only |
| C156* | Current threshold | 0 | 0 {1 %} 150 | HVAC only | |

**Function** To monitor the drive, the changeover contact of the relay K1 - terminals K11, K12, K14 - can be assigned with different functions.

Series "HVAC": C008 = -12-, -13-, -14-:

- The display value(C054) is smoothened with a ring memory with 500 ms.
- The value set under C156 corresponds to a percentage of the rated controller current [$I_r$].
- With the control mode "Square characteristic" (C014 = 3), C156 is internally adapted via the field frequency (C011):

$$C156_{internal}\ [\%] = C156\ [\%] \cdot \frac{fd^2\ [Hz^2]}{C011^2\ [Hz^2]}$$

For instance, a belt monitoring can be implemented with this function extension.

**Important** C156 is only stored in PAR1.

# Configuration

| Switching conditions | Monitoring functions | Relay |
|---|---|---|
| | Ready for operation | energised when controller is ready |
| | | drop-out when<br>• TRIP fault message<br>• Undervoltage/overvoltage |
| | TRIP fault message | energised with TRIP fault message |
| | Motor is running | energised when $f_d \neq 0$ Hz |
| | Motor is running / CW rotation;<br>Motor is running / CCW rotation | energised when $f_d \neq 0$ Hz, direction of rotation via terminal<br>CCW rotation: $f_d > 0$ Hz,<br>CW rotation: $f_d < 0$ Hz |
| | Field frequency $f_d = 0$ | energised when $f_d = 0$ Hz, because<br>• $f_{dset} = 0$ Hz, $t_{if}$ over<br>• DC brake active<br>• Controller inhibited |
| | $f_{dset}$ reached | energised when $f_d = f_{dset}$ |
| | $Q_{min}$ reached | energised when $f_d > f_{dQmin}$(C017) |
| | $I_{max}$ reached | energised when motor current =<br>• $I_{max}$ motor mode (C022)<br>• $I_{max}$ generator mode (C023) |
| | Overtemperature | energised when the heat sink temperature = $\vartheta_{max}$ -10 °C |
| | TRIP, $Q_{min}$ or IMP<br>(only "HVAC" controllers) | drop-out when<br>• TRIP fault message<br>• $f_d \leq f_{dQmin}$<br>• Pulse inhibit because of controller inhibit, overvoltage or undervoltage |
| | PTC warning<br>(only "HVAC" controllers) | drop-out when<br>• connected PTC thermistor has detected motor overtemperature. |
| | Apparent motor current<br>< current threshold<br>(only "HVAC" controllers) | drop-out when $I_{motor}$ (C054) < current threshold (C156) |
| | Apparent motor current<br>< current threshold and<br>$f_d > Q_{min}$ threshold (C017)<br>(only "HVAC" controllers) | drop-out when $I_{motor}$ (C054) < current threshold (C156) **and**<br>$f_d > f_{dQmin}$(C017) |
| | Apparent motor current<br>< current threshold and<br>ramp-function generator input =<br>ramp-function generator output<br>(only "HVAC" controllers) | drop-out when $I_{motor}$ (C054) < current threshold (C156) **and**<br>ramp-function generator input = ramp-function generator output |
| | Warning motor phase failure<br>(only "HVAC" controllers) | energised in the event of a motor-phase failure |
| | $f_d$ (C050) < $f_{dmin}$ (C010)<br>(only "HVAC" controllers) | energised when $f_d >$ C010 |

### Relay output K2

Setting range 820X/821X: K2 not available.

Setting range 822X/824X:

| Code | Name | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|
| | | Lenze | Choice | | Info | |
| C117↲ | Function relay K2 | -1- | -0- | Ready for operation | | |
| | | | -1- | TRIP fault message | | |
| | | | -2- | Motor is running | | |
| | | | -3- | Motor is running / CW rotation | | |
| | | | -4- | Motor is running / CCW rotation | | |
| | | | -5- | Field frequency $f_d$ = 0 | | |
| | | | -6- | $f_{dset}$ reached | | |
| | | | -7- | $Q_{min}$ reached | | |
| | | | -8- | $I_{max}$ reached | | |
| | | | -9- | Overtemperature ($\vartheta_{max}$ -10 °C) | | |
| | | | -10- | TRIP or $Q_{min}$ or IMP | | |
| | 822X/824X | | -11- | PTC warning | HVAC only | |
| | | | -12- | Apparent motor current (C054) < threshold C156 | HVAC only | |
| | | | -13- | Apparent motor current (C054) < current threshold C156 and $f_d$ > $Q_{min}$ threshold (C017) | HVAC only | |
| | | | -14- | Apparent motor current (C054) < threshold C156 and input of ramp function generator = output of ramp function generator | HVAC only | |
| | 822X/824X | | -15- | Warning motor phase failure | HVAC only | |
| | | | -16- | $f_d$ (C050) < $f_{dmin}$ (C010) | HVAC only | |
| C054* | Motor current | | | | HVAC only | Display only |
| C156* | Current threshold | 0 | 0 | {1 %} 150 | HVAC only | |

**Function**

The changeover contact of relay K2 - terminals K21, K22, K24 - can be assigned with different function to monitor the drive.

Series "HVAC":

C008 = -12-, -13-, -14-:

- The display value (C054) is smoothened with a ring memory with 500 ms.
- The value set under C156 corresponds to a percentage of the rated controller current [$I_r$].
- With the control mode "Square characteristic" (C014 = 3), C156 is internally adapted via the field frequency (C011):

$$\mathrm{C156}_{internal}\ [\%] = \mathrm{C156}\ [\%] \cdot \frac{fd^2\ [Hz^2]}{\mathrm{C011}^2\ [Hz^2]}$$

For instance, a belt monitoring can be implemented with this function extension.

**Important**

C156 is only stored in PAR1.

# Configuration

| Switching conditions | Monitoring functions | Relay |
|---|---|---|
| | Ready for operation | energised when controller is ready |
| | | drop-out when<br>• TRIP fault message<br>• Undervoltage/overvoltage |
| | TRIP fault message | energised with TRIP fault message |
| | Motor is running | energised when $f_d \neq 0$ Hz |
| | Motor is running / CW rotation;<br>Motor is running / CCW rotation | energised when $f_d \neq 0$ Hz, direction of rotation via terminal<br>CCW rotation: $f_d > 0$ Hz,<br>CW rotation: $f_d < 0$ Hz |
| | Field frequency $f_d = 0$ | energised when $f_d = 0$ Hz, because<br>• $f_{dset} = 0$ Hz, $t_{if}$ over<br>• DC-injection brake active<br>• Controller inhibited |
| | $f_{dset}$ reached | energised when $f_d = f_{dset}$ |
| | $Q_{min}$ reached | energised when $f_d > f_{dQmin}$ (C017) |
| | $I_{max}$ reached | energised when motor current =<br>• $I_{max}$ motor mode (C022)<br>• $I_{max}$ generator mode (C023) |
| | Overtemperature | energised when the heat sink temperature = $\vartheta_{max}$ -10 °C |
| | TRIP, $Q_{min}$ or IMP<br>(only “HVAC” controllers) | drop-out when<br>• TRIP fault message<br>• $f_d \leq f_{dQmin}$<br>• Pulse inhibit because of controller inhibit, overvoltage or undervoltage |
| | PTC warning<br>(only “HVAC” controllers) | drop-out when<br>• connected PTC thermistor has detected motor overtemperature. |
| | Apparent motor current<br>< current threshold<br>(only “HVAC” controllers) | drop-out when $I_{motor}$ (C054) < current threshold (C156) |
| | Apparent motor current<br>< current threshold and<br>$f_d > Q_{min}$-threshold (C017)<br>(only “HVAC” controllers) | drop-out when $I_{motor}$ (C054) < current threshold (C156) **and**<br>$f_d > f_{dQmin}$(C017) |
| | Apparent motor current<br>< current threshold and<br>ramp-function generator input =<br>ramp-function generator output<br>(only “HVAC” controllers) | drop-out when $I_{motor}$ (C054) < current threshold (C156) **and**<br>ramp-function generator input = ramp-function generator output |
| | Warning motor phase failure<br>(only “HVAC” controllers) | energised in the event of a motor-phase failure |
| | $f_d$ (C050) < $f_{dmin}$ (C010)<br>(only “HVAC” controllers) | energised when $f_d >$ C010 |

## 7.7.2 Analog output

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C108* | Gain (C111) | 128 | 0 {1} 255 | | |
| C111↲ | Monitor signal | -0- | -0- Field frequency | | |
| | | | -1- Unit load | | |
| | | | -2- Motor current | | |
| | | | -3- DC bus voltage | | |
| | | | -4- Motor power | HVAC only | |
| | | | -5- Motor voltage | HVAC only | |
| | | | -6- Analog output $1/f_d$ (1/C050) | HVAC only | |
| | | | -7- Field frequency of $f_{dmin}$ (C010) ... $f_{dmax}$ (C011) | HVAC only | |
| | | | -8- Actual PID controller value | HVAC only | |
| | | | -9- Ready for operation | HVAC only | |
| | | | -10- TRIP fault message | HVAC only | |
| | | | -11- Motor is running | HVAC only | |
| | | | -12- Motor is running / CW rotation | HVAC only | |
| | | | -13- Motor is running / CCW rotation | HVAC only | |
| | | | -14- Field frequency $f_d = 0$ | HVAC only | |
| | | | -15- $f_{dset}$ reached | HVAC only | |
| | | | -16- $Q_{min}$ reached | HVAC only | |
| | | | -17- $I_{max}$ reached | HVAC only | |
| | | | -18- Overtemperature ($\vartheta_{max}$ -10°) | HVAC only | |
| | | | -19- TRIP, $Q_{min}$ or IMP set | HVAC only | |
| | 822X/824X | | -20- PTC warning | HVAC only | |
| | | | -21- Apparent motor current (C054) < current threshold (C156) | HVAC only | |
| | | | -22- Apparent motor current (C054) < current threshold (C156) and $f_d$ > $Q_{min}$ threshold | HVAC only | |
| | | | -23- Apparent motor current (C054) < threshold (C156) and input of ramp function generator = output of ramp function generator | HVAC only | |
| | 822X/824X | | -24- Warning motor phase failure | HVAC only | |
| | | | -25- $f_d$ (C050) < $f_{dmin}$ (C010) | HVAC only | |

**Function**

- To monitor the drive, you can output different process value as standardised voltage via terminal 62.
- With C111 = -0-, C108 = 0 ... 225 corresponds to an output voltage of 0 V ... 10 V (at $f_d$ = C011).
  - With C111, C108 = 128 corresponds to an output voltage of 6 V (factory setting).

Series “HVAC”:

- If C111 = -6-, the analog output is reciprocal to the field frequency of the motor. This function can for instance be used for the external display of a cycle time
  - of a product or
  - through a furnace.

# Configuration

| | | | |
|---|---|---|---|
| **Adjustment** | **C111** | 820X: | Voltage at terminal 62, if C108 = 220 |
| | | 821X/822X/824X: | Voltage at terminal 62, if C108 = 128 |
| | -0- | 6 V, if $f_d = f_{dmax}$ | |
| | -1- | 3 V, if C056 = 100 % | |
| | -2- | 3 V, if C054 = rated controller current | |
| | -3- | 820X: | 6 V, if $V_{DC}$ = 380 VDC |
| | | 821X/822X/824X: | 6 ,V if $V_{DC}$ = 1000 VDC |
| Series "HVAC": | -4- | 3 V at rated power, $P_r$ = C052 * C056 | |
| | -5- | 4.8 V at motor voltage = 400 V | |
| | -6- | 2 V, if C011 = 50 Hz, C050 = 20 Hz | |
| | -7- | $\text{Monitor output voltage [V]} = 6.00\text{V} \cdot \frac{f_d - \text{C011}}{\text{C011} - \text{C010}}$ | |
| | -8- | 6 V, if C051 = $f_{dmax}$ | |

**Important**

- The gain of the analog output (C108) can be adjusted ONLINE.

Series "HVAC":

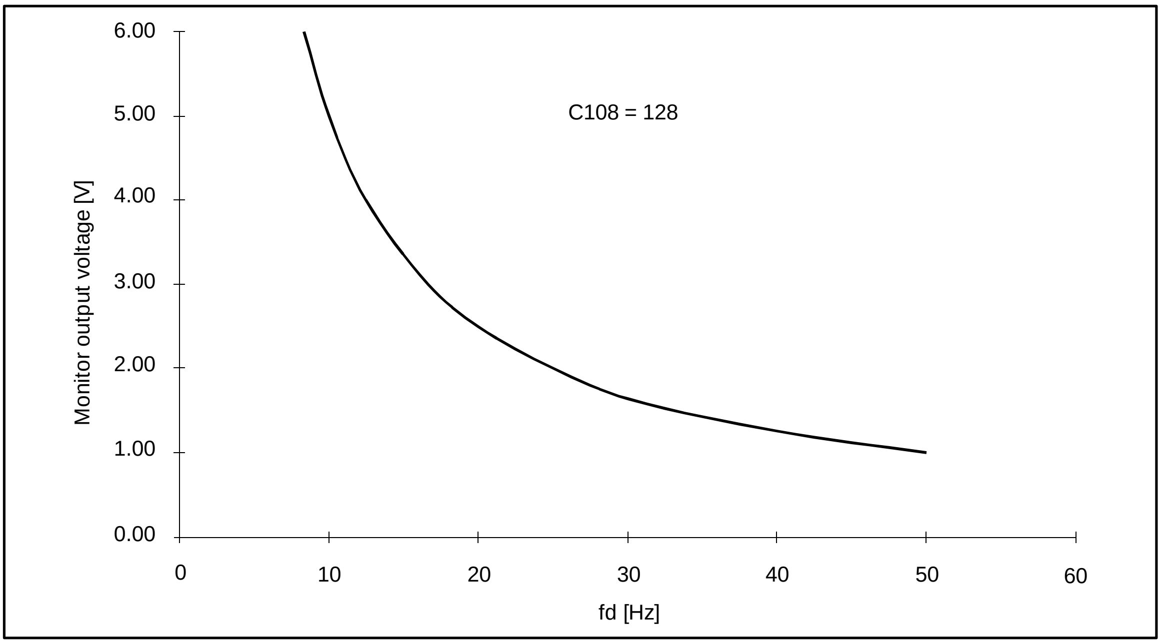
- C111 = -9- to C111 = -25- correspond to the relay output functions C008 and C117:
  - LOW = 0 V
  - HIGH = 10 V

*Series "HVAC":*

**C111 = -6-**

Normalisation of the monitor output voltage with a reciprocal field frequency output:

$$\text{Monitor output voltage [V]} = 1.00\ \text{V} \cdot \frac{\text{C011 [Hz]}}{\text{C050 [Hz]}} \cdot \frac{\text{C108}}{128}$$



## 7.7.3 Thermal motor monitoring

### 7.7.3.1 $I^2$ x t monitoring

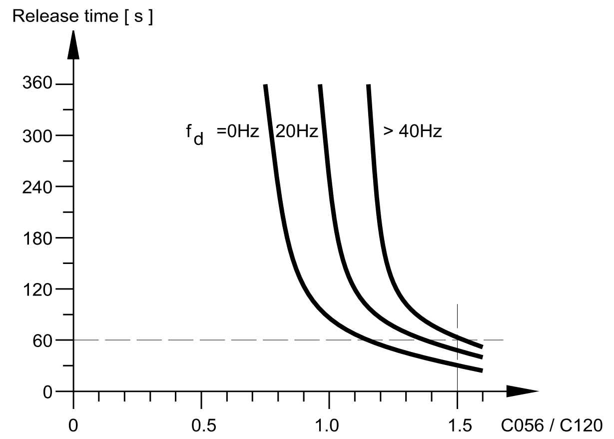
| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C120 | $I^2 \cdot t$ switch-off | 0 | 0 {1 %} 100 | | |

**Function**

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

**Adjustment**

- Enter an individual load limit for the motor connected.
  - If this values is exceeded for a longer period of time, the controller will set the fault OC6 and switch-off (see chart).
- The current limits C022 and C023 only have an indirect influence on the $I^2 \cdot t$ calculation:
  - The settings of C022 and C023 can make the operation with maximum controller load (C056) impossible.
- When selecting a drive which does not match (output current much higher than rated motor current):
  - Reduce C120 by the factor of the mismatch.




Example:
With C120 = 100 % and a load of C056 = 150 %, the controller switches off after 60 s when reaching $f_d$ > 40 Hz, or earlier with $f_d$ < 40 Hz.

**Important**

- The setting 0 % deactivates the function.
- This monitoring does not provide full motor protection since the calculated motor temperature is set to "0" after every mains connection or disconnection. The connected motor can be overheated, if
  - it is already hot but still overloaded,
  - the cooling-air stream is interrupted or the air is too hot.
- Full motor protection can be achieved with a PTC thermistor in the motor.
  - We recommend the general use of PTC monitoring systems for multi-motor drives.
- To prevent motors with forced ventilation from starting too early, this function can be deactivated.
- If load-adapted motors are to be monitored at a load of < 100 %, C120 must also be reduced accordingly.
- The operation of the controller with 120 % overload might lead to the activation of the $I^2 \cdot t$ switch-off, because the setting of C120 > 100 % is not possible.
  - Deactivate the $I^2 \cdot t$ switch-off for the operation of the controller at 120 % overload.

### 7.7.3.2 PTC input

Setting range 820X/821X: Option, see Accessories

Setting range 822X/824X:

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C119↵ | Function PTC 822X/824X | -0- | -0- PTC input not active | | |
| | | | -1- PTC input active<br>TRIP and IMP inhibit are set (OH3 message) | | |
| | | | -2- PTC input active<br>Warning via relay (adjustable) | Message not visible in the history buffer (C161 ... C164) | |

**Function**

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

**Activation**

1. Connect the monitoring circuit of the motor to the provided terminals T1 and T2.
2. Parameter setting for the evaluation of the PTC signal:
   If the PTC evalution detects an overtemperature, it can be evaluated in three ways:
   - C119 = -0- PTC not active
   - C119 = -1- TRIP
   - C119 = -2- warning

**Important**

- The controller can only evaluate a motor-PTC system.
  - Several motor-PTC systems connected in parallel or in series are not allowed.
- If you connect several motors to an inverter, use thermistors (normally-close) to monitor the motor temperature.
  - For the evaluation, thermistors can be connected in series.
- The OH3 message is activated at approx. R $\geq$ 1.6 k$\Omega$. If, for a functionality test, the PTC input is assigned to a variable resistor, the following occurs:
  - R > 2 k$\Omega$ a message is set.
  - R < 250 $\Omega$ no message is set.

## 7.7.4 Motor-phase failure detection

*Only series “HVAC”*

Setting range 821X: not possible

Setting range 822X/824X:

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C597*↵ | Activation of motor-phase failure detection | -0- | -0- Inactive<br>-1- TRIP<br>-2- Warning | | |
| C599 | Current limit for motor-phase failure detection | 5 | 1 {1 %} 50 | | |

**Function**

If the function is activated under C597, the controller monitors the motor phases for failure. The current limit value (C599) defines the threshold when a motor phase failure is indicated. The value set under C599 corresponds to the percentage of the rated controller current [$I_r$].

**Activation**

- C597 = -0- function not active
- C597 = -1- fault message TRIP
- C597 = -2- warning message

**Fault indication**

- 8201BB operating module:
  - TRIP: LP1
  - Warning: LP1
- Fieldbus:
  - TRIP: 32
  - Warning: 182

**Important**

C597 and C599 are only stored in parameter set 1.

EDS8200U--D1
00406185

# Manual
# Part D1

## Code table

## for the series
## 8200/10/20/40 standard

## Global Drive
*Frequency inverters 8200*

This Manual is valid for 82XX controllers as of version:

| | | | | | |
|---|---|---|---|---|---|
| 33.820X- | E- | 1x. | 1x | | (8201 - 8204) |
| 33.8202- | E- | 1x. | 1x | -V002 | Reduced assembly depth (8202) |
| 33.821X- | E- | 0x. | 1x | | (8211 - 8218) |
| 33.821X- | E- | 1x. | 2x | | (8211 - 8218) |
| 33.821X- | C- | 1x. | 2x | -V003 | Cold plate (8215 - 8218) |
| 33.821X- | E- | 3a. | 3x | -V020 | HVAC (8211 - 8218) |
| 33.822X- | E- | 0x. | 0x | | (8221 - 8227) |
| 33.822X- | C- | 1x. | 2x | -V003 | Cold plate (8221 - 8222) |
| 33.822X- | E- | 3a. | 3x | -V020 | HVAC (8221 - 8227) |
| 33.824X- | E- | 1x. | 1x | | (8241 - 8246) |
| 33.824X- | C- | 1x. | 1x | -V003 | Cold plate (8241 - 8246) |
| 33.824X- | E- | 3a. | 3x | -V020 | HVAC (8241 - 8246) |

Type

Design:
B = Module
C = Cold plate
E = Built-in unit IP20

Hardware version and index

Software version and index

Variant

Explanation

| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

## 7.8 Code table for “Standard” series

### How to read the code table:

| Column | Abbreviation | Meaning |
|---|---|---|
| Code | C013 | Code C013<br>• The parameter of the code can be different in PAR1 and PAR2.<br>• The parameter value is accepted immediately (ONLINE). |
| | C009* | • The parameter value of the code is always the same in PAR1 and PAR2, but is always displayed in PAR1. |
| | C001↵ | • The parameter value of the code will be accepted after pressing SH+ PRG. |
| | [C002] | • The parameter value of the code will be accepted after pressing SH+ PRG but only, if the controller is inhibited. |
| | C010• | • Parameter value of the code will only be displayed in [Hz], if C500 = 2000 and C501 = 10 (factory setting). See chapter 7.6.3. |
| Name | | Name of the code. |
| | 820X | Unit-specific setting possibilities (here for 820X).<br>Without unit designation the code is valid for all unit types. |
| Lenze | | Factory setting of the code |
| | * | The column ”Important” contains further information |
| Choice | 1 {1 %} 99 | Min. value {Steps/Unit} Max. value |
| Info | - | Meaning of the code |
| IMPORTANT | - | Additional, important explanation of the code |

| Code | Name | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|
| | | Lenze | Choice | | Info | |
| C001↵ | Operating mode | -0- | -0- | Setpoint selection via term. 8<br>Control via terminals<br>Parameter setting via 8201BB | Page 7-9, 7-42 | |
| | | | -1- | Setpoint selection via 8201BB or LECOM<br>Control via terminals<br>Parameter setting via 8201BB | | |
| | | | -2- | Setpoint selection via term. 8<br>Control via terminals<br>Parameter setting via LECOM | | |
| | | | -3- | Setpoint selection via LECOM<br>Control via LECOM<br>Parameter setting via LECOM | | |
| [C002]* | Parameter set | | -0- | Function executed | Page 7-10 | |
| | | | -1- | Overwrite PAR1 with factory setting | | |
| | | | -2- | Overwrite PAR2 with factory setting | | |
| | | | -3- | Overwrite PAR1 and PAR2 with the data of the operating module | | |
| | | | -4- | Overwrite PAR1 with the data of the operating module | | |
| | | | -5- | Overwrite PAR2 with the data of the operating module | | |
| | | | -6- | Transmit PAR1 and PAR2 to the operating module | | |
| C004↵ | Switch-on display | -0- | -0- | Field frequency $f_d$ | Page 7-62 | |
| | | | -1- | Unit load | | |
| | | | -2- | Motor current | | |

# Configuration

| Code | Name | Lenze | Choice | Info | IMPORTANT |
|---|---|---|---|---|---|
| | | Possible settings | | | |
| [C007]* | Terminal configuration | -0- | E4 E3 E2 E1 | Page 7-10, 7-44, 7-46, 7-50, 7-54, 7-58, | • R = CW rotation<br>• L = CCW rotation<br>• GSB = DC-injection brake<br>• PAR = Parameter set changeover<br>• JOG = Fixed frequency<br>• QSP = Quick stop<br>• TRIP Set = External fault<br>• UP/DOWN = Motor potentiometer functions<br><br>For parameter set changeover via terminals, the corresponding terminal must be assigned with PAR in both parameter sets. |
| | | | -0- CW/CCW GSB JOG1/2/3 | | |
| | | | -1- CW/CCW PAR JOG1/2/3 | | |
| | | | -2- CW/CCW QSP JOG1/2/3 | | |
| | | | -3- CW/CCW PAR GSB JOG1 | | |
| | | | -4- CW/CCW QSP PAR JOG1 | | |
| | | | -5- CW/CCW GSB TRIP set JOG1 | | |
| | | | -6- CW/CCW PAR TRIP set JOG1 | | |
| | | | -7- CW/CCW PAR GSB TRIP set | | |
| | | | -8- CW/CCW QSP PAR TRIP set | | |
| | | | -9- CW/CCW QSP TRIP set JOG1 | | |
| | | | -10- CW/CCW TRIP set UP DOWN | | |
| | | | -11- CW/CCW GSB UP DOWN | | |
| | | | -12- CW/CCW PAR UP DOWN | | |
| | | | -13- CW/CCW QSP UP DOWN | | |
| | | | -14- CCW/QSP CW/QSP GSB JOG1 | | |
| | | | -15- CCW/QSP CW/QSP PAR JOG1 | | |
| | | | -16- CCW/QSP CW/QSP JOG1/2/3 | | |
| | | | -17- CCW/QSP CW/QSP PAR GSB | | |
| | | | -18- CCW/QSP CW/QSP PAR TRIP set | | |
| | | | -19- CCW/QSP CW/QSP GSB TRIP set | | |
| | | | -20- CCW/QSP CW/QSP TRIP set JOG1 | | |
| | | | -21- CCW/QSP CW/QSP UP DOWN | | |
| | | | -22- CCW/QSP CW/QSP UP JOG1 | | |
| C008↵ | Function relay K1 | -1- | -0- Ready for operation | Page 7-65 | |
| | | | -1- TRIP fault message | | |
| | | | -2- Motor is running | | |
| | | | -3- Motor is running / CW rotation | | |
| | | | -4- Motor is running / CCW rotation | | |
| | | | -5- Field frequency $f_d$ = 0 | | |
| | | | -6- $f_{dset}$ reached | | |
| | | | -7- $Q_{min}$ reached | | |
| | | | -8- $I_{max}$ reached | | |
| | | | -9- Overtemperature ($\vartheta_{max}$ -10 °C) | | |
| | | | -10- TRIP or $Q_{min}$ or IMP | | |
| C009*↵ | Device address | 1 | 1 {1} 99 | | Only for LECOM applications |
| C010• | Minimum field frequency | | | Page 7-15 | |
| | 820X | 0.00 | 0.00 {0.05 Hz} 480.00 | | |
| | 821X/822X/ 824X | 0.00 | 0.00 {0.02 Hz} 480.00 | | |
| C011• | Maximum field frequency | | | Page 7-15 | |
| | 820X | 50.00 | 30.00 {0.05 Hz} 480.00 | | |
| | 821X/822X/ 824X | 50.00 | 7.50 {0.02 Hz} 480.00 | | |
| C012 | Acceleration time $T_{ir}$ | | | Page 7-16 | |
| | 820X | 5.00 | 0.00 {0.05 s} 999.00 | | |
| | 821X/822X/ 824X | 5.00 | 0.00 {0.02 s} 999.00 | | |

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C013 | Deceleration time $T_{if}$ | | | Page 7-16, 7-55 | |
| | 820X | 5.00 | 0.00 {0.05 s} 999.00 | | |
| | 821X/822X/ 824X | 5.00 | 0.00 {0.02 s} 999.00 | | |
| C014↵ | Control mode | | | Page 7-19, 7-22, 7-24 | |
| | 820X | -0- | -0- Linear characteristic $V \sim f_d$ with auto boost<br>-1- Square characteristic $V \sim f_d^2$ with auto boost | | |
| | | | -2- Linear characteristic $V \sim f_d$ with constant $V_{min}$ boost<br>-3- Square characteristic $V \sim f_d^2$ with constant $V_{min}$ boost | | |
| | 821X/822X/ 824X | -4- | -4- Motor-current control | | |
| C015 | V/f-rated frequency | | | Page 7-22 | |
| | 820X | 50.00 | 30.00 {0.05 Hz} 960.00 | | |
| | 821X/822X/ 824X | 50.00 | 7.50 {0.02 Hz} 960.00 | | |
| C016 | $V_{min}$ setting | | | Page 7-24 | |
| | 820X | * | 0.00 {0.02 %} 40.00 | | * depends on the unit |
| | 821X/822X/ 824X | 0.00 | 0.00 {0.02 %} 40.00 | | |
| C017• | Threshold $Q_{min}$ | 0.00 | 0.00 {0.02 Hz} 480.00 | Page 7-65 | |
| C018↵ | Chopper frequency | | | Page 7-29 | |
| | 821X/822X/824X | -1- | -0- 4 kHz power-loss optimised<br>-1- 8 kHz power-loss optimised<br>-2- 12 kHz power-loss optimised<br>-3- 16 kHz power-loss optimised<br>-4- 12 kHz noise optimised<br>-5- 16 kHz noise optimised | | |
| C019• | Threshold auto DC brake | | | Page 7-56 | |
| | 821X/822X/824X | 0.10 | 0.10 {0.02 Hz} 5.00 | | |
| C021 | Slip compensation | | | Page 7-28 | * If C014 = -2-, -3-, controller dependent |
| | 820X | 0.0* | 0.0 {0.1 %} 12.0 | | |
| | 821X/822X/ 824X | 0.0* | 0.0 {0.1 %} 20.0 | | |
| C022 | $I_{max}$ limit (motor mode) | 150 | 30 {1 %} 150 | Page 7-17 | |
| C023 | $I_{max}$ limit (generator mode) | 80 | 30 {1 %} 110 | Page 7-17 | The current-limit controller for operation in generator mode is not active at 30 %. |
| | 822X/824X | 80 | 30 {1 %} 150 | As of software 1.6 | |
| C034↵ | Master current | -0- | -0- 0 to 20 mA / 0 to 5 V / 0 to 10 V<br>-1- 4 to 20 mA | Page 7-40 | |

# Configuration

| Code | Name | Lenze | Choice | Info | IMPORTANT |
|---|---|---|---|---|---|
| C036 | Voltage/current for DCB | * | 0.00 {0.02 %} 40.00 | Page 7-56 | * depends on the unit |
| C037• | JOG value 1 | 20.00 | 0.00 {0.02 Hz} 480.00 | Page 7-43 | |
| C038• | JOG value 2 | 30.00 | 0.00 {0.02 Hz} 480.00 | Page 7-43 | |
| C039• | JOG value 3 | 40.00 | 0.00 {0.02 Hz} 480.00 | Page 7-43 | |
| C050*• | Output frequency | | | Page 7-62 | Display only |
| C052* | Motor voltage | | | Page 7-62 | Display only [V] |
| C054* | Motor current | | | Page 7-62 | Display only [A] |
| C056* | Unit load | | | Page 7-62 | Display only [%] |
| C061* | Heat sink temperature | | | Page 7-62 | Display only [°C] |
| C079 | Oscillation damping | * | | Page 7-31 | * depends on the unit Is not transferred when transferring parameters via the operating module. |
| | 822X/824X | 5 | 0 {1} 80 | | |
| C088 | Rated motor current 821X/822X/824X | * | 0.0 ... 1.2 · rated output current | Page 7-27 | * depends on the unit |
| C091 | Motor cos φ 821X/822X/824X | * | 0.4 {0.1} 1.0 | Page 7-27 | |
| C093* | Type | | | Page 7-64 | Display only |
| | 820X | | 820X | | |
| | 821X | | 821X | | |
| | 822X/824X | | 822X | | |
| C099* | Software version | | | Page 7-64 | |
| | 820X | | 82 1x (Software 1x) | | |
| | 821X | | 82 2x (Software 2x)<br>82 1x (Software 1x) | | |
| | 822X/824X | | 82 1x (Software 1x) | | |
| C105 | Deceleration time QSP 821X/822X/824X | 5.00 | 0.00 {0.02 s} 999.00 | Page 7-55 | |
| C106 | Holding time for autom. DC injection brake | | | Page 7-56 | |
| | 820X | 0.00 | 0.00 {0.01 s} 50.00 | | |
| | 821X/822X 824X | 0.02 | 0.00 {0.01 s} 999.00 | | |
| C108* | Gain (C111) | | | Page 7-69 | |
| | 820X | 220 | 0 {1} 255 | | |
| | 821X/822X/ 824X | 128 | 0 {1} 255 | | |
| C111↲ | Monitor signal | -0- | -0- Field frequency<br>-1- Unit load<br>-2- Motor current<br>-3- DC-bus voltage | Page 7-69 | |

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C117↲ | Function relay K2<br>822X/824X | -0- | -0- Ready for operation<br>-1- TRIP fault message<br>-2- Motor is running<br>-3- Motor is running / CW rotation<br>-4- Motor is running / CCW rotation<br>-5- Field frequency $f_d$ = 0<br>-6- $f_{dset}$ reached<br>-7- $Q_{min}$ reached<br>-8- $I_{max}$ reached<br>-9- Overtemperature ($\vartheta_{max}$ -10°C)<br>-10- TRIP or $Q_{min}$ or IMP<br>-11- PTC warning | Page 7-65 ff | |
| C119↲ | Function PTC<br>822X/824X | -0- | -0- PTC input not active<br>-1- PTC input active, TRIP and pulse inhibit will be set<br>-2- PTC input active Warning | Page 7-72 | |
| C120 | $I^2 \cdot t$ switch-off<br>822X/824X | 0 | 0 {1 %} 100 | Page 7-71 | If C120 = 0, the function is not active |
| C125↲* | LECOM baud rate | -0- | -0- 9600 baud<br>-1- 4800 baud<br>-2- 2400 baud<br>-3- 1200 baud<br>-4- 19200 baud | | Only for LECOM applications |
| C142↲ | Start condition | -1- | -0- Automatic start inhibited, flying-restart circuit not active<br>-1- Automatic start, if term. 28 HIGH, flying-restart circuit not active<br>-2- Automatic start inhibited, flying-restart circuit active<br>-3- Automatic start, if term. 28 HIGH, flying-restart circuit active | Page 7-49 | |
| C144↲ | Chopper-frequency reduction<br>821X/822X/824X | -1- | -0- No chopper-frequency lowering<br>-1- Automatic chopper frequency reduction at $\vartheta_{max}$ - 10 °C | Page 7-29 | |
| C161* | Current fault | | | Page 8-2 | Display only |
| C162* | Last fault | | | Page 8-2 | Display only |
| C163* | Last but one fault | | | Page 8-2 | Display only |
| C164* | Last but two fault | | | Page 8-2 | Display only |
| C170↲ | TRIP-reset selection | | -0- TRIP reset by pressing the STP key or LOW signal at ctrl. enable or fieldbus<br>-1- Auto TRIP reset or TRIP reset by pressing the STP key or LOW signal at ctrl. enable or fieldbus | Page 8-4 | |
| C171 | Deceleration for Auto-TRIP reset | 0.00 | 0.00 {0.01 s} 60.00 | Page 8-4 | |
| C178* | Operating time | | | Page 7-64 | Display only |

# Configuration

| Code | Name | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|
| | | Lenze | Choice | | Info | |
| C179* | Mains connection time | | | | Page 7-64 | Display only |
| C377*↲ | Gain voltage detection 822X/824X | | | | | **Should only be changed by the Lenze Service!** |
| C500* | Display factor Application datum numerator 821X/822X/824X | 2000 | 1 {1} | 25000 | Page 7-63 | |
| C501* | Display factor for process variable denominator 821X/822X/824X | 10 | 1 {1} | 25000 | Page 7-63 | |

EDS8200U--D2
00406186

# Manual
# Part D2

## Code table

## for the series
## 8210/20/40 HVAC (V020)

**Global Drive**

*Frequency inverters 8200*

This Manual is valid for 82XX controllers as of version:

| Type | Design | Hardware version and index | Software version and index | Variant | Explanation |
|---|---|---|---|---|---|
| 33.820X- | E- | 1x. | 1x | | (8201 - 8204) |
| 33.8202- | E- | 1x. | 1x | -V002 | Reduced assembly depth (8202) |
| 33.821X- | E- | 0x. | 1x | | (8211 - 8218) |
| 33.821X- | E- | 1x. | 2x | | (8211 - 8218) |
| 33.821X- | C- | 1x. | 2x | -V003 | Cold plate (8215 - 8218) |
| 33.821X- | E- | 3a. | 3x | -V020 | HVAC (8211 - 8218) |
| 33.822X- | E- | 0x. | 0x | | (8221 - 8227) |
| 33.822X- | C- | 1x. | 2x | -V003 | Cold plate (8221 - 8222) |
| 33.822X- | E- | 3a. | 3x | -V020 | HVAC (8221 - 8227) |
| 33.824X- | E- | 1x. | 1x | | (8241 - 8246) |
| 33.824X- | C- | 1x. | 1x | -V003 | Cold plate (8241 - 8246) |
| 33.824X- | E- | 3a. | 3x | -V020 | HVAC (8241 - 8246) |

Type

Design:
B = Module
C = Cold plate
E = Built-in unit IP20

Hardware version and index

Software version and index

Variant

Explanation

| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

## 7.9 Code table for “HVAC” series

### How to read the code table:

| Column | Abbreviation | Meaning |
|---|---|---|
| Code | C013 | Code C013<br>● The parameter of the code can be different in PAR1 and PAR2.<br>● The parameter value is accepted immediately (ONLINE). |
| | C009* | ● The parameter value of the code is always the same in PAR1 and PAR2, but is always displayed in PAR1. |
| | C001↵ | ● The parameter value of the code will be accepted after pressing SH+ PRG. |
| | [C002] | ● The parameter value of the code will be accepted after pressing SH+ PRG, but only if the controller is inhibited. |
| | C010• | ● Parameter value of the code will only be displayed in [Hz], if C500 = 2000 and C501 = 10 (factory setting). See chapter 7.6.3. |
| Name | | Name of the code. |
| | 821X | Controller-specific setting possibilities (here for 821X).<br>Without unit designation, the code is valid for all unit types. |
| Lenze | | Factory setting of the code |
| | * | The column ”Important” contains further information. |
| Choice | 1 {1 %} 99 | Min. value {Steps/Unit} Max. value |
| Info | - | Meaning of the code |
| IMPORTANT | - | Additional, important explanation of the code |

| Code | Name | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|
| | | Lenze | Choice | | Info | |
| C001↵ | Operating mode | -0- | -0- | Setpoint selection via term. 8<br>Control via terminals<br>Parameter setting via 8201BB | Page 7-9, 7-42 | |
| | | | -1- | Setpoint selection via 8201BB or LECOM<br>Control via terminals<br>Parameter setting via 8201BB | | |
| | | | -2- | Setpoint selection via term. 8<br>Control via terminals<br>Parameter setting via LECOM | | |
| | | | -3- | Setpoint selection via LECOM<br>Control via LECOM<br>Parameter setting via LECOM | | |
| [C002]* | Parameter set | -0- | -0- | Function executed | Page 7-10 | |
| | | | -1- | Overwrite PAR1 with factory setting | | |
| | | | -2- | Overwrite PAR2 with factory setting | | |
| | | | -3- | Overwrite PAR1 and PAR2 with the data of the operating module | | |
| | | | -4- | Overwrite PAR1 with the data of the operating module | | |
| | | | -5- | Overwrite PAR2 with the data of the operating module | | |
| | | | -6- | Transmit PAR1 and PAR2 to the operating module | | |
| | | | -7- | Overwrite PAR1, PAR2 and the unit-dependent data (C016, C036, C088, C091) with the data of the operating module | | |

# Configuration

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C003↲ | Save parameter set | -1- | -0- Data will not be saved on EEPROM; all data will be lost when switching off the mains<br>-1- Data will be saved on EEPROM; setting when switching on the mains | Page 7-8 | -0- only valid for C010, C011, C012, C013, C037, C038, C105, C181 and C182 |
| C004↲ | Switch-on display | -0- | -0- Field frequency $f_d$<br>-1- Unit load<br>-2- Motor current | Page 7-62 | |
| C005↲ | Configuration | -0- | -0- Operation with open-loop control via terminal 8<br>-1- Operation with open-loop control via terminal 8 with setpoint summation via frequency input E1<br>-2- Operation with open-loop control via frequency input E1 with setpoint summation via terminal 8 | Page 7-26, 7-61 | If C005 = -0-<br>• 2 ms cycle time<br>If C005 = -1- ... -7-<br>• 4 ms cycle time<br>C005 = -4-, -5- not applicable |
| | | | -3- Open loop operation via frequency input E1 with limitation of the apparent motor current via terminal 8<br>-6- Operation with closed-loop control; setpoint via terminal 8 with digital frequency feedback via terminal E1<br>-7- Operation with closed-loop control, setpoint via frequency input E1 with analog feedback via terminal 8 | C005 = -3- with C014 = -2-, -4- possible | |
| C007↲ | Terminal configuration | -0- | E4 E3 E2 E1<br>-0- CW/CCW GSB JOG1/2/3<br>-1- CW/CCW PAR JOG1/2/3<br>-2- CW/CCW QSP JOG1/2/3<br>-3- CW/CCW PAR GSB JOG1<br>-4- CW/CCW QSP PAR JOG1<br>-5- CW/CCW GSB TRIP set JOG1<br>-6- CW/CCW PAR TRIP set JOG1<br>-7- CW/CCW PAR GSB TRIP set<br>-8- CW/CCW QSP PAR TRIP set<br>-9- CW/CCW QSP TRIP set JOG1<br>-10- CW/CCW TRIP set UP DOWN | Page 7-10, 7-44, 7-46, 7-50, 7-54, 7-58, | • R = CW rotation<br>• L = CCW rotation<br>• GSB = DC-injection brake<br>• PAR = Parameter set changeover<br>• JOG = Fixed frequency<br>• QSP = Quick stop |

| Code | Name | Possible settings | | | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | | | Info | |
| C007↲ | Terminal configuration | -0- | | E4 | E3 | E2 | E1 | | • TRIP Set =<br>External fault<br>• UP/DOWN =<br>Motor potentiometer functions<br>• H/Re =<br>Manual/remote changeover<br>• I-OFF =<br>Reset of the I-component of the PID controller<br>• D/F =<br>Digital frequency input 0 - 10 kHz<br>• EINFL_0 =<br>Set the influence of the PID controller to 0<br><br>For parameter set changeover via terminals, the corresponding terminal must be assigned with PAR in both parameter sets. |
| (continued) | | | -11- | CW/CCW | GSB | UP | DOWN | | |
| | | | -12- | CW/CCW | PAR | UP | DOWN | | |
| | | | -13- | CW/CCW | QSP | UP | DOWN | | |
| | | | -14- | CCW/QSPCW/QSP | | GSB | JOG1 | | |
| | | | -15- | CCW/QSPCW/QSP | | PAR | JOG1 | | |
| | | | -16- | CCW/QSPCW/QSP | | JOG1/2/3 | | | |
| | | | -17- | CCW/QSPCW/QSP | | PAR | GSB | | |
| | | | -18- | CCW/QSPCW/QSP | | PAR | TRIP set | | |
| | | | -19- | CCW/QSPCW/QSP | | GSB | TRIP set | | |
| | | | -20- | CCW/QSPCW/QSP | | TRIP set | JOG1 | | |
| | | | -21- | CCW/QSPCW/QSP | | UP | DOWN | | |
| | | | -22- | CCW/QSPCW/QSP | | UP | JOG1 | | |
| | | | -23- | H/Re | CW/CCW | UP | DOWN | | |
| | | | -24- | H/Re | PAR | UP | DOWN | | |
| | | | -25- | H/Re | GSB | UP | DOWN | | |
| | | | -26- | H/Re | JOG1 | UP | DOWN | | |
| | | | -27- | H/Re | TRIP set | UP | DOWN | | |
| | | | -28- | JOG1/2/3 | | I-OFF | D/F | | |
| | | | -29- | JOG1 | GSB | I-OFF | D/F | | |
| | | | -30- | JOG1 | QSP | I-OFF | D/F | | |
| | | | -31- | GSB | QSP | I-OFF | D/F | | |
| | | | -32- | TRIP set | QSP | I-OFF | D/F | | |
| | | | -33- | QSP | PAR | I-OFF | D/F | | |
| | | | -34- | CCW/QSPCW/QSP | | I-OFF | D/F | | |
| | | | -35- | JOG1/2/3 | | PAR | D/F | | |
| | | | -36- | GSB | QSP | PAR | D/F | | |
| | | | -37- | JOG1 | QSP | PAR | D/F | | |
| | | | -38- | JOG1 | PAR | TRIP set | D/F | | |
| | | | -39- | JOG1/2/3 | | TRIP set | D/F | | |
| | | | -40- | JOG1 | QSP | TRIP set | D/F | | |
| | | | -41- | JOG1 | GSB | TRIP set | D/F | | |
| | | | -42- | QSP | GSB | TRIP set | D/F | | |
| | | | -43- | CW/CCW | QSP | TRIP set | D/F | | |
| | | | -44- | UP | DOWN | PAR | D/F | | |
| | | | -45- | CW/CCW | QSP | PAR | D/F | | |
| | | | -46- | H/Re | PAR | QSP | JOG1 | | |
| | | | -47- | CW/QSPCCW/QSP | | H/Re | JOG1 | | |
| | | | -48- | INFL_0 | GSB | I-OFF | D/F | | |
| | | | -49- | INFL_0 | JOG1 | QSP | D/F | | |
| | | | -50- | INFL_0 | JOG1 | I-OFF | D/F | | |
| | | | -51- | GSB | PAR | I-OFF | D/F | | |

# Configuration

| Code | Name | Possible settings: Lenze | Possible settings: Choice | Possible settings: Info | IMPORTANT |
|---|---|---|---|---|---|
| C008↲ | Function relay K1 | -1- | -0- Ready for operation | Page 7-65 | |
| | | | -1- TRIP fault message | | |
| | | | -2- Motor is running | | |
| | | | -3- Motor is running / CW rotation | | |
| | | | -4- Motor is running / CCW rotation | | |
| | | | -5- Field frequency $f_d$ = 0 | | |
| | | | -6- $f_{dset}$ reached | | |
| | | | -7- $Q_{min}$ reached | | |
| | | | -8- $I_{max}$ reached | | |
| | | | -9- Overtemperature ($\vartheta_{max}$ -10 °C) | | |
| | | | -10- TRIP or $Q_{min}$ or IMP | | |
| | 822X/824X | | -11- PTC warning | | |
| | | | -12- Apparent motor current (C054) < threshold C156 | | |
| | | | -13- Apparent motor current (C054) < current threshold C156 and $f_d$ > $Q_{min}$threshold (C017) | | |
| | | | -14- Apparent motor current (C054) < threshold C156 and input of ramp function generator = output of ramp function generator | | |
| | 822X/824X | | -15- Warning motor phase failure | | |
| | | | -16- $f_d$ (C050) < $f_{dmin}$ (C010) | | |
| C009*↲ | Device address | 1 | 1 {1} 99 | | Only for LECOM applications |
| C010• | Minimum field frequency | 0.00 | 0.00 {0.02 Hz} 480.00 | Page 7-15 | |
| C011• | Maximum field frequency | 50.00 | 7.50 {0.02 Hz} 480.00 | Page 7-15 | |
| C012 | Acceleration time $T_{ir}$ | 5.00 | 0.00 {0.02 s} 1300.00 | Page 7-16 | |
| C013 | Deceleration time $T_{if}$ | 5.00 | 0.00 {0.02 s} 1300.00 | Page 7-16, 7-55 | |
| C014↲ | Control mode | -4- | -2- Linear characteristic V ~ $f_d$ with constant $V_{min}$ boost | Page 7-19, 7-22, 7-24 | |
| | | | -3- Square characteristic V ~ $f_d^2$ with constant $V_{min}$ boost | | |
| | | | -4- Motor-current control | | |
| C015 | V/f rated frequency | 50.00 | 7.50 {0.02 Hz} 960.00 | Page 7-22 | |
| C016 | $V_{min}$ setting | * | 0.00 {0.02 %} 40.00 | Page 7-24 | * depends on the unit |
| C017• | Threshold $Q_{min}$ | 0.00 | 0.00 {0.02 Hz} 480.00 | Page 7-65 | |
| C018↲ | Chopper frequency | -1- | -0- 4 kHz power-loss optimised | Page 7-29 | |
| | | | -1- 8 kHz, power-loss optimised | | |
| | | | -2- 12 kHz power-loss optimised | | |
| | | | -3- 16 kHz power-loss optimised | | |
| | | | -4- 4 kHz noise optimised | | |
| | | | -5- 8 kHz noise optimised | | |
| | | | -6- 12 kHz noise optimised | | |
| | | | -7- 16 kHz noise optimised | | |
| C019• | Threshold auto DC brake | 0.10 | 0.00 {0.02 Hz} 5.00 | Page 7-56 | |

| Code | Name | Possible settings: Lenze | Choice | Info | IMPORTANT |
|---|---|---|---|---|---|
| C021 | Slip compensation | 0.0* | -50.0 {0.1 %} 50.0 | Page 7-28 | * If C014 = -2-, -3-, controller dependent |
| | | 0.0 | 0.0 {0.1 %} 20.0 | | If C014 = -4- |
| C022 | $I_{max}$ limit (motor mode) | 150 | 30 {1 %} 150 | Page 7-17 | |
| C023 | $I_{max}$ limit (generator mode) | 80 | 30 {1 %} 150 | Page 7-17 | The current-limit controller for operation in generator mode is not active at 30 %. |
| C026 | Offset adjustment analog input | 0.00 | -10.00 {0.01 V} 10.00 | Page 7-40 | C026 < 0 V<br>• $f_{dmin}$ can fall below the value set under C010 |
| C027 | Scaling factor of analog input | 100.0 | -200.0 {0.1 %} 200.0 | Page 7-40 | |
| C034↲ | Master current | -0- | -0- 0 to 20 mA / 0 to 5 V / 0 to 10 V<br>-1- 4 to 20 mA | Page 7-40 | |
| C035*↲ | Selection DC brake | -0- | -0- Selection of brake voltage under C036<br>-1- Selection of brake current under C036 | Page 7-56 | |
| C036 | Voltage/current for DCB | * | 0.00 {0.02 %} 150.00 | Page 7-56 | * depends on the unit |
| C037• | JOG value 1 | 20.00 | -480.00 {0.02 Hz} 480.00 | Page 7-43 | |
| C038• | JOG value 2 | 30.00 | -480.00 {0.02 Hz} 480.00 | Page 7-43 | |
| C039• | JOG value 3 | 40.00 | -480.00 {0.02 Hz} 480.00 | Page 7-43 | |
| C040 | Controller enable | * | -0- Controller inhibited<br>-1- Controller enabled | Page 7-62 | * see Operating Instructions 2102 |
| C043 | TRIP reset | * | -0- No current fault<br>-1- Current fault | | |
| C046• | Frequency setpoint | * | -480.00 {0.02 %} 480.00 | Page 7-62 | |
| C047* | Current setpoint $I_{max}$ limit value | | | Page 7-62 | Display only [%]<br>$I_{max}$ limit value (C022) |
| C049*• | Additional setpoint | | | Page 7-47, 7-62 | Display only<br>• Only if C005 = 1, 2 |
| C050*• | Output frequency | | | Page 7-62 | Display only |
| C051*• | Actual PID controller value | | | Page 7-34, 7-62 | |
| C052* | Motor voltage | | | Page 7-62 | Display only [V] |
| C053* | DC-bus voltage | | | Page 7-62 | |
| C054* | Motor current | | | Page 7-62, 7-65 | Display only [A] |
| C056* | Unit load | | | Page 7-62 | Display only [%] |
| C061* | Heat sink temperature | | | Page 7-62 | Display only [°C] |

# Configuration

| Code | Name | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | Info | |
| C070 | Gain PID controller | 1.00 | 0.00 | {0.01} | 300.00 | Page 7-34 | 0.0 = P-component not active |
| C071 | Integral action time PID controller | 100 | 10 | | 9999 | Page 7-34 | 9999 = I-component not active |
| C072 | Differential component of PID controller | 0.0 | 0.0 | {0.1} | 5.0 | Page 7-34 | 0.0 = D-component not active |
| C074 | Influence PID controller | 0.0 | 0.0 | {0.1 %} | 100.0 | Page 7-34 | |
| C077* | Gain $I_{max}$ controller | 0.25 | 0.00 | {0.01} | 1.00 | Page 7-18 | |
| C078* | Integral action time $I_{max}$ controller | 65 | 12 | {1 ms} | 9990 | Page 7-18 | |
| C079 | Oscillation damping | * | | | | Page 7-31 | * depends on the unit |
| | 822X/824X | 5 | 0 | {1} | 80 | | |
| C088 | Rated motor current | * | 0<br>0.0 ... 2.0 · rated output current | {1 A} | 480 | Page 7-27 | |
| C091 | Motor cos φ | * | 0.4 | {0.1} | 1.0 | Page 7-27 | |
| C093* | Type | | | | | Page 7-64 | Display only |
| | 821X | | 821X | | | | |
| | 822X | | 822X | | | | |
| | 824X | | 824X | | | | |
| C099* | Software version | | 82 3x (Software 3x) | | | Page 7-64 | |
| C105 | Deceleration time QSP | 5.00 | 0.00 | {0.02 s} | 1300.00 | Page 7-55 | |
| C106 | Holding time for autom. DC injection brake | 0.02 | 0.00 | {0.01 s} | 999.00 | Page 7-56 | |
| C108* | Gain (C111) | 128 | 0 | {1} | 255 | Page 7-69 | |

| Code | Name | Possible settings Lenze | Choice | | Info | IMPORTANT |
|---|---|---|---|---|---|---|
| C111↵ | Monitor signal | -0- | -0- | Field frequency | Page 7-69 | Selection -9- ... -25- corresponds to the relay output functions C008 and C117:<br>• LOW = 0 V<br>• HIGH = 10 V |
| | | | -1- | Unit load | | |
| | | | -2- | Motor current | | |
| | | | -3- | DC-bus voltage | | |
| | | | -4- | Motor power | | |
| | | | -5- | Motor voltage | | |
| | | | -6- | Analog output $1/f_d$ (1/C050) | | |
| | | | -7- | Field frequency of $f_{dmin}$ (C010) ... $f_{dmax}$ (C011) | | |
| | | | -8- | Actual PID controller value | | |
| | | | -9- | Ready for operation | | |
| | | | -10- | TRIP fault message | | |
| | | | -11- | Motor is running | | |
| | | | -12- | Motor is running / CW rotation | | |
| | | | -13- | Motor is running / CCW rotation | | |
| | | | -14- | Field frequency $f_d$ = 0 | | |
| | | | -15- | $f_{dset}$ reached | | |
| | | | -16- | $Q_{min}$ reached | | |
| | | | -17- | $I_{max}$ reached | | |
| | | | -18- | Overtemperature ($\vartheta_{max}$ -10°) | | |
| | | | -19- | TRIP, $Q_{min}$ or IMP set | | |
| | 822X/824X | | -20- | PTC warning | | |
| | | | -21- | Apparent motor current (C054) < current threshold (C156) | | |
| | | | -22- | Apparent motor current (C054) < current threshold (C156) and $f_d$ > $Q_{min}$ threshold | | |
| | | | -23- | Apparent motor current (C054) < threshold (C156) and input of ramp function generator = output of ramp function generator | | |
| | 822X/824X | | -24- | Warning motor phase failure | | |
| | | | -25- | $f_d$ (C050) < $f_{dmin}$ (C010) | | |

| Code | Name | Lenze | Choice | E4 | E3 | E2 | E1 | Info | IMPORTANT |
|---|---|---|---|---|---|---|---|---|---|
| C114↵ | Signal level digital inputs | -0- | -0- | 0 | 0 | 0 | 0 | Page 7-52 | 0: Ex is not inverted<br>1: Ex is inverted |
| | | | -1- | 0 | 0 | 0 | 1 | | |
| | | | -2- | 0 | 0 | 1 | 0 | | |
| | | | -3- | 0 | 0 | 1 | 1 | | |
| | | | -4- | 0 | 1 | 0 | 0 | | |
| | | | -5- | 0 | 1 | 0 | 1 | | |
| | | | -6- | 0 | 1 | 1 | 0 | | |
| | | | -7- | 0 | 1 | 1 | 1 | | |
| | | | -8- | 1 | 0 | 0 | 0 | | |
| | | | -9- | 1 | 0 | 0 | 1 | | |
| | | | -10- | 1 | 0 | 1 | 0 | | |
| | | | -11- | 1 | 0 | 1 | 1 | | |
| | | | -12- | 1 | 1 | 0 | 0 | | |
| | | | -13- | 1 | 1 | 0 | 1 | | |
| | | | -14- | 1 | 1 | 1 | 0 | | |
| | | | -15- | 1 | 1 | 1 | 1 | | |

# Configuration

| Code | Name | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|
| | | Lenze | Choice | | Info | |
| C115↲ | Priority mask digital inputs | -0- | | E4 E3 E2 E1 | Page 7-53 | 0: Function Ex depends on C001<br>1: Function Ex is independent of C001<br>• Ctrl. inhibit and TRIP reset always have first priority.<br>• With -0- also TRIP set and QSP have priority. |
| | | | -0- | 0 0 0 0 | | |
| | | | -1- | 0 0 0 1 | | |
| | | | -2- | 0 0 1 0 | | |
| | | | -3- | 0 0 1 1 | | |
| | | | -4- | 0 1 0 0 | | |
| | | | -5- | 0 1 0 1 | | |
| | | | -6- | 0 1 1 0 | | |
| | | | -7- | 0 1 1 1 | | |
| | | | -8- | 1 0 0 0 | | |
| | | | -9- | 1 0 0 1 | | |
| | | | -10- | 1 0 1 0 | | |
| | | | -11- | 1 0 1 1 | | |
| | | | -12- | 1 1 0 0 | | |
| | | | -13- | 1 1 0 1 | | |
| | | | -14- | 1 1 1 0 | | |
| | | | -15- | 1 1 1 1 | | |
| C117↲ | Function relay K2 | | | | Page 7-65 ff | |
| | | -0- | -0- | Ready for operation | | |
| | | | -1- | TRIP fault message | | |
| | | | -2- | Motor is running | | |
| | | | -3- | Motor is running / CW rotation | | |
| | | | -4- | Motor is running / CCW rotation | | |
| | | | -5- | Field frequency $f_d = 0$ | | |
| | | | -6- | $f_{dset}$ reached | | |
| | | | -7- | $Q_{min}$ reached | | |
| | | | -8- | $I_{max}$ reached | | |
| | | | -9- | Overtemperature ($\vartheta_{max}$ -10°C) | | |
| | | | -10- | TRIP or $Q_{min}$ or IMP | | |
| | 822X/824X | | -11- | PTC warning | | |
| | | | -12- | Apparent motor current (C054) < threshold C156 | | |
| | | | -13- | Apparent motor current (C054) < current threshold C156 and $f_d > Q_{min}$ threshold (C017) | | |
| | | | -14- | Apparent motor current (C054) < threshold C156 and input of ramp function generator = output of ramp function generator | | |
| | 822X/824X | | -15- | Warning motor phase failure | | |
| | | | -16- | $f_d$ (C050) < $f_{dmin}$ (C010) | | |
| C119↲ | Function PTC | | | | Page 7-72 | |
| | 822X/824X | -0- | -0- | PTC input not active | | |
| | | | -1- | PTC input active, TRIP and pulse inhibit will be set | | |
| | | | -2- | PTC input active<br>Warning | | |
| C120 | $I^2 \cdot t$ switch-off | | | | Page 7-71 | |
| | 822X/824X | 0 | 0 | {1 %} 100 | | If C120 = 0, the function is not active |

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C125↲* | LECOM baud rate | -0- | -0- 9600 baud<br>-1- 4800 baud<br>-2- 2400 baud<br>-3- 1200 baud<br>-4- 19200 baud | | Only for LECOM applications |
| C126* | Selection of communication fault | -0- | -0- No TRIP when stopping the communication in the process channel<br>-1- TRIP (-CEO-) when stopping the communication in the process channel | | Only for bus operation |
| C127 | Choice Set-value input | -0- | -0- Absolute setpoint selection in Hz via C046 or process channel<br>-1- Normalised setpoint selection via C141 (0 ... 100 %) or process channel (± 16384 = $f_{dmax}$ (C011)) | | |
| C135* | Control word | | | | See Operating Instructions 2102 |
| C141* | Standardised setpoint | | -100.00 {0.01 %} 100.00 | | Only for bus operation<br>Only when C127 = 1 active |
| C142↲ | Start condition | -1- | -0- Automatic start inhibited, flying-restart circuit not active<br>-1- Automatic start, if term. 28 HIGH, flying-restart circuit not active<br>-2- Automatic start inhibited, flying-restart circuit active<br>-3- Automatic start, if term. 28 HIGH, flying-restart circuit active | Page 7-49 | |
| C144↲ | Chopper frequency reduction | -1- | -0- No chopper-frequency reduction<br>-1- Automatic chopper frequency reduction at $\vartheta_{max}$ - 10 °C | Page 7-29 | |
| C150* | Status word | | | | See Operating Instructions 2102 |
| C156* | Current threshold | 0 | 0 {1 %} 150 | Page 7-65<br>E.g. with belt monitoring | |
| C161* | Actual fault | | | Page 8-2 | Display only |
| C162* | Last fault | | | Page 8-2 | |
| C163* | Last but one fault | | | Page 8-2 | |
| C164* | Last but two fault | | | Page 8-2 | |
| C170↲ | TRIP-reset selection | | -0- TRIP reset by pressing the STP key or LOW signal at ctrl. enable or fieldbus<br>-1- Auto TRIP reset or TRIP reset by pressing the STP key or LOW signal at ctrl. enable or fieldbus | Page 8-4 | |
| C171 | Deceleration for Auto-TRIP reset | 0.00 | 0.00 {0.01 s} 60.00 | Page 8-4 | |
| C178* | Operating time | | | Page 7-64 | Display only |
| C179* | Mains connection time | | | Page 7-64 | |
| C181*• | Setpoint PID controller | 0.00 | -480.00 {0.02 Hz} 480.00 | Page 7-34, 7-38 | Only with C181 ≠ 0 active |

# Configuration

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C182* | Integration time ramp function generator S-shape | 0.00 | 0.00 {0.01 s} 50.00 | Page 7-32 | • C182 = 0.00<br>- Linear ramp function generator<br>• C182 > 0.00<br>- Ramp function generator S shape with $T_i$ time = C182 |
| C196*↲ | Input condition autom. DC injection brake | -0- | -0- DC brake active at C050 < C019<br>-1- DC brake active at C050 < C019 **and** Setpoint < C019 | Page 7-56 | |
| C200 | Software EKZ | | | | |
| C238↲ | Frequency precontrol | -1- | -0- No precontrol<br>-1- With setpoint precontrol | Page 7-34, 7-39 | |
| C239↲ | Frequency setting range | -0- | -0- Bipolar<br>-1- Unipolar | Page 7-39 | |
| C304 | Password1 | | | | **Should only be changed by the Lenze Service!** |
| C305 | Password2 | | | | |
| C307 | Contents of the address | | | | |
| C308 | Address | | | | |
| C377*↲ | Gain voltage detection 822X/824X | | | | |
| C395 | LWORD process input data | | | | Only for bus operation |
| C396 | LWORD process output data | | | | |
| C425↲* | Adjustment of digital frequency | -2- | Dig.-freq. / Reso-lution / Scann-ing / Max.-freq.<br>-0- 100 Hz 1/200 1 s 300 Hz<br>-1- 1 kHz 1/200 100 ms 3 kHz<br>-2- 10 kHz 1/200 10 ms 10 kHz<br>-3- 10 kHz 1/1000 50 ms 10 kHz<br>-4- 10 kHz 1/10000 500 ms 10 kHz | Page 7-60 | When using the analog input module 9279 for the frequency input E1:<br>• Set C425 to 2, 3 or 4 |
| C426* | Gain adjustment frequency input E1 | 100 | -200.0 {0.1 %} 200.0 | Page 7-60 | |
| C427 | Offset adjustment frequency input E1 | 0.0 | -12.5 {0.1 %} 12.5 | Page 7-60 | |
| C500* | Display factor Application datum numerator | 2000 | 1 {1} 25000 | Page 7-63 | |
| C501* | Display factor for process variable denominator | 10 | 1 {1} 25000 | Page 7-63 | |
| C597*↲ | Activation of motor phase failure detection 822X/824X | -0- | -0- Inactive<br>-1- TRIP<br>-2- Warning | Page 7-73 | |

| Code | Name | Possible settings | | | | | IMPORTANT |
|---|---|---|---|---|---|---|---|
| | | Lenze | Choice | | | Info | |
| C599*↲ | Current limit value Motor phase failure detection | | | | | Page 7-73 | |
| | 822X/824X | 5 | 1 | {1 %} | 50 | | |
| C625*• | Skip frequency 1 | 480.00 | 0.00 | {0.02 Hz} | 480.00 | Page 7-33 | |
| C626*• | Skip frequency 2 | 480.00 | 0.00 | {0.02 Hz} | 480.00 | Page 7-33 | |
| C627*• | Skip frequency 3 | 480.00 | 0.00 | {0.02 Hz} | 480.00 | Page 7-33 | |
| C628* | Bandwidth of skip frequencies | 0.00 | 0.00 | {0.01 %} | 100.00 | Page 7-33 | |
| C988* | DC-bus voltage threshold for DC-bus voltage control | 0 | 0 | {1 %} | 200 | Page 7-12 | • C988 = 0 %<br>- No parameter set changeover via DC-bus voltage<br>• C988 = 1 ... 200 %<br>- Parameter set changeover via DC-bus voltage is active<br>**Parameter set changeover via terminal or LECOM is not possible with C988 > 0!** |

EDS8200U--E
00406187

# Manual
# Part E

## Troubleshooting and fault elimination

## Maintenance

**Global Drive**

*Frequency inverters 8200*

This Manual is valid for 82XX controllers as of version:

| Type | Design | Hardware version and index | Software version and index | Variant | Explanation |
|---|---|---|---|---|---|
| 33.820X- | E- | 1x. | 1x | | (8201 - 8204) |
| 33.8202- | E- | 1x. | 1x | -V002 | Reduced assembly depth (8202) |
| 33.821X- | E- | 0x. | 1x | | (8211 - 8218) |
| 33.821X- | E- | 1x. | 2x | | (8211 - 8218) |
| 33.821X- | C- | 1x. | 2x | -V003 | Cold plate (8215 - 8218) |
| 33.821X- | E- | 3a. | 3x | -V020 | HVAC (8211 - 8218) |
| 33.822X- | E- | 0x. | 0x | | (8221 - 8227) |
| 33.822X- | C- | 1x. | 2x | -V003 | Cold plate (8221 - 8222) |
| 33.822X- | E- | 3a. | 3x | -V020 | HVAC (8221 - 8227) |
| 33.824X- | E- | 1x. | 1x | | (8241 - 8246) |
| 33.824X- | C- | 1x. | 1x | -V003 | Cold plate (8241 - 8246) |
| 33.824X- | E- | 3a. | 3x | -V020 | HVAC (8241 - 8246) |

Type

Design:
B = Module
C = Cold plate
E = Built-in unit IP20

Hardware version and index

Software version and index

Variant

Explanation


| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

# 8 Troubleshooting and fault elimination

Occuring faults can be easily recognized through the display elements or status information (chapter 8.1).

The faults can be analysed with the history buffer (chapter 8.2) and the list in chapter 8.3, which helps you to eliminate the faults.

## 8.1 Troubleshooting

### 8.1.1 Display at the controller

During operation without operating module, two LEDs at the front indicate the operating status of the controller.

| LED | | Operating status |
|---|---|---|
| **green** | **red** | |
| on | off | Controller enabled |
| on | on | Mains switched on, automatic start inhibited (AS_LC) |
| blinking | off | Controller inhibited |
| off | blinking every second | Fault message, check under C161 |
| off | blinking every 0.4 seconds | Undervoltage switch-off |
| off | off | Programming mode (only 820X) |

### 8.1.2 Display at the operating module

Status message in the display indicate the controller status.

| Display | Meaning |
|---|---|
| OV | Overvoltage |
| UV | Undervoltage |
| IMAX | Set current limit exceeded |
| TEMP | Heat sink temperature near switch-off limit |

### 8.1.3 Maloperation of the drive

| Maloperation | Possible causes |
|---|---|
| **Motor does not rotate** | • DC-bus voltage too low<br>(Red LED is blinking every 0.4 seconds, message LU is indicated)<br>• Controller inhibited<br>(Green LED is blinking, display of the operating module: OFF, STOP or AS_LC)<br>• Setpoint = 0<br>• DC braking active<br>• Quick-stop function active<br>• JOG setpoint activated and JOG frequency = 0<br>• Fault message is displayed (see chapter 8.3)<br>• Mechanical motor brake is not released |
| **Motor does not rotate smoothly** | • Defective motor cable<br>• Maximum current C022 and C023 too low<br>• Motor underexcited or overexcited (check parameter setting) |
| **Current consumption of motor too high** | • Setting of C016 too high<br>• Setting of C015 too low<br>• C088 and C091 are not adapted to the motor data |

## 8.2 Fault analysis with the history buffer

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

The memory locations can be retrieved via the codes.

| Structure of the history buffer | | | |
|---|---|---|---|
| **Code** | **Memory unit** | **Entry** | **Note** |
| C161 | Memory unit 1 | Active fault | If the fault is no longer active or has been acknowledged:<br>• The contents of the memory locations 1 - 3 will be saved in a "higher" location.<br>• The contents of the memory location 4 will be eliminated from the history buffer and cannot be read any longer.<br>• Memory location 1 will be deleted (= no active fault). |
| C162 | Memory unit 2 | Last fault | |
| C163 | Memory unit 3 | Last but one fault | |
| C164 | Memory unit 4 | Last but two fault | |

## 8.3 Fault messages

| Display | Fault | Cause | Remedy |
|---|---|---|---|
| --- | No fault | - | - |
| EEr | External fault (TRIP-Set) | A digital input assigned to the TRIP-Set function has been activated. | Check external encoder |
| H05 | Internal fault | | Contact Lenze |
| LP1 | Motor phase failure | - Failure of one or several motor phases<br>- Motor current too low | Check motor cables, check $V_{min}$ setting, connect motor with corresponding power or adapt motor under C599. |
| LU | Undervoltage | DC-bus voltage too low | • Check mains voltage<br>• Check supply module |
| OC1 | Short-circuit | Short-circuit | Find out cause of short circuit; check cable |
| | | Excessive capacitive charging current of the motor cable | Use shorter motor cables or cables with less capacitance |

# Troubleshooting and fault elimination

| Display | Fault | Cause | Remedy |
|---|---|---|---|
| OC2 | Earth fault | Grounded motor phase | Check motor; check cable |
| | | Excessive capacitive charging current of the motor cable | Use motor cable which is shorter or has a lower capacitance |
| OC3 | Overload inverter during acceleration or short circuit | Acceleration time too short (C012) | • Increase acceleration time<br>• Check drive selection |
| | | Defective motor cable | Check wiring |
| | | Interturn fault in the motor | Check motor |
| OC4 | Overload controller during deceleration | Deceleration time too short (C013) | • Increase deceleration time<br>• Check the selection of the brake resistor or connect the brake chopper |
| OC5 | I x t overload | Frequent and too long acceleration processes with overcurrent | Check drive selection |
| | | Permanent overload with $I_{motor} > 1.05 \times I_{rx}$ | |
| OC6 | Overload motor | Motor is thermally overloaded, for instance, because of<br>• impermissible continuous current<br>• frequent or too long acceleration processes | • Check drive selection<br>• Check the setting under C120 |
| OH | Heat sink temperature is higher than the value set in the controller | Ambient temperature $T_{amb} > +40\ °C$ or $+50\ °C$ | • Allow controller to cool and ensure ventilation<br>• Check the ambient temperature in the control cabinet |
| | | Heat sink very dirty | Clean heat sink |
| | | Incorrect mounting position | Change mounting position |
| OH3 | PTC monitoring | 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 (C0585 = 3) |
| OH4 | Overtemperature unit | Inside unit too hot | • Reduce controller load<br>• Improve cooling<br>• Check fan in the controller |
| OU | Overvoltage | Mains voltage too high | Check voltage supply |
| | | Feedback operation<br>Braking operation | • Prolong deceleration times<br>• For operation with brake choppers:<br>- Check the selection and connection of the brake resistor<br>- Increase the deceleration times |
| | | Earth leakage on the motor side | Check motor cable and motor for earth fault (disconnect motor from inverter) |
| OUE | Overvoltage | Mains overvoltage longer than 5 s | Check mains voltage |
| Pr | Faulty parameter transfer via the operating module | PAR1 and PAR2 are defective | It is absolutely necessary to repeat the data transfer or load the factory setting before enabling the controller. |
| Pr1 | Faulty PAR1 transfer via the operating module | PAR1 is defective | |
| Pr2 | Faulty PAR2 transfer via the operating module | PAR2 is defective | |
| rSt | Faulty auto-TRIP reset | More than 8 fault messages in 10 minutes | Depends on the fault message |

## 8.4 Reset of fault messages

### TRIP

After eliminating the fault, the pulse inhibit will only be reset after the acknowledgement of TRIP.

**Note!**
If the TRIP source is still active, the TRIP cannot be reset.

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C170↵ | TRIP-reset selection | | -0- TRIP reset by pressing the STP key or LOW signal at ctrl. enable or fieldbus<br>-1- Auto-TRIP reset or TRIP reset by pressing the STP key or LOW signal at ctrl. enable or fieldbus | | |
| C171 | Deceleration for Auto-TRIP reset | 0.00 | 0.00 {0.01 s} 60.00 | | |

**Function**

You can select whether the fault is to be reset automatically or manually.
Auto-TRIP reset does not reset all faults automatically.

**Activation**

**C170 = -0-:**
- TRIP reset (fieldbus)
- STP key
- LOW signal at terminal 28

**C170 = -1-:**
- Auto-TRIP reset resets all faults after the time set under C171.
- TRIP reset (fieldbus)
- STP key
- LOW signal at terminal 28

**Important**

- Mains switching always resets TRIP.
- With more than 8 auto-TRIP resets within 10 minutes (internal counter), the controller sets TRIP and indicates rST (counter exceeded).
  - With TRIP reset by pressing the STP key or LOW signal at ctrl. enable or fieldbus, the controller resets the internal counter.

# 9 Maintenance

## 9.1 Maintenance services

- The controller is free of maintenance, if the prescribed conditions are observed (see chapter 3.3).
- If the ambient air is polluted, the air vents of the controller may be obstructed.
  - Check the air vents periodically (depending on the degree of pollution approx. every 4 weeks).
  - Free the obstructed air vents using a vacuum cleaner.

STOP

**Stop!**
Do not use sharp or pointed tools, such as knives or screwdrivers, to clean the air vents.

## 9.2 Service addresses

The addresses of your Lenze world-wide representatives are listed on the back cover of every Lenze publication.

Show/Hide Bookmarks

EDS8200U--F
00406188

# Manual
# Part F

## Network of several drives

## Global Drive
Frequency inverters 8200

Show/Hide Bookmarks

This Manual is valid for 82XX controllers as of version:

| Type | Design | Hardware version and index | Software version and index | Variant | Explanation |
|---|---|---|---|---|---|
| 33.820X- | E- | 1x. | 1x | | (8201 - 8204) |
| 33.8202- | E- | 1x. | 1x | -V002 | Reduced assembly depth (8202) |
| 33.821X- | E- | 0x. | 1x | | (8211 - 8218) |
| 33.821X- | E- | 1x. | 2x | | (8211 - 8218) |
| 33.821X- | C- | 1x. | 2x | -V003 | Cold plate (8215 - 8218) |
| 33.821X- | E- | 3a. | 3x | -V020 | HVAC (8211 - 8218) |
| 33.822X- | E- | 0x. | 0x | | (8221 - 8227) |
| 33.822X- | C- | 1x. | 2x | -V003 | Cold plate (8221 - 8222) |
| 33.822X- | E- | 3a. | 3x | -V020 | HVAC (8221 - 8227) |
| 33.824X- | E- | 1x. | 1x | | (8241 - 8246) |
| 33.824X- | C- | 1x. | 1x | -V003 | Cold plate (8241 - 8246) |
| 33.824X- | E- | 3a. | 3x | -V020 | HVAC (8241 - 8246) |

Type

Design:
B = Module
C = Cold plate
E = Built-in unit IP20

Hardware version and index

Software version and index

Variant

Explanation

| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

# 10 Network of several drives

## 10.1 Function

- A DC-bus network of controllers enables the energy exchange between the connected controllers on the DC-voltage level.
- If one or more controllers operate in generator mode (braking), the recovered energy will be fed into the shared DC-voltage bus or the DC source. The energy will then be available in the network of controllers which operate in motor mode.
- The energy from the three-phase AC mains can be supplied as follows:
  - Central supply via a 934X supply and feedback module.
  - Decentral supply by connecting several controllers of the network to the mains.
- The use of brake units, supply units and the energy consumption from the three-phase AC mains can be reduced.
- The number of mains supplies can be perfectly adapted to your application.

## 10.2 Conditions for trouble-free network operation

**Stop!**

- The installation and assembly notes must be applied (chapter 4).
- Connect controllers only when they have similar DC-bus/mains-voltage ranges (see the following table).
- Adapt the thresholds of brake units and input and feedback modules.
- All supplies should only be operated with the prescribed mains chokes/mains filters! (See page 10-11)

### 10.2.1 Possible combinations

Possible combinations of Lenze controllers in DC-bus connection:

| Type | Data | 820X | 821X | 822X | 824X | 93XX |
|---|---|---|---|---|---|---|
| 820X **) | ① | 1 / N / PE / AC / 190 ... 260 V ± 0 % / 50 Hz/60 Hz | | | | |
| | ② | 270 V ... 360 V | | | | |
| | ③ | 375 V | | | | |
| 821X | ① | | 3 / PE / AC / 320 ... 510 V ± 0 % / 50 Hz/60 Hz | | | |
| | ② | | 450 V ... 715 V | | | |
| | ③ | | 725 V *) | | | |
| 822X | ① | | 3 / PE / AC / 320 ... 528 V ± 0 % / 50 Hz/60 Hz | | | |
| | ② | | 460 V ... 740 V | | | |
| | ③ | | 725/765 V *) | | | |
| 824X | ① | | 3 / PE / AC / 320 ... 528 V ± 0 % / 50 Hz/60 Hz | | | |
| | ② | | 460 V ... 740 V | | | |
| | ③ | | 725/765 V *) | | | |
| 93XX | ① | | 3 / PE / AC / 320 ... 528 V ± 0 % / 50 Hz/60 Hz | | | |
| | ② | | 460 V ... 740 V | | | |
| | ③ | | 725/765 V *) | | | |

① Max. permissible mains-voltage range

② DC-bus voltage range

③ Operating threshold - brake unit

*) Set the thresholds of all units connected to the DC-bus to the same value.
Procedure: See the corresponding Operating Instructions.

**) Central supply only possible from a DC source

## 10.2.2 Mains connection

### 10.2.2.1 Cable protection/cable cross-section

- Mains fuses and cable cross-section of the mains cables must be selected according to the mains current which results from the input power $P_{DC100\,\%}$. Observe national standards, temperatures and other conditions.
- Rule of thumb for the mains current in networks:

$$I_{mains}\ [A] \approx \frac{P_{DC100\ \%} \cdot 575}{V_{mains}}$$

- See page 10-10.

### 10.2.2.2 Mains choke/mains filter

- Use the mains chokes/mains filters assigned to the network operation. Function:
  - Mains-current limitation
  - Current/power symmetry of the mains input circuits of the controllers in decentral network operation.
- Mains choke/mains filter must be selected according to the mains current and the required radio interference suppression (see page 10-11).

### 10.2.2.3 Controller protection

**Switch-on conditions**

- **Ensure simultaneous mains connection of all controller connected to the network.**

**Mains-failure detection at the controller when selecting decentral supply**

- Monitoring of the mains supply of each controller:
  - In the event of failure, the controllers still connected to the mains can be overloaded.
- Measure:
  - Switch-off the whole drive network, if a mains supply fails.
- Possibilities for detecting/indicating mains failures:
  - Application of mains fuses with alarm contact.
  - Application of thermal overcurrent releases (bimetall relay), which is connected after the mains fuses.
  - Application of power switches with thermal and magnetic releases as well as integrated alarm contact to protect the cable.

### 10.2.3 DC-bus connection

- Use short cable connections to the shared DC-bus star point.
- Cross-section of the DC-bus connection cable $\pm U_G \leftrightarrow$ DC-bus
  - must be selected according to the fuses F1 ... F3 of the corresponding controller and the local conditions.
- Cable cross-section of the DC-bus
  - must be selected according to the sum of the mains supplies in the DC-bus (see chapter 10.2.4).
- Example:

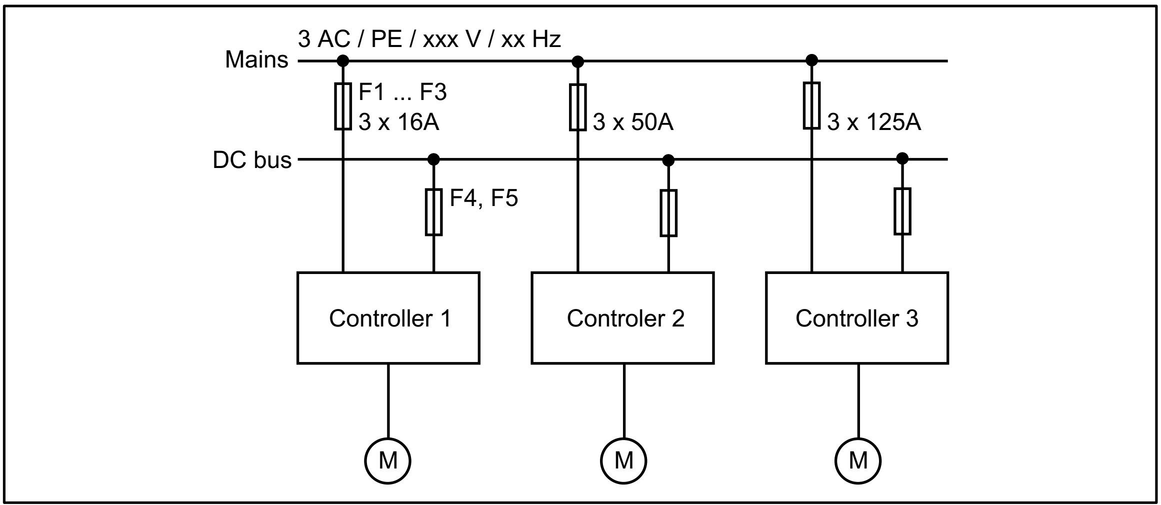



FIG 10-1 Example for the rating of the cable cross-section of the DC-bus

  - 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.
- Ensure smallest possible line inductivity by selecting the corresponding type of installation:
  - DC-bus star point in control cabinet above parallel busbar.
  - Cables between controller (connections $+U_G$ and $-U_G$) and DC-bus start point must be in parallel or twisted.

- Use the assigned DC-bus fuses F4, F5.
  (For protection, see chapter 10.2.5).
  The controller is protected by the two-pole, type-dependent protection of the controller and the DC-bus against:
  - internal short circuit,
  - internal earth fault,
  - a short circuit $+U_G \rightarrow -U_G$ on the DC-bus,
  - an earth fault via $+U_G \rightarrow$ PE or $-U_G \rightarrow$ PE.

**Note!**

- With only two controllers connected to the network, one fuse pair F4/F5 is sufficient.
  - The rating must be made taking into account the weakest controller.
- Connect an additional fuse pair F4/F5 before each controller, if more than two controllers are connected to the DC-bus.

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

The table values are valid for the operation of 821X/822X/824X controller in DC-bus operation with PDC100 %, i.e. use of the max. rated controller power on the DC-bus level (see page 10-10).

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

| Type | 821X/822X/824X: Mains input L1, L2, L3, PE | | | | | DC input $+V_{DC}$, $-V_{DC}$, PE | | |
|---|---|---|---|---|---|---|---|---|
| | Operation with mains filter/mains choke | | | | | | | |
| | Fuse F1, F2, F3 | | E.l.c.b. | Cable cross-section[1] | | Fuse F4, F5 | Cable cross-section[1] | |
| | VDE | UL | VDE | $mm^2$ | AWG | | $mm^2$ | AWG |
| **8211** | M 6A | - | B 6A | 1 | 17 | 6.3A | 1 | 17 |
| **8212** | M 6A | - | B 6A | 1 | 17 | 6.3A | 1 | 17 |
| **8213** | M 10A | - | B 10A | 1.5 | 15 | 12A | 1.5 | 15 |
| **8214** | M 10A | - | B 10A | 1.5 | 15 | 12A | 1.5 | 15 |
| **8215** | M 16A | - | B 13A | 2.5 | 13 | 16A | 2.5 | 13 |
| **8216** | M 16A | - | B 16A | 2.5 | 13 | 20A | 4 | 11 |
| **8217** | M 32A | - | B 32A | 6 | 10 | 40A | 6 | 10 |
| **8218** | M 32A | - | B 32A | 6 | 10 | 40A | 6 | 10 |
| | | | | | | | | |
| **8221** | M 50A | 50A | - | 16 | 5 | 80A | 16 | 7 |
| **8222** | M 80A | 80A | - | 25 | 3 | 100A | 25 | 5 |
| **8223** | M 80A | 80A | - | 25 | 3 | 100A | 25 | 3 |
| **8224** | M 125A | 125A | - | 70 | 2/0 | 2x 100A [2] | 2x 25 (1x 70) | 2x 3 (1x 2/0) |
| **8225** | M 125A | 125A | - | 70 | 2/0 | 2x 100A [2] | 2x 25 (1x 70) | 2x 3 (1x 2/0) |
| **8226** | M 160A | 175A | - | 95 | 3/0 | 3x 80A [2] | 3x 16 (1x 95) | 3x 5 (1x 3/0) |
| **8227** | M 200A | 200A | - | 120 | 4/0 | 3x 100A [2] | 3x 25 (1x 120) | 3x 3 (1x 4/0) |
| | | | | | | | | |
| **8241** | M 6A | 5A | B 6A | 1 | 17 | 6.3A | 1 | 17 |
| **8242** | M 6A | 5A | B 6A | 1 | 17 | 6.3A | 1 | 17 |
| **8243** | M 10A | 10A | B 10A | 1.5 | 15 | 12A | 1.5 | 15 |
| **8244** | M 10A | 10A | B 10A | 1.5 | 15 | 12A | 1.5 | 15 |
| **8245** | M 16A | 20A | B 16A | 2.5 | 13 | 20A | 4 | 11 |
| **8246** | M 32A | 25A | B 32A | 6 | 10 | 40A | 6 | 10 |

1) Observe national and regional regulations (e.g. VDE/EVU)!

2) F4, F5 are possible because of parallel fuse connection.
Parallel connection cables can be used accordingly.

## 10.2.5 Protection in networks of several drives

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 analyse the risk.

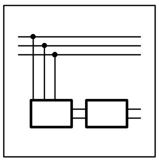
**Please note:**

- The rating of the cable cross-section of the common DC-bus must be appropriate for the sum of parallel mains supplies:
  - The sum of the rated fuse currents is the rated value for the cross-section of the busbars.
  - Observe the local standards and regulations.
- On the motor side, the cable protection is supported by the current limitation of the controller. Condition:
  - The current limit set for the controller corresponds to the rated current of the connected motor.
  - For group drives, additional protection of the single drives is required/recommended.

**Definition: "internal fault"**

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

| **Protection by** | **F1 ... F3** | |
|---|---|---|
| **Protection of** | **Cable protection**<br>• on the mains side<br>• on the DC-bus<br>• on the motor side | **No unit protection** |
| **Possible faults** | One or more controllers with<br>- internal short circuit (+$U_G$ → -$U_G$)<br>- internal earth fault (+$U_G$ → PE/-$U_G$ → PE)<br>- motor-side earth fault on phase W | Mains failure of a controller with decentral supply. |
| **Risk** | Several parallel controllers supply the fault location(s) via the DC-bus. This may lead to overload of the intact controller, as the faulty controller is not selectively activated on the DC-bus.<br>• Possible damage with central and decentral supply<br>- destruction of the controller concerned<br>- destruction of the controllers still intact<br>- destruction of the supply unit | If a mains-side supply/input fails because F1 ... F3 blows, the active controller which is connected can be overloaded. |
| **Note** | The extent of destructions depends on the ratio "DC-bus power of the whole system / rated power of the controller concerned". | |



# Network of several drives

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

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

## 10.3 Selection basics

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

### 10.3.1 Conditions

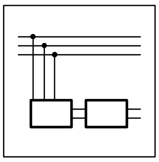
The unit data list in the table TAB 1 are only valid, if the network fulfills the following conditions:

- All inputs are connected to the three-phase AC mains by means of the mains filters prescribed in TAB 2.
- Chopper frequencies:
  - 93XX: 8 kHz.
  - 821X/822X/824X: 4 kHz or 8 kHz.
- Motors (three-phase AC asynchronous motors, asynchronous servo motor, synchronous servo motors):
  - Simultaneity factor $F_g$ = 1, i.e. all motors operate simultaneously with 100 % motor load.
  - Mains voltage $V_{mains}$ = 400 V / 50 Hz
  - Ambient temperature during operation: max. +40 °C

# Network of several drives

| **Supply power in network operation** | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **First input with type** | 9341 | 9342 | 9343 | 9330<br>8224 | 9322<br>8242 | 8211 | 8212 | 8215 | 9326<br>8246<br>8218 | 8217 | 9328<br>8222 | 8213 | 8214 | 9329<br>8223 | 9323<br>8243 | 9325<br>8245<br>8216 | 9327<br>8221 | 9324<br>8244 | 9321<br>8241 |
| Power loss $P_V$ [kW] | 0.1 | 0.2 | 0.4 | 1.1 | 0.065 | 0.0055 | 0.075 | 0.15 | 0.36<br>0.36<br>0.4 | 0.28 | 0.64 | 0.09 | 0.1 | 0.81 | 0.1 | 0.21<br>0.21<br>0.2 | 0.43 | 0.15 | 0.05 |
| $P_{DC100\,\%}$ [kW] | 8.3 | 16.6 | 31.2 | 51.8 | 2 | 2 | 2 | 6.2 | 13 | 13 | 32.7 | 4.1 | 4.1 | 34.5 | 4.2 | 7.2 | 28 | 4.6 | 2.7 |
| **Further inputs with type** | | | | | | | | | | | | | | | | | | | |
| 9341 | | | | | | | | | | | | | | | | | | | |
| 9342 | | | | | | | | | | | | | | | | | | | |
| 9343 | | | | | | | | | | | | | | | | | | | |
| 9330, 8224 | 22.9 | 33.5 | 39.3 | 42.4 | | | | | | | | | | | | | | | |
| 9322, 8242 | 0.9 | 1.3 | 1.5 | 1.6 | 1.6 | | | | | | | | | | | | | | |
| 8211 | 0.9 | 1.3 | 1.5 | 1.6 | 1.6 | 1.6 | | | | | | | | | | | | | |
| 8212 | 0.9 | 1.3 | 1.5 | 1.6 | 1.6 | 1.6 | 1.6 | | | | | | | | | | | | |
| 8215 | 2.6 | 3.8 | 4.5 | 4.8 | 4.9 | 4.9 | 4.9 | 5.1 | | | | | | | | | | | |
| 8326, 8246, 8218 | 5.2 | 7.6 | 8.9 | 9.6 | 9.7 | 9.7 | 9.7 | 10.2 | 10.6 | | | | | | | | | | |
| 8217 | 5.2 | 7.6 | 8.9 | 9.6 | 9.7 | 9.7 | 9.7 | 10.2 | 10.6 | 10.6 | | | | | | | | | |
| 9328, 8222 | 12.9 | 19 | 22.3 | 24 | 24.3 | 24.3 | 24.3 | 25.4 | 26.6 | 26.6 | 26.8 | | | | | | | | |
| 8213 | 1.6 | 2.3 | 2.7 | 2.9 | 2.9 | 2.9 | 2.9 | 3.1 | 3.2 | 3.2 | 3.2 | 3.4 | | | | | | | |
| 8214 | 1.6 | 2.3 | 2.7 | 2.9 | 2.9 | 2.9 | 2.9 | 3.1 | 3.2 | 3.2 | 3.2 | 3.4 | 3.4 | | | | | | |
| 9329, 8223 | 13 | 19 | 22.3 | 24 | 24.3 | 24.3 | 24.3 | 25.4 | 26.6 | 26.6 | 26.8 | 27.9 | 27.9 | 28.2 | | | | | |
| 9323, 8243 | 1.5 | 2.3 | 2.7 | 2.9 | 2.9 | 2.9 | 2.9 | 3 | 3.2 | 3.2 | 3.2 | 3.3 | 3.3 | 3.4 | 3.4 | | | | |
| 9325, 8245, 8216 | 2.6 | 3.8 | 4.5 | 4.8 | 4.9 | 4.9 | 4.9 | 5.1 | 5.3 | 5.3 | 5.4 | 5.6 | 5.6 | 5.7 | 5.8 | 5.9 | | | |
| 9327, 8221 | 9.7 | 14.3 | 16.7 | 18 | 18.2 | 18.2 | 18.2 | 19 | 20 | 20 | 20.1 | 20.9 | 20.9 | 21.2 | 21.6 | 22.1 | 22.9 | | |
| 9324, 8244 | 1.5 | 2.3 | 2.7 | 2.9 | 2.9 | 2.9 | 2.9 | 3 | 3.2 | 3.2 | 3.2 | 3.3 | 3.3 | 3.4 | 3.4 | 3.5 | 3.6 | 3.8 | |
| 9321, 8241 | 0.9 | 1.3 | 1.5 | 1.6 | 1.6 | 1.6 | 1.6 | 1.7 | 1.8 | 1.8 | 1.8 | 1.9 | 1.9 | 1.9 | 1.9 | 2 | 2 | 2.1 | 2.2 |

TAB 1 Supply power in DC-bus connection



| Filter assignment in network operation | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Input with type** | 9341 | 9342 | 9343 | 9330<br>8224 | 9322<br>8242 | 8211 | 8212 | 8215 | 9326<br>8246<br>8218 | 8217 | 9328<br>8222 | 8213 | 8214 | 9329<br>8223 | 9323<br>8243 | 9325<br>8245<br>8216 | 9327<br>8221 | 9324<br>8244 | 9321<br>8241 |
| Filter inductivity [mH] | 1.2 | 0.88 | 0.55 | 0.34 | 9 | 9 | 9 | 3 | 1.5 | 1.5 | 0.6 | 5 | 5 | 0.6 | 5 | 3 | 0.8 | 5 | 9 |
| Filter current [A] | 17 | 35 | 55 | 100 | 4 | 4 | 4 | 13 | 24 | 24 | 54 | 7 | 7 | 54 | 7 | 13 | 42 | 7 | 4 |
| Order No. | EZN3A0120H017 | EZN3A0088H035 | EZN3A0055H055 | EZN3A0034H100 | EZN3A0900H004 | EZN3A0900H005 | EZN3A0900H006 | EZN3A0300H013 | EZN3A0150H024 | EZN3A0150H025 | EZN3A0060H054 | EZN3A0500H007 | EZN3A0500H008 | EZN3A0060H054 | EZN3A0500H007 | EZN3A0300H013 | EZN3A0500H042 | EZN3A0500H007 | EZN3A0900H004 |

TAB 2 Prescribed mains filters for the supply in network operation

## 10.3.2 Selection example for 4 drives

### 10.3.2.1 Supply only via controllers

| Drive data | | | |
|---|---|---|---|
| **Drive** | **Controller type** | **Motor $P_M$** | **Efficiency** |
| Drive 1 | 9328 | 22 kW | $\eta = 0.9$ |
| Drive 2 | 9325 | 5.5 kW | |
| Drive 3 | 8214 | 3.0 kW | |
| Drive 4 | 8212 | 1.5 kW | |

1. Determine DC-power requirements:
   - Power loss $P_{loss}$ TAB 1.

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

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

$$P_{DC} = 34.575\ \text{kW}$$

2. Determine first input:
   - $P_{DC100\%}$ TAB 1.

| | **9328** | **9325** | **8214** | **8212** |
|---|---|---|---|---|
| **$P_{DC100\%}$** | 32.7 kW | 7.2 kW | 4.1 kW | 2.0 kW |

   - First input selected is 9328.
   - Additionally required input powers are:
     34.573 kW - 32.7 kW = 1.875 kW
3. Determine the second input:
   - Input power for 9325/8214/8212 from ”9328/8222” in TAB 1.

| | **9325** | **8214** | **8212** |
|---|---|---|---|
| **$P_{DC2}$** | 5.4 kW | 3.2 kW | not possible |

   - The power of 8214 is not sufficient.
4. Result:
   - This drive network must be connected to the three-phase AC mains via the controllers 9328 and 8214.

## 10.3.2.2 Supply by means of 934X supply and feedback module

The same drive is to be additionally equipped with 934X.

| Drive data | | | |
|---|---|---|---|
| **Drive** | **Controller type** | **Motor $P_M$** | **Efficiency** |
| Drive 1 | 9328 | 22 kW | $\eta$ = 0.9 |
| Drive 2 | 9325 | 5.5 kW | |
| Drive 3 | 8214 | 3.0 kW | |
| Drive 4 | 8212 | 1.5 kW | |

1. Determine DC-power requirements:
   - Power loss $P_{loss}$ from TAB 1.

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

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

$$P_{DC} = 34.575\ \text{kW}$$

2. Determine the required supply module:

| | **Powers** | **9341** | **9342** | **9343** |
|---|---|---|---|---|
| | $P_{DC}$<br>$P_{V934X}$<br>$P_{DCtotal}$ | 34.575 kW<br>0.1 kW<br>34.675 kW | 34.575 kW<br>0.2 kW<br>34.775 kW | 34.575 kW<br>0.4 kW<br>34.975 kW |
| Input | $P_{DC100\%934X}$ | 8.3 kW | 16.6 kW | 31.2 kW |
| Input (s) | $P_{DC2100\%9328}$<br>$P_{DC2100\%9325}$<br>$P_{DC2100\%8214}$<br>$P_{DC2100\%8212}$ | 12.9 kW<br>2.6 kW<br>1.6 kW<br>0.9 kW | 19.0 kW<br>3.8 kW<br>2.3 kW<br>1.3 kW | 22.3 kW<br>4.5 kW<br>2.7 kW<br>1.5 kW |
| | Max. possible input power | 26.3 kW | 43.0 kW | 62.2 kW |

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

3. Determine the second input:
   - Network with 9342: Second input at 9328
   - Network with 9343: Second input at 9328 or 9325

## 10.4 Central supply

The DC-bus is supplied via a central supply source. Supply sources are:

- DC source - 820X.
- Supply and feedback module - 821X/822X/824X/93XX.
- Controller with reserve power.

### 10.4.1 Central supply of 820X

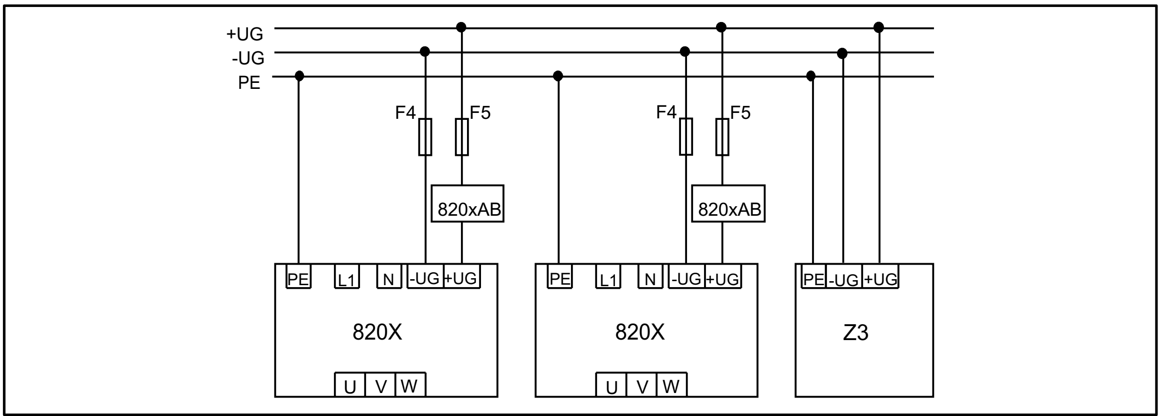



FIG 10-2 Block diagram: Central supply of several 820X controllers connected to a network

| | |
|---|---|
| F4, F5 | Fuses, DC level, see Accessories |
| Z3 | Brake chopper/brake module, see Accessories |
| 820XAB | Current-limitation module, see Accessories |

**Stop!**

For faultless network operation, the following conditions must be fulfilled in addition to the conditions described in chapter 10.2:

- The voltage flow $+U_G \rightarrow PE$ / $-U_G \rightarrow PE$ must be symmetrical!
  - The controller will be destroyed, if $+U_G$ or $-U_G$ are grounded.
- Use the current limitation module 820XAB.

## 10.4.2 Central supply via 934X for 821X/822X/824X/93XX

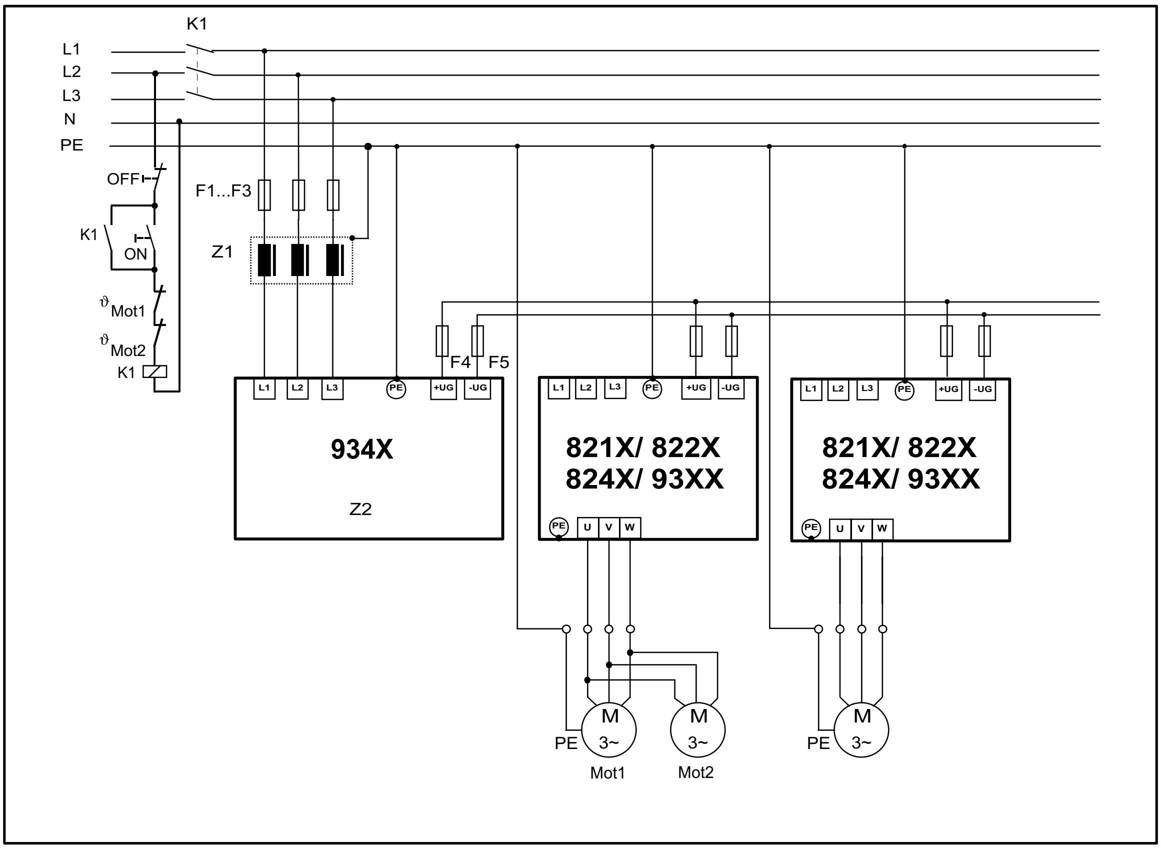



FIG 10-3 Principle diagram: Central supply for network operation of 821X/822X/824X/93XX

| | |
|---|---|
| Z1 | Mains filter/choke |
| Z2 | Regenerative power supply |
| F1 ... F5 | Fuses |
| K1 | Main contactor |

**Stop!**
The DC-bus voltage thresholds of the 93XX controller and the 934X supply unit must be set to the same value.

**Note!**
Z2 is selected after balancing the power in the DC-bus. If the power supply of the supply is not sufficient, a parallel supply can be installed via the mains input of a controller (see Network of severval drives with decentral supply).

## 10.5 Decentral supply

The DC-bus is supplied via several controllers or supply units connected in parallel to the mains.

### 10.5.1 Decentral supply for 820X

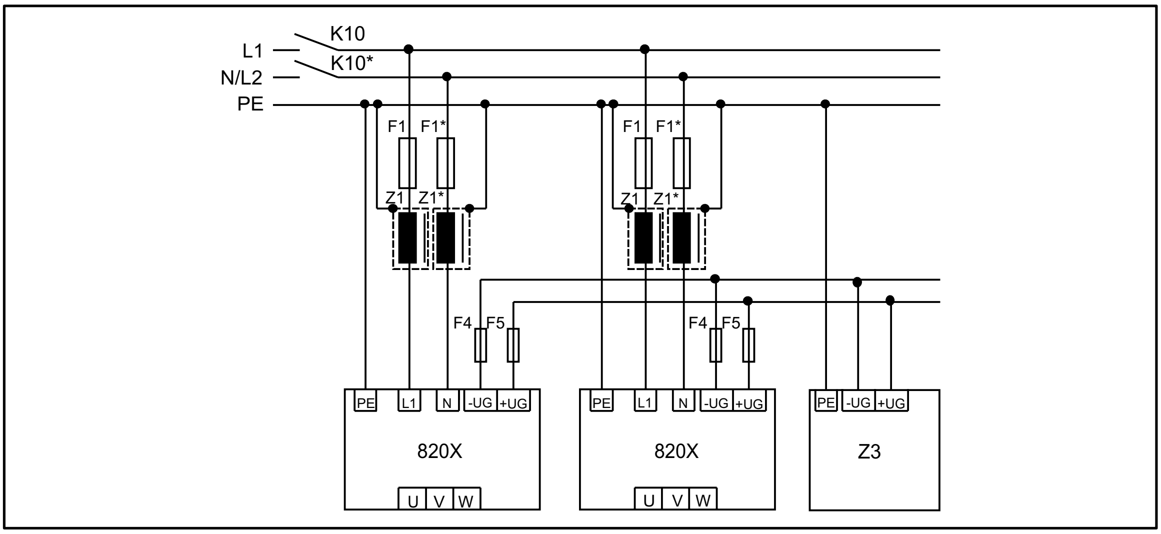



FIG 10-4 Block diagram: Decentral supply of several 820X controllers connected to a network

| | |
|---|---|
| F1, F1* | Fuses, see Accessories<br>F1* only for supply voltage 2AC / PE / 190 - 260 V ±0 % / 45 - 65 Hz ±0 % |
| K10, K10* | Mains contactor<br>K10* only for supply voltage 2AC / PE / 190 - 260 V ±0 % / 45 - 65 Hz ±0 % |
| F4, F5 | Fuses, DC level, see Accessories |
| Z1, Z1* | Mains choke/mains filter, see Accessories<br>Z1* only for supply voltage 2AC / PE / 190 - 260 V ±0 % / 45 - 65 Hz ±0 % |
| Z3 | Brake chopper/brake module, see Accessories |

STOP

**Stop!**

For faultless network operation, the following conditions must be fulfilled in addition to the conditions described in chapter 10.2:

- In-phase connection on the mains side
- With two-phase supply
  - Cable and overload protection via second assigned mains fuse F1*
  - Ensure current and power symmetry by providing a second mains choke/mains filter Z1*.

## 10.5.2 Central supply for 821X/822X/824X/93XX/934X

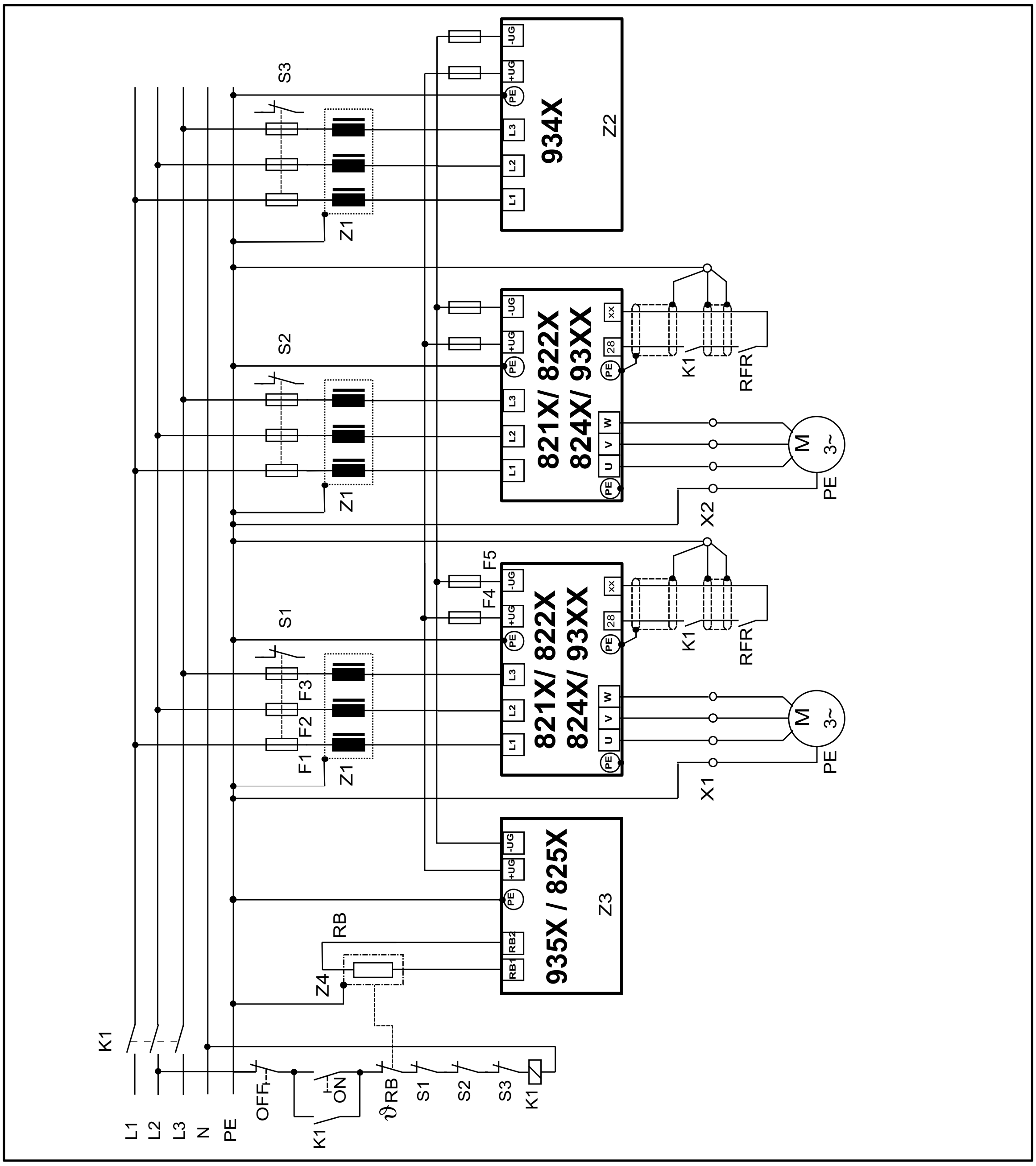



FIG 10-5 Block diagram: Decentral supply of several controllers (821X/822X/824X/93XX/934X) connected to a network

| | |
|---|---|
| F1, F2, F3 | Fuses, see Accessories |
| K10 | Mains contactor |
| F4, F5 | Fuses, DC level, see Accessories |
| Z1 | Mains choke/mains filter, see Accessories |
| Z2 | Supply module |
| Z3 | Brake unit, see Accessories |
| Z4 | Brake resistor |

# Network of several drives

## See: Table of contents of the attached Operating Instructions

Show/Hide Bookmarks

EDS8200D--G
00393452

# Manual
# Teil G

Application of brake units

**Global Drive**

*Frequency inverters 8200*

# 11 Application of brake units

**See: Table of contents of the attached Operating Instructions**

# Application of brake units

EDS8200D--H
00393453

# *Manual*
# *Teil H*

Automation

**Global Drive**

*Frequency inverters 8200*

# 12 Automation

**See: Table of contents of the attached Operating Instructions**

EDS8200U--I
00406189

# Manual
# Part I

## Accessories and motors

## Global Drive

Frequency inverters 8200

This Manual is valid for 82XX controllers as of version:

| | | | | | |
|---|---|---|---|---|---|
| 33.820X- | E- | 1x. | 1x | | (8201 - 8204) |
| 33.8202- | E- | 1x. | 1x | -V002 | Reduced assembly depth (8202) |
| 33.821X- | E- | 0x. | 1x | | (8211 - 8218) |
| 33.821X- | E- | 1x. | 2x | | (8211 - 8218) |
| 33.821X- | C- | 1x. | 2x | -V003 | Cold plate (8215 - 8218) |
| 33.821X- | E- | 3a. | 3x | -V020 | HVAC (8211 - 8218) |
| 33.822X- | E- | 0x. | 0x | | (8221 - 8227) |
| 33.822X- | C- | 1x. | 2x | -V003 | Cold plate (8221 - 8222) |
| 33.822X- | E- | 3a. | 3x | -V020 | HVAC (8221 - 8227) |
| 33.824X- | E- | 1x. | 1x | | (8241 - 8246) |
| 33.824X- | C- | 1x. | 1x | -V003 | Cold plate (8241 - 8246) |
| 33.824X- | E- | 3a. | 3x | -V020 | HVAC (8241 - 8246) |

Type

Design:
B = Module
C = Cold plate
E = Built-in unit IP20

Hardware version and index

Software version and index

Variant

Explanation

| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

# 13 Accessories (Survey)

A detailed description of the accessories and Lenze three-phase AC motors can be obtained from the corresponding catalogs.

## 13.1 Accessories for all types

| Name | Order number |
|---|---|
| 8201BB operating module | EMZ8201BB |
| Diagnosis terminal (2.5 m cable) | EMZ8272BB-V001 |
| Diagnosis terminal (5.0 m cable) | EMZ8272BB-V002 |
| Diagnosis terminal (10 m cable) | EMZ8272BB-V003 |
| Digital display | EPD203 |
| Setpoint potentiometer | ERPD0001k0001W |
| Rotary button for potentiometer | ERZ0001 |
| Scale for potentiometer | ERZ0002 |
| RS232/485 fieldbus module | EMF2102IB-V001 |
| RS485 fieldbus module | EMF2102IB-V002 |
| Level converter for RS485 | EMF2101IB |
| PC system cable RS232/485 | EWL0020 |
| Optical fibre fieldbus module | EMF2102IB-V003 |
| Optical fibre adaptor for PLC 0 ... 40 m | EMF2125IB |
| Supply unit for optical fibre adaptor 2125 | EJ0013 |
| INTERBUS module | EMF2111IB |
| PROFIBUS module | EMF2131IB |
| System bus module (CAN) | EMF2171IB |
| System bus module (CAN) with addressing | EMF2172IB |
| PTC module | EMZ8274IB |
| I/O module | EMZ8275IB |
| Monitor module | EMZ8276IB |
| Bipolar setpoint module | EMZ8278IB |

## 13.2 Software

| Name | Order number |
|---|---|
| PC program for Global Drive controllers | ESP-GDC 1 |

## 13.3 Type-specific accessories

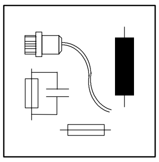
### 13.3.1 Types 820X

| Name | Order number | | | |
|---|---|---|---|---|
| | **8201** | **8202** | **8203** | **8204** |
| E.l.c.b. | EFA1C10A | EFA1C16A | EFA1C20A | EFA1C20A |
| Fuse | EFSM-0100ASB | EFSM-0150ASB | EFSM-0200ASC | EFSM-0200ASC |
| Fuse holder | EFH30001 | EFH30001 | EFH30001 | EFH30001 |
| Mains filter type "A" | EZN2-004A001 | EZN2-008A001 | EZN2-013A001 | EZN2-017A001 |
| Mains choke | ELN1-0900H005 | ELN1-0500H009 | ELN1-0350H014 | ELN1-0160H017 |
| RFI filter for operation:<br>With mains choke | EZF1-006A002 | EZF1-009A002 | EZF1-018A002 | EZF1-018A002 |
| Without mains choke | EZF1-006A002 | EZF1-009A002 | EZF1-018A002 | inadmissible |
| Motor filter | ELM3-030H003 | ELM3-020H004 | ELM3-010H010 | ELM3-014H010 |
| Sine filter | EZS3-003A001 | EZS3-004A002 | EZS3-007A001 | EZS3-010A001 |
| Brake module | EMB8251-E | EMB8251-E | EMB8251-E | EMB8251-E |
| Swivel wall assembly | EJ0001 | EJ0001 | EJ0001 | EJ0001 |
| DIN-rail assembly | EJ0002 | EJ0002 | EJ0002 | EJ0002 |
| Fan for flat assembly | EJ0003 | EJ0003 | EJ0003 | EJ0003 |
| Current-limiting module | EMZ8201AB | EMZ8201AB | EMZ8203AB | EMZ8203AB |
| DC-bus fuse | EFSM-0060AWE | EFSM-0060AWE | EFSM-0100AWE | EFSM-0160AWE |
| Fuse holder | EFH10001 | EFH10001 | EFH10001 | EFH10001 |

## 13.3.2 Types 821X

| Name | Order number | | | |
|---|---|---|---|---|
| | **8211** | **8212** | **8213** | **8214** |
| E.l.c.b. | EFA3B06A | EFA3B06A | EFA3B10A | EFA3B10A |
| Fuse | EFSM-0060AWE | EFSM-0060AWE | EFSM-0100AWE | EFSM-0100AWE |
| Fuse holder | EFH10001 | EFH10001 | EFH10001 | EFH10001 |
| Mains filter type B | EZN3B1500H003 | EZN3B0800H004 | EZN3B0750H005 | EZN3B0500H007 |
| Mains choke | ELN3-0700H003 | ELN3-0450H004 | ELN3-0350H006 | ELN3-0250H007 |
| RFI filter | | | | |
| Operating with mains choke | EZF3-008A003 | EZF3-008A003 | EZF3-008A003 | EZF3-016A003 |
| Operation without mains choke | EZF3-008A003 | EZF3-008A003 | EZF3-008A003 | inadmissible |
| Motor filter | ELM3-030H004 | ELM3-030H004 | ELM3-014H010 | ELM3-014H010 |
| Sine filter | EZS3-002A001 | EZS3-004A001 | EZS3-006A001 | EZS3-010A001 |
| Brake module | EMB8252-E | EMB8252-E | EMB8252-E | EMB8252-E |
| Brake chopper | EMB8253-E | EMB8253-E | EMB8253-E | EMB8253-E |
| Brake resistor | ERBM470R100W | ERBM370R150W | ERBM240R200W | ERBD180R300W |
| Swivel wall assembly | EJ0001 | EJ0001 | EJ0001 | EJ0001 |
| DIN-rail assembly | EJ0002 | EJ0002 | EJ0002 | EJ0002 |
| DC-bus fuse | EFSCC0063AYJ | EFSCC0063AYJ | EFSCC0080AYJ | EFSCC0120AYJ |
| Fuse holder | EFH20004 | EFH20004 | EFH20004 | EFH20004 |

| Name | Order number | | | |
|---|---|---|---|---|
| | **8215** | **8216** | **8217** | **8218** |
| E.l.c.b. | EFA3B13A | EFA3B20A | EFA3B25A | EFA3B32A |
| Fuse | EFSM-0160AWE | EFSM-0200AWE | EFSM-0250AWH | EFSM-0320AWH |
| Fuse holder | EFH10001 | EFH10001 | EFH10001 | EFH10001 |
| Mains filter type B | EZN3B0400H009 | EZN3B0300H013 | EZN3B0250H015 | EZN3B0150H024 |
| Mains choke | ELN3-0160H012 | ELN3-0160H012 | ELN3-0120H017 | ELN3-0120H025 |
| RFI filter | | | | |
| Operating with mains choke | EZF3-016A003 | EZF3-016A003 | EZF3-016A003 | EZF3-024A001 |
| Operation without mains choke | EZF3-016A003 | EZF3-024A001 | EZF3-024A001 | inadmissible |
| Motor filter | ELM3-014H010 | ELM3-007H025 | ELM3-007H025 | ELM3-007H025 |
| Sine filter | EZS3-009A002 | EZS3-013A001 | EZS3-017A001 | EZS3-024A001 |
| Brake module | EMB8252-E | EMB8252-E | EMB8252-E | EMB8252-E |
| Brake chopper | EMB8253-E | EMB8253-E | EMB8253-E | EMB8253-E |
| Brake resistor | ERBD100R600W | ERBD082R600W | ERBD068R800W | ERBD047R01k2 |
| Thermal separation ("Push-through technique") | EJ0004 | EJ0004 | EJ0004 | EJ0004 |
| Heat sink with assembly kit only for variant V003 | EJ0005 | EJ0005 | EJ0005 | EJ0005 |
| DC-bus fuse | EFSCC0160AYJ | EFSCC0200AYJ | EFSCC0320AYJ | EFSCC0400AYJ |
| Fuse holder | EFH20004 | EFH20004 | EFH20004 | EFH20004 |





## 13.3.3 Types 822X

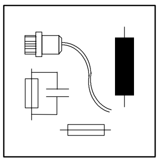
| Name | Order number | | | |
|---|---|---|---|---|
| | **8221** | **8222** | **8223** | **8224** |
| Mains filter type A | EZN3A0110A030 | EZN3A0080A042 | EZN3A0060H054 | |
| Mains filter type B | EZN3B0110A030 | EZN3B0080A042 | EZN3B0060H054 | |
| Mains choke | ELN3-088H035 | ELN3-0075H045 | ELN3-0055H055 | ELN3-0038H085 |
| Motor filter | ELM3-004H055 | ELM3-004H055 | on request | on request |
| Sine filter | on request | on request | on request | on request |
| Brake module | EMB9351-E | EMB9351-E | EMB9351-E | EMB9351-E |
| Brake chopper | EMB9352-E | EMB9352-E | EMB9352-E | EMB9352-E (2 x) |
| Brake resistor | ERBD033R02k0 | ERBD022R03k0 | ERBD018R03k0 | ERBD022R03k0 (2 x) |
| Thermal separation ("Push-through technique") | EJ0011 | EJ0011 | EJ0011 | EJ0011 |
| DC-bus fuse | EFSCC0500AYJ | EFSCC0800AYJ | EFSCC1000AYJ | EFSCC0800AYJ (2 x) |
| Fuse holder | EFH20004 | EFH20004 | EFH20004 | EFH20004 (2 x ) |

| Name | Order number | | |
|---|---|---|---|
| | **8225** | **8226** | **8227** |
| Mains filter type A | | | |
| Mains filter type B | | | |
| Mains choke | ELN3-0027H105 | ELN3-0022H130 | ELN3-0017H170 |
| Motor filter | on request | on request | on request |
| Sine filter | on request | on request | on request |
| Brake module | EMB9351-E | EMB9351-E | EMB9351-E |
| Brake chopper | EMB9352-E (2 x ) | EMB9352-E (3 x) | EMB9352-E (3 x) |
| Brake resistor | ERBD018R03k0 (2 x) | ERBD022R03k0 (3 x) | ERBD018R03k0 (3 x) |
| Thermal separation ("Push-through technique") | | | |
| DC-bus fuse | EFSCC1000AYJ (2 x) | EFSCC0800AYJ (3 x) | EFSCC1000AYJ (3 x) |
| Fuse holder | EFH20004 (2 x ) | EFH20004 (3 x) | EFH20004 (3 x) |

## 13.3.4 Types 824X

| Name | Order number | | | |
|---|---|---|---|---|
| | **8241** | **8242** | **8243** | **8244** |
| E.l.c.b. | EFA3B06A | EFA3B06A | EFA3B10A | EFA3B10A |
| Fuse | EFSM-0060AWE | EFSM-0060AWE | EFSM-0100AWE | EFSM-0100AWE |
| Fuse holder | EFH10001 | EFH10001 | EFH10001 | EFH10001 |
| Mains filter type A | EZN3A2400H002 | EZN3A1500H003 | EZN3A0900H004 | EZN3A0500H007 |
| Mains filter type B | EZN3B2400H002 | EZN3B1500H003 | EZN3B0900H004 | EZN3B0500H007 |
| Motor filter | ELM3-030H004 | ELM3-030H004 | ELM3-014H010 | ELM3-014H010 |
| Sine filter | EZS3-002A001 | EZS3-004A001 | EZS3-006A001 | EZS3-010A001 |
| Brake module | EMB9351-E | EMB9351-E | EMB9351-E | EMB9351-E |
| Brake chopper | EMB9352-E | EMB9352-E | EMB9352-E | EMB9352-E |
| Brake resistor | ERBD180R300W | ERBD180R300W | ERBD082R600W | ERBD068R800W |
| Thermal separation ("Push-through technique") | EJ0036 | EJ0036 | EJ0037 | EJ0037 |
| DC-bus fuse | EFSCC0060AYJ | EFSCC0060AYJ | EFSCC0080AYJ | EFSCC0120AYJ |
| Fuse holder | EFH20004 | EFH20004 | EFH20004 | EFH20004 |

| Name | Order number | |
|---|---|---|
| | **8245** | **8246** |
| E.l.c.b. | EFA3B13A | EFA3B20A |
| Fuse | EFSM-0160AWE | EFSM-0200AWE |
| Fuse holder | EFH10001 | EFH10001 |
| Mains filter type A | EZN3A0300H013 | EZN3B0300H013 |
| Mains filter type B | EZN3B0300H013 | ELN3-0160H012 |
| Motor filter | ELM3-014H010 | EZN3A0150H024 |
| Sine filter | EZS3-009A002 | EZN3B0150H024 |
| Brake module | EMB9351-E | EMB9351-E |
| Brake chopper | EMB9352-E | EMB9352-E |
| Brake resistor | ERBD047R01k2 | ERBD047R01k2 |
| Thermal separation ("Push-through technique") | EJ0038 | EJ0038 |
| DC-bus fuse | EFSCC0200AYJ | EFSCC0400AYJ |
| Fuse holder | EFH20004 | EFH20004 |



# Accessories

EDS8200U--K
00406190

# Manual
# Part K

## Selection help

## Application examples

Global Drive

Frequency inverters 8200

This Manual is valid for 82XX controllers as of version:

| Type | Design | Hardware version and index | Software version and index | Variant | Explanation |
|---|---|---|---|---|---|
| 33.820X- | E- | 1x. | 1x | | (8201 - 8204) |
| 33.8202- | E- | 1x. | 1x | -V002 | Reduced assembly depth (8202) |
| 33.821X- | E- | 0x. | 1x | | (8211 - 8218) |
| 33.821X- | E- | 1x. | 2x | | (8211 - 8218) |
| 33.821X- | C- | 1x. | 2x | -V003 | Cold plate (8215 - 8218) |
| 33.821X- | E- | 3a. | 3x | -V020 | HVAC (8211 - 8218) |
| 33.822X- | E- | 0x. | 0x | | (8221 - 8227) |
| 33.822X- | C- | 1x. | 2x | -V003 | Cold plate (8221 - 8222) |
| 33.822X- | E- | 3a. | 3x | -V020 | HVAC (8221 - 8227) |
| 33.824X- | E- | 1x. | 1x | | (8241 - 8246) |
| 33.824X- | C- | 1x. | 1x | -V003 | Cold plate (8241 - 8246) |
| 33.824X- | E- | 3a. | 3x | -V020 | HVAC (8241 - 8246) |

Type

Design:
B = Module
C = Cold plate
E = Built-in unit IP20

Hardware version and index

Software version and index

Variant

Explanation

| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

# 14 Selection help

will be added

# Selection help

# 15 Application examples

## 15.1 Pump application with pressure control

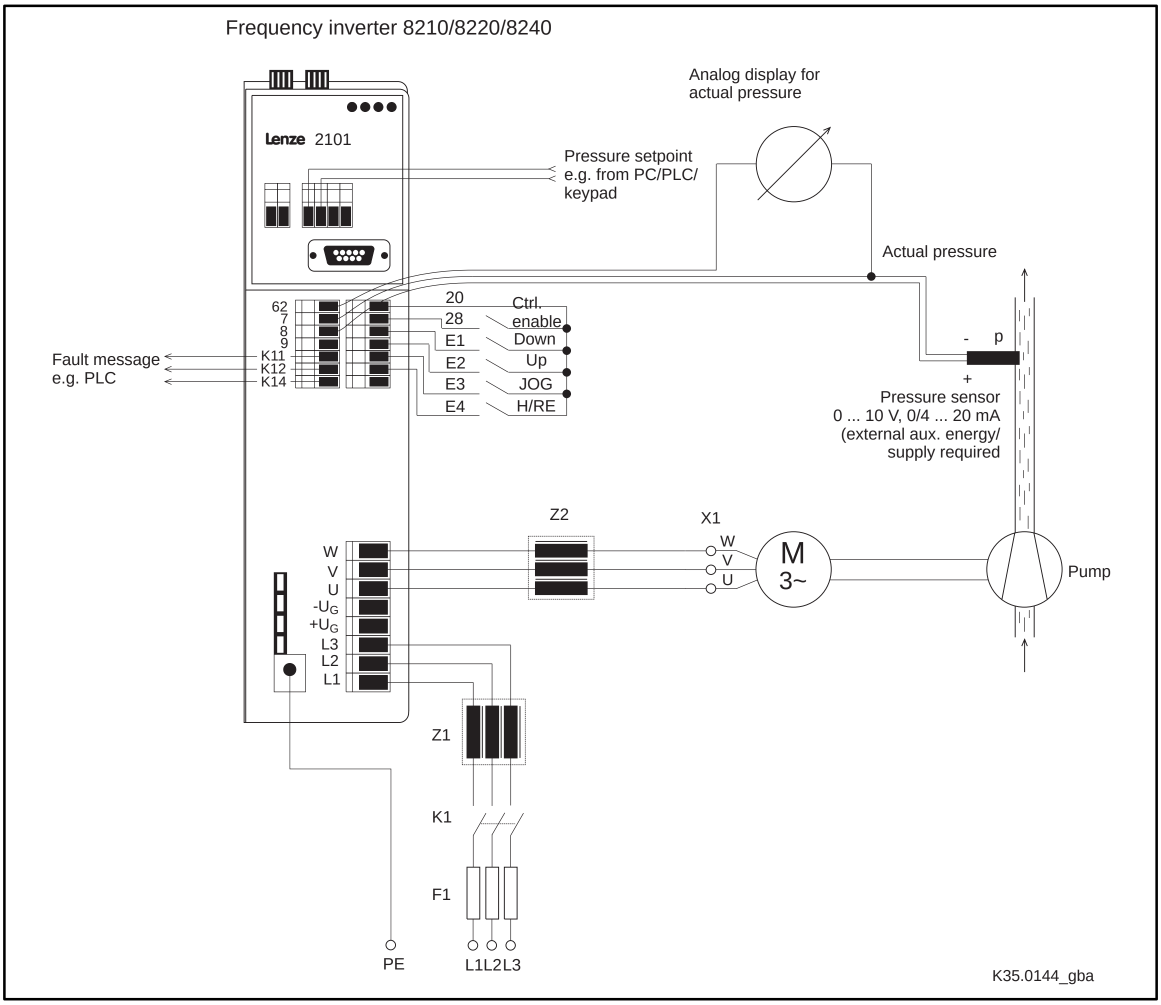



FIG 15-1 Application of a pump with pressure control

| | |
|---|---|
| Z1 | Mains filter required for radio interference level A or B. For mains chokes see chapter 3.4 ff. |
| Z2 | Motor filter/sine filter required for long motor cables or motors not designed for inverter operation (see chapter 4.2.7.2). |

Shield all signal and motor cables. Please observe the corresponding installation instructions given in chapters 4.2 and 4.3.

# Application examples

**Exercise for FIG 15-1:**

A centrifugal pump is used to ensure constant pressure in a pipeline system (e.g. for water supply of residential and industrial premises).

The application does not only require remote control from a central operating panel but also setting possibilities at site. The pressure is to be reduced to a fixed value during times when only few water is required. Thus, indirectly possible burst pipes can be detected by monitoring the actual pressure.

Functions used

- Internal PID controller for pressure control
  - Regular control, setpoint selection via fieldbus with feedback via analog channel terminal 8.
- Networking via fieldbus (e.g. via plug-in module 2102)
- Manual/remote changeover (H/Re)
  - Setpoint selection change via key ( E1 = DOWN / E2 = UP)
- Process setpoint selection (e.g. pressure [p]) via inverter JOG value
- Electrical controller inhibit (ctrl. enable)

*Code settings:*

| Code | Name | Possible settings | | | | IMPORTANT |
|---|---|---|---|---|---|---|
| | | Lenze | Choice | | Info | |
| C001 | Operating mode | -0- | -3- | Setpoint selection - control, parameter setting via LECOM | | |
| C005 | Configuration | -0- | -7- | Controlled operation, with analog feedback via term. 8 | | |
| C007 | Terminal configuration | -0- | -26- | Motor potentiometer, JOG, H/Re | | |
| C037 | JOG value 1 | 20.00 | 16.67 Hz | Fixed reduction to 1/3 of the rated pressure | | |
| C051 | Actual PID controller value | | | | | Only display of actual pressure |
| C070 | Gain PID controller | 1.00 | 0.02 ... 0.1 | | | Adaptation to process |
| C071 | Integral action time PID controller | 100 | 0.2 ... 1 s | | | |
| C072 | Differential component PID controller | 0.0 | 0.0 | | | Inactive |
| C074 | Influence PID controller | 0.0 | 100.0 % | | | |
| C111↵ | Monitor signal | -0- | -8- | Actual PID controller value | | |
| C238 | Frequency precontrol | -1- | -0- | No precontrol | | |
| C239 | Frequency setting range | -0- | -1- | Unipolar | | Direction of rotation cannot be changed via the process controller |

All other parameters are based on the factory setting.

Set the rated motor data under C088 (rated motor current) and C091 (motor cos $\varphi$) depending on the motor connected.

In addition to the setpoint input via fieldbus, the pressure setpoint can also be selected via the 8201BB keypad (installation up to max. 10 m away from the controller) or via an analog input signal (using the 8274 plug-in module).

## Note!

- For more detailed information on the process controller, see chapter 7.5.10.
- Calibration of the setpoints and actual values to the application datum under C500 and C501.
  (See chapter 7.6.3)

## 15.2 Pump application with level control

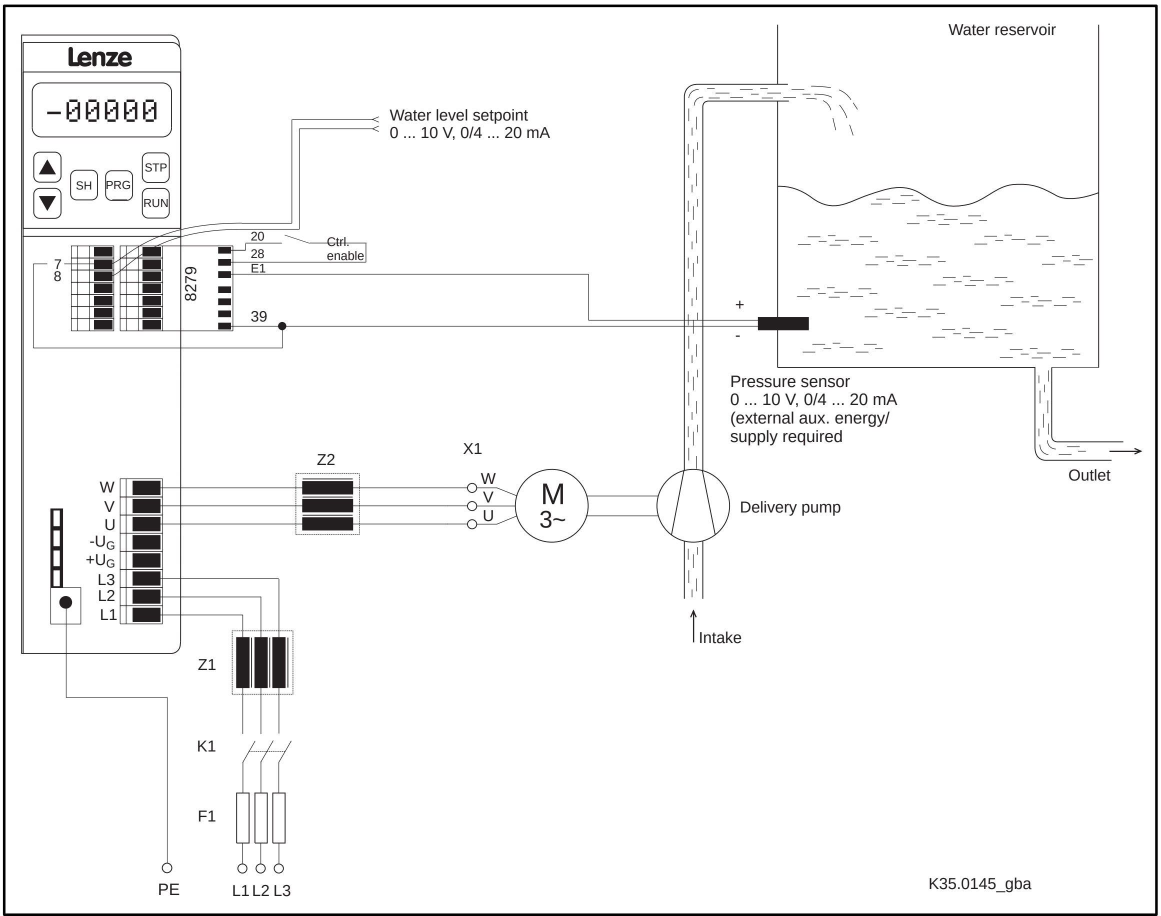



FIG 15-2 Application of a pump with level control

Z1 Mains filter required for radio interference level A or B. For mains chokes see chapter 3.4 ff.

Z2 Motor filter/sine filter required for long motor cables or motors not designed for inverter operation (see chapter 4.2.7.2).

Shield all signal and motor cables. Please observe the corresponding installation instructions given in chapters 4.2 and 4.3.

**Application FIG 15-2:**

In a tank the water is to be held at a constant level. The speed of the pump must be controlled depending on the amount of water delivered.

Functions used

- Internal PID controller for level control.
  - Regular control, analog setpoint input via terminal 8 with feedback via analog channel E1 with plug-in module 8279IB.

*Code settings:*

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C005 | Configuration | -0- | -6- Operation with closed-loop control; setpoint via terminal 8 with digital frequency feedback via terminal E1 | | |
| C007↲ | Terminal configuration | -0- | -28- ... -45- or -48- ... -51- | | Act. level value via terminal E1 |
| C070 | Gain PID controller | 1.00 | 0.02 ... 0.1 | | Adaptation to process |
| C071 | Integral action time PID controller | 100 | 0.2 ... 1 s | | |
| C072 | Differential component of PID controller | 0.0 | | | Inactive |
| C074 | Influence PID controller | 0.0 | 100.0 % | | |
| C238↲ | Frequency precontrol | -1- | -0- No precontrol | | |
| C239↲ | Frequency setting range | -0- | -1- Unipolar | | Direction of rotation cannot be changed via the process controller. |

All other parameters are based on the factory setting.

Set the rated motor data under C088 (rated motor current) and C091 (motor cos $\varphi$) depending on the motor connected.

**Note!**

- Adapt C426 and C427 if the actual value input is 4 mA ... 20 mA.
  (See chapter 3.7.1 and chapter 7.5.14.9)
- Calibration of the setpoints and actual values to the application datum under C500 and C501.
  (See chapter 7.6.3)

Show/Hide Bookmarks



## 15.3 Dancer-position control (line drive)

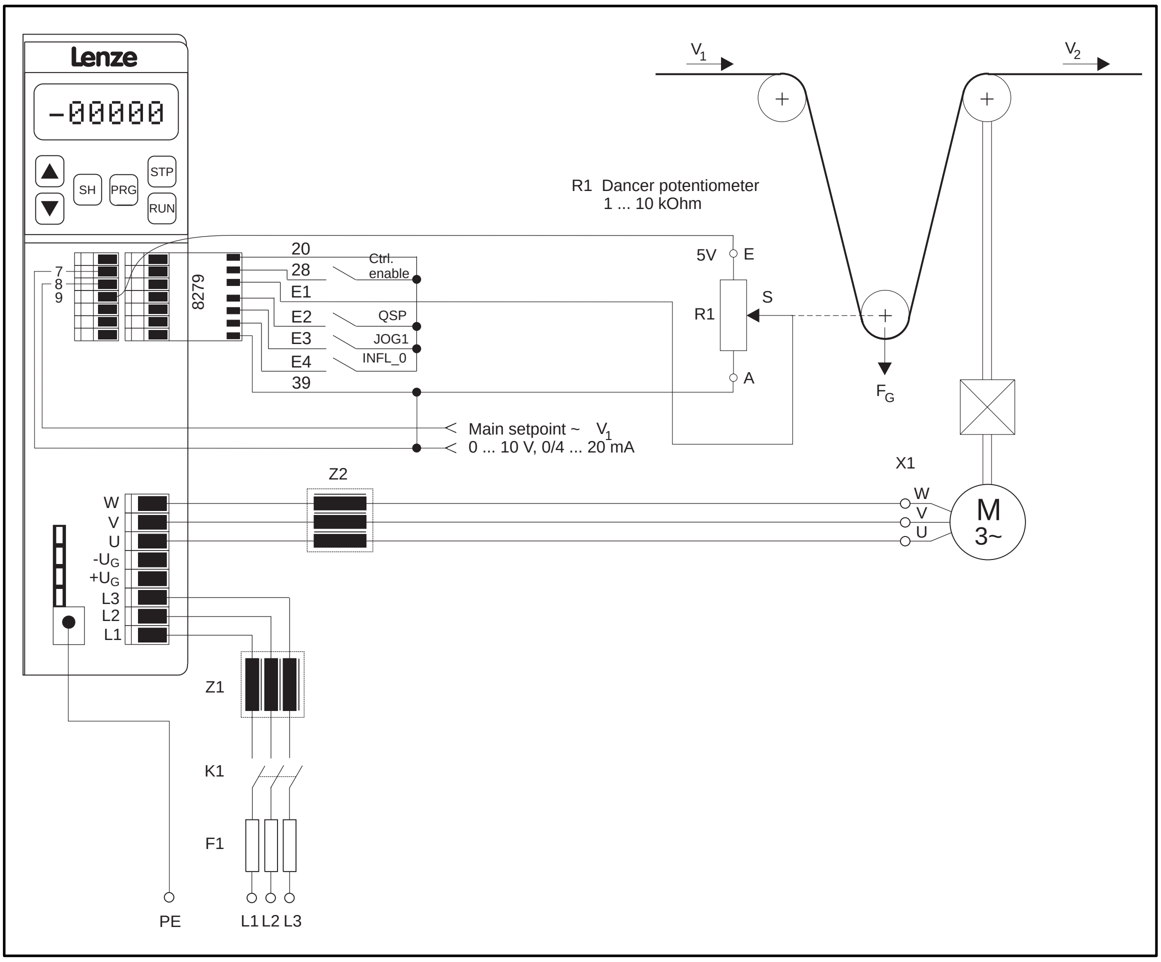



FIG 15-3 Application of a dancer-position control

Z1 Mains filter required for radio interference level A or B. For mains chokes see chapter 3.4 ff.

Z2 Motor filter/sine filter required for long motor cables or motors not designed for inverter operation (see chapter 4.2.7.2).

Shield all signal and motor cables. Please observe the corresponding installation instructions in chapters 4.2 and 4.3.

**Application FIG 15-3:**

The material speed $v_2$ is to be synchronised to the line speed $v_1$ by means of a dancer-position control. The dancer-position setpoint is internally set.

Functions used

- Internal PID controller as position controller.
- Selection of the line speed $v_1$ via terminal 8.
- Act. dancer position from the dancer potentiometer to the analog plug-in module 8279IB.

*Code settings:*

| Code | Name | Possible settings | | | IMPORTANT |
|---|---|---|---|---|---|
| | | Lenze | Choice | Info | |
| C005 | Configuration | -0- | -6- Controlled operation; setpoint via terminal 8 with digital frequency feedback via terminal E1 | | Jumper setting for terminal 8 must be adapted to 5 V (see chapter 4.2.8.2). |
| C007 | Terminal configuration | -0- | -49- | | Actual dancer position via terminal E1 |
| C037 | JOG value 1 | 20.00 | Fixed in-take speed $v_1$ for material guidance, individually adjustable | | |
| C070 | Gain PID controller | 1.00 | | | Adaptation to process |
| C071 | Integral action time PID controller | 100 | | | |
| C072 | Differential component PID controller | 0.0 | | | |
| C074 | Influence PID controller | 0.0 | 10.0 % | | |
| C105 | Deceleration time QSP | 5.00 | Enter approx. 1 s | | Emergency-stop function:<br>• The drive geometry must be adjusted so that it is possible to brake the controller to standstill within a very short time. |
| C239 | Frequency setting range | -0- | -1- Unipolar | | Direction of rotation cannot be changed via the process controller. |

All other parameters are based on the factory setting.

Set the rated motor data under C088 (rated motor current) and C091 (motor cos $\varphi$) depending on the motor connected.

**Note!**

- For more detailed information on the process controller, see chapter 7.5.10.
- Calibration of the setpoints and actual values to the application datum under C500 and C501.
(See chapter 7.6.3)

## 15.4 Air conditioning system

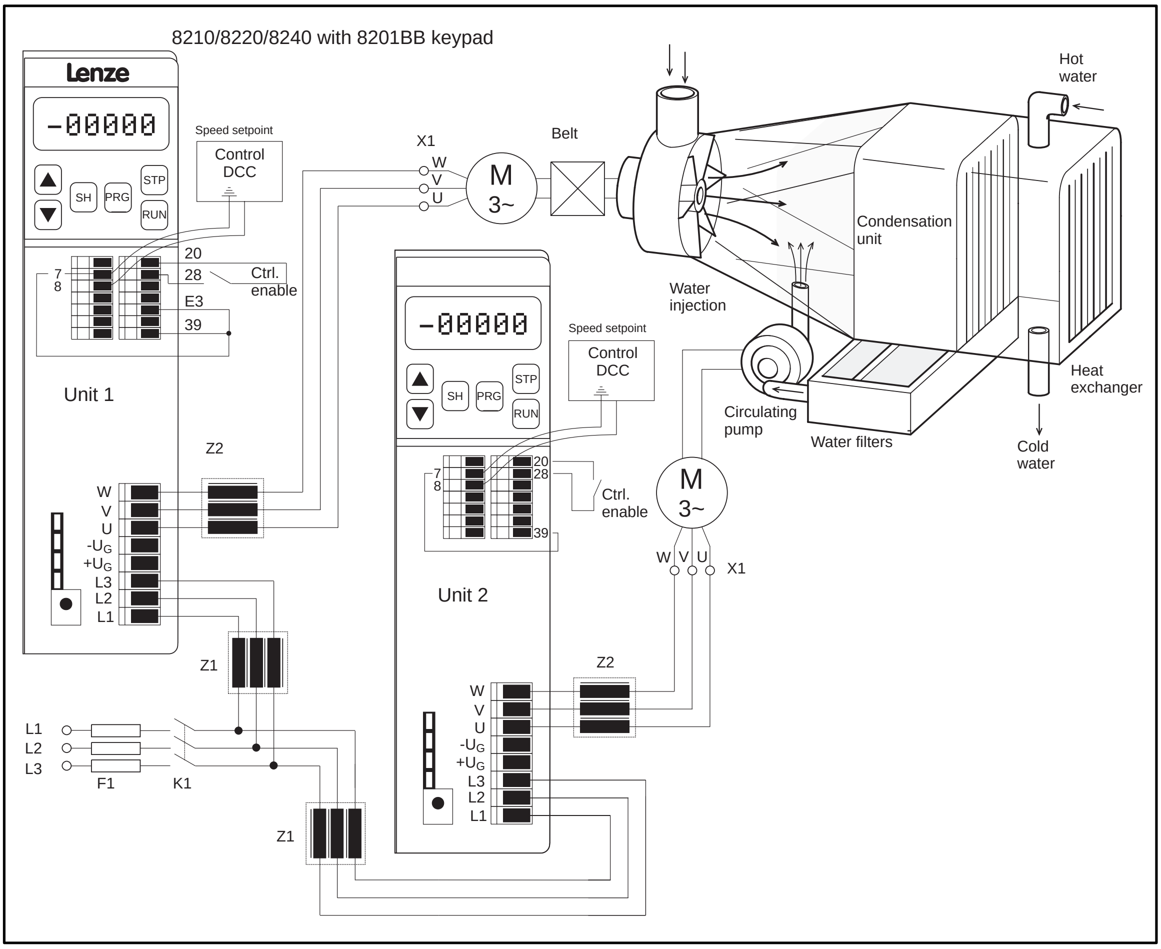



FIG 15-4 Application example of an air conditioning system

| | |
|---|---|
| Z1 | Mains filter required for radio interference level A or B. For mains chokes see chapter 3.4 ff. |
| Z2 | Motor filter/sine filter required for long motor cables or motors not designed for inverter operation (see chapter 4.2.7.2). |

Shield all signal and motor cables. Please observe the corresponding installation instructions given in chapters 4.2 and 4.3.

### Application FIG 15-4:

The air conditioning system of a department store is to be controlled according to the number of persons present. The fans must circulate an amount of air that depends on the number of people (e.g. data provided by a person counter).

Functions used

- Belt monitoring
- Mains failure detection
  - Controlled deceleration and stopping of the drive after mains failure
- Flying-restart circuit on coasting motor
- Suppression of mechanical resonances
- Smooth start/stop with S ramps

*Code settings for unit 1:*

| Code | Name | Possible settings | | | |
|---|---|---|---|---|---|
| | | Lenze | Choice | | Info |
| C001<br>C2001 | Operating mode | -0- | -0- | Setpoint selection via term. 8 (jumper setting see chapter 4.2.8.2)<br>Control via terminals parameter setting with 8201BB | |
| C005<br>C2005 | Configuration | -0- | -0- | Operation with open-loop control via terminal 8 | |
| C008<br>C2008 | Function relay K1 | -1- | -14- | Apparent motor current (C054) < Current threshold C156 and acceleration finished (Belt monitoring) | |
| C014<br>C2014 | Control mode | -0- | -3- | Square characteristic $V \sim f_d^2$ with constant $V_{min}$ boost | |
| C142<br>C2142 | Start condition | -1- | -3- | Automatic start, if term. 28 HIGH, flying-restart circuit active | |
| C156 | Current threshold | 0 | 50 % | | |
| C182 | $t_{integration}$ RFG S-shape | 0.00 | 0.50 s | Smooth start / stop | |
| C625 | Skip frequency 1 | 480.00 | 30.00 Hz | Removal of mechanical resonances | |
| C628 | Skipping bandwidth, $f_{skip}$ | 0.00 | 10.00 % | | |
| C988 | DC-bus voltage threshold for DC-bus voltage control | 0 | 81 % | Controlled deceleration after mains failure by changing the parameter set | |

**Motor deceleration after mains failure**
Parameter set changeover via DC-bus voltage control

| PAR 1 | PAR 2 (Code = C2XXX) |
|---|---|
| C007 = 2<br>C105 = 0.5 s | C2007 = 0<br>C2105 = 5.00 s |

**Note!**
Terminal E3 must always be at L-level (PAR2: normal operation; PAR1: QSP)

# Application examples

*Code settings for unit 2:*

| Code | Name | Possible settings | | | |
|---|---|---|---|---|---|
| | | Lenze | Choice | | Info |
| C001 | Operating mode | -0- | -0- | Setpoint selection via term. 8 (jumper setting see chapter 4.2.8.2)<br>Control via terminals parameter setting with 8201BB | |
| C005 | Configuration | -0- | -0- | Operation with open-loop control via terminal 8 | |
| C014 | Control mode | -0- | -3- | Square characteristic $V \sim f_d^2$ with constant $V_{min}$ boost | |

According to the information given in both tables (code setting for unit 1 and 2):

1. All other parameters are based on the factory setting.
2. Set the rated motor data under C088 (rated motor current) and C091 (motor cos $\varphi$) depending on the motor connected.

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EDS8200U--L
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# Manual
# Part L

## Signal-flow charts

Global Drive

Frequency inverters 8200

Show/Hide Bookmarks

This Manual is valid for 82XX controllers as of version:

| Type | Design | Hardware version and index | Software version and index | Variant | Explanation |
|---|---|---|---|---|---|
| 33.820X- | E- | 1x. | 1x | | (8201 - 8204) |
| 33.8202- | E- | 1x. | 1x | -V002 | Reduced assembly depth (8202) |
| 33.821X- | E- | 0x. | 1x | | (8211 - 8218) |
| 33.821X- | E- | 1x. | 2x | | (8211 - 8218) |
| 33.821X- | C- | 1x. | 2x | -V003 | Cold plate (8215 - 8218) |
| 33.821X- | E- | 3a. | 3x | -V020 | HVAC (8211 - 8218) |
| 33.822X- | E- | 0x. | 0x | | (8221 - 8227) |
| 33.822X- | C- | 1x. | 2x | -V003 | Cold plate (8221 - 8222) |
| 33.822X- | E- | 3a. | 3x | -V020 | HVAC (8221 - 8227) |
| 33.824X- | E- | 1x. | 1x | | (8241 - 8246) |
| 33.824X- | C- | 1x. | 1x | -V003 | Cold plate (8241 - 8246) |
| 33.824X- | E- | 3a. | 3x | -V020 | HVAC (8241 - 8246) |

Type

Design:
B = Module
C = Cold plate
E = Built-in unit IP20

Hardware version and index

Software version and index

Variant

Explanation

| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

# 16 Signal-flow charts

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# 16.1 Signal-flow chart for types 820X

## 16.1.1 Control structure

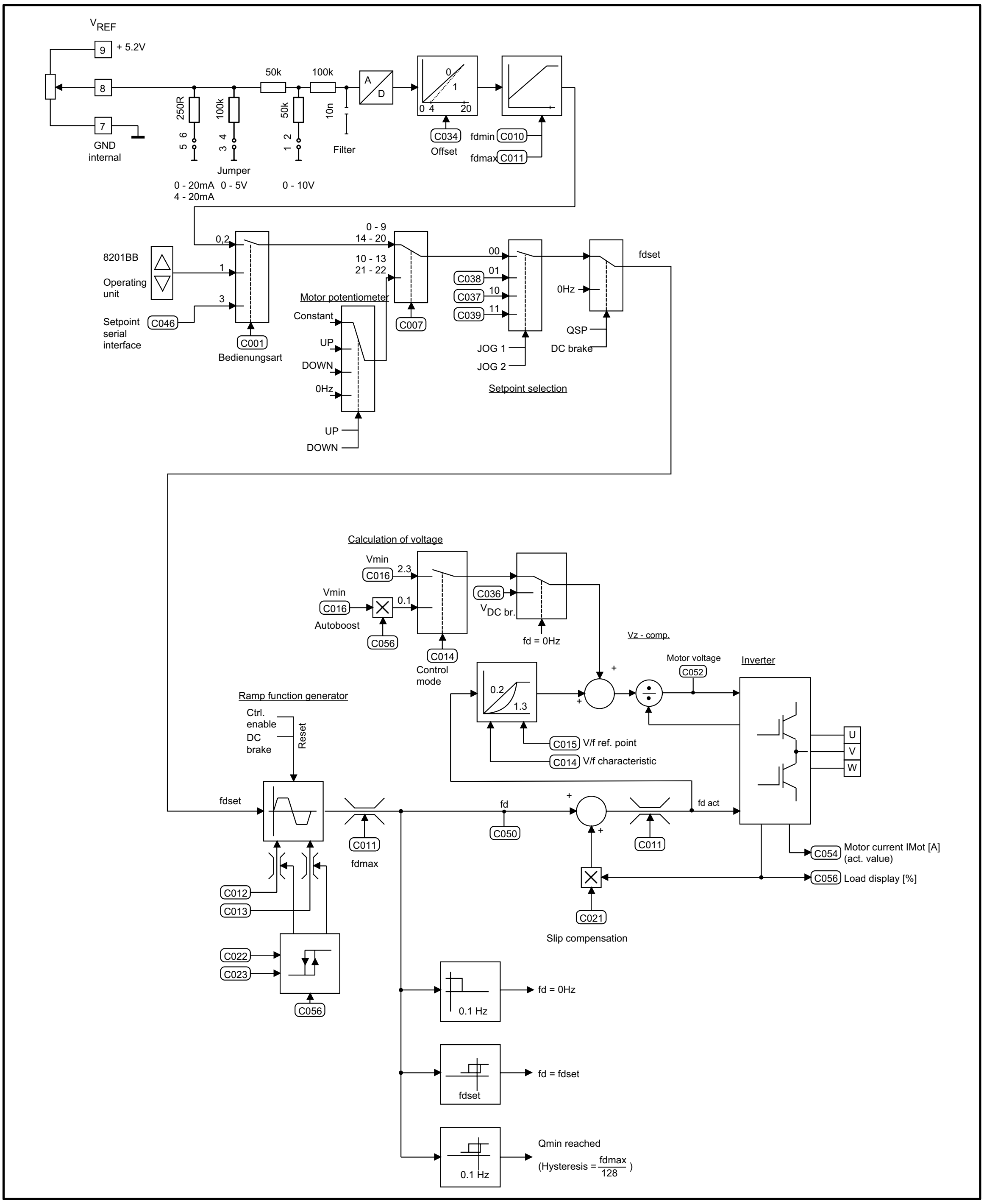


FIG 16-1 Signal flow 8200: Control structure

## 16.1.2 Inverter control

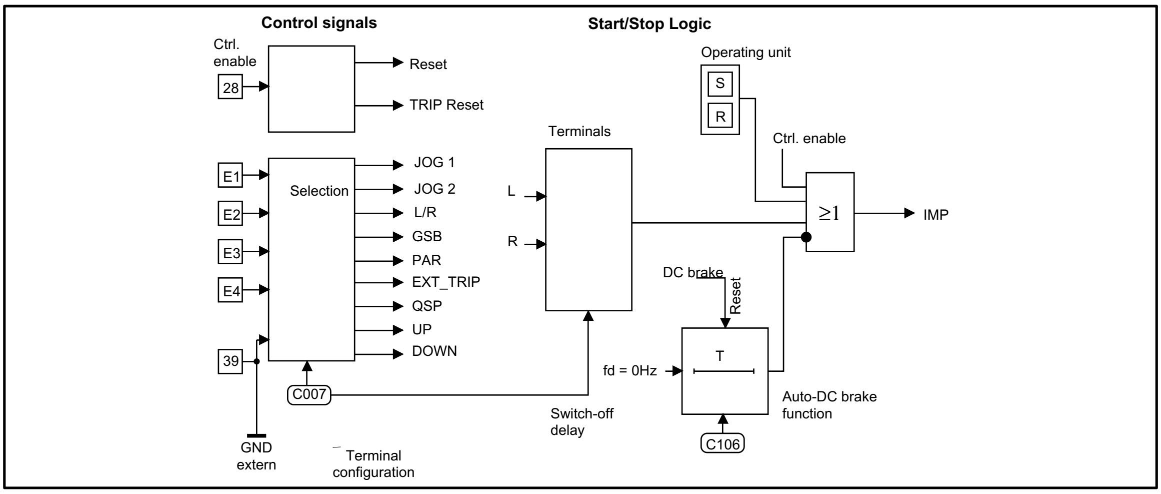


FIG 16-2 820X signal flow: Inverter control

## 16.1.3 Monitorings

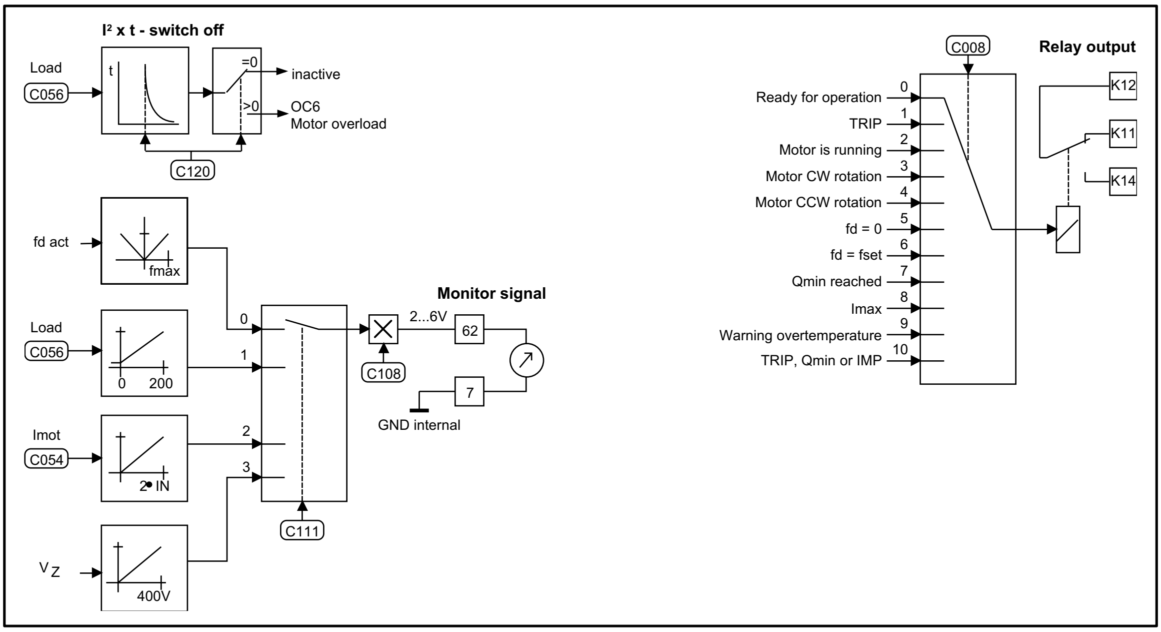


FIG 16-3 Signal flow 820X: Monitorings

## 16.2 Signal-flow charts for types 821X/822X/824X

### 16.2.1 Control structure control mode V/f control

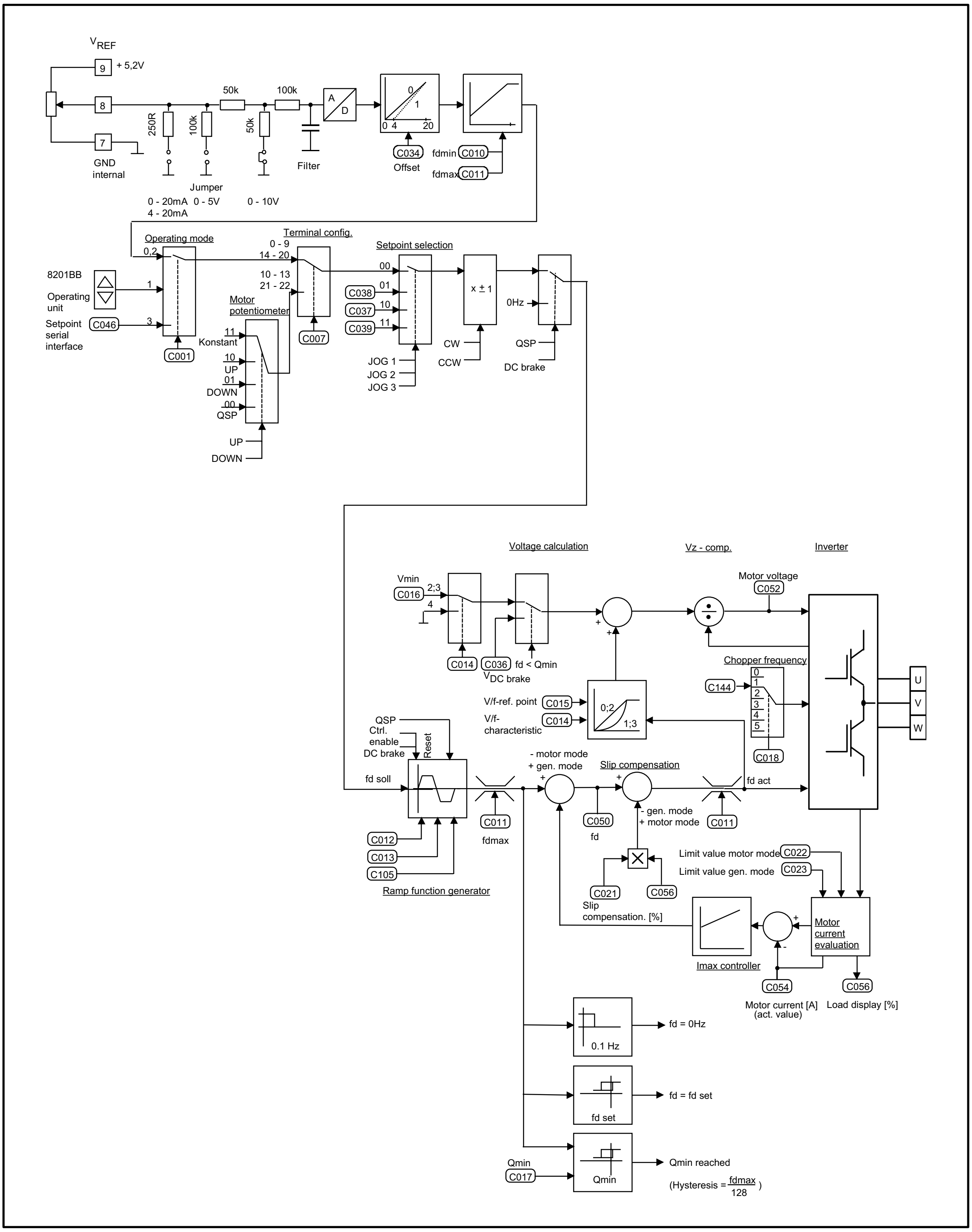


FIG 16-4 Signal flow 821X/822X/824X: Control structure control mode V/f-control

## 16.2.2 Control structure control mode motor current control

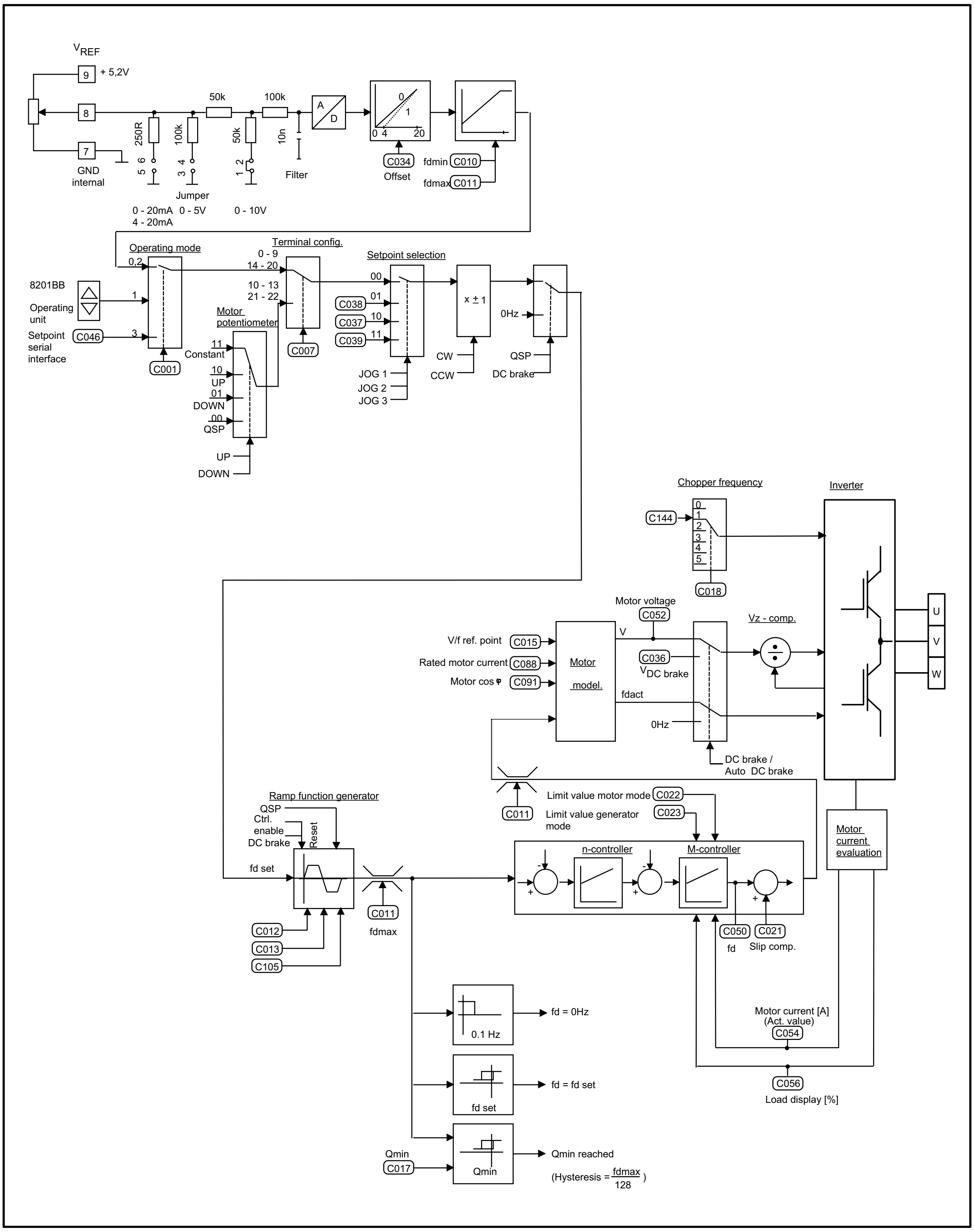


FIG 16-5 Signal-flow 821X/822X/824X: Control structure control mode motor current control

### 16.2.3 Inverter control

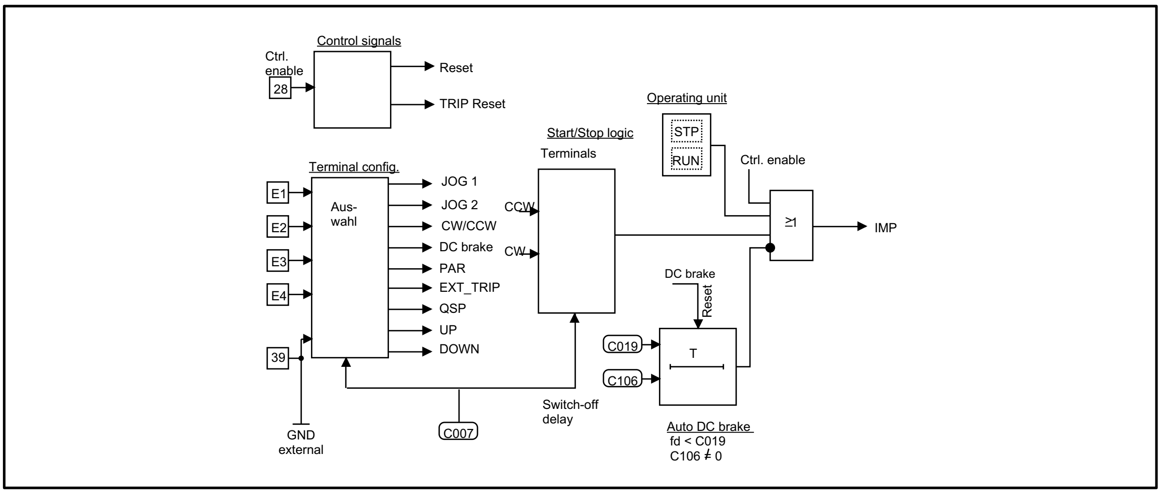


FIG 16-6 821X/822X/824X signal flow: Inverter control

### 16.2.4 Monitorings

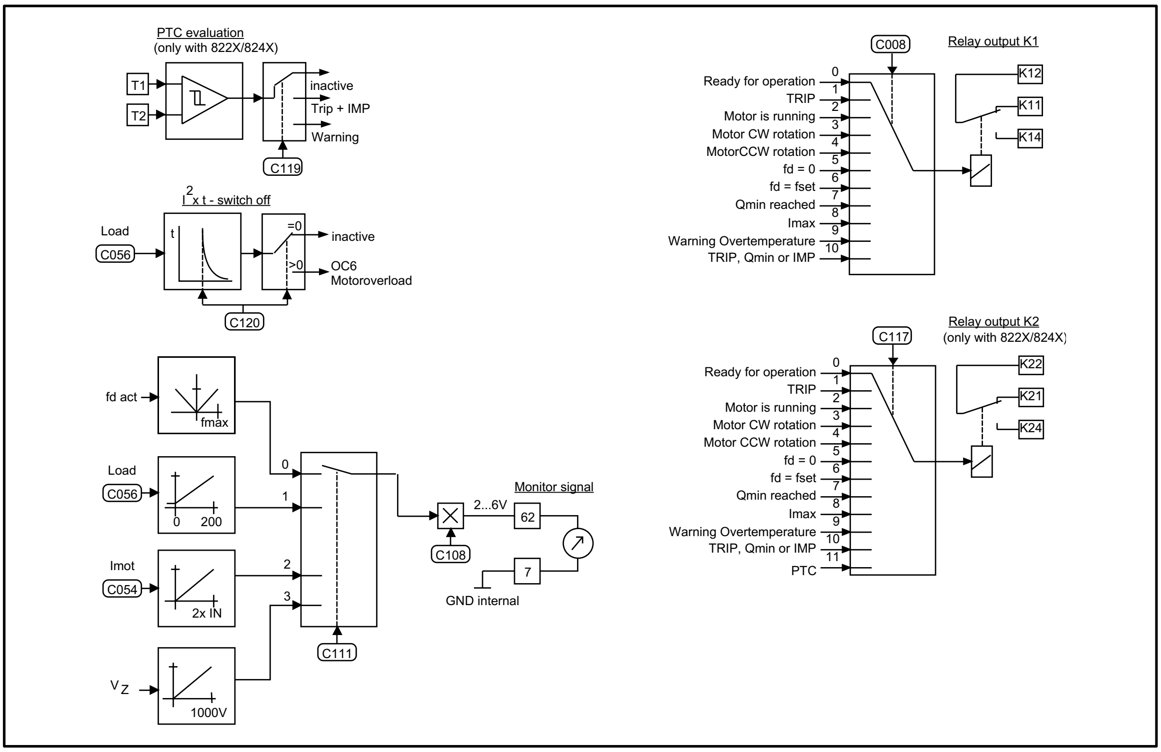


FIG 16-7 Signal-flow 821X/822X/824X: Monitorings

## 16.3 Signal-flow charts for types 821X/822X/824X-HVAC

### 16.3.1 Process and speed controller for C005 = -0-

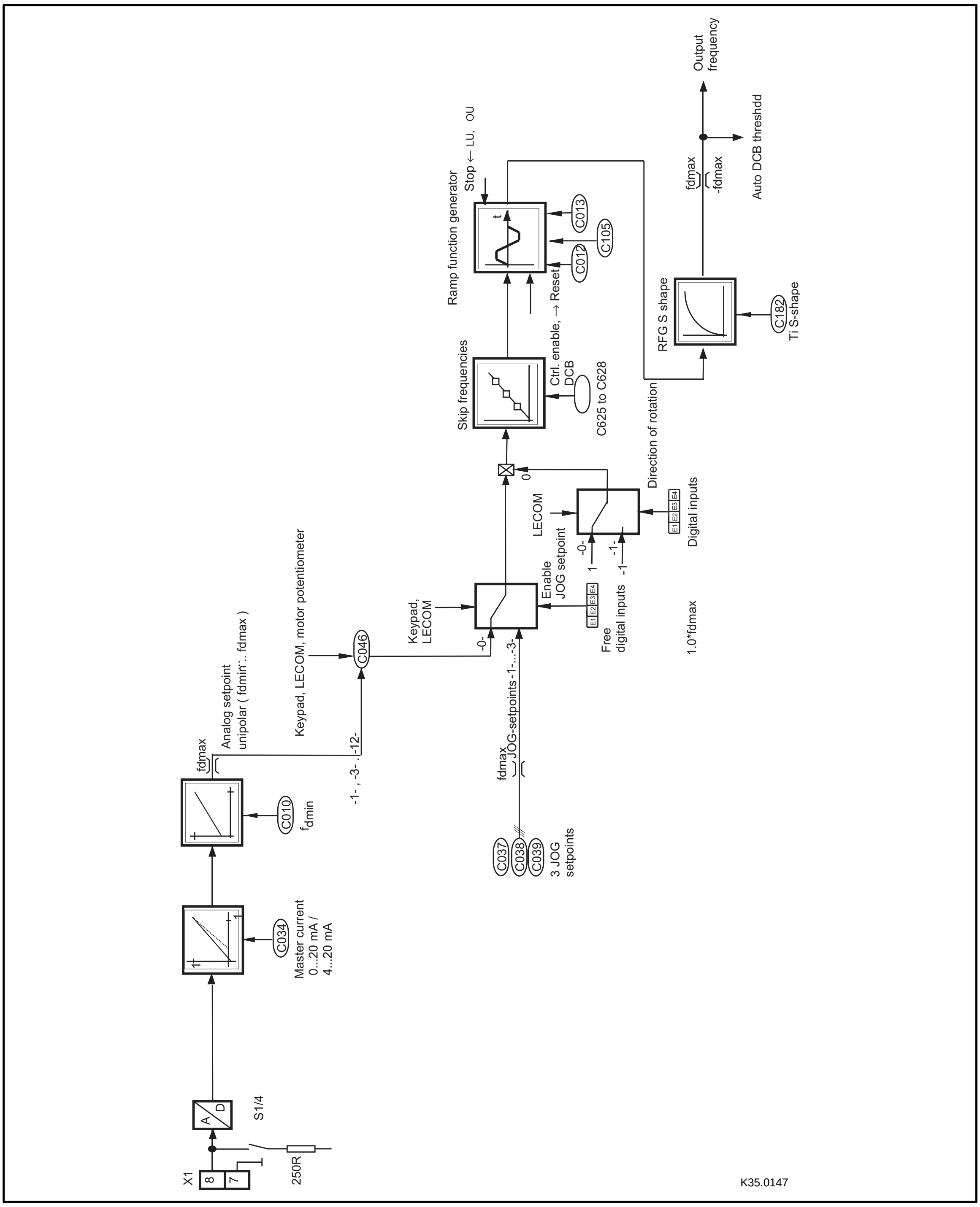


FIG 16-8 Process and speed controller for C005 = -0-

### 16.3.2 Process and speed controller for C005 = -1- ... -7-

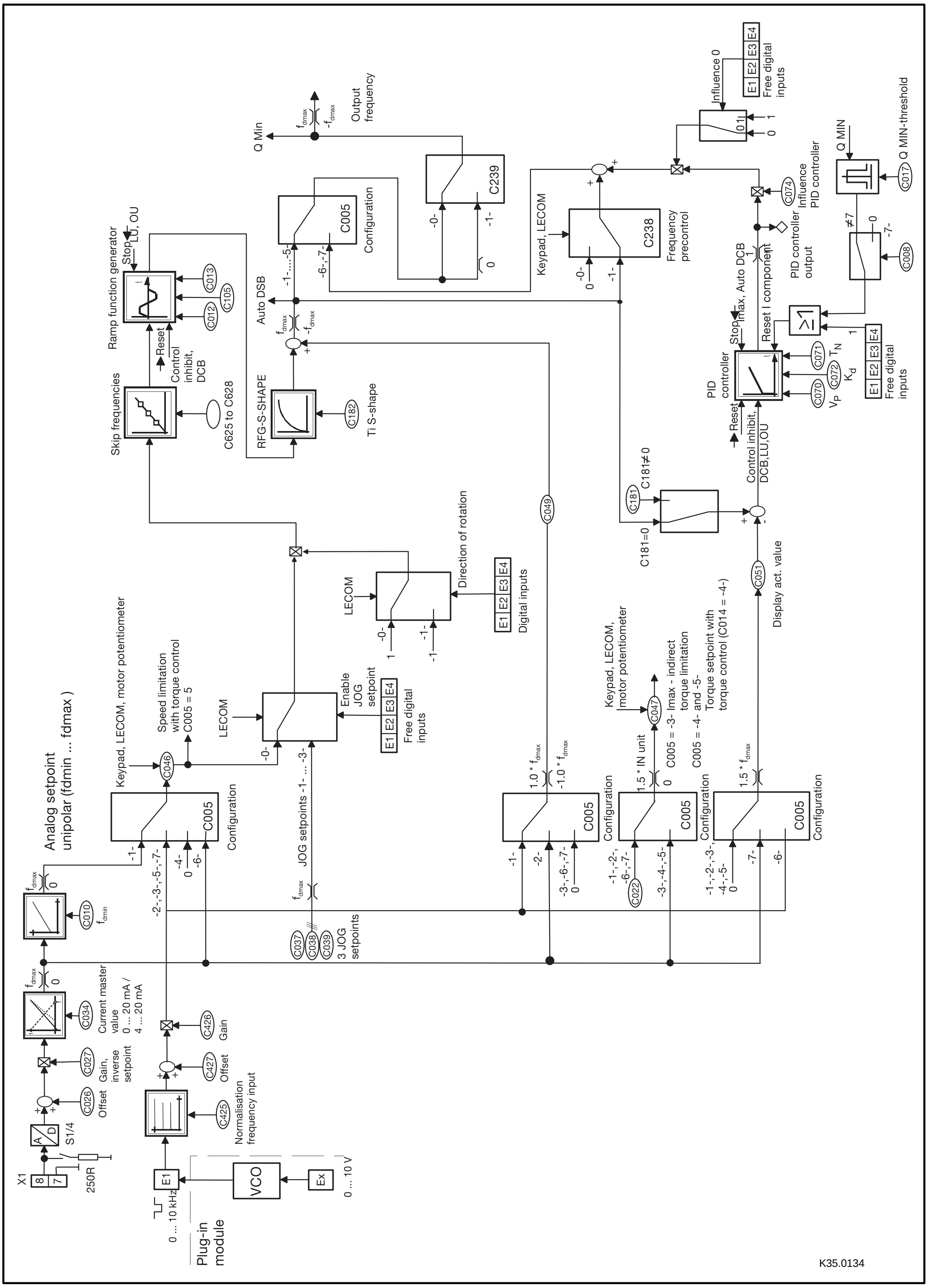


FIG 16-9 Process and speed controller for C005 = -1- ... -7-

EDS8200U--M
00406192

# Manual
# Part M

## Glossary

## Table of keywords

## Global Drive

*Frequency inverters 8200*

This Manual is valid for 82XX controllers as of version:

| | | | | | |
|---|---|---|---|---|---|
| 33.820X- | E- | 1x. | 1x | | (8201 - 8204) |
| 33.8202- | E- | 1x. | 1x | -V002 | Reduced assembly depth (8202) |
| 33.821X- | E- | 0x. | 1x | | (8211 - 8218) |
| 33.821X- | E- | 1x. | 2x | | (8211 - 8218) |
| 33.821X- | C- | 1x. | 2x | -V003 | Cold plate (8215 - 8218) |
| 33.821X- | E- | 3a. | 3x | -V020 | HVAC (8211 - 8218) |
| 33.822X- | E- | 0x. | 0x | | (8221 - 8227) |
| 33.822X- | C- | 1x. | 2x | -V003 | Cold plate (8221 - 8222) |
| 33.822X- | E- | 3a. | 3x | -V020 | HVAC (8221 - 8227) |
| 33.824X- | E- | 1x. | 1x | | (8241 - 8246) |
| 33.824X- | C- | 1x. | 1x | -V003 | Cold plate (8241 - 8246) |
| 33.824X- | E- | 3a. | 3x | -V020 | HVAC (8241 - 8246) |

Type

Design:
B = Module
C = Cold plate
E = Built-in unit IP20

Hardware version and index

Software version and index

Variant

Explanation

| | | | |
|---|---|---|---|
| | | revised | |
| Edition of: | 01/1999 | | |

# 17 Glossary

| Term | Meaning |
|---|---|
| AIF | Automation interface (X1) |
| CAN | Controller Area Network |
| CE | Communauté Européenne (English: European Community) |
| Code | For entry and display (access) of parameter values<br>Variable addressing according to the format "code/subcode" (Cxxxx/xx)<br>All variables can be addressed via the code digits. |
| Ctrl. enable | Controller enable |
| Ctrl. inhibit | Controller inhibit ( = $\overline{\text{Controller enable}}$) |
| Fieldbus | For data exchange between superimposed control and positioning control, e.g. INTERBUS or PROFIBUS |
| FPDA | Freely programmable digital output |
| FPDE | Freely programmable digital input |
| GDC | Global Drive Control (PC-program (Windows) for Lenze controllers) |
| RFG | Ramp generator |
| INTERBUS | Industrial communication standard to DIN E19258 |
| JOG | Fixed speed or input for fixed speed |
| Target position | The target which is to be approached by means of a defined traversing profile |
| LECOM | Lenze Communication |
| LEMOC2 | PC-program (DOS) for Lenze controllers |
| LU | Undervoltage |
| Master | Masters are host systems, e.g. PLC or PC. |
| OU | Overvoltage |
| PC | Personal Computer |
| $P_{DC}$ | This power can be additionally obtained from the DC bus when operating a matching motor. |
| PM | Permanent magnet |
| PROFIBUS | Communication standard DIN 19245, consisting of part 1, part 2 and part 3 |
| Process data | For instance, setpoints and actual values of controllers which must be exchanged within a minimum of time<br>Process data are usually small amounts of data which are to be transmitted cyclically.<br>For PROFIBUS, these data are transmitted in the logic process data channel. |
| QSP | Quick stop |
| Slave | Bus device which may only send after the request of the master. Controllers are slaves. |
| PLC | Programmable logic controller |

abc

# Glossary

# 18 Table of keywords

## A



## B



## C

abc

# Table of keywords

# D



# E



# F

abc

# Table of keywords

# M



# N



# O

abc

# Table of keywords

# Table of keywords