

EDBEME9360EN  
00419618

# Lenze

## *Operating Instructions*



***Global Drive***  
***9360 DC supply units***



These Operating Instructions are only valid for the following DC-supply units:

EME9364 - I  
EME9365 - I

In connection with the unit series as from the nameplate data:

E82EV	551	-	x	B000	XX	Vx	1x
E82EV	751	-	x	B000	XX	Vx	1x
E82EV	152	-	x	B000	XX	Vx	1x
E82EV	222	-	x	B000	XX	Vx	1x
824X	-	E.				0x.	0x.
93XX	-	E.				0x.	0x.

(8241 - 8246)

(9321 - 9333)

Type

Design:

E = Built-in unit IP20

IB = Module

Power

(e. g. 551 =  $55 \times 10^1 \text{ W} = 0.55 \text{ kW}$ )

Function module (option)

(see Operating Instructions for 8200 vector)

Voltage class:

2 = 240 V

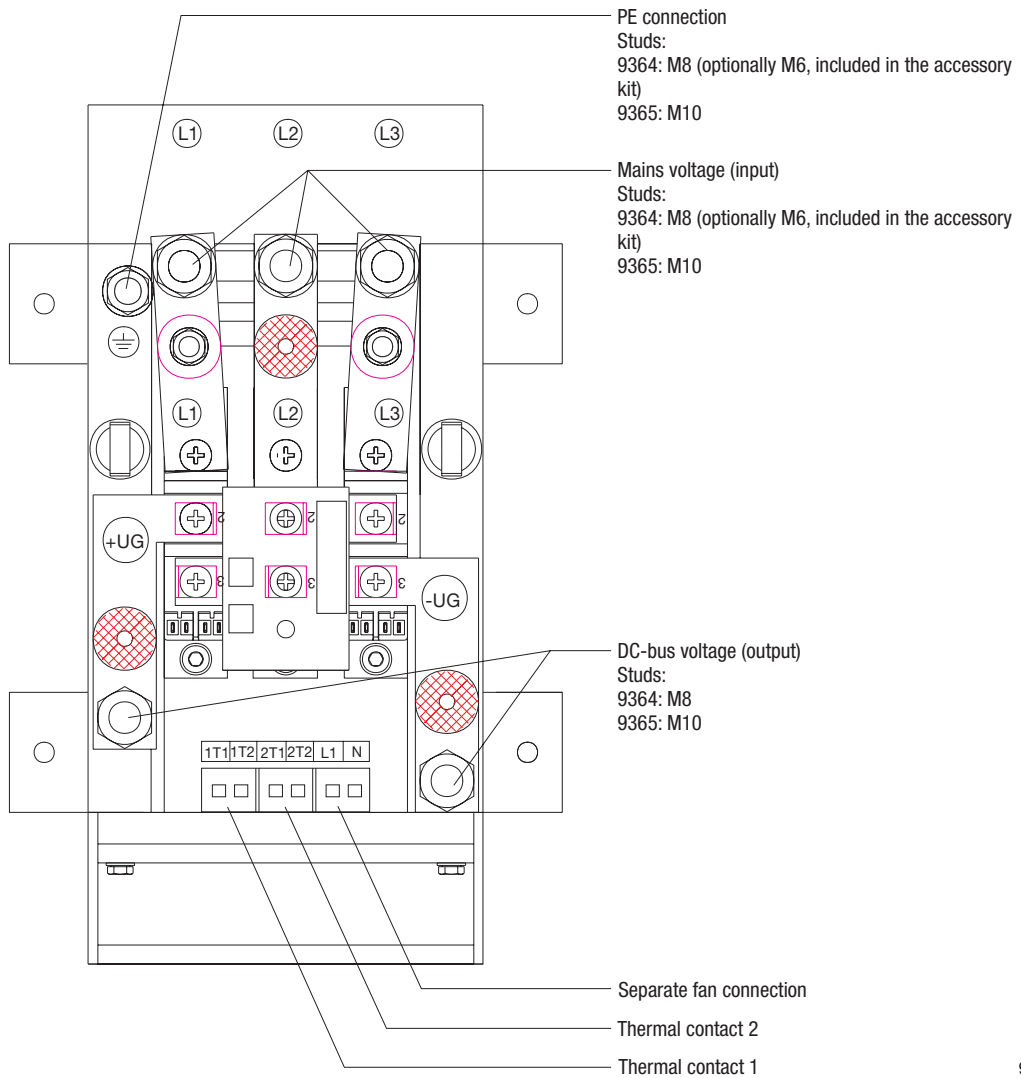
4 = 400 V/500 V

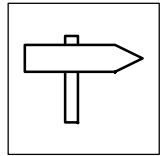
Hardware version

Software version

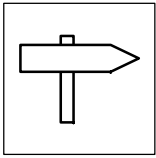
Version

Explanation



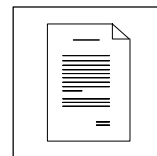


<b>1 Preface and general information</b> .....	<b>1-1</b>
1.1 About these Operating Instructions .....	1-1
1.1.1 Terminology used .....	1-1
1.2 What is new? .....	1-1
1.3 Packing list .....	1-1
1.4 Legal regulations .....	1-2
<b>2 Safety information</b> .....	<b>2-1</b>
2.1 General safety and application information for Lenze controllers .....	2-1
2.2 Layout of the safety information .....	2-2
2.3 Residual hazards .....	2-2
<b>3 Technical data</b> .....	<b>3-1</b>
3.1 Features .....	3-1
3.2 General data/Operating conditions .....	3-2
3.3 Ratings .....	3-3
3.3.1 Operating conditions .....	3-3
3.3.2 9364 and 9365 DC supply units .....	3-4
3.4 Mains filter and mains choke .....	3-5
3.4.1 Mains choke dimensions .....	3-6
3.4.2 Rough selection of mains filter / mains choke for 3 AC / 400 V .....	3-7
3.4.3 Calculation examples for the selection of mains filters/mains chokes .....	3-8
3.4.3.1 Drives M1, M2 and M3 in motor mode operation .....	3-8
3.4.3.2 Drive M1 and M2 in motor-mode operation, drive M3 in generator-mode operation with an assumed generative power of PDC = 10 kW .....	3-10
3.5 Fuses and cable cross-sections .....	3-12
3.5.1 Fuses and cable cross-sections for mains voltage of the the DC supply unit .....	3-12
3.5.2 DC-bus fuses for DC-bus operation with DC supply .....	3-13
3.6 Dimensions .....	3-14



# Contents

<b>4</b>	<b>Installation</b>	<b>4-1</b>
4.1	Mechanical installation	4-1
4.1.1	Important notes	4-1
4.1.2	Mounting with mains filter	4-2
4.1.3	Mounting with subassembled mains filter	4-3
4.2	Electrical installation	4-5
4.2.1	Important notes	4-5
4.2.1.1	Protection of persons	4-5
4.2.1.2	Additional measures for protection of persons	4-6
4.2.2	Mains isolation	4-6
4.2.3	Protection of the DC supply unit	4-6
4.2.4	Mains types / mains conditions	4-7
4.2.5	Cable specification	4-7
4.2.6	Connection of DC supply unit	4-7
4.2.6.1	Mains connection	4-9
4.2.6.2	DC-bus connection	4-9
4.2.6.3	Separate fan connection	4-10
4.2.6.4	Connection of temperature monitoring	4-10
4.3	Circuit diagrams	4-11
4.3.1	Three-phase controller connected to a central supply	4-11
4.3.2	Single phase controller connected to a central supply unit	4-12
4.3.3	DC-supply unit with 9352 brake chopper	4-13
4.3.4	DC-supply unit with a 934X regenerative power supply unit	4-14
4.3.5	Parallel operation of two 9365 DC supply units	4-15
4.4	Installation of a CE-typical drive system	4-16
<b>5</b>	<b>Commissioning</b>	<b>5-1</b>
5.1	Initial switch-on	5-1
<b>6</b>	<b>Troubleshooting and fault elimination</b>	<b>6-1</b>
6.1	Tripping of the temperature monitoring	6-1
6.2	Mains phase failure	6-2
<b>7</b>	<b>Maintenance</b>	<b>7-1</b>
7.1	Maintenance	7-1
7.2	Service addresses	7-2
<b>8</b>	<b>Index</b>	<b>8-1</b>



## 1 Preface and general information

### 1.1 About these Operating Instructions

- The present Operating Instructions are used for operations concerning safety measures on and with the 9360 DC supply units. They include safety notes which you must observe.
- All persons working on and with 9360 DC supply units must have the Operating Instructions available and must observe the information and notes relevant for their work.
- The Operating Instructions must always be in a complete and perfectly readable state.

#### 1.1.1 Terminology used

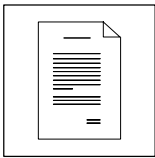
Term	In the following text used for
DC supply unit	9364 and 9365 DC supply units
Controller	Servo inverter 9300, frequency inverter 9300 vector control, Frequency inverter 8200, 8200 vector
Drive system	Drive systems with 93XX servo inverter, 93XX vector control and other Lenze drive components

### 1.2 What is new?

Version	ID No.	Edition
1.0 02/2001	00419618	First edition

### 1.3 Packing list

Scope of delivery	Important
<ul style="list-style-type: none"><li>• 1 936X DC supply unit</li><li>• 1 Operating Instructions</li><li>• 1 accessory kit (bits and pieces for mechanical and electrical installation)</li></ul>	<p>After receipt of the delivery, check immediately whether the items delivered match the accompanying papers. Lenze does not accept any liability for deficiencies claimed subsequently.</p> <p>Claim</p> <ul style="list-style-type: none"><li>• visible transport damage immediately to the forwarder.</li><li>• visible deficiencies/incompleteness immediately to your Lenze representative.</li></ul>



# Preface and general information

## 1.4 Legal regulations

<b>Identification</b>	<b>Nameplate</b>	<b>CE-identification</b>	<b>Manufacturer</b>
	Lenze DC supply units are unambiguously identified by their nameplates.	Conforms to the EC Low Voltage Directive	Lenze GmbH & Co KG Postfach 101352 D-31763 Hameln
<b>Application as directed</b>	<p><b>936X DC supply units</b></p> <ul style="list-style-type: none"> <li>are units which can be used with Lenze controllers: <ul style="list-style-type: none"> <li>– 822X frequency inverters (8221 to 8227)</li> <li>– 8200 vector frequency inverters (E82EV551-XB, E82EV751-XB, E82EV152-XB, E82EV222-XB)</li> <li>– 824X frequency inverters (8241 to 8246)</li> <li>– 93XX vector control (9321 to 9333)</li> <li>– 93XX servo inverters (9321 to 9333)</li> </ul> </li> <li>must only be operated under the conditions prescribed in these Operating Instructions.</li> <li>are components <ul style="list-style-type: none"> <li>– for installation into a machine</li> <li>– used for assembly together with other components to form a machine.</li> </ul> </li> <li>are electric units for the installation into control cabinets or similar enclosed operating housing.</li> <li>comply with the requirements of the Low-Voltage Directive.</li> <li>are not machines for the purpose of the Machinery Directive.</li> <li>are not to be used as domestic appliances, but only for industrial purposes.</li> </ul> <p><b>Drive systems with 936X DC supply units</b></p> <ul style="list-style-type: none"> <li>meet the EC Electromagnetic Compatibility Directive if they are installed according to the guidelines of CE-typical drive systems.</li> <li>can be used <ul style="list-style-type: none"> <li>– for operation at public and non-public mains</li> <li>– for operation in industrial premises and residential areas.</li> </ul> </li> <li>The user is responsible for the compliance of his application with the EC directives.</li> </ul> <p><b>Any other use shall be deemed inappropriate!</b></p>		
<b>Liability</b>	<ul style="list-style-type: none"> <li>The information, data, and notes in these instructions met the state of the art at the time of printing. Claims referring to drive systems which have already been supplied cannot be derived from the information, illustrations, and descriptions given in these Operating Instructions.</li> <li>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.</li> <li>The specifications in these Instructions describe the product features without guaranteeing them.</li> <li>Lenze does not accept any liability for damage and operating interference caused by: <ul style="list-style-type: none"> <li>– disregarding the operating instructions</li> <li>– Unauthorized changes on the DC supply unit</li> <li>– Operating errors</li> <li>– Improper working on and with the DC supply unit</li> </ul> </li> </ul>		
<b>Warranty</b>	<ul style="list-style-type: none"> <li>Warranty conditions: see Sales and Delivery Conditions of Lenze GmbH &amp; Co KG.</li> <li>Warranty claims must be made to Lenze immediately after detecting the deficiency or fault.</li> <li>The warranty is void in all cases where liability claims cannot be made.</li> </ul>		
<b>Waste disposal</b>	<b>Material</b>	<b>recycle</b>	<b>dispose</b>
	Metal	●	-
	Plastic	●	-
	Assembled PCBs	-	●



## 2 Safety information

### 2.1 General safety and application information for Lenze controllers

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

#### 1. General

Some parts of Lenze controllers (frequency inverters, servo inverters, DC controllers) can be live, shining, moving and rotating, some surfaces can be hot. Non-authorized removal of the required cover, inappropriate use, incorrect installation or operation, creates the risk of severe injury to personnel or damage to equipment. More 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 installation, 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. They are not to be used as appliances. They are intended exclusively for professional and commercial purposes according to EN 61000-3-2. The documentation includes information on compliance with the EN 61000-3-2.

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

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

The drive controllers meet the requirements of the Low Voltage Directive 73/23/EEC. The harmonised standards of the series EN 50178/DIN VDE 0160 apply to the controllers. The technical data as well as the connection conditions can be obtained from the nameplate and the documentation. They must be observed in all cases.

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

#### 3. Transport, storage

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

Observe the climatic conditions required to EN 50178.

#### 4. Installation

The controller must be installed and cooled according to the instructions given in the corresponding documentation.

Protect the controller from impermissible load. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts.

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

#### 5. Electrical connection

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

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

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

#### 6. Operation

Systems including controllers must be equipped with additional monitoring and protection devices according to the corresponding standards (e.g. technical equipment, regulations for prevention of accidents, etc.). Use the software provided to adapt the controllers to your application.

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

Please close all protective covers and doors during operation.

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

#### 7. Safe standstill

The variant V004 of 9300, 9300 vector and 8220 controllers and the variant B40x of 8200 vector controllers support the function "Safe standstill", protection against unintended start according to the requirements of Appendix I No. 1.2.7 of the EC Directive "Machinery" 98/37/EC, DIN EN 954-1 category 3 and DIN EN 1037. Please observe the corresponding information given in the documentation for the variants.

#### 8. Maintenance and service

Please see the documentation of the manufacturer.

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





## Safety information

### 2.2 Layout of the safety information

- All safety information has a uniform layout:
  - The icon characterizes the type of danger.
  - The signal word characterizes the severity of danger.
  - The note text describes the danger and gives information how to prevent dangerous situations.



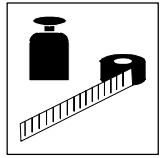
#### Signal word

Note

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

### 2.3 Residual hazards

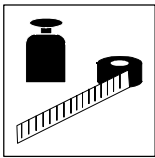
<b>Protection of persons</b>	After mains switch-off, the power terminals U, V, W and +U <sub>DC</sub> , -U <sub>DC</sub> carry hazardous voltages at least 3 minutes after mains disconnection. <ul style="list-style-type: none"> <li>Before working on the controller, check that no voltage is applied to the power terminals.</li> </ul>
<b>Protection of devices</b>	The input current limit in the DC bus in the controllers can be exceeded when the DC supply unit is cyclically switched on and of. The DC supply unit is not equipped with a switch-on current limitation.



## **3 Technical data**

### **3.1 Features**

- Power range: 50 kW and 100 kW
- Supply of AC controllers
- Parallel connection of 2 9365 DC supply units
- Connection of a separate to a 9365 DC supply unit
- Connection of controllers via DC bus
  - Central mains supply via the DC supply unit
  - Reduction of the wiring
- Thermal contacts for pre-warning and switch-off
- Power connections from the top
  - Simple connection for multi-axis applications
- Conformity: CE

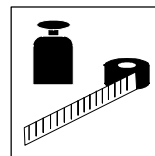


## Technical data

### 3.2 General data/Operating conditions

Field	Values
Vibration resistance	Germanischer Lloyd, general conditions
Permissible moisture	Humidity class F without condensation (average relative humidity 85 %)
Permissible temperature ranges	during transport of the unit: -25 °C ... +70 °C during storage of the controller: -25 °C ... +55 °C during operation of the unit: -10 °C ... +40 °C without derating +40 °C ... +55 °C with power derating
Permissible installation height h	h ≤ 1000 m a.m.s.l. without derating 1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l. with power derating
Permissible pollution	VDE 0110 part 2 pollution degree 2
Noise emission <sup>1)</sup>	Requirements acc. to EN 50081-2, EN 50082-1, IEC 22G-WG4 (Cv) 21 Limit value class A to EN 55011 (industrial premises) is possible with mains filter B
Noise immunity	Limit values maintained using mains filter. Requirements acc. to EN 50082-2, IEC 22G-WG4 (Cv) 21 . <b>Requirements</b> <b>Standard</b> <b>Severity</b> Running time      EN61000-4-2      3, i.e. 8 kV for air discharge and 6 kV for contact discharge RF interference (enclosure)      EN61000-4-3      3, i.e. 10 V/m; 27 to 1000 MHz Burst      EN61000-4-4      3/4, i.e. 2 kV / 5 kHz Surge on mains cable)      IEC 1000-4-5      3, i. i. 1.2/50 μs, 1 kV phase-phase, 2 kV phase-PE
Insulation strength	Overvoltage category III to VDE 0110
Packing	according to DIN 4180
Type of protection	IP00 Safe from touch by the back of the hand to VBG 4
Conformity	CE:      Low Voltage Directive EMC directive

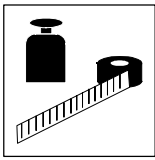
- <sup>1)</sup> Measured under typical installation conditions according to chapter 4.4 with 8 93XX controller and 10 m screen motor cable each.  
With 8 93XX controllers and 50 m screened motor cable each, the limit value for noise emission is slightly exceeded (approx. 6 dB of 1.5 ... 4 MHz).  
The noise emission to EN 55011 increases with the number of controller connected to the DC supply unit and the length of the motor cable (screened) per controller.  
We recommend an individual measurement of the noise emission if you connect many controllers and use long motor cables.  
Limit value class B (residential premises) cannot be achieved with the mains filters used.



## 3.3 Ratings

### 3.3.1 Operating conditions

- Operation permitted only:
  - With a mains voltage 3 AC / 100 ... 550 V  $\pm$ 0 % / 48 ... 62 Hz
  - Use the DC supply unit only with assigned mains filters/mains chokes.
- Accessories on the mains side:
  - Fuses and cable cross-sections (📖 3-12)
  - Mains filter/mains choke (📖 3-5)



## Technical data

### 3.3.2 9364 and 9365 DC supply units



#### Stop!

DC supply units must only be operated with assigned mains chokes or mains filters!

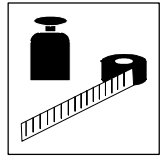
		Type	9364	9365
		Order No.	EME9364-E	EME9365-E
Mains voltage		$U_r$ [V]	100 V $\pm$ 0 % $\leq U_r \leq$ 550 V $\pm$ 0 %; 48 Hz ... 62 Hz $\pm$ 0 %	
Mains voltage for separate fan		$U_f$ [V]	-	1 AC / 230 V / 50 Hz / 60 Hz
Mains current with mains filter / choke <sup>1)</sup>		$I_r$ [A]	74.0	148.0
Max. mains current <sup>2)</sup>		$I_{Nmax}$ [A]	111.0	222.0
Apparent power on the mains side		$S_r$ [kVA]	51.0	103.0
DC-bus voltage		$U_{DC}$ [V]	150 V $\pm$ 0 % $\leq U_{DC} \leq$ 780 V $\pm$ 0 %	
DC-bus current		$I_{DC}$ [A]	90.0	180.0
Maximum DC-bus current <sup>2)</sup>		$I_{DCmax}$ [A]	135.0	270.0
Active output power <sup>3)</sup>		$P_{DCN}$ [kW]	50.0	100.0
Maximum active output power <sup>3)</sup>		$P_{DCmax}$ [kW]	75.0	150.0
Power loss at rated operation		$P_{loss}$ [W]	173.0	389.0
Power derating		[%/°C] [%/m]	+40 °C < $T_U$ < +55 °C: 1.5 %/K 1000 m a.m.s.l. < $h \leq$ 4000 m amsl: 5 %/1000 m	
Operating temperature (monitoring with temperature contact (TKO)) <sup>4)</sup>	Pre-heat temperature	[°C]	100.0	85.0
	Switch-off temperature	[°C]	112.0	100.0
	Tolerances: TKO 85 °C TKO 100 °C TKO 112 °C	[K] [K] [K]	Open: $\pm$ 3 K, close: $\pm$ 6 K Open: $\pm$ 4 K, close: $\pm$ 7 K Open: $\pm$ 4 K, close: $\pm$ 7 K	
	Load capacity		250 VAC / 10 A	
Dimensions	Length Width Height	[mm]	280 175 208	
Weight		[kg]	4.8	5.8

- 1) The calculation is done according to the  $I_r \geq \Sigma I_{mains}$  ( $I_{mains}$  is the mains current of the controller with mains filter/mains choke)
- 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) For mains voltage  $U_r = 400$  V
- 4) Critical and maximum temperatures are detected by 1 thermal contact (NC contact) each



#### Tip!

With group drives operating in generator mode or central winders the mains currents ( $I_{mains}$ ) of the controllers are lower. The DC supply unit can be smaller accordingly.



## 3.4 Mains filter and mains choke



### Stop!

Please observe that a mains filter or mains choke is always required before the DC supply unit!

Mains filter for RFI degree B <sup>3)</sup>					
Lenze order number	I <sub>r</sub> [A] <sup>1)</sup>	L [mH]	U <sub>r</sub> [V]	Power loss PV [W]	Weight [kg]
EZN3B0110H030U <sup>2)</sup>	30.0	1.10 mH	380 ... 480	82	22.5
EZN3B0080H042	42.0	0.80 mH		125	22.5
EZN3B0055H060	60.0	0.55 mH		225	30.0
EZN3B0037H090	90.0	0.37 mH		260	42.0
EZN3B0030H110	110.0	0.30 mH		320	50.0
EZN3B0022H150 <sup>2)</sup>	150.0	0.22 mH		335	65.0

1) If the mains current consumption is less, the mains filter used can be smaller accordingly.

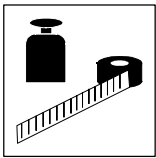
2) Subassembly possible

3) Because of the multi-axis operation one of the filters must be filter type B to achieve radio interference level A (EN 3-2 and 4-16)

Mains choke <sup>2)</sup>					
Lenze order number	I <sub>r</sub> [A] <sup>1)</sup>	L [mH]	U <sub>r</sub> [V]	Power loss PV [W]	Weight [kg]
ELN3-0088H035	35.0 A	0.88 mH	380 ... 500	60	9.8
ELN3-0075H045	45.0 A	0.75 mH		80	8.5
ELN3-0055H055	55.0 A	0.55 mH		100	13.0
ELN3-0038H085	85.0 A	0.38 mH		115	18.0
ELN3-0027H105	105.0 A	0.27 mH		130	18.0
ELN3-0022H130	130.0 A	0.22 mH		150	20.6
ELN3-0017H170	170.0 A	0.17 mH		170	20.6

1) If the mains current consumption is less, the mains choke used can be smaller accordingly

2) With mains chokes only the low frequency harmonic waves of the mains current will be reduced. Thus, the compliance with cable related noise emission (radio interference suppression) is not possible.



## Technical data

### 3.4.1 Mains choke dimensions

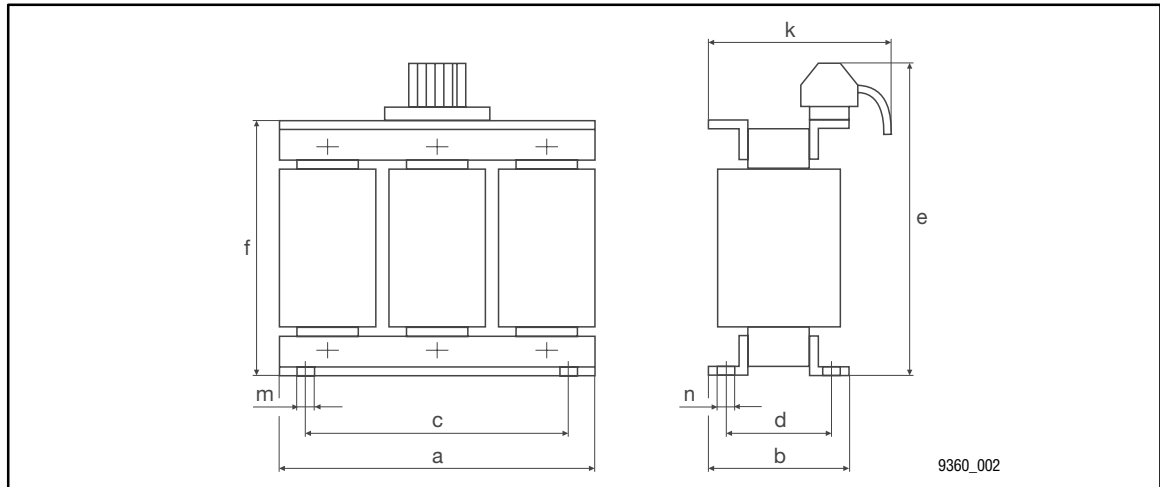
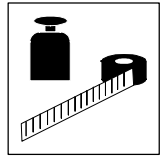


Fig. 3-1 Mains choke dimensions

Mains choke	a [mm]	b [mm]	c [mm]	d [mm]	e [mm]	f [mm]	k [mm]	m [mm]	n [mm]
ELN3-0088H035	180	91	161	74	225	165	120	6.3	11
ELN3-0075H045	180	91	161	74	225	165	120	6.3	11
ELN3-0055H055	228	88	206	69	263	205	120	6.3	11
ELN3-0038H085	228	111	206	94	263	205	140	6.3	11
ELN3-0027H105	228	111	206	94	273	205	150	6.3	11
ELN3-0022H130	264	102	240	81	265	237	135	6.3	11
ELN3-0017H170	264	128	240	107	257	237	166	8.3	16



## 3.4.2 Rough selection of mains filter / mains choke for 3 AC / 400 V

### Mains filter

DC supply unit		Assigned mains filters					
Type	Current Power	Type	AC [A]	Mains fuse recommended	P <sub>DC</sub> [kW] <sup>1)</sup>	I <sub>DC</sub> [A] <sup>1)</sup>	ΣP <sub>mot</sub> [kW] <sup>2)</sup>
9364	I <sub>DCr</sub> = 90 A I <sub>ACr</sub> = 74 A P <sub>DCr</sub> = 50 kW	EZN3B0110H030U <sup>3)</sup>	30.0	M 50 A	20.4	37.0	16.3
		EZN3B0080H042	42.0	M 50 A	28.2	51.0	22.6
		EZN3B0055H060	60.0	M 80 A	40.3	73.0	32.2
		EZN3B0037H090	74.0	M 100 A	50.0	90.0	40.0
9365	I <sub>DCr</sub> = 180 A I <sub>ACr</sub> = 148 A P <sub>DCr</sub> = 100 kW	EZN3B0037H090	90.0	M 125 A	61.0	110.0	50.0
		EZN3B0030H110	110.0	M 160 A	74.0	134.0	59.0
		EZN3B0022H150 <sup>3)</sup>	150.0	M 200 A	100.0	180.0	80.0

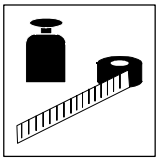
### Mains choke

DC supply unit		Assigned mains chokes					
Type	Current Power	Type	AC [A]	Mains fuse recommended	P <sub>DC</sub> [kW] <sup>1)</sup>	I <sub>DC</sub> [A] <sup>1)</sup>	ΣP <sub>mot</sub> [kW] <sup>2)</sup>
9364	I <sub>DCr</sub> = 90 A I <sub>ACr</sub> = 74 A P <sub>DCr</sub> = 50 kW	ELN3-0088H035	35.0	M 50 A	23.6	42.7	18.9
		ELN3-0075H045	45.0	M 63 A	30.4	55.0	24.3
		ELN3-0055H055	55.0	M 80 A	37.0	67.0	29.6
		ELN3-0038H085	74.0	M 100 A	50.0	90.0	40.0
9365	I <sub>DCr</sub> = 180 A I <sub>ACr</sub> = 148 A P <sub>DCr</sub> = 100 kW	ELN3-0038H085	85.0	M 125 A	57.0	104.0	45.6
		ELN3-0027H105	105.0	M 160 A	71.0	128.0	57.0
		ELN3-0022H130	130.0	M 160 A	88.0	159.0	70.0
		ELN3-0017H170	148.0	M 200 A	100.0	180.0	80.0

- 1) Continuous output values with assigned mains filter or mains choke
- 2) Connectable continuous motor power with assigned mains filter or mains choke at medium efficiency  $\eta_{AR} * \eta_{Mot} = 0.80$
- 3) Subassembly filter

$\eta_{AR}$  = Controller efficiency  
 $\eta_{Mot}$  = Motor efficiency





## Technical data

### 3.4.3 Calculation examples for the selection of mains filters/mains chokes

#### 3.4.3.1 Drives M1, M2 and M3 in motor mode operation

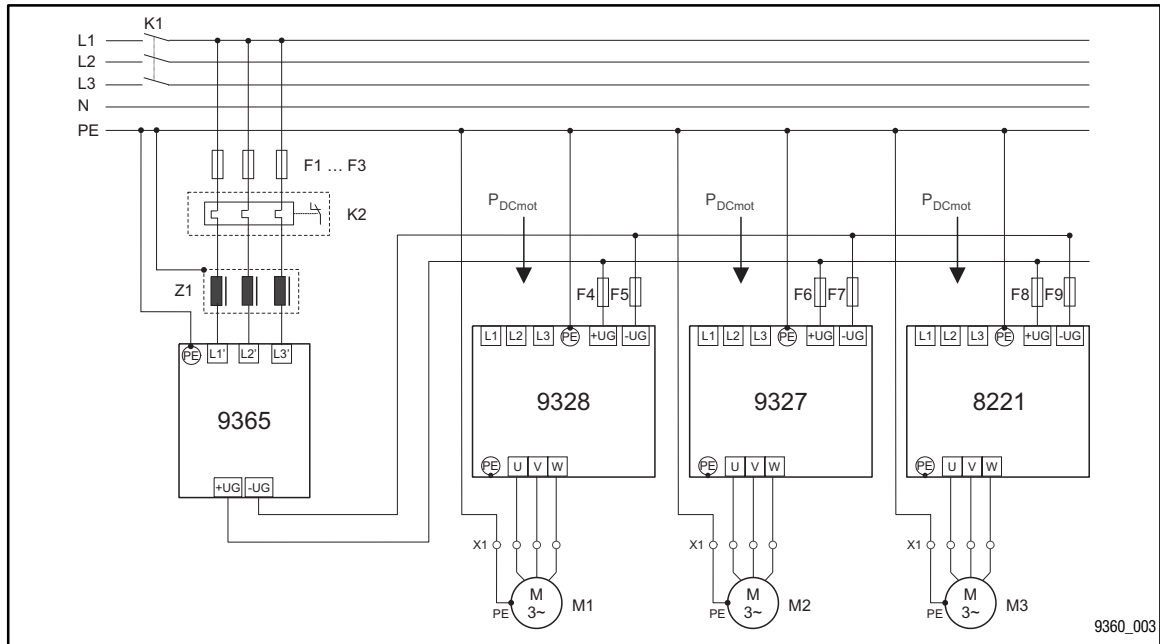


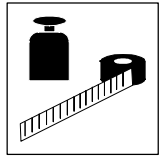
Fig. 3-2 Calculation example: Drives M1, M2 and M3 in motor mode operation

K2 Lenze recommends the use of a bimetal relay to monitor the r.m.s. current (overload, phase failure).

The following example is based on the use of the motors and controllers listed:

	Motor			Controller	
	Type	Motor power $P_r$ [kW]	$\eta$ <sup>1)</sup>	Type	Power loss $P_V$ [W] <sup>1)</sup>
M1	DFRAXX 180-22	22	0.91	9328	640
M2	DFRAXX 160-22	15	0.90	9327	430
M3	DFRAXX 160-22	15	0.90	8221	430

<sup>1)</sup> The power losses [ $P_V$ ] of the controllers and efficiencies [ $\eta$ ] of the motors are described in the corresponding Operating Instructions and Motor Catalogues.



## Calculation of the total power

$$P_{DCtotal} = \sum_{i=1}^n \frac{P_{Nshaft\ i}}{\eta_i} + P_{Vi}$$

- That means:

$$P_{DCtotal} = \frac{P_{N1}}{\eta_1} + P_{V1} + \frac{P_{N2}}{\eta_2} + P_{V2} + \frac{P_{N3}}{\eta_3} + P_{V3}$$

- With values inserted:

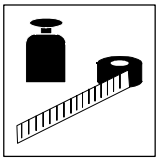
$$P_{DCtotal} = \frac{22\text{ kW}}{0.91} + 0.64\text{ kW} + \frac{15\text{ kW}}{0.9} + 0.43\text{ kW} + \frac{15\text{ kW}}{0.9} + 0.43\text{ kW}$$

- Result:

$$P_{DCtotal} = 59.10\text{ kW}$$

## Selection

If the DC power required is  $P_{DC} = 59.1\text{ kW}$ , select the 9365 DC supply unit with a EZN3B0037H90 mains filter or a ELN3-0027H105 mains choke. (☞ 3-7)



## Technical data

### 3.4.3.2 Drive M1 and M2 in motor-mode operation, drive M3 in generator-mode operation with an assumed generative power of $P_{DC} = 10 \text{ kW}$

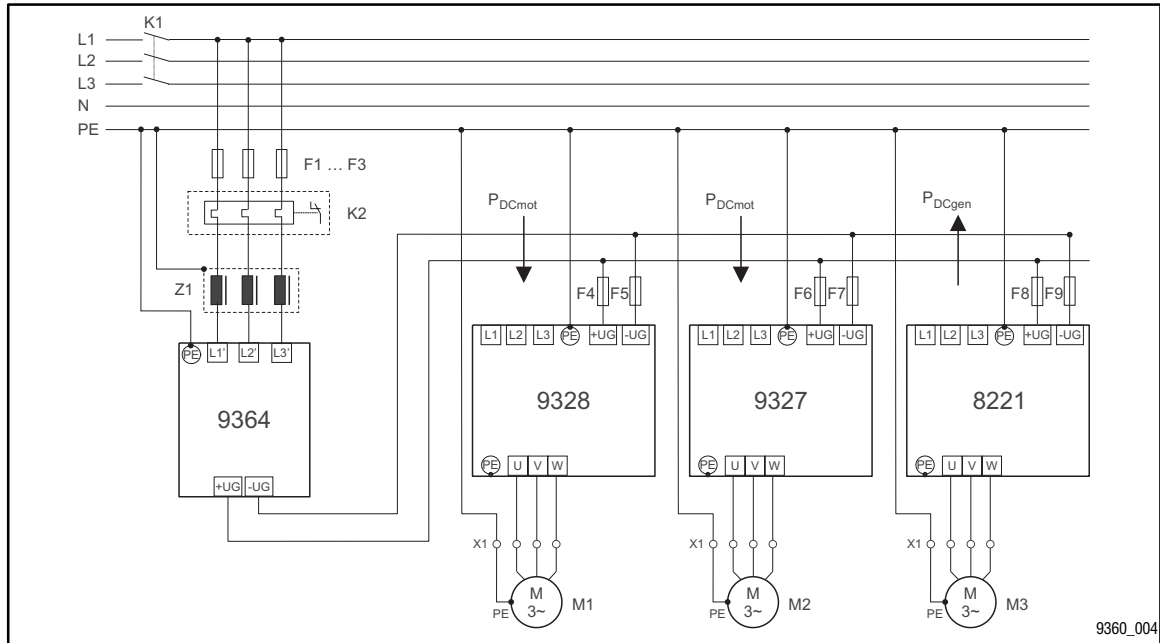


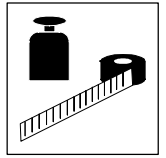
Fig. 3-3 Calculation example: Drives M1 and M2 in motor-mode operation, drive M3 in generator-mode operation

K2 Lenz recommends the use of a bimetal relay to monitor the r.m.s. current (overload, phase failure).

The following example is based on the use of the motors and controllers listed:

Motor				Controller		
	Type	Motor power $P_r$ [kW]	$\eta$ <sup>1)</sup>	Type	Power loss $P_v$ [W] <sup>1)</sup>	Generative power $P_{DCgen}$ [kW]
M1	DFRAXX 180-22	22	0.91	9328	640	-
M2	DFRAXX 160-22	15	0.90	9327	430	-
M3	DFRAXX 160-22	15	0.90	8221	430	10

<sup>1)</sup> The power losses [ $P_v$ ] of the controllers and efficiencies [ $\eta$ ] of the motors are described in the corresponding Operating Instructions and Motor Catalogues.



## Calculation of the total power

$$P_{\text{DCtotal}} = \sum_{i=1}^n \frac{P_{\text{Nshaft } i}}{\eta_i} + P_{\text{Vi}}$$

- That means:

$$P_{\text{DCtotal}} = \frac{P_{\text{N1}}}{\eta_1} + P_{\text{V1}} + \frac{P_{\text{N2}}}{\eta_2} + P_{\text{V2}} + P_{\text{V3}} - P_{\text{DCgen}}$$

- With values inserted:

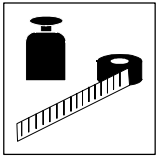
$$P_{\text{DCtotal}} = \frac{22 \text{ kW}}{0.91} + 0.64 \text{ kW} + \frac{15 \text{ kW}}{0.9} + 0.43 \text{ kW} + 0.43 \text{ kW} - 10 \text{ kW}$$

- Result:

$$P_{\text{DCtotal}} = 32.30 \text{ kW}$$

## Selection

If the DC power required is  $P_{\text{DC}} = 32.3 \text{ kW}$ , select the 9364 DC supply unit with a EZN3B0055H060 mains filter or a ELN3-0055H055 mains choke. (☞ 3-7)



## Technical data

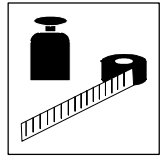
### 3.5 Fuses and cable cross-sections

#### 3.5.1 Fuses and cable cross-sections for mains voltage of the the DC supply unit

DC supply unit	Mains input L1, L2, L3, PE	
	Fuse to VDE	Cable cross-section [mm] <sup>1)</sup>
9364 <sup>2)</sup>	M 50A	16
	M 63A	25
	M 80A	25
	M 100A	50
9365 <sup>2)</sup>	M125A	50
	M 160A	70
	M 200A	95

1) The valid local regulations must be observed

2) If the current consumption is lower, the fuses and cable cross-sections can be smaller.

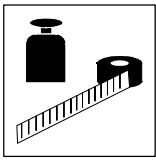


## 3.5.2 DC-bus fuses for DC-bus operation with DC supply

Controllers	Fuse				Fuse holder			Cable cross-sections required [mm <sup>2</sup> ] <sup>1)</sup>
	Mains current [A]	Size [mm]	Order No.	Required number	Order No.	Required number	Pole number	
8241, 8242, 9321ES, 9322ES, 9321EV, 9322EV, 82EV551_2B, 82EV751_2B, 82EV551_4B, 82EV751_4B	6.3	27 60	EFSCC0063AYJ	2	EFH20004	1	2	1
9323ES	8	27 60	EFSCC0080AYJ	2	EFH20004	1	2	1.5
82EV152_4B, 82EV222_4B	10	27 60	EFSCC0100AYJ	2	EFH20004	1	2	1.5
8243, 9323EV, 9324ES	12	27 60	EFSCC0120AYJ	2	EFH20004	1	2	1.5
9325ES, 9341, 82EV152_2B, 82EV222_2B, 82EV302_4B, 82EV402_4B	16	27 60	EFSCC0160AYJ	2	EFH20004	1	2	2.5
8244, 9324EV	20	27 60	EFSCC0200AYJ	2	EFH20004	1	2	4
8245, 9325EV, 9342, 9352, 82EV302_2B, 82EV402_2B, 82EV552_4B	32	27 60	EFSCC0320AYJ	2	EFH20004	1	2	6
8246, 9326EV, 9326ES, 82EV552_2B, 82EV752_2B, 82EV752_4B, 82EV113_4B	40	27 60	EFSCC0400AYJ	2	EFH20004	1	2	6
9327ES	50	27 60	EFSCC0500AYJ	2	EFH20004	1	2	10
8221, 9327EV, 9328ES, 9343	80	27 60	EFSCC0800AYJ	2	EFH20004	1	2	16
9330ES	80	27 60	EFSCC0800AYJ	4 <sup>2)</sup>	EFH20004	2 <sup>2)</sup>	2	2 16
9332ES	80	27 60	EFSCC0800AYJ	6 <sup>2)</sup>	EFH20004	3 <sup>2)</sup>	2	3 16
8222, 8223, 9328EV, 9329EV, 9329ES	100	27 60	EFSCC1000AYJ	2	EFH20004	1	2	25
8224, 8225, 9330EV, 9331EV, 9331ES	100	27 60	EFSCC1000AYJ	4 <sup>2)</sup>	EFH20004	2 <sup>2)</sup>	2	2 25
8226, 8227, 9332EV, 9333EV	100	27 60	EFSCC1000AYJ	6 <sup>2)</sup>	EFH30002	2 <sup>2)</sup>	3	3 25

1) The valid local regulations must be observed

2) Parallel



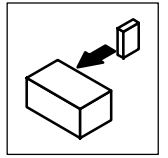
## Technical data

### Dimensions of the fuse holders

Type	a [mm]	b [mm]	c [mm]
EFH20004	77.0	150.0	107.0
EFH30002	142.0	150.0	

## 3.6 Dimensions

The dimensions of DC supply units depend on the mechanical installation. (4-1)



## 4 Installation

### 4.1 Mechanical installation

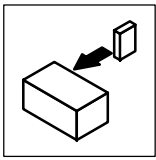
#### 4.1.1 Important notes

- Use DC supply units as built-in devices only!
- Observe the free space requirements!
  - You can install several controllers next to each other without free space in a control cabinet.
  - Allow a free space of 100 mm at the top and at the bottom.
- Ensure unimpeded ventilation of cooling air and outlet of exhaust air.
- If the cooling air contains pollutants (dust, fluff, grease, aggressive gases), which may impair the function of the DC supply unit:
  - Take suitable preventive measures, e.g. separate air duct, installation of filters, regular cleaning, etc.
- Do not exceed the ambient temperature permissible during operation. (📖 3-2)
- If DC supply units are permanently subjected to vibration or shaking:
  - Check whether shock absorbers are necessary.

#### Possible mounting positions

- Vertically to the control cabinet back panel with mains connections at the top





# Installation

## 4.1.2 Mounting with mains filter

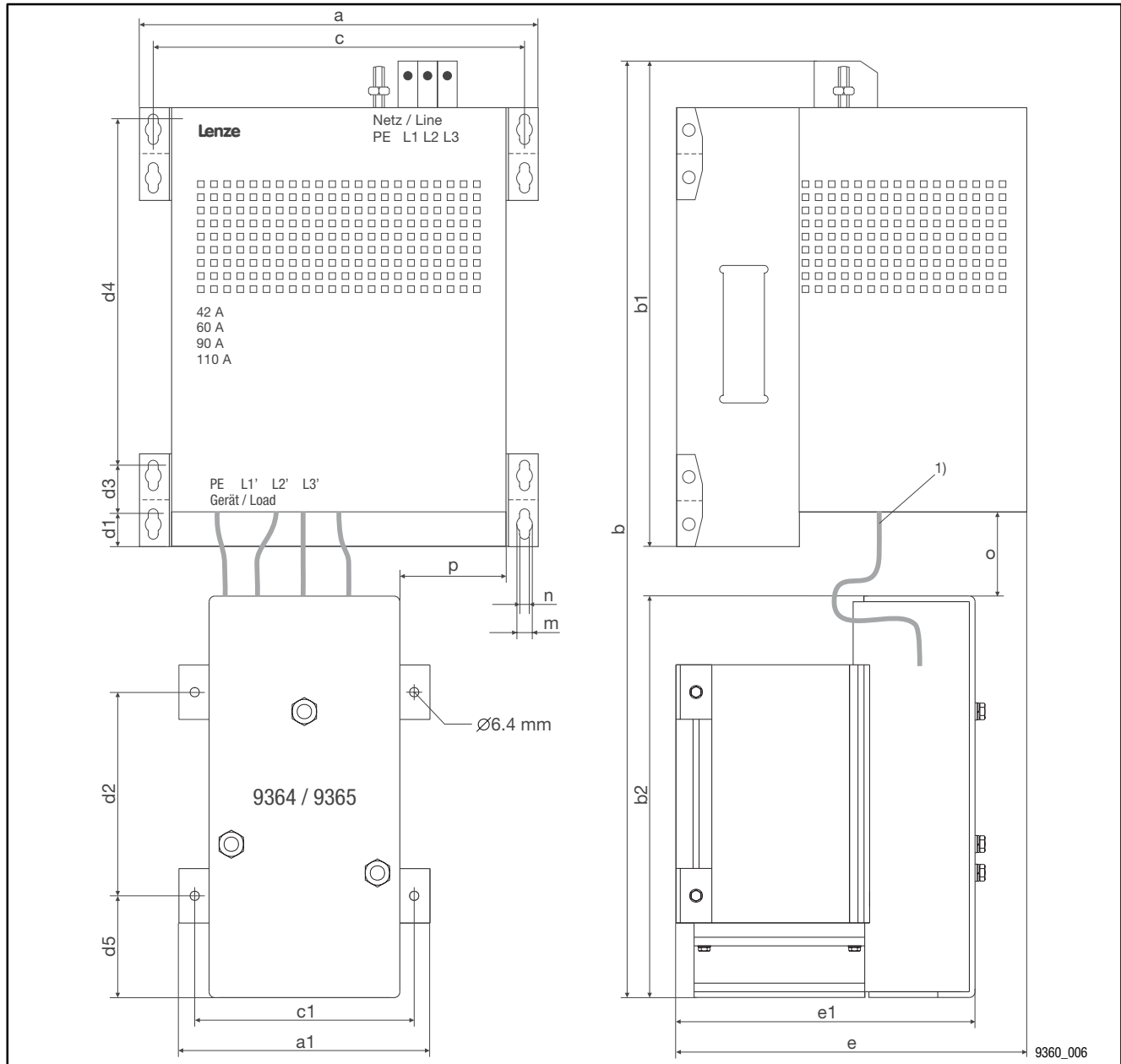
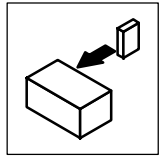


Fig. 4-1 Dimensions for mounting of the DC supply unit with mains filter

Mains filter	a	a1	b	b1	b2	c	c1	d1	d2	d3	d4	d5	e	e1	m	n	o	p
EZN3B0080H042	278	175	620	370	280	258	153	22	142	38	300	70	230	208	11	6.5	25	78
EZN3B0055H060			285										15				83	
EZN3B0037H090	368	175	835	516	280	345	153	38	142	48	335	70	285	208	18	11	75	130
EZN3B0030H110																		

1) The output cables of the filter are pre-cut. All electrical connection equipment is included in the accessory kit.  
All dimensions in [mm]



## 4.1.3 Mounting with subassembled mains filter

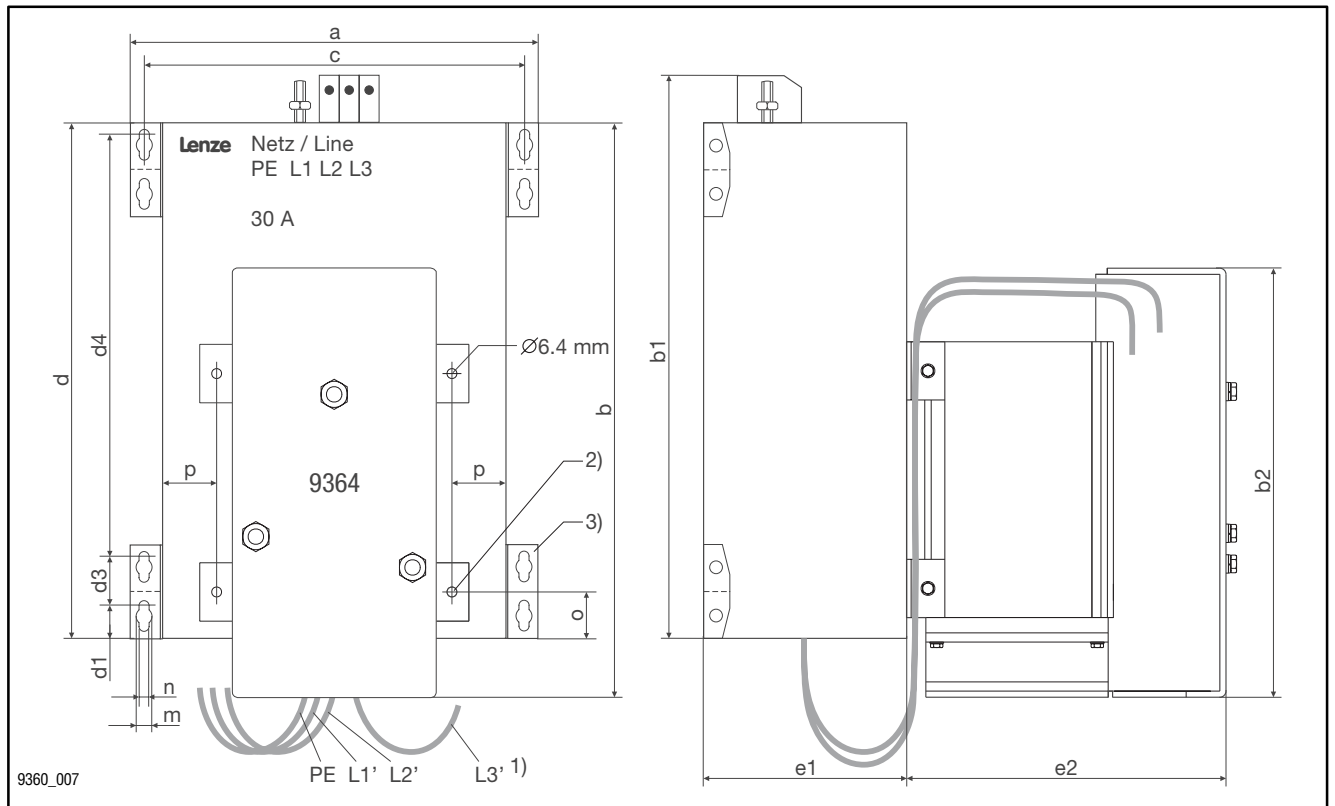
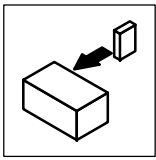


Fig. 4-2 Dimensions for mounting the 9364 DC supply unit with subassembled mains filter EZN3B0110H030U

Mains filter	a	b	b1	b2	c	d	d1	d3	d4	e1	e2	m	n	o	p
EZN3B0110H030U	278	375	361	280	258	336	22	38	268	132	208	11	6.5	30	41

- 1) The output cables of the filter are pre-cut. All electrical connection equipment is included in the accessory kit.  
Cable lengths: PE, L1', L2', L3' per 330 mm.
- 2) The threads for mounting the DC supply unit are in the filter housing.
- 3) The filter attachment only needs a mounting clip

All dimensions in [mm]



# Installation

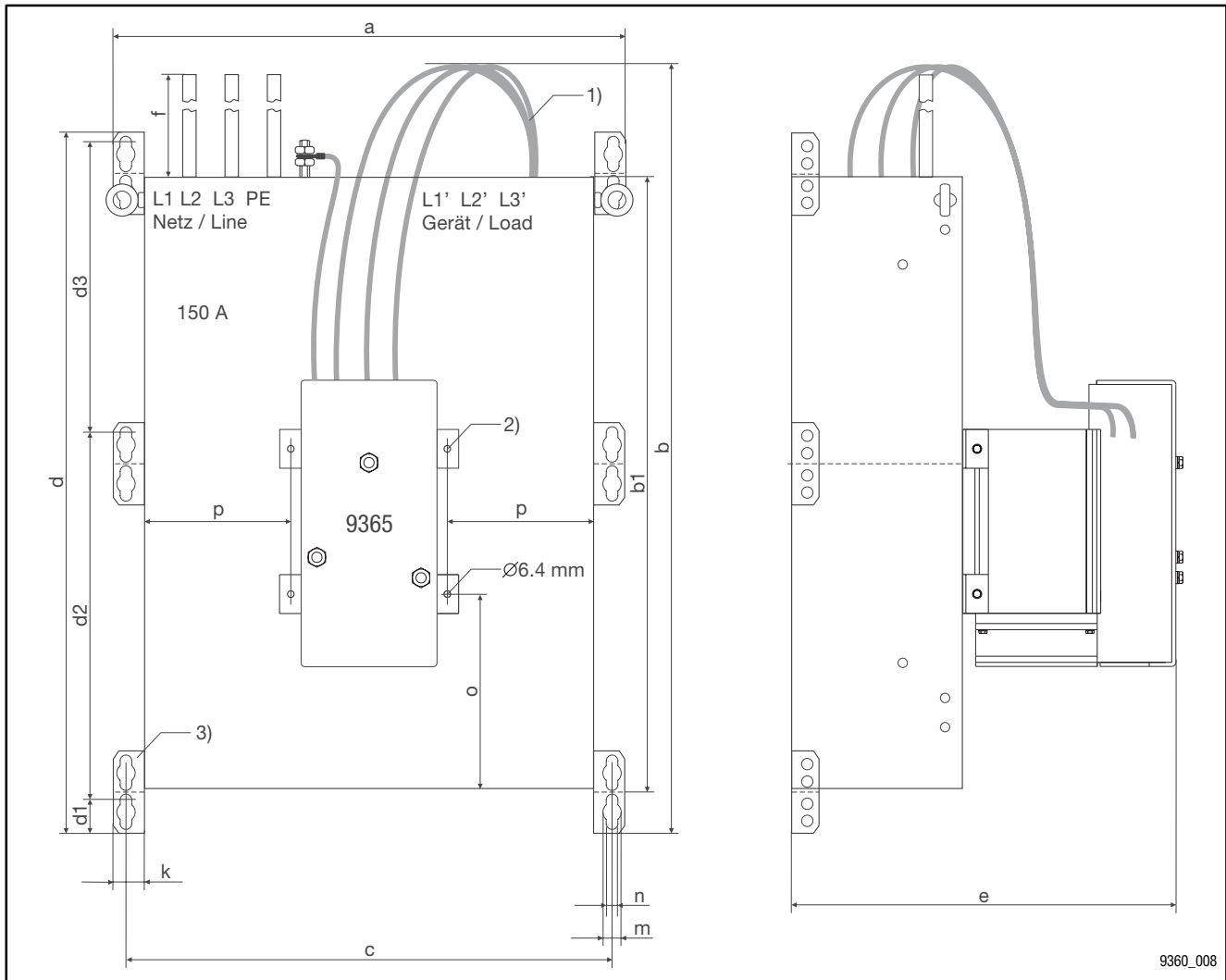


Fig. 4-3 Dimensions for assembly with subassembled mains filter EZN3B0022H150

Mains filter	a	b	b1	c	d	d1	d2	d3	e	f	k	m	n	o	p
EZN3B0022H150	478	800	680	455	750	38	372	328	400	1000	28	18	11	190	135

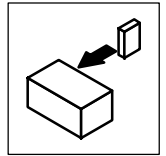
1) The output cables of the filter are pre-cut. All electrical connection equipment is included in the accessory kit.

Cable lengths: L1', L2', L3' per approx. 700 mm.

2) The threads for mounting the DC supply unit are in the filter housing.

3) The filter attachment only needs a mounting clip

All dimensions in [mm]



## 4.2 Electrical installation

### 4.2.1 Important notes

#### 4.2.1.1 Protection of persons

##### Protection of persons through RCCBs

RCCB type	Symbol on the RCCB		
	AC sensitive RCCB, type AC	pulse-current sensitive RCCB, type A	universal-current sensitive RCCB, type B

#### Definition

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

#### Protection of persons and animals

DIN VDE 0100 with RCCBs

- DC-supply units are internally equipped with mains rectifiers. 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 RCCB and thus eliminate the protective function for all units connected to this RCCB.
- We therefore recommend:
  - “universal-current RCCB” in systems with controllers on a 3-phase mains (L1/I2/I3).

#### Note about the use of universal-current sensitive RCCBs

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

#### Rated fault current

- RCCBs with a fated fault current of:
  - $\geq 300$  mA
- The RCCB may be activated unintentionally by
  - capacitive leakage currents between cable screens (especially with long screened motor cables),
  - Use of additional RFI filters

#### Installation

RCCBs must only be installed between the supplying mains and the DC supply unit.

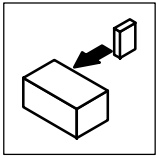
#### Capacitive discharge currents

Guide values for capacitive discharge currents with screened cables (270 nF/1 km; capacity core/screen of PVC cables):

- Approx. 80 mA at 50 m motor cable length and a chopper frequency of 8 kHz
- Approx. 100 mA at 60 m motor cable length and a chopper frequency of 8 kHz
- Approx. 180 mA at 100 m motor cable length and a chopper frequency of 8 kHz
- With a chopper frequency of 16 kHz, the capacitive discharge current is increased by approx. 40 %.

#### Note:

- A 300 mA RCCB should only be used with max. 100 mA capacitive discharge current.
- With 2 parallel operated controllers, the capacitive leakage currents are underproportional by approx. 150%.
- With screened PE motor cables the capacitance per unit length for core/screen are approx. 110 nF/1 km.



## Installation

### 4.2.1.2 Additional measures for protection of persons

- Replacement of defective fuses** Replace defective fuses with the prescribed type only when no voltage is applied.
- Controllers carry a hazardous voltage for up to 3 minutes after mains disconnection.
  - In a drive network, all controllers must be inhibited and disconnected from the mains.

**Disconnection of controllers from the mains through a DC supply unit** Disconnect the controller from the only through a contactor in the mains input of the DC supply unit.

### 4.2.2 Mains isolation

Terminals 1T1, 1T2, 2T1, 2T2 and L1 and N (only with 9365) have a double basic insulation (double isolating distance, safe mains isolation to VDE0160). The protection against contact is ensured without any further measures.

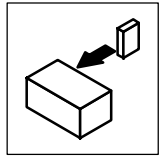


#### Danger!

- Protection against contact in case of fault is ensured only by additional measures.

### 4.2.3 Protection of the DC supply unit

- The DC supply units 9364 and 9365 must only be operated with the assigned mains chokes / mains filters. (☞ 3-5)
- The DC supply unit is protected by external fuses. (☞ 3-12)
- Lenze recommends the use of a bimetal relay to monitor the r.m.s. current (overload, phase failure).
- In the event of condensation, connect the DC supply unit to the mains voltage only after the visible humidity has evaporated.



## 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 the rated data of the DC supply unit
With isolated neutral (IT mains)	possible, if the controller is protected in the event of an earth fault in the mains supply <ul style="list-style-type: none"> <li>by corresponding equipment which detects the earth fault and</li> <li>immediately separates the controller from the mains</li> </ul>	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

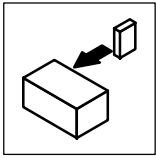
## 4.2.5 Cable specification

- The cables used must comply with the approvals required at the site
- The prescribed minimum cross-sections for PE conductors must be maintained in all cases. The cross-section of the PE conductor must be at least as large as the cross-section of the power connection (max. 16 mm<sup>2</sup>).
- 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 a cover angle of 90°.

## 4.2.6 Connection of DC supply unit



Remove the cover to have access to all connection terminals:

1. Loosen the screws ②
2. Remove the cover ①
3. Find the accessory kit which is included in the packaging of the DC supply unit



# Installation

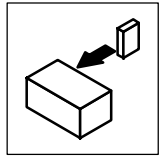
## Fuses

<b>Fuses and cable cross-sections</b>	The specifications in Chapter 3.5 are recommendations. (  3-12 ) They refer to the use <ul style="list-style-type: none"><li>• in control cabinets and machines</li><li>• installation in cable ducts,</li><li>• max. ambient temperature +40 °C.</li></ul>
<b>Selection of the cable cross-section</b>	Take the voltage drop under load (acc. to DIN 18015 part 1: 3 %) into account for the selection. $\leq 3 \%$ .
<b>Protection of the cables on the AC side (L1, L2, L3)</b>	<ul style="list-style-type: none"><li>• By standard commercial fuses.</li><li>• 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".</li></ul>
<b>Protection of the cables and the controller on the DC side (+UG, -UG)</b>	<ul style="list-style-type: none"><li>• By means of recommended DC fuses.</li></ul>
<b>Connection of a brake unit</b>	If the unit is connected to the terminals +UG / -UG, the fuses and cross-sections indicated in chapter 3.5 are not valid. These unit-specific data can be obtained from the technical documentation for the brake unit.
<b>Further information</b>	 3-12: Cable protection and protection of the DC supply unit and the controller
<b>Further standards</b>	The compliance with other standards (e.g.: VDE 0113, VDE 0289, etc.) remains the responsibility of the user.



### Tip!

We recommend the use of screened cables to comply with the EMC regulations



## 4.2.6.1 Mains connection

Studs ① for L1, L2, L3:

- 9364: M8
- 9365: M10

Pre-cut electrical connections of mains filters can be mounted using smaller studs if necessary. ①

- 9364: M6 (parts required in the accessory kit)
- 9364: M8 (parts required in the accessory kit)

Cable cross-sections and screw tightening torques						
Type	Connections L1, L2, L3			PE connection		
	Max. permissible cable cross-sections	Studs	Tightening torques	Max. permissible cable cross-sections	Studs	Tightening torques
9364	95 mm <sup>2</sup>	M8	7 Nm (62 lbin)	95 mm <sup>2</sup>	M8	7 Nm (62 lbin)
	25 mm <sup>2</sup>	M6	4 Nm (35 lbin)		M6	4 Nm (35 lbin)
9365	120 mm <sup>2</sup>	M10	12 Nm (106.2 lbin)		M8	7 Nm (62 lbin)
	95 mm <sup>2</sup>	M8	7 Nm (62 lbin)			

## 4.2.6.2 DC-bus connection

Studs ① for -UG, +Ug:

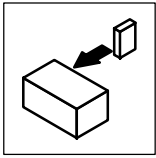
- 9364: M8
- 9365: M10

Make a correct screen connection with screened cables:

- Connect the screen with the conductive mounting plate in the control cabinet using a suitable clamp. Do not use as a strain relief!

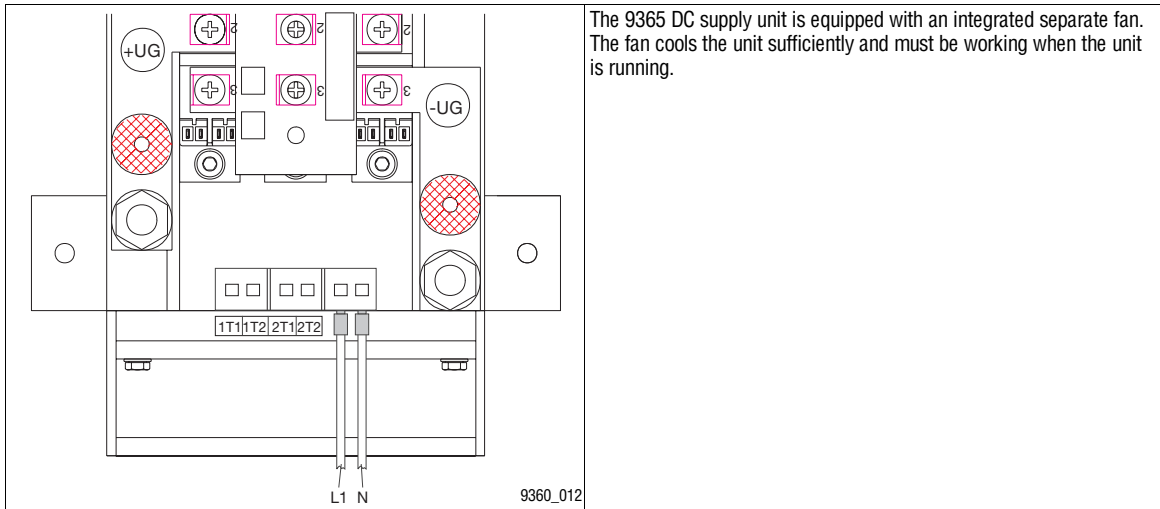
Cable cross-sections and screw tightening torques			
Type	Connections -UG, +UG		
	Max. permissible cable cross-sections	Studs	Tightening torques
9364	95 mm <sup>2</sup>	M8	7 Nm (62 lbin)
9365	120 mm <sup>2</sup>	M10	12 Nm (106.2 lbin)





# Installation

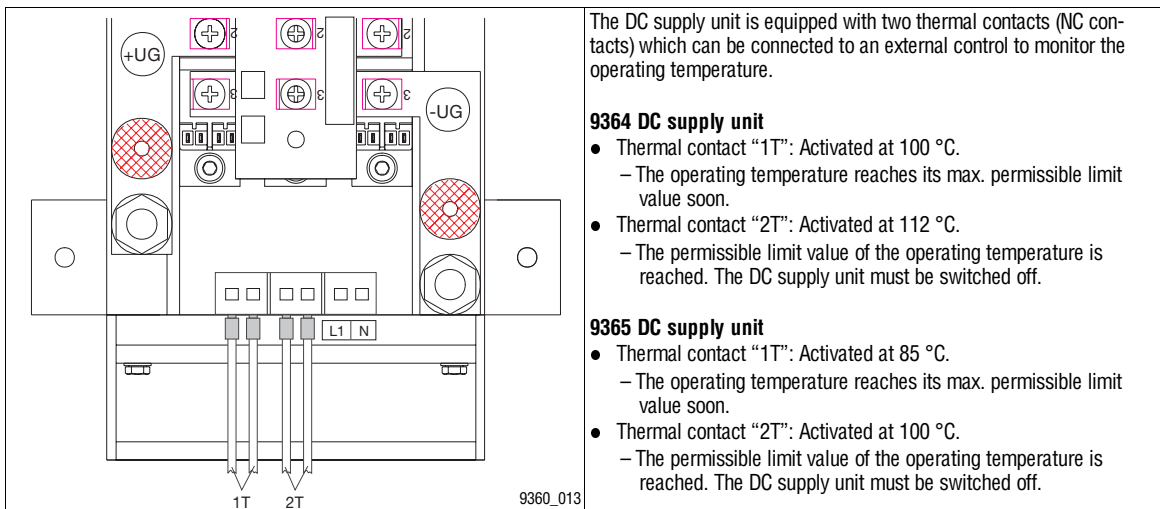
## 4.2.6.3 Separate fan connection



The 9365 DC supply unit is equipped with an integrated separate fan. The fan cools the unit sufficiently and must be working when the unit is running.

Cable cross-sections and screw tightening torques	
Max. permissible cable cross-section	Tightening torque
1.5 mm <sup>2</sup>	0.5 ... 0.6 Nm (4.4 ... 5.3 lbin)

## 4.2.6.4 Connection of temperature monitoring



The DC supply unit is equipped with two thermal contacts (NC contacts) which can be connected to an external control to monitor the operating temperature.

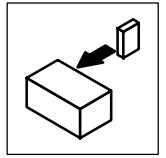
### 9364 DC supply unit

- Thermal contact "1T": Activated at 100 °C.
  - The operating temperature reaches its max. permissible limit value soon.
- Thermal contact "2T": Activated at 112 °C.
  - The permissible limit value of the operating temperature is reached. The DC supply unit must be switched off.

### 9365 DC supply unit

- Thermal contact "1T": Activated at 85 °C.
  - The operating temperature reaches its max. permissible limit value soon.
- Thermal contact "2T": Activated at 100 °C.
  - The permissible limit value of the operating temperature is reached. The DC supply unit must be switched off.

Cable cross-sections and screw tightening torques	
Max. permissible cable cross-section	Tightening torque
1.5 mm <sup>2</sup>	0.5 ... 0.6 Nm (4.4 ... 5.3 lbin)



## 4.3 Circuit diagrams

### 4.3.1 Three-phase controller connected to a central supply

Please observe the corresponding Operating Instructions for the controllers.

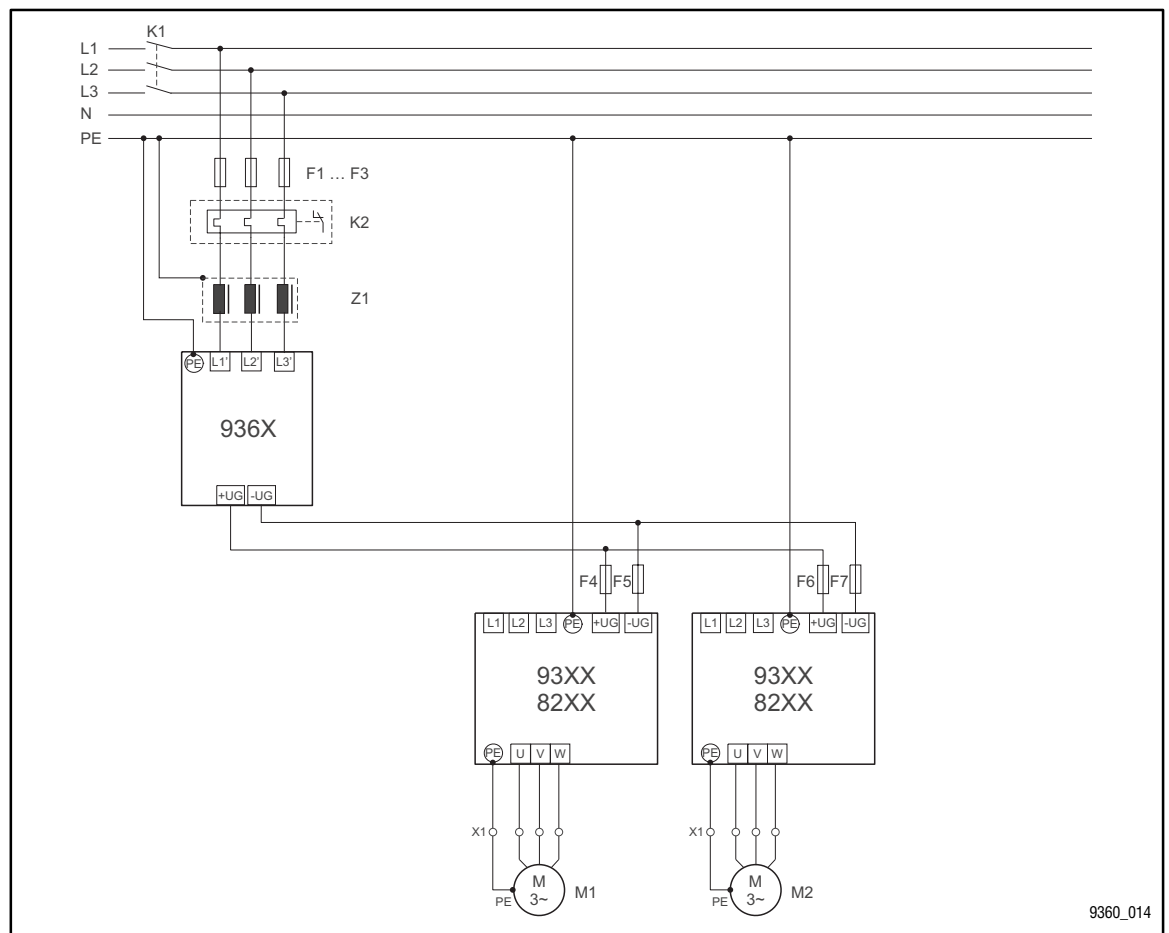
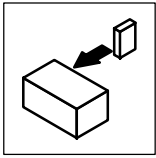


Fig. 4-4 Central supply for DC-bus connection of several three-phase controllers

- |           |                                                                                                                     |
|-----------|---------------------------------------------------------------------------------------------------------------------|
| F1 ... F3 | Mains fuses for the DC supply unit                                                                                  |
| F4 ... F7 | DC bus fuses for the controller                                                                                     |
| K1        | Main contactor                                                                                                      |
| K2        | Bimetal relay. Lenze recommends the use of a bimetal relay to monitor the r.m.s. current (overload, phase failure). |
| Z1        | Mains filter and mains choke                                                                                        |



# Installation

## 4.3.2 Single phase controller connected to a central supply unit

Please observe the corresponding Operating Instructions for the controllers.

Benefit of using single-phase controllers with a 936X DC supply unit:

- Economical concept for multi-motor applications
- Energy exchange in the DC-bus
- Symmetrical mains load with load of the neutral conductor
- Reduced harmonic waves in the supply mains and thus reduced apparent power consumption

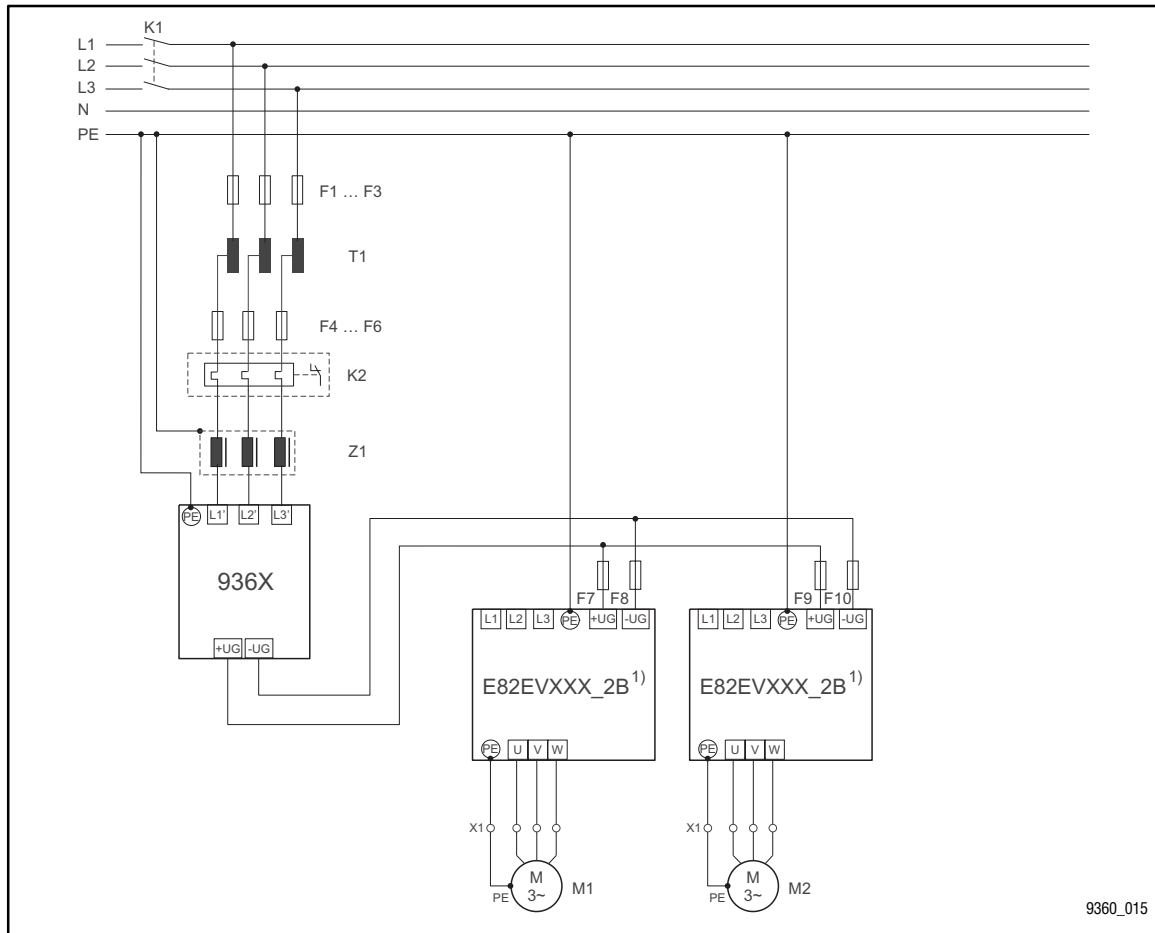
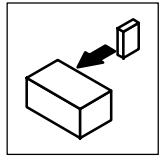


Fig. 4-5 Central supply for DC-bus connection of several single-phase controllers

- F1 ... F3 Mains fuses
- F4 ... F6 Mains fuses for the DC supply unit
- F7 ... F10 DC bus fuses for the controller
- K1 Main contactor
- K2 Bimetal relay. Lenze recommends the use of a bimetal relay to monitor the r.m.s. current (overload, phase failure).
- T1 Auto transformer
  - Input voltage: 3 AC 400 V
  - Output voltage: 3 AC 230 V
- Z1 Mains filter and mains choke. Use a mains filter type B with a rated voltage of 380 ... 480 V or a mains choke with a rated voltage of 380 ... 500 V.
- 1) Single-phase 82XX controllers. With units providing a min. power of 0.55 kW DC supply is possible.



## 4.3.3 DC-supply unit with 9352 brake chopper

Please observe the corresponding Operating Instructions for the controllers and the 9352 brake chopper.

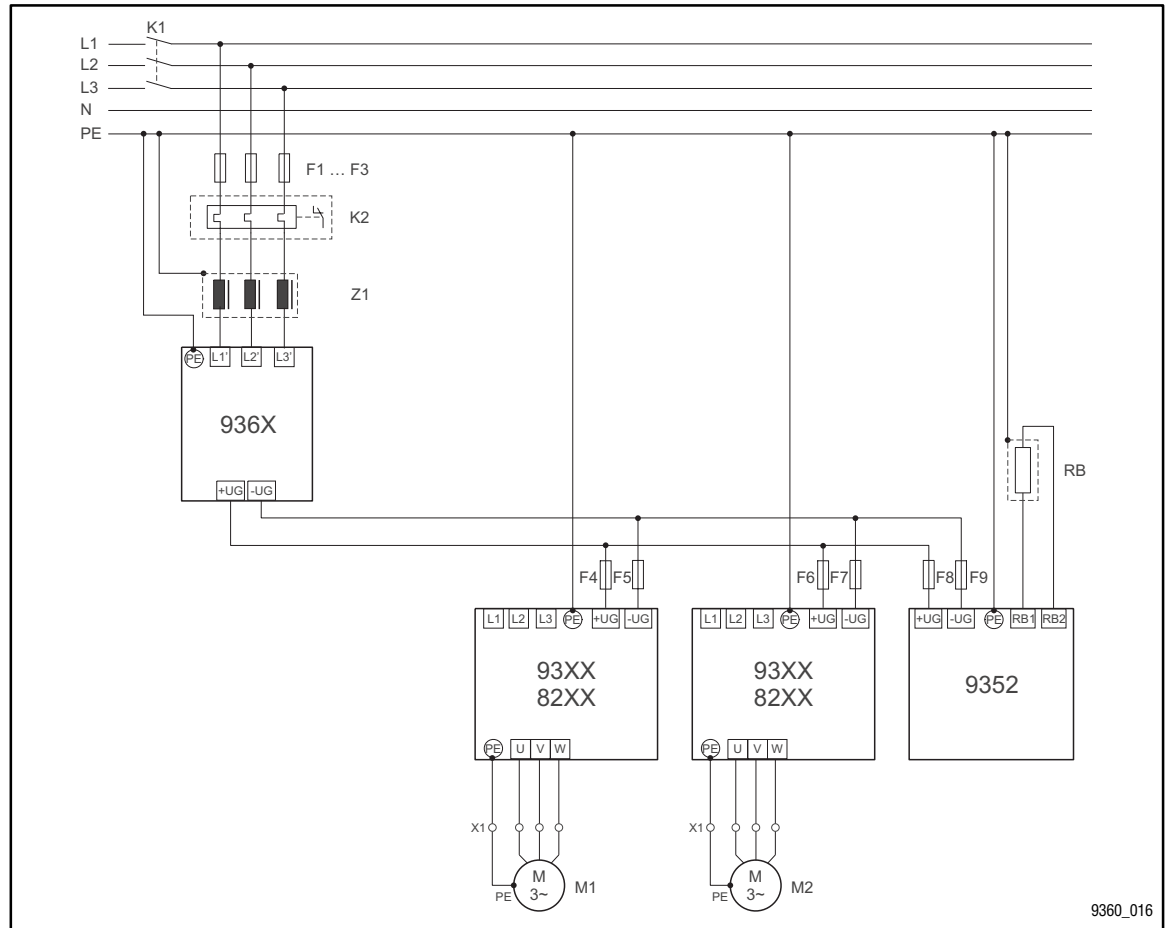
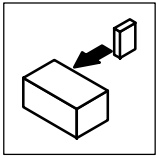


Fig. 4-6 Central supply for DC-bus connection of several controllers and a 9352 brake chopper.

F1 ... F3	Mains fuses for the DC supply unit
F4 ... F7	DC bus fuses for the controller
F8, F9	DC-bus fuses for the brake chopper. The fuses must be adapted to the brake power (max. 32 A).
K1	Main contactor
K2	Bimetal relay. Lenze recommends the use of a bimetal relay to monitor the r.m.s. current (overload, phase failure).
RB	Brake resistor. The connection of the temperature monitoring is described in the Operating Instructions for the "9350 brake unit".
Z1	Mains filter and mains choke



# Installation

## 4.3.4 DC-supply unit with a 934X regenerative power supply unit

Please observe the corresponding Operating Instructions for the controllers and the 934X regenerative power supply unit.

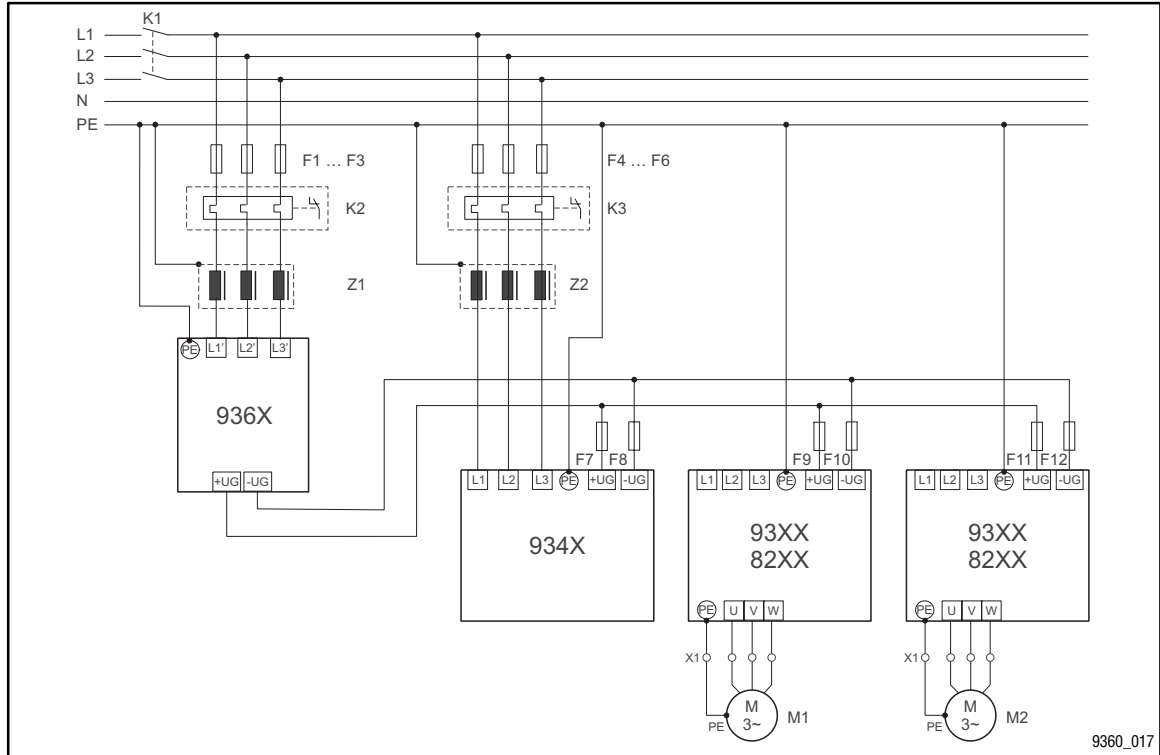


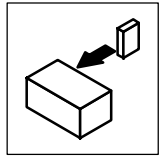
Fig. 4-7 Central supply for DC-bus connection of several controllers and regenerative power supply units

- F1 ... F3 Mains fuses for the DC supply unit
- F4 ... F6 Mains fuses for the 934X regenerative power supply unit
- F7, F8 DC-bus fuses for the 934X regenerative power supply unit
- F9 ... F12 DC bus fuses for the controller
- K1 Main contactor
- K2, K3 Bimetal relay. Lenze recommends the use of a bimetal relay to monitor the r.m.s. current (overload, phase failure).
- Z1, Z2 Mains filter and mains choke



### Tip!

- The power fed back into the mains is determined by the regenerative power supply unit.
- The motoric power from the mains is a combination of the output power  $P_{DC}$  of the DC supply unit and a reduced output power of the regenerative power supply unit. Please contact Lenze for detailed information.
- It is not permitted to connect several 934X regenerative power supply units in parallel to increase the generative power.
- Also the use of additional brake choppers or brake modules is not permitted.



## 4.3.5 Parallel operation of two 9365 DC supply units

Please observe the corresponding Operating Instructions for the controllers.

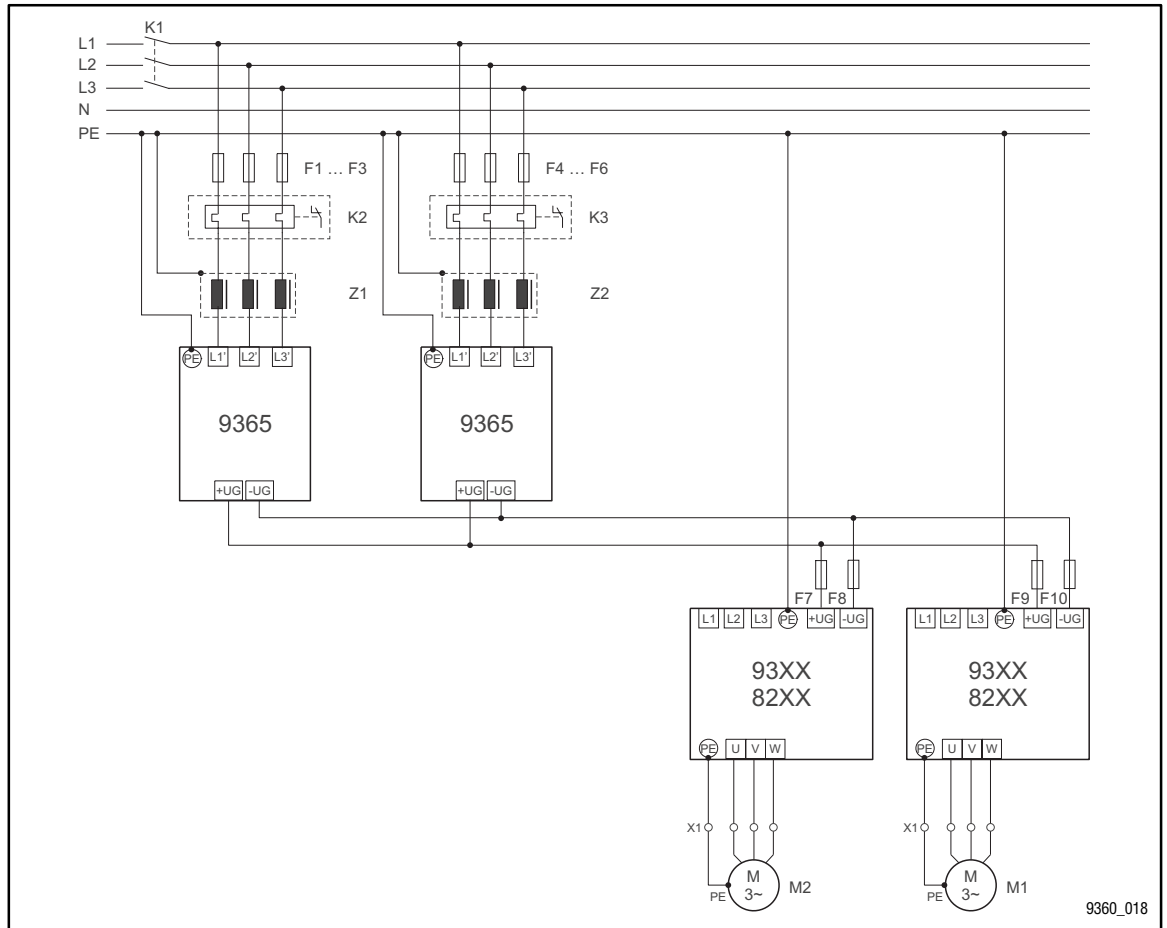


Fig. 4-8 Central supply for DC-bus connection of several controllers and 2 9365 DC supply units connected in parallel

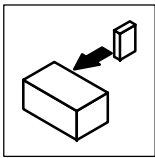
F1 ... F3	Mains fuses for DC supply units
F4 ... F6	
F9 ... F12	DC bus fuses for the controller
K1	Main contactor
K2, K3	Bimetal relay. Lenze recommends the use of a bimetal relay to monitor the r.m.s. current (overload, phase failure).
Z1, Z2	Mains filter and mains choke



### Tip!

When two 9365 DC supply units are connected in parallel the current can be distributed unsymmetrically because of the tolerances in the mains filters and mains chokes (Z1 and Z2).

- To avoid overload, the active output power must be reduced by 20 % for every DC supply unit.
- Thus the total power of the two DC supply unit is max. 160 kW.



# Installation

## 4.4 Installation of a CE-typical drive system

<b>General notes</b>	<ul style="list-style-type: none"> <li>● The electromagnetic compatibility of a machine depends on the type of installation and care taken. Please observe:             <ul style="list-style-type: none"> <li>– Assembly</li> <li>– Filters</li> <li>– Shielding</li> <li>– Grounding</li> </ul> </li> <li>● 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             <ul style="list-style-type: none"> <li>– Use of unscreened cables</li> <li>– Use of group RFI filters instead of assigned RFI filters</li> <li>– Operation without mains filter</li> </ul> </li> <li>● <b>The compliance of the machine application with the EMC Directive is in the responsibility of the user.</b> <ul style="list-style-type: none"> <li>– 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.</li> <li>– If devices which do not comply with the CE requirement regarding noise immunity EN 50082-2 are operated close to the drive system, these devices can be electromagnetically interfered by the drive system.</li> </ul> </li> </ul>
<b>Assembly</b>	<ul style="list-style-type: none"> <li>● Connect as much surface as possible of the DC supply unit, controller and mains choke/filter to the grounded mounting plate:             <ul style="list-style-type: none"> <li>– Mounting plates with conductive surfaces (zinc-coated, stainless steel) allow permanent contact.</li> <li>– Painted plates are not suitable for the installation in accordance with the EMC.</li> </ul> </li> <li>● If you use several mounting plates:             <ul style="list-style-type: none"> <li>– Connect as much surface as possible of the mounting plates (e.g. with copper bands).</li> </ul> </li> <li>● Ensure the separation of motor cable and signal or mains cable.</li> <li>● Do not use the same terminal strip for mains input and motor output.</li> <li>● Cable guides as close as possible to the reference potential. Unguided cables have the same effect as aerials.</li> </ul>
<b>Filters</b>	<ul style="list-style-type: none"> <li>● Only use the mains filters and RFI filters designated for the DC supply unit:             <ul style="list-style-type: none"> <li>– RFI filters reduce impermissible high-frequency interference to a permissible value.</li> <li>– Mains chokes reduce low-frequency interferences which depend on the motor cable and its length.</li> <li>– Mains filters combine the functions of mains choke and RFI filter. <sup>1)</sup></li> </ul> </li> </ul>
<b>Shielding</b>	<ul style="list-style-type: none"> <li>● Connect the screen of the motor cable to the controller             <ul style="list-style-type: none"> <li>– to the screen connection of the controller.</li> <li>– additionally to the mounting plate with a surface as large as possible.</li> <li>– Recommendation: For the connection, use ground clamps on bare metal mounting surfaces.</li> </ul> </li> <li>● If contactors, motor-protecting switches or terminals are located in the motor cable:             <ul style="list-style-type: none"> <li>– Connect the screens of the connected cables also to the mounting plate, with a surface as large as possible.</li> </ul> </li> <li>● Connect the screen in the motor terminal box or on the motor housing to PE:             <ul style="list-style-type: none"> <li>– Metal glands at the motor terminal box ensure a connection of the screen and the motor housing.</li> </ul> </li> <li>● If the mains cable between mains filter and DC supply unit             <ul style="list-style-type: none"> <li>– Screen mains cables.</li> <li>– Connect the screen of the mains cable directly to the DC supply unit and to the mains filter and connect it to the mounting plate with as large a surface as possible.</li> </ul> </li> <li>● Screening of controller control cables:             <ul style="list-style-type: none"> <li>– Connect both screen ends of the digital control cables.</li> <li>– Connect one screen end of the analog control cables.</li> <li>– Always connect the screens to the screen connection at the controller over the shortest possible distance.</li> </ul> </li> <li>● Use of the drive system in residential premises:             <ul style="list-style-type: none"> <li>– Use an additional screen damping of <math>\geq 10</math> dB. This is usually achieved by installation in enclosed and grounded control cabinets made of metal. <sup>2)</sup></li> </ul> </li> </ul>
<b>Grounding</b>	<ul style="list-style-type: none"> <li>● Ground all metal components (DC supply unit, controller, mains filter, motor filter, mains choke) using suitable cables connected to a central point (PE bar).</li> <li>● Maintain the minimum cross-sections prescribed in the safety regulations:             <ul style="list-style-type: none"> <li>– For the EMC, not the cable cross-section is important, but the surface and the contact with a cross-section as large as possible, i.e. large surface.</li> </ul> </li> </ul>

<sup>1)</sup> Measured under typical installation conditions according to chapter 4.4 with 8 93XX controller and 10 m screen motor cable each. With 8 93XX controllers and 50 m screened motor cable each, the limit value for noise emission is slightly exceeded (approx. 6 dB of 1.5 ... 4 MHz). The noise emission to EN 55011 increases with the number of controller connected to the DC supply unit and the length of the motor cable (screened) per controller.

We recommend an individual measurement of the noise emission if you connect many controllers and use long motor cables. Limit value class B (residential premises) cannot be achieved with the mains filters used.

<sup>2)</sup> The noise emission to EN55011 exceeds the permissible limit value class B for residential premises when using a typical multi-motor drive system and a central 936X DC supply unit.

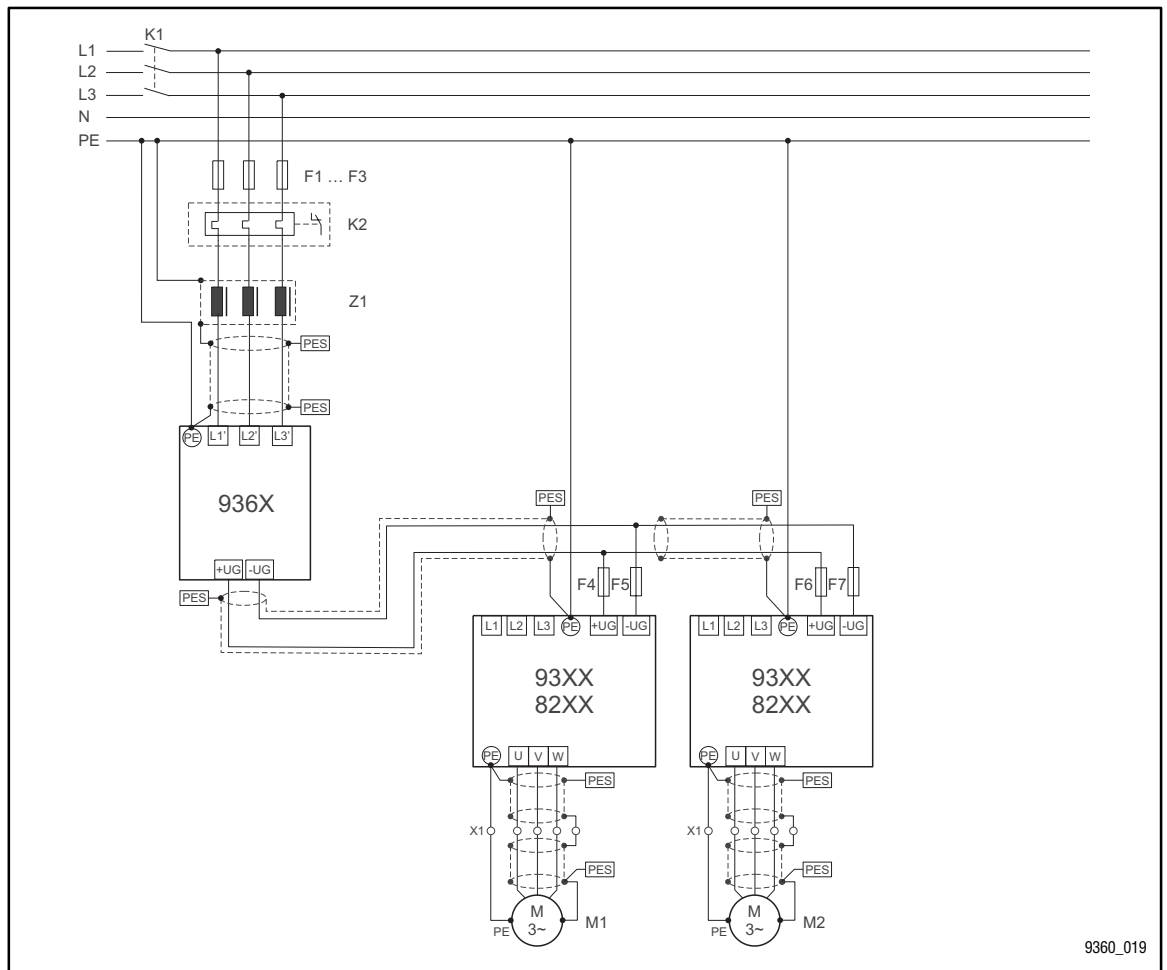
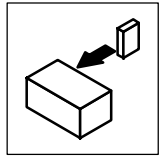
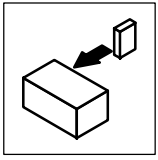


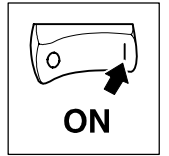
Fig. 4-9 Example for an installation in accordance with the EMC regulations

- F1 ... F3      Mains fuses for the DC supply unit
- F4 ... F7      DC bus fuses for the controller
- K1              Main contactor
- K2              Bimetal relay. Lenze recommends the use of a bimetal relay to monitor the r.m.s. current (overload, phase failure).
- Z1              Mains filter and mains choke. If you use Lenze filters and the pre-cut, short connection cables, a screen is not required. ( ( 4-2 and 4-3 )
- PES             HF screen end because of PE connection with a surface as large as possible (see "Screening" in this chapter). For screening of control cables see "Screening" in this chapter.





## *Installation*



## 5 Commissioning

### 5.1 Initial switch-on



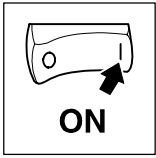
#### **Stop!**

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

- The input AC voltage (see nameplate) of the controllers connected to the DC bus must be the same as the input AC voltage of the DC supply unit.
- Power connection:
  - L1, L2 and L3 (direct mains connection, any phase angle)
  - +UG, -UG (DC-bus connection, network of drives)
- Adapt all 93XX controllers connected to the network to the mains voltage (under C0173).
- In the event of condensation, only connect the DC supply unit to the mains voltage after the visible humidity has evaporated.

**Keep to the switch-on sequence!**

---



## *Commissioning*



## 6 Troubleshooting and fault elimination

### 6.1 Tripping of the temperature monitoring

The DC supply unit is equipped with a temperature monitoring for the prewarn and switch-off temperature (thermal contact as NC contact for each temperature) The following table helps you with trouble shooting:

Type	Permissible ambient temperature		Thermal contact switches when		When the temperature monitoring has tripped please check ...
	Without Power derating	With Power derating	Prewarn temperature	Switch-off temperature	
9364	max. +40 °C	max. +55 °C	100 °C	112 °C	the permissible ambient temperature. This temperature must not be exceeded.
					the max. output power $P_{DCmax}$ . It must not be exceeded.
9365	max. +40 °C	max. +55 °C	85 °C	100 °C	the permissible ambient temperature. This temperature must not be exceeded.
					the max. output power $P_{DCmax}$ . It must not be exceeded.
					trouble-free operation of the separate fan- <ul style="list-style-type: none"> <li>● Check the air vents for dirt and particles.</li> <li>● If necessary, check the fan connection.</li> </ul>



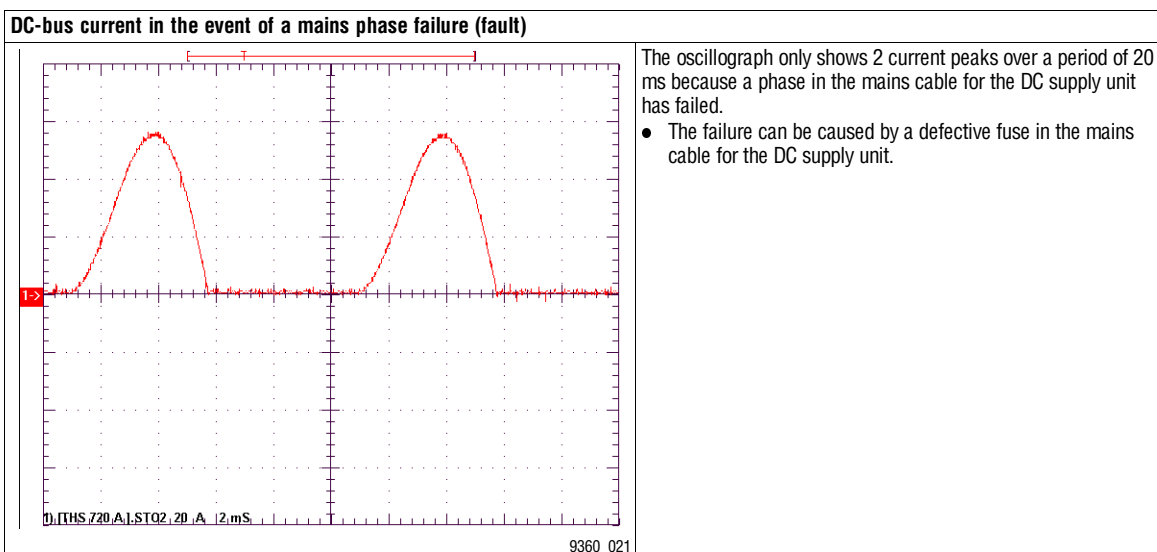
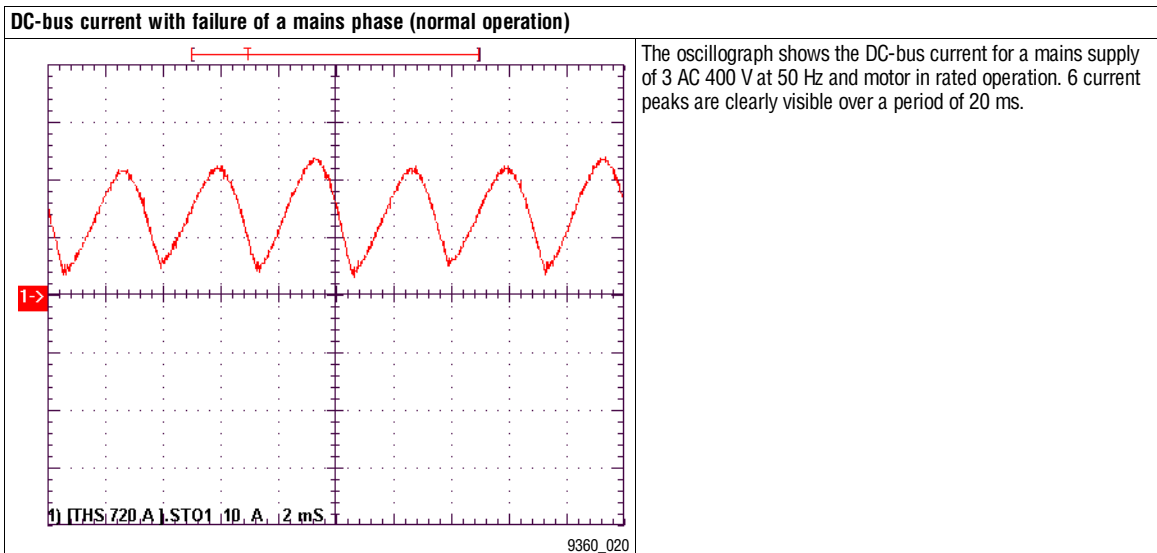
## 6.2 Mains phase failure

A phase failure in the mains cable of the DC supply unit is not monitored. The controller connected will also be supplied if a mains phase fails.

- If a phase fails, the DC bus of the connected controllers will be increased in rated operation. The DC supply unit is endangered to be overloaded.
- The mains phase failure can be caused by a defective fuse. Check the fuses in the mains cable of the DC supply unit.
- Connect a r.m.s. current monitoring system (e.g. bimetal relay) to the mains cable of the DC supply unit to ensure that the DC supply unit will be switched off if an overload occurs. (Fig. 4-11, connection diagrams)

### Current oscillograph in the event of a mains phase failure

A 5.5 kW asynchronous motor has been connected to a 8200 vector controller. The controller is supplied through a 9364 DC supply unit. In rated operation, the DC-bus current is  $I_{DC}$  14.5 A (r.m.s. value). If a phase fails, the DC-bus current  $I_{DC}$  is increased to 27 A.





## 7 Maintenance

### 7.1 Maintenance

- The DC supply unit is free of maintenance if all application conditions indicated in the Operating Instructions are observed. (📖 3-2)
- If the ambient air contains pollutants, the ventilation slots of the separate fan for the 9365 DC supply unit can be blocked.
  - Therefore please check the ventilation slots regularly (approx. every 4 weeks).
  - Clean blocked ventilation slots using a vacuum cleaner.



---

#### Stop!

Do not use any pointy or sharp tools, e.g. knife, screw driver, to clean the ventilation slots.

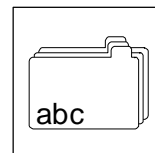
---



## ***Maintenance***

### **7.2 Service addresses**

Lenze addresses worldwide are listed on the back of every Lenze documentation.



## 8 Index

### A

- Accessory kit, 1-1
- Application as directed, 1-2

### C

- Cable cross-sections, 3-12, 4-8
  - Connection of temperature monitoring, 4-10
  - DC-bus, 4-9
  - Mains connection, 4-9
  - Separate fan connection, 4-10
- Cable length, Maximum permissible, 4-7
- Cable specifications, 4-7
- Circuit diagram for a central supply
  - for the connection
    - of single phase controllers, 4-12
    - three-phase controller, 4-11
  - with 934X regenerative power supply unit, 4-14
  - with 9352 brake chopper, 4-13
  - with parallel operation of 2 9365 DC supply units, 4-15
- Cleaning, 7-1
- Commissioning, 5-1
  - Initial switch on, 5-1
- Condensation, 5-1
- Conformity, 3-2
- Connection
  - DC-bus, 4-9
  - Mains-, 4-9
  - Parallel operation of 2 9365 DC supply units, Circuit diagram, 4-15
  - Separate fan, 4-10
  - Single phase controller, Connection diagram, 4-12
  - Temperature monitoring, 4-10
  - Three-phase controller, Circuit diagram, 4-11
    - with 934X regenerative power supply unit, Circuit diagram, 4-14
    - with 9352 brake chopper, Circuit diagram, 4-13
- Connections, Power, 4-7
- Controller mounting positions, 4-1
- Controller protection, 2-2
- Controllers, 1-1

### D

- DC supply unit
  - Application as directed, 1-2
  - Identification, 1-2
  - Operating conditions, 3-2
  - Protection, 4-6
- DC supply units, 1-1
- DC-bus, Connection, 4-9
- Definitions, 1-1
- Degree of pollution, 3-2
- Dimensions
  - Mains choke, 3-6
  - Types 9364 to 9365, 3-4
    - with mains filter, 4-2
    - with subassembled mains filter, 4-3
- Drive system, 1-1
  - CE-typical installation, 4-16

### E

- Electrical data, Types 9364 to 9365, 3-4
- Electrical installation, 4-5
  - Important notes, 4-5
- EMC
  - Assembly, 4-16
  - CE-typical drive system, Installation, 4-16
  - Filters, 4-16
  - Grounding, 4-16
  - Shielding, 4-16
- Errors, 6-1
  - Mains phase failure, 6-2
  - Temperature monitoring, 6-1

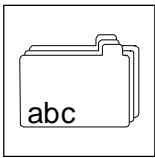
### F

- Fuses, 3-12
  - Mains connection, 4-8

### G

- Gases, aggressive, 4-1





# Index

## I

- Identification, DC supply unit, 1-2
- Important notes, 4-1
- Initial switch-on, 5-1
- Installation, 4-1
  - CE-typical, 4-16
  - CE-typical drive system
    - Assembly, 4-16
    - Filters, 4-16
    - Grounding, 4-16
    - Shielding, 4-16
  - Controller mounting positions, 4-1
  - Electrical, 4-5
  - Important notes, 4-1
  - Mains conditions, 4-7
  - Mains types, 4-7
  - mechanical, 4-1
  - Protection of the DC supply unit, 4-6
    - with mains choke, 3-6
    - with mains filter, 4-2
    - with subassembled mains filter, 4-3
- Insulation strength, 3-2

## L

- Legal regulations, 1-2
- Liability, 1-2

## M

- Mains choke, 3-5
  - Calculation examples for the selection, 3-8
  - Rough selection, 3-7
- Mains conditions, 4-7
- Mains connection, 4-9
  - Fuses, 4-8
- Mains filter, 3-5
  - Calculation examples for the selection, 3-8
  - Rough selection, 3-7
- Mains isolation, 4-6
  - according to VDE 0160, 4-6
  - double basic insulation, 4-6
- Mains phase failure, Fault elimination, 6-2
- Mains types, 4-7
- Maintenance, 7-1
- Manufacturer, 1-2
- Maximum cable length, 4-7
- Monitoring
  - in the event of a mains phase failure, 6-2
  - of the temperature, 6-1

## N

- Noise emissions, 3-2
- Noise immunity, 3-2

## O

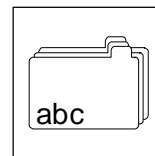
- Operating conditions, 3-2
  - Conformity, 3-2
  - Degree of pollution, 3-2
  - Insulation strength, 3-2
  - Noise emissions, 3-2
  - Noise immunity, 3-2
  - Packaging, 3-2
  - Permissible installation height, 3-2
  - Permissible moisture, 3-2
  - Permissible temperature ranges, 3-2
  - Type of protection, 3-2
  - Vibration resistance, 3-2

## P

- Packaging, 3-2
- Permissible installation height, 3-2
- Permissible moisture, 3-2
- Permissible temperature ranges, 3-2
- Power connections, 4-7
  - Max. permissible cross-sections
    - for mains connection, 4-9
    - for the connection of a separate fan, 4-10
    - for the connection of a temperature monitoring system, 4-10
    - for the DC bus, 4-9
- Protection of persons, 2-2, 4-5
  - Additional measures, 4-6
  - with RCCBs, 4-5

## R

- Rated data, 3-3
  - Fuses, cable cross-sections, 3-12
  - Mains choke, 3-5
  - Mains filter, 3-5
  - Selection with mains choke, 3-7
    - Calculation examples, 3-8
  - Selection with mains filter, 3-7
    - Calculation examples, 3-8
  - Types 9364 to 9365, 3-4
    - Dimensions, 3-4
- RCCBs, 4-5
- Residual hazards, 2-2

**S**

- Safety information, 2-1
  - for drive controllers in accordance with the Low-Voltage Directive, 2-1
  - Layout, 2-2
    - Other notes, 2-2
    - Warning of damage to material, 2-2
    - Warning of damage to persons, 2-2
- Scope of delivery, 1-1
- Separate fan, Connection, 4-10
- Service addresses, 7-2
- Shielding, EMC, 4-16
- Switch-on, Initial, 5-1

**T**

- Technical data, 3-1
  - Electrical data, 3-3
  - Features, 3-1
  - Fuses, cable cross-sections, 3-12
  - General data/application conditions, 3-2
  - Mains choke, 3-5
  - Mains filter, 3-5
- Temperature monitoring
  - Connection, 4-10
  - Fault elimination, 6-1
- Tightening torques
  - Power terminals
    - DC-bus, 4-9
    - Mains connection, 4-9
  - Terminals
    - for the connection of a separate fan, 4-10
    - for the connection of a temperature monitoring system, 4-10
- Troubleshooting and fault elimination, 6-1
- Type of protection, 3-2

**U**

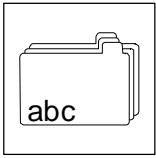
- Use, as directed, 1-2

**V**

- Vibration resistance, 3-2
- Voltage drop, 4-8

**W**

- Warranty, 1-2
- Waste disposal, 1-2



# ***Index***

