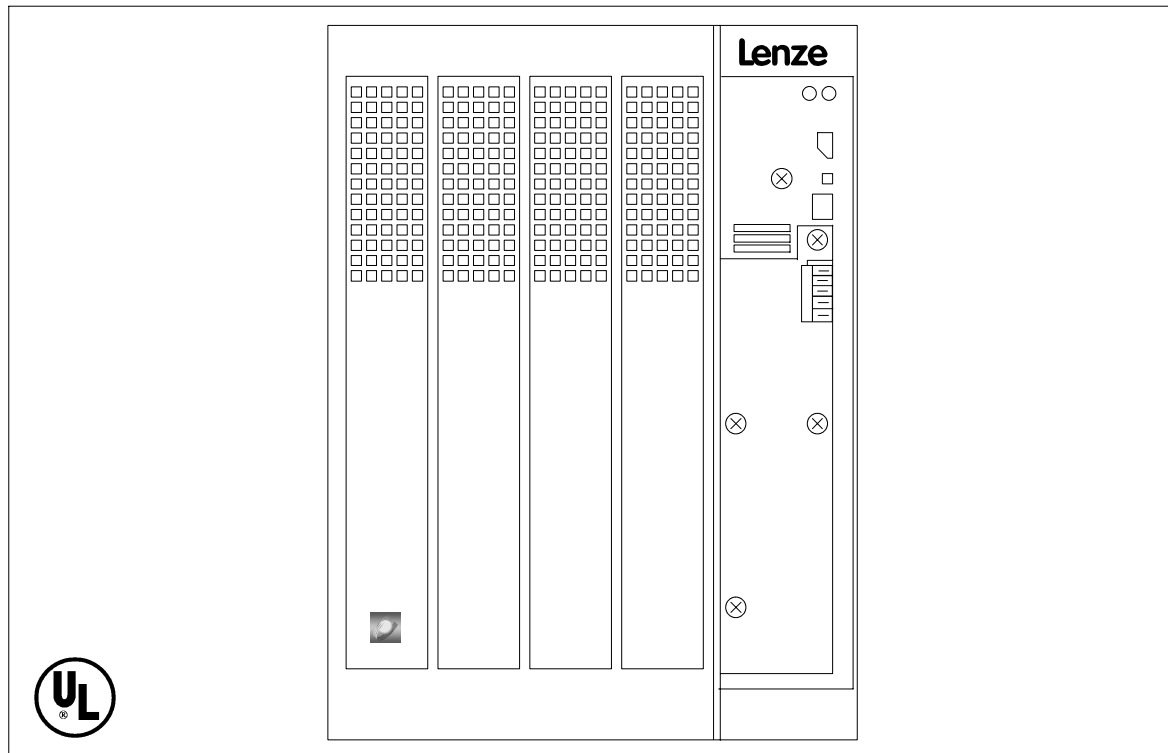


EDB9340UE
00420151

Lenze

Operating Instructions



Global Drive

Regenerative Power Supplies 9340

These Operating Instructions are valid for regenerative power supplies with the following nameplate data:

| | |
|------------------------|---------------------------|
| 934X - E. 1A. 10. | (9341 - 9343) |
| 934X - E. 1A. 10. V003 | (Cold plate, 9341 - 9343) |

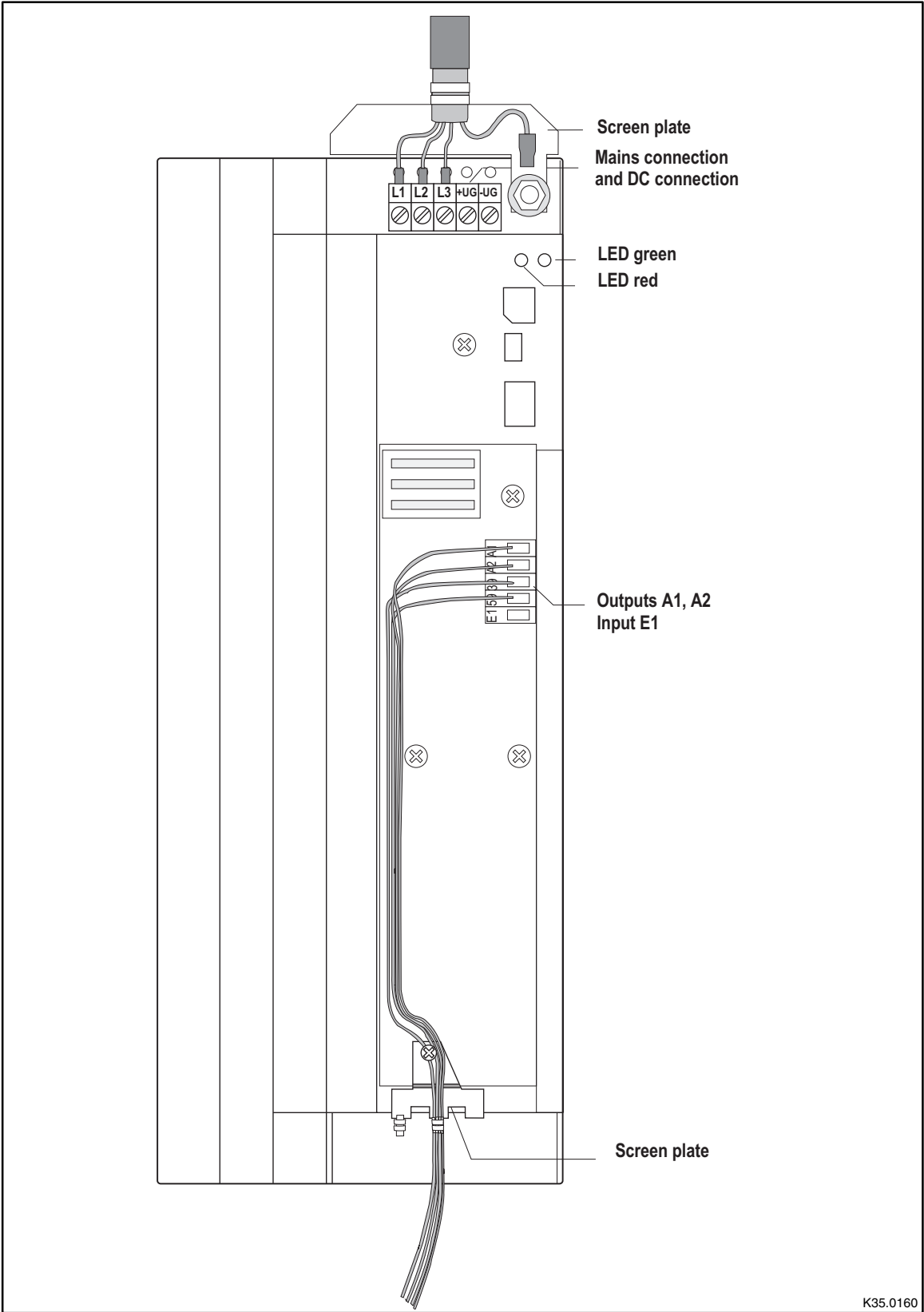
In connection with the unit series as from the nameplate data:

| | |
|-------------------|---------------|
| 822X - E. 0x. 0x. | (8221 - 8227) |
| 824X - E. 0x. 0x. | (8241 - 8246) |
| 93XX - E. 0x. 0x. | (9321 - 9332) |

| | |
|--|--|
| Type | |
| Design: E = Enclosure IP20 IB = Module | |
| Hardware level and index | |
| Software level and index | |
| Variant | |
| Explanation | |

What is new?

| Material no. | Edition of | Important | Content |
|--------------|------------|--------------------|--|
| 391726 | 02.09.1996 | 1. Edition of | Pre-series version |
| 395128 | 06.01.1997 | replaces 391726 | <ul style="list-style-type: none"> • Series version • Chapter 4 • Editorial revision |
| 399907 | 01.02.1998 | replaces 395128 | <ul style="list-style-type: none"> • Chapter 3; Technical data • Chapter 4, Mains filter 9343 • Editorial revision |
| 420151 | 03/2001 | replaces 399907 | <ul style="list-style-type: none"> • Chapter 4, Central supply for DC-bus connection of several drives • Chapter 4, Mains types / Mains conditions |



K35.0160



Safety and application notes for controllers

(according 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.

Unauthorized removal of the required cover, inappropriate use, incorrect installation or operation, creates the risk of severe personal injury 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).

Qualified skilled personnel according to this basic safety information 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 harmonized standards of the prEN 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 about 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 prEN 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 in 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.

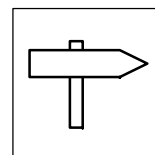
During operation, all covers and doors must be closed.

7. Maintenance and servicing

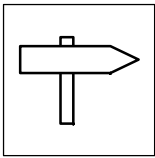
The manufacturer's documentation must be observed.

This safety information must be preserved!

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

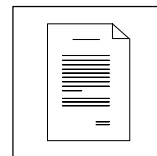


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1 Preface and general information

1.1 About these Operating Instructions ...

- The present Operating Instructions are used for safety-relevant operations on and with the 934X regenerative power supplies. They contain safety information which must be observed.
- All persons who work on and with 934X regenerative power supplies must have the Operating Instructions available and observe all relevant notes and instructions.
- The Operating Instructions must always be in a complete and perfectly readable state.

1.1.1 Terminology used

Regenerative power supply

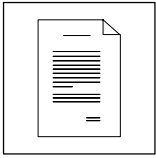
In the following the term "regenerative power supply" is used for "934X regenerative power supply".

Controller

In the following, the term "controller" is used for "93XX servo inverters" and "82XX frequency inverters".

Drive system

For drive systems with regenerative power supplies, 93XX servo inverters and other Lenze drive components, the term "drive system" is used in the following text.



Preface and general information

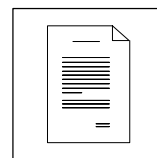
1.2 Contents of delivery

- The contents of delivery include:
 - 1 934X regenerative power supply
 - 1 book of operating instructions
 - 1 accessory kit with plug-in terminals, screen plates and fixing material
- After receipt of the delivery, check immediately whether the contents match the accompanying papers. Lenze does not accept any liability for deficiencies claimed subsequently. Claim
 - visible transport damage immediately to the forwarder.
 - visible deficiencies/incompleteness immediately to your Lenze representative.

1.3 The 934XX regenerative power supply

1.3.1 Labelling

- Lenze 934XX regenerative power supplies are clearly identified by the indication on the nameplate.
- CE mark
 - Conformity with the EC Low-Voltage Directive
 - Conformity with the EC Electromagnetic Compatibility Directive in preparation
- Manufacturer:
 - Lenze GmbH & Co KG
 - Postfach 101352
 - D-31763 Hameln



1.3.2 Application as directed

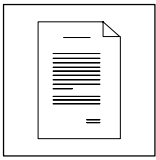
934X regenerative power supplies

- Additional units for Lenze controllers:
 - 822X frequency inverters (8221 to 8227)
 - 821X frequency inverters (8211 to 8218)
 - 824X frequency inverters (8241 to 8246)
 - 93XX servo inverters (9321 to 9333)
- Operate the brake units only under the conditions prescribed in these Operating Instructions.
- They are components
 - for installation in a machine.
 - for assembly with other components to form a machine.
- They are electrical equipment for installation into control cabinets or similar closed operating rooms.
- They meet the protection requirements of the EC Low-Voltage Directive.
- They are not machinery in the sense of the EC Machinery Directive.
- They are not household appliances, but are intended exclusively as components for further commercial use.

Drive systems with 934X regenerative power supplies

- They correspond to the EC Electromagnetic Compatibility Directive if they are installed according to the guidelines of CE-typical drive systems.
- They can be operated
 - on public and non-public mains.
 - in industrial as well as residential and commercial premises.
- The compliance with the EC Directives in machine application is in the responsibility of the user.

Any other use shall be deemed inappropriate!



Preface and general information

1.3.3 Legal regulations

Liability

- The information, data, and notes in the Operating Instructions met the state of the art at the time of printing. Claims referring to drive systems which have already been supplied cannot be derived from the information, illustrations, and descriptions given in these Operating Instructions.
- The specifications, processes, and circuitry described in these Operating Instructions are for guidance only and must be adapted to your own specific application. Lenze does not take responsibility for the suitability of the process and circuit proposals.
- The indications given in these Operating Instructions describe the features of the product without warranting them.
- Lenze does not accept any liability for damage and operating interference caused by:
 - Disregarding these operating instructions.
 - Unauthorized changes to the regenerative power supply.
 - Operating mistakes.
 - Inappropriate working on and with the regenerative power supply.

Warranty

- Terms of warranty: see terms of sale and delivery of Lenze GmbH & Co KG.
- Warranty claims must be made to Lenze immediately after detecting the deficiency or fault.
- The warranty is void in all cases where liability claims cannot be made.

Disposal

The 934X regenerative power supply consists of different materials.

The following table informs about the disposal:

| Material | recycle | dispose |
|--------------------------|----------------|----------------|
| Metal | x | - |
| Plastic | x | - |
| Printed-board assemblies | - | x |



2 Safety information

2.1 Personnel responsible for safety

Operator

- An operator is any natural or legal person who uses the drive system or on behalf of whom the drive system is used.
- The operator or his safety officer are obliged
 - to check whether all relevant regulations, notes, and laws are observed.
 - to ensure that only qualified personnel work with and on the drive system.
 - to ensure that the personnel have the operating instructions available for all corresponding operations
 - to prohibit unqualified personnel from working with and on the drive system.

Qualified personnel

Qualified personnel are persons who are - because of their education, experience, instructions, and knowledge about corresponding standards and regulations, rules for the prevention of accidents, and operating conditions - authorized by the person responsible for the safety of the plant to perform the required actions and who are able to recognize and avoid potential hazards.

(see IEC 364, definition of qualified personnel)



2.2 General safety information

- This safety information is not claimed to be complete. In case of questions and problems please contact your Lenze representative.
- At the time of supply, the regenerative power supplies meet the state-of-the-art and ensure basically safe operation.
- The indications given in these Operating Instructions refer to the stated hardware and software versions of the regenerative power supplies.
- The regenerative power supply is hazardous for persons, the regenerative power supply itself and other property of the operator, if
 - unqualified personnel work on and with the regenerative power supply.
 - the regenerative power supply is used inappropriately.
- The specifications, processes, and circuitry described in these operating instructions are for guidance only and must be adapted to your own specific application.
- regenerative power supplies must be designed so that they comply with their function and, under faultless operation as instructed, do not cause any hazards for persons. This is also effective for the interaction with the complete plant.
- Take additional measures to limit consequences of malfunctions which may cause hazards for persons or material assets:
 - Further independent equipment which can take over the function of the regenerative power supply
 - Electrical or non-electrical protection (latching or mechanical blocking)
 - Measures covering the complete system
- Only operate the drive system in a perfect condition.
- Changes or retrofittings to the regenerative power supply are prohibited in general. In any case, Lenze must be contacted.



2.3 Layout of the safety information

- All safety information in these operating instructions has a uniform layout:



Signalwort

Note

- The icon designates the type of danger.
- The signal word designates the severity of danger.
- The note describes the danger and suggests how to avoid the danger.

Warning of danger for persons

| Icons used | | Signal words | |
|------------|---|-----------------|---|
| | Warning of hazardous electrical voltage | Danger! | Warns of impending danger . Consequences if disregarded: Death or very severe injuries. |
| | | Warning! | Warns of potential, very hazardous situations . Possible consequences if disregarded: Death or very severe injuries. |
| | Warning of a general danger | Caution! | Warns of potential, hazardous situations . Possible consequences if disregarded: Light or minor injuries. |

Warning of material damage

| Icons used | | Signal words | |
|------------|--|--------------|--|
| | | Stop! | Warns of potential material damage . Possible consequences if disregarded: Damage of the regenerative power supply/drive system or its environment. |

Other notes

| Icons used | | Signal words | |
|------------|--|--------------|---|
| | | Note! | Designates a general, useful tip. If you observe it, handling of the supply and feedback unit/drive system is made easier. |



Safety information

2.4 Residual hazards

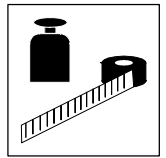
Protection of persons

After mains voltage disconnection, the power terminals L1, L2, L3 and +U_G, -U_G remain live for 3 minutes.

Protection of devices

Cyclic connection and disconnection of the supply voltage to L1, L2, L3 can overload the input current limiting:

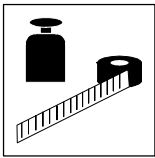
- Allow at least 3 minutes between disconnection and reconnection.



3 Technical data

3.1 Features

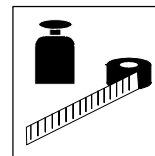
- Low profile
 - thus space-saving installation
- Power range: 5.5 kW, 11 kW and 22 kW
- Supply of controllers
- Brake power of controllers is fed back to the mains
- Connection of controllers via DC bus
 - Central mains supply via the regenerative power supply
 - Reduction of the wiring
- Automatic detection of rotating field
- Self-synchronizing
- Overload protection in regenerative operation
- Temperature-controlled fan
- Display of the operating state via LED
- Automatic adaption of the regenerative voltage threshold to the mains voltage
- Monitoring of mains voltage, mains frequency, DC-bus voltage and temperature
- Heat sink can be separated
 - External cooling possible
- Power connections from the top
 - Simple connection for multi-axis applications
- Approvals
 - CE
 - UL 508 file No. 132659 (listed)



Technical Data

3.2 General data/application conditions

| Field | Values |
|--------------------------------|---|
| Vibration resistance | Germanischer Lloyd, general conditions |
| Permissible temperature ranges | during transport: -25 °C ... +70 °C during storage: -25 °C ... +55 °C during operation: 0 °C ... +40 °C without power derating +40 °C ... +55 °C with power derating |
| Permissible moisture | Humidity class F without condensation (average relative humidity 85 %) |
| Installation height | ≤ 1000 m amsl without power derating 1000 m amsl ... 4000 m amsl with power derating |
| Air pressure | 100% rated current up to 900 mbar (~1000 m amsl) to VDE0875 part 11 and prEN55082 |
| Degree of pollution | VDE 0110 part 2 pollution degree 2 |
| Noise immunity | IEC801-2 to 5 severity 4 |
| Insulation strength | Overvoltage category III according to VDE 0110 |
| Packing | to DIN 4180 • 9341 and 9342: dust-free packing • 9343: dispatch packing |
| Type of protection | IP20 IP41 on the heat-sink side for thermal separation (push-through technique) NEMA 1 Protection against contact |
| Protection against contact | CE: Low-Voltage Directive UL508: Industrial Control Equipment UL508C: Power Conversion Equipment |



3.3 Rated data

3.3.1 Regenerative power supply

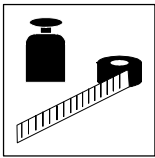
| Type (= Order No.) | | EMB9341-E | EMB9342-E | EMB9343-E |
|---|---------------------------|---|--------------------|--------------------|
| Mains voltage | V_N [V] | $320 \pm 0\% \leq V_N \leq 528 \pm 0\%$ | | |
| Mains frequency | f_N [Hz] | 48 ... 62 $\pm 0\%$ | | |
| Power of regenerative power supply to an $\pm V_G$ ¹⁾ | P_{DC} [kW] | 7.2 | 14.4 | 27.0 |
| Max. power of regenerative power supply to $\pm V_{DC}$ | P_{DCmax} [kW] | 10.8 | 21.6 | 40.5 |
| Apparent power - mains side motor/generator mode | S_N [kVA] | 8.3 | 16.6 | 31.2 |
| Sum of the shaft power of all motors connected via controllers motor mode ¹⁾ | $\Sigma P_{mechmot}$ [kW] | 6.0 ³⁾ | 12.0 ³⁾ | 24.0 ⁴⁾ |
| Sum of the shaft power of all motors connected via controllers generator mode ¹⁾ | $\Sigma P_{mechgen}$ [kW] | 8.5 ³⁾ | 17.0 ³⁾ | 30.0 ⁴⁾ |
| | | | | |
| Rated mains current motor/generator mode | I_{Neff} [A] | 12 | 24 | 45 |
| Maximum mains current motor/generator mode ²⁾ | I_{Nmax} [A] | 18 | 36 | 67,5 |
| DC-bus current motor/generator mode | I_{DC} [A] | 13 | 26 | 48 |
| Max. DC-bus current motor/generator mode ²⁾ | I_{DCmax} [A] | 19.5 | 39 | 72.0 |
| Power loss | P_V [W] | 100 | 200 | 400 |
| Power derating | [%/K] | 40 °C < T_a < 50 °C: 2%/K | | |
| | [%/m] | 1000 m a.m.s.l. < h \leq 4000 m a.m.s.l.: 5%/1000 m | | |
| Weight | m [kg] | 7.5 | 7.5 | 12.5 |

- 1) referred to mains voltage 3×400 V
- 2) These currents apply to periodically changing load cycles with 150% rated current for 1 minute and 75% rated current for 2 minutes.
- 3) Controller losses can be ignored / efficiency $\eta = 0.85$
- 4) Controller losses can be ignored / efficiency $\eta = 0.90$



Stop!

The regenerative power supplies 943X cannot be connected in parallel!



Technical Data

3.3.2 Fuses and cable cross-sections

| Type | Mains L1, L2, L3, PE | | | | +UG, -UG | | |
|------|----------------------|-----|---------------------|---------|----------|---------------------|-----|
| | Fuse | | Cable cross-section | | Fuse | Cable cross-section | |
| | VDE | UL | mm ² | AWG | | mm ² | AWG |
| 9341 | M 16A | 15A | 2.5 | 13 (12) | 20A | 2.5 | 12 |
| 9342 | M 32A | 30A | 6 | 9 (8) | 40A | 6 | 8 |
| 9343 | M 50A | 50A | 16 | 5 (4) | 80A | 16 | 4 |

3.3.3 Mains choke and mains filter A



Stop!

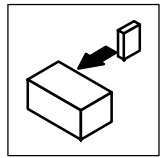
Please ensure to preconnect a mains choke or mains filter A!

| Type | Mains choke | | | |
|------|--|--------|---------|----------|
| | Order no. | I_N | V_N | L |
| | | [A] | [V] | [mH] |
| 9341 | ELN3-0120H017 | 3 × 17 | 3 × 400 | 3 × 1.2 |
| 9342 | ELN3-0088H035 | 3 × 35 | 3 × 400 | 3 × 0.88 |
| 9343 | Application of mains filter A prescribed | | | |

| Type | Mains filter A | | | |
|------|----------------|--------|---------|----------|
| | Order no. | I_N | V_N | L |
| | | [A] | [V] | [mH] |
| 9341 | EZN3A0120H012 | 3 × 12 | 3 × 400 | 3 × 1.2 |
| 9342 | EZN3A0088H024 | 3 × 24 | 3 × 400 | 3 × 0.88 |
| 9343 | EZN3A0055H045 | 3 × 45 | 3 × 400 | 3 × 0.55 |

3.4 Dimensions

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



4 Installation

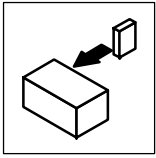
4.1 Mechanical installation

4.1.1 Important notes

- The regenerative power supply should only be used as a built-in unit!
- Observe free space!
 - You can install several controllers and regenerative power supplies 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 regenerative power supply:
 - Take suitable preventive measures, e.g. separate air duct, installation of filters, regular cleaning, etc.
- Do not exceed the permissible range of the operating ambient temperature (see chapter 3.2).
- If the regenerative power supplies are exposed to continuous vibrations:
 - Check whether shock absorbers are necessary.

4.1.1.1 Possible mounting positions

- Vertically on the control cabinet back panel with mains connections at the top:
 - with enclosed fixing rails or fixing brackets (see chapter 4.1.2)
 - thermally separated with external heat sink
 - Push-through technique (see chapter 4.1.3)
 - Cold plate technique (see chapter 4.1.4)



Installation

4.1.2 Standard assembly with fixing rails or fixing angles

4.1.2.1 9341 and 9342 regenerative power supplies

- Preparation for assembly:
 - Take out fixing rail(s) (accessory kit in the box) and mount on the housing of the regenerative power supply.

4.1.2.2 9343 regenerative power supply

- Remove the cover:
 - Loosen screws (X)
 - Swing cover upwards and detach
- Preparation for assembly:
 - Take out fixing rail(s) (accessory kit in the box) and mount on the housing of the regenerative power supply.

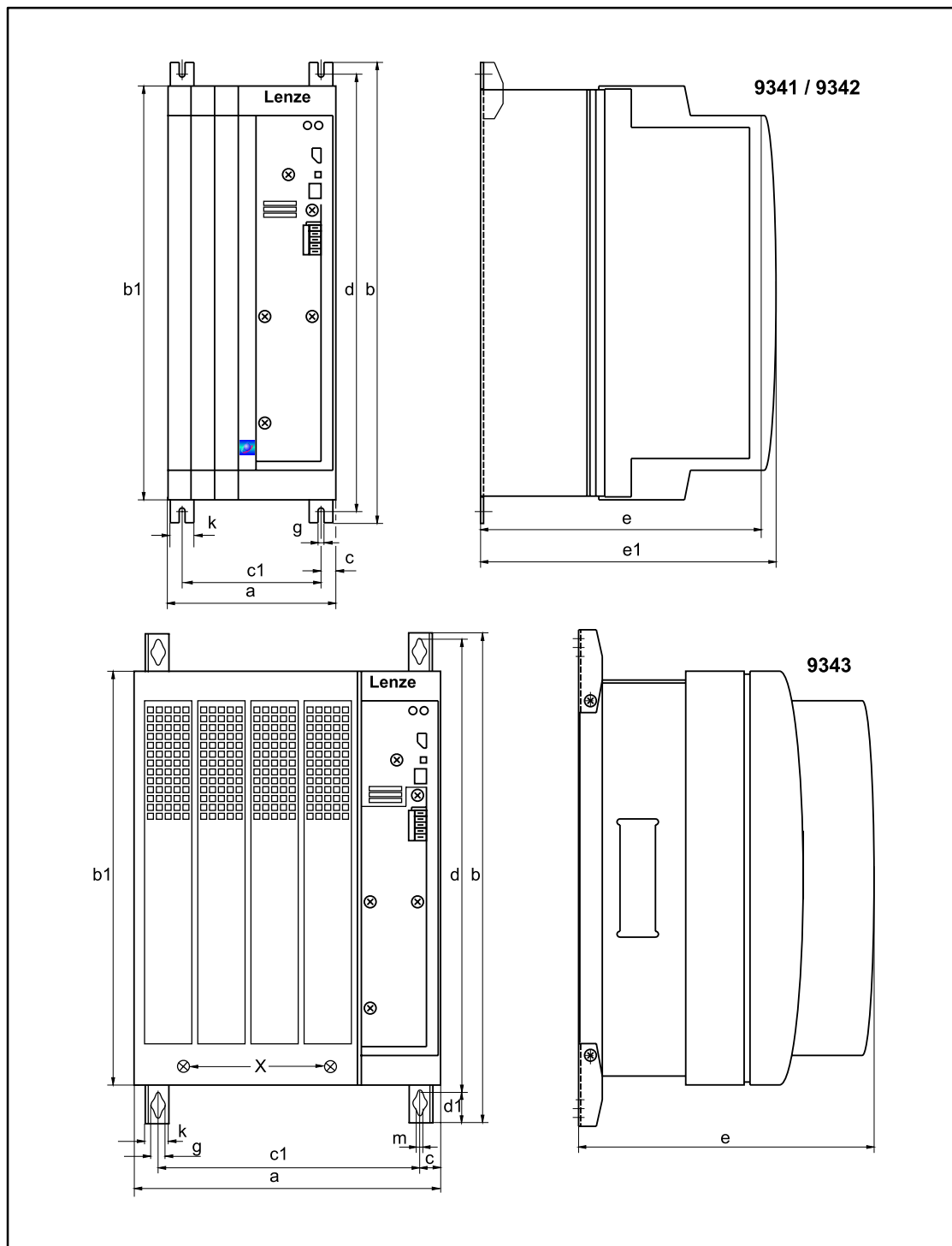
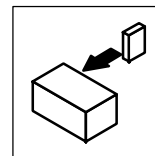
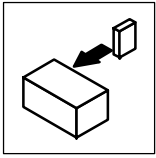


FIG 4-1 Dimensions for assembly with fixing rails or fixing angles

| | a | b | b1 | c | c1 | d | d1 | e | e1 | g | k | m |
|-----------|-----|-----|-----|------|-----|-----|----|-----|-----|-----|----|----|
| 9341/9342 | 135 | 384 | 350 | 21.5 | 92 | 365 | - | 230 | 250 | 6.5 | 30 | - |
| 9343 | 250 | 404 | 350 | 22.5 | 205 | 396 | 24 | 230 | 250 | 6.5 | 25 | 11 |



Installation

4.1.3 Assembly with thermally separated power stage ("Push-through technique")

The heat sinks of the regenerative power supplies can also be externally mounted to reduce the heat generated in the control cabinet. You need an assembly frame with seal (can be ordered from Lenze).

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

4.1.3.1 Assembly preparation

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

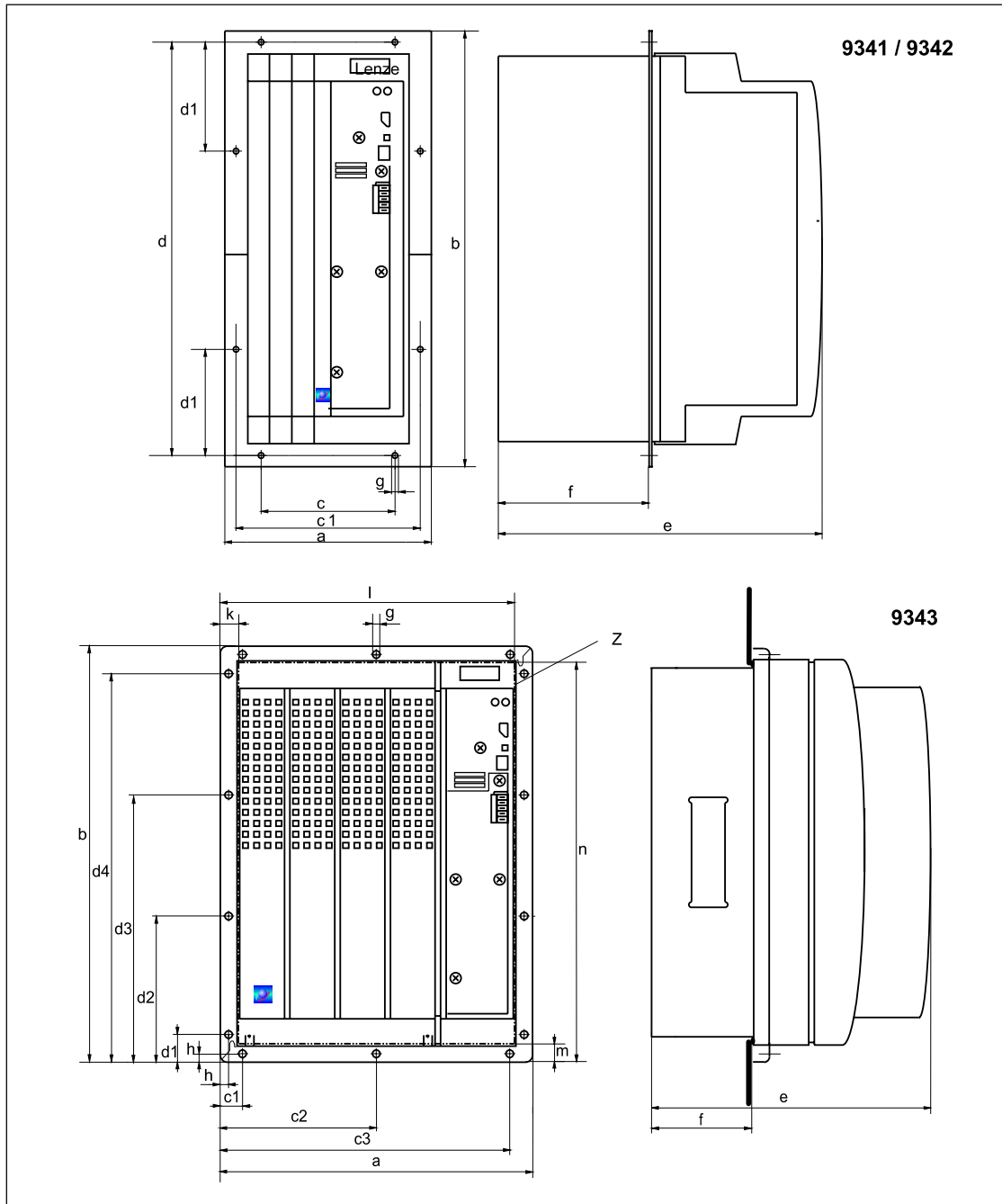
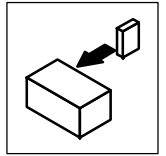
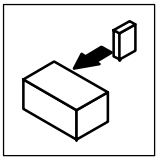


FIG 4-2 934X dimensions: Assembly with thermally separated power stage

| | a | b | b1 | c | c1 | c2 | c3 | d | d1 | d2 | d3 | d4 | e | f | g | h |
|-----------|-----|-------|-----|-----|-------|-----|-----|-------|-------|-----|-----|-----|-----|----|-----|---|
| 9341/9342 | 135 | 385.5 | 350 | 117 | 137.5 | - | - | 365.5 | 105.5 | - | - | - | 250 | 92 | 6.5 | - |
| 9343 | 280 | 379 | - | - | 28 | 140 | 252 | - | 41 | 141 | 238 | 338 | 250 | 90 | 6 | 9 |

| Assembly cut-out Z | Height | Width | k | l | m | n |
|--------------------|----------|----------|------|-------|------|-------|
| 9341/9342 | 350 (±3) | 139 (±3) | - | - | - | - |
| 9343 | 338 (±1) | 238 (±1) | 20±2 | 259±2 | 20±2 | 359±2 |

All dimensions in mm



Installation

4.1.4 Assembly of the 934X-V003 "Cold plate" variant

4.1.4.1 General

Fields of application

This variant is used mainly for the following applications:

- Application of cooling units without separately driven fan:
 - e.g. if the cooling air is so polluted that it is not possible to use separately driven fans, since the performance as well as the service life would be reduced.
- High enclosure with thermal separation:
 - If thermal separation is required because of the power efficiency in the control cabinet, and the enclosure 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.

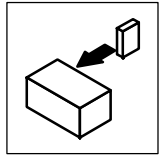
4.1.4.2 Demands on the cooling unit

Cooling units, which can use different coolants (air, water, oil, etc.) can dissipate the power loss of the regenerative power supply.

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

- Good thermal connection to the cooling unit
 - Minimum contact surface of the cooling unit with the regenerative power supply = surface of the cold plate of the regenerative power supply
 - Surface flatness of the contact surface approx. 0.05 mm
 - Connect cooling unit and cold plate by means of the provided screws.
- Observe the thermal resistance $R_{thmin \text{ heat sink}}$ (transition cooling unit - coolant) according to the table. The values are valid for
 - the operation of the regenerative power supply under rated conditions (see chapter 3.3; "Rated data").
 - a maximum temperature of the cold plate of 85°C, measuring point: narrow side of the cold plate at the mid-height of the controller.

| Regenerative power supply | Cooling path | |
|---------------------------|--------------------------------------|-------------------------------------|
| | Power to be dissipated P_{VAR} [W] | $R_{thmin \text{ heat sink}}$ [K/W] |
| 9341V003 | 100 | 0.123 |
| 9342V003 | 200 | 0.123 |
| 9343-V003 | 400 | 0.057 |



4.1.4.3 Thermal performance of the whole system

The thermal conditions of a system are influenced by several factors. Consider the following points for the right selection of the control cabinet for your 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 supply and feedback unit.

Heat generation inside control cabinets

In addition to the unit losses, which are to be dissipated via the heat sink, further losses must be considered:

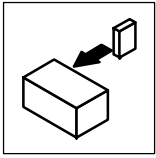
- Internal losses of the regenerative power supply
 - These losses are generated by the electronics supply, fans, DC-bus capacitors, etc.
- Losses of the mains and motor components
- Heat dissipation from the external cooling unit to the inside of the control cabinets
 - This portion of the thermal energy depends, among others, on the type of the cooling unit and the assembly.
 - Currently no comments possible.

Thermal distribution to common cooling units/in the control cabinet

If you mount several components (controller, brake units, etc.) on one common cooling unit, it must be ensured that the temperature at the cold plate of each single component does not exceed 85 °C.

Measures:

- Ensure minimum free space around the convection cooling unit.
- Do not install the components one on top of the other.
- If necessary, use internal fans to avoid heat concentration inside the control cabinet.



Installation

4.1.4.4 Assembly of 934X-V003

- Apply the supplied heat-conducting paste before you bolt the cooling unit to the cold plate of the regenerative power supply, to reduce the heat transfer resistance to its minimum.
- The heat-conducting paste which you find in the accessory kit is enough for an area of approx. 1000 cm².

For installation in the control cabinet with other heat sinks as "Cold Plate Technique".

- Observe the following points to comply with the technical data:
 - Ensure sufficient ventilation of the heat sink.
 - The free space behind the control cabinet back panel must be at least 500 mm.
- Insertion depth t of the screws into the base plate of the unit:

$$8 \text{ mm} \leq t \leq 10 \text{ mm}$$

- Please contact Lenze for further information about the drilling pattern and surface of the heat sink.

Assembly

1. Clean the contact surfaces with ethyl alcohol.
2. Apply the heat-conducting paste thinly with a scraper or a brush.
3. Bolt the controller onto the heat sink using the fixing screws.
Tightening torque: 3.4 Nm.

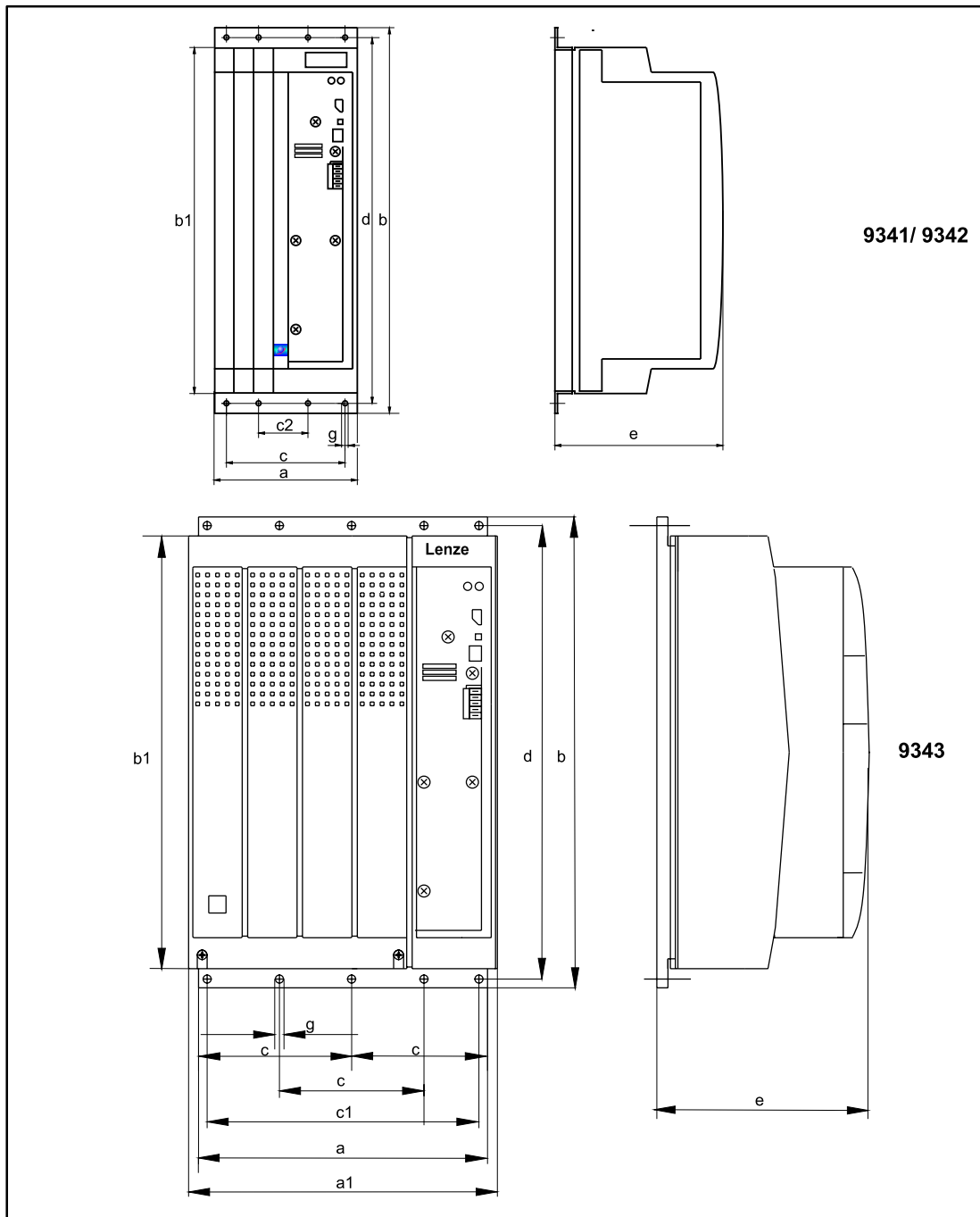
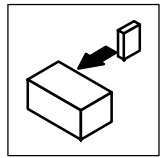
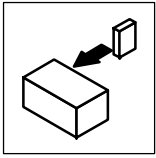


FIG 4-3 Dimensions for the assembly of the 934X-V003 "Cold plate" variant

| | a | a1 | b | b1 | c | c1 | d | e | g |
|-----------|----------|-----------|----------|-----------|----------|-----------|----------|----------|----------|
| 9341 V003 | 135 | - | 381 | 350 | 105 | 38 | 367 | 168 | 6.5 |
| 9342 V003 | 135 | - | 381 | 350 | 105 | 38 | 367 | 168 | 6.5 |
| 9343 V003 | 234 | 250 | 381 | 350 | 110 | 220 | 367 | 171 | 6.5 |

All dimensions in mm



Installation

4.2 Electrical installation

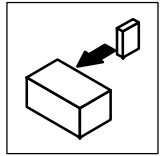
4.2.1 Operator's safety



Gefahr!

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

- Protection of persons and animals according to DIN VDE 100 with residual-current-operated protective devices:
The regenerative power supplies have an internal mains rectifier. After a short-circuit to frame a DC fault current may prevent the tripping of the current-operated protective device. Therefore we recommend the use of "universal current sensitive e.l.c.b.".
- When dimensioning the tripping current of current-operated e.l.c.b., it must be observed that there are capacitive leakage currents between cable screens and RFI filters during operation. These currents may result in false tripping of the current-operated e.l.c.b.
- Comment on the application of universal-current sensitive current-operated e.l.c.b.:
The preliminary standard prEN50178 (previously VDE0160) about the application of universal-current sensitive current-operated e.l.c.b. has passed the German Committee K226.
The final decision about this standard will be made by CENELEC/CS (European Committee for Electrotechnical Standardization) in Brussels. For further information about the application of universal-current sensitive current-operated e.l.c.b., can be obtained from the supplier.
- Replace defective fuses with the prescribed type only when no voltage is applied.
 - For single drives, the regenerative power supply carries a hazardous voltage up to 3 minutes after mains disconnection.
 - In a drive network, all controllers must be inhibited and disconnected from the mains.
- Make a safety disconnection between the regenerative power supply and the mains only by means of a contactor at the input side.
 - Please observe, that all controllers in a drive network must be inhibited.



4.2.2 Galvanic isolation

The terminal X2 has a reinforced basic insulation (safe galvanic isolation to VDE 0160). The protection against contact is ensured without any additional measures.



Gefahr!

If an external voltage supply (24 V DC) is used, the degree of basic insulation of the regenerative power supply depends on the degree of basic insulation of the voltage supply.

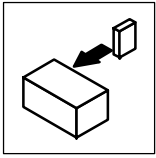
4.2.3 Protection of the regenerative power supply



Stop!

Regenerative power supplies include electrostatically sensitive components.

- Prior to assembly and service operations, the personnel must be free of electrostatic charge:
 - They can discharge themselves by touching the PE fixing screw or another grounded metal part in the control cabinet.
-
- Screw lengths for the connection of the screen cable/screen plate for type 9343:
< 12 mm
 - Frequent mains switching may overload the internal switch-on current limitation. For cyclic mains switching, the regenerative power supply can be switched on every three minutes as a maximum.
 - The regenerative power supply must only be operated with the assigned mains choke or mains filter (see chapter 3.3.3).
 - The regenerative power supply is protected by external fuses (see chapter 3.3.2)
 - In case of condensation, do not connect the regenerative power supply to the mains voltage before the visible moisture has evaporated.
 - Cover unused control inputs and outputs with plugs.



Installation

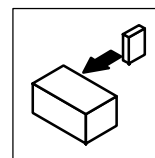
4.2.4 Mains types / Mains conditions

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. 3-3 |
| With isolated neutral (IT mains) | Not permitted | 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 Specification of used cables

- 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
Use only screens with tin-plated or nickel-plated copper braid!
Screens of steel braid are not suitable.
 - the degree of coverage of the screen braid:
at least 70% to 80% with a coverage angle of 90.
- Protect the cables of the 934X regenerative power supply with the prescribed cable-protection fuses.



4.2.6 Power Connection

| Regenerative power supplies | Preparation required for power connection |
|-----------------------------|--|
| 9341 and 9342 | <ul style="list-style-type: none"> Remove the covers of the power connections: <ul style="list-style-type: none"> - Unlatch at the front by gentle pressure. - Pull off. |
| 9343 | <ul style="list-style-type: none"> Remove the cover: <ul style="list-style-type: none"> - Loosen screws (X) (see FIG 4-1, page 4-3). - Swing cover upwards and detach. - Take the accessory out of the regenerative power supply. |

4.2.6.1 Protection (see chapter 3.3.2)

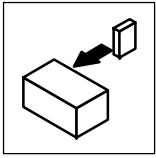
- The indications in chapter 3.3.2 (Fuses and cable cross-sections) are recommendations and refer to the use
 - in control cabinets and machines
 - in cable ducts
 - max. ambient temperature +40 °C.
- When selecting the cable cross-section, please consider the voltage drop under load.
- Protection of the cables and the regenerative power supply on the AC side (L1, L2, L3):
 - By normal fuses.
 - Fuses in UL-conform plant must have UL approval.
 - The rated voltages of the fuses must be dimensioned according to the mains voltage at the site.
- Protection of the cables and the regenerative power supply on the DC side (+UG, -UG):
 - By means of recommended DC fuses.
 - The fuses/fuse holders recommended by Lenze are all UL approved.
- When connecting a brake unit:
 - The fuses and cross section stated in chap. 3.3.2 are invalid for brake units.
 - For these notes see the documentation about brake units.
- The compliance with other standards (e.g.: VDE 0113, VDE 0289, etc.) remains the responsibility of the user.

Connection



Danger!

Ensure correct terminal connection. Only terminals with the same designation should be connected.



Installation

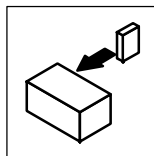


Stop!

Please observe the tightening torques:

| Type | 9341E and 9342E | 9343E |
|--------------------------------------|--------------------|-----------|
| Terminals L1, L2, L3, +UG, -UG | 0.5 ... 0.6 Nm | 4 Nm |
| | 4.4 ... 5.3 lbf·in | 35 lbf·in |
| Tightening torque PE - connection | 3.4 Nm | 4 Nm |
| | 30 lbf·in | 35 lbf·in |

- Connect mains cables to the screw terminals L1, L2, L3 of the regenerative power supply. A 3-phase connection is always required.
- Connect the cables for the brake unit (935X), a controller (93XX) or several controllers in DC-bus connection to the screw terminals +UG, -UG of the regenerative power supply.
- Only for 9343 (see FIG 4-4):
The cables L1A, L1B, X4 and X10 do not connect the mains filter A to the regenerative power supply 9343. Connect them to the bolts with the same designation.



| Types 9341 and 9342 | Type 9343 |
|--|--|
| | |
| <p>For screened cables</p> <ul style="list-style-type: none"> • Connect the screen correctly (required parts in the accessory kit): <ul style="list-style-type: none"> - Schirmblech ① to the fixing bracket ②. - Fix screen using cable lugs. Do not use the screen for strain relief! - The PE connection is made via the stud next to the power connections. | <p>For screened cables</p> <ul style="list-style-type: none"> • Connect the screen correctly: <ul style="list-style-type: none"> - Connect the screen with a suitable clamp on the conducting mounting plate of the control cabinet (see FIG 4-9). - To improve the screen connection: Connect screen additionally to the stud PE next to the power connections. |

FIG 4-4 Power connection



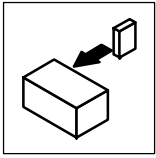
Stop!

Provide sufficient distance between the cables connected to X4 (blue) and X10 (red) (see FIG 4-4).



Tip!

Screening of the cable is required to comply with existing standards FIG 4-4 (e.g. VDE 0160, EN 50178).



Installation

4.2.6.2 Central supply for DC-bus connection of several drives

Types 9341 and 9342

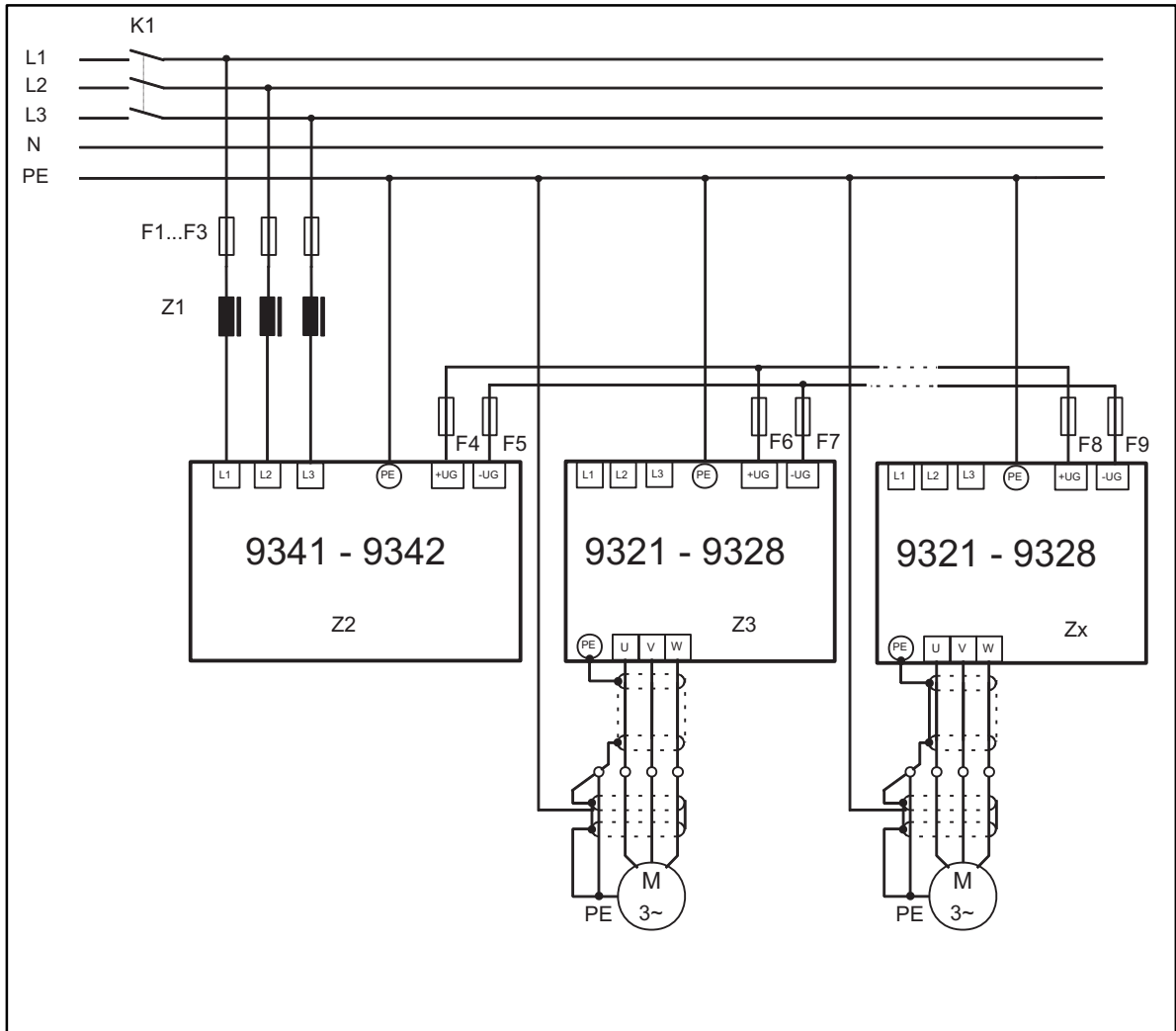
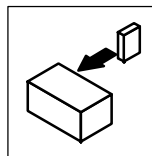


FIG 4-5 Central supply for DC-bus connection of several drives types 9341 and 9342

| | |
|---------|--|
| Z1 | Mains choke |
| Z2 | Regenerative power supply |
| F1...F3 | Mains fuse (see chapter 3.3.2 and chapter 4.2.6) |
| K1 | Main contactor |
| F4...F9 | DC-bus fuses (recommendation) |
| Zx | further controllers |



Type 9343

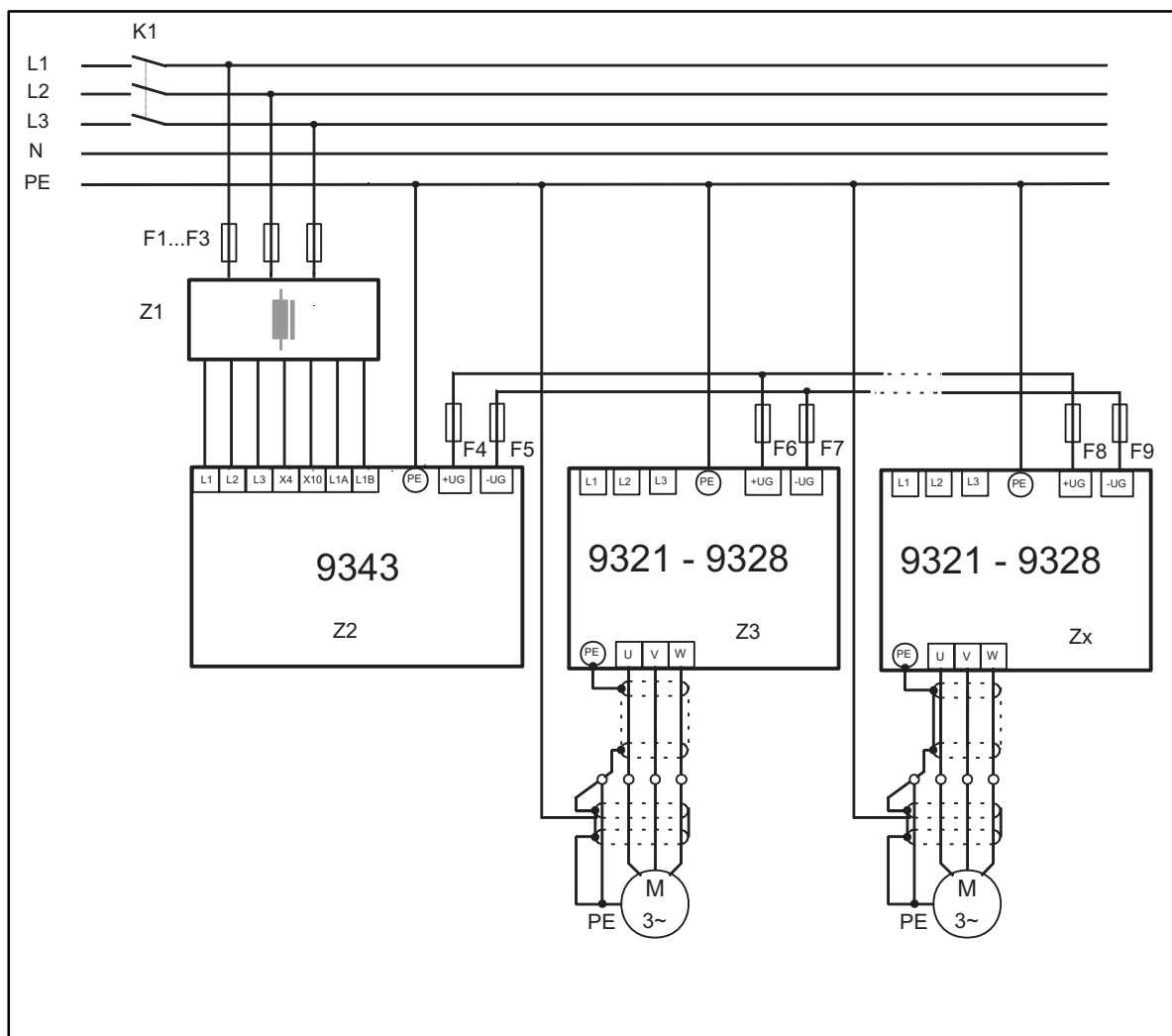
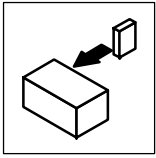


FIG 4-6 Central supply for DC-bus connection of several drives type 9343
 Z1 Mains choke
 Z2 Regenerative power supply
 F1...F3 Mains fuse (see chapter 3.3.2 and chapter 4.2.6)
 K1 Main contactor
 F4...F9 DC-bus fuses (recommendation)
 Zx further controllers



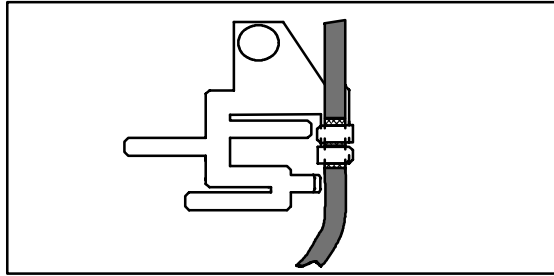
If the power supply of the supply module is not sufficient, a parallel supply can be installed via the mains input of a controller (see 93XX Manual).

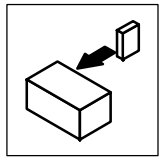


Installation

4.2.7 Control cables

- Connect the control cables to the screw terminals X2 at the front of the 934X regenerative power supply.
Tightening torque: 0.5 - 0.6 Nm
- Do not lay control cables in parallel to interference-generating motor cables.
- Screening of the control cables.
 - The PE connection is made via the illustrated screen plate(s) (included in the accessory kit). Do not use the screen for strain relief!
 - In the connecting area, the screen plate of the regenerative power supply must be connected to the PE area by using a screw.





4.2.8 Control connections

Digital signals are contacted via the 5-pole terminal block X2.

The levels of the digital outputs are compatible with a PLC.

The external voltage source (24 V) supplies the digital outputs.

- The external voltage source must be selected so that a current can be driven > the current consumption of the connected relay.
- Connection of the external voltage source
 - Supply voltage +24V an X2/59
 - External ground at X2/39

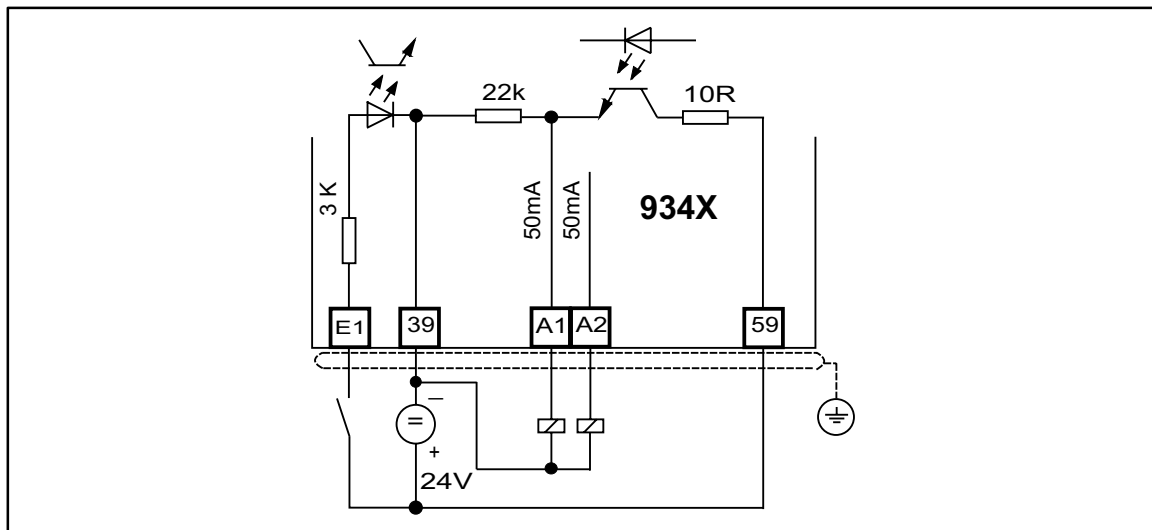
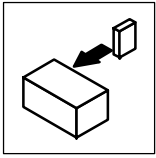


FIG 4-7 Digital outputs

| Digital outputs | | | |
|-----------------|--|-----------------------------|---|
| Terminal | Use | Level with activated output | Data |
| A1 | General fault indication | LOW | LOW level: 0 ... +4 V HIGH level: +13 ... +30 V Output current: max. 50 mA per output (external resistance > 480 Ohm with 24 V) Input current with 24V: 8mA Reading and processing of the input: once per 1ms (average value) |
| A2 | Mains failure | LOW | |
| E1 | Inhibit feedback operation | HIGH | |
| 39 | Ground of the digital outputs/of the digital input | - | |
| 59 | Supply input of the digital output | - | |



Installation

4.3 Wiring according to EMC

Carry out all described measures to comply with the radio interference level A.

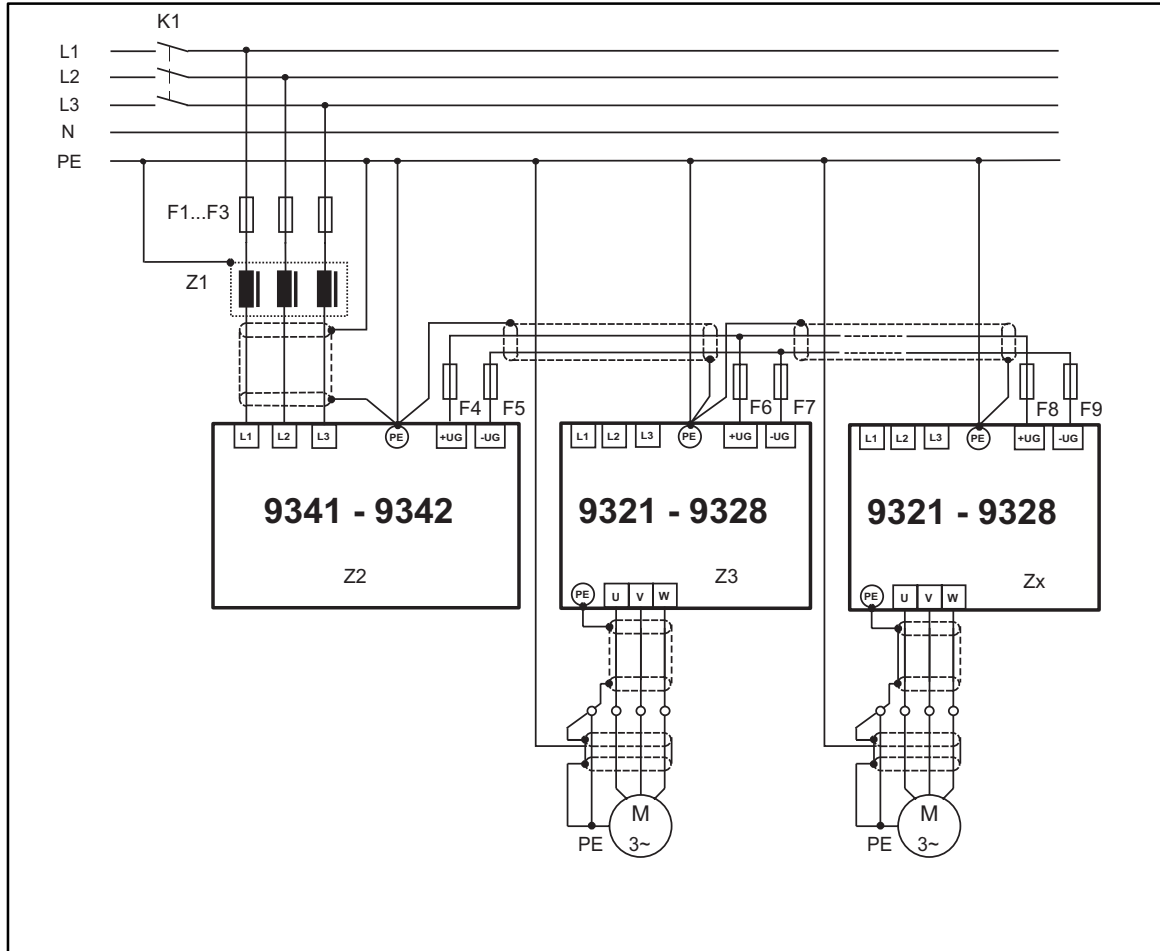
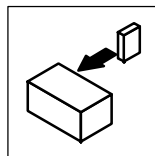


FIG 4-8 Block diagram: Wiring according to EMC with central input of a network of several drives types 9341 and 9342
 Z1 Mains choke
 Z2 Regenerative power supply
 F1...F3 Mains fuse (see chapter 3.3.2)
 K1 Main contactor
 F4...F9 DC-bus fuses (recommendation)
 Zx further controllers



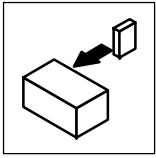
4.3.1 Necessary measures

4.3.1.1 Control cabinet mounting plate

- For HF grounding, only use mounting plates with an electrically conductive surface (e.g. zinc-coated surface).
- If you use mounting plates with badly conductive surfaces (e.g. painted, anodized, yellow passivated):
 - Remove the paint or coating from the contact surfaces of the mains filters, mains chokes, regenerative power supplies and screen connections to provide a large-surface, electrically conductive connection.
- If you use several mounting plates, connect them with a surface as large as possible (e.g. copper bands).
- Provide a surface contact as large as possible between the 934X regenerative power supply, mains choke and mains filter and the earthed mounting surface.

4.3.1.2 Control cables

- Control cables must always be screened.
- Connect both screens of the digital control cables.
- Connect the screens of the control cables over the shortest possible distance with the screen connection of the 934X regenerative power supply.
- If you expect potential differences, provide an additional equalizing cable.



Installation

4.3.1.3 Screen connection

- The screen must be connected to the conductive mounting plate of the control cabinet with an appropriate clip.
- The connection should be as close to the cable end as possible.
- If possible, cover the screen end with a shrink tube.

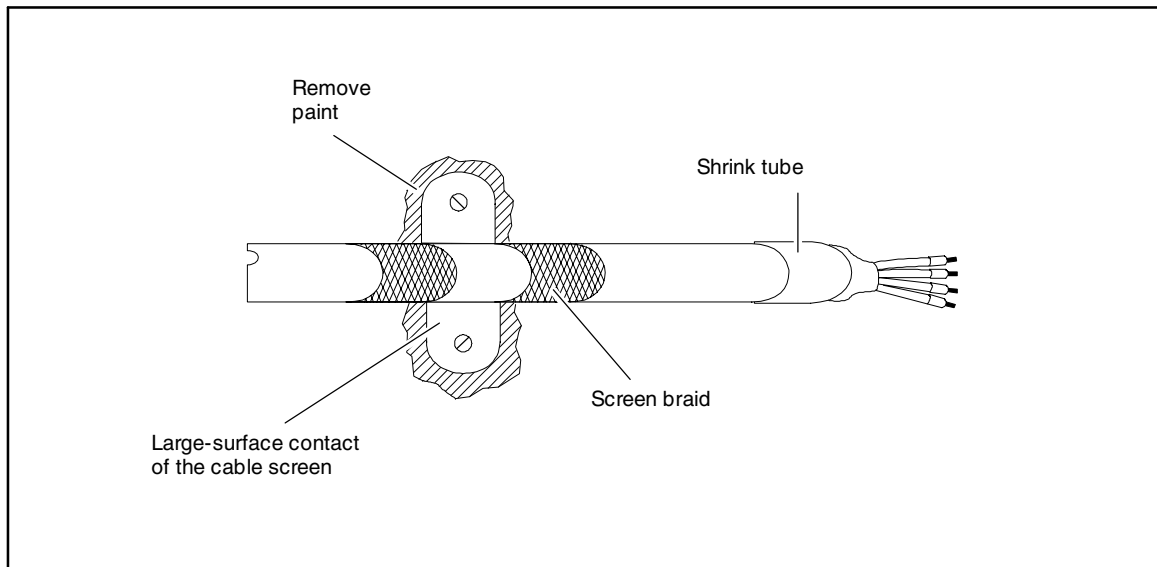


FIG 4-9 Screen connection

Carefully connect screens, ground connections (GND), and earth potential connection (PE) to avoid interferences:

- Do not interrupt screening.
- If an interruption cannot be avoided:
 - connect the screen (terminal boards, relays, fuses), with a large surface and with both ends to the mounting plate.
- Cables must be laid as close as possible to the reference potential (dangling cables are like antennas).

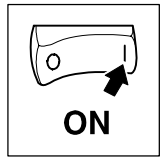
4.3.1.4 Grounding

Ensure a good equipotential bonding of all systems parts (934X regenerative power supply, controller, mains choke, mains filter) by cables to a central earthing point (PE bar). It is absolutely necessary to observe the prescribed minimum cable cross-sections.

4.3.1.5 Filters

- Only use filters assigned to the regenerative power supply:
 - Mains filters reduce non-permissible high-frequency interference to a permissible value.

For compliance with the standard EN 55022 7/92 (noise emission according to limit value class A) a special mains input filter from Lenze is required. For further information please see the Operating Instructions for the mains input filter (see chapter 3.3.3; Mains filter A).



5 Commissioning



Stop!

- Prior to initial switch-on: check the completeness, the polarity, short circuit and earth fault of the drive network.
- **Maintain the switch-on sequence!**

5.1 Initial switch-on

1. Connect mains:
 - The drive network will be ready for operation after approx. 0.5 s.
2. Check whether the controller is ready for operation:
 - Green LED on:
Regenerative power supply is ready for operation, go on to the next point.
 - Green LED off, red LED on:
A fault has occurred. Before proceeding with the commissioning, eliminate the fault (see chapter 6 "Troubleshooting and fault elimination").
3. Adapt all 93XX controllers to the mains voltage by means of C0173.

Additional brake units integrated in the DC network:

4. Adapt the 935X brake unit to the mains voltage by means of the switches S1 and S2. Switch off the mains voltage.



Danger!

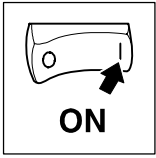
- S1 and S2 are live!
- Wait for at least 3 minutes before you change the threshold of the brake unit.

No voltage must be applied to the brake unit when it is adapted.



Note!

Set the highest switching threshold at the brake units to have full use of the feedback power of the regenerative power supply.



Commissioning



6 Troubleshooting and fault elimination

The two LEDs on the 934X regenerative power supply indicate the operating state:

| LED display | | Operating state |
|-------------|-----|---|
| green | red | |
| on | off | The regenerative power supply is connected to mains voltage, the supply voltages Vcc (+15V) have reached their minimum values, faults have not occurred |
| off | on | A malfunction occurred |

6.1 Fault indications

The type of fault is indicated via the status of terminals A1 and A2, if the external voltage supply is not interrupted during faulty operation:

A1 = LOW any type of fault (collective fault indication)

A2 = LOW only faults of the supply network

| Terminal X2/ A1 A2 | | Operating characteristic | Possible cause | Remedy | Fault reset |
|--------------------------|------|--|--|---|---|
| HIGH | HIGH | Input and regenerative operation possible | No malfunction | | |
| LOW | HIGH | Input operation still possible regenerative operation inhibited | Overtemperature <ul style="list-style-type: none"> Ambient temperature too high Overload of the regenerative power supply | <ul style="list-style-type: none"> Reduce ambient temperature Check dimensioning, if necessary use additional brake units | Automatically after cooling down of the regenerative power supply |
| | | | Overcurrent during regeneration <ul style="list-style-type: none"> Peak brake power too high | <ul style="list-style-type: none"> Use additional brake units | Because of mains connection and disconnection |
| LOW | LOW | Operation not possible | Mains voltage < 320V <ul style="list-style-type: none"> Isolated operation with generator All-pole mains failure Mains voltage > 555 V | <ul style="list-style-type: none"> Check the selection of the generator Switch on the mains | Automatically, if the mains voltage is within the permissible range |
| | | Input operation still possible regenerative operation inhibited | Mains frequency < 48 Hz or >62 Hz <ul style="list-style-type: none"> Isolated operation with generator possible | <ul style="list-style-type: none"> Check the selection of the generator | Automatically, if the mains voltage is within the permissible range |
| | | 2-phase input operation still possible regenerative operation inhibited | Single-pole phase failure L1, L2 or L3 <ul style="list-style-type: none"> Defective fuse | <ul style="list-style-type: none"> Replace fuse when no voltage is applied | Automatically after mains reconnection |



6.2 Reaction times of the fault indications of mains failures (switch-off)

The reaction time of the fault indication via A_1 and A_2 depends on the type of fault (mains faults) and are $< 10\text{ms}$.

The same conditions are valid for the reaction time of reconnection (switch-on). Here the reaction time is $< 0.5\text{s}$.



7 Maintenance

The regenerative power supply is free of maintenance if the prescribed operating conditions are maintained (see chapter 3.2).

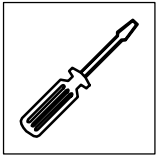
If the ambient air is polluted, the air vents may be obstructed. It is therefore necessary to check the pollution level of the air vents approx. every 4 weeks.



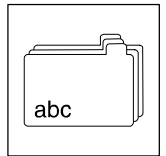
Stop!

Do not use sharp or pointed objects, for instance a knife or a screw driver to clean the air vents.

Free the obstructed air vents by using a vacuum cleaner.



Maintenance

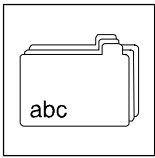


8 Supplement

8.1 Accessories

Lenze offers the following accessories for the 934X regenerative power supply:

| Name | Order number | | |
|--|---------------|---------------|---------------|
| | 9341 | 9342 | 9343 |
| Unit | | | |
| Mains filter type A | EZN3A0120H012 | EZN3A0088H024 | EZN3A0055H045 |
| Mains filter type B | - | - | - |
| Thermal separation (push-through technology) | EJ0038 | EJ0038 | EJ0011 |
| DC-bus fuse | EFSCC0160AYJ | EFSCC0320AYJ | EFSCC0800AYJ |
| Fuse holder | EFH2004 | EFH2004 | EFH2004 |



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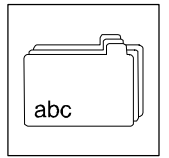
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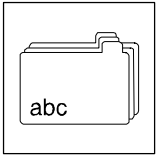
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