Bonfiglioli
Vectron

Device Series

Active Energy Control

AEC 401

Operating Instructions

Bonfiglioli
Forever Forward

TABLE OF CONTENTS

1 General Information about the Documentation

1.1 Instructions

For better clarity, the documentation is structured according to the customer-specific requirements made on the device.

Quick Start Guide
The "Quick Start Guide" describes the basic steps required for mechanical and electrical installation of the device. The guided commissioning supports you in the selection of necessary parameters and the configuration of the frequency inverter by the software.

Operating Instructions
The Operating Instructions document the complete functionality of the device. The parameters required for special purposes, for adjustment to the application and the numerous additional functions are described in detail.

Application manual
The application manual supplements the documentation for purposeful installation and commissioning of the device. Information on various topics in connection with the use of the device is described in context with the specific application.

If you need a copy of the documentation or additional information, contact your local representative of BONFIGLIOLI.

The following instructions are available for the *AEC (ACTIVE Energy Control)* series:

Operating Instructions *AEC*	Functionality of feed-back unit / mains unit.
Quick Start Guide *AEC*	Installation and commissioning supplied with the device.
Operating instructions Liquid Cooling Supplemental	Special features of liquid-cooled frequency inverters
Application manual Parallel connection	Parallel connection of Size 8 frequency inverters
Application Manual Hoisting Gear Drives	Advanced brake control for hoist unit drives.

The products for CANopen® communication comply with the specifications of the user organization CiA® (CAN in Automation).

The present documentation was prepared with great care and it was subjected to extensive and repeated reviews. For reasons of clarity, it was not possible to include all details of all types of the product in the documentation. Neither was it possible to consider all conceivable installation, operation or maintenance situations. If you require further information or if you meet with specific problems which are not dealt with in sufficient detail in the documentation, contact your local BONFIGLIOLI agent.
The present document was created in German. Other language versions are translations.

1.2 This document

This documentation applies to the following device series:

- AEC 401

This documentation describes the AEC device series mains unit / feed-back unit. The Operating Instructions contain important information on the installation, use and specified application range of the product. Compliance with this document contributes to avoiding risks, minimizing repair cost and downtimes and increasing the reliability and service live of the device.
For this reason, make sure you read the Operating Instructions carefully.

IMPORTANT:

Compliance with the documentation is required to ensure safe operation of the device. BONFIGLIOLI VECTRON MDS GmbH shall not be held liable for any damage caused by any non-compliance with the documentation.

In case any problems occur which are not covered by the documentation sufficiently, please contact the manufacturer.

For safe commissioning and operation of the AEC (ACTIVE Energy Control) series, the following documentation must be complied with:

- These Operating Instructions
- Document "Quick Start Guide" which is enclosed with the delivery as a standard.

In the following, the abbreviation "AEC" (ACTIVE Energy Control) is used both for the "Mains Unit" and the "Feed-back Unit". Wherever a certain description only refers to the mains unit or the feed-back unit, the device will be mentioned accordingly.

The AEC series of devices can be identified by the corresponding rating plate. For the rating plate, refer to chapter Rating plate.
In additions, the device series can be identified by its label on the case and the identification below the top cover.

1.3 Warranty and liability

BONFIGLIOLI VECTRON MDS GmbH states that the contents of these Operating Instructions do not form part of any previous or existing agreement, assurance or legal relationship. Neither are they intended to supplement or replace such agreements, assurances or legal relationships. Any obligations of the manufacturer shall solely be based on the relevant purchase agreement which also includes the complete and solely valid warranty stipulations. These contractual warranty provisions are neither extended nor limited by the specifications contained in this documentation.
The manufacturer reserves the right to correct or amend the specifications, product information and omissions in these operating instructions without prior notice. The manufacturer assumes no responsibility to update these Operating Instructions. The manufacturer shall not be liable for any damage, injuries or costs which may be caused by the aforementioned reasons.
In addition, the manufacturer excludes any warranty and disclaims all liability, including, without limitation, direct, indirect, special, punitive, incidental, exemplary or consequential damages arising out of or in connection with one or more of the following causes:

- inappropriate use of the device,
- non-compliance with the instructions, warnings and prohibitions contained in the documentation,
- unauthorized modifications of the device,
- insufficient monitoring of parts of the machine/plant which are subject to wear,
- repair work at the machine/plant not carried out properly or in time,
- catastrophes by external impact and force majeure.

1.4 Obligation

These Operating Instructions must be read before commissioning and complied with. Anybody entrusted with tasks in connection with the

- transport,
- assembly,
- installation of the device and
- operation of the device

must have read and understood the Operating Instructions and, in particular, the safety instructions in order to prevent personal and material losses.

1.5 Copyright

1.6 Storage of documents

The documentation form an integral part of the AEC. It must be stored such that it is accessible to operating staff at all times. If the AEC is sold on to other users, then these Operating Instructions must also be handed over.

2 General safety instructions and information on use

The chapter "General safety instructions and information on use" contains general safety instructions for the Operator and the Operating Staff. At the beginning of certain main chapters, some safety instructions are included which apply to all work described in the relevant chapter. Special work-specific safety instructions are provided before each safety-relevant work step.

2.1 Terminology

According to the documentation, different activities must be performed by certain persons with certain qualifications.
The groups of persons with the required qualification are defined as follows:

Operator

This is the entrepreneur/company who/which operates the AEC and uses it as per the specifications or has it operated by qualified and instructed staff.

Operating staff

The term Operating Staff covers persons instructed by the Operator of the device and assigned the task of operating the AEC.

Skilled Personnel

The term Skilled Personnel covers staff that are assigned special tasks by the Operator of the device, e.g. installation, maintenance and service/repair and troubleshooting. Based on their qualification and/or know-how, Skilled Personnel must be capable of identifying defects and assessing functions.

Qualified Electrician

The term Qualified Electrician covers qualified and trained staff that have special technical know-how and experience with electrical installations. In addition, Qualified Electricians must be familiar with the applicable standards and regulations, they must be able to assess the assigned tasks properly and identify and eliminate potential hazards.

Mains unit

An AEC unit connected to a supply mains and frequency inverters via additional application components. The mains unit uses energy supplied by the connected supply mains and for supplying the connected drives. Regenerative energy produced in system operation, can be fed back into the connected mains (sine form) by means of the mains unit.

Instructed Person

The term Instructed Person covers staff that are instructed and trained about/in the assigned tasks and the potential hazards that might result from inappropriate behavior. In addition, Instructed Persons must have been instructed in the required protection provisions, protective measures, the applicable directives, accident prevention regulations as well as the operating conditions and verified their qualification.

Feed-back unit

An AEC unit connected to a supply mains and frequency inverters via additional application components. The feed-back unit supplies the regenerative energy produced in system operation back into the connected mains (block form). The drives connected in the system are supplied directly from the supply mains in this case.

Expert

The term Expert covers qualified and trained staff that have special technical know-how and experience relating to AEC. Experts must be familiar with the applicable government work safety directives, accident prevention regulations, guidelines and generally accepted rules of technology in order to assess the operationally safe condition of the AEC.

2.2 Designated use

The product is an electric inverter unit. It is designed for

- installation in machines and electrical equipment
- industrial environments

AEC are electrical components intended for installation in industrial plants or machines. Commissioning and start of operation is not allowed until it has been verified that the machine meets the requirements of the EC Machinery Directive 2006/42/EC and DIN EN 60204-1.
The AEC inverter unit meets the requirements of the low voltage directive 2014/35/EU and DIN EN 61800-5-1. CE-labeling is based on these standards. Responsibility for compliance with the EMC Directive 2014/30/EU lies with the operator. The AEC inverter units are only available at specialized dealers and are exclusively intended for industrial use as per DIN EN 61000-3-2.
The technical data, connection specifications and information on ambient conditions are indicated on the rating plate and in the documentation and must be complied with at all times.

2.3 Misuse

Any use other than that described in "Designated use" shall not be permissible and shall be considered as misuse.
For, example, the machine/plant must not be operated

- by uninstructed staff,
- when the equipment is not in perfect condition,
- without protection enclosure (e.g. covers),
- without safety equipment or with safety equipment deactivated.

The manufacturer shall not be held liable for any damage resulting from such misuse. The sole risk shall be borne by the operator.

Explosion protection

The AEC is an IP20 ingress protection rating device. For this reason, use of the device in explosive atmospheres is not permitted.

2.4 Residual risks

Residual risks are special hazards involved in handling of the AEC which cannot be eliminated despite the safety-compliant design of the device. Residual risks are not obviously identifiable and can be a potential source of injury or a health hazard.
Typical residual hazards include:

Electrical hazard

Danger of contact with energized components due to a defect, opened covers or enclosures or improper working on electrical equipment.
Danger of contact with energized components in the device if no external disconnection device was installed by the operator.

Electrostatic charging

Touching electronic components entails the risk of electrostatic discharges.

Thermal hazards

Risk of accidents by hot machine/plant surfaces, e.g. heat sink, transformer, fuse or sine filter.

Charged capacitors in DC link

The DC-link, depending on the device type, may have dangerous voltage levels even up to 8 minutes after shutdown.

Danger of equipment falling down/over, e.g. during transport

Center of gravity is not the middle of the electrical cabinet modules.

2.5 Safety and warning signs

- Comply with all safety instructions and danger information provided on the AEC.
- Safety information and warnings on the device must not be removed.

2.6 Warning information and symbols used in the Operating Instructions

2.6.1 Hazard classes

The following hazard identifications and symbols are used in the Operating Instructions to mark particularly important information:

DANGER

Identification of immediate threat holding a **high** risk of death or serious injury if not avoided.

WARNING

Identification of immediate threat holding a **medium** risk of death or serious injury if not avoided.

CAUTION

Identification of immediate threat holding a **low** risk of minor or moderate physical injury if not avoided.

NOTE

Identification of a threat holding a risk of material damage if not avoided.

2.6.2 Hazard symbols

Symbol	Meaning	Symbol	Meaning
	General hazard		Suspended load
	Electrical voltage		Hot surfaces

2.6.3 Prohibition signs

Symbol	Meaning
	No switching; it is forbidden to switch the machine/plant, assembly on

2.6.4 Personal safety equipment

Symbol	Meaning
	Wear body protection

2.6.5 Recycling

Symbol	Meaning
	Recycling, to avoid waste, collect all materials for reuse

2.6.6 Grounding symbol

Symbol	Meaning
	Ground connection

2.6.7 ESD symbol

Symbol	Meaning
	ESD: Electrostatic Sensitive Devices, i.e. components and assemblies sensitive to electrostatic energy

2.6.8 Information signs

Symbol	Meaning
	Tips and information making using the device easier.

2.7 Font style in documentation

Example	Font style	Use
1234	bold	Representation of parameter numbers
Parameter	inclined, font: Times New Roman	Representation of parameter names
1234	font: Courier New	Representation of parameter values and other values
P.1234	bold	Representation of parameter numbers without name, e.g. in formulas
Q.1234	bold	Representation of source numbers
•	Bullet point	Indicates an action to be taken
_	Bullet dash	Indicates a list of items

2.8 Directives and guidelines to be adhered to by the operator

The operator must follow the following directives and regulations:

- Ensure that the applicable workplace-related accident prevention regulations as well as other applicable national regulation are accessible to the staff.
- An authorized person must ensure, before using the AEC, that the device is used in compliance with its designated use and that all safety requirements are met.
- Additionally, comply with the applicable laws, regulations and directives of the country in which the AEC is used.
- Any additional guidelines and directives that may be required additionally shall be defined by the operator of the machine/plant considering the operating environment.

2.9 Operator's general plant documentation

- In addition to the Operating Instructions, the operator should issue separate internal user manuals for the AEC. The Operating Instructions of the AEC must be included in the Operating Instructions of the whole plant.

2.10 Operator's/operating staff's responsibilities

2.10.1 Selection and qualification of staff

- Any work on the AEC may only be carried out by Skilled Personnel. The staff must not be under the influence of any drugs. Note the minimum age required by law. Define the staff's responsibility pertaining to all work on the AEC clearly.
- Work on the electrical components may only be performed by a qualified electrician according to the applicable rules of electrical engineering.
- The operating staff must be trained for the relevant work to be performed.

2.10.2 General work safety

- In addition to the Operating Instructions of the machine/plant, any applicable legal or other regulations relating to accident prevention and environmental protection must be complied with. The staff must be instructed accordingly.
  Such regulations and/or requirements may include, for example, handling of hazardous media and materials or provision/use of personal protective equipment.
- In addition to these Operating Instructions, issue any additional directives that may be required to meet specific operating requirements, including supervision and reporting requirements, e.g. directives relating to work organization, workflow and employed staff.
- Unless approved of expressly by the manufacturer, do not modify the AEC in any way, including addition of attachments or retrofits.
- Only use the AEC if the nominal connection and setup values specified by the manufacturer are met.
- Provide appropriate tools as may be required for performing all work on the AEC properly.

2.10.3 Ear protectors

- The devices produce noise. For this reason they should be installed in areas where people normally don't stay.
- Noise emission in operation is < 85 dB(A) in the case of sizes 1 through 7.
- Noise emission in operation is approx. 86 dB(A) in the case of size 8. Ear protectors must be used when staying near the device

2.11 Organizational measures

2.11.1 General

- Train your staff in the handling and use of the AEC and the machine/plant as well as the risks involved.
- Use of any individual parts or components of the AEC in other parts of the operator's machine/plant is prohibited.
- Optional components for the AEC must be used in accordance with their designated use and in compliance with the relevant documentation.

2.11.2 Use in combination with third-party products

- Please note that Bonfiglioli Vectron MDS GmbH will not accept any responsibility for compatibility with third-party products (e.g. motors, cables or filters).
- In order to enable optimum system compatibility, Bonfiglioli Vectron MDS GmbH offers components facilitating commissioning and providing optimum synchronization of the machine/plant parts in operation.
- If you use the AEC in combination with third-party products, you do this at your own risk.

2.11.3 Transport and storage

- The frequency inverters must be transported and stored in an appropriate way. During transport and storage the devices must remain in their original packaging.
- The units may only be stored in dry rooms which are protected against dust and moisture and are exposed to small temperature deviations only. The requirements of DIN EN 60721-3-1 for storage, DIN EN 60721-3-2 for transport and labeling on the packaging must be met.
- The duration of storage without connection to the permissible nominal voltage may not exceed one year.

2.11.4 Handling and installation

- Do not commission any damaged or destroyed components.
- Prevent any mechanical overloading of the AEC. Do not bend any components and never change the isolation distances.
- Do not touch any electronic construction elements and contacts. The AEC is equipped with components which are sensitive to electrostatic energy and can be damaged if handled improperly. Any use of damaged or destroyed components will endanger the machine/plant safety and result in non-compliance with the applicable standards.
- Only install the AEC in a suitable operating environment. The AEC is exclusively designed for installation in industrial environments.
- If seals are removed from the case, this can result in the warranty becoming null and void.

2.11.5 Electrical connections

- The five safety rules must be complied with.
- Never touch live terminals. The DC-link may have dangerous voltage levels even up to 8 minutes after shutdown.
- When performing any work on/with the AEC, always comply with the applicable national and international regulations/laws on work on electrical equipment/plants of the country in which the AEC is used.
- The cables connected to the AEC may not be subjected to high-voltage insulation tests unless appropriate circuitry measures are taken before.
- Only connect the AEC to suitable supply mains.

2.11.6 The five safety rules

When working on/in electrical plants, always follow the five safety rules:

1. Isolate
2. Secure to prevent restarting
3. Check isolation
4. Earth and short-circuit
5. Cover or shield neighboring live parts

2.11.7 Safe operation

- During operation of the AEC, always comply with the applicable national and international regulations/laws on work on electrical equipment/plants.
- Before commissioning and the start of the operation, make sure to fix all covers and check the terminals. Check the additional monitoring and protective devices according to the applicable national and international safety directives.
- During operation, never open the machine/plant.
- Do not connect/disconnect any components/equipment during operation.
- The machine/plant holds high voltage levels during operation, is equipped with rotating parts (fan) and has hot surfaces. Any unauthorized removal of covers, improper use, wrong installation or operation may result in serious injuries or material damage.
- Some components, e.g. the heat sink or braking resistor, may be hot even some time after the machine/plant was shut down. Do not touch any surfaces directly after shutdown. Wear safety gloves where necessary.
- The device may hold dangerous voltage levels until the capacitor in the DC link is discharged. After shutdown, wait for at least 3 minutes (device sizes 3 through 7) and at least 8 minutes (device size 8) before starting any electrical or mechanical work on the AEC. Even after this waiting time, make sure that the equipment is deenergized in accordance with the safety rules before starting the work.
- In order to avoid accidents or damage, only qualified staff and electricians may carry out the work such as installation, commissioning or setup.
- In the case of a defect of terminals and/or cables, immediately disconnect the device from power supply.
- Persons not familiar with the operation of AECs must not have access to the device. Do not bypass nor decommission any protective devices.
- Devices (sizes 3 through 7) disconnected from mains supply may only be reconnected after 60s. Devices of size 8 my only be reconnected after 8 minutes. This must be considered when operating a mains contactor in jog operation mode. For commissioning or after an emergency stop, a non-recurrent, direct restart is permissible.
- Before commissioning and the start of the operation, make sure to fix all covers and check the terminals. Check the additional monitoring and protective devices according to EN 60204 and applicable the safety directives (e.g. Working Machines Act or Accident Prevention Directives).

2.11.8 Maintenance and service/troubleshooting

- Visually inspect the device when carrying out the required maintenance work and inspections at the machine/plant.
- Perform the maintenance work and inspections prescribed for the machine carefully, including the specifications on parts/equipment replacement.
- Work on the electrical components may only be performed by a qualified electrician according to the applicable rules of electrical engineering. Only use original spare parts.
- Unauthorized opening and improper interventions in the machine/plant can lead to personal injury or material damage. Repairs to the AEC may only be carried out by the manufacturer or persons authorized by the manufacturer. Check protective equipment regularly.
- Before performing any maintenance work, the machine/plant must be disconnected from mains supply and secured against restarting. The five safety rules must be complied with.

2.11.9 Final decommissioning

Unless separate return or disposal agreements were made, recycle the disassembled AEC components:

- Scrap metal materials
- Recycle plastic elements
- Sort and dispose of other component materials

Electric scrap, electronic components, lubricants and other utility materials must be treated as special waste and may only be disposed of by specialized companies.

In any case, comply with any applicable national disposal regulations as regards environmentally compatible disposal of the device. For more details, contact the competent local authorities.

3 Description of function

In many processes, the energy produced by generator operation, cannot be fed-back into the supply mains by frequency inverters directly. Instead of losing the energy that is converted to unusable heat, the energy can be fed back into the supply mains by the AEC for re-use.
Depending on the chosen configuration, the energy generated in this way can be recovered in sine or block form.
One or more frequency inverters can be connected to the DC-link of the AEC.

3.1 Sinusoidal feedback

This type of supply/feedback is characterized by continuous feedback of the available recuperated energy into and supply of energy by the connected mains. AEC devices used in this way are called "Mains Units".

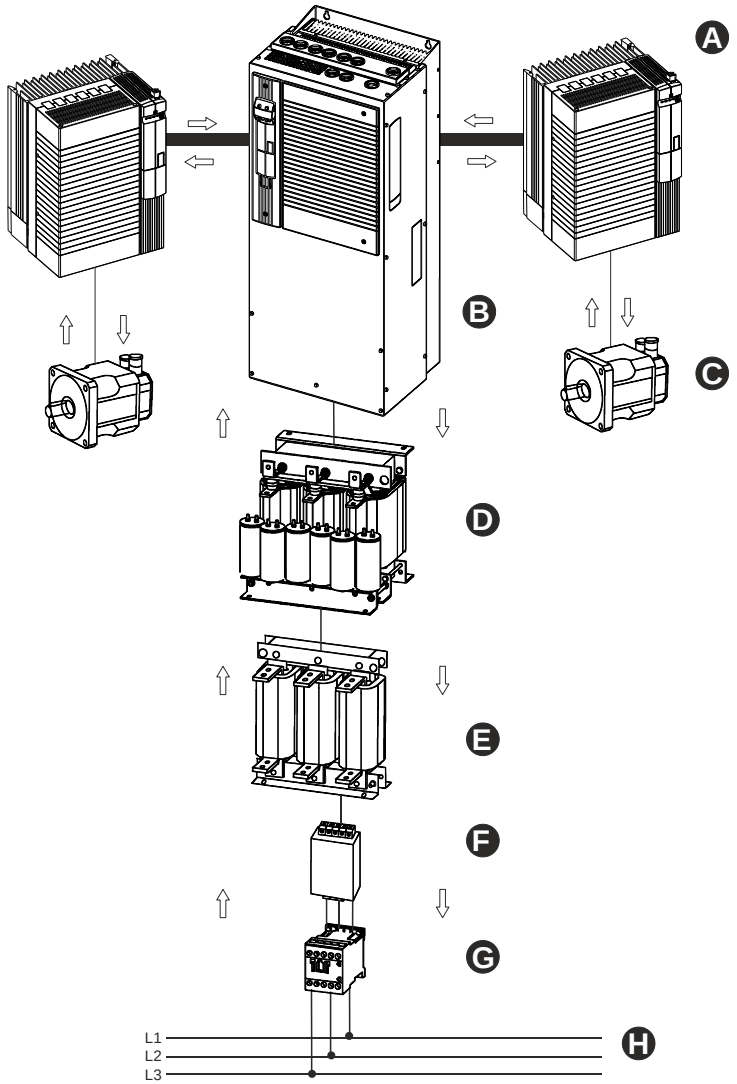
Schematic diagram

CAUTION

Device damage

Unsuitable frequency inverters will be damaged or destroyed if used in combination with a mains unit.

- For the "Sinusoidal recovery" function, IT-ACU/ANG devices must be used in any case.

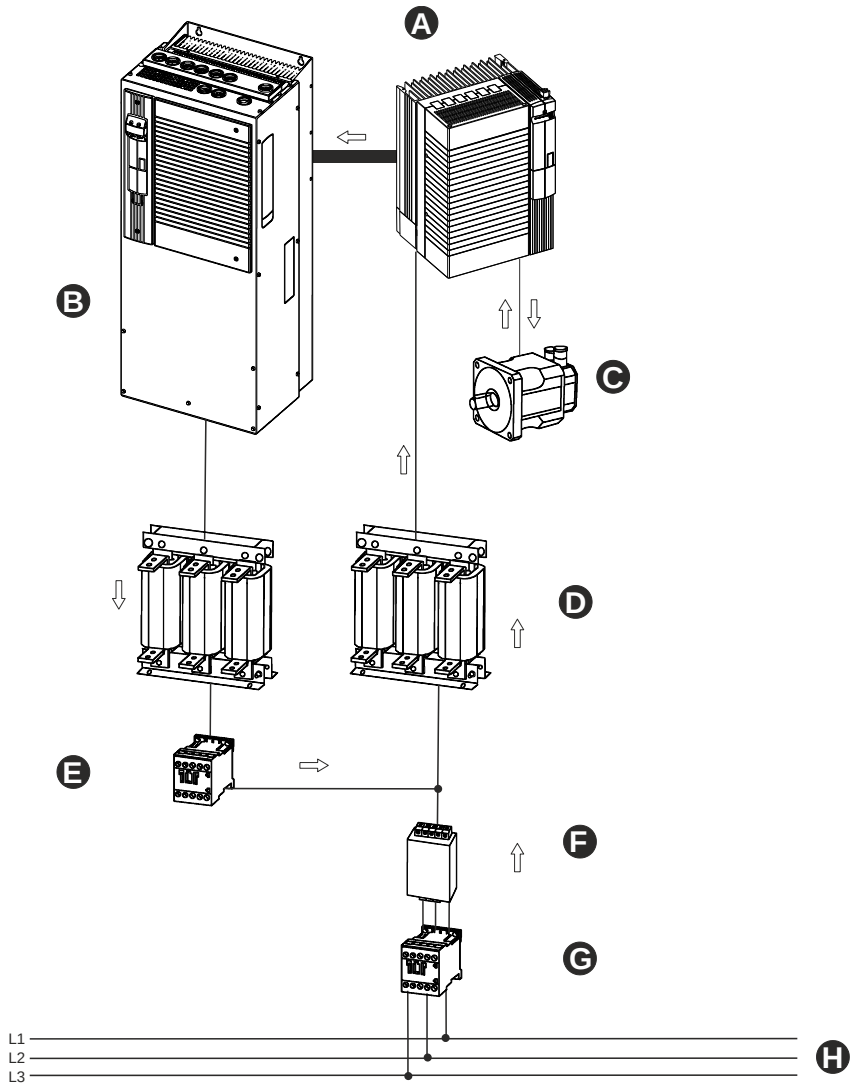


A	Frequency inverter		E	Line choke
B	Mains unit		F	Radio interference filter
C	Motor		G	Contactor
D	Sine filter		H	Supply mains
⇨	Direction of energy flow			

3.2 Block-shaped feedback

In the case of this type of feedback, the available recuperated energy is fed back into the connected mains as required for a short time. The drive inverters are supplied with energy from the connected mains. The amount of energy recovered by the AEC device may be significantly lower than the amount of energy tapped from the mains by the frequency inverter.
AEC devices used in this way are called "Feed-back Units".

Schematic diagram



A	Frequency inverter		E	Contactor
B	Feed-back unit		F	Radio interference filter
C	Motor		G	Contactor
D	Sine filter		H	Supply mains
⇨	Direction of energy flow			

4 Storage and transport

NOTICE

Draining the heat sink

Liquid cooled devices may be transported and stored only with the heat sink completely drained of the coolant.

- Use compressed air to drain the heat sink radiator.

4.1 Storage

NOTE

Damage caused by incorrect storage

Wrong or inappropriate storage may result in damage, e.g. due to moisture and dirt.

- The frequency inverters must be stored in an appropriate way. During storage, the devices must remain in their original packaging.
- The units may only be stored in dry rooms which are protected against dust and moisture and are exposed to small temperature deviations only.
- The requirements of DIN EN 60721-3-1 for storage, DIN EN 60721-3-2 for transport and labeling on the packaging must be met.
- The duration of storage without connection to the permissible nominal voltage may not exceed one year. After one year of storage, connect the device to mains voltage for 60 minutes.

4.2 Special safety instructions on transport of heavy devices

WARNING

High weight and unusual center of gravity!

Tilting the device may result in death or serious injuries. Due to the size and weight of the device, there is the risk of accidents during transport. The center of gravity may be not in the middle of the device. The underside of the device, due to its design, cannot support the frequency inverter.

- Take utmost care during transport in order to prevent damage and deformation. Transport, attachment and lifting of loads may only be carried out by specially instructed staff who are familiar with the work.
- Only use suitable transport and lifting equipment with sufficient carrying capacity. The lifting cables/chains used must be able to carry the weight of the device. Check the ropes or chains for damage.
- Wear appropriate safety clothing.
- When lifting the frequency inverter up ensure that it does not fall over, is displaced, swings out or falls down.
- Before the device is lifted up, everybody must have left the work area.
- Before transport, make sure the transport path has sufficient carrying capacity.
- Do not step under suspended loads.
- Do not put the device down in upright position without providing a suitable supporting structure.

4.3 Dimensions/weight

For information on the weight and dimensions of the device, refer to chapter "Technical data".

4.4 Transfer to place of installation

Transfer to the place of installation is done with the product in its original packaging. Devices as from size 7 must be transferred to the place of installation in horizontal position, rear-side down. A fork lift truck or crane with crane fork can be used for transfer to the place of installation.

- Apply the fork in the middle of the transport unit.
- Secure the transport unit to prevent it from falling down and overturning.
- Lift the transport unit up carefully.
- At the place of installation, put the transport unit down on a level and bearing surface.

4.5 Unpacking the device

- Carefully remove packaging.
- Check if the delivered devices corresponds to the order.
- Check the device for transport damage and completeness.
- Any defects/damage must be reported to the supplier immediately.

Ensure that all packaging materials are disposed of in an environmentally compatible manner.

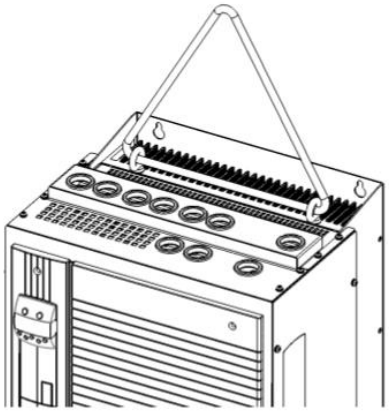
4.6 Bringing the device into installation position

4.6.1 Sizes 3 through 6

- Depending on the weight, one or two persons are required for lifting the device into the installation position in the electrical cabinet. Installation, see Chapter „Mechanical installation".

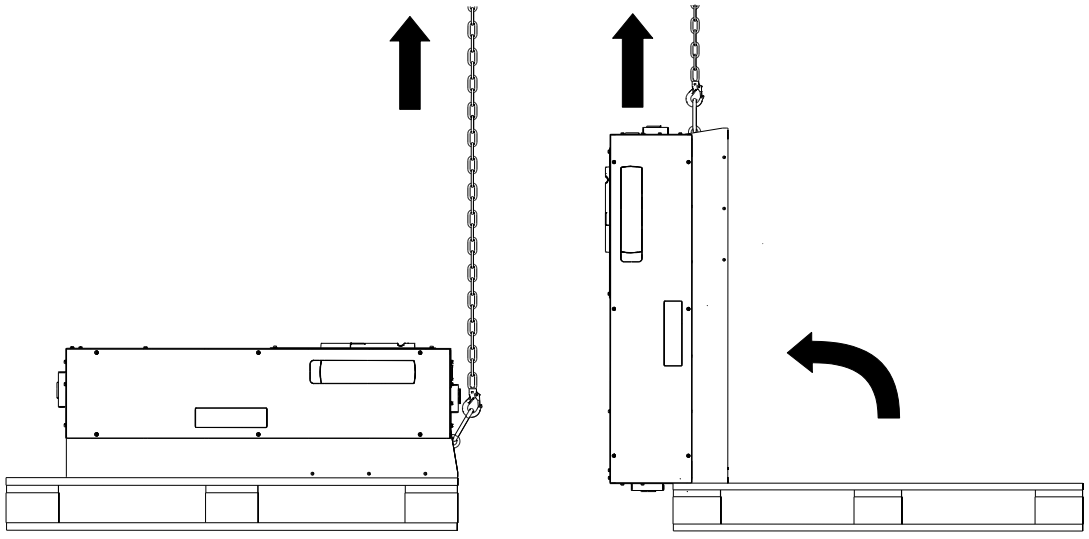
4.6.2 Sizes 7 and 8

- Fix two transport eyes (M8) in the marked threaded holes on the top side of the device.
- Use appropriate lifting means.



NOTE

The pull angle must not be smaller than 60°.



- Use appropriate lifting means and a crane to lift the device up carefully. Bring the device into vertical position by turning it up on the pallet via the rear lower edge of the case.

NOTE

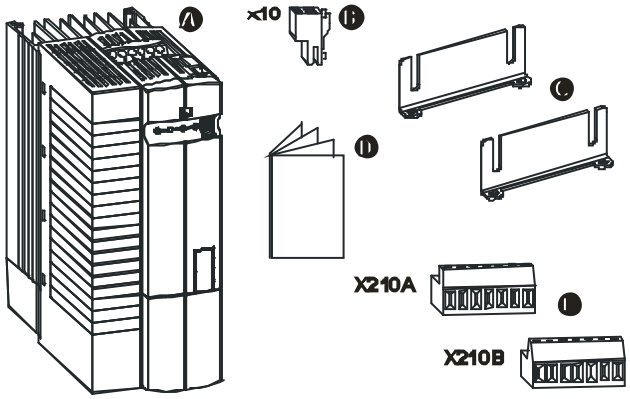
Do not leave the device standing in upright position.

- Move the device to its installation position in the electrical cabinet and fix it there, see Chapter 7 "Mechanical installation".
- After mechanical installation, disconnect the device from the crane and remove the transport eyes.

5 Scope of supply

Thanks to the modular hardware components, the mains unit can be integrated in the automation concept easily. The scope of delivery described can be supplemented by optional components and adapted to the customer-specific requirements.

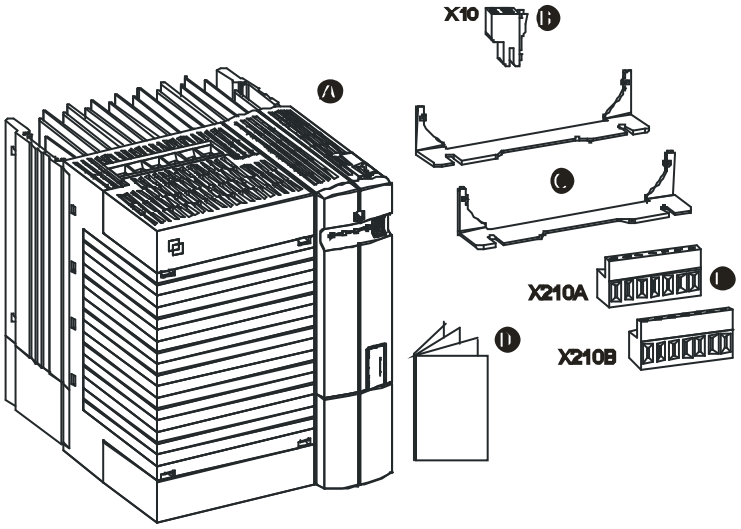
5.1 Size 3 and Size 4



Scope of supply	
A	AEC
B	Terminal strip X10 (Phoenix ZEC 1.5/3ST5.0) Plug-in terminals for the relay output
C	Standard fittings with fitting screws (M4x20, M4x60) for vertical assembly
D	Quick Start Guide and Operating Instructions
E	Control terminals X210A / X210B (Wieland DST85 / RM3.5) Plug-in terminal for connection of the control signals

Please check incoming goods for quality, quantity and nature without delay. Obvious defects such as exterior damage of the packing and/or the unit must be notified to the sender within seven days for insurance reasons.

5.2 Size 5

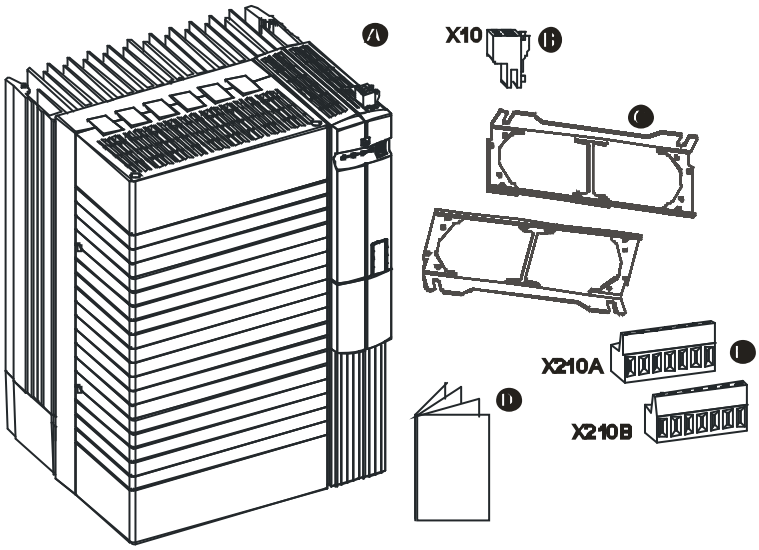


Scope of supply

A	AEC
B	Terminal strip X10 (Phoenix ZEC 1.5/3ST5.0) Plug-in terminals for the relay output
C	Standard fittings with fitting screws (M4x20, M4x70) for vertical assembly
D	Quick Start Guide and Operating Instructions
E	Control terminals X210A / X210B (Wieland DST85 / RM3.5) Plug-in terminal for connection of the control signals

Please check incoming goods for quality, quantity and nature without delay. Obvious defects such as exterior damage of the packing and/or the unit must be notified to the sender within seven days for insurance reasons.

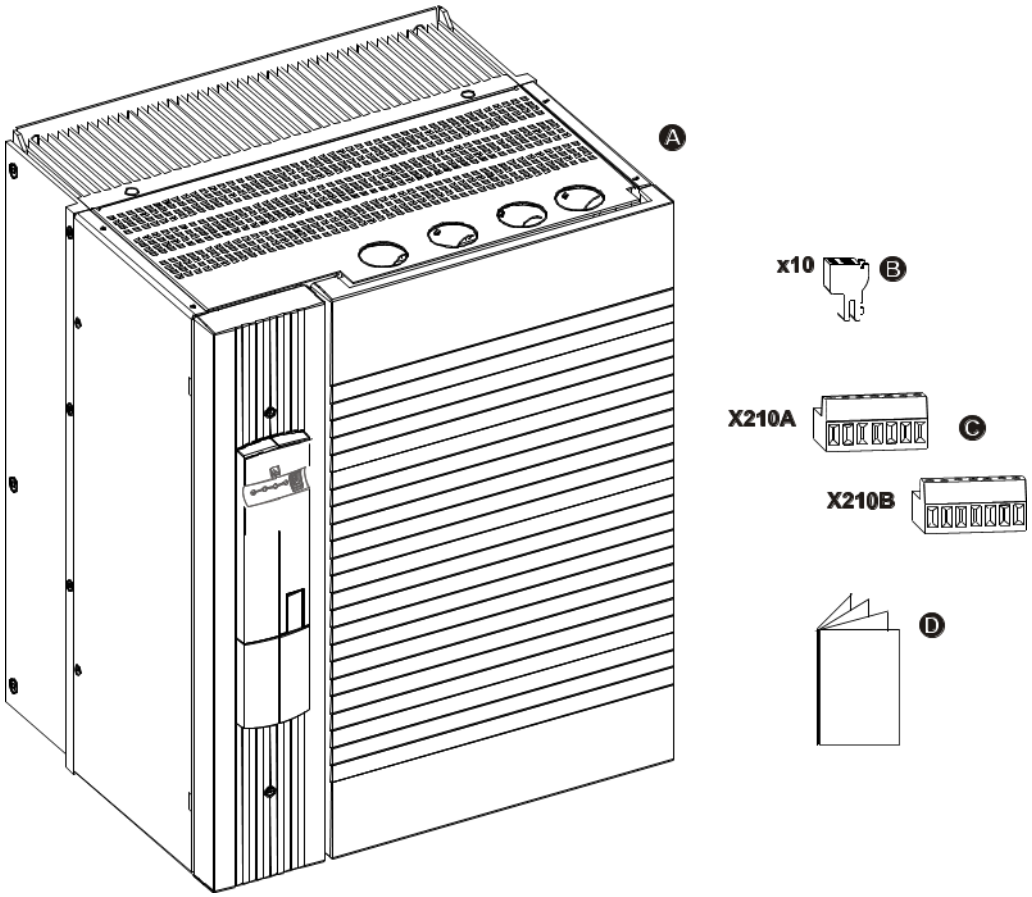
5.3 Size 6



Scope of supply	
A	AEC
B	Terminal strip X10 (Phoenix ZEC 1.5/3ST5.0) Plug-in terminals for the relay output
C	Air-cooled devices only: Standard fixtures with fixing bolts (M5x20) for vertical assembly
D	Quick Start Guide and Operating Instructions
E	Control terminals X210A / X210B (Wieland DST85 / RM3.5) Plug-in terminal for connection of the control signals

Please check incoming goods for quality, quantity and nature without delay. Obvious defects such as exterior damage of the packing and/or the unit must be notified to the sender within seven days for insurance reasons.

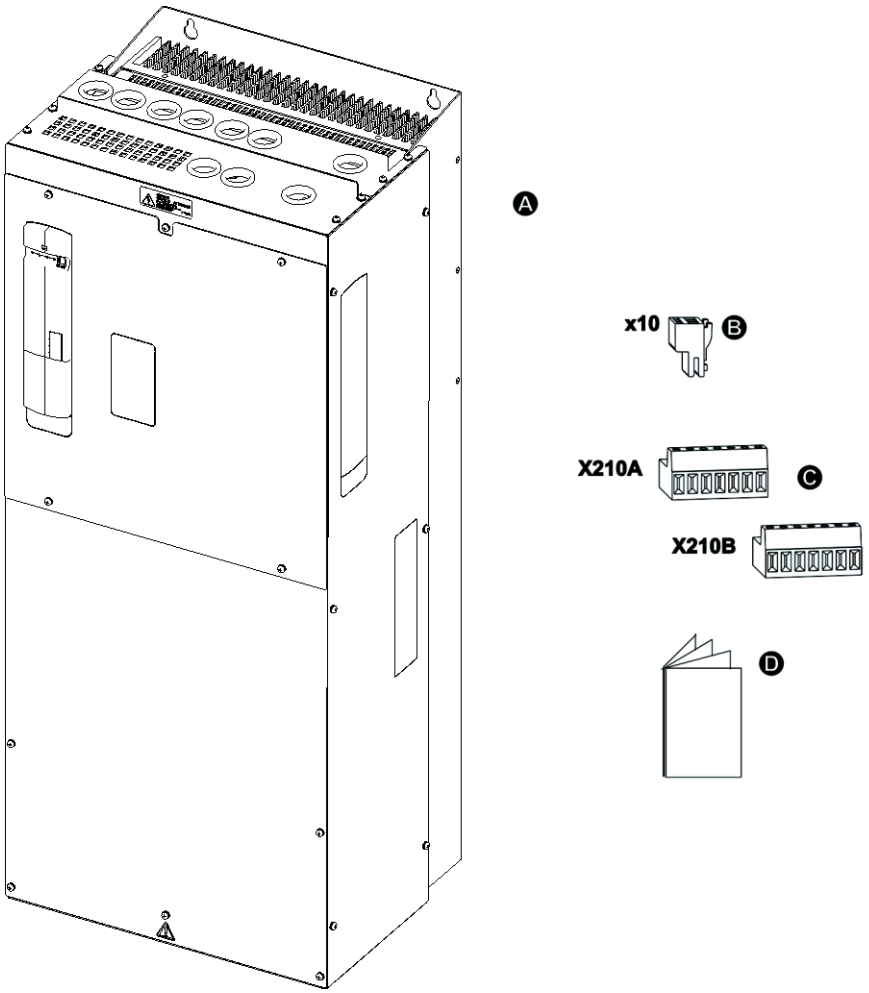
5.4 Size 7



Scope of supply	
A	AEC
B	Terminal strip X10 (Phoenix ZEC 1.5/3ST5.0) Plug-in terminals for the relay output
C	Control terminals X210A / X210B (Wieland DST85 / RM3.5) Plug-in terminal for connection of the control signals
D	Quick Start Guide and Operating Instructions

Please check incoming goods for quality, quantity and nature without delay. Obvious defects such as exterior damage of the packing and/or the unit must be notified to the sender within seven days for insurance reasons.

5.5 Size 8

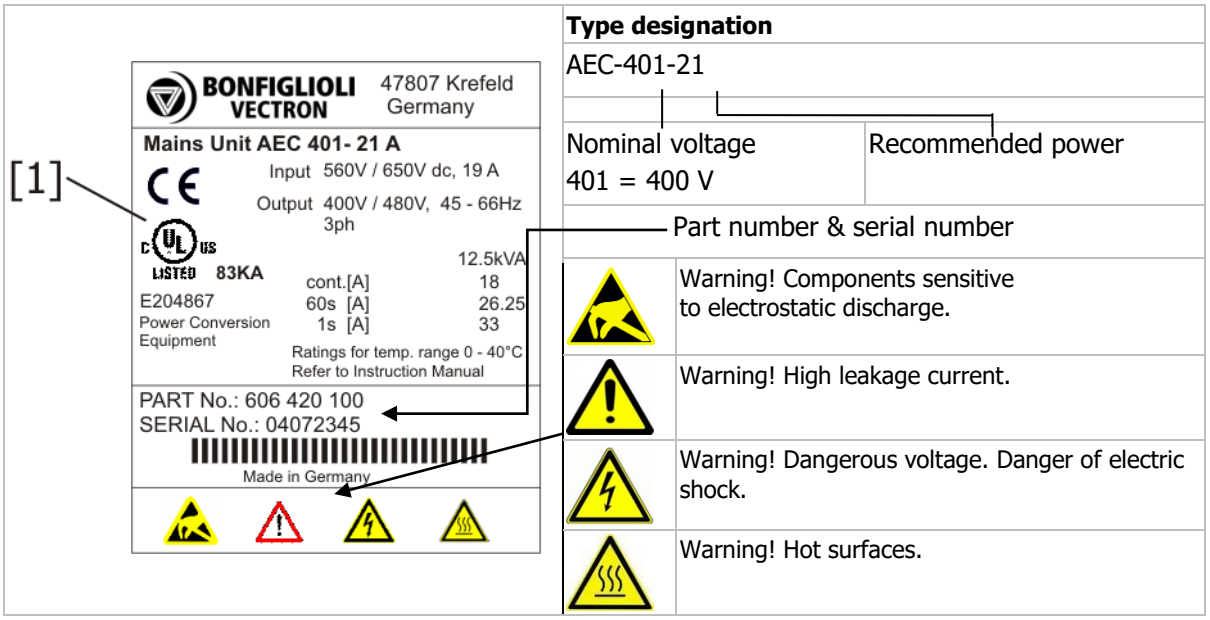


Scope of supply	
A	AEC
B	Terminal strip X10 (Phoenix ZEC 1.5/3ST5.0) Plug-in terminals for the relay output
C	Control terminals X210A / X210B (Wieland DST85 / RM3.5) Plug-in terminal for connection of the control signals
D	Quick Start Guide and Operating Instructions

Please check incoming goods for quality, quantity and nature without delay. Obvious defects such as exterior damage of the packing and/or the unit must be notified to the sender within seven days for insurance reasons.

6 Technical data

6.1 Rating plate



[1] Marking for UL508c (where applicable).

6.2 General technical data

CE conformity	The AEC mains unit meet the requirements of the Low Voltage Directive 2006/95/EEC and EN 50178 / DIN VDE 0160 and EN 61800-2.
EMC directive	For proper installation of the mains unit in order to meet the requirements of EN 61800-3, please comply with the installation instructions in these Installation Instructions.
Interference immunity	The AEC mains unit meets the requirements of EN 61800-3 for use in industrial environments.
UL Approval	The frequency inverters are also marked with the UL label according to UL508c, which proves that they also meet the requirements of the CSA Standard C22.2-No. 14-95.
Ambient temperature	Operation: 0…55 °C; as from 40 °C power reduction should be considered.
Environmental class	Operation: 3K3 (EN60721-3-3) Relative humidity 15…85%, no water condensation
Ingress protection rating	IP20 if covers and connection terminals are used properly.
Altitude of installation	Up to 1000 m at nominal specifications. Up to 4000 m at reduced power.
Storage	Storage according to EN 50178. Bonfiglioli Vectron recommends that the unit be connected to nominal voltage for 60 minutes after one year, at the latest.
Overload capacity	Continuous operation 100% I_N Up to 150% I_N for 60 s Up to 200% I_N for 1 s Overload capacity can be used every 10 minutes.
Parameterization	Freely programmable digital inputs and outputs. Four separate data sets

6.3 Technical Data – Control Electronic Equipment

Control terminal X210A		Control terminal X210B	
X210A.1	DC 20 V output (I_{max}=180 mA) or DC 24 V ±10% input for external power supply	X210B.1	Digital inputs [2]
X210A.2	GND 20 V/ GND 24 V (ext.)	X210B.2[3]	Digital input **S7IND**
X210A.3	Digital input **S1IND** for release and acknowledging errors [1]	X210B.3	Digital output [2]
X210A.4	Digital inputs [2]	X210B.4	Multifunction output [2]
X210A.5		X210B.5	DC 10 V output (I_{max}=4 mA)
X210A.6		X210B.6	multifunction input [2]
X210A.7		X210B.7	Ground 10 V

Relay output X10	
X10	Wire with precharging circuit or with network access. See chapter "8.3.3.3"/"8.3.4.3".

[1] Release of mains unit: Contact at X210A.3 must be closed.

[2] Control terminals are freely configurable.

[3] Release of mains unit: Contact at X210B.2 must be closed.

Control terminals are assigned certain default settings. These settings can be adjusted to the specific application. You can assign various functions to the control terminals.

Technical data of control terminals
Digital inputs (X210A.3...X210B.2): PLC compatible – Low Signal: DC 0 V ... 3 V, High signal: DC 12 V ... 30 V, – Input resistance: 2.3 kΩ, response time: 2 ms , except for X210A.3 and X210B.2 response time: 10 ms
Digital output (X210B.3): – Low Signal: DC 0 V ... 3 V, High signal: DC 12 V ... 30 V, – Maximum output current: 50 mA, PLC compatible
Multifunction output (X210B.4): Analog signal: DC 19 ... 28 V, maximum output current: 50 mA, pulse-width modulated (f_{PWM}= 116 Hz), Digital signal: Low Signal: DC 0 V ... 3 V, High signal: DC 12 V ... 30 V, output current: 50 mA, PLC compatible Frequency signal: Output voltage: DC 0 V ... 24 V, maximum output current: 40 mA, maximum output frequency: 150 kHz
Multifunction input (X210B.6): Analog signal: Input voltage: DC 0... 10 V (Ri=70 kΩ), input current: DC 0 mA ... 20 mA (R_i=500 Ω), Digital signal: Low Signal: DC 0 V ... 3 V, High signal: DC 12 V...30 V, response time: 4 ms, PLC compatible
Relay output (X10): Change-over contact, response time approx. 40 ms – Make contact AC 5 A / 240 V, DC 5 A (ohmic) / 24 V, – Break contact AC 3 A / 240 V, DC 1 A (ohmic) / 24 V For connection of a coupler relay for controlling power contactors. Note the technical data of the existing customer-provided components.
Conductor cross-section: The signal terminals are suitable for the following cable sizes: with ferrule: 0.25 mm² ... 1.0 mm² without ferrule: 0.14 mm² ... 1.5 mm²

6.4 Technical data

6.4.1 Sizes 3 and 4

Type						
AEC 401		**-19**	**-21**	**-22**	**-23**	**-25**
Size		3	3	3	4	4
Output, mains side, at 400 V mains voltage						
Output power	kVA	9.7	12.5	15.2	17.3	22.2
Nominal output current	A	14	18	22	25	32
Voltage	V	320 … 460				
Frequency	Hz	45 … 66				
Protection		Short circuit / earth fault proof				
Switching frequency	kHz	4, 8, 12, 16				
Line fuses	-	external				
Mechanical						
Dimensions HxWxD	mm	250 x 100 x 200			250 x 125 x 200	
Weight approx.	Kg	3	3	3	3.7	3.7
Conductor cross-section	mm^2	0.2 … 6	0.2 … 6	0.2 … 6	0.2 … 16	0.2 … 16
Ingress protection rating	-	IP20 (EN60529)				
Form of assembly	-	vertical				
Ambient conditions						
Coolant temperature	°C	0 … 40 (3K3 DIN IEC 721-3-3)				
Storage temperature	°C	-25 … 55				
Transport temperature	°C	-25 … 70				
Rel. humidity	%	15...85, not condensing				
DC-link						
DC nominal current	A	17	19	27	31	39
Max. DC input voltage	VDC	Overvoltage shutdown at >800 VDC				

Output current				
Output power	**Switching frequency**			
	4 kHz	**8 kHz**	**12 kHz**	**16 kHz**
9.7 kVA	14.0 A	14.0 A	11.8 A	9.5 A
12.5 kVA	18.0 A	18.0 A	15.1 A	12.2 A
15.2 kVA	22.0 A	22.0 A	18.5 A	15.0 A
17.3 kVA	25.0 A	25.0 A	21.0 A	17.0 A
22.2 kVA	32.0 A	32.0 A	26.9 A	21.8 A

6.4.2 Size 5

Type						
AEC 401		**-27**	**-29**	**-31**	**-**	**-**
Size		5	5	5	-	-
Output, mains side, at 400 V mains voltage						
Output power	kVA	27.7	31.2	41.6	-	-
Nominal output current	A	40	45	60	-	-
Voltage	V	320 … 460				
Frequency	Hz	45 … 66				
Protection		Short circuit / earth fault proof				
Switching frequency	kHz	4, 8				
Line fuses	-	external				
Mechanical						
Dimensions HxWxD	mm	250x200x260			-	-
Weight approx.	Kg	8	8	8	-	-
Conductor cross-section	mm^2	up to 25	up to 25	up to 25	-	-
Ingress protection rating	-	IP20 (EN60529)				
Form of assembly	-	vertical				
Ambient conditions						
Coolant temperature	°C	0 … 40 (3K3 DIN IEC 721-3-3)				
Storage temperature	°C	-25 … 55				
Transport temperature	°C	-25 … 70				
Rel. humidity	%	15...85, not condensing				
DC-link						
DC nominal current	A	47	53	71	-	-
Max. DC input voltage	VDC	Overvoltage shutdown at >800 VDC				

Output current				
Output power	**Switching frequency**			
	4 kHz	**8 kHz**	**12 kHz**	**16 kHz**
27.7 kVA	40.0 A	40.0 A	-	-
31.2 kVA	45.0 A	45.0 A	-	-
41.6 kVA	60.0 A	60.0 A	-	-

6.4.3 Size 6

Type						
AEC 401		-33	-35	-37	-39	-
Size		6	6	6	6	-
Output, mains side, at 400 V mains voltage						
Output power	kVA	52.0	62.3	76.2	86.6	-
Nominal output current	A	75	90	110	125	-
Voltage	V	320 … 460				
Frequency	Hz	45 … 66				
Protection		Short circuit / earth fault proof				
Switching frequency	kHz	4, 8				
Line fuses	-	external				
Mechanical						
Dimensions HxWxD	mm	400x275x260				-
Weight approx.	kg	20	20	20	20	-
Conductor cross-section	mm^2	up to 70	up to 70	up to 70	up to 70	-
Ingress protection rating	-	IP20 (EN60529)				
Form of assembly	-	vertical				
Ambient conditions						
Coolant temperature	°C	0 … 40 (3K3 DIN IEC 721-3-3)				
Storage temperature	°C	-25 … 55				
Transport temperature	°C	-25 … 70				
Rel. humidity	%	15...85, not condensing				
DC-link						
DC nominal current	A	90	109	132	152	-
Max. DC input voltage	VDC	Overvoltage shutdown at >800 VDC				

Output current				
Output power	**Switching frequency**			
	4 kHz	**8 kHz**	**12 kHz**	**16 kHz**
52.0 kVA	75.0 A	75.0 A	-	-
62.3 kVA	90.0 A	90.0 A	-	-
76.2 kVA	110.0 A	110.0 A	-	-
86.6 kVA	125.0 A	125.0 A	-	-

6.4.4 Size 7

Type						
AEC 401		-43	-45	-47	-49	-
Size		7	7	7	7	-
Output, mains side, at 400 V mains voltage						
Output power	kVA	103.9	124.7	145.5	173.2	-
Nominal output current	A	150	180	210	250	-
Voltage	V	320 … 460				
Frequency	Hz	45 … 66				
Protection		Short circuit / earth fault proof				
Switching frequency	kHz	4, 8				
Line fuses	-	external				
Mechanical						
Dimensions HxWxD	mm	510x412x351				-
Weight approx.	kg	48	48	48	48	-
Conductor cross-section	mm^2	up to 2 x 95				
Ingress protection rating	-	IP20 (EN60529)				
Form of assembly	-	vertical				
Ambient conditions						
Coolant temperature	°C	0 … 40 (3K3 DIN IEC 721-3-3)				
Storage temperature	°C	-25 … 55				
Transport temperature	°C	-25 … 70				
Rel. humidity	%	15...85, not condensing				
DC-link						
DC nominal current	A	181	217	253	301	-
Max. DC input voltage	VDC	Overvoltage shutdown at >800 VDC				

Output current				
Output power	**Switching frequency**			
	4 kHz	**8 kHz**	**12 kHz**	**16 kHz**
103.9 kVA	150.0 A	150.0 A	-	-
124.7 kVA	180.0 A	180.0 A	-	-
145.5 kVA	210.0 A	210.0 A	-	-
173.2 kVA	250.0 A	250.0 A	-	-

6.4.5 Size 8

Type							
AEC 401 (400 V)		-51	-53	-55	-57	-59	-61
Size		8	8	8	8	8	8
Output, mains side, at 400 V mains voltage							
Output power	kVA	211.4	263.3	329.1	412.3	447.0	509.4
Nominal output current	A	305	380	475	595	645	735
Voltage	V	320 … 528					
Frequency	Hz	45 … 66					
Protection		Short circuit / earth fault proof					
Switching frequency	kHz	4, 8					
Line fuses	-	external					
Mechanical							
Dimensions HxWxD	mm	1067 x 439 x 375					
Weight approx.	kg	120	120	140	140	140	140
Conductor cross-section	mm^2	up to 2 x 240					
Ingress protection rating	-	IP20 (EN60529)					
Form of assembly	-	vertical					
Ambient conditions							
Coolant temperature	°C	0 … 40 (3K3 DIN IEC 721-3-3)					
Storage temperature	°C	-25 … 55					
Transport temperature	°C	-25 … 70					
Rel. humidity	%	15...85, not condensing					
DC-link							
DC nominal current	A	366	456	570	714	774	882
Max. DC input voltage	VDC	Overvoltage shutdown at >800 VDC					

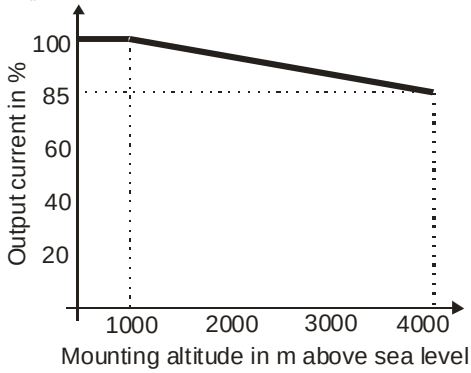
Output current				
Output power	**Switching frequency**			
	4 kHz	**8 kHz**	**12 kHz**	**16 kHz**
211.4 kVA	305.0 A	305.0 A	-	-
263.3 kVA	380.0 A	380.0 A	-	-
329.2 kVA	475.0 A	475.0 A	-	-
412.3 kVA	595.0 A	595.0 A	-	-
446.9 kVA	645.0 A	645.0 A	-	-
509.4 kVA	735.0 A	735.0 A	-	-

6.5 Operation diagrams

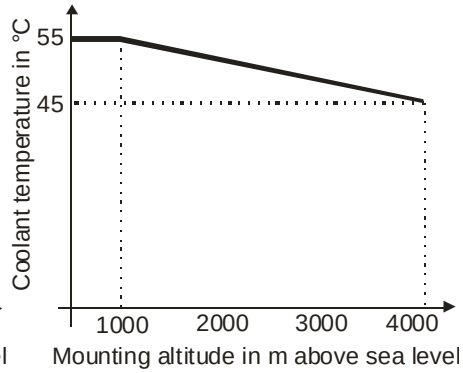
The technical data of the mains unit refer to the nominal point which was selected to enable a wide range of applications. A functionally and efficient dimensioning (derating) of the mains unit is possible based on the following diagrams.

Installation altitude

Power reduction (Derating),
5%/1000 m above sea level,
h_{max} = 4000 m

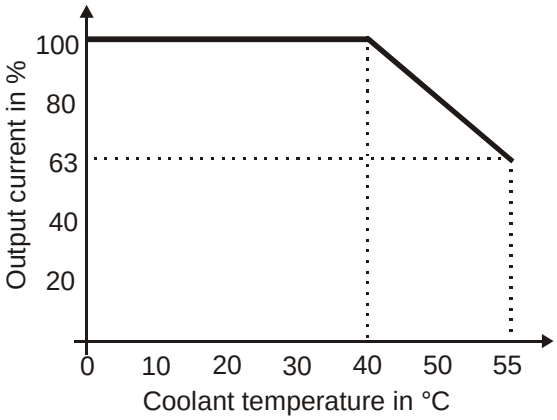


max. coolant temperature,
3.3 °C/1000 m above sea level,



Coolant temperature

Power reduction (Derating)
2.5%/K upper 40 °C, T_{max}= 55 °C



6.6 Extension modules

Thanks to the modular hardware components, the AEC can be integrated in the automation concept easily. The standard and optional modules are recognized during the initialization, and the controller functionality is adjusted automatically. For the information required for installation and handling of the optional modules, refer to the corresponding documentation.

WARNING

Dangerous voltage!

When the device is disconnected from power supply, the mains, DC-link voltage and motor terminals may still be live for some time. Work on the device may only be started once the DC link capacitors have discharged. The time to wait is at least 3 minutes in the case of sizes 1 through 7 and at least 8 minutes in the case of size 8.

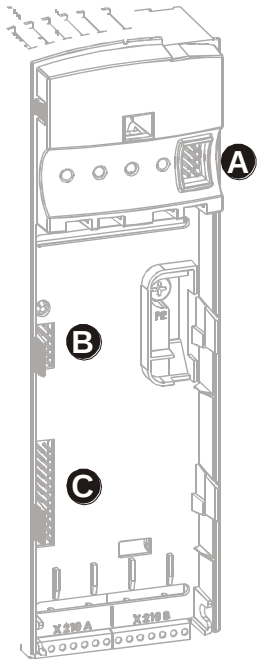
- The electrical installation must be carried out by qualified electricians according to the general and regional safety and installation directives.
- The documentation and device specification must be complied with during installation.
- Before any assembly or connection work, disconnect the device from power supply.
- Check for absence of voltage.
- Do not connect inappropriate voltage sources. The nominal voltage of the device must correspond to the supply voltage.
- The device must be connected to ground potential.
- Do not remove any covers of the device while power supply is on.

CAUTION

Disconnection!

If two optional components with CAN-Protocol controller are installed, the system bus interface in the EM extension module is deactivated!

- Only one optional component with CAN Protocol controller may be installed.



Ⓐ Control unit KP500

Connection of the optional control unit KP500 or an interface adapter KP232.

Ⓑ Communication module CM

Slot for connection to various communication protocols:

- CM-232: RS232 interface
- CM-485: RS485 interface
- CM-PDP: Profibus-DP interface
- CM-CAN: CANopen interface

Ⓒ Extension module EM

Slot for customer-specific adaptation of the control inputs and outputs to various applications:

- EM-IO, analog and digital inputs and outputs
- EM-SYS: System Bus

(system bus in combination with CM-CAN communication module upon request)

6.7 Application components required

NOTE

Sine filter must be used

For the "sinusoidal feedback" function, a sine filter must be used in any case.

- Use a sine filter as per the following table.

Bonfiglioli Vectron recommends using the following accessories in combination with AEC mains units. These accessories are available at Bonfiglioli Vectron MDS GmbH

6.7.1 Fuses

The fuses to be used with AEC mains units must be selected considering the type and power requirements. See the following table.

- The plant components and cables installed must be protected by means of appropriate fuses. The fuses to be used are to be selected depending on the specific application.
- The mains power circuit (mains fuses, contactor K2) must be designed for the power of the mains unit.
- Select line fuses per DIN IEC 60364-4-43
- Install fuses, e.g. NH fuses[1], of operating class gL[2] as per VDE 636 Part 1 – low-voltage fuses (IEC 60269-1).
- Fuses UL-type 600 VAC RKS.

[1] Low-voltage, high-performance fuses
[2] Full-range cable and line protection

In mains unit mode, a central DC-link can be powered via the AEC mains unit. The cables in the DC-link of the connected frequency inverters are to be fused properly. When dimensioning the DC-fuses, the derating factors specified by the fuse manufacturer must be considered in addition to the specified DC-link voltage setpoint.

Mains unit		
Type	**AC mains nominal current [A]**	**DC nominal current[A]**
AEC 401-19	14	17
AEC 401-21	18	19
AEC 401-22	22	27
AEC 401-23	25	31
AEC 401-25	32	39
AEC 401-27	40	47
AEC 401-29	45	53
AEC 401-31	60	71
AEC 401-33	75	90
AEC 401-35	90	109
AEC 401-37	110	132
AEC 401-39	125	152
AEC 401-43	150	181
AEC 401-45	180	217
AEC 401-47	210	253
AEC 401-49	250	301
AEC 401-51	305	366
AEC 401-53	380	456
AEC 401-55	475	570
AEC 401-57	595	714
AEC 401-59	645	774
AEC 401-61	735	882

6.7.2 Line choke

Line chokes reduce mains harmonics and reactive power. In addition, a longer service life of the device is possible. When using a line choke, note that line chokes may reduce the maximum output voltage of the device.

- The line choke must be installed between the mains connection and the input filter.

Mains unit/feed-back unit		Line choke	
Type	**AC mains current [A]**	**Part number**	**Inductance [mH]**
AEC 401-19	14	184 420 015	1.95
AEC 401-21	18	184 420 018	1.63
AEC 401-22	22	184 420 025	1.17
AEC 401-23	25		
AEC 401-25	32	184 420 034	0.86
AEC 401-27	40	184 420 050	0.59
AEC 401-29	45		
AEC 401-31	60	184 420 060	0.49
AEC 401-33	75	184 420 075	0.37
AEC 401-35	90	184 420 090	0.33
AEC 401-37	110	184 420 115	0.25
AEC 401-39	125	184 420 135	0.22
AEC 401-43	150	184 420 160	0.18
AEC 401-45	180	184 420 180	0.16
AEC 401-47	210	184 420 210	0.14
AEC 401-49	250	184 420 250	0.12
AEC 401-51	305	184 525 280	0.105

Mains unit/feed-back unit		Line choke	
Type	**AC mains current [A]**	**Part number**	**Inductance [mH]**
AEC 401-53	380	184 525 350	0.084
AEC 401-55	475	184 525 440	0.068
AEC 401-57	595	184 525 550	0.052
AEC 401-59	645	184 400 690	0.046
AEC 401-61	735	184 400 690	0.046

6.7.3 Sine filter

NOTE

Sine filter must be used

For the "sinusoidal feedback" function, a sine filter must be used in any case.

- Use a sine filter as per the following table.

Mains unit		Sine filter	
Type	**AC mains current [A]**	**Part number**	**Switching frequency**
AEC 401-19	14	181 421 014	4 kHz / 8 kHz
AEC 401-21	18	181 421 018	4 kHz / 8 kHz
AEC 401-22	22	181 421 025	4 kHz / 8 kHz
AEC 401-23	25		4 kHz / 8 kHz
AEC 401-25	32	181 421 034	4 kHz / 8 kHz
AEC 401-27	40	181 421 045	4 kHz / 8 kHz
AEC 401-29	45		4 kHz / 8 kHz
AEC 401-31	60	181 421 060	4 kHz / 8 kHz
AEC 401-33	75	181 421 075	4 kHz / 8 kHz
AEC 401-35	90	181 421 090	4 kHz / 8 kHz
AEC 401-37	110	181 421 115	4 kHz / 8 kHz
AEC 401-39	125	181 421 150	4 kHz / 8 kHz
AEC 401-43	150		4 kHz / 8 kHz
AEC 401-45	180	181 421 180	4 kHz / 8 kHz
AEC 401-47	210	181 421 210	4 kHz / 8 kHz
AEC 401-49	250	181 421 250	4 kHz / 8 kHz
AEC 401-51	305	181 421 380	4 kHz / 8 kHz
AEC 401-53	380		4 kHz / 8 kHz
AEC 401-55	475	181 421 595	4 kHz / 8 kHz
AEC 401-57	595		4 kHz / 8 kHz
AEC 401-59	645	181 421 735	4 kHz / 8 kHz
AEC 401-61	735		4 kHz / 8 kHz

6.7.4 Radio interference filter

Radios interference filters reduce grid-bound, high-frequency radio interference voltage. Input filters should be installed on the mains side upstream of the device.

Mains unit/feed-back unit		EMC mains filter
Type	**AC mains nominal current [A]**	**Part number**
AEC 401-19	14	189 430 035
AEC 401-21	18	
AEC 401-22	22	
AEC 401-23	25	
AEC 401-25	32	
AEC 401-27	40	189 430 080
AEC 401-29	45	
AEC 401-31	60	

Mains unit/feed-back unit		EMC mains filter
Type	**AC mains nominal current [A]**	**Part number**
AEC 401-33	75	
AEC 401-35	90	189 430 150
AEC 401-37	110	
AEC 401-39	125	
AEC 401-43	150	
AEC 401-45	180	189 430 300
AEC 401-47	210	
AEC 401-49	250	
AEC 401-51	305	185 400 401
AEC 401-53	380	
AEC 401-55	475	
AEC 401-57	595	185 400 630
AEC 401-59	645	
AEC 401-61	735	

7 Mechanical installation

The AEC of degree of protection IP20 are designed, as a standard, for stationary installation in electrical cabinets.
Other installation variants are available apart from the air-cooled standard installation variant described in these Operating Instructions:

- Feedthrough assembly for sizes 1 through 8, see "Installation Instructions – Feedthrough Assembly"
- ColdPlate for sizes 1 through 5, see "Installation Instructions – ColdPlate"
- Liquid cooling for sizes 6 through 8, see "Amendment to operating instructions - Liquid cooling"

During installation, both the installation and the safety instructions as well as the device specifications must be complied with.

WARNING

Improper handling

Improper handling of the device can result in serious injuries and serious material damage.

- To avoid serious physical injuries or major material damage, only qualified persons are allowed to work on the device.

WARNING

Short-circuit and fire hazard

The device complies with IP20 ingress protection rating only if the covers, components and terminals are mounted properly.

- During assembly, make sure that no foreign particles (e.g. chips, dust, wires, screws, tools) can get inside the device. Otherwise there is the risk of short circuits and fire.
- Overhead installation or installation in horizontal position is not permissible.

CAUTION

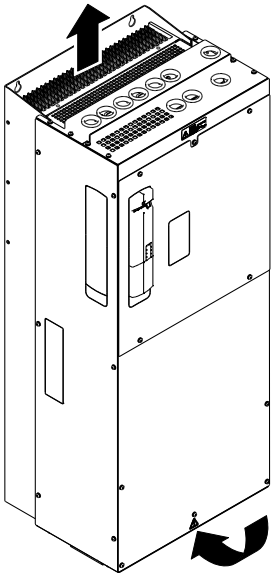
Short-circuit and fire hazard

Insufficient cooling air circulation can result in significant material damage and, indirectly, in physical injury.

- Mount the devices with sufficient clearance to other components so that the cooling air can circulate freely.
- Avoid soiling by grease and air pollution by dust, aggressive gases, etc.
- Keep inlet and outlet openings of the fans clear.

In the case of liquid-cooled devices, the coolant lines must be connected after mechanical installation. Refer to "Amendment to operating instructions - liquid cooling".

7.1 Air circulation

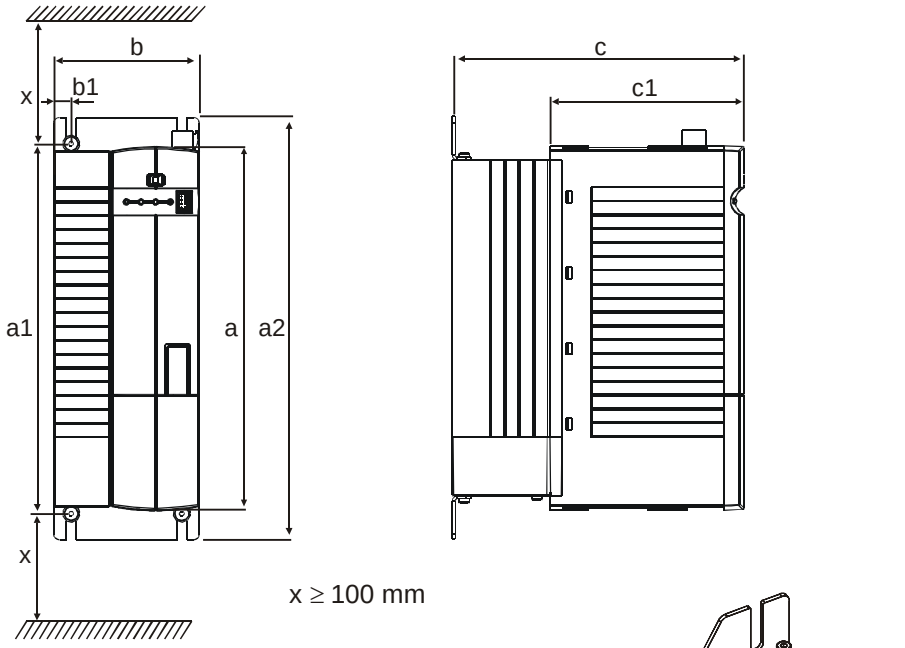


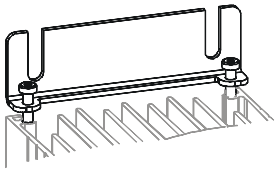
For cooling air-cooled mains units, air is taken in through openings in the bottom plate. The air coming from below heats up and escapes through openings in the top of the case. The illustration shows the air flow from below in the case of a device of size 8.

7.2 Size 3 and Size 4

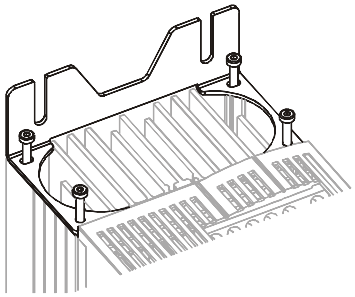
The frequency inverter is mounted in a vertical position on the assembly panel by means of the standard fittings. The following illustration shows the standard fitting.

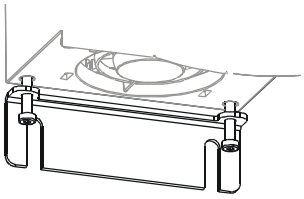
Standard installation



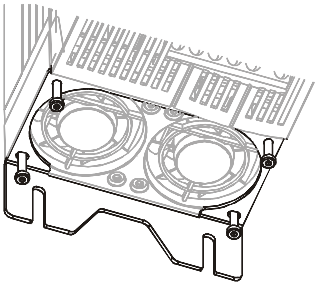


fixing bracket top
(fixing with screws **M4x20**)





fixing bracket bottom
(fixing with screws **M4x60**)



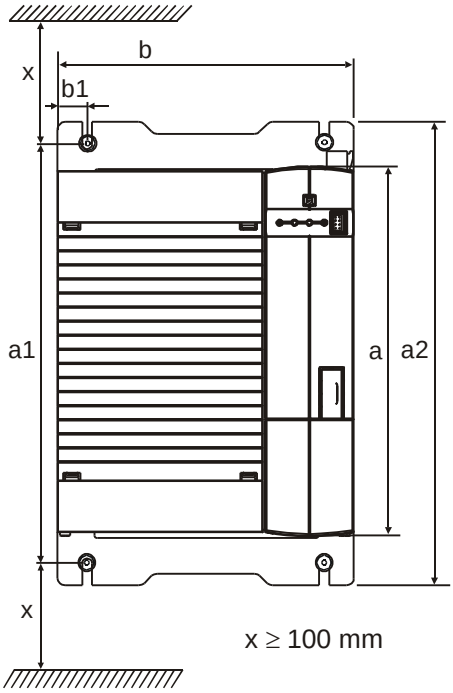
Assembly is done by screwing the two fixing brackets to the heat sink of the device and the assembly panel. The devices are provided with fixing brackets, which are fitted using four thread-cutting screws. The dimensions of the device and the installation dimensions are those of the standard device without optional components and are given in millimeters.

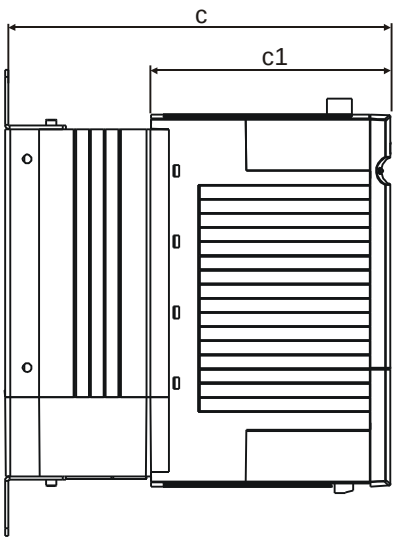
Dimensions [mm]				Assembly dimensions [mm]			
AEC 401	**a**	**b**	**c**	**a1**	**a1**	**b1**	**c1**
-19/-21/-22	250	100	200	270 … 290	315	12	133
-23/-25	250	125	200	270 … 290	315	17.5	133

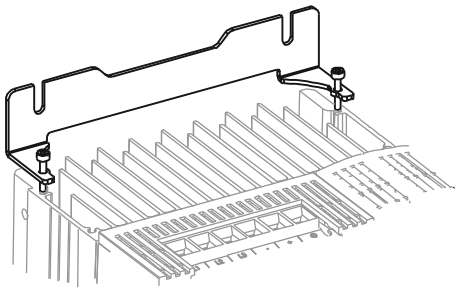
7.3 Size 5

The following illustration shows the standard fitting.

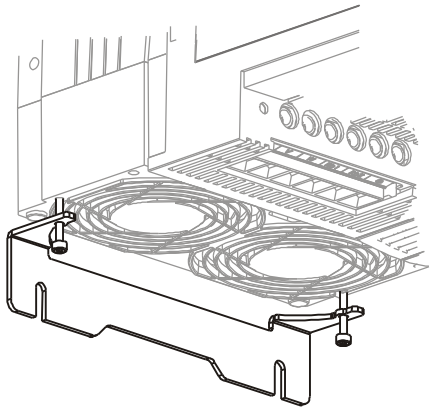
Standard installation







fixing bracket top
(fixing with screws **M4x20**)



fixing bracket bottom
(fixing with screws **M4x70**)

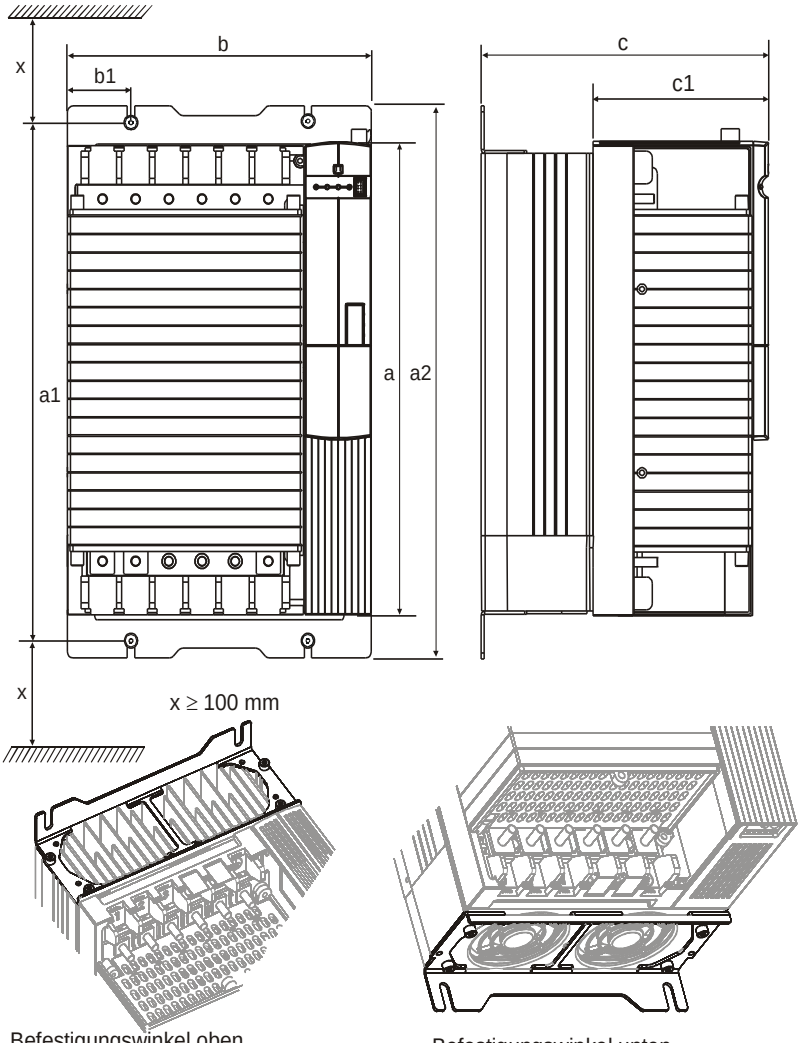
Assembly is done by screwing the two fixing brackets to the heat sink of the device and the assembly panel. The devices are provided with fixing brackets, which are fitted using four thread-cutting screws. The dimensions of the device and the installation dimensions are those of the standard device without optional components and are given in millimeters.

Dimensions [mm]				Assembly dimensions [mm]			
AEC 401	**a**	**b**	**c**	**a1**	**a1**	**b1**	**c1**
-27/-29/-31	250	200	260	270 … 290	315	20	160

7.4 Size 6

The frequency inverter is mounted in a vertical position on the assembly panel by means of the standard fittings. The following illustration shows the standard fitting.

Standard installation



Befestigungswinkel oben
(Befestigung mit Schrauben **M5x20**)

Befestigungswinkel unten
(Befestigung mit Schrauben **M5x20**)

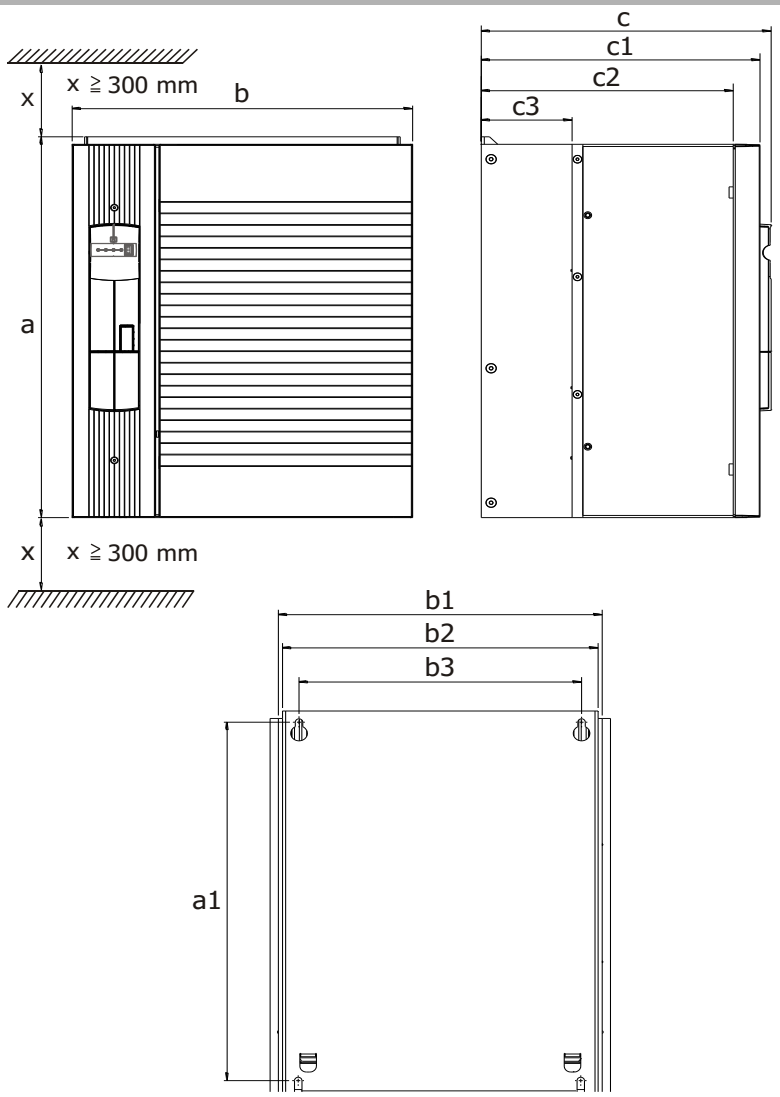
Assembly is done by screwing the two fixing brackets to the heat sink of the device and the assembly panel. The devices are provided with fixing brackets, which are fitted using four thread-cutting screws. The dimensions of the device and the installation dimensions are those of the standard device without optional components and are given in millimeters.

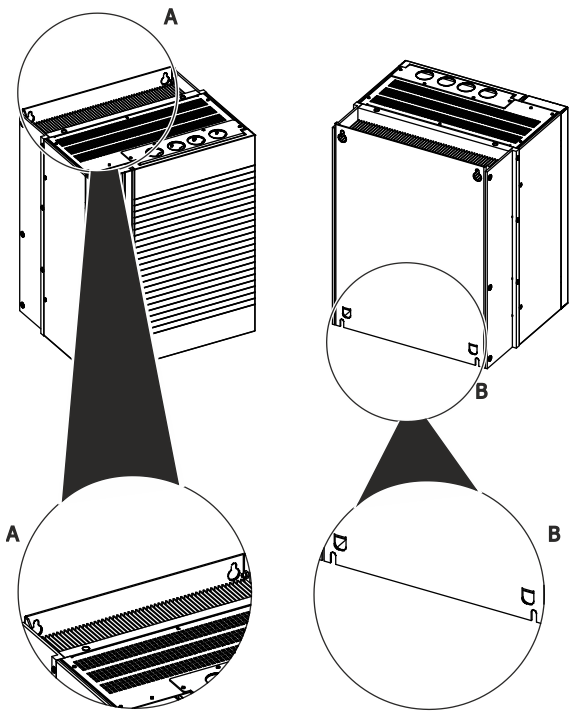
Dimensions [mm]				Assembly dimensions [mm]			
AEC 401	**a**	**b**	**c**	**a1**	**a1**	**b1**	**c1**
-33/-35/-37/-39	400	275	260	425 … 445	470	20	160

7.5 Size 7

The frequency inverter is mounted in a vertical position on the assembly panel. The following illustration shows the standard fitting.

Standard installation





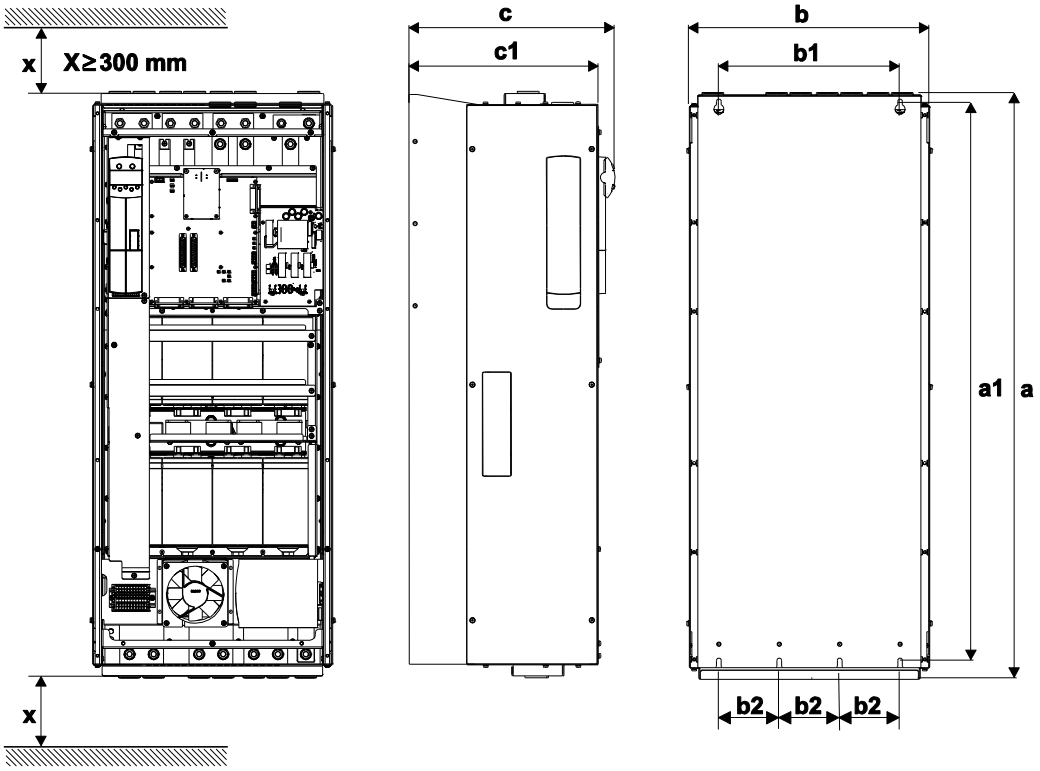
Assembly is done by screwing the back wall of the device to the assembly panel. The dimensions of the device and the installation dimensions are those of the standard device without optional components and are given in millimeters.
The diameter of the fixing holes is 9 mm.

Dimensions [mm]				Assembly dimensions [mm]						
AEC 401	**a**	**b**	**c**	**a1**	**b1**	**b2**	**b3**	**c1**	**c2**	**c3**
-43/-45/-47/-49	510	412	351	480	392	382	342	338	305	110

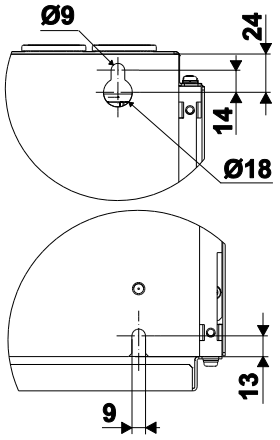
7.6 Size 8

The frequency inverter is mounted in a vertical position on the assembly panel. The following illustration shows the standard fitting.

Standard installation



The diameter of the fixing holes is 9 mm.
Screw the rear wall of the device heat sink to the mounting plate.



Dimensions in mm				Assembly dimensions in mm			
AEC 401/601	**a**	**b**	**c**	**a1**	**b1**	**b2**	**c1**
-51/-53/-55/-57/-59/-61	1063	439	376	1017	330	110	345

8 Electrical installation

WARNING

Dangerous voltage!

When the device is disconnected from power supply, the mains, DC-link voltage and motor terminals may still be live for some time. Work on the device may only be started once the DC link capacitors have discharged. The time to wait is at least 3 minutes in the case of sizes 1 through 7 and at least 8 minutes in the case of size 8.

- The electrical installation must be carried out by qualified electricians according to the general and regional safety and installation directives.
- The documentation and device specification must be complied with during installation.
- Before any assembly or connection work, disconnect the device from power supply.
- Check for absence of voltage.
- Do not connect inappropriate voltage sources. The nominal voltage of the device must correspond to the supply voltage.
- The device must be connected to ground potential.
- Do not remove any covers of the device while power supply is on.

For a safe operation of the device, it is necessary that the documentation and the device specifications be complied with during installation and commissioning. In the case of special applications, you may also have to comply with further guidelines and instructions.
The connecting cables must be protected outside of the device, considering the maximum voltage and current values of the fuses.

- The mains fuses and cable cross-sections are to be selected according to EN 602041 and DIN VDE 0298 Part 4 for the nominal operating point of the mains unit. According to UL/CSA, the mains unit is suitable for operation with a supply mains of a maximum of 480 VAC which delivers a maximum symmetrical current of 5000 A (effective value) if protected by suitable fuses. Only use copper cables with a temperature range of 60/75 °C.
- The protective conductor cross-section required for grounding the fixing plate must be selected according to the size of the unit. In these applications, the cross-section must correspond to the recommended cross-section of the wire.

IP20 ingress protection rating is only achieved with terminals plugged and properly mounted covers.

In order to meet the specific functional requirements, a distinction is made in the following between "precharging circuit" for the "sinusoidal feedback" function and "network access" for the "block-shaped feedback" function.

8.1 EMC-compliant installation

The AEC is designed according to the requirements and limit values of product norm EN 61800-3 with an interference immunity factor (EMI) for operation in industrial applications. Electromagnetic interference is to be avoided by expert installation and observation of the specific product information.

EMC measures

- Install the AEC and other components (radio interference filter, line choke, sine filter) on a metal mounting plate, ensuring full-surface contact with the plate. Ideally, the mounting plate should be galvanized, not painted.

- Provide proper equipotential bonding within the system or plant. Plant components such as electrical cabinets, control panels, machine frames must be connected by means of PE cables, i.e. sufficient area and with good conductivity.
- The shield of the control cables is to be connected to ground potential properly, i.e. with good conductivity, on both sides (shield clamp). Mount shield clamps for cable shields close to the unit.
- Connect the AEC and its components to an earthing point via short cables.
- Excessive cable length and loosely suspended cabling must be avoided.
- Contactors, relays and solenoids in the electrical cabinet are to be provided with suitable interference suppression components.
- Separate installation of power cables (AC and DC) and control cables is required.
- Cables with a length >300 mm must be shielded, the cable shield must be connected to the mounting plate on both sides. Use twisted cables where possible.

8.2 Conductor cross-section

- The cable dimensions must be selected according to the current load and voltage drop to be expected.
- Select the cable cross-section of the cables such that the voltage drop is as small as possible.
- Comply with any additional national and application-specific regulations and the separate UL instructions.
- The mains fuses and cable cross-sections are to be selected according to DIN VDE 0100 Part 430 and DIN VDE 0298 Part 4 for the nominal operating point of the mains unit.
- According to UL/CSA, approved Class 1 copper lines with a temperature range of 60/75 °C and matching mains fuses are to be used for the power cables.
- Protective earth (PE) conductor cross-section is to be dimensioned as per (PE) EN61800-5-1.
- For typical mains cable fuses, refer to chapter "Fuses".

PE-conductor

According to EN61800-5-1, the cross-sections of the PE conductor shall be dimensioned as follows:

Mains cable	Protective conductor
Mains cable up to 10 mm²	Install two protective conductors of the same size as the mains cable, or one protective conductor of a size of 10 mm².
Mains cable 10…16 mm²	Install one protective conductor of the same size as the mains cable.
Mains cable 16…35 mm²	Install one protective conductor of a size of 16 mm².
Mains cable > 35 mm²	Install one protective conductor of half the size of the mains cable.

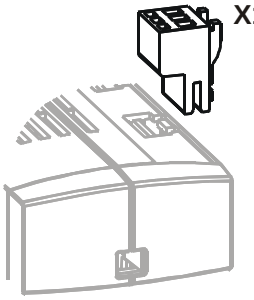
The following table provides an overview of typical conductor cross-sections (copper cable with PVC insulation, 30 °C ambient temperature, continuous mains current max. 100% nominal input current). Actual mains cable cross-section requirements may deviate from these values depending on actual operating conditions.

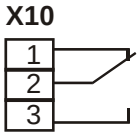
Mains connection

AEC 401		Mains cable	PE-conductor
-19	9.7 kVA	2.5 mm²	2x2.5 mm² or 1x10 mm²
-21	12.5 kVA	2.5 mm²	2x2.5 mm² or 1x10 mm²
-22	15.2 kVA	4 mm²	2x4 mm² or 1x10 mm²
-23	17.3 kVA	4 mm²	2x4 mm² or 1x10 mm²
-25	22.2 kVA	6 mm²	2x6 mm² or 1x10 mm²
-27	27.7 kVA	10 mm²	1x10 mm²
-29	31.2 kVA	10 mm²	1x10 mm²
-31	41.6 kVA	16 mm²	1x16 mm²
-33	52.0 kVA	25 mm²	1x16 mm²
-35	62.3 kVA	35 mm²	1x16 mm²
-37	76.2 kVA	35 mm²	1x16 mm²
-39	86.6 kVA	50 mm²	1x25 mm²

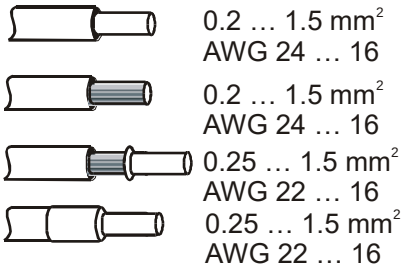
AEC 401		Mains cable	PE-conductor
-43	103.9 kVA	70 mm²	1x35 mm²
-45	124.7 kVA	95 mm²	1x50 mm²
-47	145.5 kVA	2x70 mm²	1x70 mm²
-49	173.2 kVA	2x95 mm²	1x95 mm²
-51	160 kVA	150 mm²	95 mm²
-53	200 kVA	240 mm²	120 mm²
-55	250 kVA	2x120 mm²	120 mm²
-57	315 kVA	2x150 mm²	150 mm²
-59	355 kVA	2x185 mm²	185 mm²
-61	400 kVA	2x240 mm²	240 mm²

Relay output

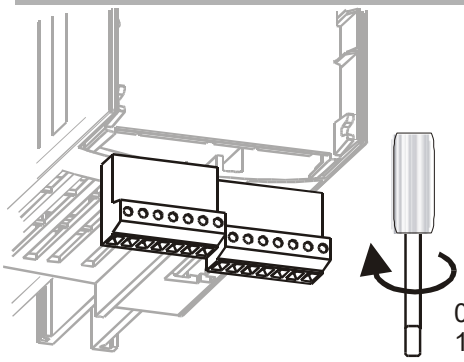




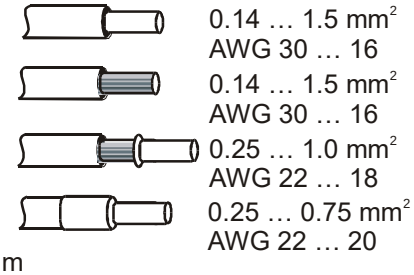
Phoenix ZEC 1,5/3ST5,0



Control terminals



Wieland DST85 / RM3,5



0.2 … 0.3 Nm
1.8 … 2.7 lb-in

8.3 Connection of device

WARNING

Dangerous voltage!

When the device is disconnected from power supply, the mains, DC-link voltage and motor terminals may still be live for some time. Work on the device may only be started once the DC link capacitors have discharged. The time to wait is at least 3 minutes in the case of sizes 1 through 7 and at least 8 minutes in the case of size 8.

- The electrical installation must be carried out by qualified electricians according to the general and regional safety and installation directives.
- The documentation and device specification must be complied with during installation.
- Before any assembly or connection work, disconnect the device from power supply.
- Check for absence of voltage.
- Do not connect inappropriate voltage sources. The nominal voltage of the device must correspond to the supply voltage.
- The device must be connected to ground potential.
- Do not remove any covers of the device while power supply is on.

WARNING

Dangerous currents!

High currents can destroy the device!

- The AEC mains unit may only be connected to mains via a precharging circuit.

CAUTION

Incorrectly installed covers

IP20 ingress protection rating is only achieved with terminals plugged and properly mounted covers. Incorrectly installed or missing covers result in dirt and foreign objects entering the case and potentially in malfunction of the device or defects.

- Ensure that the covers are installed properly.
- For operation, always connect all terminals and install the covers.

The equipment required by the local electric utility for parallel operation with the low or medium voltage mains must the integrated in the application separately, i.e. independent of AEC mains unit.

- The unit may only be connected with the power supply switched off.

The connecting cables must be protected externally, considering the maximum voltage and current values of the fuses. The mains fuses and cable cross-sections are to be selected according to EN 602041 and DIN VDE 0298 Part 4 for the nominal operating point of the system. According to UL/CSA, the device is suitable for operation with a supply mains of a maximum of 480 VAC which delivers a maximum symmetrical current of 5000 A (effective value) if protected by suitable fuses.

- Only use copper cables with a temperature range of 60 / 75 °C.
- According to EN 61800-5-1 a permanent connection must be provided.
- The protective conductor cross-section required for grounding the fixing plate must be selected according to the size of the unit.
- In these applications, the cross-section must correspond to the recommended cross-section of the wire.

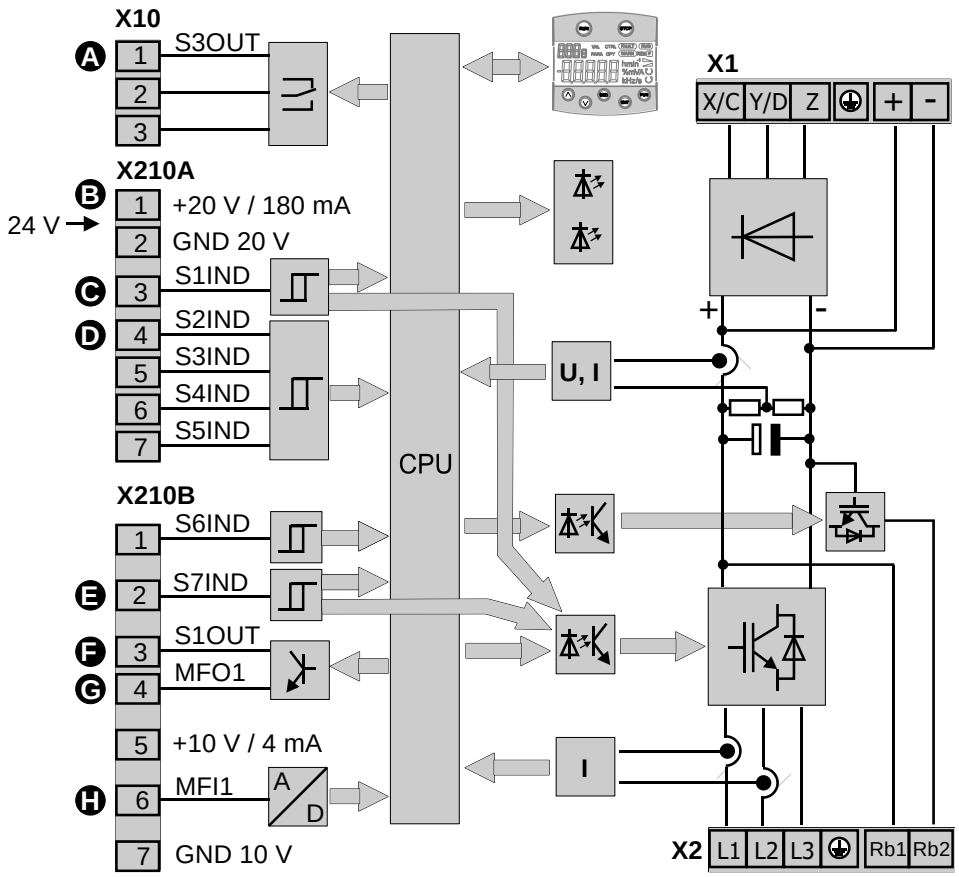
Special connection variants are possible apart from the standard connection variant described in these Operating Instructions:

- Parallel connection (see "Application Manual – Parallel Connection")

8.3.1 Control connections

Additional control connections are available by using appropriate components.
See Chapter 6.6 "Extension modules".

The control hardware and the software of the mains unit are freely configurable to a great extent. Certain functions can be assigned to the control terminals, and the internal logic of the software modules can be freely selected.



A	Relay connection S3OUT	E	Digital input S7IND/STOB
B	Voltage output/input	F	Digital output S1OUT
C	Digital input S1IND/STOA	G	Multifunction Output MFO1
D	Digital inputs S2IND … S6IND	H	Multifunction input MFI1

	Level:
Digital inputs (X210A.3 … X210B.2) **Digital output (X210B.3)**	Low: 0 V … 3 V, High: 12 V … 30 V

Control terminal X10	**make contact:**	AC 5 A / 240 V, DC 5 A (ohmic) / 24 V
	break contact:	AC 3 A / 240 V, DC 1 A (ohmic) / 24 V

Relay output

CAUTION

Device damage

When disconnected from mains supply, the mains unit may only be reconnected to mains supply after a defined waiting time. If the relay output is **not** connected to a coupler relay controlling the mains contactor, the device might be damaged.

- Connect the relay output to a coupling relay controlling the mains contactor.

For more information, refer to "Precharging circuit".

Control terminals

CAUTION

Device damage

Carrying out installation work with voltage applied can damage the device.

- The keyed control inputs and outputs must be disconnected from power supply before wiring. Otherwise, components may be damaged.
- Verify safe isolation from power supply.

External DC 24 V power supply

CAUTION

Device damage

The digital inputs and the DC 24 V terminal of the electronic control equipment can withstand external voltage up to DC 30 V. Higher voltage levels might destroy the device.

- Avoid higher voltage levels.
- Use suitable external power supply units with a maximum output current of DC 30 V or use appropriate fuses to protect the unit.

The bidirectional control terminals X210A.1/ X210A.2 can be used as a voltage output or voltage input. By connecting an external power supply of DC 24 V ±10% to terminals X210A.1/X210A.2, the function of inputs and outputs as well as the communication can be parameterized and maintained, even when mains voltage is off.

Requirements to be met by external power supply	
Input voltage range	DC 24 V ±10%
Nominal input current	Max. 1.0 A (typically 0.45 A)
Peak inrush current	Typically: < 20 A
External fuse	Via standard fuse elements for nominal current, characteristic: slow
Safety	Safe Extra Low Voltage circuit (SELV) per EN 61800-5-1

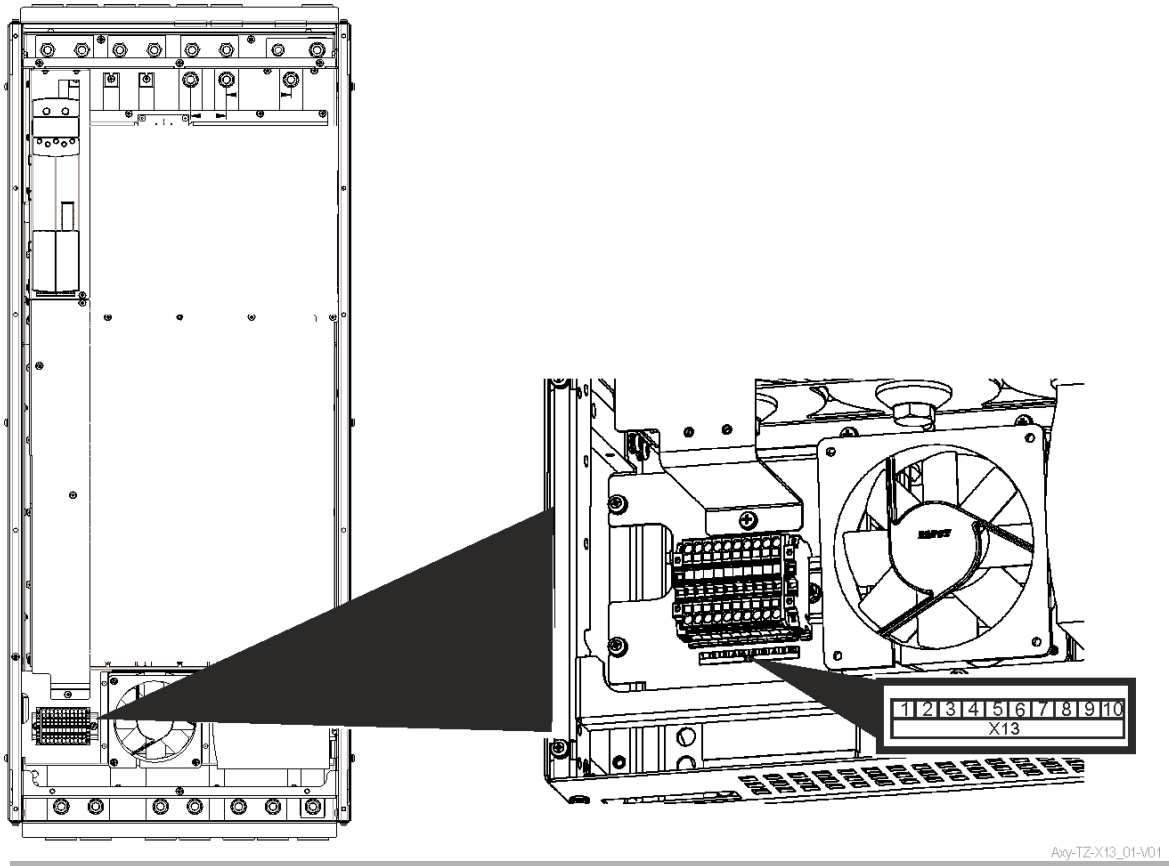
8.3.2 Connection of auxiliary voltage, size 8

For supply of the control circuits of AEC size 8, you will need a 400 V power supply unit or other 400 V auxiliary voltage supply.

NOTE

If no 400 V auxiliary voltage supply is available at the place of installation, a 400 V power supply unit must be installed for the control circuits of the ACU and AEC.

Connection of AC 3x400 V to terminal 13 is required. The illustration shows an example of terminal X13 with an air-cooled device.



Auxiliary voltage terminal X13	
1 … 6	Not used
7	⏚ PE
8	L1
9	L2
10	L3

Connection	
Connected load	≥ 1.2 kW
Supply voltage	400 V +- 10 %
Supply frequency	50 / 60 Hz

Figure 7-2: Connection of external 400 V auxiliary voltage

8.3.3 Mains unit power connection

WARNING

Dangerous currents!

High currents can destroy the device!

- The AEC mains unit may only be connected to mains via a precharging circuit.

The mains unit is integrated in a system typically comprising the following components:

- AEC main unit
- Sine filter
- Line choke
- Radio interference filter
- Frequency inverter
- Asynchronous motor or synchronous motor
- (shielded) mains cable
- Shielded control cables
- Metal mounting plate

- In addition to the components listed above, a precharging circuit must be provided

Sine filter

- Only use the AEC mains unit in combination with a sine filter.

  Sine filters with a relative short-circuit voltage of uk = 8% are available as an accessory.

- Connect the sine filter such that the inductances of the sine filter are on the terminal side (L1, L2, L3) of the mains unit and the capacitances of the sine filter are on the mains side.

Line choke

- Install the line choke between the radio interference filter and the sine filter.

Radio interference filter

- The Load terminal of the radio interference filter is to be wired to the AEC side, the Line terminal to the mains side.

Connection conditions

The system is to be installed, considering the applicable directives and regulations, in a way that guarantees that it is suitable for parallel operation with the local mains and that disturbance of the local mains or the systems of other customers is impossible.

- The AEC must be connected to the mains such that it can be disconnected from the mains by means of disconnecting elements (e.g. main switch, contactor, circuit breaker)
- While the system is operating, disconnection of the AEC connected to the DC-link terminals of the mains unit is only possible by means of appropriate DC switches.
- Use all-current sensitive circuit breakers or circuit breakers with adjustable tripping delay.

The conditions for connection of the AEC mains unit to the local mains depend on the safety equipment installed and/or the switch point implemented.

NOTE

Residual current circuit breakers (r.c.c.b.) can be used in combination with AECs to a limited extent only. An all-current sensitive residual current relay with leakage current separation must be used. There are two reasons for this:

1. All rectifier loads (i.e. not just AECs) can produce a direct current in the mains cables which can reduce sensitivity of the circuit breaker.
2. When radio interference filters are used, high leakage currents might trip the r.c. circuit breaker too soon which would result in unwanted failure of the AEC.

- Interference-free operation with residual current device is guaranteed at a tripping current ≥ 30 mA if the following points are observed:
  - All-current sensitive residual current devices (Type B to EN 61800-5-1)
  - Use EMC filters with reduced leakage current or, if possible, do not use EMC filters at all.
  - The length of the shielded motor cable is ≤ 10 m and there are no additional capacitive components between the mains or motor cables and PE.

NOTE

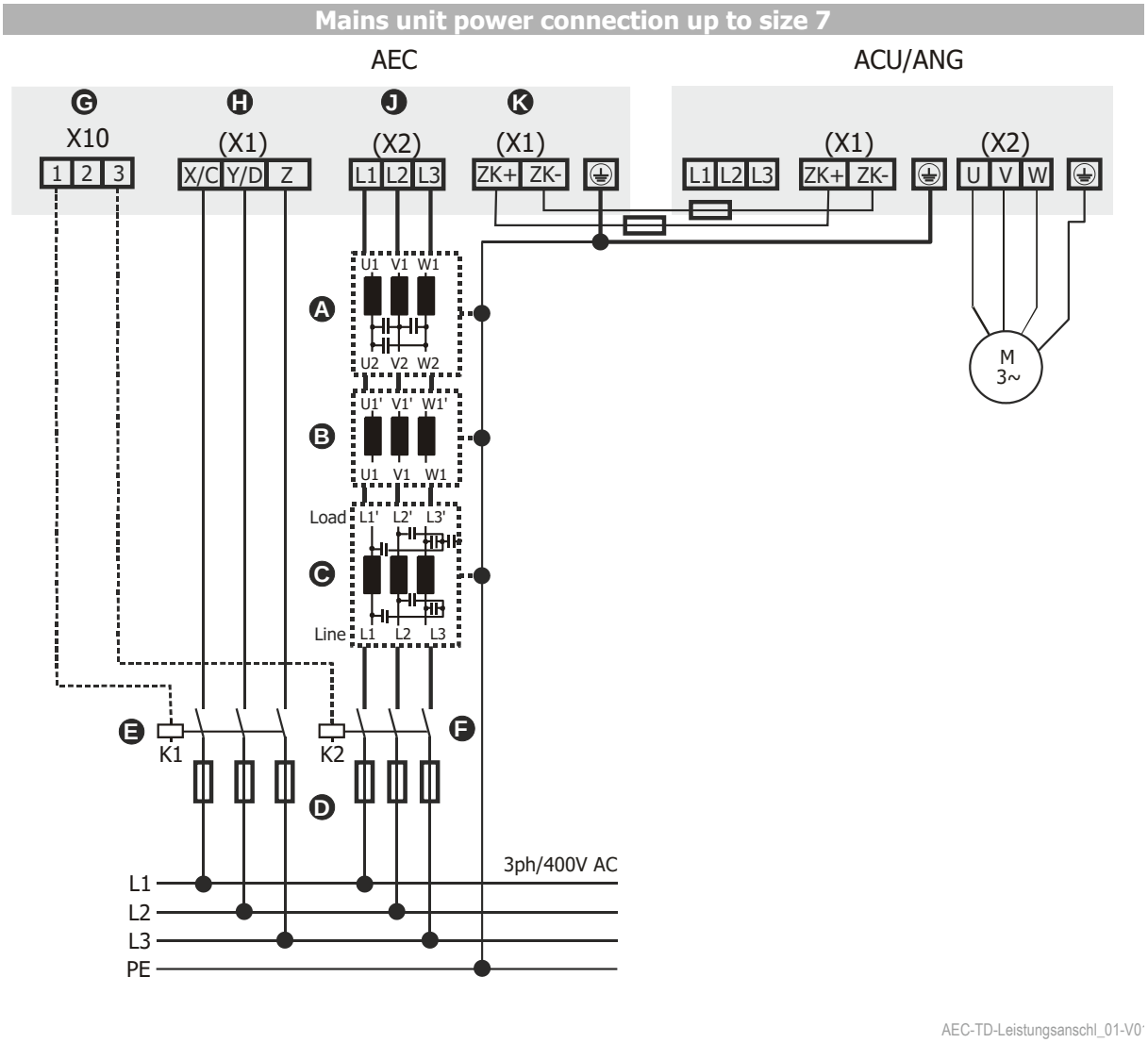
Unexpected currents

Please note (according to EN61800-5-1): This product, especially if used in combination with connected components, can cause a direct current in the protective earth conductor.

- Where residual current devices (RCD) or residual current monitors (RCM) are used as a protection against direct or indirect contact, only RCDs / RCMs of Type B are permissible on the power supply side of this product.

The terminal identifiers (X1) and (X2) shown in the following illustration apply to devices of sizes 3 through 6. Devices as from size 7 feature appropriate contact pins.

8.3.3.1 Power connection up to size 7



A	Sine filter			G	Control terminal X10
B	Line choke			H	Precharging circuit connection
C	Radio interference filter			J	Power circuit connection
D	Mains fuses			K	DC link connection
E	Precharge relay			K1	Precharging circuit contactor
F	Mains contactor			K2	Mains contactor
(X1)/(X2): Terminal identifiers in sizes 3 to 6					

Figure 8-1: Wiring of mains unit up to size 7

Connections, mains unit size 7

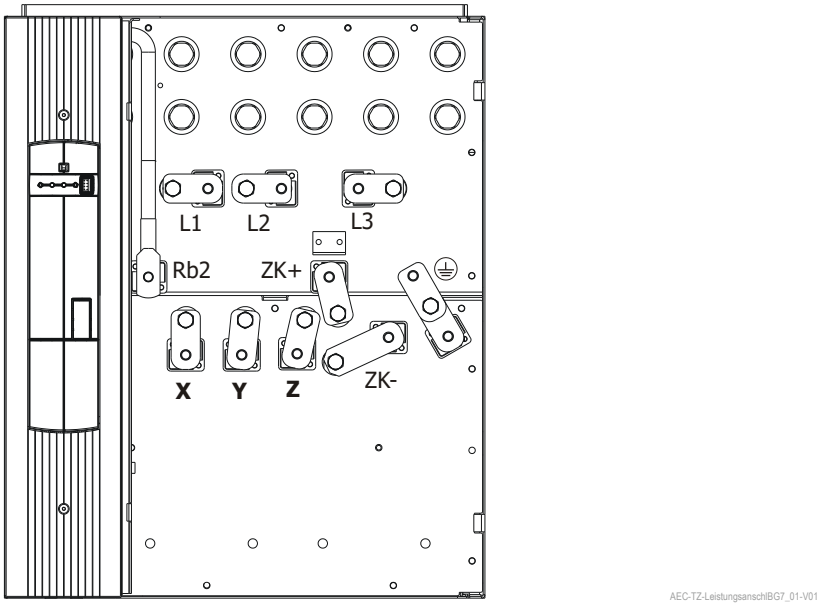
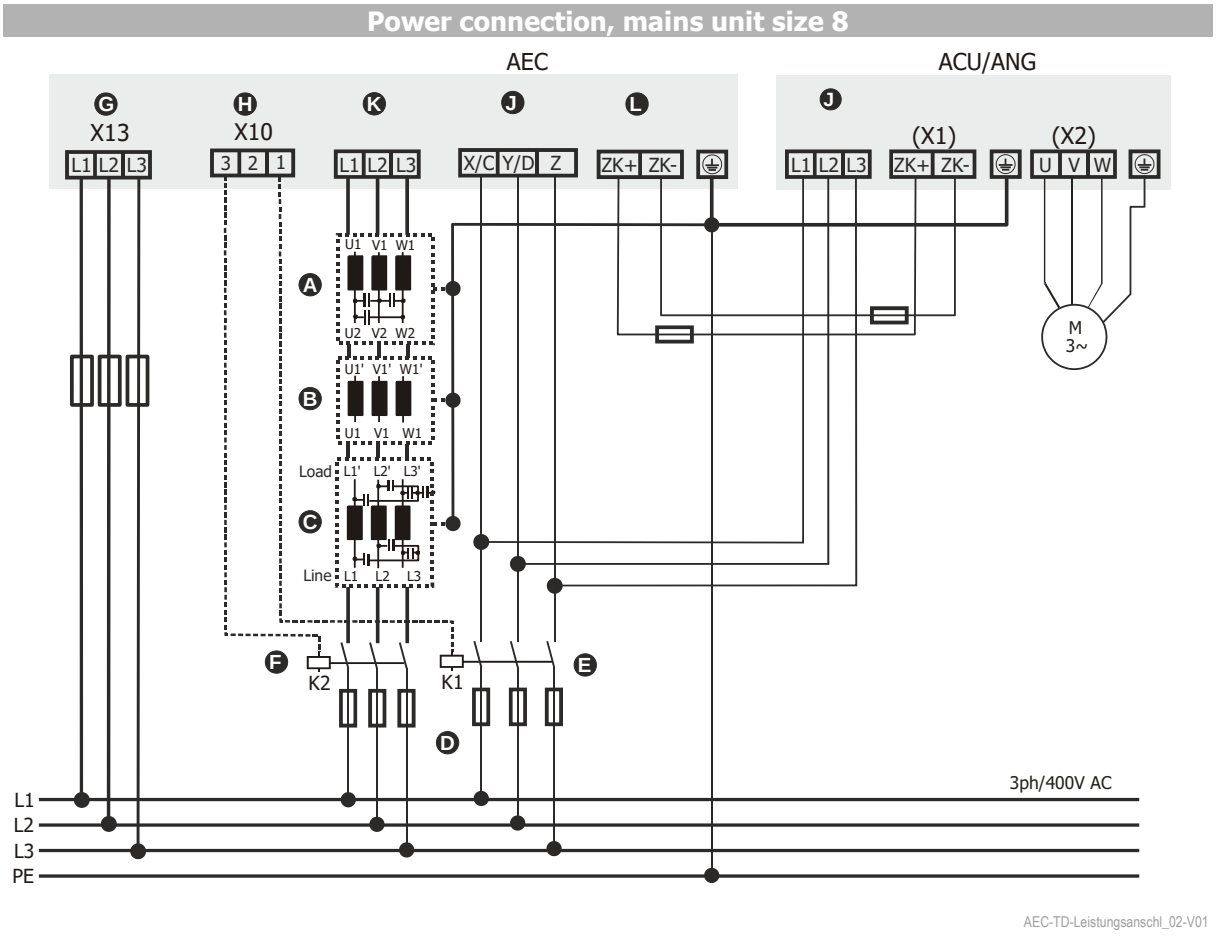


Figure 8-2: Power connections, size 7

8.3.3.2 Power connections, size 8

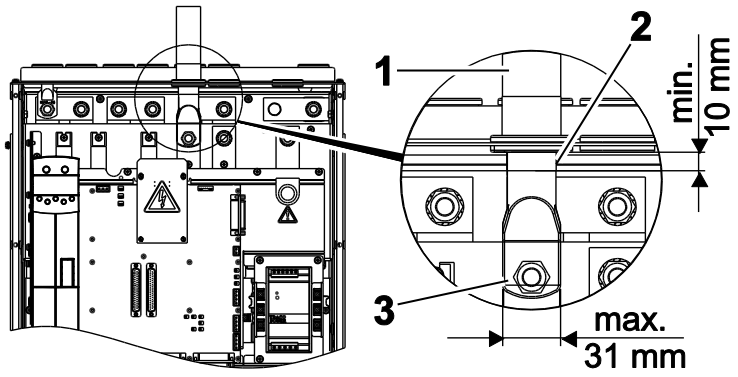


A	Sine filter		H	Control terminal X10
B	Line choke		J	Precharging circuit connection
C	Radio interference filter		K	Power circuit connection
D	Mains fuses		L	DC link connection
E	Precharge relay		K1	Precharging circuit contactor
F	Mains contactor		K2	Mains contactor
G	Connection of external power supply			

Figure 8-3: Wiring of mains unit, size 8

If the size 8 mains unit is combined with frequency inverters of the same size, the frequency inverters must be precharged at the same time as the mains unit. If the size 8 mains unit is combined with frequency inverters of sizes 1 through 7, simultaneous precharging of the AEC and frequency inverters is not required. In this case, the AEC mains unit can precharge the connected frequency inverters via the DC link.

Power connection requirements



CAUTION

Device damage

Improper cabling can damage the device.

- For power connection, note (see drawing above):
  - Ensure that cable dimensions are correct (1).
  - Min. length of insulation under/after cable gland: 10 mm (2)
  - Max. width of cable lugs: 31 mm (3)

Connection of precharger, size 8

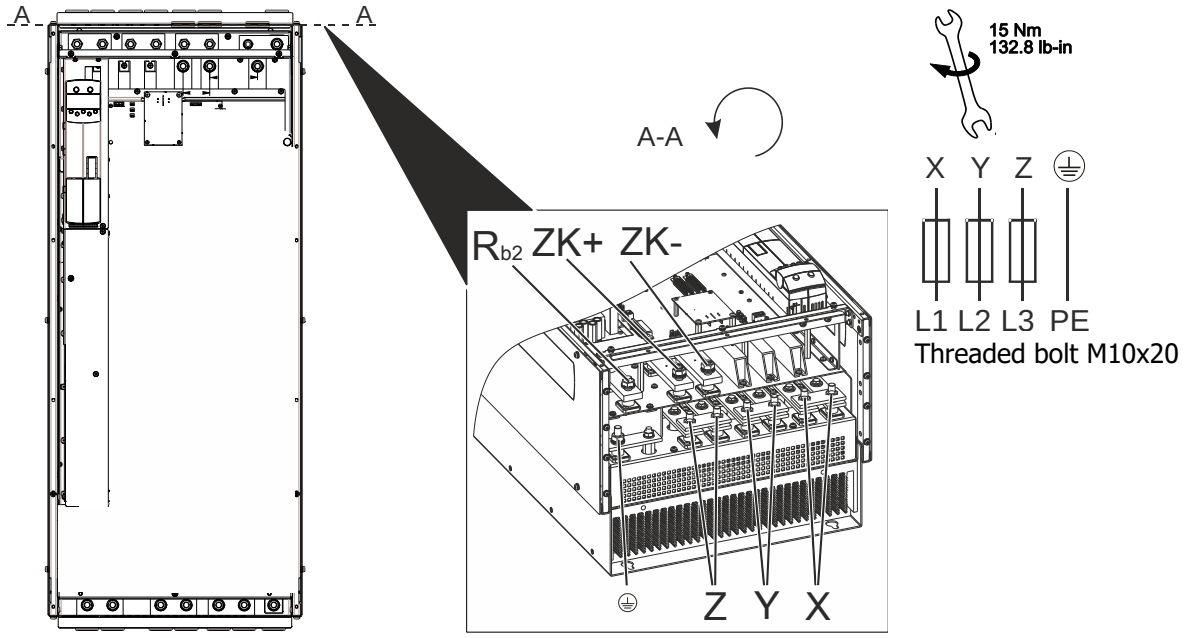


Figure 8-4: Connection of mains unit precharger , size 8

Connection of sine filter, size 8

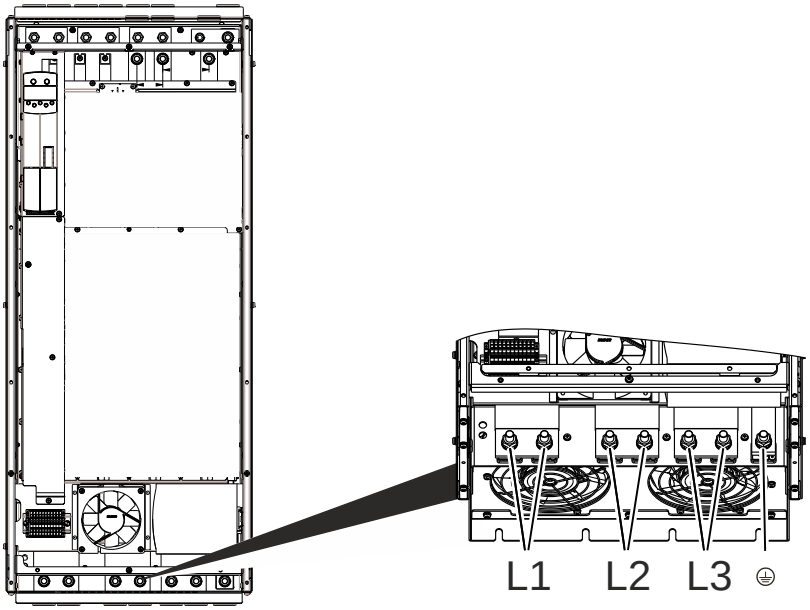


Figure 8-5: Connection of mains unit sine unit, size 8

For information on how to connect the device, refer to Chapter "Conductor cross-section" and Chapter "Fuses".

NOTE

- The cables of the AEC feed-back unit connected to the inverter DC-link must be fused using appropriate DC fuses.
- When dimensioning the DC-fuses, the derating factors specified by the fuse manufacturer must be considered in addition to the expected current and voltage values. If an AEC feed-back unit with a power corresponding to the drive inverter is used, no DC-fuses are required.

8.3.3.3 Precharging circuit

Relay X10 is controlled by the mains unit through the DC-link voltage. Once a constant DC voltage corresponding to the rectified mains voltage is reached, precharging is considered as complete.
The discharging operation of the DC link capacitors delays the switching operation of relay X10. The mains unit control ensures that the precharging circuit will be switched on first before connection to mains supply.

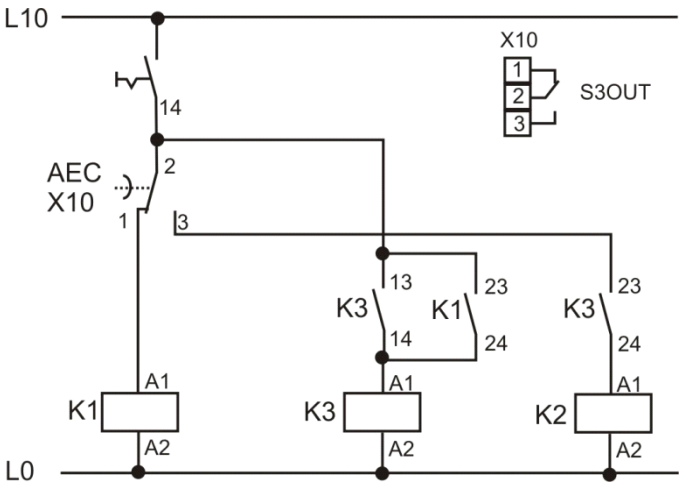
- The mains unit may only be connected to mains via the precharging circuit.
- Jog operation of the mains contactor is not permissible.
- When disconnected from mains supply, the mains unit may only be reconnected to mains supply after a defined waiting time.

- If precharging is **not** controlled via control terminal X10, the waiting time, e.g. by time links, must be considered.
- The mains power circuit (mains fuses, contactor K2) must be designed for the power of the AEC mains unit.
- Use the following table when designing the precharging circuit (precharge fuse, contactor K1):

AEC	C	U_{AC}	U_{DC}	W_{total}	W / R	W_{max} / R	R
	[mF]	[V]	[V]	[Ws]	[Ws]	[Ws]	[Ohm]
400V/250kW	9	400	565.69	1440	480	3500	2.8
400V/400kW	18	400	565.69	2880	960	3500	2.8

- Use fuses type gL ≥ 160 A for the precharging circuit. In case the total power is higher, the precharging circuit must be designed for higher power values accordingly.

The following circuit suggestions must be adjusted to the specific application and relevant regulations.



When the main switch is turned on directly after it was turned off before the waiting time has elapsed, the mains unit may be damaged.
To avoid this, a precharging circuit as shown in the illustration must be set up.
When the main switch is opened, the DC-link voltage of the mains unit will only drop slowly due to the DC link capacitors. The contact at relay X10 is maintained between terminals two and three until the DC-link voltage has dropped between a certain value. When the main switch is closed again, the mains unit is connected to mains via the inverter and can be destroyed as a result. In the circuit suggested, contactor K3 opens power supply of contactor K2 so that contactor K2 disconnects the connection between the AEC mains unit and mains.

NOTE

- The AEC mains unit requires separate wiring of the main power circuit and the DC-link precharging circuit.
- An external precharging circuit must be installed in order to protect the mains unit from the destructive charging currents of the DC link capacitors.
- Precharging contactors must be selected per the specific application requirements. Contact your BONFIGLIOLI contact for information on this.

The mains unit features an internal precharging circuit between the rectifier and the DC link capacitors. This precharging circuit closes the contact once a certain DC link voltage is reached. However, the precharging circuit does not limit the current when the mains unit is connected to mains supply, as the AEC is connected to mains via the inverter.

8.3.4 Feed-back unit power connection

The feed-back unit is integrated in a system typically comprising the following components:

- Feed-back unit AEC
- Line chokes
- Radio interference filter

  - Frequency inverter
  - Asynchronous motor or synchronous motor
  - (shielded) mains cable
  - Shielded control cables
  - Metal mounting plate
- In addition to the components listed above, a precharging circuit must be provided.

Line choke

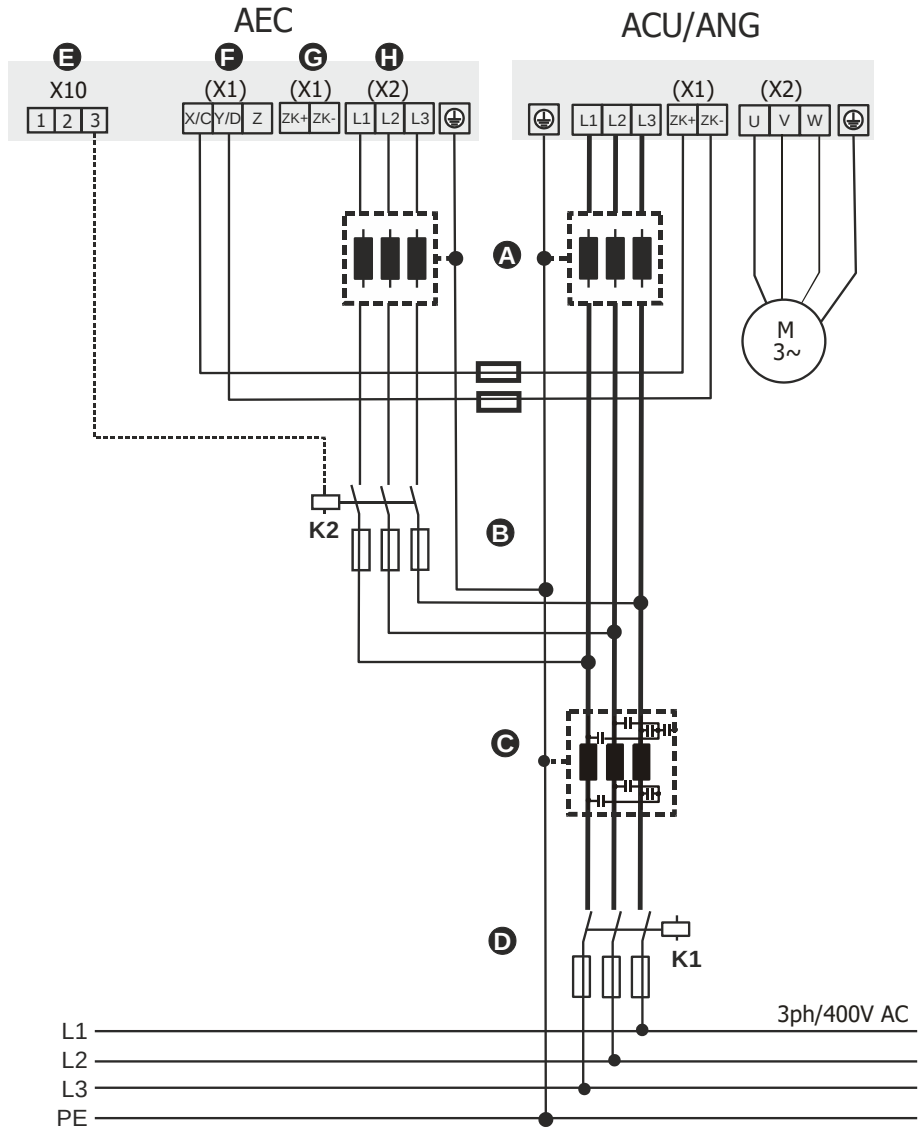
- Install the line choke between the radio interference filter and the feed-back unit.
- Install another line choke between the radio interference filter and the drive inverter.

Radio interference filter

- The Load terminal of the radio interference filter is to be wired to the mains unit side, the Line terminal to the mains side.

8.3.4.1 Power connection up to size 7

Feed-back unit power connection up to size 7



A	Line choke		F	Rectifier connection
B	Mains contactor		G	DC link connection
C	Radio interference filter		H	Power circuit connection
D	Main contactor		K1	Main contactor
E	Control terminal X10		K2	Mains contactor
(X1)/(X2): Terminal identifiers in sizes 3 to 6				

Figure 8-6: Wiring of feed-back unit up to size 7

Connections, feed-back unit size 7

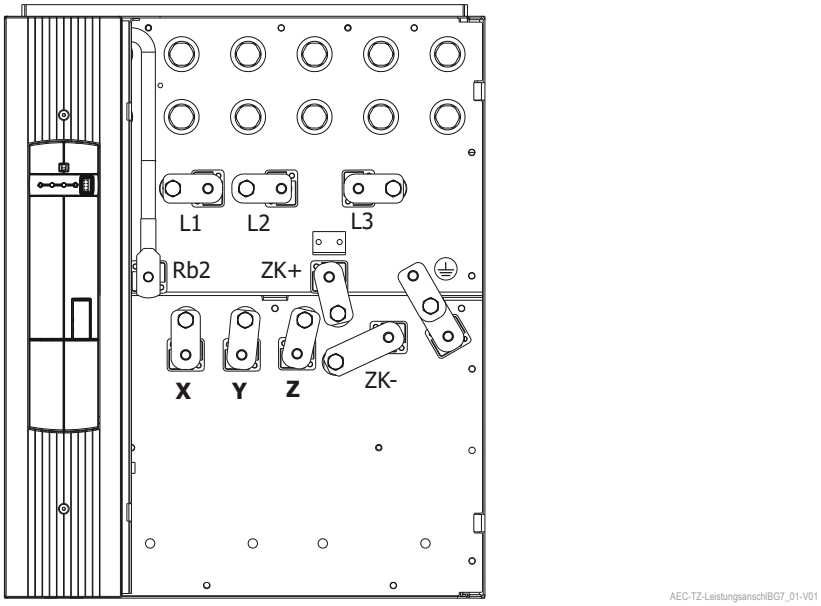
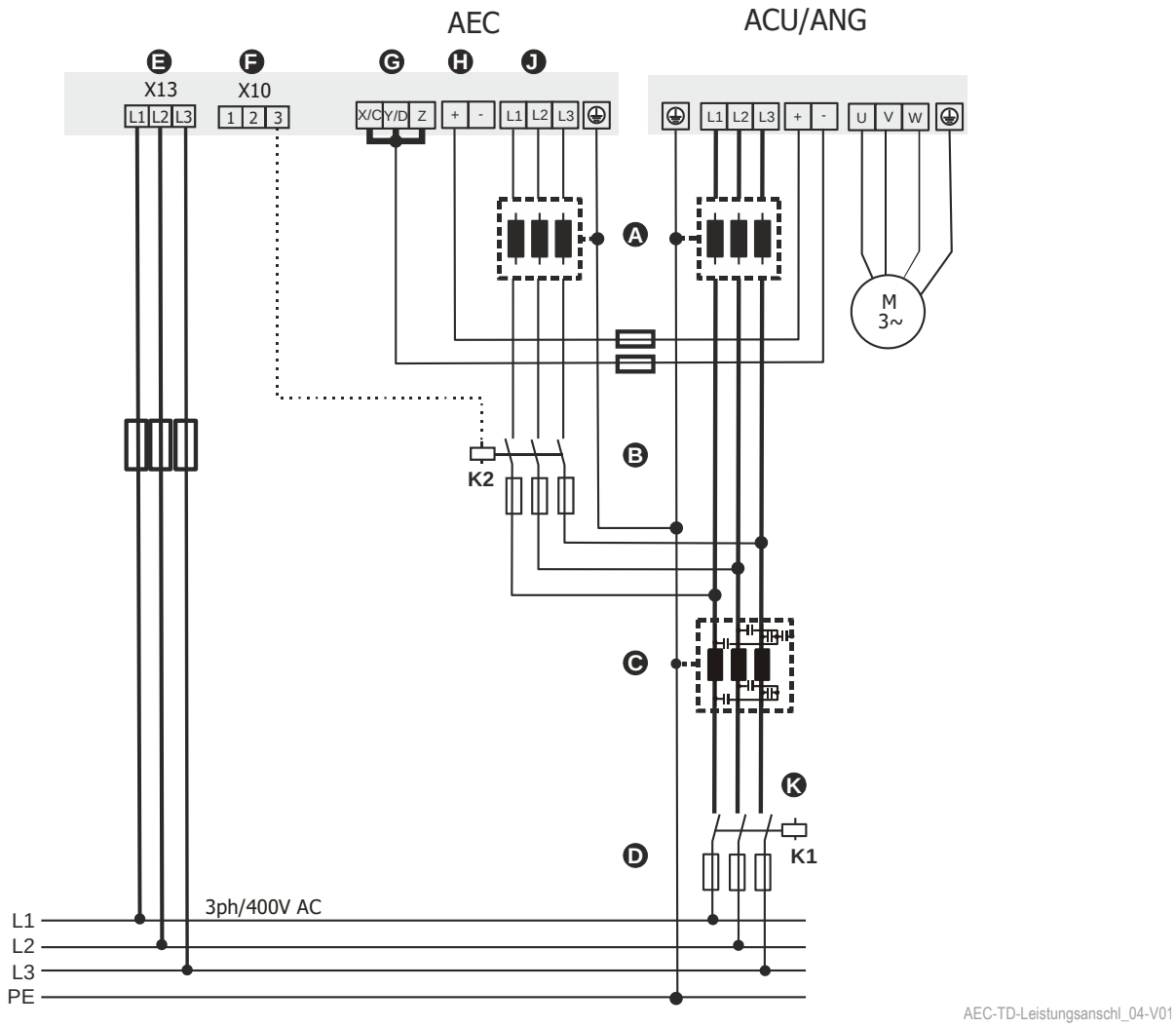


Figure 8-7: Connections , size 7

8.3.4.2 Power connections, size 8

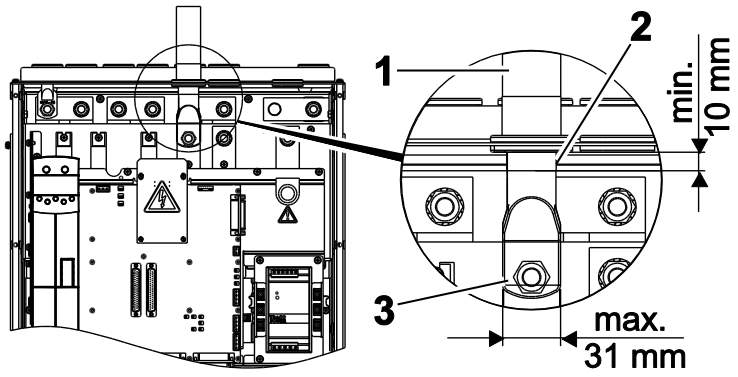
Power connection, feed-back unit size 8



A	Line choke		G	DC link connection -
B	Mains contactor		H	DC link connection +
C	Radio interference filter		J	Power circuit connection
D	Mains fuses		K	Main contactor
E	Connection of external power supply		K1	Main contactor
F	Control terminal X10		K2	Mains contactor

Figure 8-8: Wiring of feed-back unit, size 8

Power connection requirements



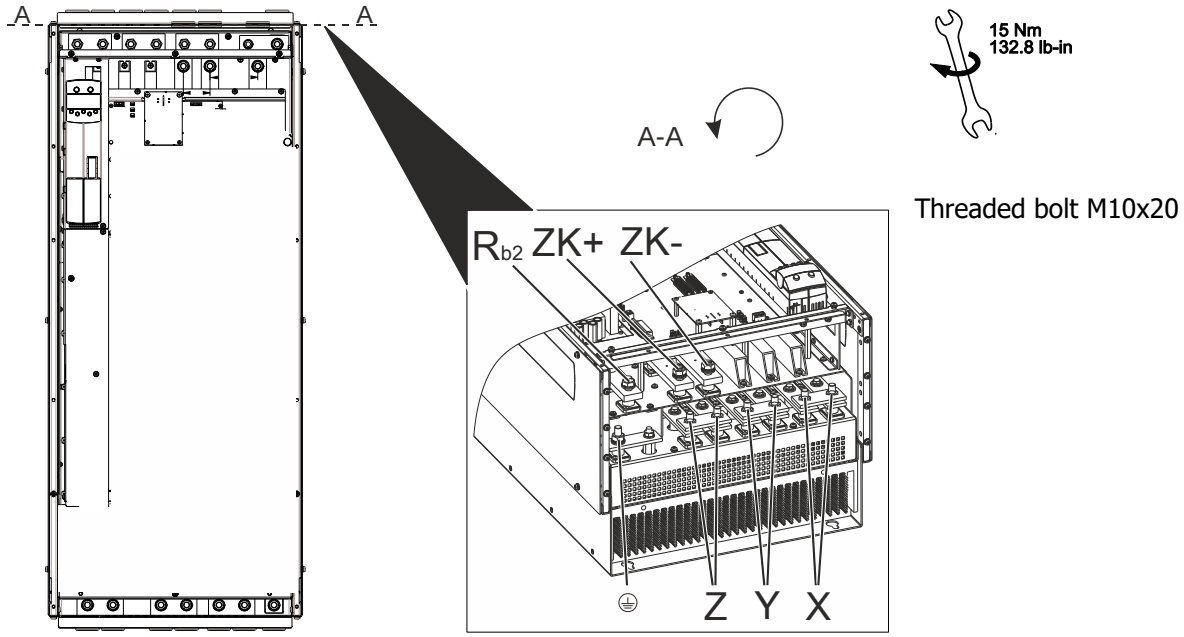
CAUTION

Device damage

Improper cabling can damage the device.

- For power connection, note (see drawing above):
  - Ensure that cable dimensions are correct (1).
  - Min. length of insulation under/after cable gland: 10 mm (2)
  - Max. width of cable lugs: 31 mm (3)

Connection of network access, size 8



Connection of line choke

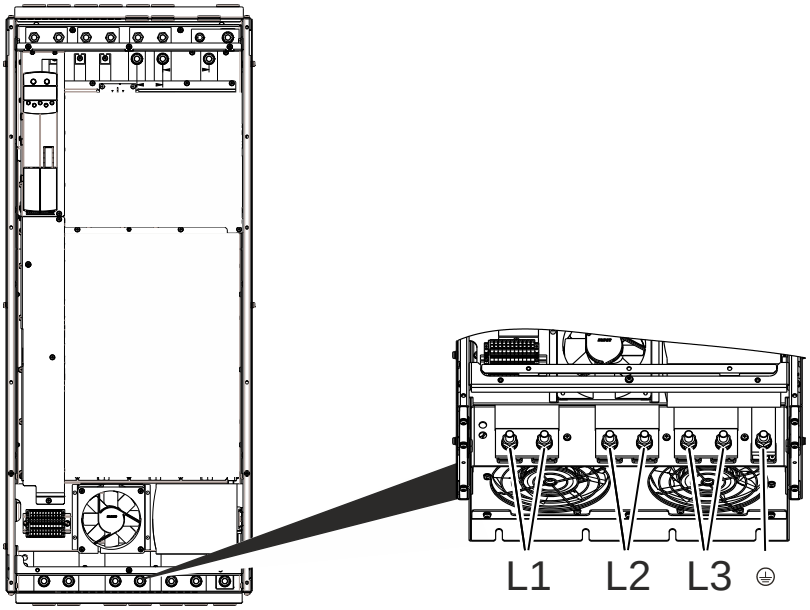
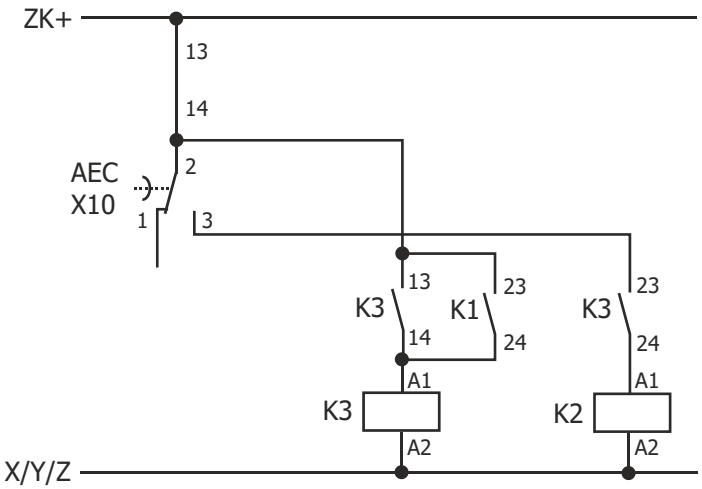


Figure 8-9: Connection of feed-back unit line choke, size 8

8.3.4.3 Network access

The AEC feed-back unit requires separate wiring for mains connection.
The mains contactor K2 must be controlled by relay output X10. When the mains contactor K2 was switched off, it must be ensured that the DC link is discharged before the mains contactor K2 can be switched on again.
Relay output X10 will be active once the pre-charging operation in the DC-link has been completed. If the DC-link voltage does not reach a certain level, relay output X10 will remain in idle state.



Mains contactor K2 must be designed for the maximum expected braking power of the drive.

8.4 DC link connection, frequency inverter with AEC

WARNING

Dangerous voltage!

When the device is disconnected from power supply, the mains and DC terminals may still be live for some time. Work on the device may only be started once the DC link capacitors have discharged. The time to wait is at least 3 minutes in the case of sizes 1 through 7 and at least 8 minutes in the case of size 8.

- The electrical installation must be carried out by qualified electricians according to the general and regional safety and installation directives.
- The documentation and device specification must be complied with during installation.
- Before any assembly or connection work, disconnect the device from power supply.
- Check for absence of voltage.
- Do not connect inappropriate voltage sources. The nominal voltage of the device must correspond to the supply voltage.
- The devices must be connected to ground potential.
- Do not remove any covers of the device while power supply is on.

CAUTION

Device damage

Unsuitable frequency inverters will be damaged or destroyed if used in combination with a mains unit.

- For the "Sinusoidal feedback" function, IT-ACU/ANG devices must be used in any case.

For mains and motor connection of an ACU or ANG frequency inverter, comply with the Operating Instructions of this device.

For wiring of the DC link with ACU and ANG devices, see Chapters 8.3.3 and 8.3.4.

9 Commissioning and operation AEC

- Before turning mains voltage on for the first time, check all control and power connections.
- Ensure that the mains unit is not enabled (control input S1IND/terminal X210A.3 and X210B.3).
- Turn mains voltage on.

  The device will perform a self-test. After some seconds, the device will be ready for operation.

- Turn device release on (control input S1IND/terminal X210A.3) while closing digital input S7IND/ terminal X210B.2 at the same time.

  The device will synchronize with the mains. Feed-in and/or feed-back operation is enabled.
  Digital output S1OUT signals "No fault" due to the default setting of Parameters *Op. Mode Digital Output* **530** = ***„103 – Inv. Error Signal"***.

Alternatively, digital output S1OUT can output signal **30 – "Flux-Forming finished"**. As a result, "Synchronization done" is reported. This message can be used as the start signal for connected ACU frequency inverters, for example.
The device is supplied with default parameters. Generally, the operation mode parameters don't have to be changed. The parameters controlling the error and warning behavior may have to be adjusted to the relevant application. See Chapter 10. For an overview of the most important parameters, refer to Chapter "AEC-relevant parameters".

9.1 Commissioning as mains unit

- Before commissioning the mains unit, it must be ensured that Parameter **P.30** is set to Configuration `710` **"Mains Inverter Feedback".**
- To release the AEC, digital inputs S1IND (terminal X210A.3) and S7IND (terminal X210B.2) must be activated.
- Before turning the start command on at the drive inverter, the release must be set at the AEC.

9.2 Commissioning as feed-back unit

- For operation of the AEC as feed-back unit, Parameter 30 **30** "*Configuration*" must be set to `711`. Other parameter settings are not required.
- Before setting the release at the AEC feed-back unit, mains contactor K2 must be closed.
- To release the AEC, digital inputs S1IND (terminal X210A.3) and S7IND (terminal X210B.2) must be activated.
- Before turning the start command on at the drive inverter, the release must be set at the AEC.

10 Error and warning behavior

Operation of the AEC and the connected load are monitored continuously. The monitoring functions are to be parameterized with the corresponding limit values specific to the application. If the limits were set below the switch-off limit of the frequency inverter, an error switch-off can be prevented by suitable measures if a warning message is issued.
The warning message is displayed by the LED's and can be read out on the operating unit via parameter *Warnings* **269** or output via one of the digital control outputs.

Some of the parameters described in the following are only available in one of the two operating modes (mains unit or feed-back unit). For more information, refer to "List of parameters".

10.1 Overload Ixt

The admissible load behavior depends on various technical data of the devices and the ambient conditions. The selected *Switching Frequency* **400** defines the nominal current and the available overload for one second and sixty seconds, respectively. The *Warning Limit Short Term Ixt* **405** and *Warning Limit Long Term Ixt* **406** are to be parameterized accordingly.

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory setting**
405	Warning Limit Short Term Ixt	6%	100%	80%
406	Warning Limit Long Term Ixt	6%	100%	80%

Output signals

Reaching of warning limits is reported via digital signals.

165 -	Warning Ixt	1)	*Warning Limit Short Term Ixt* **405** or *Warning Limit Long Term Ixt* **406** was reached.
7 -	Ixt warning	2)	

1) For linking to device functions 2) For output via a digital output

10.2 Temperature

The ambient conditions and the energy dissipation at the current operating point result in the frequency inverter heating up. In order to avoid a fault switch-off of the frequency inverter, the Warning *Limit Tk* **407** for the heat sink temperature limit and the *Warning Limit Ti* **408** as an internal temperature limit are to be parameterized. The temperature value at which a warning message is output is calculated from the type-dependent temperature limit minus the adjusted warning limit.
The switch-off limit of the frequency inverter for the maximum temperature is an internal temperature of 65 °C and a heat sink temperature of 80°C – 90°C.

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory setting**
407	Warning Limit Heat Sink Temp.	-25 °C	0 °C	-5 °C
408	Warning Limit Inside Temp.	-25 °C	0 °C	-5 °C

Minimum temperatures are defined as -10 °C (interior) and 30 °C for the heat sink temperature.

Output signals

Reaching of warning limits is reported via digital signals.

166 - 8 -	Heat sink temperature warning	1) 2)	Value "80 °C minus *Warning Limit Tk* **407**" was reached.
167 - 9 -	Inside temperature warning	1) 2)	Value "65 °C minus *Warning Limit Ti* **408**" was reached.
170 -	Warning overtemperature	1)	The value "80 °C minus *Warning Limit Tk* **407**" or "65 °C minus *Warning Limit Tk* **408**" was reached.
12 -		2)	

1) For linking to frequency inverter functions 2) For output via a digital output

11 Operational and error diagnosis

The various control methods and the hardware of the device include functions which continuously monitor the application. The operational and error diagnosis is facilitated by the information stored in the error protocol.

11.1 List of errors

The last 16 fault messages are stored in chronological order and *No. of Errors* **362** shows the number of errors which have occurred since initial commissioning of the frequency inverter. The error code FXXXX is displayed in menu branch VAL of the control unit. For the meaning of the error code, refer to the following chapter "Error messages". Via the PC user interface, the number of operation hours (h), operation minutes (m) and the fault message can additionally be read out. The current operating hours are shown by parameter *Operating hours counter* **245.** The fault report can be acknowledged via the keys of the operating unit and according to the assignment *Error acknowledgment* **103.**

List of errors		
No.	**Description**	**Function**
310	Last Error	hhhhh:mm ; FXXXX error message.
311	Last Error but one	hhhhh:mm ; FXXXX error message.
312 to 325		Error 3 to error 16.
362	No. of Errors	Number of errors occurred after the initial commissioning of the frequency inverter.

The error and warning behavior of the frequency inverter can be set in various ways. The automatic error acknowledgment enables acknowledgment of the faults Overcurrent F0500, Overcurrent F0507 and Overvoltage F0700 without intervention by an overriding control system or the user. The *No. of self acknowledged Errors* **363** shows the total number of automatic error acknowledgments.

List of errors		
No.	**Description**	**Function**
363	No. of self acknowledged Errors	Total number of automatic error acknowledgment with synchronization.

11.1.1 Error messages

The error code saved after a fault consists of the error group FXX and the code number XX.

Key		Meaning
Error messages		
F00	00	No fault has occurred.
Overload		
F01	00	Device overloaded.
F01	02	Frequency inverter overloaded (60 s), check load behavior.
	03	Short-term overload (1 s), check motor and application parameters
Heat sink		
F02	00	Heat sink temperature too high, check cooling system and fan.
	01	Temperature sensor defective or ambient temperature too low.
Interior		
F03	00	Interior temperature too high, check cooling system and fan.

Key		Meaning
	01	Interior temperature too low, check control cabinet heating.
Output current		
F05	00	Overloaded, check load situation and ramps.
	01	Instantaneous output current value too high. Check load.
	02	Dyn. Phase-Current Limitation Check load.
	04	Overloaded, check load situation and current value limit controller.
DC-Link Voltage		
F07	00	DC link voltage too high, check deceleration ramps and connected brake resistor.
	01	DC link voltage too low, check mains voltage.
	02	Mains failure, check mains voltage and circuit.
	03	Phase failure, check mains fuse and circuit.
	05	Brake chopper *Trigger threshold* **506** too small, check mains voltage.
Electronic voltage		
F08	01	Electronics voltage DC 24 V too low, check control terminal.
	04	Electronic voltage too high, check wiring of control terminals.
Output frequency		
F11	00	Output frequency too high, check control signals and settings.
	01	Max. frequency achieved by control, check deceleration ramps and connected brake resistor.
	10	Overfrequency. See application manual "Hoisting Gear Drives".
Modbus and VABus		
F20	10	Communication error according to parameter *CM: VABus Watchdog Timer* **413**.
CANopen		
F20	21	CAN Bus OFF
	22	CAN Guarding
	23	Error state
	24	SYNC error (SYNC timing)
	25	CAN error state
	26	RxPDO1 length error — Number of received bytes differs from mapping.
	27	RxPDO2 length error
	28	RxPDO3 length error
	2A	CAN RxPDO1 Timeout
	2B	CAN RxPDO2 Timeout
	2C	CAN RxPDO3 Timeout
System Bus		
F21	nn	Malfunction message in system bus master with malfunction in system bus slave nn = node ID of slave (hex)
F22	00	Communication fault, system bus, timeout Sync telegram
	01	Communication fault, system bus, timeout RxPDO1
	02	Communication fault, system bus, timeout RxPDO2
	03	Communication fault, system bus, timeout RxPDO3
	10	Communication fault, system bus, bus Off

Key		Meaning
CANopen		
F23	nn	Heartbeat error, nn = triggering node.
CM module identification		
F24	00	Unknown CM module. Verify compatibility of firmware and CM module
EM module identification		
F25	00	Unknown EM module. Verify compatibility of firmware and EM module
Industrial Ethernet		
F27	nn	Industrial Ethernet error. Please note the instructions on the Ethernet module used.
User error VPLC		
F30	3n	Internal PLC function error caused by the user. Please refer to VPLC user manual.
Optional components		
F0A	10	Data transmission from control unit KP 500 to the frequency inverter not possible. At least one file must be stored in the control unit.
F0B	13	The communication module was fitted to slot B without disconnection of the mains voltage, switch mains voltage off.
Internal monitoring		
F0C	40	This error is triggered after 6 warm starts in less than 3 minutes because there will probably be an error in the programming in the PLC or the function table. In addition the function table will be stopped (**P.1399** = 0 in RAM only).

11.1.2 Output signals in the case of error messages

Errors are signaled via digital signals.

162 - 3 -	Error Signal	1) 2)	A monitoring function reports an error displayed via Parameter *Current Error* **259**.

1) For linking to frequency inverter functions 2) For output via a digital output

In addition to fault messages mentioned, there are further fault messages. However these messages are only used for internal purposes and are not listed here. If you receive fault messages which are not listed here, please contact the BONFILGLIOLI customer service.

Please save the parameter file on your PC before.

11.2 Error environment

The parameters of the error environment help troubleshooting both in the settings of the frequency inverter and also in the complete application. The error environment documents the operational behavior of the frequency inverter at the time of the last four faults.

Error environment

No.	Description	Function
330	DC-Link Voltage	Direct voltage in DC-link.
331	Output voltage	Calculated output voltage (motor voltage) of the frequency inverter.
335	Phase Current Ia	Measured current in motor phase U.
336	Phase Current Ib	Measured current in motor phase V.
337	Phase Current Ic	Measured current in motor phase W.

Error environment

No.	Description	Function
339	Isd/Reactive Current	Current component forming the magnetic flux or the calculated reactive current.
340	Isq/Active Current	Current component forming the torque or the calculated active current.
343	Analog input MFI1A	Input signal on multifunction input 1 in analog *Operation mode* **452**.
346	Analog Output MFO1A	Output signal on multifunction input 1 in *Operation mode* **550** – analog.
349	Repetition Frequency Output	Signal at repetition frequency output according to *Operation mode* **550** – repetition frequency.
350	Status of Digital Inputs	Decimally coded status of the six digital inputs and of multifunction input 1 in *Operation mode* **452** – digital input.
351	Status of Digital Outputs	Decimally coded status of the two digital outputs and of multifunction output 1 in *Operation mode* **550** – digital.
352	Time since Release	The time of the error in hours (h), minutes (m) and seconds (s) after the release signal: hhhhh:mm:ss . $^{sec}/_{10}$ $^{sec}/_{100}$ $^{sec}/_{1000}$.
353	Heat Sink Temperature	Measured heat sink temperature.
354	Inside Temperature	Measured inside temperature.
355	Controller Status	The reference value signal is limited by the controller coded in the controller status.
356	Warning Status	The warning messages coded in warning status.
357	Int. value 1	Software service parameter.
358	Int. value 2	Software service parameter.
359	Long value 1	Software service parameter.
360	Long value 2	Software service parameter.
367	Application Warning Status	The application warnings coded in warning status.

The *Checksum* **361** parameter shows whether the storage of the error environment was free of errors (OK) or incomplete (NOK).

Error environment

No.	Description	Function
361	Checksum	Check protocol of the error environment.

12 List of parameters

The parameter list is structured according to the menu branches of the control unit. The parameters are listed in ascending numerical order. A headline (shaded) can appear several times, i.e. a subject area may be listed at different places in the table. Not all of the parameters listed are relevant to the AEC. See the following chapters.
For better clarity, the parameters have been marked with pictograms:

- The parameter is available in the four data sets.
- ☑ The parameter value is set by the SETUP routine.
- ⊗ This parameter cannot be written when the device is in operation.
- This parameter is only relevant to the device if configured as "Mains Unit".
- This parameter is only relevant to the device if configured as "Feed-back Unit".

I_{NEN}, U_{NEN}, P_{NEN}: Nominal values of device,
ü: Overload capacity of device

In the KP500 control unit, parameter numbers > 999 are shown in hexadecimal form (999, A00 … B5 … C66).

12.1 Actual Value Menu (VAL)

	No.	Description	Unit	Display range
		Actual values of the system		
	211	R.m.s Current	A	0.0 … I_{max}
	212	Output Voltage	V	0.0 … $U_{nominal}$
		Actual values of mains unit		
	222	DC-Link Voltage	V	0.0 … U_{dmax}-25
	223	Modulation	%	0 … 100
	229	Reference percentage	%	± 300,00
		Actual value memory		
	231	Peak value long-term Ixt	%	0.00 … 100.00
	232	Peak value short-term Ixt	%	0.00 … 100.00
		Actual values of device		
	243	Digital Inputs (Hardware)	-	00 … 255
	244	Working Hours Counter	h	99999
	245	Operation Hours Counter	h	99999
	249	Active Data Set	-	1 … 4
	250	Digital Inputs	-	00 … 255
	251	Analog input MFI1A	%	± 100,00
	254	Digital Outputs	-	00 … 255
	255	Heat Sink Temperature	deg.C	0 … T_{kmax}
	256	Inside Temperature	deg.C	0 … T_{imax}
	257	Analog Output MFO1A	V	0.0 … 24.0
	258	PWM input	%	0.00 … 100.00
	259	Current Error	-	FXXXX
	269	Warnings	-	AXXXX
	273	Application Warnings	-	AXXXX
	275	Controller Status	-	CXXXX

	No.	Description	Unit	Display range
	277	STO Status	-	XXXX
	287	Peak Value Vdc	V	0.0 ... U_{dmax}
	288	Average Value Vdc	V	0.0 ... U_{dmax}
	289	Peak Value Heat Sink Temp.	deg.C	0 ... T_{kmax}
	290	Average Value Heat Sink Temp.	deg.C	0 ... T_{kmax}
	291	Peak Value Inside Temperature	deg.C	0 ... T_{imax}
	292	Average Value Inside Temperature	deg.C	0 ... T_{imax}
	293	Peak Value Irms	A	0.0 ... ü $I_{nominal}$
	294	Average Value Irms	A	0.0 ... ü $I_{nominal}$
	295	Peak Value Active Power pos.	kW	0.0 ... ü·$P_{nominal}$
	296	Peak value active power neg.	kW	0.0 ... ü·$P_{nominal}$
	297	Average value active power	kW	0.0 ... ü·$P_{nominal}$
	301	Energy	kWh	0 ... 99999
	302	Energy	kWh	0 ... 99999
		List of errors		
	310	Last Error	h:m; F	00000:00; FXXXX
	311	Last Error but one	h:m; F	00000:00; FXXXX
	312	Error 3	h:m; F	00000:00; FXXXX
	313	Error 4	h:m; F	00000:00; FXXXX
	314	Error 5	h:m; F	00000:00; FXXXX
	315	Error 6	h:m; F	00000:00; FXXXX
	316	Error 7	h:m; F	00000:00; FXXXX
	317	Error 8	h:m; F	00000:00; FXXXX
	318	Error 9	h:m; F	00000:00; FXXXX
	319	Error 10	h:m; F	00000:00; FXXXX
	320	Error 11	h:m; F	00000:00; FXXXX
	321	Error 12	h:m; F	00000:00; FXXXX
	322	Error 13	h:m; F	00000:00; FXXXX
	323	Error 14	h:m; F	00000:00; FXXXX
	324	Error 15	h:m; F	00000:00; FXXXX
	325	Error 16	h:m; F	00000:00; FXXXX
		Error environment		
	330	DC-Link Voltage	V	0.0 ... U_{dmax}
	331	Output voltage	V	0.0 ... $U_{nominal}$
	335	Phase Current Ia	A	0.0 ... I_{max}
	336	Phase Current Ib	A	0.0 ... I_{max}
	337	Phase Current Ic	A	0.0 ... I_{max}
	339	Isd / Reactive Current	A	0.0 ... I_{max}
	361	Checksum	-	OK / NOK
		List of errors		
	362	No. of Errors	-	0 ... 32767
	363	No. of self acknowledged Errors	-	0 ... 32767
		Error environment		
	367	Application Warning Status	-	A0000 ... AFFFF
		Digital Outputs		
	537	Actual Warning Mask	-	AXXXXXXXX
	627	Actual Appl. Warning Mask	-	AXXXX

	No.	Description	Unit	Display range
		Mains actual values		
	850	Frequency	Hz	0.0 ... 999.99
	852	Power Supply Current	A	0.0 ... I_{max}
	853	Mains voltage	V	0.0 ... 999.99

12.2 Parameter Menu (PARA)

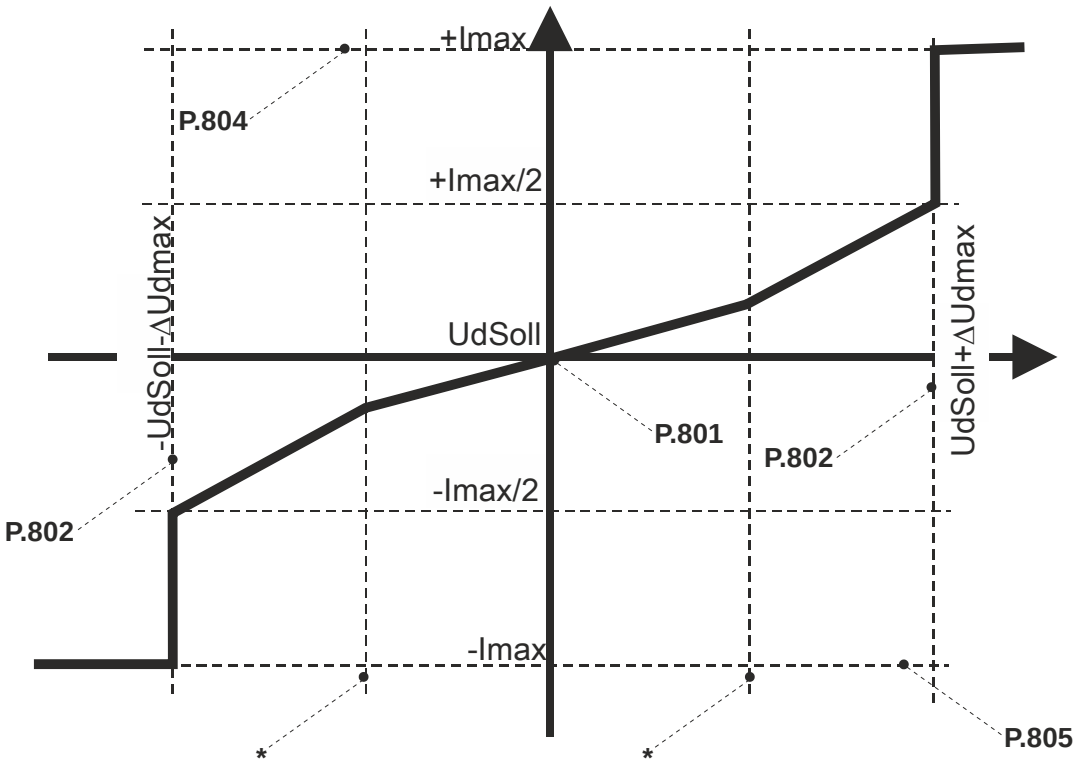
	No.	Description	Unit	Setting range
		Device data		
	0	Serial Number	-	Characters
	1	Optional Modules	-	Characters
	12	Inverter Software Version	-	Characters
	15	Copyright	-	Characters
	27	Set Password	-	0 ... 999
	28	Control Level	-	1 ... 3
	29	User Name	-	32 characters
⊗	30	Configuration	-	Selection 710/711
	33	Language	-	Selection
⊗	34	Program(ming)	-	0 ... 9999
		Fan		
	39	Switch-On Temperature	deg.C	0 ... 60
		Digital Inputs		
	70	Data Set Change-Over 1	-	Selection
	71	Data Set Change-Over 2	-	Selection
	72	Percent Motorpoti Up	-	Selection
	73	Percent Motorpoti Down	-	Selection
	75	Fixed Percent Change-Over 1	-	Selection
	76	Fixed Percent Change-Over 2	-	Selection
	83	Timer 1	-	Selection
	84	Timer 2	-	Selection
	87	Start 3-Wire Ctrl	-	Selection
	103	Error Acknowledgment	-	Selection
	183	External Error	-	Selection
	204	Therm. Contact	-	Selection
		Pulse width modulation		
∿	400	Switching frequency	-	Selection
		Error/warning behavior		
	405	Warning Limit Short Term Ixt	%	6 ... 100
	406	Warning Limit Long Term Ixt	%	6 ... 100
	407	Warning Limit Heat Sink Temp.	deg.C	-25 ... 0
	408	Warning Limit Inside Temp.	deg.C	-25 ... 0
		Error/warning behavior		
	409	Controller-Status Message	-	Selection
		Bus controller		
	412	Local/Remote	-	Selection
		Error/warning behavior		
∿	415	IDC Compensation Limit	V	0.0 ... 1.5
	417	Frequency Switch-off Limit	Hz	0.00 ... 599.00
		Multifunction input 1		
	450	Tolerance Band	%	0.00 ... 25.00
	451	Filter time constant	ms	Selection
	452	Operation Mode	-	Selection

	No.	Description	Unit	Setting range
	453	Error/Warning Behavior	-	Selection
	454	Point X1	%	0.00 ... 100.00
	455	Point Y1	%	-100.00 ... 100.00
	456	Point X2	%	0.00 ... 100.00
	457	Point Y2	%	-100.00 ... 100.00
	Digital Outputs			
	510	Setting Frequency	Hz	0.00 ... 599.00
	517	Setting Frequency Off Delta	Hz	0.00 ... 599.00
	Percentage Value Limits			
	518	Minimum Reference Percentage	%	0.00 ... 300.00
	519	Maximum Reference Percentage	%	0.00 ... 300.00
	520	Fixed Percentage 1	%	0.00 ... 300.00
	Digital Outputs			
	530	Op. Mode Digital Output 1	-	Selection
	535	Op. Mode ext. Error	-	Selection
	540	Op. Mode Comparator 1	-	Selection
	Multifunction output 1			
	550	Operation Mode	-	Selection
	551	Voltage 100%	V	0.0 ... 24.0
	552	Voltage 0%	V	0.0 ... 24.0
	553	Analog Operation	-	Selection
	554	Digital Operation	-	Selection
	PWM-/repetition frequency input			
	652	Offset	%	-100.00 ... 100.00
	653	Amplification	%	5.0 ... 1000.0
	DC-link			
	801	Reference DC-Link Voltage	V	0.0 ... Udmax
	Voltage controller			
	802	Max. DC-Link Voltage Deviation	V	0.0 ... Udmax
	804	Max. Feed Current	A	0.0 ... Imax
	805	Max. Feedback Current	A	0.0 ... Imax
	Filter compensation			
	810	Operation Mode	-	Selection
	811	Relative Short-Circuit Voltage	%	0.0 ... 30.0

12.3 AEC-relevant parameters

12.3.1 Description of parameters

AEC-relevant parameters			
Mains unit (P.30 = **710**)		**Feed-back unit** (P.30 = **711**)	
520	Fixed Percentage 1	651	Operation Mode
800	Operation mode of voltage controller	811	Relative Short-Circuit Voltage
801	Reference DC-Link Voltage		
802	Max. DC-Link Voltage Deviation		
803	Max. Output Current		
804	Max. Feed Current		
805	Max. Feedback Current		
810	Operation Mode Filter Compensation		



AEC-GR-AEC-Feed-In-Feed-Back-V01

UdSet: Parameter 801, DC-Link Voltage
ΔUdmax: Parameter 802, Max. DC-Link Voltage Deviation
+ Imax : Parameter 804, Max. Feed Current
- Imax : Parameter 805, Max. Feedback Current
* : Fixed value controlled by PI controller

In the KP500 control unit, parameter numbers > 999 are shown in hexadecimal form (999, A00 … B5 … C66).

AEC-relevant parameters				
	No.	**Description**	**Unit**	**Explanation**
1)	30	Configuration		Selection of feedback method
2)	400	Switching frequency	Hz	Pulse width modulation
2)	520	Fixed Percentage 1	%	Setting of phase displacement between output current and mains voltage via input of $I_{react}/I_{nominal}$
1)	530	Op. Mode Digital Output 1		Selection of operation mode of digital output 1. By default, it is set to "103 Inv. Error Signal". Alternatively, you can also choose "130 Inv. Flux-Forming finished". Then, output S1OUT will signal that synchronization was successful (can be used, for example, as the start signal for connected ACU frequency inverters).
3)	651	Operation Mode		Control of autostart behavior
2)	700	Amplification		Amplification for controller of internal control circuit
2)	701	Integral Time	ms	Integral Time for controller of internal control circuit
2)	800	Operation mode of voltage controller		Set the operation mode. In the standard software, "1 Voltage Control" is set
2)	801	Reference DC-Link Voltage	V	Input of reference value of DC link voltage
2)	802	Max. DC-Link Voltage Deviation	V	
2)	803	Max. Output Current	A	Max. inverter output current; limits both the feed-in current and the feed-back current
2)	804	Max. Feed Current	A	Input of maximum feed-in current, the mains unit may receive from mains through the inverter
2)	805	Max. Feedback Current	A	Input of maximum feedback current, the mains unit may feed into the mains via the inverter.
2)	810	Operation Mode Filter Compensation		Setting of mains filter compensation operating behavior.
2)	850	Frequency	Hz	Measured mains frequency
1)	852	Power Supply Current	A	Actual mains current value
2)	853	Mains voltage	V	Calculated mains voltage
1)	854	Active Power	kW	Current effective power, fed into the mains by the inverter in configuration 711.
2)	863	Current a	A	Actual current value in phase a
2)	864	Current b	A	Actual current value in phase b
2)	865	Current c	A	Actual current value in phase c

1) Parameter is active both in configuration 710 and 711

2) Parameter active in configuration 710 only

3) Parameter active in configuration 711 only

12.3.2 Parameter setting options

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory setting**
30	Configuration	710 – 711 –	Mains Inverter Feedback Unit	710
520	Fixed Percentage 1	-300.00 %	300.00 %	0.00 %
530	Op. Mode Digital Output 1	103 –	inverted error message	103

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory setting**
700	Amplification	0.00	80.00	0.6
701	Integral Time	0.00 ms	10.00 ms	10.00 ms
800	Operation Mode Voltage Controller	1 –	Voltage Control	1
801	Reference DC-Link Voltage	390.0 V	675.0 V	775.0 V
802	Max. DC-Link Voltage Deviation	10.0 V	75.0 V	200.0 V
803	Max. Output Current	1.6 A	$I_{nominal}$	2 * $I_{nominal}$
804	Max. Feed Current	0.0 A	2 * $I_{nominal}$	2 * $I_{nominal}$
805	Max. Feedback Current	0.0 A	2 * $I_{nominal}$	2 * $I_{nominal}$
810	Operation Mode Filter Compensation	1 – 2 – 11 – 12 –	without overload with overload without overload, with react. current priority without overload, without react. current priority	11

For the setting options of other parameters, see ACU frequency inverters operating instructions.

Index

Bonfiglioli worldwide network

Bonfiglioli Australia
2, Cox Place Glendenning NSW 2761
Locked Bag 1000 Plumpton NSW 2761
Tel. (+ 61) 2 8811 8000 - Fax (+ 61) 2 9675 6605
www.bonfiglioli.com.au

Bonfiglioli Brasil
Travessa Cláudio Armando 171
Bloco 3 - CEP 09861-730 - Bairro Assunção
São Bernardo do Campo - São Paulo
Tel. (+55) 11 4344 2323 - Fax (+55) 11 4344 2322
www.bonfigliolidobrasil.com.br

Bonfiglioli Canada
2-7941 Jane Street - Concord, Ontario L4K 4L6
Tel. (+1) 905 7384466 - Fax (+1) 905 7389833
www.bonfigliolicanada.com

Bonfiglioli China
Unit D, 8th Floor, Building D, BenQ Plaza, No.207
Songhong Road, Shanghai 200335
Tel. (+86) 21 60391118 - Fax (+86) 59702957
www.bonfiglioli.cn

Bonfiglioli Deutschland
Industrial, Mobile, Wind
Sperberweg 12 - 41468 Neuss
Tel. +49 (0) 2131 2988 0 - Fax +49 (0) 2131 2988 100
www.bonfiglioli.de
Industrial
Europark Fichtenhain B6 - 47807 Krefeld
Tel. +49 (0) 2151 8396 0 - Fax +49 (0) 2151 8396 999
www.vectron.net

Bonfiglioli España
Industrial, Mobile, Wind
Tecnotrans Bonfiglioli S.A.
Pol. Ind. Zona Franca sector C, calle F, n°6
08040 Barcelona
Tel. (+34) 93 4478400 - Fax (+34) 93 3360402
www.tecnotrans.com

Bonfiglioli France
14 Rue Eugène Pottier
Zone Industrielle de Moimont II - 95670 Marly la Ville
Tel. (+33) 1 34474510 - Fax (+33) 1 34688800
www.bonfiglioli.fr

Bonfiglioli India
Industrial
Bonfiglioli Transmission PVT ltd.
Survey No. 528, Perambakkam High Road
Mannur Village - Sriperumbudur Taluk 602105
www.bonfiglioli.in
Mobile, Wind
Bonfiglioli Transmission PVT ltd.
PLOT AC7-AC11 Sidco Industrial Estate
Thirumudivakkam - Chennai 600 044
Tel. +91(0) 44 24781035 - 24781036 - 24781037
Fax +91(0) 44 24780091 - 24781904
www.bonfiglioli.in

Bonfiglioli Italia
Industrial
Via Sandro Pertini lotto 7b - 20080 Carpiano (Milano)
Tel. (+39) 02 985081 - Fax (+39) 02 985085817
www.bonfiglioli.it
Bonfiglioli Mechatronic Research
Via F. Zeni 8 - 38068 Rovereto (Trento)
Tel. (+39) 0464 443435/36 - Fax (+39) 0464 443439
www.bonfiglioli.it

Bonfiglioli New Zealand
88 Hastie Avenue, Mangere Bridge, Auckland
2022, New Zealand - PO Box 11795, Ellerslie
Tel. (+64) 09 634 6441 - Fax (+64) 09 634 6445
www.bonfiglioli.co.nz

Bonfiglioli Österreich
Molkereistr 4 - A-2700 Wiener Neustadt
Tel. (+43) 02622 22400 - Fax (+43) 02622 22386
www.bonfiglioli.at

Bonfiglioli South East Asia
24 Pioneer Crescent #02-08
West Park Bizcentral - Singapore, 628557
Tel. (+65) 6268 9869 - Fax. (+65) 6268 9179
www.bonfiglioli.com

Bonfiglioli South Africa
55 Galaxy Avenue,
Linbro Business Park - Sandton
Tel. (+27) 11 608 2030 OR - Fax (+27) 11 608 2631
www.bonfiglioli.co.za

Bonfiglioli Türkiye
Atatürk Organize Sanayi Bölgesi,
10044 Sk. No. 9, 35620 Çiğli - Izmir
Tel. +90 (0) 232 328 22 77 (pbx)
Fax +90 (0) 232 328 04 14
www.bonfiglioli.com.tr

Bonfiglioli United Kingdom
Industrial
Unit 7, Colemeadow Road
North Moons Moat - Redditch, Worcestershire
B98 9PB
Tel. (+44) 1527 65022 - Fax (+44) 1527 61995
www.bonfiglioli.co.uk
Mobile, Wind
3 - 7 Grosvenor Grange, Woolston Warrington
- Cheshire WA1 4SF
Tel. (+44) 1925 852667 - Fax (+44) 1925 852668
www.bonfiglioli.co.uk

Bonfiglioli USA
3541 Hargrave Drive Hebron, Kentucky 41048
Tel. (+1) 859 334 3333 - Fax (+1) 859 334 8888
www.bonfiglioliusa.com

Bonfiglioli Vietnam
Lot C-9D-CN My Phuoc Industrial Park 3
Ben Cat - Binh Duong Province
Tel. (+84) 650 3577411 - Fax (+84) 650 3577422
www.bonfiglioli.vn

Bonfiglioli
Forever Forward

Bonfiglioli has been designing and developing innovative and reliable power transmission and control solutions for industry, mobile machinery and renewable energy applicacations since 1956.

Bonfiglioli Riduttori S.p.A.
Via Giovanni XXIII, 7/A
40012 Lippo di Calderara di Reno
Bologna (Italy)

tel: +39 051 647 3111
fax: +39 051 647 3126
bonfiglioli@bonfiglioli.com
www.bonfiglioli.com

COD. VEC 466 R1