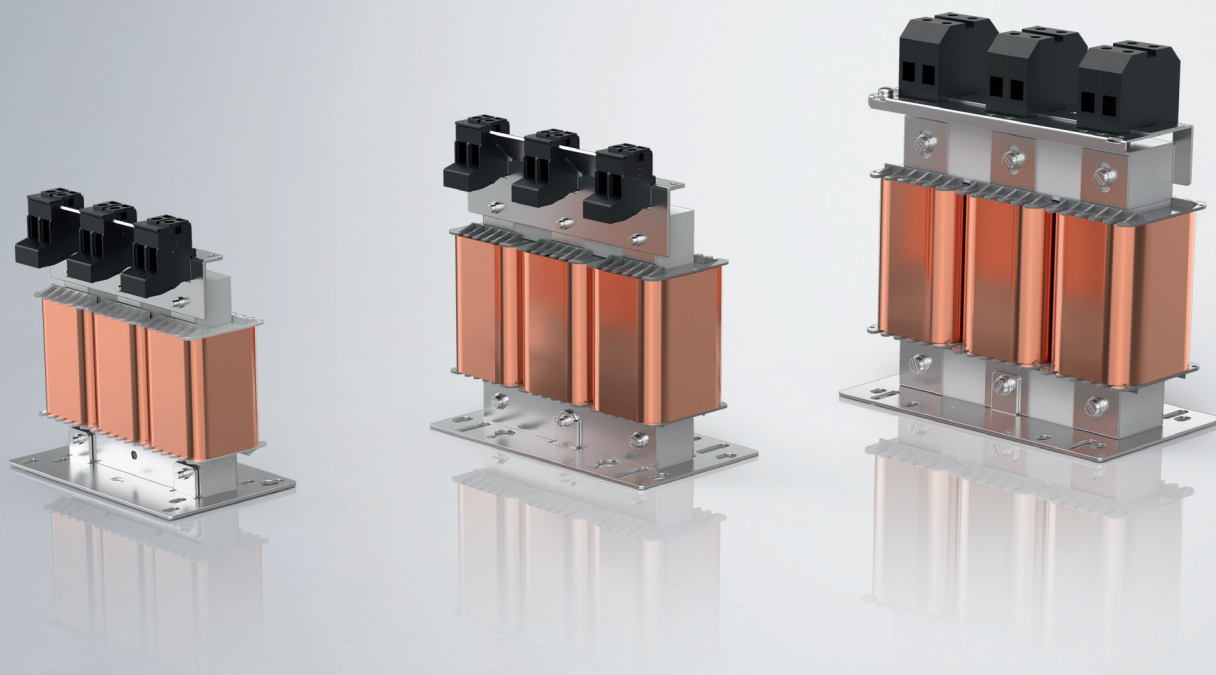


Operating instructions | EN

# AX2090-ND80

Mains choke





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## Disclaimer

Beckhoff products are subject to continuous further development. We reserve the right to revise the operating instructions at any time and without prior announcement. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in these operating instructions.

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The EtherCAT technology is protected by patent rights through the following registrations and patents with corresponding applications and registrations in various other countries:

- EP1590927
- EP1789857
- EP1456722
- EP2137893
- DE102015105702



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## Limitation of liability

All components in this product as described in the operating instructions are delivered in a specific configuration of hardware and software, depending on the application regulations. Modifications and changes to the hardware or software configuration that go beyond the documented options are prohibited and nullify the liability of Beckhoff Automation GmbH & Co. KG.

### **The following is excluded from the liability:**

- Failure to observe these operating instructions
- Improper use
- Use of untrained personnel
- Use of unauthorized spare parts

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## Version numbers



### **Provision of revision levels**

On request, you can obtain a list of revision levels for changes in the operating instructions.

- Send your request to: [motion-documentation@beckhoff.de](mailto:motion-documentation@beckhoff.de)

### **Origin of the document**

These operating instructions were originally written in German. All other languages are derived from the German original.

### **Product features**

Only the product properties specified in the current operating instructions are valid. Further information given on the product pages of the Beckhoff homepage, in emails or in other publications is not authoritative.

## Staff qualification

These operating instructions are intended for trained control and automation specialists with knowledge of the applicable and required standards and directives.

Specialists must have knowledge of drive technology and electrical equipment as well as knowledge of safe working on electrical systems and machines. This includes knowledge of proper setup and preparation of the workplace as well as securing the working environment for other persons.

The operating instructions published at the respective time of each installation and commissioning is to be used. The products must be used in compliance with all safety requirements, including all applicable laws, regulations, provisions and standards.

### Instructed person

Instructed persons have a clearly defined task area and have been informed about the work to be carried out. Instructed persons are familiar with:

- the necessary protective measures and protective devices
- the intended use and risks that can arise from use other than for the intended purpose

### Trained person

Trained persons meet the requirements for instructed persons. Trained persons have additionally received training from the machine builder or vendor:

- machine-specific or
- plant-specific

### Trained specialists

Trained specialists have received specific technical training and have specific technical knowledge and experience. Trained specialists can:

- apply relevant standards and directives
- assess tasks that they have been assigned
- recognize possible hazards
- prepare and set up workplaces

## **Qualified electricians**

Qualified electricians have comprehensive technical knowledge gained from a course of study, an apprenticeship or technical training. They have an understanding of control technology and automation. They are familiar with relevant standards and directives. Qualified electricians can:

- independently recognize, avoid and eliminate sources of danger
- implement specifications from the accident prevention regulations
- assess the work environment
- independently optimize and carry out their work



## Safety and instruction

Read the contents that refer to the activities you have to perform with the product. Always read the chapter For your safety in the operating instructions. Observe the warnings in the chapters so that you can handle and work with the product as intended and safely.

## Explanation of symbols

Various symbols are used for a clear arrangement:

- ▶ The triangle indicates instructions that you should execute
- The bullet point indicates an enumeration
- [...] The square parentheses indicate cross-references to other text passages in the document
- [+] The plus sign in square brackets indicates ordering options and accessories

## Pictograms

In order to make it easier for you to find text passages, pictograms and signal words are used in warning notices:

### **DANGER**

Failure to observe will result in serious or fatal injuries.

### **WARNING**

Failure to observe may result in serious or fatal injuries.

### **CAUTION**

Failure to observe may result in minor or moderate injuries.



## Notes

Notes are used for important information on the product. The possible consequences of failure to observe these include:

- Malfunctions of the product
- Damage to the product
- Damage to the environment



## Information

This sign indicates information, tips and notes for dealing with the product or the software.



## Examples

This symbol shows examples of how to use the product or software.



## QR-Codes

This symbol shows a QR code, via which you can watch videos, animations or other documents. Internet access is required in order to use it.

You can read the QR code, for example, with the camera of your smartphone or tablet. If your camera doesn't support this function you can download a free QR code reader app for your smartphone. Use the Appstore for Apple operating systems or the Google Play Store for Android operating systems.

*If you cannot read the QR code on paper, make sure that the lighting is adequate and reduce the distance between the reading device and the paper. In the case of documentation on a monitor screen, use the zoom function to enlarge the QR code and reduce the distance.*

## Beckhoff Services

Beckhoff and the worldwide partner companies offer comprehensive support and service.

### Support

The Beckhoff Support offers technical advice on the use of individual Beckhoff products and system planning. The employees support you in the programming and commissioning of complex automation systems.

Hotline: +49(0)5246/963-157  
Fax: +49(0)5246/963-199  
e-mail: [support@beckhoff.com](mailto:support@beckhoff.com)  
Web: [www.beckhoff.de/support](http://www.beckhoff.de/support)

### Training

Training in Germany takes place in our training center at the Beckhoff headquarters in Verl, at branch offices or, by arrangement, at the customer's premises.

Hotline: +49(0)5246/963-5000  
Fax: +49(0)5246/963-95000  
e-mail: [training@beckhoff.com](mailto:training@beckhoff.com)  
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### Service

The Beckhoff Service Center supports you with after-sales services such as on-site service, repair service or spare parts service.

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e-mail: [service@beckhoff.com](mailto:service@beckhoff.com)  
Web: [www.beckhoff.de/service](http://www.beckhoff.de/service)

### Download area

In the download area you can obtain product information, software updates, the TwinCAT automation software, documentation and much more.

Web: [www.beckhoff.de/download](http://www.beckhoff.de/download)

### Headquarters

Beckhoff Automation GmbH & Co. KG  
Hülshorstweg 20  
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Fax: +49(0)5246/963-198  
e-mail: [info@beckhoff.com](mailto:info@beckhoff.com)  
Web: [www.beckhoff.de](http://www.beckhoff.de)

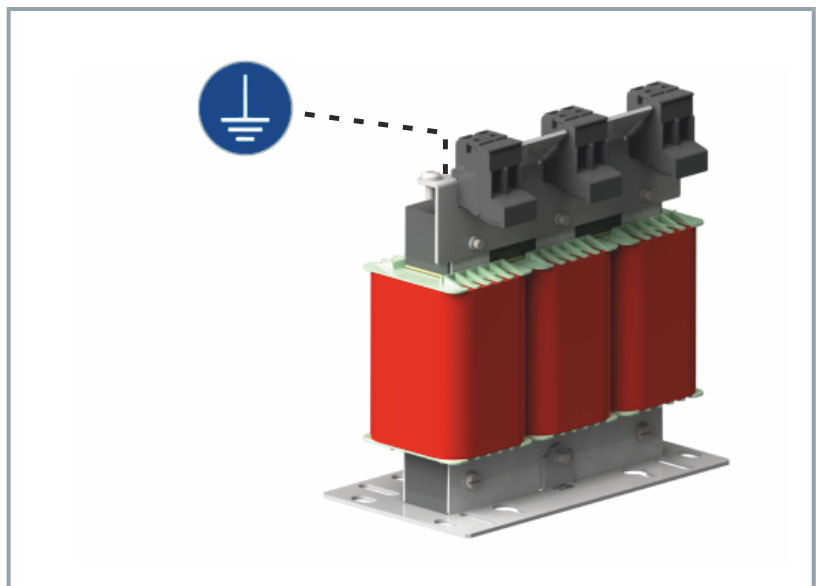
The addresses of the international Beckhoff branch offices can be found on the Beckhoff website: <http://www.beckhoff.de>

Read this chapter containing general safety information. The chapters in these operating instructions also contain warning notices. Always observe the safety instructions for your own safety, the safety of other persons and the safety of the product.

When working with control and automation products, many dangers can result from careless or incorrect use. Work particularly thoroughly, not under time pressure and responsibly towards other people.

## Safety pictograms

On Beckhoff products you will find attached or lasered safety pictograms, which vary depending on the product. They serve to protect people and to prevent damage to the products. Safety pictograms must not be removed and must be legible for the user.



### **Pay attention to the ground connection**

Mount the mains choke only on a chrome-plated or galvanized mounting plate and ground it in accordance with EMC guidelines.

## General safety instructions

This chapter provides you with instructions on safety when handling the product. This product is not capable of stand-alone operation and is therefore categorized as an incomplete machine. The product must be installed in a machine or plant by the machine manufacturer. Read the documentation prepared by the machine manufacturer.

### Before operation

#### **Keep the immediate environment clean**

Keep your workplace and the surrounding area clean. Ensure safe working.

#### **Shut down and secure the machine or plant**

Shut down the machine or plant. Secure the machine or plant against being inadvertently started up.

#### **Do not use damaged components**

Adhere to the specifications from the technical data for storage, transport and operation. Do not use damaged components.

#### **Check safety pictograms**

Check whether the designated pictograms are on the product. Replace missing or illegible stickers.

#### **Observe tightening torques**

Mount and repeatedly check connections and components, complying with the prescribed tightening torques.

#### **Correctly ground electrical components or modules**

Avoid electric shocks due to improper grounding of electrical components or modules. Ground all conductive components according to the specifications in the chapters "Electrical Installation" and "Mechanical Installation".

#### **Use the original packaging only**

When shipping, transporting, storing and packing, use the original packaging or conductive materials.

## During operation

### **Observe the discharge times of the capacitors**

Observe the following delay times after disconnecting from the mains supply:

AX8620 and AX8640	<b>30 minutes</b>
AX8108, AX8118 and AX8206	<b>30 minutes</b>
AX8525 and AX8540	<b>30 minutes</b>

### **Do not work on live electrical parts**

Do not open the multi-axis servo system while it is live. Measure the voltage on the DC link test contacts DC+ und DC-. Only work on the multi-axis servo system when the voltage has dropped to < 50 V. Ensure that the protective conductor is connected properly. Never loosen electrical connections when live. Disconnect all components from the mains and secure them against being switched on again.

### **Do not touch hot surfaces**

Check the cooling of the surfaces with a thermometer. Do not touch the components during and immediately after operation. Allow the components to cool sufficiently after switching off.

### **Avoid overheating**

Operate the components according to the technical specifications. Refer here to the chapter: "Technical data". Provide for sufficient cooling. Switch the components off immediately if the temperature is too high.

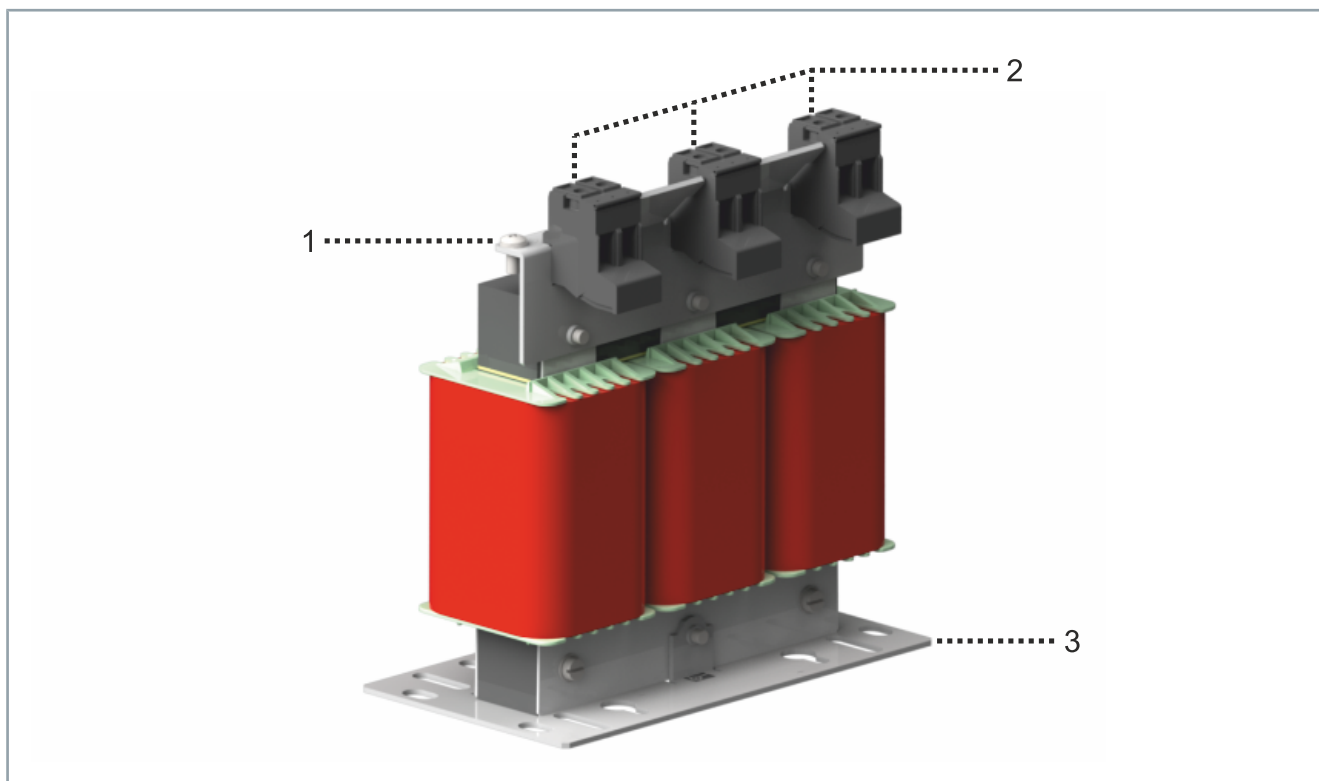
### **Do not touch any moving or rotating components**

Do not touch any moving or rotating components. Fasten all parts or components on the machine or plant.

## After operation

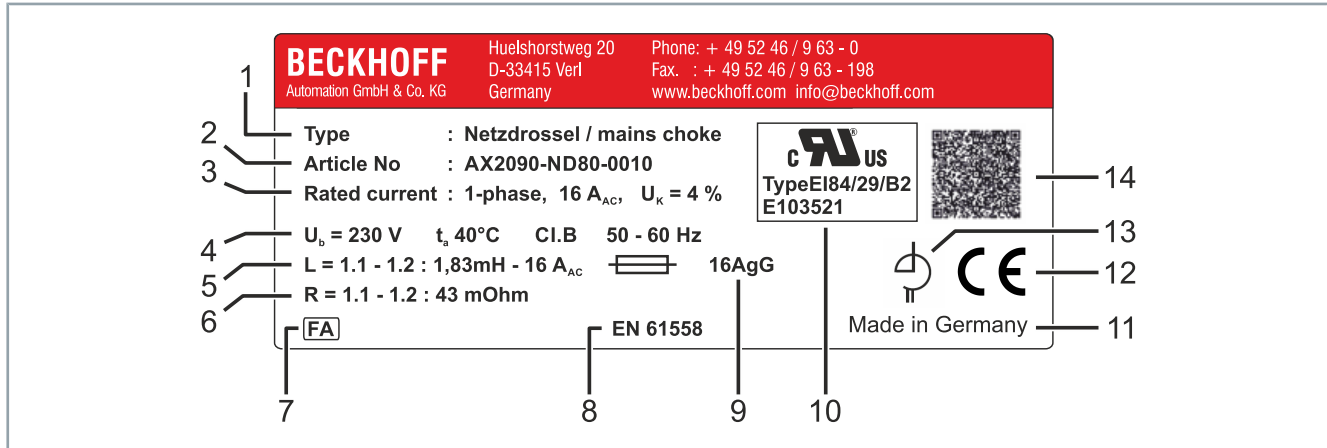
### **De-energize and switch off components before working on them**

Check the functionality of all safety-relevant devices. Secure the working environment. Secure the machine or plant against being inadvertently started up. Observe the chapter: "Decommissioning".



Number	Explanation
1	Screw for PE ground connection
2	Terminal block connections L1/L1' L2/L2' L3/L3'
3	Base plate for mounting

Name plate



Number	Explanation
1	Article name/product type
2	Order number/order identifier
3	Rated current; A <sub>AC</sub> with indication of the short-circuit voltage; U <sub>K</sub>
4	Supply voltage; U <sub>b</sub> with indication of ambient temperature; t <sub>a</sub> , coil insulation material class; B and mains frequency; 50 ... 60 Hz
5	Inductance
6	Resistance
7	Serial number
8	European standard EN 61558
9	Back-up fuse
10	UR certification with specification of the E-number
11	Country of manufacture
12	CE certification
13	Mains choke
14	Data Matrix Code with Beckhoff BTN



## Type key

<b>AX2090 – ND80 – 0xxx</b>	<b>Explanation</b>
AX2090	Product line Drive Technology Accessories
ND	Mains supply Mains choke
80	Series AX8000
00	Not defined
0xxx	Execution 0010 = AX8620-0000 with single-phase power supply 0020 = AX8620-0000 with three-phase power supply 0040 = AX8640-0000 with three-phase power supply 0080 = AX8525/AX8540-0000 with three-phase power supply

## Product characteristics

### **External mains choke**

Mains chokes reduce the interference on the supply grid caused by the IGBT switching processes of the AX8000 multi-axis servo system and smooth current peaks.

### **UL and CSA marking**

The mains chokes from the AX2090-ND80-xxxx series are marked "UL Recognized Component" in accordance with applicable UL and CSA safety requirements. You may therefore use the mains chokes in products, plants or systems bearing the UL test mark.

## Intended use

The mains chokes from the AX2090-ND80-xxxx series may only be operated on an AX8620 power supply module on terminal X1 or on an AX8640 power supply module on terminal X02. For the combined AX85xx power supply and axis modules, the connection is made at terminal X01.

Together with the AX86xx power supply modules or the combined AX85xx power supply and axis modules on a multi-axis servo system, the mains chokes are to be installed in electrical plants or machines and may only be put into operation as integrated components of the plant or machine.



### **Read the entire drive system documentation:**

- This translation of the original instructions
- Original operating instructions for the AX8000 multi-axis servo system
- Complete machine documentation provided by the machine manufacturer

## Improper use

Any type of use that exceeds the permissible values from the technical data is regarded as inappropriate and is thus prohibited.

The mains chokes from the AX2090-ND80-xxxx series are not suitable for use in the following areas:

- Potentially explosive atmospheres without a suitable housing
- Areas with aggressive environments, for example aggressive gases or chemicals
- Areas with ionizing radiation and nuclear plants
- Aerospace industry
- Food processing, pharmacy and cosmetics
- Product areas that are not protected from abrasion

## Data for operation and environment



### Operate mains chokes only under the specified environmental conditions

Operate the mains chokes only under the conditions for operation and the environment listed in this chapter. This way you can ensure a long service life and operation as intended.

*Temperatures above +40 °C and encapsulated installation can shorten the life of the mains chokes.*

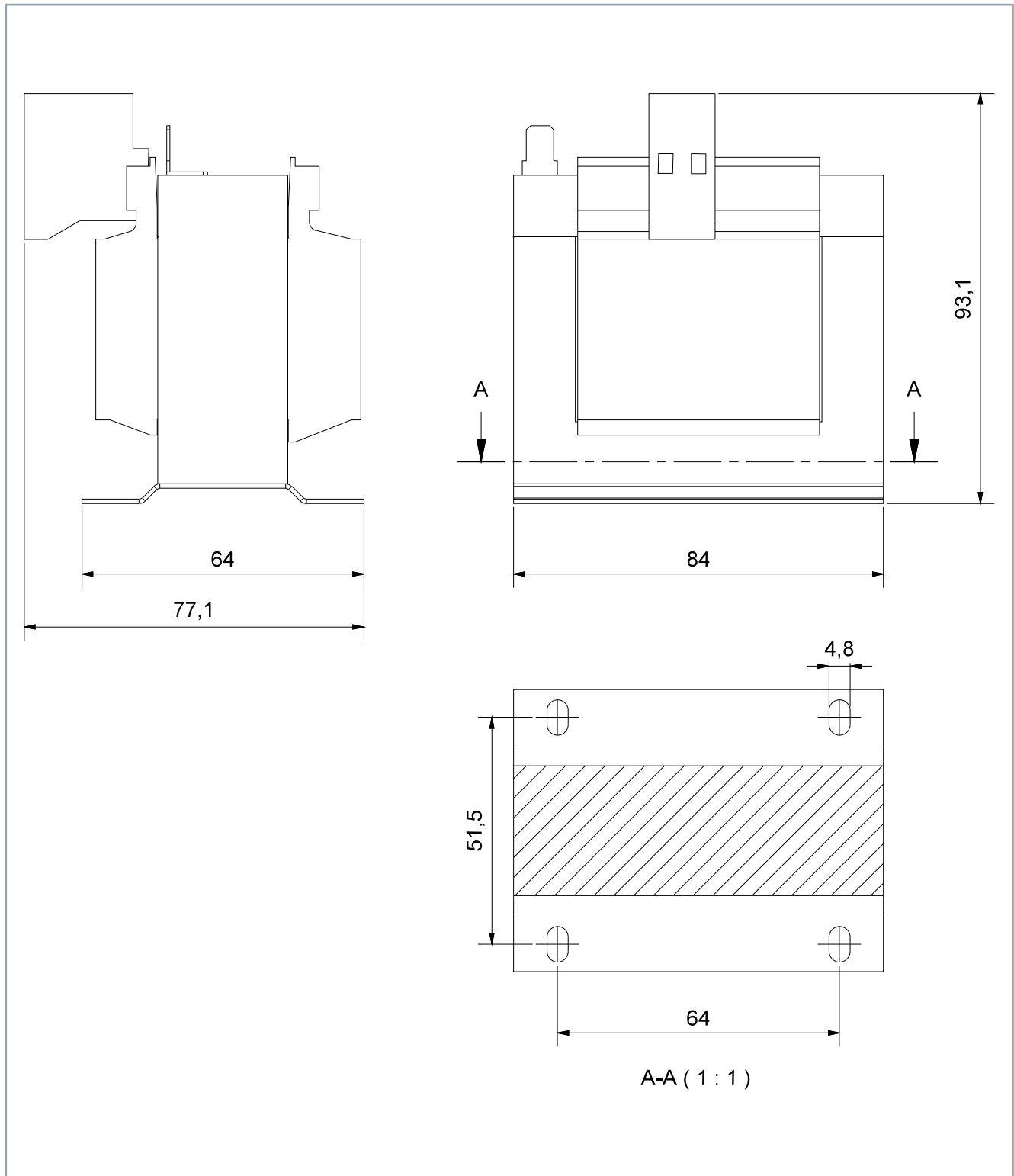
Beckhoff products are designed for operation under certain environmental conditions, which vary according to the product. The following specifications must be observed for operation and environment in order to achieve the optimum service life of the products.

Environmental requirements	
Ambient temperature during operation	-10°C to +40°C Extended temperature range up to 55 °C with a power derating of 2 % / K
Ambient temperature during storage	-25 °C to +70 °C
Permissible humidity in operation	15% ... 95%; condensation not permitted
Degree of pollution	P2 according to EN 61558-1
Specifications for intended use	
Insulation material class	IEC = F / UL = 155
Protection class	IP00
Installation position	Standing upright
Approvals	cURus See chapter: Guidelines and Standards

## AX2090-ND80-0010

<b>Electrical data</b>	<b>AX2090-ND80-0010</b>
Rated current [ $I_{AC}$ ]	16
Power dissipation [W]	25
Rated supply voltage [ $V_{AC}$ ]	1 x 240
Voltage drop [ $V_{AC}$ ]	9.2
Inductance [mH]	1.83
Inductance tolerance [%]	$\pm 10$
Test voltage	2500
<b>Connection technology</b>	
Phase connection [mm <sup>2</sup> ]	4; Screw terminal
Ground connection; PE [mm]	6.3 x 0.8; flat connector
<b>Mechanical data</b>	
Weight [kg]	1.4
Protection class	IP00

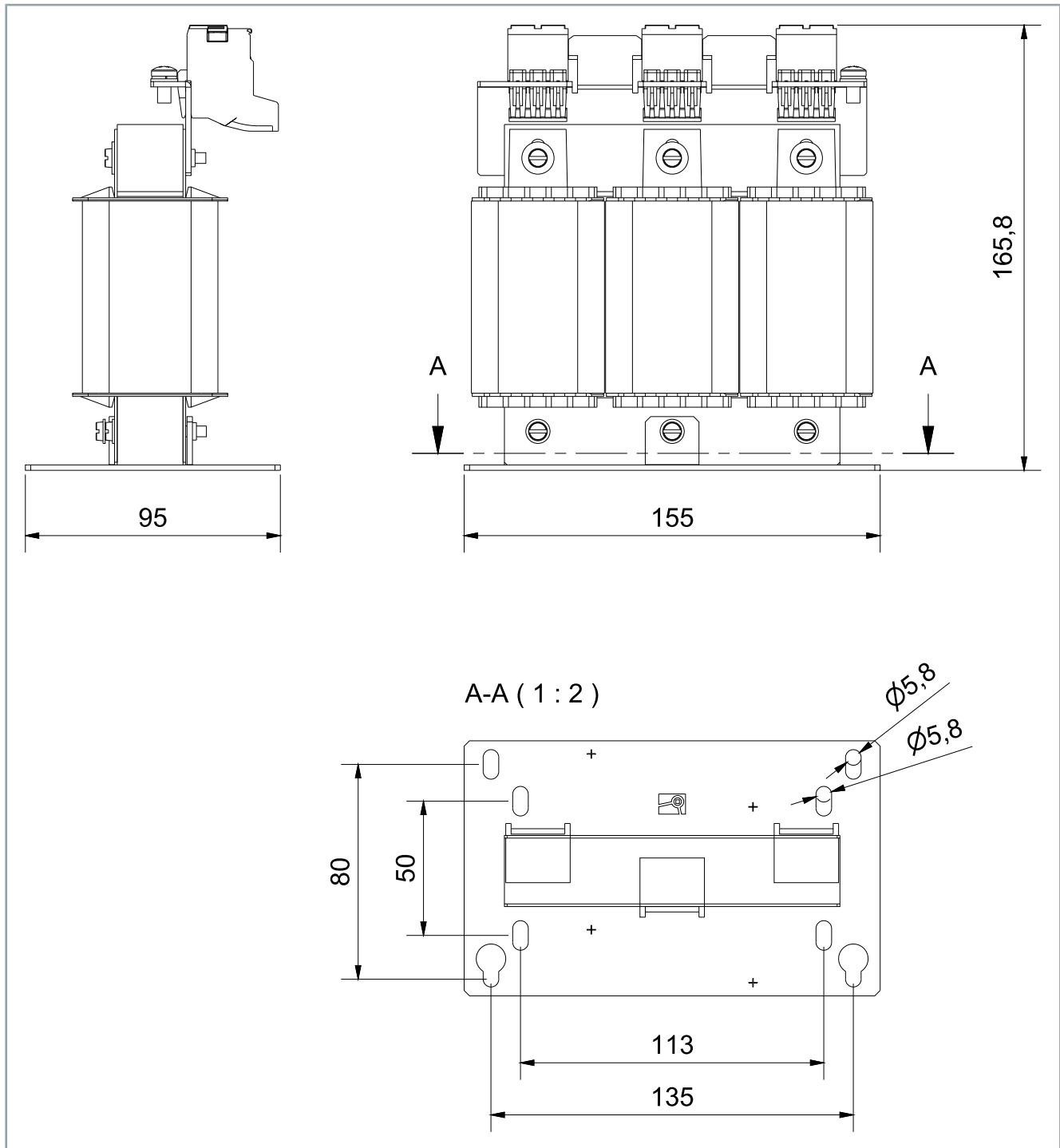
Dimensional drawing



## AX2090-ND80-0020

<b>Electrical data</b>	<b>AX2090-ND80-0020</b>
Rated current [ $I_{AC}$ ]	20
Power dissipation [W]	58
Rated supply voltage [ $V_{AC}$ ]	3 x 480
Voltage drop [ $V_{AC}$ ]	9.2
Inductance [mH]	1.47
Inductance tolerance [%]	$\pm 10$
Test voltage	4000
Short-circuit voltage [ $U_K$ ]	4% at 400 V
<b>Connection technology</b>	
Phase connection [mm <sup>2</sup> ]	4; Screw terminal
Ground connection; PE [mm]	For M5
<b>Mechanical data</b>	<b>AX2090-ND80-0020</b>
Weight [kg]	3.8
Protection class	IP00

Dimensional drawing

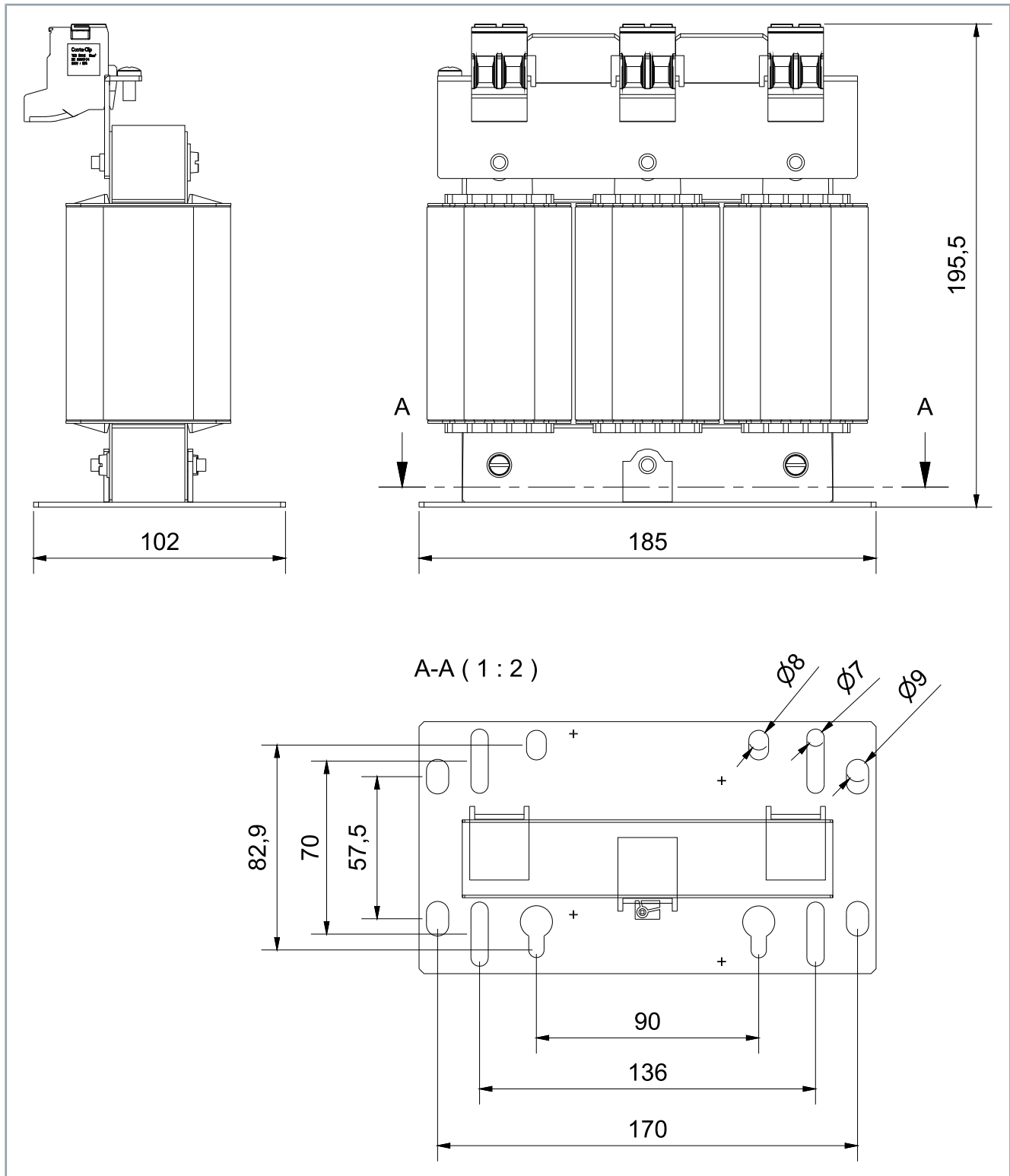




**AX2090-ND80-0040**

<b>Electrical data</b>	<b>AX2090-ND80-0040</b>
Rated current [ $I_{AC}$ ]	40
Power dissipation [W]	115
Rated supply voltage [ $V_{AC}$ ]	3 x 480
Voltage drop [ $V_{AC}$ ]	9.2
Inductance [mH]	0.74
Inductance tolerance [%]	$\pm 10$
Test voltage	4000
Short-circuit voltage [ $U_K$ ]	4% at 400 V
<b>Connection technology</b>	
Phase connection [mm <sup>2</sup> ]	10; Screw terminal
Ground connection; PE [mm]	For M6
<b>Mechanical data</b>	<b>AX2090-ND80-0040</b>
Weight [kg]	6.8
Protection class	IP00

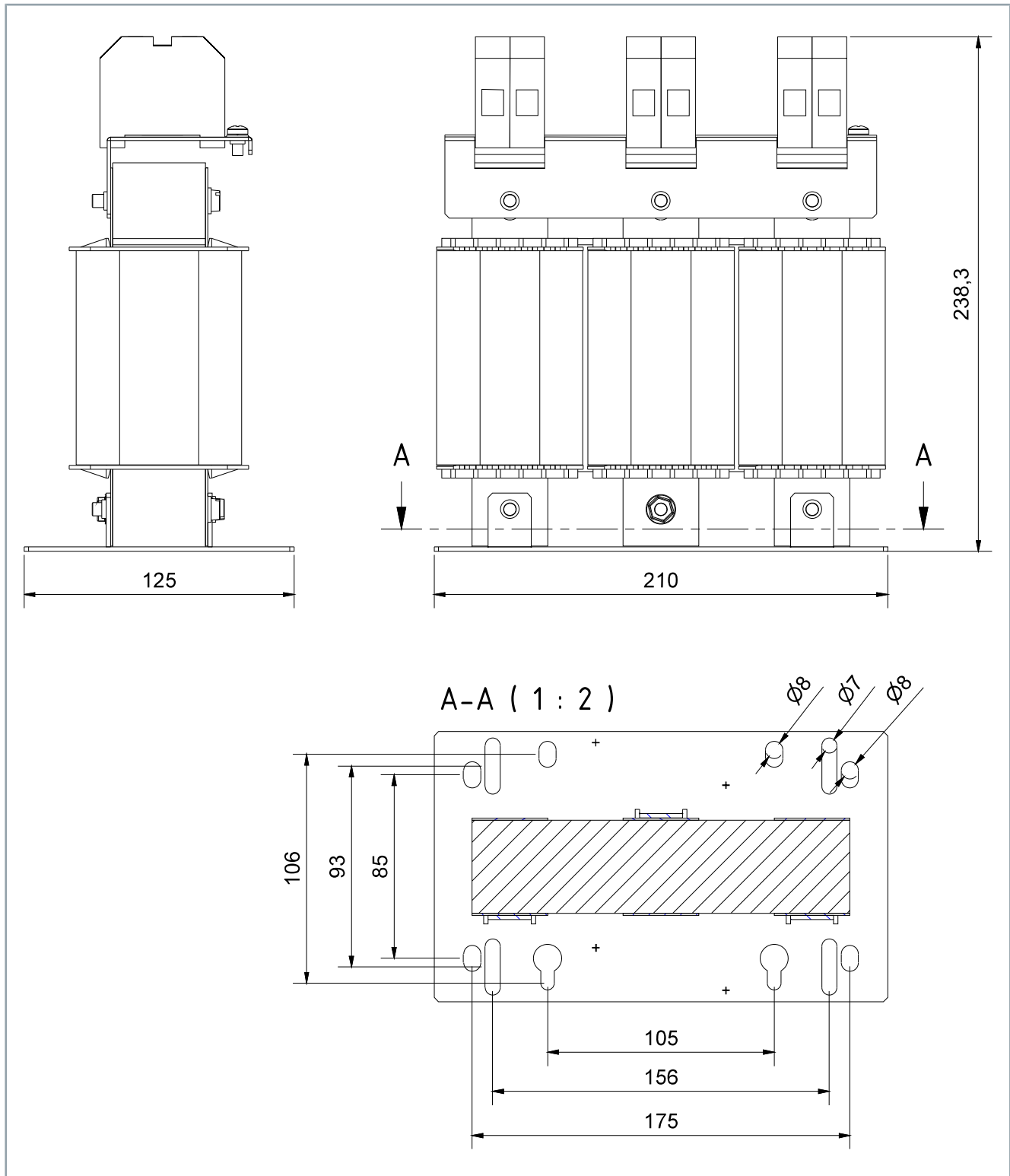
Dimensional drawing



## AX2090-ND80-0080

<b>Electrical data</b>	<b>AX2090-ND80-0040</b>
Rated current [ $I_{AC}$ ]	40
Power dissipation [W]	230
Rated supply voltage [ $V_{AC}$ ]	3 x 480
Voltage drop [ $V_{AC}$ ]	9.2
Inductance [mH]	0.37
Inductance tolerance [%]	$\pm 10$
Test voltage	4000
Short-circuit voltage [ $U_K$ ]	4% at 400 V
<b>Connection technology</b>	
Phase connection [mm <sup>2</sup> ]	10; Screw terminal
Ground connection; PE [mm]	For M6
<b>Mechanical data</b>	<b>AX2090-ND80-0040</b>
Weight [kg]	6.8
Protection class	IP00

Dimensional drawing



**Check the scope of supply for missing or damaged parts**




Check your delivery for completeness. If any parts are missing or became damaged during transport, contact the carrier, vendor or our service department immediately.

Please check that the delivery includes the following items:

- AX2090-ND80-xxxx mains choke

## Packaging

If the mains choke is dispatched in a collective order, instructions for handling are printed on the packaging of the collective order:

Symbol	Explanation
	This is the correct position for the packaging.
	The packaging must be protected from moisture.
	The contents are fragile.

## ⚠ WARNING

### Protect the mains choke against damage

During transport and storage, protect the mains choke against damage and comply with the conditions.

*Damage may result in hazardous voltages being present on the housing or exposed components and can lead to serious or even fatal injuries.*



### Avoid damage to the mains choke

Observe the conditions and the following chapters on transport and storage.

*Failure to comply with the conditions may result in damage to the mains choke and the expiry of the warranty.*

### Avoid short-circuit due to moisture

Condensed water can form during transport in cold weather or in case of extreme temperature differences. Make sure that there is no moisture on and around the mains choke. Slowly adjust the temperature to room temperature. Switch on the mains choke only when it is dry.

*If the mains choke is not completely dry, condensed water can lead to a short circuit when switching on, damaging the mains choke and the system.*

## Conditions

During transport and storage, ensure that the mains choke and individual components are not damaged. Observe the specifications in the following chapters and comply with the following conditions:

- Avoid electrostatic charging
- Avoid contact with highly insulating materials
- Temperature: -40 °C to +55 °C, maximum fluctuation 20 K/hour
- Air humidity: Max. relative humidity 95 %, non-condensing
- Use of suitable means of transport
- Use of the vendor's original packaging

The table shows the maximum stacking height with which you can store and transport the mains chokes on a pallet in the original packaging:

Mains choke type	Stacking height [pieces]
AX2090-ND80	5

## Transport



### **Avoid high mechanical stresses**

Use suitable means of transport and secure the mains choke against large mechanical stresses.

*Large mechanical stresses will damage the mains choke and individual components.*

All mains choke models from the AX2090-ND80-xxxx series can be transported without aids.

## Long-term storage



### **Observe the maximum storage time**

Do not exceed a maximum storage time of five years.

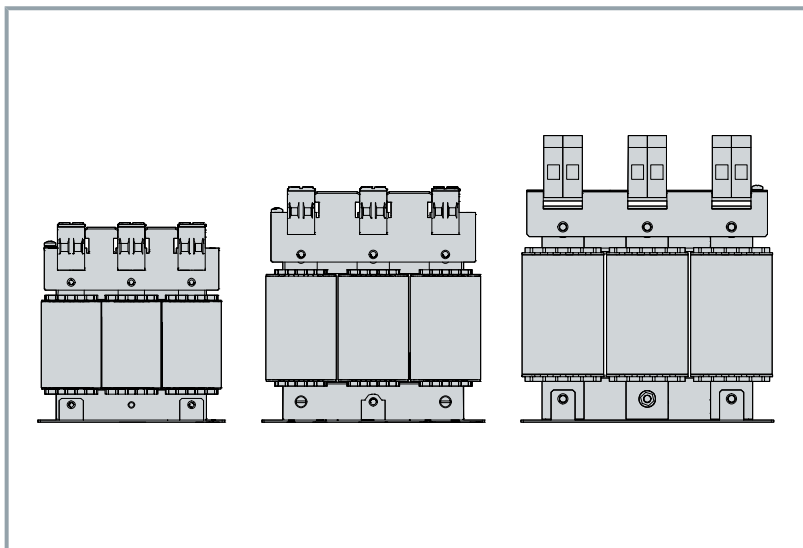
*Exceeding the specified maximum storage time can change the properties of the mains choke and damage it in operation.*

You have the option of storing the mains choke for a short or longer period of time. For storage we always recommend the original packaging. Adhere to the conditions specified in the chapter: "Transport and storage", [Page 30].

Ensure the storage space is vibration-free.

## Installation position

The standard installation position of the mains choke is the upright mounting position.





## ⚠ WARNING

### Avoid contact with DC link DC+ and DC-

Measure the voltage on the DC link test contacts DC+ und DC-. Keep to the waiting times after disconnection from the supply network:

- 30 minutes for AX8620 and AX8640
- 30 minutes for AX8108, AX8118 and AX8206

*There is still a life-threatening voltage of  $> 875 V_{DC}$  on the capacitors after disconnection from the supply network. Serious or even fatal injuries may result if this is ignored.*

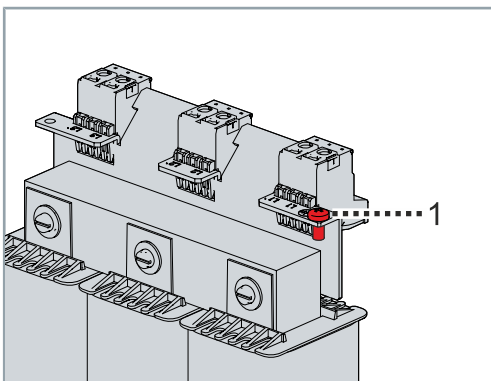


### Electromagnetic compatibility

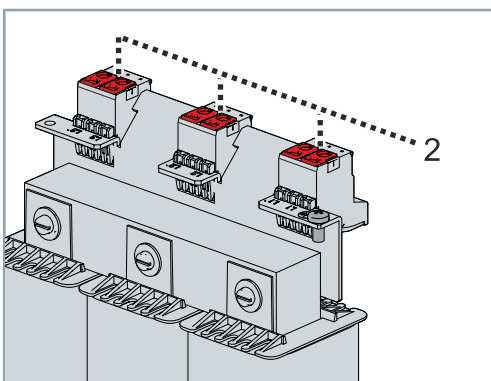
Connect all components and use only shielded cables. Ground the shields of the assembled cables via the mounting plate and place the star point centrally on the unpainted mounting plate.

In the case of larger applications, implement the potential equalization via PE rails.

*Improper grounding or faulty contacting can lead to damage to the multi-axis servo system or to EMC interference emissions. The minimum cross-sections of separate protective conductors can be found in EN 61439-1.*



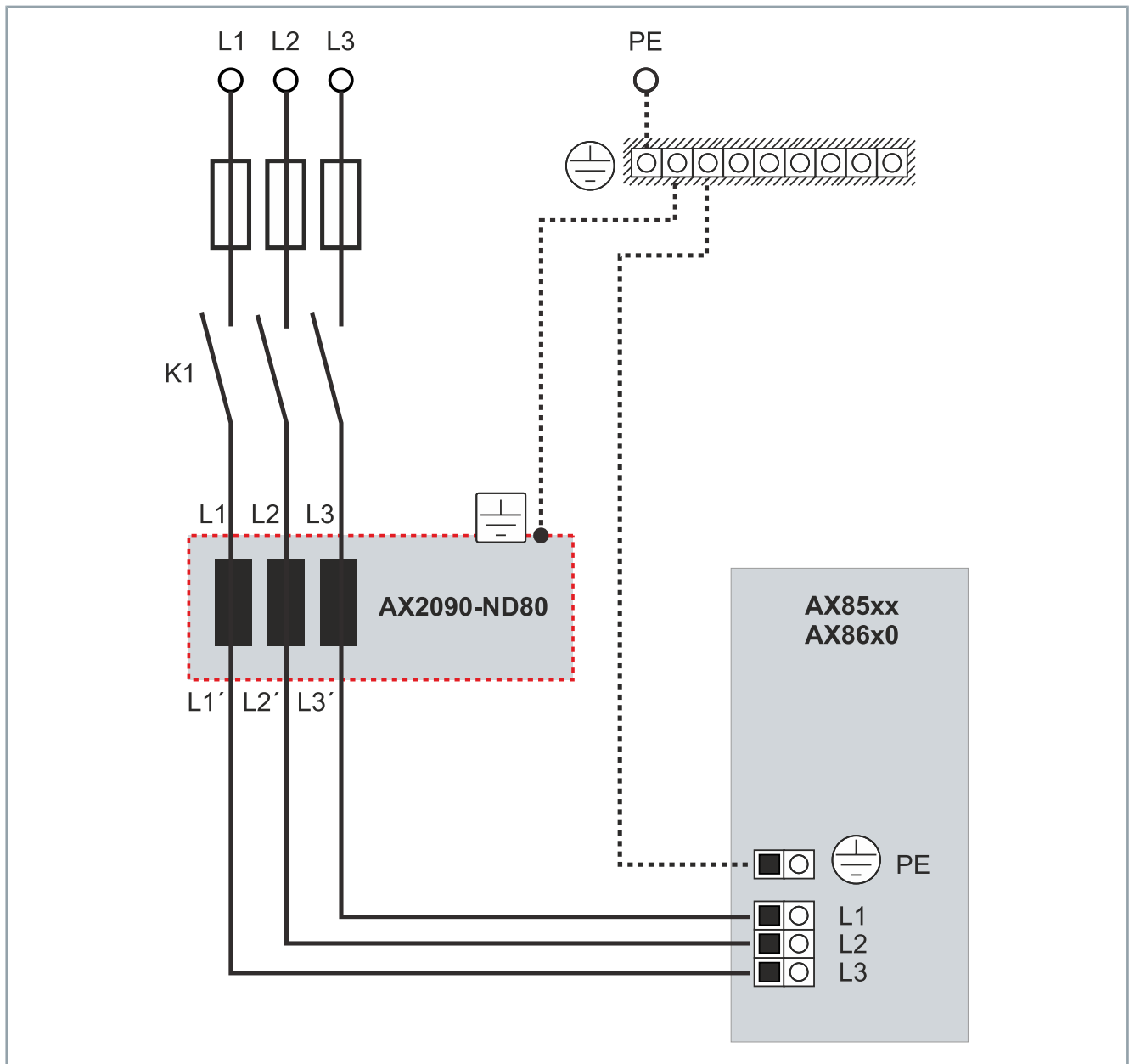
- ▶ Make the ground (PE) connection [1]



- ▶ Make the following connections [2]:

- L1/L1'
- L2/L2'
- L3/L3'

Connection overview



## **WARNING**

### **Ensure safe condition for cleaning work**

Basically, electronic devices are not fail-safe. The condition is always safe when the unit is switched off and not energized. Place the connected mains choke and the machine in a safe state for cleaning work.

*Carrying cleaning work during operation can lead to serious or fatal injuries.*

### **Do not touch hot surfaces**

The surface of the housing can reach a temperature of 200 °C. Allow the mains choke to cool to below 40°C after switching off.

*Ignoring this can lead to burns being sustained.*



### **Do not immerse or spray the mains choke**

Wipe the mains choke only with a cloth.

*Cleaning by immersion will destroy the mains choke. Impermissible solutions will damage the mains choke and surfaces.*

Contamination, dust or chips can have a negative effect on the function of the components. In the worst case, contamination can lead to failure. Beckhoff recommends regular cleaning and maintenance of the components in a system at regular and required intervals.

As a rule, no special maintenance and cleaning measures are foreseen for mains chokes from the AX2090-ND80-xxxx series. A mains choke must be replaced in the event of malfunctions or faults.

Disassembly may only be carried out by qualified and trained personnel.

Read the chapter Documentation notes

When disposing of electronic waste, make sure that you dispose of it in accordance with the regulations applicable in your country. Read and follow the instructions for proper disposal.

## Disassembly

### **WARNING**

#### **Avoid contact with DC link DC+ and DC-**

Measure the voltage on the DC link test contacts DC+ und DC-. Keep to the waiting times after disconnection from the supply network:

- 30 minutes for AX8620 and AX8640
- 30 minutes for AX8108, AX8118 and AX8206

*There is still a life-threatening voltage of  $> 875 V_{DC}$  on the capacitors after disconnection from the supply network. Serious or even fatal injuries may result if this is ignored.*



#### **Do not remove components from the products**

Only Beckhoff Automation GmbH & Co. KG is permitted to remove components.

Contact Beckhoff Service if you have any questions.

#### **Removing the mains choke from the machine**

- Remove cables and electrical connections
- Loosen and remove the mains choke fixing screws
- Transport the mains choke to the workplace or put it into storage

## Disposal

Depending on your application and the products used, ensure the professional disposal of the respective components:

### Cast iron and metal

Dispose of cast and metal parts as scrap metal for recycling.

### Cardboard, wood and foam polystyrene

Dispose of packaging materials made of cardboard, wood or foam polystyrene in accordance with the regulations.

### Plastics and hard plastics

You can recycle parts made of plastic and hard plastic via the recycling depot or re-use them depending on the component designations and markings.

### Oils and lubricants

Dispose of oils and lubricants in separate containers. Hand over the containers at the used oil collection station.

### Batteries and rechargeable batteries

Batteries and rechargeable batteries may also be marked with the crossed-out trash can symbol. You must separate these components from the waste and are legally obliged to return used batteries and rechargeable batteries within the EU. Observe the relevant provisions outside the area of validity of the EU Directive 2006/66/EC.



### Electronic components

Products marked with a crossed-out waste bin must not be disposed of with general waste. Electronic components and equipment must be disposed of properly. The national regulations for the disposal of electrical and electronic equipment must be observed.

## Returning to the vendor

In accordance with the WEEE-2012/19/EU directives, you can return used devices and accessories for professional disposal. The transport costs are borne by the sender.

Send the used devices with the note "For disposal" to:

Beckhoff Automation GmbH & Co. KG  
"Service" Building  
Stahlstrasse 31  
D-33415 Verl

In addition, you have the option to contact a local certified specialist company for the disposal of used electrical and electronic appliances. Dispose of the old components in accordance with the regulations applicable in your country.

## Standards

### **EN 61000-6-2:2005**

*"Electromagnetic compatibility (EMC). Generic standards. Immunity for industrial environments"*

### **EN 61000-6-4:2007+A1:2011**

*"Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments"*

### **RoHS: EN 50581:2012**

*"Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances"*

## Guidelines

### **2014/35/EU**

Low Voltage Directive




### **2011/65/EU**

RoHS Directive

### **2014/30/EU**

EMC Directive

## Test centers

	<p>The AX2090-ND80 mains chokes do not fall within the scope of the Machinery Directive.</p> <p>However, Beckhoff products are designed and evaluated in full compliance with all relevant regulations for personal safety and use in a machine or system.</p>
	<p>The AX2090-ND80 mains chokes meet all the requirements of the Eurasian Economic Union. These include Russia, Belarus, Armenia, Kazakhstan and Kyrgyzstan.</p> <p>The EAC logo can be found on the name plate.</p>
	<p>Ax2090-ND80 mains chokes meet UL requirements and are certified as cURus components for the US and Canadian markets in accordance with US and Canadian standards.</p> <p>The cURus logo can be found on the name plate.</p>

## EU conformity



### Provision

Beckhoff Automation GmbH & Co KG will be pleased to provide you with EU declarations of conformity and manufacturer's declarations for all products on request.

Send your request to: [info@beckhoff.com](mailto:info@beckhoff.com)

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More Information:  
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