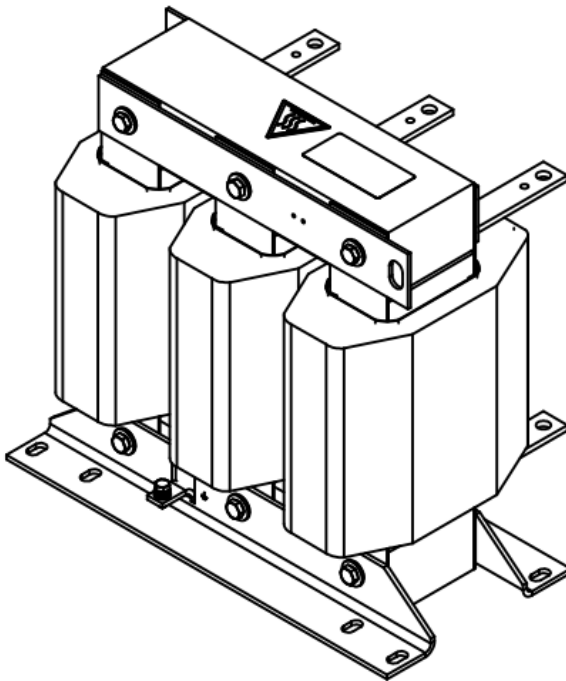




Output chokes three-phase

Instruction manual



Safety information

1

General

2

Mechanical installation

3

Electrical installation

4

Maintenance and
servicing

5

Technical specifications

6

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

DANGER

Indicates that death or severe personal injury will result if proper precautions are not taken.
--

WARNING
--

Indicates that death or severe personal injury may result if proper precautions are not taken.

CAUTION
--

Indicates that minor personal injury can result if proper precautions are not taken.
--

NOTICE

Indicates that property damage can result if proper precautions are not taken.
--

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified personnel

The product/system described in this documentation may be operated only by personnel **qualified for the specific task** in accordance with the relevant documentation for the specific task, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of AQ products

Note the following:

WARNING
--

Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be adhered to. The information in the relevant documentation must be observed.
--

Disclaimer of liability

We have reviewed the contents of this publication to ensure consistency with the product described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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1 Safety information

1.1 General safety instructions



DANGER

Danger to life due to live parts and other energy sources

Touching live parts can result in death or severe injury.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, the following six steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Disconnect the machine from the power supply.
 - Switch off the machine.
 - Wait until the discharge time specified on the warning labels has elapsed.
 - Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
 - Check whether the existing auxiliary supply circuits are de-energized.
 - Ensure that the motors cannot move.
3. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water.
4. Isolate or neutralize all dangerous energy sources, e.g. by closing switches, grounding or short-circuiting, or closing valves.
5. Secure the energy sources against being switched on again.
6. Check that the correct machine is completely locked.

After you have completed the work, restore the operational readiness in the inverse sequence.



WARNING

Electric shock due to connection to an unsuitable power supply

In the event of a fault, touching live parts can result in death or severe injury.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.



! WARNING

Electric shock due to equipment damage

Improper handling may cause damage to equipment.

For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged devices.



! WARNING

Electric shock due to unconnected cable shield

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the conductors of power cables that are not used (e.g. brake cores) at one end at the grounded housing potential.



! WARNING

Electric shock if there is no ground connection

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.



! WARNING

Arcing when a plug connection is opened during operation

Opening a plug connection when a system is in operation can result in arcing that may cause serious injury or death.

- Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.

NOTICE

Property damage due to loose power connections

Insufficient tightening torques or vibration can result in loose power connections. This can result in damage due to fire, device defects or malfunctions.

- Tighten all power connections to the prescribed torque, e.g. line connection, motor connection, DC link connections.
- Check all power connections at regular intervals, particularly after equipment has been transported.

 WARNING

Spread of fire from built-in devices

Fire and smoke development can cause severe personal injury or property damage.

- Install devices without protective housing in a metal control cabinet (or protect the device by another equivalent measure) in such a way that contact with fire is prevented.
- Ensure that smoke can only escape via controlled and monitored paths.

 WARNING

Unexpected movement of machines caused by radio devices or mobile phones

When radio devices or mobile phones with a transmission power > 1 W are used closer than approx. 2 m to the components, they may cause the equipment to malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- Switch off any radio devices or mobile phones in the immediate vicinity of the components.

 WARNING

Danger to life due to fire in the motor as a result of insulation overload

In the event of a ground fault in an IT system, the motor insulation is subjected to a higher load. A possible consequence is failure of the insulation with severe personal injury or death as a result of smoke and fire.

- Use a monitoring device that signals an insulation fault.
- Eliminate the fault as quickly as possible so that the motor insulation is not overloaded.

 WARNING

Fire due to inadequate ventilation clearances

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

 WARNING

Risk of accidents due to missing or illegible warning labels

Missing or illegible warning labels may cause accidents resulting in serious injury or death.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, where necessary in the relevant language.
- Replace illegible warning labels.

NOTICE**Device damage caused by incorrect voltage/insulation tests**

Incorrect voltage/insulation tests can damage the device.

- Before carrying out a voltage/insulation check of the system/machine, disconnect the devices, since all converters and motors have been subject to a high voltage test by the manufacturer. Therefore it is not necessary to perform an additional test within the system/machine.

**WARNING****Danger to life due to inactive safety functions**

Inactive or non-adapted safety functions can trigger machine malfunctions that may result in serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your system into live operation once you have guaranteed that the functions relevant to safety are running correctly.

1.2

Handling electrostatic sensitive devices (ESD)

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.



NOTICE

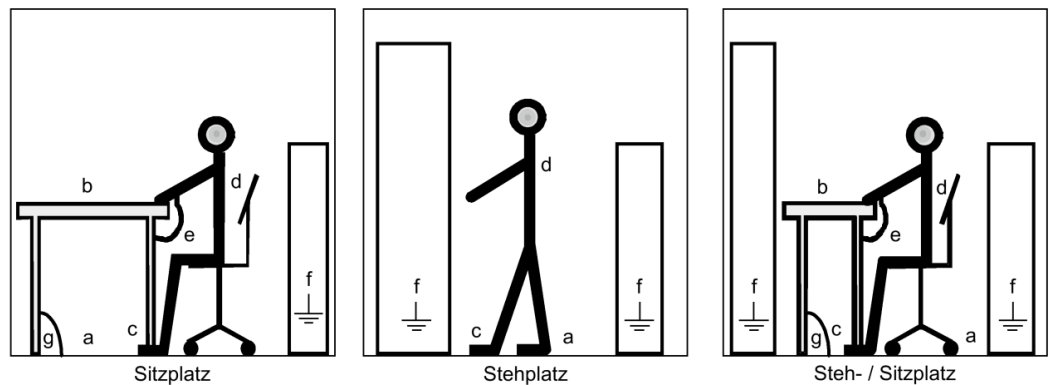
Equipment damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g. conductive foam rubber or aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
 - Wearing an ESD wrist band
 - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

The necessary ESD protective measures are clearly illustrated in the following diagram:

- a = conductive floor surface
- b = ESD table
- c = ESD shoes
- d = ESD overall
- e = ESD wristband
- f = cabinet ground connection
- g = contact with conductive flooring



Picture 1-1 ESD protective measures

2

General

2

2.1

Description

Output chokes are used on the load side of frequency inverters. They compensate capacitive charging currents in the case of long motor cables and limit the voltage rise at the motor terminals.

This makes longer motor cables possible. The inverters can be utilized better, because the load due to harmonic currents is reduced.

**WARNING****Danger to life due to non-compliance with the basic safety instructions and residual risks**

Failure to observe the basic safety instructions and residual risks in Chapter 1 may result in death or serious injury.

- Follow the basic safety instructions.
- Consider the residual risks in the risk assessment.

**WARNING****Risk of fire due to overheating in the case of insufficient ventilation clearances**

Insufficient ventilation clearances can lead to overheating with personal injury due to smoke and fire. Furthermore, increased downtime and shortened component life can occur.

- Keep the ventilation clearances of 100 mm above and below the component.

**CAUTION****Risk of burns due to high surface temperature of the output choke**

The output chokes may exceed a surface temperature of 80 °C. Touching the surface can cause severe burns.

- Mount the output chokes so that touching is impossible. Where this is not possible, affix an appropriate warning at places at risk, clearly visible and understandable.

NOTICE**Damage to the output choke due to exceeding the maximum output frequency**

The maximum allowable output frequency when using the output choke is 150 Hz. Exceeding the output frequency may damage the output choke.

- Operate the output choke with a maximum output frequency of 150 Hz.

NOTICE**Damage to the output choke due to exceeding the maximum pulse frequency**

The maximum allowable pulse frequency when using an output choke is 4 kHz. Exceeding the pulse frequency may damage the output choke.

- When using output chokes, operate the Power Module with a pulse frequency of no more than 4 kHz.

NOTICE**Damage to the output choke due to missing activation during the initial setup**

A missing activation of the output choke during the initial setup may cause damage to the output choke.

- Activate the output choke during the initial setup via the parameter specified by the inverter manufacturer.
- Activate the output choke during the initial setup via the necessary electrical characteristic values

NOTICE**Damage to the output choke when no motor is connected**

Output chokes that are operated without a connected motor can be damaged or destroyed.

- Never operate output chokes connected to the Power Module without a connected motor.

2.2 Assignment of output choke and Power Module

Table 2- 1 Assignment of the output chokes to the electrical data of the frequency inverters

Order No. output choke	TEU2532-0FP00-4EA0	TEU9932-0FP00-4EA0	TEU9932-0FS00-0EA0
Electrical data			
Rated power	18.5 kW	37 kW	55 kW
Rated voltage (phase to phase)	690 V (+10%)	690 V (+10%)	690 V (+10%)
Rated output current (rms)	24 A	45,2 A	66,7 A
Maximum output current (rms)	38 A	70 A	104 A
Rated inductance	1,5 mH	1,2 mH	0,9 mH
Winding resistance R_{20} (tolerance $\pm 5\%$)	3 x 20,9 m Ω	3 x 14,6 m Ω	3 x 10,2 m Ω
Nominal switching frequency	2 kHz	2 kHz	2 kHz
Maximum switching frequency	4 kHz	4 kHz	4 kHz
Output current at maximum switching frequency	14.4 A	27,1 A	40,0 A
Maximum inverter output frequency	150 Hz	150 Hz	150 Hz
Maximum voltage drop @ 50 Hz	11,3 V	17,0 V	18,9 V
Rated DC link voltage	935 V	935 V	935 V
Maximum allowable cable length (screened / unscreened) 3)	350 m / 525 m	350 m / 525 m	350 m / 525 m
Terminal type	Screw terminals	Screw terminals	Screw terminals
Maximum terminal cross section (load circuit)	16 mm ²	35 mm ²	50 mm ²
Degree of protection 1)	IP00	IP00	IP00
Ambient temperature 2)	-20°C to 40°C	-20°C to 40°C	-20°C to 40°C

1) Installing the output choke in an enclosure is required

2) Higher ambient temperatures up to 60°C allowed with current derating at 40°C, in the range 40...50°C with 1,5% per 1K and in the range 50...60°C with 1,9% per 1K

3) It is recommended to use exclusively motors with reinforced insulation in accordance with IEC 60034-25

Table 2- 2 Assignment of the output chokes to the electrical data of the frequency inverters

Order No. output choke	TEU9932-1FC00-1BA0	TEU9932-0FV00-1BA0	TEU4732-0FA00-0BA0
Electrical data			
Rated power	90 kW	132 kW	250 kW
Rated voltage (phase to phase)	690 V (+10%)	690 V (+10%)	690 V (+10%)
Rated output current (rms)	103 A	146 A	260 A
Maximum output current (rms)	160 A	230 A	416 A
Rated inductance	0,53 mH	0,37 mH	0,22 mH
Winding resistance R_{20} (tolerance $\pm 5\%$)	3x 4,9 m Ω	3x 3,25 m Ω	3x 1,4 m Ω
Nominal switching frequency	2 kHz	2 kHz	2 kHz
Maximum switching frequency	4 kHz	4 kHz	4 kHz
Output current at maximum switching frequency	61.8 A	87.6 A	156 A
Maximum inverter output frequency	150 Hz	150 Hz	150 Hz
Maximum voltage drop @ 50 Hz	17,2 V	17,1 V	18,0 V
Rated DC link voltage	935 V	935 V	935 V
Maximum allowable cable length (screened / unscreened) 3)	525 m / 800 m	525 m / 800 m	525 m / 800 m
Terminal type	Bus bar M8	Bus bar M10	Bus bar M10
Maximum terminal cross section (load circuit)	95 mm ²	120 mm ²	2x120 mm ² 1x185 mm ²
Degree of protection 1)	IP00	IP00	IP00
Ambient temperature 2)	-20°C to 40°C	-20°C to 40°C	-20°C to 40°C

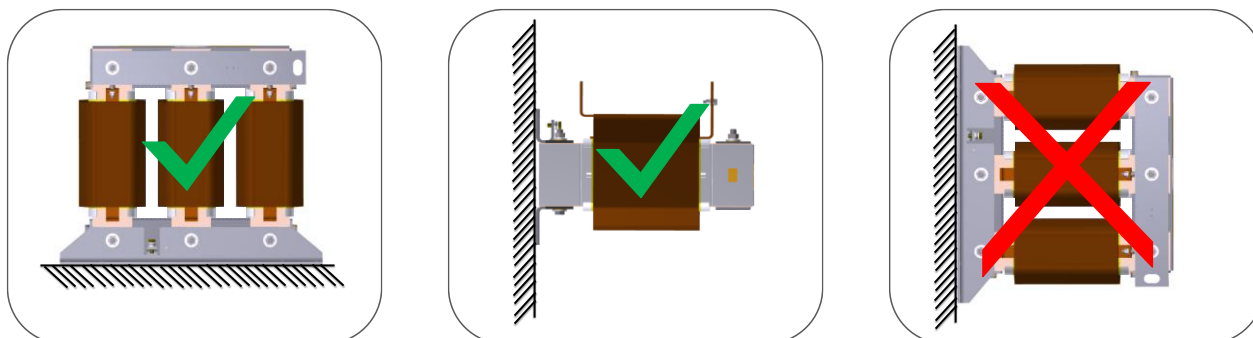
1) Installing the output choke in an enclosure is required

2) Higher ambient temperatures up to 60°C allowed with current derating at 40°C, in the range 40...50°C with 1,5% per 1K and in the range 50...60°C with 1,9% per 1K

3) It is recommended to use exclusively motors with reinforced insulation in accordance with IEC 60034-25

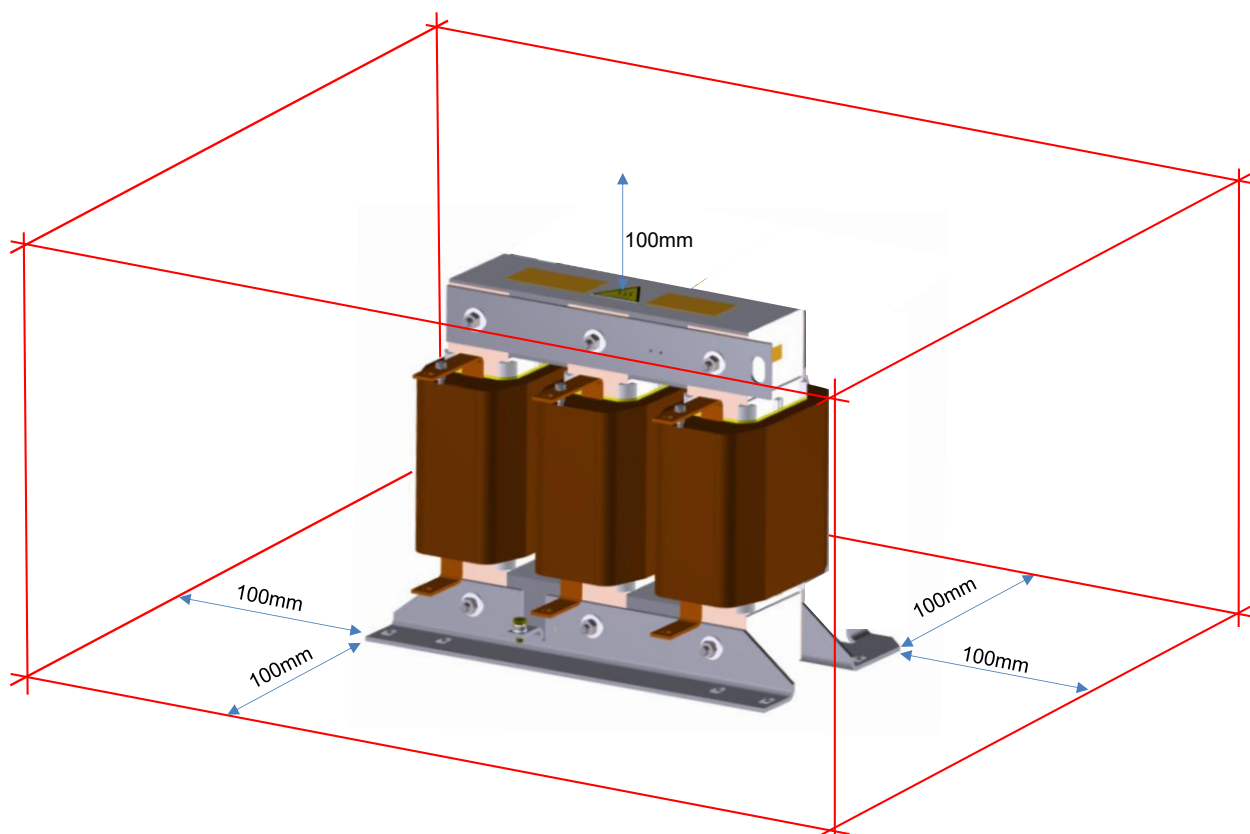
3 Mechanical installation

3.1 Mounting position in the enclosure



Picture 3-1 Mounting position in the enclosure

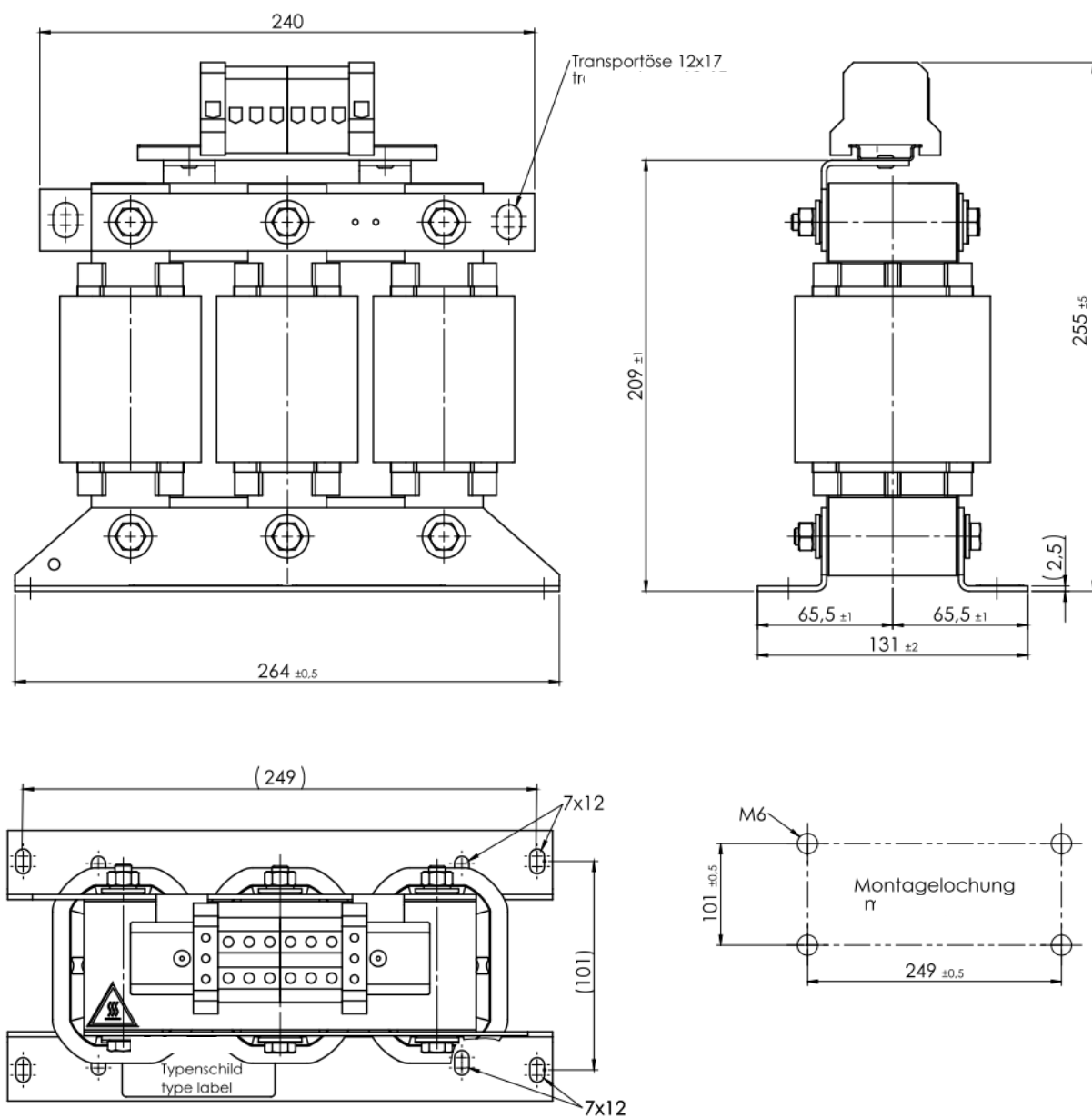
3.2 Distances to neighboring devices



Picture 3-2 Distances to neighboring devices and components

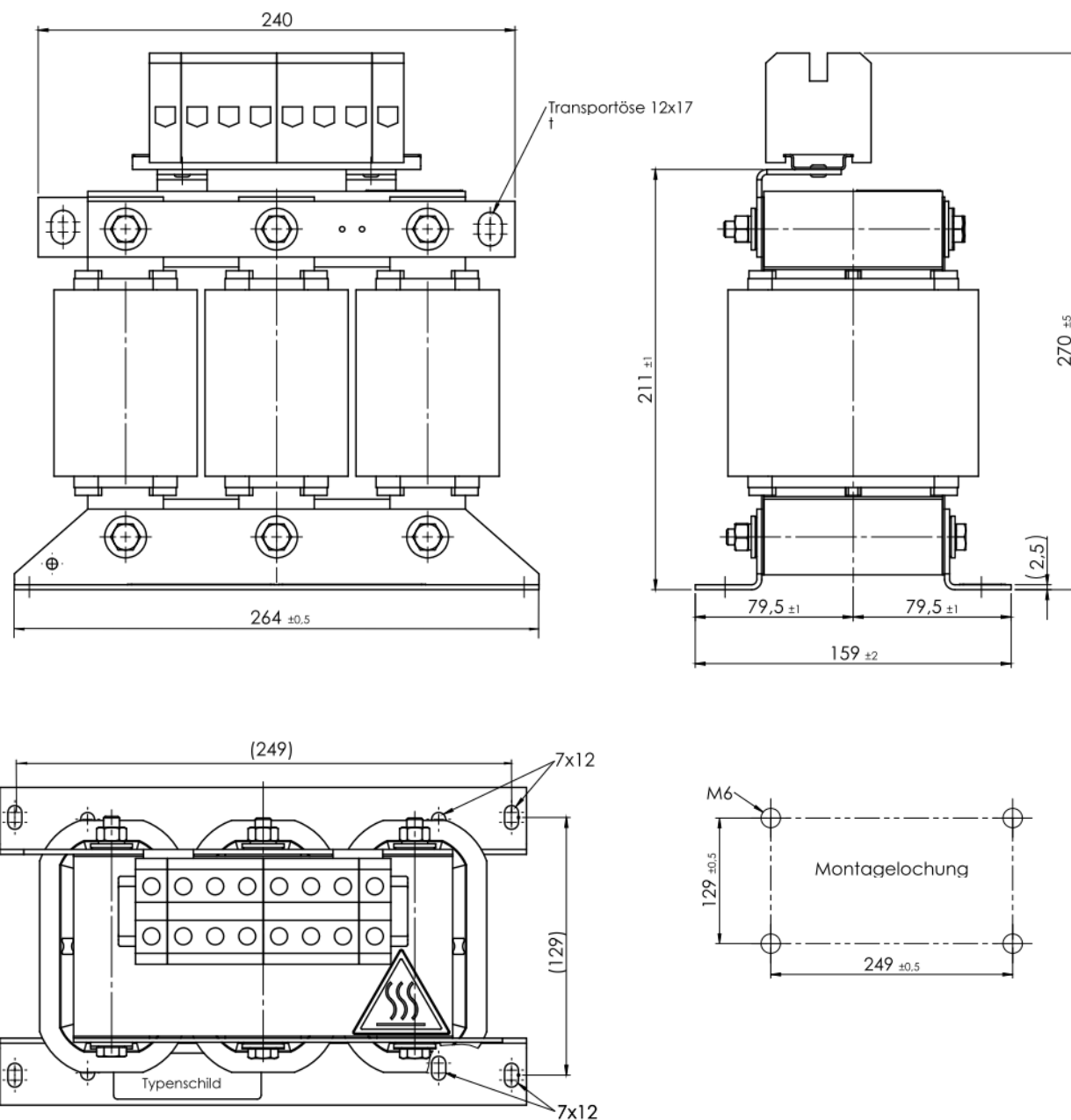
3.3 Dimensions sheets

Output choke TEU2532-0FP00-4EA0



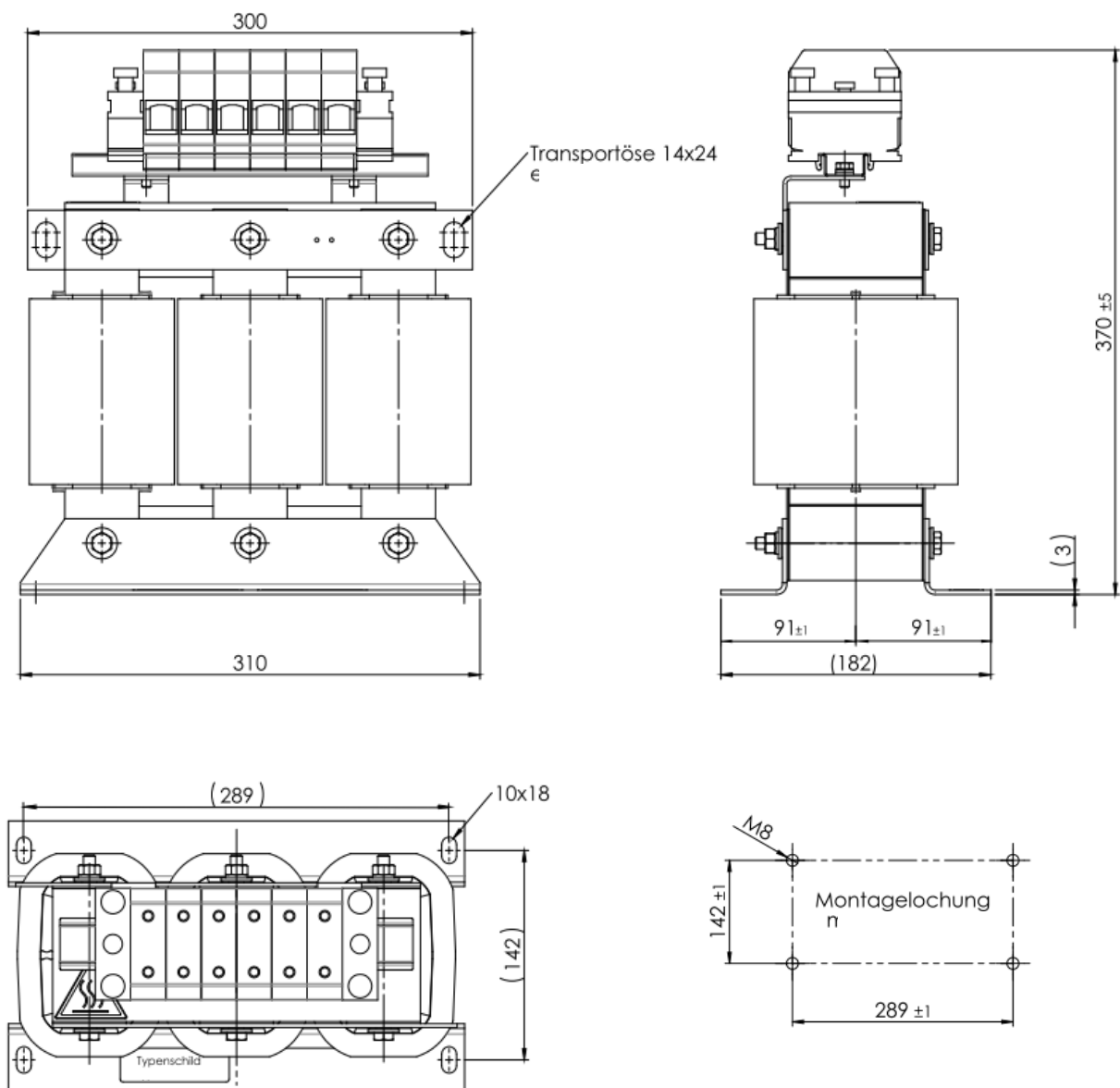
Picture 3-3 Technical drawing output choke MTZEU182-114

Output choke TEU9932-0FP00-4EA0



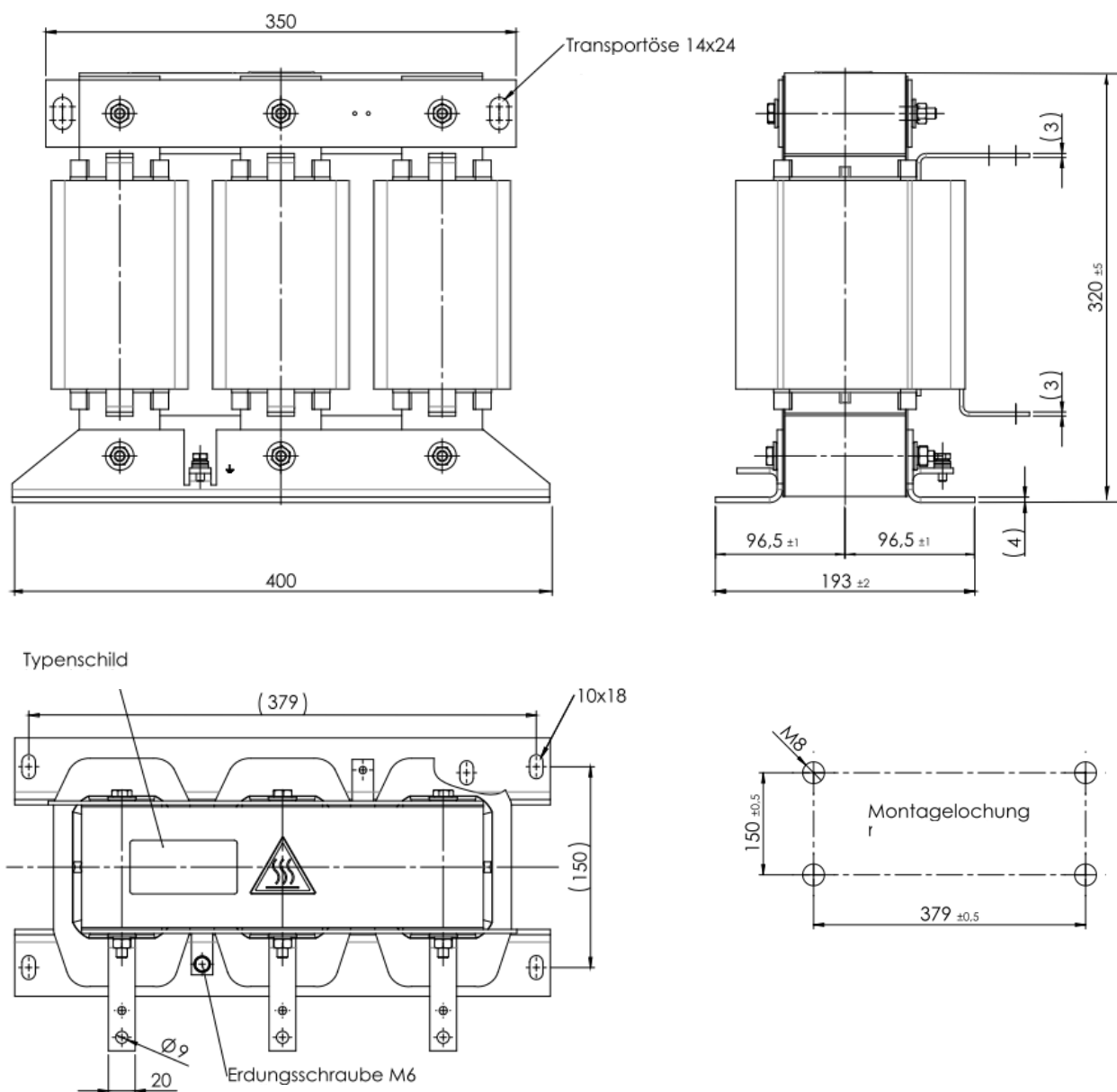
Picture 3-4 Technical drawing output choke MTZEU182-115

Output choke TEU9932-0FS00-0EA0



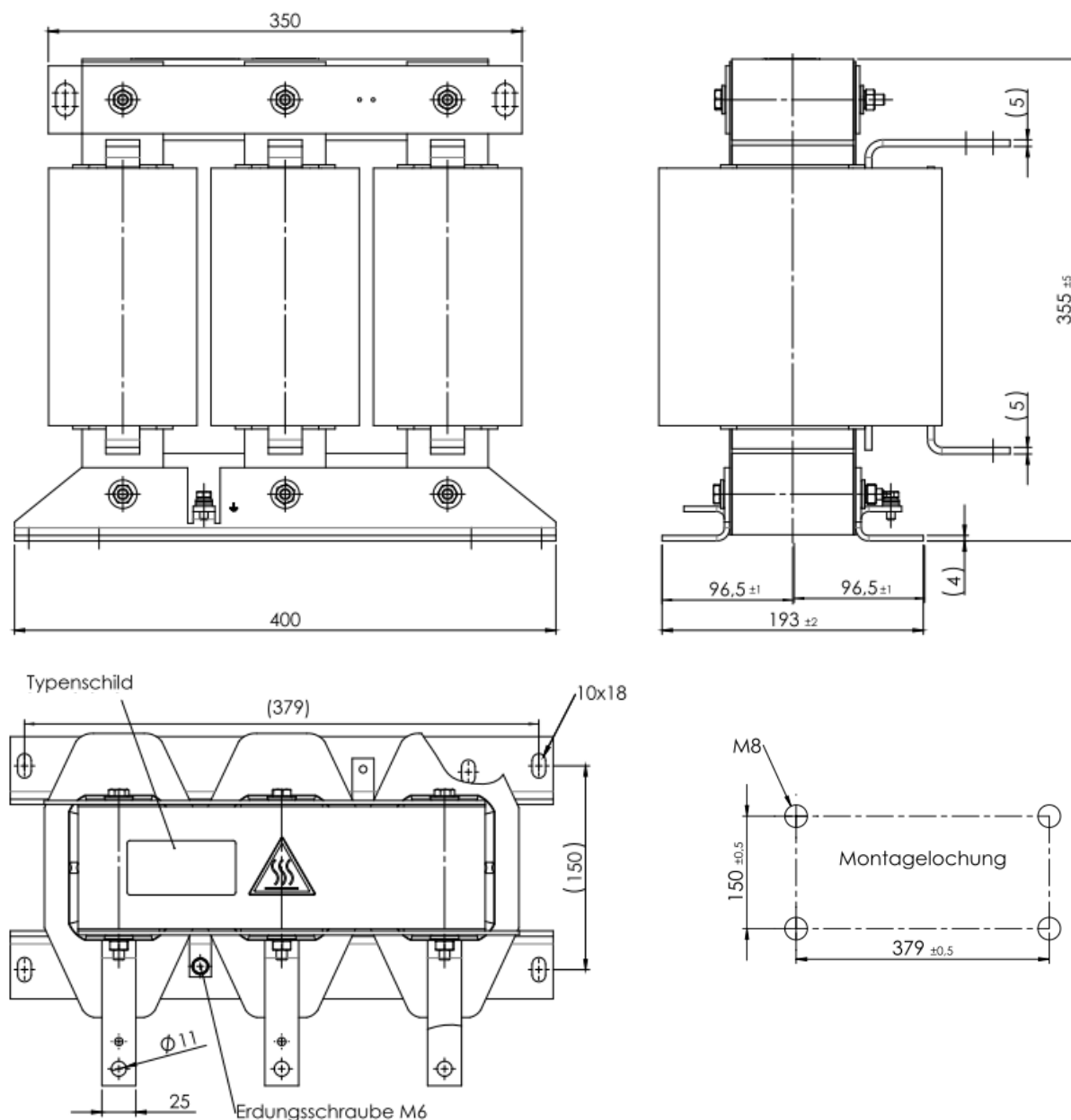
Picture 3-5 Technical drawing output choke MTZEU129-114

Output choke TEU9932-1FC00-1BA0



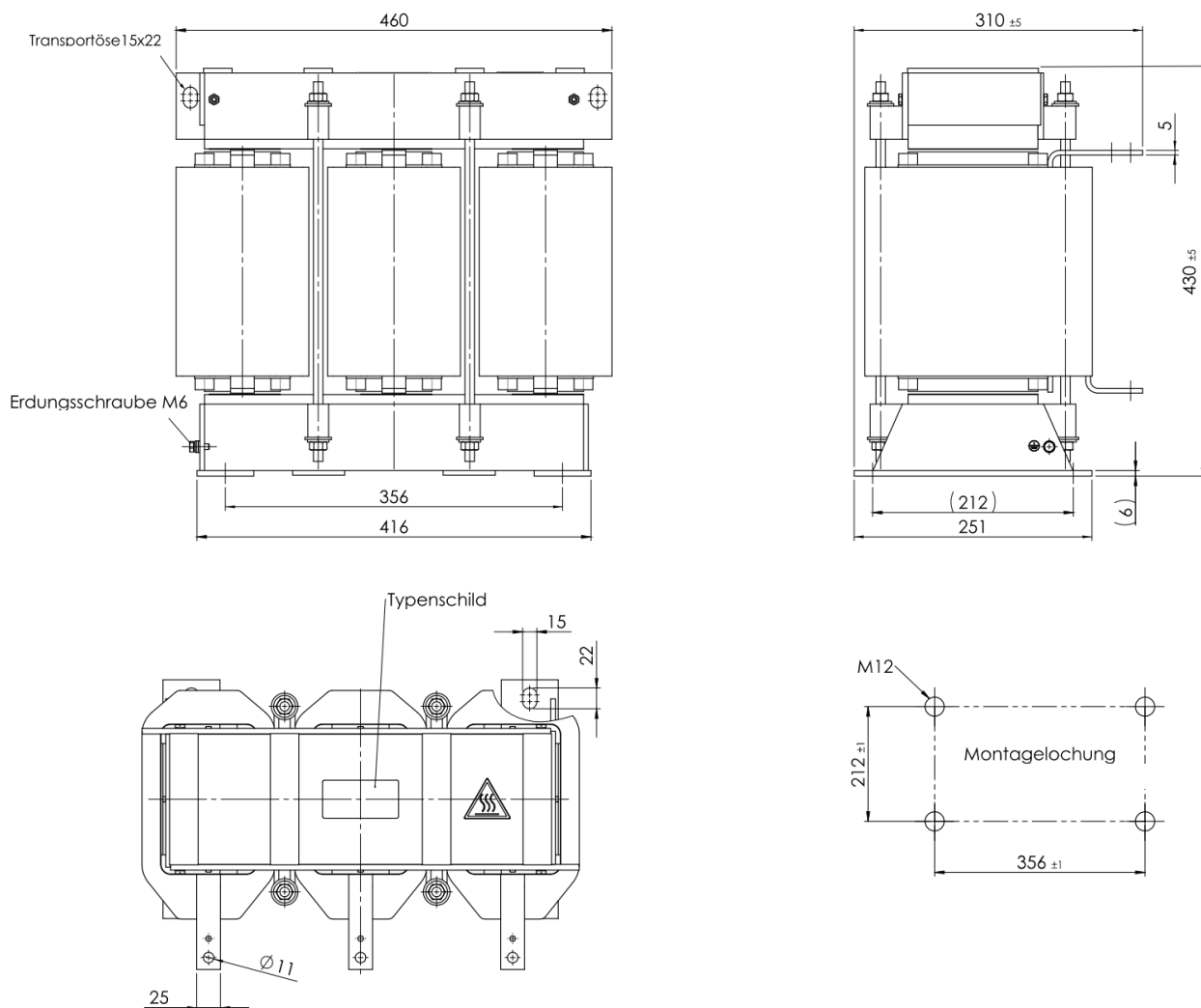
Picture 3-6 Technical drawing output choke MTZEU182-116

Output choke TEU9932-0FV00-0BA0



Picture 3-7 Technical drawing output choke MTZEU182-117

Output choke TEU4732-0FA00-0BA0

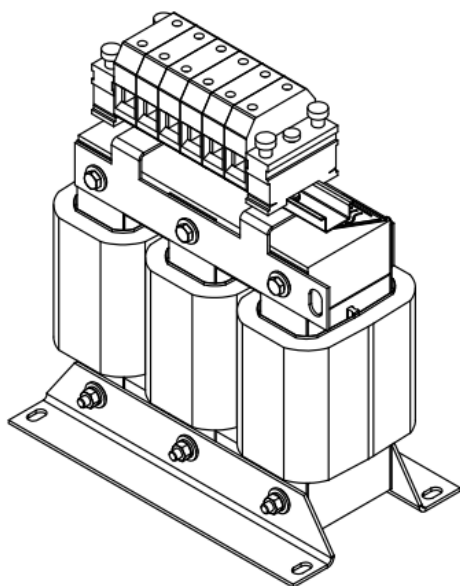


Picture 3-8 Technical drawing output choke MTZEU182-118

4 Electrical installation

4.1 Overview of electrical connections

Output choke with screw terminals

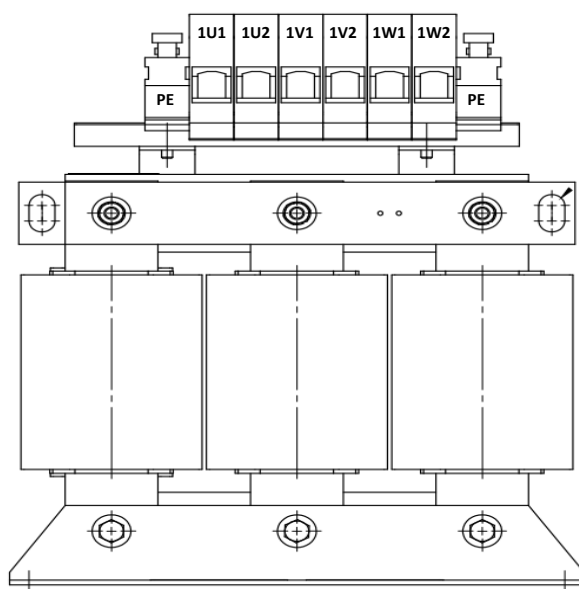


Overview of electrical connections
exemplary for:

TEU2532-0FP00-4EA0

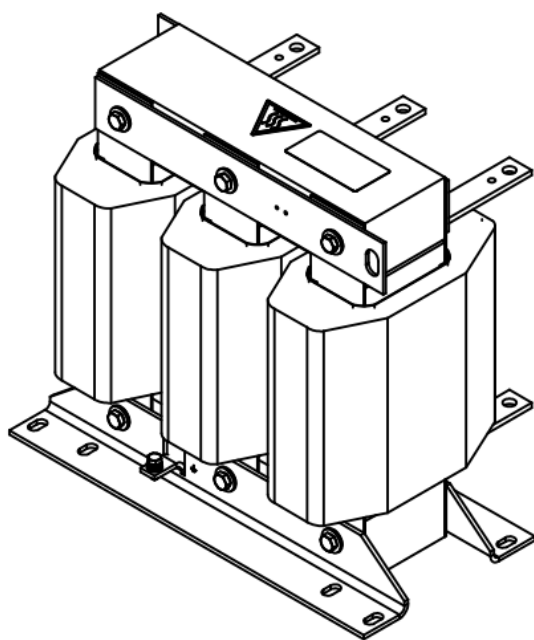
TEU9932-0FP00-4EA0

TEU9932-0FS00-0EA0

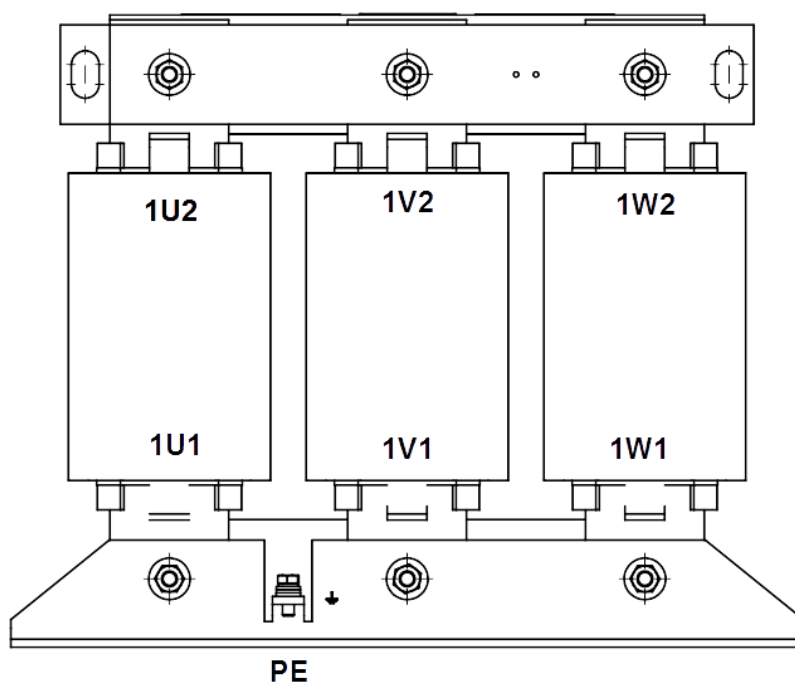


Picture 4-1 Electrical connections output choke TEU9932-0FS00-4EA0

Output choke with bus bar connection

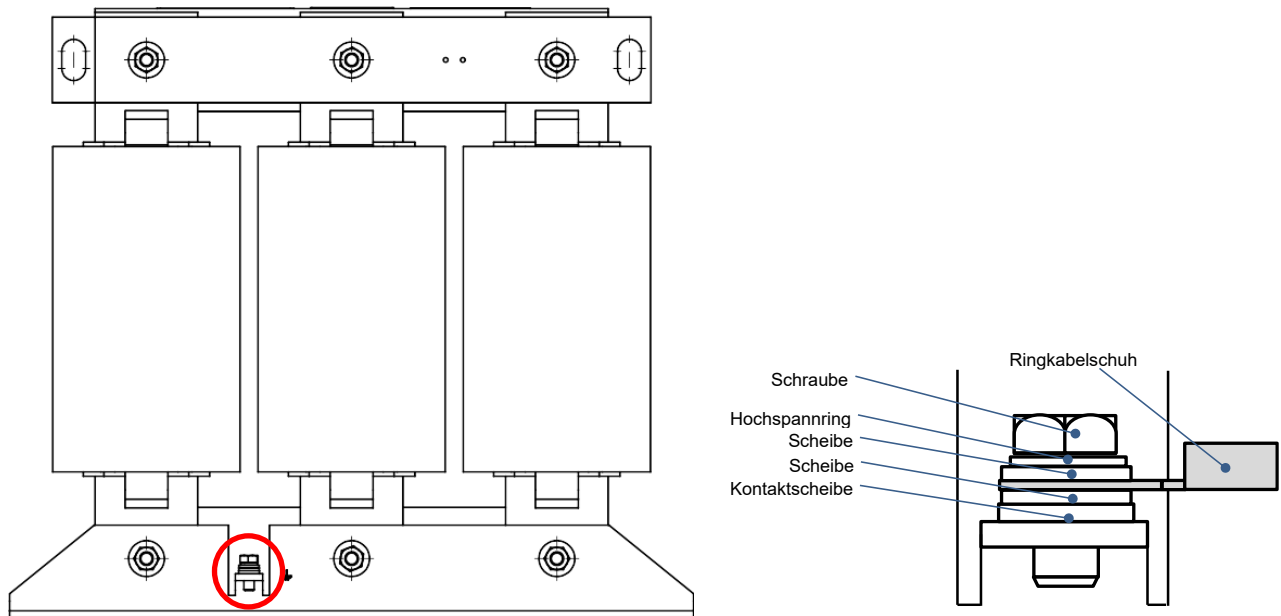


Overview of electrical connections
exemplary for:
TEU9932-1FC00-1BA0
TEU9932-0FV00-0BA0
TEU4732-0FA00-0BA0



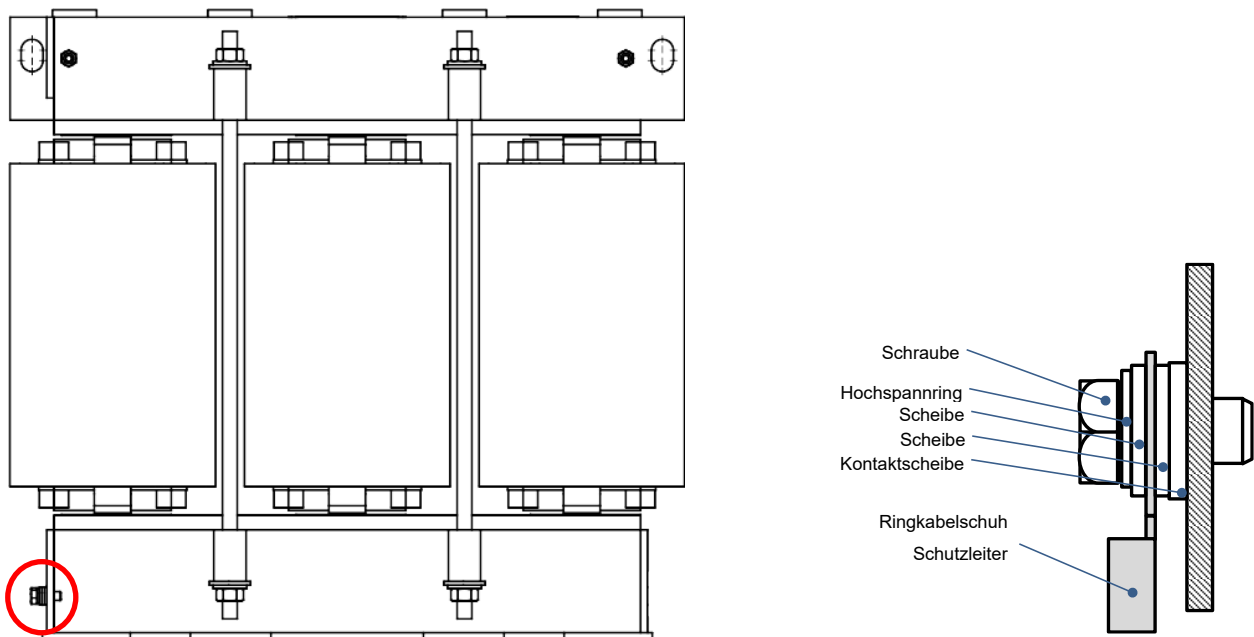
Picture 4-2 Electrical connections output choke TEU9932-0FS00-4EA0

Customer connection protective earth for TEU9932-1FC00-1BA0, TEU9932-0FV00-0BA0



Picture 4-3 Electrical connections output choke TEU9932-1FC00-1BA0, TEU9932-0FV00-0BA0

Customer connection protective earth for TEU4732-0FA00-0BA0



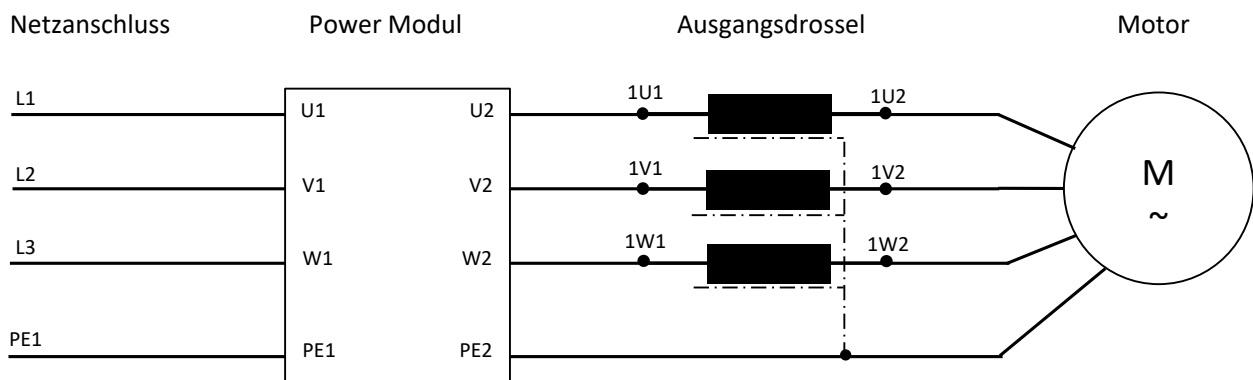
Picture 4-4 Electrical connections output choke TEU4732-0FA00-0BA0

4.2 Connection

To ensure a correct function, the following conditions must be observed when connecting the output choke:

- Control cables must be routed separately from power cables. Power cables are the motor cables from the Power Module to the output choke. In particular, you must ensure that control cables and power cables are not routed in parallel in a joint cable raceway, even if all cables are shielded
- The ground wire for the motor must be fed directly back to the Power Module

4.3 Connection overview



Picture 4-5 Connection overview

WARNING

Damage to the output choke due to mechanical stress on the connections

The connections on the output choke have not been designed for direct mechanical connection of the motor cables.

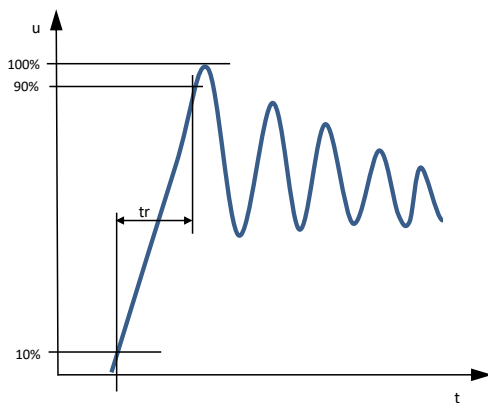
- You must take steps on the plant side to ensure that the mechanical load exerted by the connected cables cannot deform these connections.

4.4 Peak voltage at motor terminals

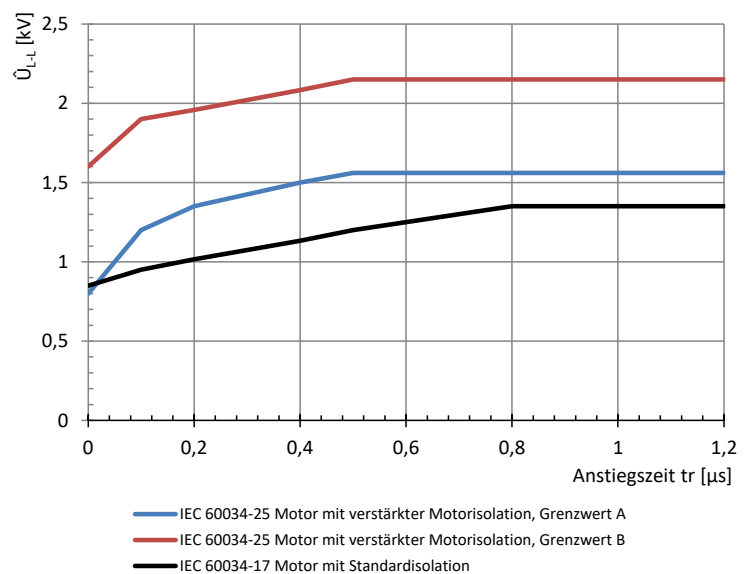
For operational reasons, overvoltages occur at the motor terminals when operating on pulse-width-modulated voltage sources. The magnitude and the rise time of the voltage oscillations depend on ...

- the DC link voltage of the inverter
- the length and type of the connected motor cable
- the surge impedance of the connected motor

The rise time and the magnitude of the voltage oscillations place high demands on the insulation system of the motor. For this reason, an adequate insulation class of the motor must be verified during project planning. For operation on controlled 690 V systems, AQ therefore recommends using exclusively motors with reinforced insulation in accordance with IEC 60034-25.



Picture 4-6 Definition of the rise time t_r at the motor terminals in accordance with IEC



Picture 4-7 Limit value curves of the permissible peak voltage at the motor terminals as a function of the rise time t_r

NOTICE

Motor damage due to excessive voltage oscillations

- For operation on controlled 690 V systems, AQ recommends using only motors with reinforced insulation in accordance with IEC 60034-25

5 Maintenance and servicing

5

5.1 Maintenance and servicing not provided

Maintenance and servicing are not provided for the output choke. In the case of error, full replacement is necessary.

6 Technical specifications

6.1 General technical specifications

Table 6- 1 General technical specifications

Product standard	EN 61558-2-20		
Rated voltage	690V+10%		
Rated frequency	0 to 150Hz		
Insulation class	H (180°C)		
Degree of protection	IP00		
Operating mode	S1		
Approvals			
Ambient conditions	Storage	Transport	Operation
Ambient temperature	-40 ... +70 °C	-40 ... +70 °C	-20 ... +40 °C
Relative humidity 1) (non-condensing) corresponds to class	10 ... 100 % 1K4 to EN 60721-3-1	95 % at 40 °C 2K4 to EN 60721-3-2	5 ... 95 % 3K3 to EN 60721-3-3
Mechanical stability	Storage	Transport	Operation
Vibrational load 1) - Displacement - Acceleration (x,y,z-axis) according to class / standard	stored in transport packaging EN 60721-3-1	1,5 mm at 5 ... 9 Hz 10 m/s ² at >10 ... 200 Hz 1 oct / min (10x sweep) EN 60721-3-2	0,075 mm at 10 ... 58 Hz 10 m/s ² at >58 ... 200 Hz 1 oct / min (10x sweep) EN 60721-3-3 IEC 61800-4-2
Shock load 1) - Acceleration (x,y,z-axis) according to class / standard	-	-	50 m/s ² at 30 ms EN 60721-3-3

¹⁾ The listed EN standards are the European versions of the international IEC standards with the same designation.

6.2 Detailed technical specifications

Table 6- 2 Detailed technical specification output choke, Part 1

Order number TEU...		2532-0FP00-4EA0	9932-0FP00-4EA0	9932-0FS00-0EA0
Rated current	A	24	44	64
Total copper losses @150Hz; 690V	W	63	137	221
Total core losses @150Hz; 690V	W	62	166	183
Connection		Metrical (mm ² / Nm) Imperial (AWG / lbf in)		
		Stripping length (mm)		
Line / motor cable		16 / 1,2 6 / 11,0	35 / 2,5 2 / 22	70 / 6,0 2/0 / 53
		13	17	24
from serial number JTA26 511267xxx (ongoing)		16 / 2,5 6 / 22,1	35 / 3,5 2 / 31	70 / 10,0 2/0 / 86
		13	17	22
Ground		16 / 1,2 6 / 11,0	35 / 2,5 2 / 22	70 / 10,0 2/0 / 86
		13	17	24
from serial number JTA26 511267xxx (ongoing)		16 / 2,5 6 / 22,1	35 / 3,5 2 / 31	70 / 10,0 2/0 / 86
		13	17	22
Maximum allowable cable length between output choke and motor	m	350 (screened) 525 (unscreened)		
Dimensions				
Width	mm	264	264	310
Height	mm	255 ±5	270 ±5	370 ±5
Depth	mm	131 ±2	159 ±2	182 ±2
Weight, approx.	kg	18	26	42

Table 6- 3 Detailed technical specification output choke, Part 2

Order number TEU...		9932-1FC00-1BA0	9932-0FV00-1BA0	4732-0FA00-0BA0
Rated current	A	103	146	260
Total copper losses @150Hz; 690V	W	277	383	572
Total core losses @150Hz; 690V	W	138	137	285
Connection		Metrical (mm ² / Nm) Imperial (AWG / lbf in)		
Line / motor cable		95 / 13,0 3/0 / 115	120 / 13,0 4/0 / 115	2 x 120 / 13,0 2 x 4/0 / 115 185 / 13,0 6/0 / 13,0
Ground		50 / 6,0 1 / 53	70 / 6,0 2/0 / 53	95 / 6,0 3/0 / 53
Maximum allowable cable length between output choke and motor		m	525 (screened) 800 (unscreened)	
Dimensions				
Width	mm	400	400	460
Height	mm	320 ±5	355 ±5	430 ±5
Depth	mm	235 ±5	258 ±5	310 ±5
Weight, approx.	kg	70	90	162

Technical Assistance: E-mail: anfrage.mtcr@aggroup.com
 Technical Support: Internet: www.aggroup.com

Subject to change without prior notice. Store for use at a later date!