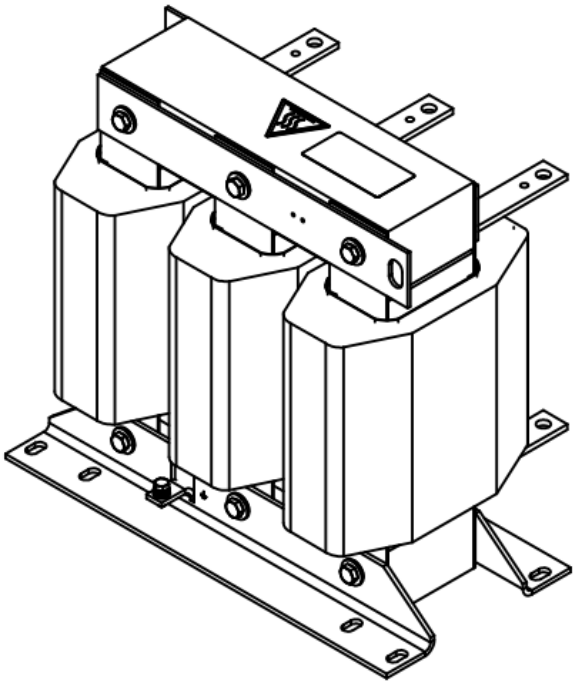
mdexx
Magnetronic Devices

Instruction manual

Output chokes 690V



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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
With a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION
Without a safety alert symbol, 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 Personal

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 mdexx 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 hardware and software 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.

Table of contents

1 Safety information

1.1 General safety instructions

⚠WARNING

Electric shock and danger to life due to other energy sources

Touching live components 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. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
   - 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 of switches,
5. Switch the energy sources to a safe state.
6. Check that the correct drive system 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

When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage that might result in serious injury or death.

- 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 Modulees.

⚠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 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.
- Check all power connections at regular intervals, particularly after equipment has been transported.

⚠WARNING

Spread of fire from built-in devices

In the event of fire outbreak, the enclosures of built-in devices cannot prevent the escape of fire and smoke. This can result in serious personal injury or property damage.

- Install built-in units in a suitable metal cabinet in such a way that Personnel are protected against fire and smoke, or take other appropriate measures to protect Personnel.
- 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 in the immediate vicinity of 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.

- If you come closer than around 2 m to such components, switch off any radios or mobile phones.

⚠WARNUNG

Damage to motor insulation due to excessive voltages

When operated on systems with grounded line conductor or in the event of a ground fault in a IT system, the motor insulation can be damaged by the higher voltage to ground. If the motor insulation is not designed for operation with grounded line conductors, you have to perform the following measures:

- IT system: Use a ground fault monitor and eliminate the fault as quickly as possible.
- TN or TT systems with grounded line conductor: Use an isolating transformer on the line side.

⚠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.

⚠WARNUNG

Unrecognized dangers due to missing or illegible warning labels

Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers 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 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

Unexpected movement of machines caused by inactive safety functions

Inactive or non-adapted safety functions can trigger unexpected machine movements 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 Equipment damage due to electric fields or electrostatic discharge

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

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 of 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

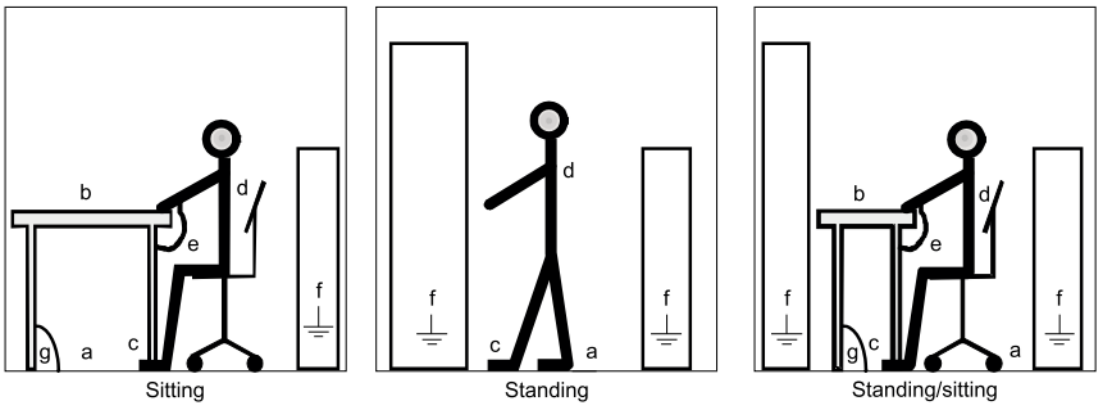


Figure 1-1 ESD protective measures

2 General 2

2.1 Description

Output chokes are used on the load side of the frequency inverters. They compensate the capacitive recharge currents of long motor cables and limit the voltage rise at the motor terminals. This result in the use of longer motor cables and with the reduction of the harmonic currents, the inverter efficiency is increased.

⚠ 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.
- Mount the output chokes only in a vertical position so that the heat sinks flow through the heat sinks from bottom to top.

⚠ NOTICE

Risk of burns due to high surface temperature of the output chokes

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

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

NOTICE

Damage to the output chokes due to exceeding the maximum output frequency

The maximum allowable output frequency during the operation is 150Hz. Exceeding the maximum output frequency may damage the output chokes.

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

NOTICE
Damage to the output chokes due to exceeding the maximum pulse frequency
The maximum allowable pulse frequency during the operation is 4kHz. Exceeding the pulse frequency may damage the output chokes. • When using a output chokes, pulse frequency of the Power Module should be not higher than 4kHz

NOTICE
Damage to the output chokes due to missing activation during the initial setup
A missing activation during the initial setup may cause a damage to the output chokes • Activate the output chokes during the initial setup via the parameter specified by the inverter manufacturer.

NOTIVE
Damage to the output chokes due to non-connected machine
Output chokes that are operates without connect machine can be damaged or destroyed. • Never operate the output chokes with a Power Module without connected motor

2.2 Assignment of output choke and Power Module

Table 2- 1 Assignment of output chokes and Power Modules

Order No. output chokes TEU…	2532-0FP00-4EA0	9932-0FP00-4EA0	9932-0FS00-0EA0
Electrical data frequency inverter			
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	44 A	64 A
Maximum output current (rms)	38 A	70 A	104 A
Inductance (Tolerance ± 5%)	1,5 mH	1,2 mH	0,9 mH
Winding resistance (Tolerance ± 5%)	3x 20,9 mΩ	3x 14,6 mΩ	3x 10,24 mΩ
Nominal switching frequency	2 kHz	2 kHz	2 kHz
Maximum switching frequency	4 kHz	4 kHz	4 kHz
Output current maximum switching frequency	14.4 A	26.4 A	38.4 A
Maximum inverter frequency	150 Hz	150 Hz	150 Hz
Voltage drop	17,15 V	17,13 V	17,97 V
Rated DC link voltage	935 V	935 V	935 V
Maximum cable length filter – motor (screened / unscreened) 3)	350 m / 525 m	350 m / 525 m	350 m / 525 m
Terminal type	Screw terminals	Screw terminals	Screw terminals
Rated terminal cross section (load circuit)	16 mm²	35 mm²	50 mm²
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 filter 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 only motors with reinforced insulation according to IEC60034-25

Table 2- 2 Assignment of output chokes and Power Modules

Order No. output chokes TEU…	**9932-1FC00-1BA0**	**9932-0FV00-1BA0**	**4732-0FA00-0BA0**
Electrical data frequency inverter			
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
Inductance (Tolerance ± 5%)	0,53 mH	0,37 mH	0,22 mH
Winding resistance (Tolerance ± 5%)	3x 4,9 mΩ	3x 3,25 mΩ	3x 1,4 mΩ
Nominal switching frequency	2 kHz	2 kHz	2 kHz
Maximum switching frequency	4 kHz	4 kHz	4 kHz
Output current maximum switching frequency	61.8 A	87.6 A	156 A
Maximum inverter frequency	150 Hz	150 Hz	150 Hz
Voltage drop	17,2 V	17,1 V	18,0 V
Rated DC link voltage	935 V	935 V	935 V
Maximum cable length filter – motor (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
Rated terminal cross section (load circuit)	95 mm²	120 mm²	2x120 mm² 1x185 mm²
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

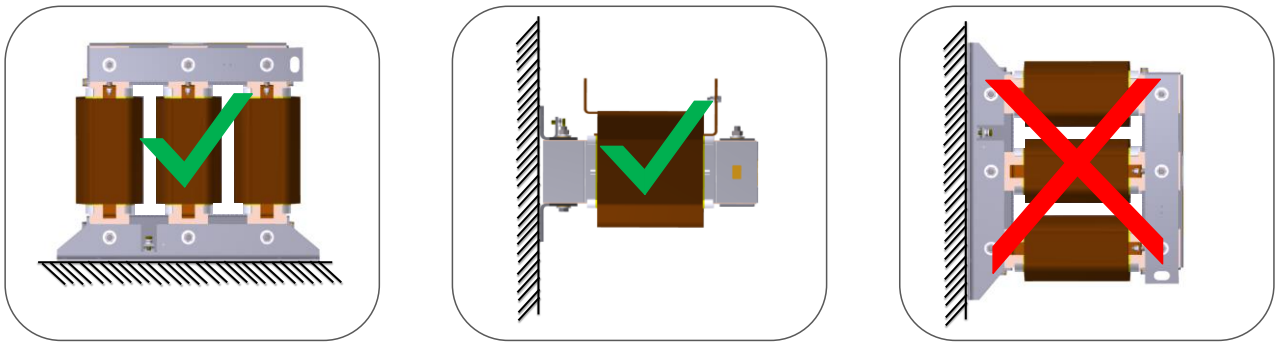
1) Installing the filter in an enclosure is required

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 only motors with reinforced insulation according to IEC60034-25

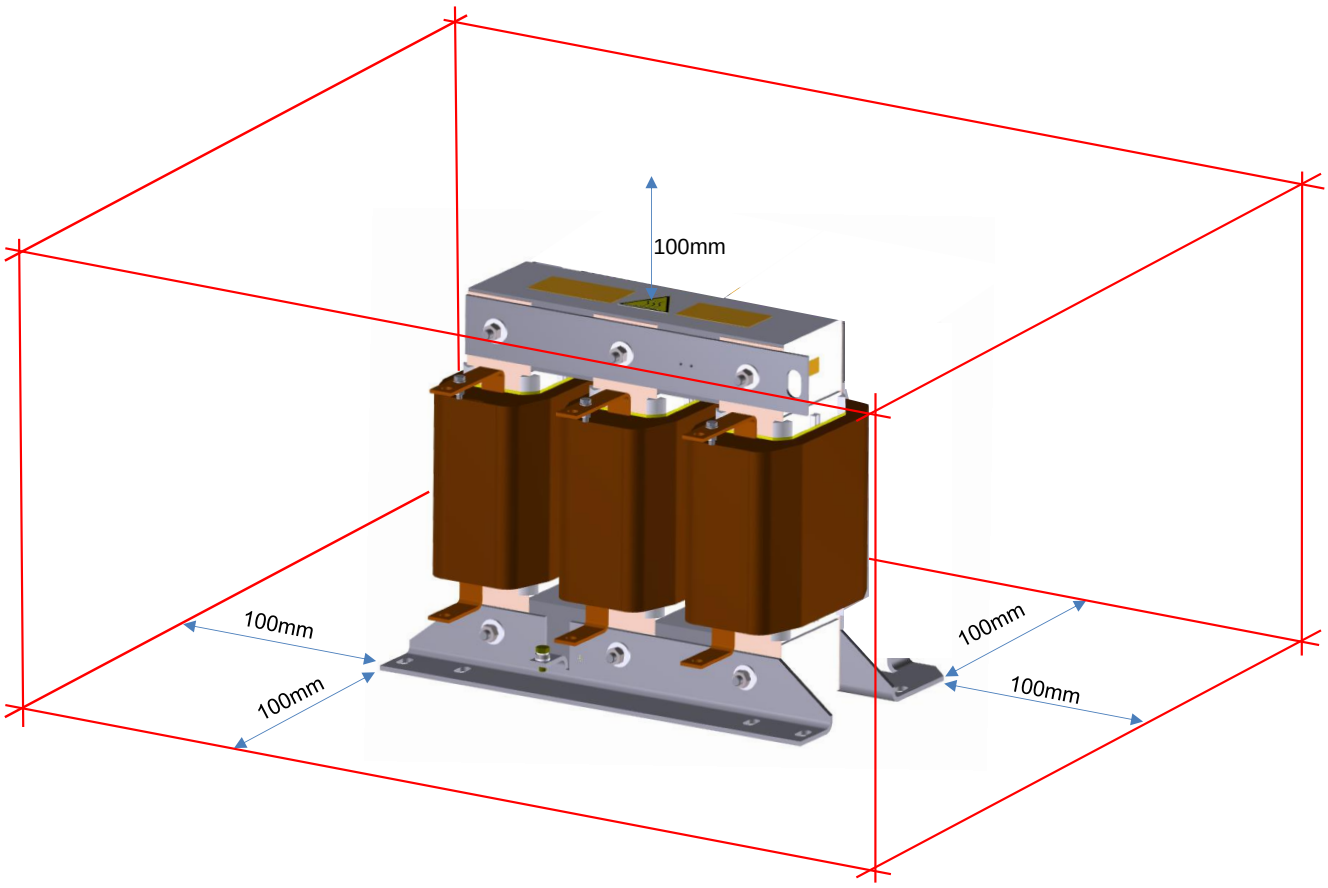
3 Mechanical installation

3.1 Mounting position in the enclosure



Picture 3-1 Mounting position in the enclosure

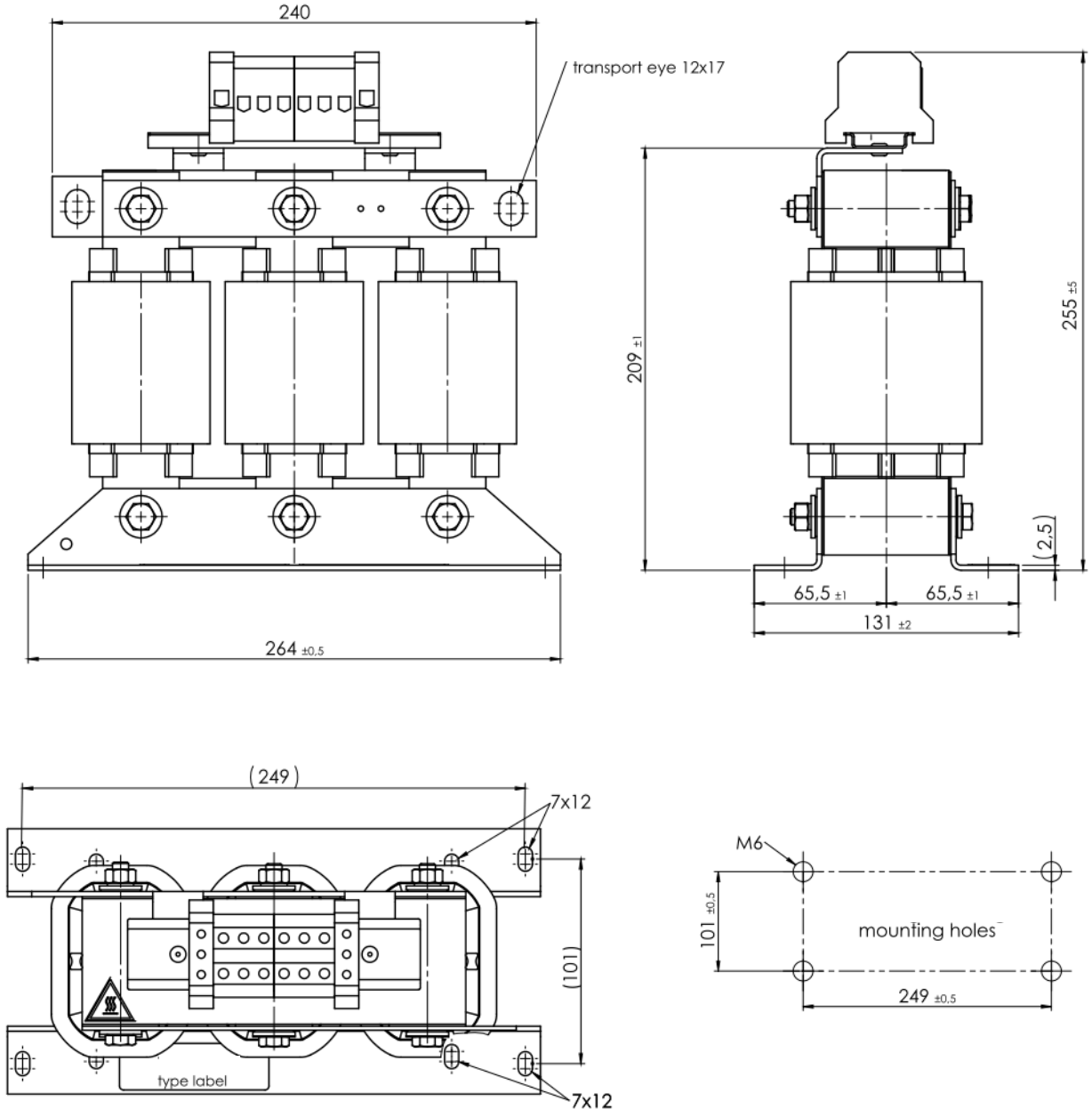
3.2 Distances to neighboring devices



Picture 3-2 Distances to neighboring devices and components

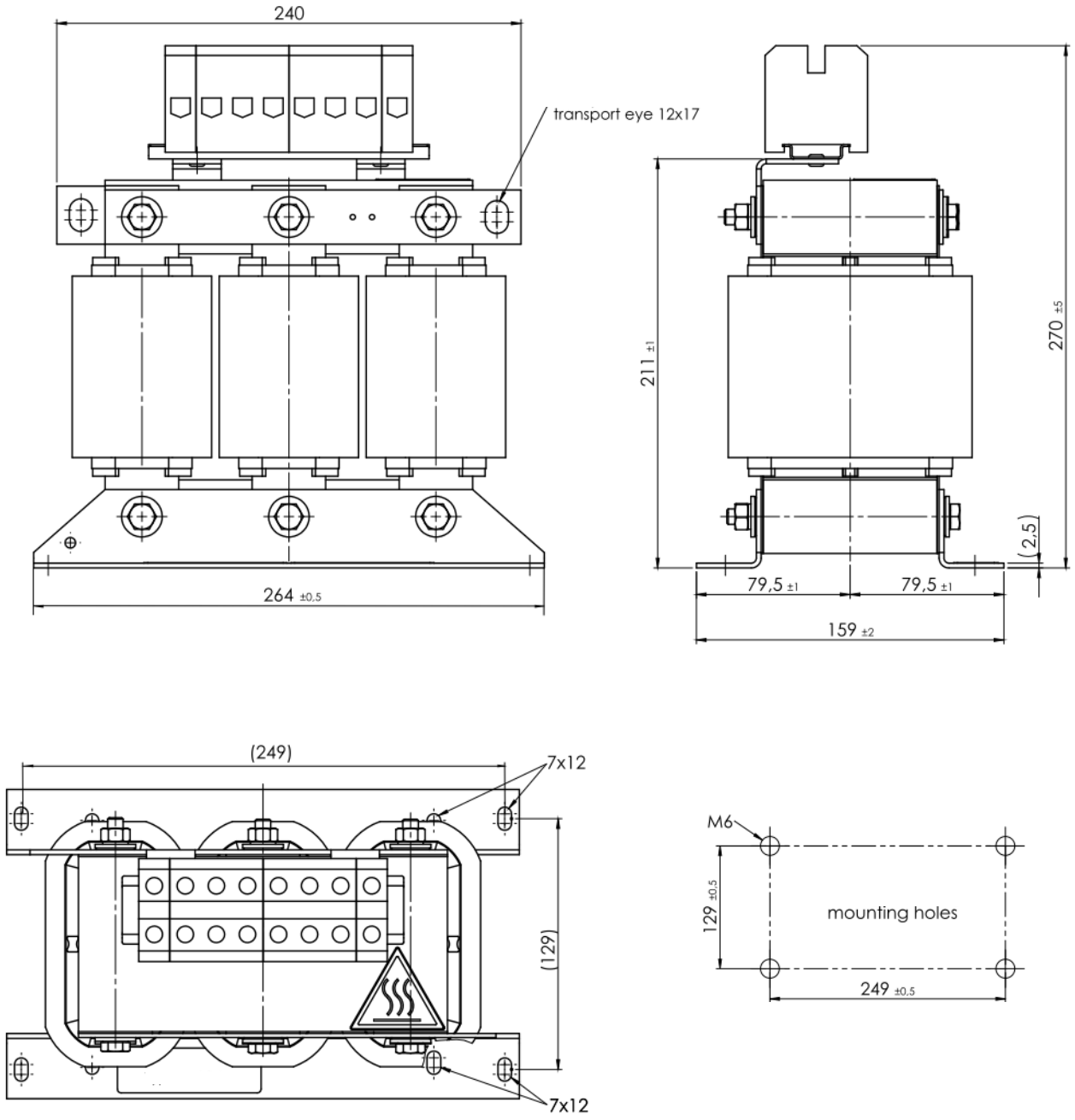
3.3 Dimensions sheets

Output chokes TEU2532-0FP00-4EA0



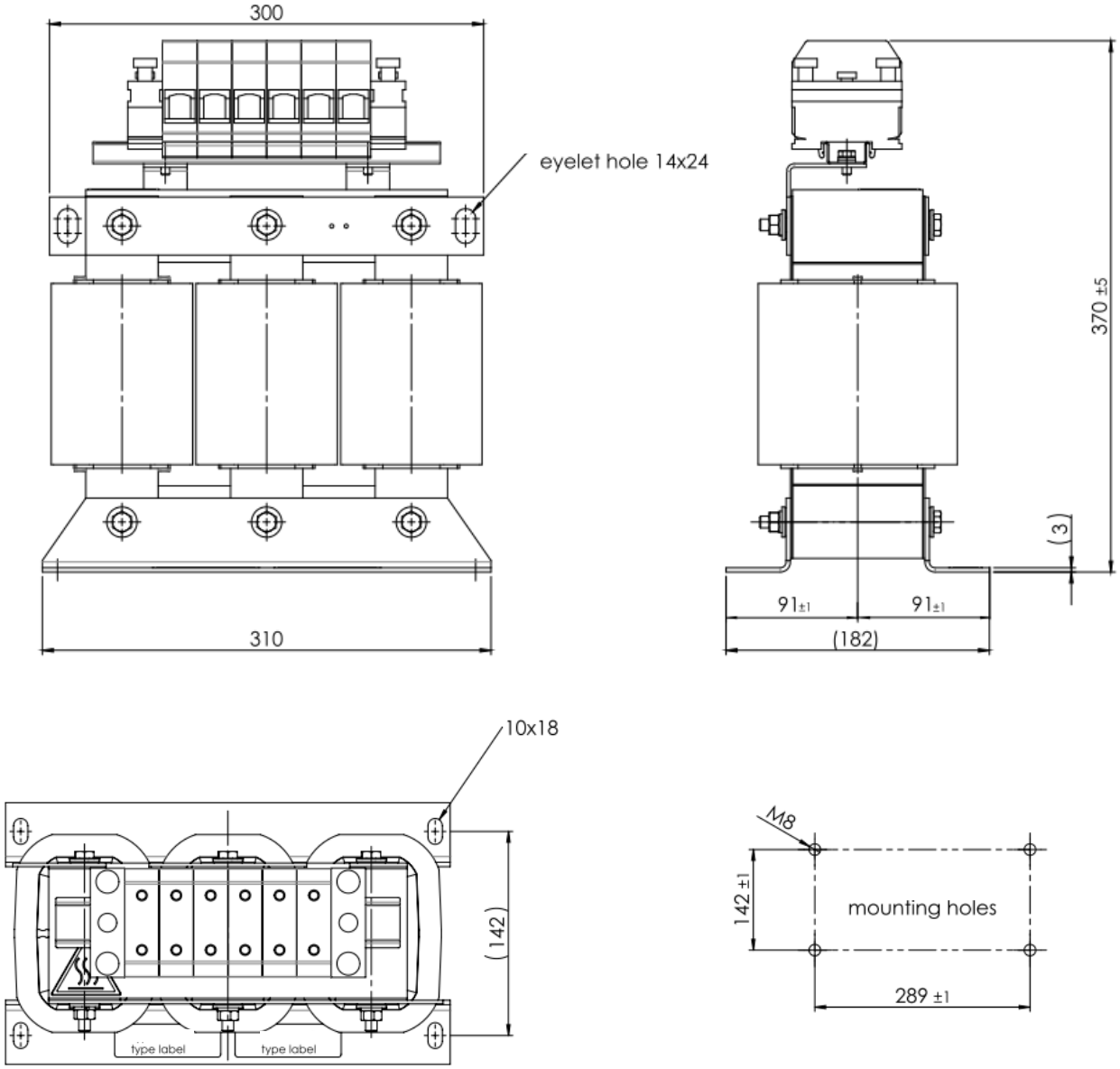
Picture 3-3 Technical drawing output choke MTZEU182-114

Output chokes TEU9932-0FP00-4EA0



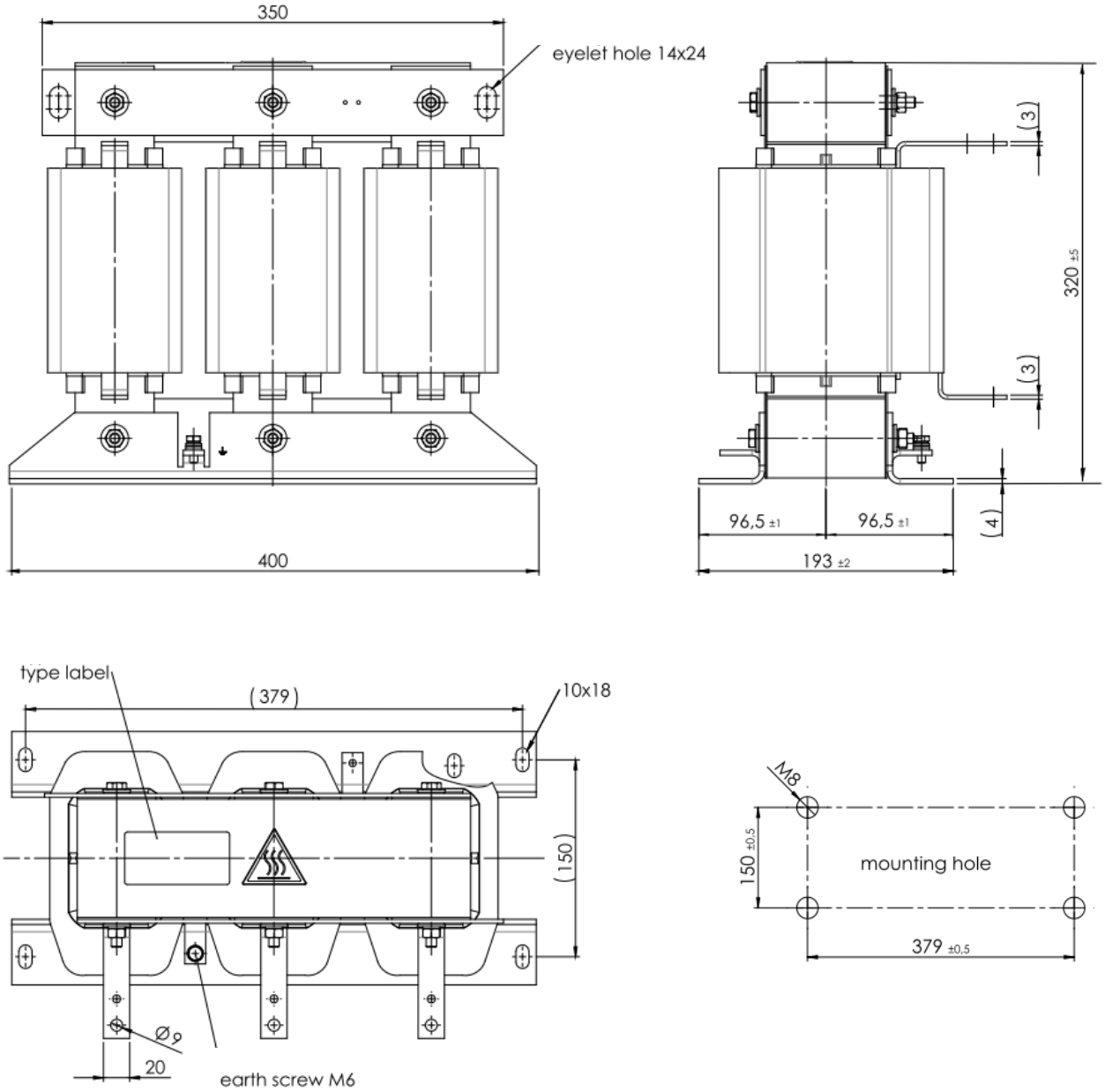
Picture 3-4 Technical drawing output choke MTZEU182-115

Output chokes TEU9932-0FS00-0EA0



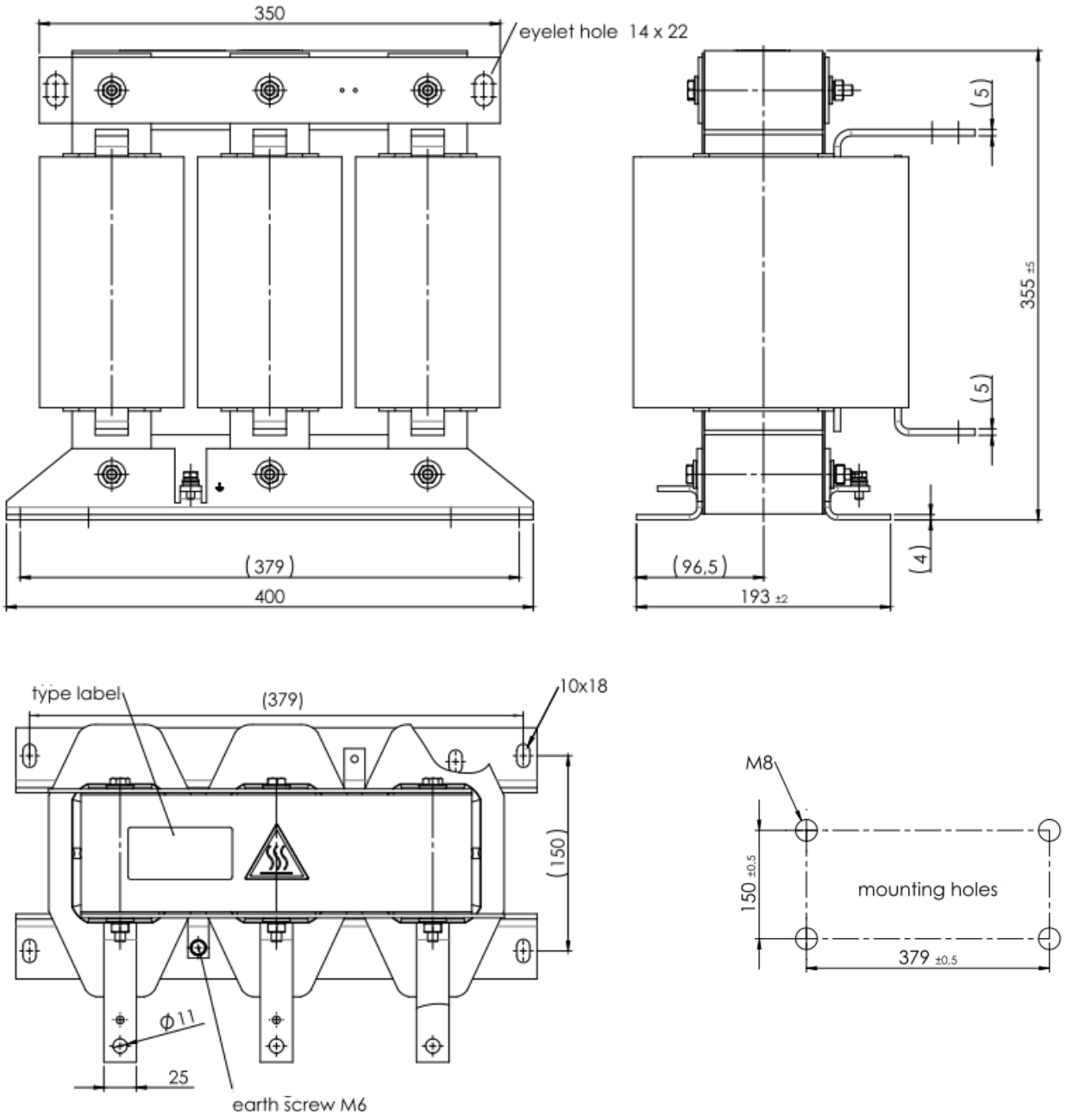
Picture 3-5 Technical drawing output choke MTZEU129-114

Output chokes TEU9932-1FC00-1BA0



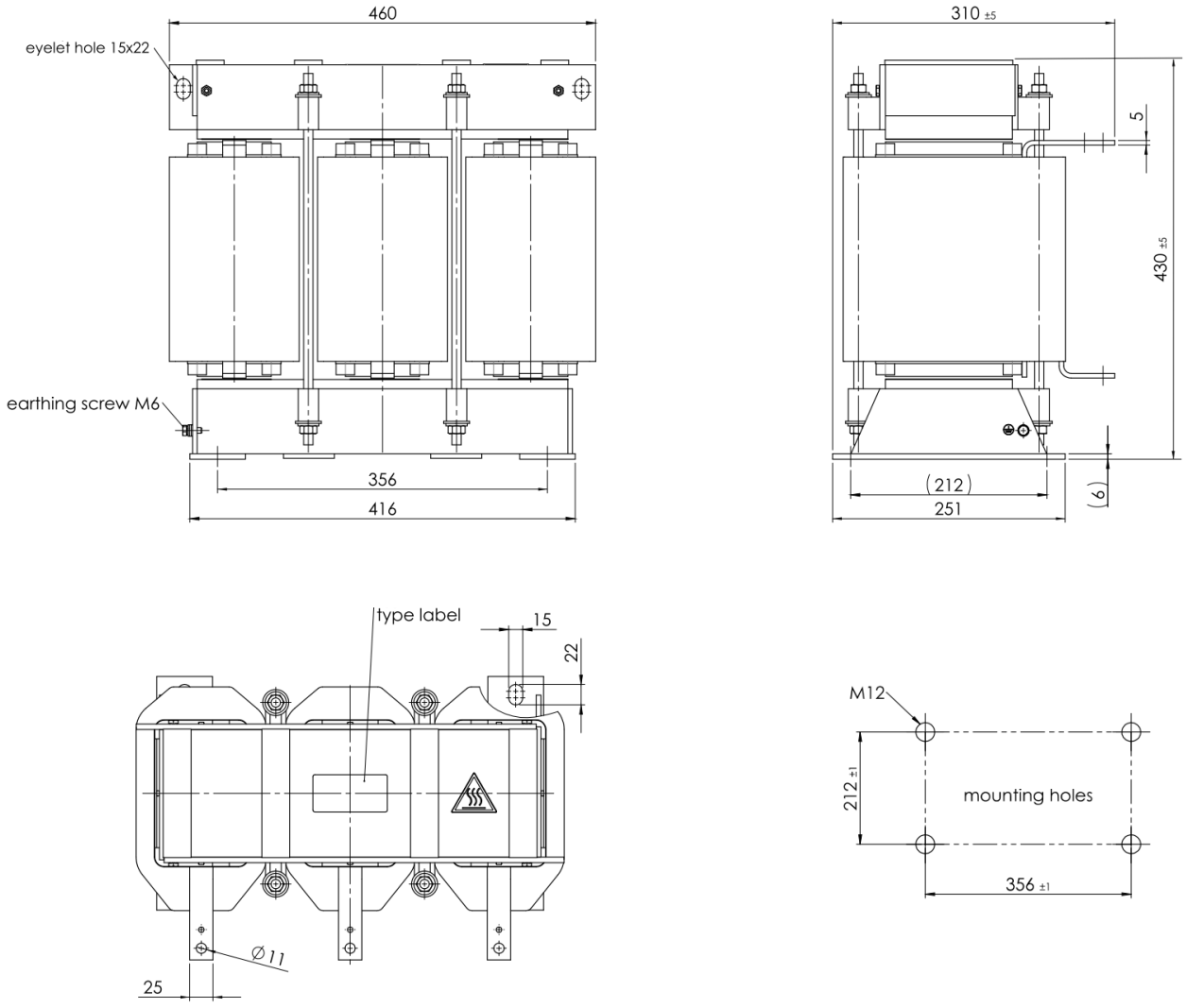
Picture 3-6 Technical drawing output chokes MTZEU182-116

Output chokes TEU9932-0FV00-0BA0



Picture 3-7 Technical drawing output chokes MTZEU182-117

Output chokes TEU4732-0FA00-0BA0

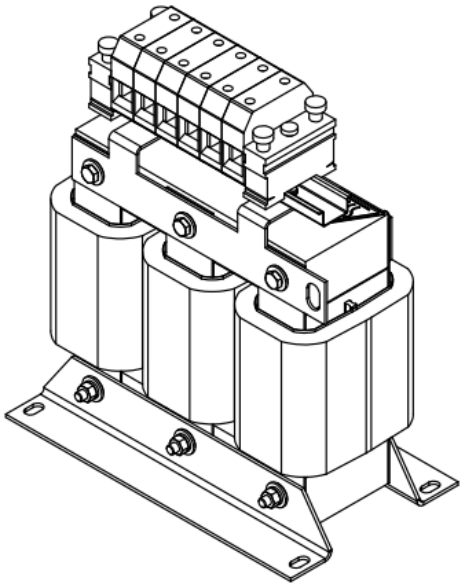


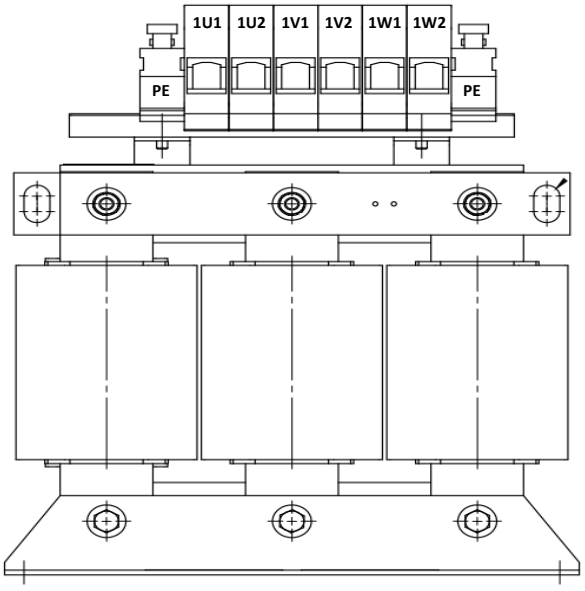
Picture 3-8 Technical drawing output chokes MTZEU182-118

4 Electrical installation

4.1 Overview of electrical connections

Output chokes with terminals





Overview electrical connections

exemplary for:

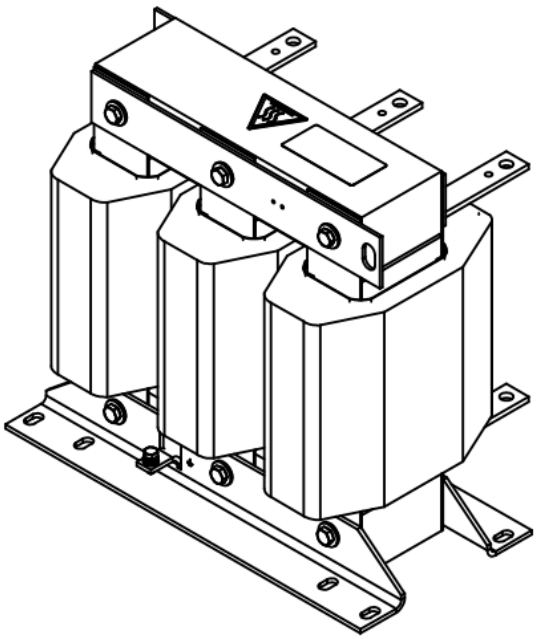
TEU2532-0FP00-4EA0

TEU9932-0FP00-4EA0

TEU9932-0FS00-0EA0

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

Output chokes with busbars



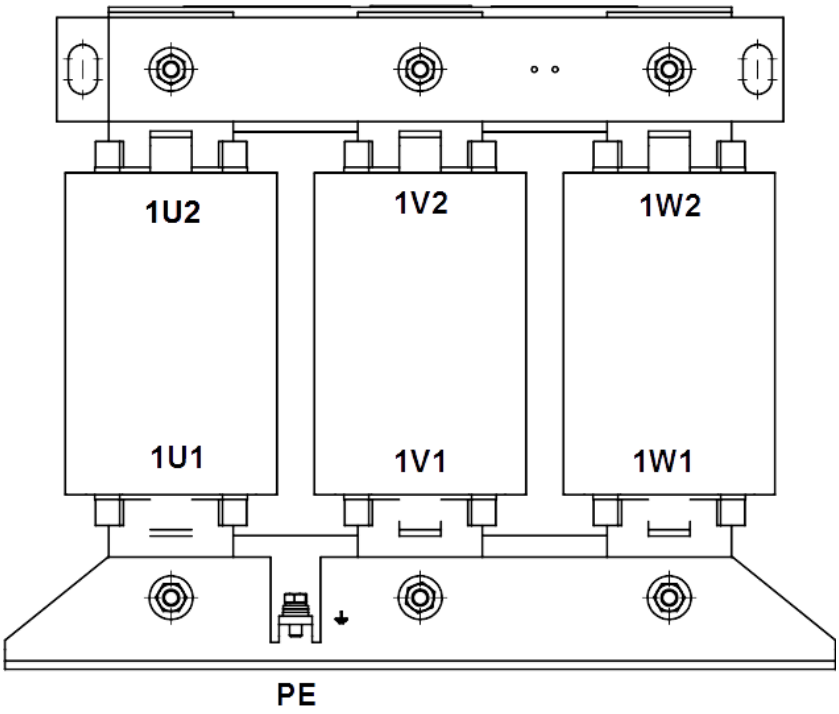
Overview electrical connections

exemplary for:

TEU9932-1FC00-1BA0

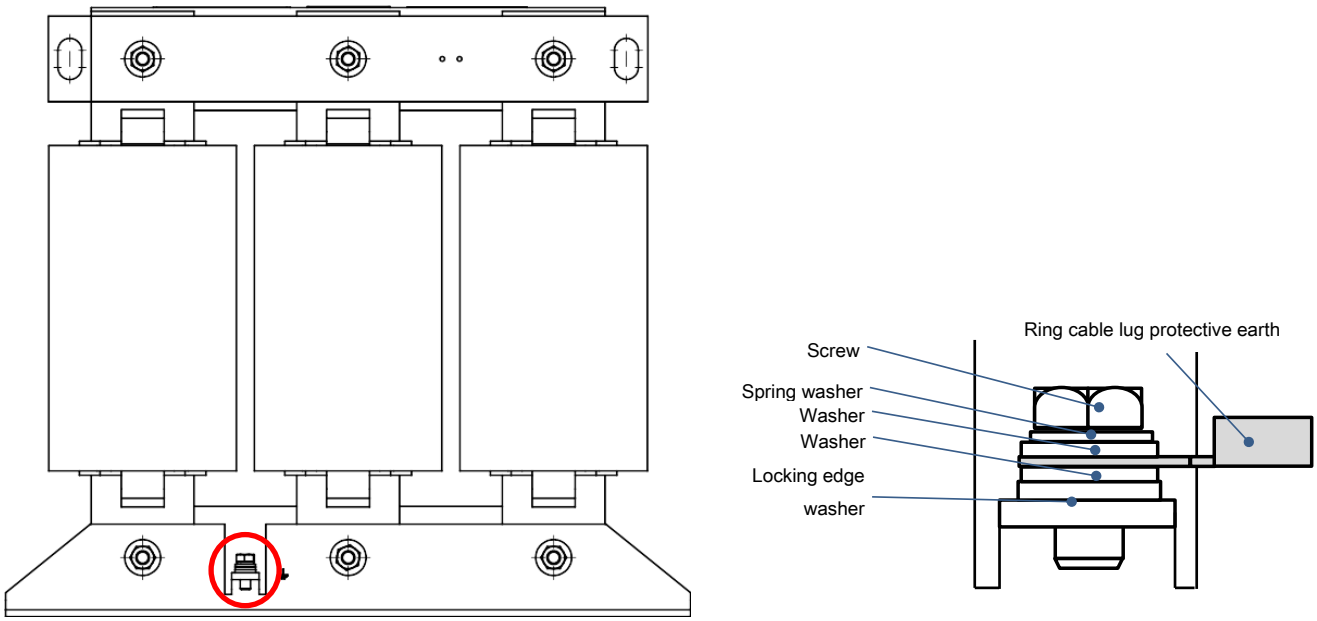
TEU9932-0FV00-0BA0

TEU4732-0FA00-0BA0



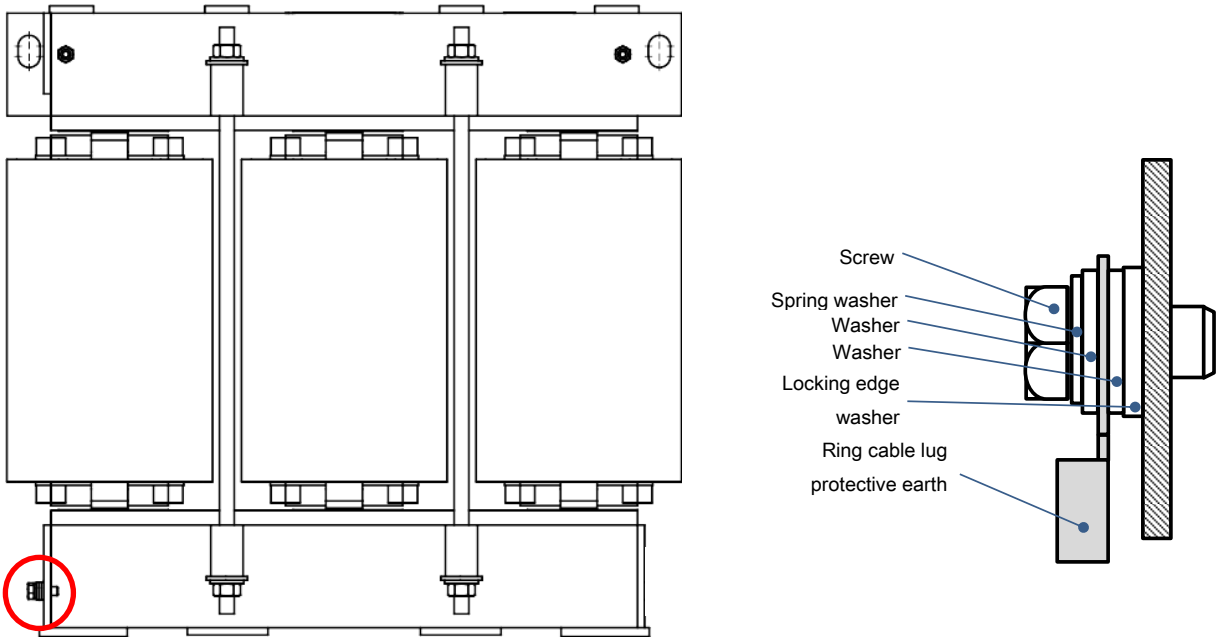
Picture 4-2 Electrical connections output choke TEU9932-0FS00-4EA0

Customer connection portective earth TEU9932-1FC00-1BA0, TEU9932-0FV00-0BA0



Picture 4-3 Customer connection portective earth TEU9932-1FC00-1BA0, TEU9932-0FV00-0BA0

Customer connection portective earth TEU4732-0FA00-0BA0



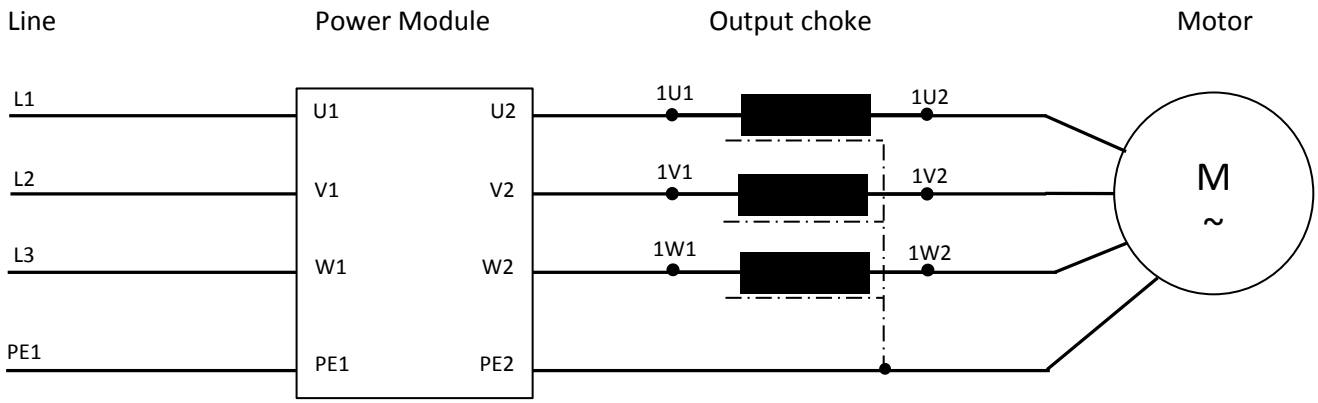
Picture 4-4 Customer connection portective earth TEU4732-0FA00-0BA0

4.2 Connection

To ensure a correct function, the following conditions must be considered:

- Control cables must be routed separately from power cables. Power cables are motor cables or the connecting cables from the DC link of the Power Module (+ / - connection directly before the AC inverter) to the output chokes. 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 fed directly back to the Power Module

4.3 Connection scheme



Picture 4-5 Connection scheme

⚠ WARNING

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

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

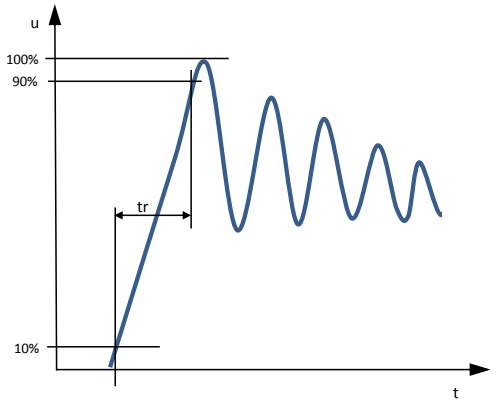
- You must take steps to ensure that the mechanical load exerted by the connected cables does not deform these connections.

4.4 Overvoltage at motor terminals

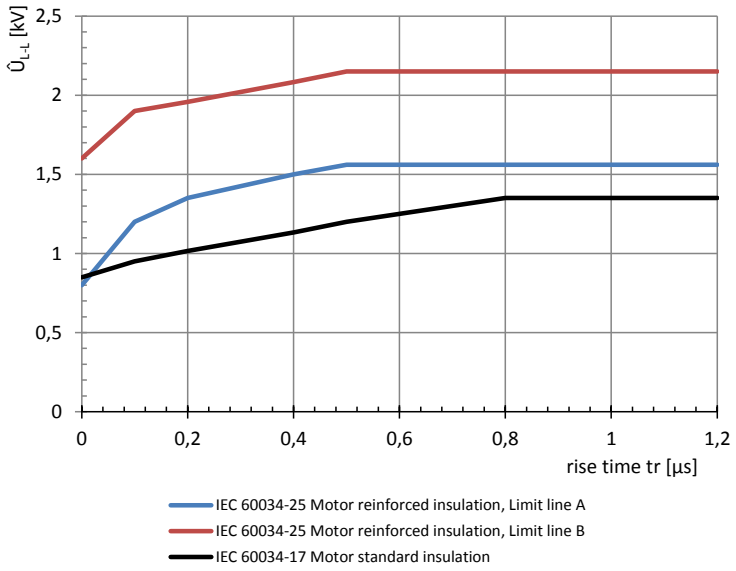
The operation with pulse width modulated sources results overvoltage peaks at the motor terminals. The height and the rise time of the voltages depend on...

- Inverter DC-Link voltage
- Type and length of the connected motor cable
- Wave impedance of the connected motor

The rise time and the level of the voltage peaks are a high demand for the insulation system of the motor. For this reason, a sufficient insulation class of the motor must be checked during the design phase. Mdexx therefore recommends that you only use motors with reinforced insulation acc. with IEC 60034-25 for operation on regulated 690V networks



Picture 4-6 Definition rise time tr at the motor terminals acc. to IEC



Picture 4-6 Limit line of the permissible peak voltage at the motor terminals as a function of the rise time tr

Caution
Motor damage due to excessive voltage peaks • For operation on regulated 690V networks, Mdexx recommends only using motors with reinforced insulation according to IEC 60034-25

5 Maintenance and servicing

5

5.1 Maintenance and servicing not provided

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

6 Technical specifications

6.1 General technical specifications

Table 6- 1 General technical specifications

Output frequency	0 ... 150 Hz		
Product standard	EN 61558-2-20		
Rated voltage [2]	690 V+10%		
Insulation class	H (180°C)		
Degree of protection	IP00		
Operating mode	S1		
Approvals	c UL us CE EAC		
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 % bei 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	In transport packaging stored EN 60721-3-1	1,5 mm at 5 ... 9 Hz 10 m/s² bei >10 ... 200 Hz 1 oct / min (10x sweep) EN 60721-3-2	0,075 mm at 10 ... 58 Hz 10 m/s² 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) accorring to class / standard	-	-	50 m/s² 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

[2] Maximum allowable line voltage according to UL: 600V

6.2 Detailed technical specifications

Tabelle 6- 2 detailed technical specification output chokes, 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 (mm² / Nm) *Imperial (AWG / lbf in* Stripping length (mm)		
Line / motor cable		16 / 1,2 *6 / 11,0* 13	35 / 2,5 *2 / 22* 17	70 / 6,0 *2/0 / 53* 24
Ground		16 / 1,2 *6 / 11,0* 13	35 / 2,5 *2 / 22* 17	70 / 10,0 *2/0 / 86* 24

Maximum allowable cable length between output chokes and motor	m	350 (screened) 525 (unscreened)

Dimensions: Width Heigh Depth	 mm mm mm	 264 255 ±5 131 ±2	 264 270 ±5 159 ±2	 310 370 ±5 182 ±2
Weight, app.	kg	18	26	42

Tabelle 6- 3 detailed technical specification output chokes, 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		Metrisch (mm² / 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 chokes and motor 1)	m	525 (screened) 800 (unscreened)

Dimensions: Width Heigh Depth	 mm mm mm	 400 320 ±5 235 ±5	 400 355 ±5 258 ±5	 460 430 ±5 310 ±5
Weight, app.	kg	70	90	162

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