THE POWER BEHIND POWER.

Operating instructions
MESSKO® ZT-F2.1. Temperature transmitter

10851779/00 EN

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We reserve the right to change the technical data, design and scope of supply.
Generally the information provided and agreements made when processing the individual quotations and orders are binding.
The product is delivered in accordance with MR's technical specifications, which are based on information provided by the customer. The customer has a duty of care to ensure the compatibility of the specified product with the customer's planned scope of application.
The original operating instructions were written in German.

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1 Introduction

This technical file contains detailed descriptions on the safe and proper installation, connection, commissioning and monitoring of the product.

This technical document is intended solely for specially trained and authorized personnel.

1.1 Manufacturer

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Customer portal

You can find additional information on this product in our at portal.reinhausen.com.

1.2 Completeness

This technical file is incomplete without the supporting documents:

- Order confirmation

1.3 Safekeeping

Keep this technical file and all supporting documents ready at hand and accessible for future use at all times.

1.4 Notation conventions

This section contains an overview of the symbols and textual emphasis used.

1.4.1 Hazard communication system

Warnings in this technical file are displayed as follows.

1.4.1.1 Warning relating to section

Warnings relating to sections refer to entire chapters or sections, sub-sections or several paragraphs within this technical document. Warnings relating to sections have the following format:

⚠ WARNING

Type of danger!
Source of the danger and its consequences.

- Action
- Action

1.4.1.2 Embedded warning information

Embedded warnings refer to a particular part within a section. These warnings apply to smaller units of information than the warnings relating to sections. Embedded warnings use the following format:

⚠ DANGER! Instruction for avoiding a dangerous situation.

1.4.1.3 Signal words

Depending on the product, the following signal words are used:

Signal word	Meaning
DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates measures to be taken to prevent damage to property.

Table 1: Signal words in warning notices

1.4.2 Information system

Information is designed to simplify and improve understanding of particular procedures. In this technical file it is laid out as follows:

Important information.

1.4.3 Instruction system

This technical file contains single-step and multi-step instructions.

Single-step instructions

Instructions which consist of only a single process step are structured as follows:

Aim of action
✓ Requirements (optional).
1. Step 1 of 1.
   » Result of step (optional).
» Result of action (optional).

Multi-step instructions

Instructions which consist of several process steps are structured as follows:

Aim of action
✓ Requirements (optional).
1. Step 1.
   » Result of step (optional).
2. Step 2.
   » Result of step (optional).
» Result of action (optional).

1.4.4 Typographic conventions

Typographic convention	Purpose	Example
UPPERCASE	Operating controls, switches	ON/OFF
[Brackets]	PC keyboard	[Ctrl] + [Alt]
Bold	Software operating controls	Press **Continue** button
...>...>...	Menu paths	Parameter > Control parameter
Italics	System messages, error messages, signals	*Function monitoring* alarm triggered
[► Number of pages]	Cross reference	[► Page 41].
Dotted underscore	Glossary entry, abbreviations, definitions, etc.	Glossary entry

Table 2: Typographic conventions used in this technical file

2 Security

Read this technical file through carefully to familiarize yourself with the product. This technical file is a part of the product.
- Read and observe the safety instructions provided in this chapter in particular.
- Observe the warnings in this technical file to avoid function-related dangers.

The product is manufactured based on state-of-the-art technology. Nevertheless, danger to life and limb for the user or impairment of the product and other material assets may arise in the event of improper use.

2.1 Appropriate use

The temperature transmitter maps the hot-spot temperature in the transformer. The temperature transmitter is suitable for use with a MESSKO® MT-ST TRASY2 series pointer thermometer or with a substitute sensor (can be ordered as an accessory from Maschinenfabrik Reinhausen GmbH).

The product is designed solely for use in stationary large-scale systems.

If used as intended and in compliance with the requirements and conditions specified in this technical file as well as the warning notices in this technical file and attached to the product, then the product does not present any danger to people, property or the environment. This applies throughout the service life of the product, from delivery, installation and operation to removal and disposal.

The following is considered intended use:
- Use the product only with the transformer specified in the order.
- Operate the product in accordance with this technical documentation, the agreed-upon delivery conditions and the technical data.
- Ensure that all necessary work is performed by qualified personnel only.
- Use the equipment and special tools supplied solely for the intended purpose and in accordance with the specifications of this technical file.
- Operate the product in electrical energy systems and facilities.

- Only operate the product in industrial areas.
- Observe the notices in this technical document regarding electromagnetic compatibility and the technical data.

2.2 Fundamental Safety Instructions

To prevent accidents, disruptions and damage as well as unacceptable adverse effects on the environment, those responsible for transport, installation, operation, maintenance and disposal of the product or parts of the product must ensure the following:

Personal protective equipment

Loosely worn or unsuitable clothing increases the danger of becoming trapped or caught up in rotating parts and the danger of getting caught on protruding parts. This results in danger to life and limb.

- All necessary devices and personal protective equipment required for the specific task, such as a hard hat, safety footwear, etc. must be worn. Observe the "Personal protective equipment" [▶Section 2.4, Page 14] section.
- Never wear damaged personal protective equipment.
- Never wear rings, necklaces or other jewelry.
- If you have long hair, wear a hairnet.

Work area

Untidy and poorly lit work areas can lead to accidents and malfunctions.

- Keep the work area clean and tidy.
- Make sure that the work area is well lit.
- The device, tools and installation materials must be clean and dry.
- Observe the applicable laws for accident prevention in the relevant country.

Contamination level

Moisture, dust, sweat and other conductive dirt may cause malfunctions in the device. To ensure contamination level II, observe the following information:

- Wear assembly gloves.
- Ensure that no dirt or moisture enters the device when it is open.
- Close up the device after installation.

Explosion protection

Highly flammable or explosive gases, vapors and dusts can cause serious explosions and fire.

- Do not install or operate the product in areas where a risk of explosion is present.

Safety markings

Warning signs and safety information plates are safety markings on the product. They are an important aspect of the safety concept. Safety markings are depicted and described in the chapter "Product description".

- Observe all safety markings on the product.
- Make sure all safety markings on the product remain intact and legible.
- Replace safety markings that are damaged or missing.

Ambient conditions

To ensure reliable and safe operation, the product must only be operated under the ambient conditions specified in the technical data.

- Observe the specified operating conditions and requirements for the installation location.

Modifications and conversions

Unauthorized or inappropriate changes to the product may lead to personal injury, material damage and operational faults.

- Only modify the product after consultation with Maschinenfabrik Reinhausen GmbH.

Spare parts

Spare parts not approved by Maschinenfabrik Reinhausen GmbH may lead to physical injury, damage to the product and malfunctions.

- Only use spare parts that have been approved by Maschinenfabrik Reinhausen GmbH.
- Contact Maschinenfabrik Reinhausen GmbH.

Working during operation

You must only operate the product when it is in a sound operational condition. Otherwise it poses a danger to life and limb.

- Regularly check the operational reliability of safety equipment.
- Perform the inspection tasks described in this technical document regularly.

2.3 Personnel qualification

The person responsible for assembly, commissioning, operation and inspection must have the following qualifications.

Electrically skilled person

The electrically skilled person has a technical qualification and therefore has the required knowledge and experience, and is also conversant with the applicable standards and regulations. The electrically skilled person is also proficient in the following:

- Can identify potential dangers independently and is able to avoid them.
- Is able to perform work on electrical systems.
- Is specially trained for the working environment in which (s)he works.
- Must satisfy the requirements of the applicable statutory regulations for accident prevention.

Technical Service

We strongly recommend having repairs and retrofitting carried out by our Technical Service department. This ensures that all work is performed correctly. If a repair is not carried out by our Technical Service department, please ensure that the personnel who carry out the maintenance are trained and authorized by Maschinenfabrik Reinhausen GmbH to carry out the work.

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2.4 Personal protective equipment

Personal protective equipment must be worn during work to minimize risks to health.

- Always wear the personal protective equipment required for the job at hand.
- Never wear damaged personal protective equipment.
- Observe information about personal protective equipment provided in the work area.

Protective clothing	Close-fitting work clothing with a low tearing strength, with tight sleeves and with no protruding parts. It mainly serves to protect the wearer against being caught by moving machine parts.
Safety shoes	To protect against falling heavy objects and slipping on slippery surfaces.
Safety glasses	To protect the eyes from flying parts and splashing liquids.
Visor	To protect the face from flying parts and splashing liquids or other dangerous substances.
Hard hat	To protect against falling and flying parts and materials.
Hearing protection	To protect against hearing damage.
Protective gloves	To protect against mechanical, thermal and electrical hazards.

Table 3: Personal protective equipment

3 Product description

3.1 Scope of delivery

The product is packaged with protection against moisture and is delivered as follows:
- Temperature transmitter with 1x Pt100 measurement resistor
- Technical documents

Optional:
- Version with 2x Pt100 measurement resistors
- Version with up to 2x 4...20 mA analog outputs
- Version with 1x Pt100 measurement resistor and 1x 4...20 mA analog output

Please note the following:
- Check the shipment against the shipping documents for completeness
- Store the parts in a dry place until installation
- The product must remain in the packaging and may only be removed immediately before installation

3.2 Function description

The temperature transmitter maps the hot-spot temperature in the transformer. The temperature transmitter is suitable for use with a MESSKO® MT-ST TRASY2 series pointer thermometer or with a substitute sensor (can be ordered as an accessory from Maschinenfabrik Reinhausen GmbH).

The winding temperature is measured indirectly. The temperature transition between the insulating fluid and winding depends on the current in the winding, among other factors. The secondary transformer current is proportional to the current in the winding of the transformer. The secondary transformer current supplies a heating resistor in the temperature transmitter with power, which causes a display increase of the actually measured oil temperature (transition temperature) corresponding to the transformer load.

The winding temperature is simulated in the temperature transmitter. The gradient of the hot-spot temperature for the top-oil temperature at nominal load is set via DIP switches. To display the winding temperature mechanically, either the temperature sensor of a pointer thermometer will be installed or, if a pointer thermometer is not used, a substitute sensor (accessory) will be installed in the temperature transmitter.

Depending on the device version, the measured value can be transmitted via the installed Pt100 measurement resistor or via an optional 4...20 mA analog output to, for example, a moving-coil display or a digital display.

3.3 Design

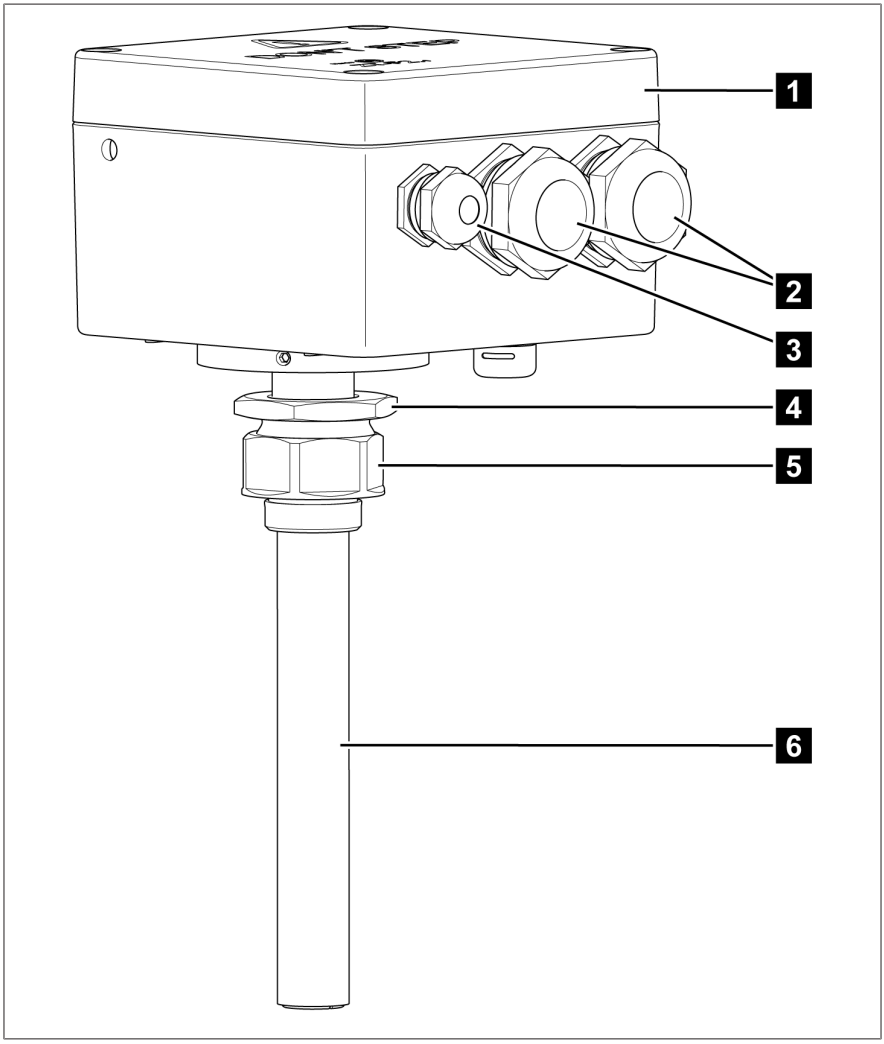


Figure 1: Temperature transmitter

1	Cover	2	2x M25x1.5 cable glands for electrical connection
3	M16x1.5 cable gland for temperature sensor	4	Double screw connection upper nut
5	Double screw connection lower nut	6	Immersion pipe

3.4 Nameplate

The nameplate is on the side of the device.

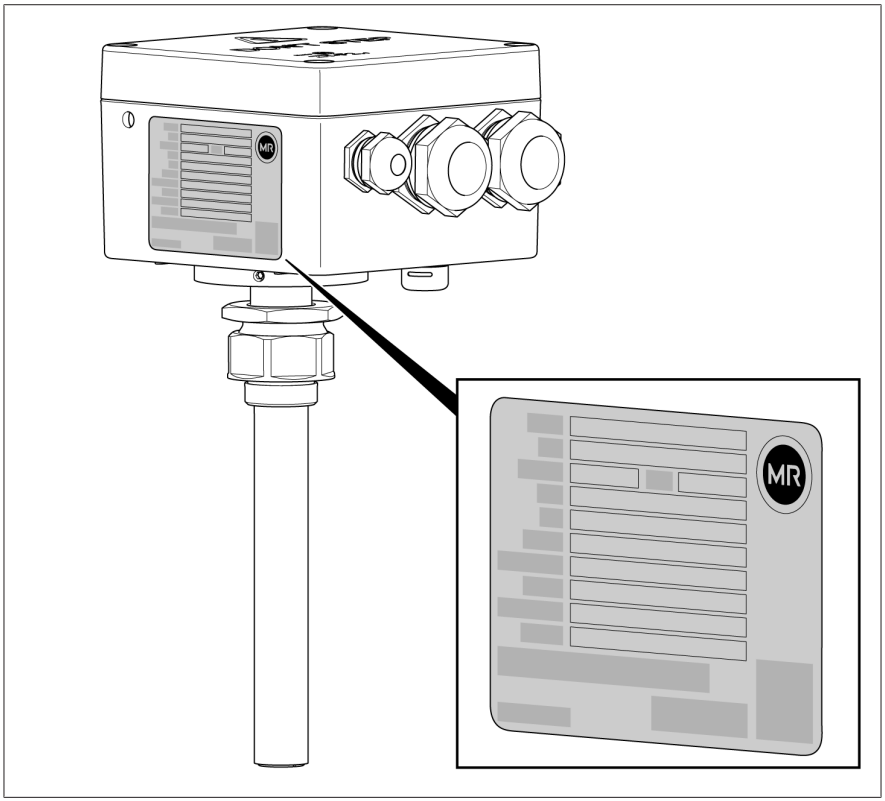


Figure 2: Nameplate

4 Packaging, transport and storage

4.1 Purpose

The packaging is designed to protect the packaged product during transport, loading, unloading and during periods of storage in such a way that no detrimental changes occur. The packaging must protect the goods against permitted transport stresses such as vibration, knocks and moisture (rain, snow, condensation).

The packaging also prevents the packaged goods from moving impermissibly within the packaging.

4.2 Suitability, structure and production

The goods are packaged in a sturdy cardboard box or solid wooden crate. These ensure that the shipment is secure when in the intended transportation position and that none of its parts touch the loading surface of the means of transport or touch the ground after unloading.

Inlays inside the box or crate stabilize the goods, preventing impermissible changes of position and protecting them from vibration.

4.3 Markings

The packaging bears a signature with instructions for safe transport and correct storage. The following symbols apply to the shipment of non-hazardous goods. Adherence to these symbols is mandatory.

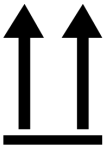
Protect against moisture	 Top	Fragile	Attach lifting gear here	Center of mass

Table 4: Shipping pictograms

4.4 Transportation, receipt and handling of shipments

In addition to vibrations, jolts must also be expected during transportation. To prevent possible damage, avoid dropping, tipping, knocking over and colliding with the product.

If the packaging tips over or falls, damage is to be expected regardless of the weight.

Every delivered shipment must be checked for the following by the recipient before acceptance (acknowledgment of receipt):
- Completeness based on the delivery slip
- External damage of any type.

The checks must take place after unloading when the cartons or transport container can be accessed from all sides.

Visible damage

If external transport damage is found upon receipt of the shipment, proceed as follows:

- Immediately record the transport damage found in the shipping documents and have this countersigned by the carrier.
- In the event of severe damage, total loss or high damage costs, immediately notify the sales department at Maschinenfabrik Reinhausen GmbH and the relevant insurance company.
- After identifying damage, do not modify the condition of the shipment further and retain the packaging material until an inspection decision has been made by the transport company or the insurance company.
- Record the details of the damage immediately on site together with the carrier involved. This is essential for any claim for damages.
- If possible, photograph damage to packaging and packaged goods. This also applies to signs of corrosion on the packaged goods due to moisture inside the packaging (rain, snow, condensation).
- Be absolutely sure to also check the sealed packaging.

Hidden damage

When damage is not determined until unpacking after receipt of the shipment (hidden damage), proceed as follows:

- Make the party responsible for the damage liable as soon as possible by telephone and in writing, and prepare a damage report.
- Observe the time periods applicable to such actions in the respective country. Inquire about these in good time.

With hidden damage, it is very hard to make the transportation company (or other responsible party) liable. Any insurance claims for such damage can only be successful if relevant provisions are expressly included in the insurance terms and conditions.

4.5 Storage of shipments

When selecting and setting up the storage location, ensure the following:
- Store the product and accessories in the original packaging until installation.
- Protect stored goods against moisture (rain, flooding, water from melting snow and ice), dirt, pests such as rats, mice, termites etc. and against unauthorized access.
- Store crates and boxes on pallets, timber beams or planks as protection against ground moisture and for improved ventilation.
- Ensure that the foundation has sufficient load-bearing capacity.
- Keep entrance paths clear.
- Check the stored goods at regular intervals. Also take appropriate action after storms, heavy rain or snow etc.

4.6 Further transport

Use the original product packaging for further transport.

If you transport the product to the final installation site in a mounted state, observe the following information in order to protect the product against mechanical damage due to external influences.

Transport packaging requirements
- Select packaging suitable for the duration of transport or storage, taking the climatic conditions into consideration.
- Ensure that the packaging protects the product against transport stress such as shaking, vibrations and impacts.
- Ensure that the packaging protects the product against moisture such as rain, snow and condensation.
- Ensure that the packaging allows for sufficient air circulation in order to prevent the formation of condensation.

5 Mounting

This chapter describes how to correctly mount and connect the device. Observe the following hazard notices prior to opening the device:

⚠ DANGER

Electric shock!

Risk of fatal injury due to electrical voltage. Always observe the following safety regulations when working in or on electrical equipment.

- Disconnect the equipment.
- Lock the equipment to prevent an unintentional restart.
- Make sure all poles are de-energized.
- Ground and short-circuit.
- Cover or cordon off adjacent energized parts.

NOTICE

Damage to the device!

Electrostatic discharge can lead to damage to the device.

- Take precautionary measures to prevent the build-up of electrostatic charges on work surfaces and personnel.

5.1 Installation conditions

- The temperature transmitter is suitable for installation in the thermometer pocket in accordance with DIN EN 50216-4 type A1. Other fittings are available as an option.
- The thermometer pocket must be installed on the transformer cover in the area of greatest oil flow to ensure good heat exchange between the coolant, thermometer pocket, and the temperature sensors in the temperature transmitter.
- The thermometer pocket must be filled with approximately 50 ml of oil at room temperature to ensure the correct heat transfer (do not use any aluminum foil or similar).
- If the temperature transmitter is to be tested prior to installation, the test setup must replicate similar conditions to those on the transformer (see chapter "Function test").

5.2 Function test

You can perform a function test prior to installing the temperature transmitter. The test setup for the function test must replicate similar conditions to those in the transformer:

- The oil bath is regulated and stirred. Use of the MESSKO MZT1650S calibration bath offered by Maschinenfabrik Reinhausen GmbH is recommended.
- The thermometer pocket has been installed in the oil bath.
- The thermometer pocket has been filled with approximately 50 ml of oil at room temperature.
- The temperature transmitter has been installed in the thermometer pocket.
- The Pt100 or 4...20 mA output (optional) has been connected (see the chapter "Connecting the Pt100 measurement resistor or the chapter "Connecting the 4...20 mA analog output (optional)").
- The temperature sensor has been pushed in up to the stop (approx. 215 mm/8.46 in deep).
- The temperature of the oil bath may not exceed 30 °C, otherwise the heat radiation via the double screw connection will falsify the conditions.

- The adjustment to the temperature of the oil bath must be at least 30 minutes.
- The measurement cycle must be at least 20 minutes until the set gradient is reached.

5.3 Installing the temperature transmitter

✓ Use a suitable thermometer pocket in accordance with DIN EN 50216-4 type A1.

1. Fill the thermometer pocket with approximately 50 ml of oil at room temperature.
2. Unscrew the lower nut of the double screw connection and screw into the thermometer pocket.
3. *NOTICE!* Damage to the device! Ensure that the double screw connection is free before aligning or turning the temperature transmitter. Insert the immersion pipe of the temperature transmitter into the thermometer pocket, align it, and screw tight using the upper nut of the double screw connection.

5.4 Installing the temperature sensor of the pointer thermometer

If you are going to use a pointer thermometer for displaying the winding temperature mechanically, first install the pointer thermometer in accordance with the corresponding operating instructions. Then install the temperature sensor of the pointer thermometer in the temperature transmitter:

✓ The temperature sensor of the pointer thermometer used has a diameter of 9.5 mm (0.37 in).

1. Unscrew the cover of the temperature transmitter.
2. Open the M16x1.5 cable gland.
3. *NOTICE!* Damage to the capillary line! The shield contact on the cable gland can make it difficult to withdraw the capillary line or damage the capillary line when it is withdrawn. Remove the shield contact from the cable gland for the temperature sensor.
4. Push the pressure nut and gasket over the temperature sensor and the capillary line.

5. Feed the temperature sensor through the cable gland and feed approximately 50 cm (19.69 in) through.
6. Push the temperature sensor into the temperature sensor well of the temperature transmitter up to the stop (approx. 215 mm/8.46 in deep).
7. Pull out and lay the capillary line without kinks.
8. Close the cable gland.

5.5 Installing the substitute sensor

If you are not going to use a pointer thermometer for displaying the winding temperature mechanically, install a substitute sensor in the temperature transmitter:

1. Unscrew the cover of the temperature transmitter.
2. Push the substitute sensor into the temperature sensor well of the temperature transmitter up to the stop (approx. 215 mm/8.46 in deep).
3. *NOTICE!* To ensure the IP degree of protection of the device, close the unused M16x1.5 cable gland tight.

5.6 Electrical connection

This chapter describes how to connect the device correctly. Note the connection diagrams provided. Observe the following hazard notices prior to opening the device:

⚠ DANGER

Electric shock!

Risk of fatal injury due to electrical voltage. Always observe the following safety regulations when working in or on electrical equipment.

- Disconnect the equipment.
- Lock the equipment to prevent an unintentional restart.
- Make sure all poles are de-energized.
- Ground and short-circuit.
- Cover or cordon off adjacent energized parts.

NOTICE

Damage to the device!

Electrostatic discharge can lead to damage to the device.

› Take precautionary measures to prevent the build-up of electrostatic charges on work surfaces and personnel.

5.6.1 Current transformer connection

The secondary current must be 1.5...2 A nominal. With other current strengths, a multi-ballast transformer must be used depending on the desired hotspot gradient.

1. Open one of the M25x1.5 cable glands.
2. Pull the connection cable through the cable gland and connect the current transformer via terminals 1 and 2.

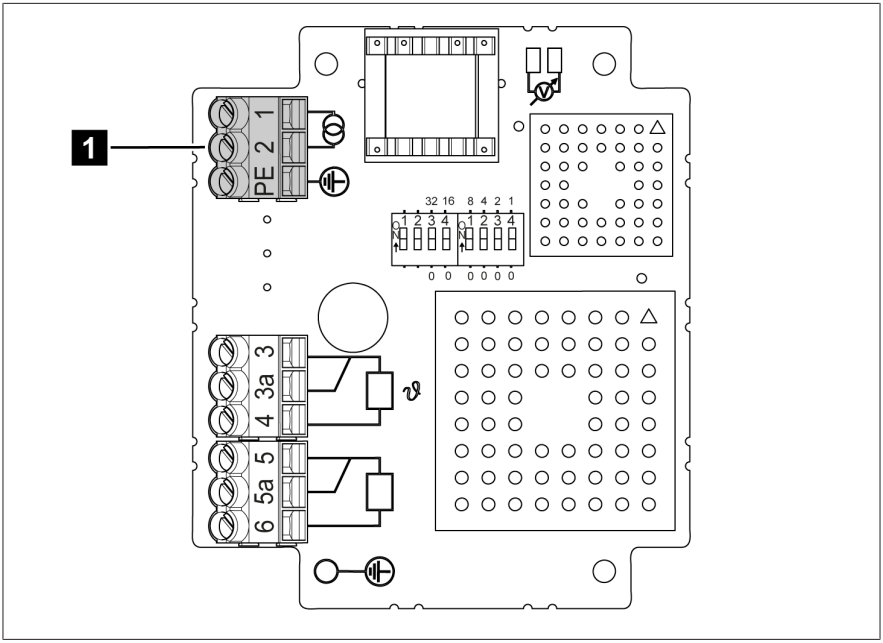


Figure 3: Current transformer and ground connection terminals

1	Terminals 1, 2 and PE		

3. Connect the grounding cable via the PE terminal.
4. Close the cable gland.

5.6.2 Pt100 measurement resistor connection

The device is equipped with a Pt100 measurement resistor in accordance with IEC 751. The device is designed for the connection of a display instrument with 3-conductor technology. The display instrument used can also have a 2-conductor or 4-conductor technology design.

Connection cable length

The length of the connection cables is based on the specifications of the measuring transducer or display device to be connected (e.g. Pt-MU 100 Ω per cable). As a general rule, a cable length of 50 m must not be exceeded with 3-conductor technology. With 3-conductor or 4-conductor technology, it must be ensured that the individual wires are identical (same length and same cross-section). Otherwise, deviations may arise due to incorrect compensation of the conductor resistances.

3-conductor technology (2 measurement lines, 1 compensation line)

1. Open one of the M25x1.5 cable glands.
2. Pull the connection cable through the cable gland.

3. Connect one measurement line to terminal 3.

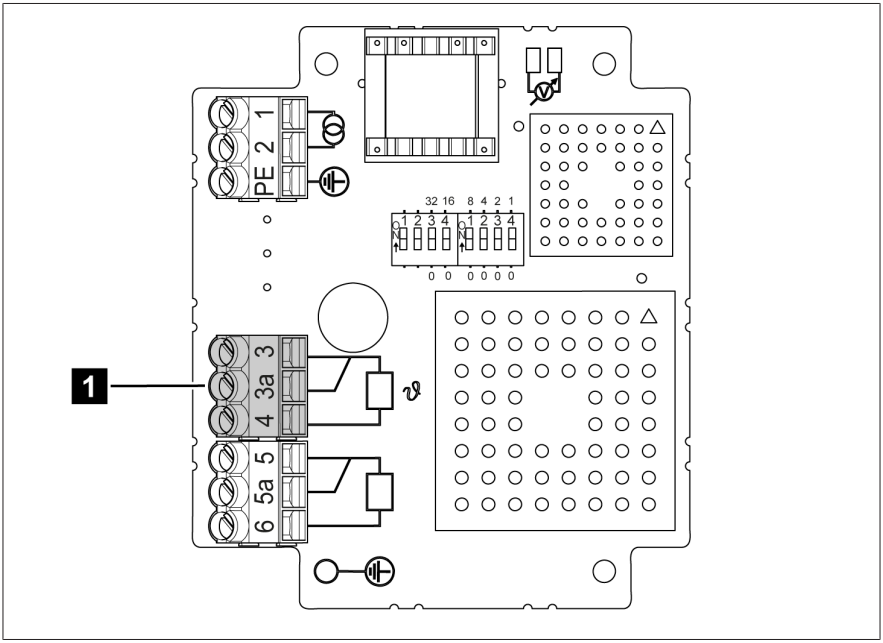


Figure 4: Pt100 measurement resistor connection terminals

1	Terminals 3, 3a and 4		

4. Connect the second measurement line to terminal 4.
5. Connect the compensation line to terminal 3a.
6. Close the cable gland.

2-conductor technology (2 measurement lines)

1. Open one of the M25x1.5 cable glands.
2. Pull the connection cable through the cable gland.
3. Connect one measurement line to terminal 3.
4. Connect the second measurement line to terminal 4.
5. Close the cable gland.

4-conductor technology (2 measurement lines, 2 compensation lines)

1. Open one of the M25x1.5 cable glands.
2. Pull the connection cable through the cable gland.

3. Connect one measurement line to terminal 3.
4. Connect the second measurement line and one compensation line to terminal 4.
5. Connect the second compensation line to terminal 3a.
6. Close the cable gland.

Additional Pt100 measurement resistor (optional)

If the device is equipped with an additional Pt100 measurement resistor, you can connect an additional display instrument to terminals 5, 5a and 6. The device is designed for the connection of a display instrument with 3-conductor technology. The display instrument used can also have a 2-conductor or 4-conductor technology design.

5.6.3 4...20 mA analog output connection (optional)

As an option, the temperature transmitter can be equipped with a 4...20 mA analog output instead of a Pt100 measurement resistor. The connection is made via 2-conductor technology (R/L max. 750 Ω at 24 V DC).

1. Open one of the M25x1.5 cable glands.
2. Pull the connection cable through the cable gland.

3. Connect the measurement lines via terminals 3 and 3a.

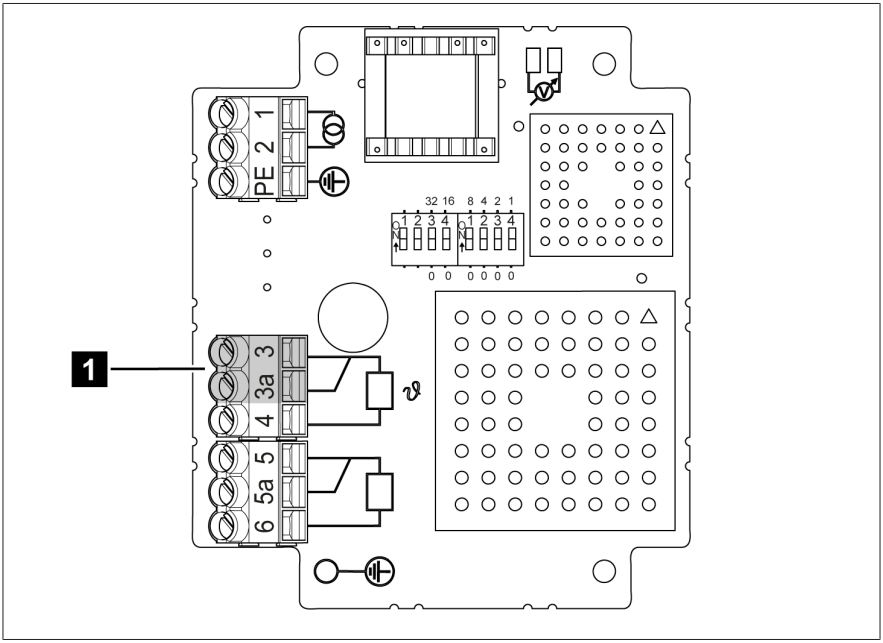


Figure 5: 4...20 mA analog output connection terminals

1	Terminals 3 and 3a		

4. Close the cable gland.

Current loop I_1 as passive analog output

The device acts as a regulated resistor that, with a supply voltage of 10...30 V DC, regulates the current flow of 4...20 mA as a descriptive dimension of the measured temperature.

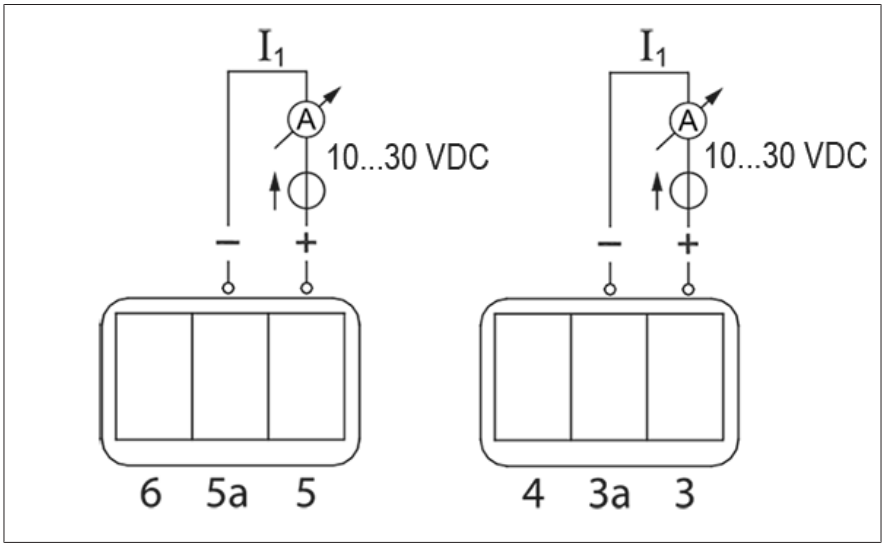


Figure 6: Passive analog output

Version with 2 analog outputs or analog output and measurement resistor (optional)

As an option, the device can be equipped with two 4...20 mA analog outputs or with one 4...20 mA analog output and one Pt100 measurement resistor.

Version	Analog output 1 connection terminals	Analog output 2 connection terminals	Pt100 measurement resistor connection terminals
2x 4...20 mA analog outputs	3, 3a	5, 5a	-
1x 4...20 mA analog output and 1x Pt100 measurement resistor	5, 5a	-	3, 3a, 4

Table 5: Connection terminals

6 Commissioning

6.1 Setting the hotspot gradient

6.1.1 Setting for CT nominal current = 2 A

You can set the hotspot gradient at nominal load via the two DIP switches S1 and S2 on the circuit board. You can set the hotspot gradient in 1 K increments from 4 K to 50 K.

1. Determine the position of the DIP switches S1 and S2 for the desired hotspot gradient using the table in the chapter "Hot spot gradient for 2 A CT nominal current" (see appendix).
2. Set the DIP switches S1 and S2 on the circuit board in accordance with the table.

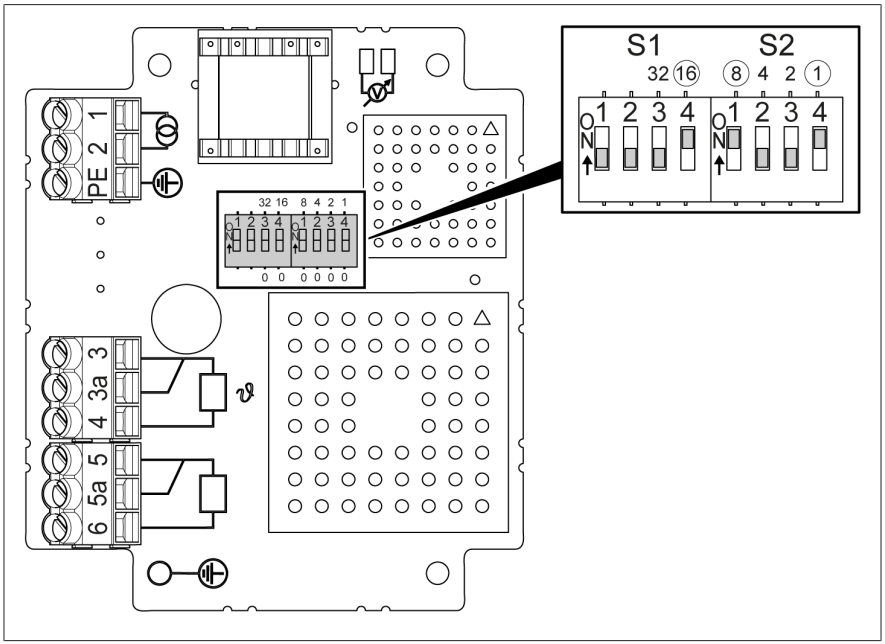


Figure 7: DIP switch S1 and S2 setting (example setting for 25 K hotspot gradient)

6.1.2 Setting for CT nominal current ≠ 2 A

If the CT nominal current is greater or less than 2 A, you can use the following equation to calculate the hotspot gradient to be set:

$Hg[K] = Hg_N \times 4\ A^2 / CT_N^2$
where N = nominal current

Example:

$Hg_N = 16\ K$
$CT_N = 1.6\ A$
$Hg[K] = 16\ K \times 4\ A^2 / (1.6\ A)^2 = 25\ K$ at 2 A CT nominal current

Determine the position of the DIP switches S1 and S2 for the calculated hotspot gradient using the table in the chapter "Hot spot gradient for 2 A CT nominal current" (see appendix). Where necessary, round the calculated value to an integer, because the value to be set can only be set in 1 K increments from 4 K to 50 K.

Alternatively, you can determine the setting using the diagram in the chapter "Hotspot gradients diagram" (see appendix). If the intersection of the CT nominal current and the target hotspot gradient lies between two curves in the diagram, interpolate the required curve or calculate the value to be set using the equation listed above.

6.2 Display check

1. After a warmup period of 30 minutes, compare the pointer thermometer display and the electronic display.

» The displays of both devices should be within the tolerance range.

The following table lists corrective measures to take if the gradient display is too high or too low. If these measurements do not correct the issue, contact MR Service & Complaint.

Gradient display	Measure
Gradient display too high	Check whether there is just oil in the thermometer pocket.
Gradient display on the thermometer too low	Check whether the mechanical temperature sensor has been pushed in up to the stop. Alternatively, check whether the thermometer pocket has been filled with sufficient oil.

Table 6: Gradient display too high or too low

You may be able to change deviations between the displays caused by special operating conditions by changing the DIP switch positions.

6.3 Overvoltage protection

All inputs and outputs have a protective circuit for dissipating residual currents, e.g. lightning strikes and switching events.

During a high-voltage test >300 V AC between the housing and inputs or outputs, residual currents that are greater than the maximum permitted residual current can be dissipated.

7 Maintenance, inspection and care

Maintenance

The device is maintenance-free.

Inspection and care

Depending on the conditions of use of the device and the national regulations in the respective country of use, the transformer manufacturers can specify different inspection intervals.

› Observe the inspection intervals defined in CIGRE Publication No. 445 "Guide for Transformer Maintenance" or the inspection intervals specified by the transformer manufacturer.

Check and clean the device as part of each transformer inspection as follows:

1. Use only a damp towel and mild cleaning agent to clean the housing of the device when needed.
2. Ensure that the ventilation is free of dirt and deposits.
3. Check the device for external damage and contamination.

In the event of questions or irregularities, contact the Technical Service department:

Maschinenfabrik Reinhausen GmbH
MR Service & Complaint
Falkensteinstrasse 8
93059 Regensburg
Germany

service@reinhausen.com

8 Disposal

Observe the national disposal regulations in the country of use.

8.1 SVHC information in accordance with the REACH regulation

This product complies with the provisions of European Regulation 1907/2006/EC dated December 18, 2006 on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

The following components of the product contain > 0.1% [w/w] of the SVHC substance lead (CAS no. 7439-92-1):

- Brass alloy
- Standard parts with a low property class

9 Technical data

Permissible ambient conditions	
Location of use	Indoors and outdoors, tropic-proof
Ambient air temperature	-50...+85 °C
Storage temperature	-50... +80 °C
Operating temperature	-40...+80 °C
Thermometer measuring range	In accordance with the thermometer used
Installation	Thermometer pocket in accordance with DIN EN 50216-4 type A1 or similar
Installation position	Any
Degree of protection	IP66 in accordance with IEC 60529

Basic materials	
Housing / terminal box	Aluminum Coating with corrosion-protection class C4H, optional C5H, in accordance with DIN EN ISO 12944-9 RAL 7033 or RAL 7038
Offshore version option	Cable glands in accordance with EN 60423, ISO 965 Coating CX in accordance with DIN EN ISO 12944-9
Double screw connection	G1B double screw connection, bare brass Optional double screw connection M27x2; M27x1.5; G3/4B
Flange	Teflon

Terminal box	
Cable glands	1 x M16x1.5 WADI; 2 x M25x1.5 WADI
Terminal strip assignment	See chapter "Installation"
Connection terminals	4 mm^2 single-wire
Ventilation	Via pressure equalization element

Specifications		
CT nominal current	2 A from transformer	
Overload resistance	Permanent max. 3 A (equals 1.5 x CT nominal current); 12 A for 30 seconds	
Gradient setting	Via DIP switches (see appendix)	
Heating	Integrated into the temperature sensor well	
CT power	P [VA] = I^2_{CT} x 4.5 Ω	
Rated insulation voltage	300 V AC, 50 Hz	
Analog output signal	Up to 2x Pt100/PT1000 or 2 x 4...20 mA others on request	
4...20 mA current output	Supply voltage	Min. 10 V DC... max. 30 V DC
	Load resistance	Max. 750 Ω at 24 V DC

Dimensions and weight	
Dimensions	See dimensional drawings
Weight	1.7 kg

10 Drawings

The product may have been altered since this document was published.

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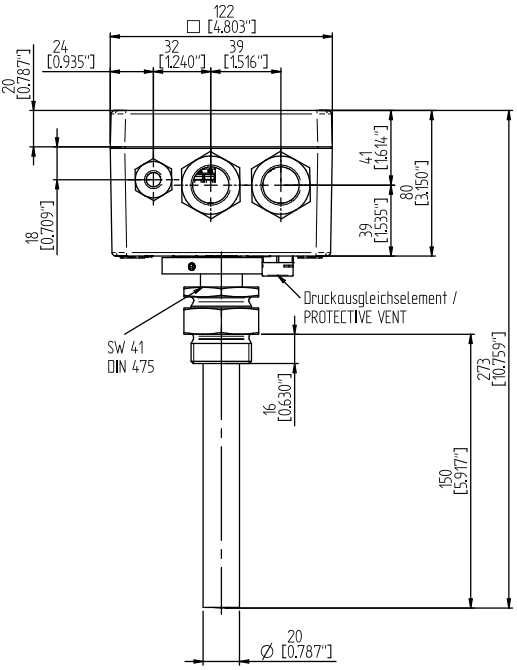

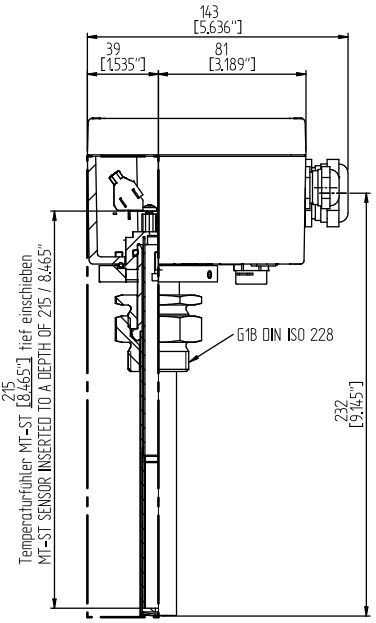

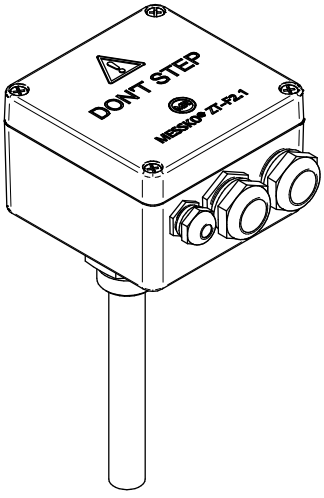

M16x1,5 WADI nach EN 60423
für Zeigerthermometer /
M16x1,5 WADI ACC. TO EN 60423
FOR POINTER THERMOMETER

M25x1,5 WADI nach EN 60423
für elektr. Anschluss /
M25x1,5 WADI ACC. TO EN 60423
FOR ELECTRICAL CONNECTION

	DATE	NAME	DOCUMENT NO.
DFTR.	22.05.2025	KAFFENBERGER	SED 10835732 000 00
EHKD.	23.05.2025	THIELEK	CHANGE NO. / SCALE
STAND	23.05.2025	THIELEK	1137063 / 12

DIMENSION IN mm EXCEPT AS NOTED

Zubehör Transformator / ACC
MESSKO® ZT-F2.1
Maßzeichnung/DIMENSION DRAWING

SERIAL NUMBER

MATERIAL NUMBER 101894930M

SHEET 1 / 1

A3

	DATE	NAME	DOCUMENT NO.	
DFTR.	22.05.2025	KAFFENBERGER	SED 10839027 000 00	
CHKD.	23.05.2025	THIELEK	CHANGE NO.	SCALE
STAND.	23.05.2025	THIELEK	1137063	2:1

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DIMENSION IN mm EXCEPT AS NOTED

MR

Zubehör Transformator / ACC
MESSKO® ZT-F2.1
Maßzeichnung/DIMENSION DRAWING

SERIAL NUMBER
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MATERIAL NUMBER
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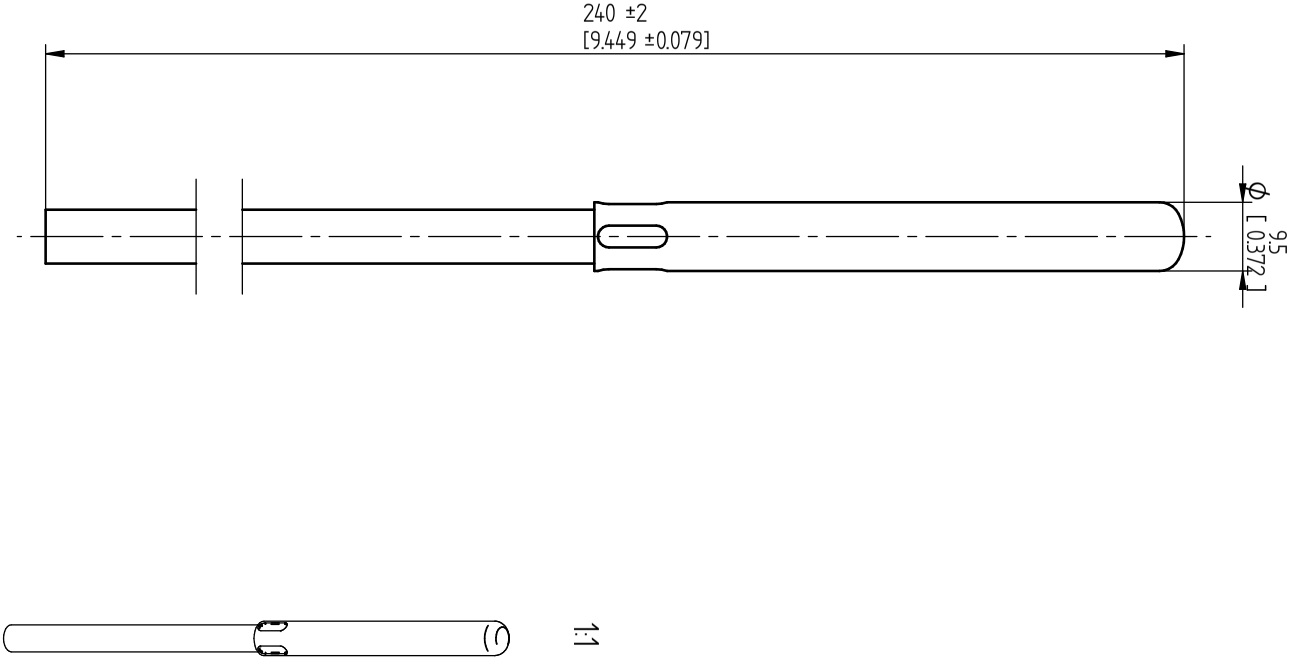

11 Appendix

11.1 Hotspot gradients for 2 A CT nominal current

Gradient	DIP switch S1	DIP switch S2
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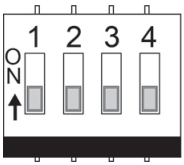
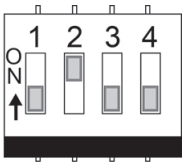
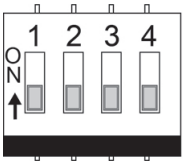
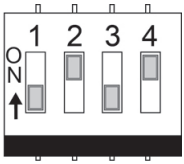
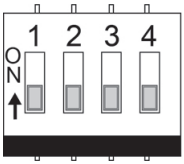
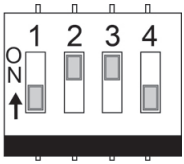
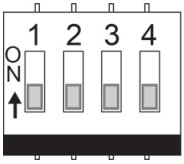
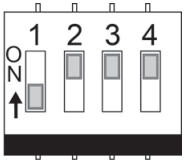
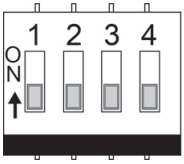
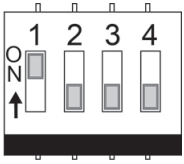
4 K		
5 K		
6 K		
7 K		
8 K		

Gradient	DIP switch S1	DIP switch S2
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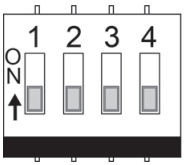
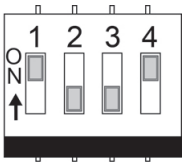
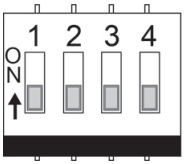
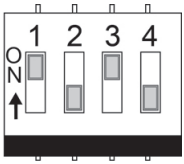
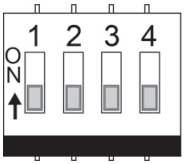
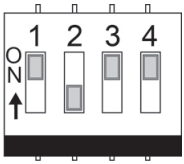
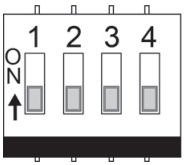
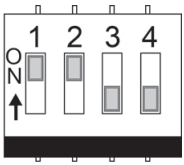
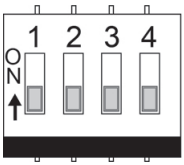
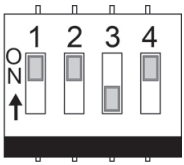
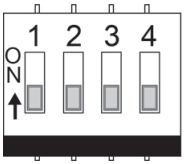
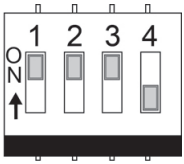
9 K		
10 K		
11 K		
12 K		
13 K		
14 K		

Gradient	DIP switch S1	DIP switch S2
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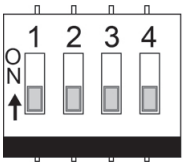
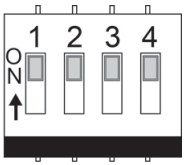
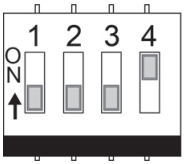
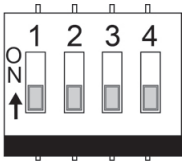
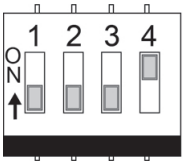
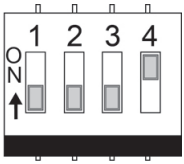
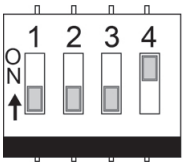
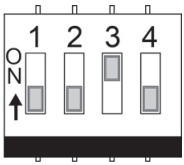
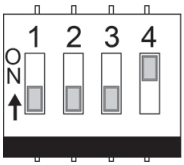
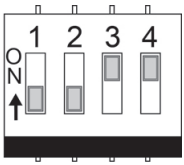
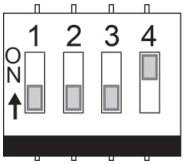
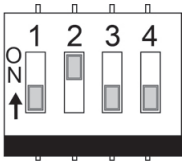
15 K		
16 K		
17 K		
18 K		
19 K		
20 K		

Gradient	DIP switch S1	DIP switch S2
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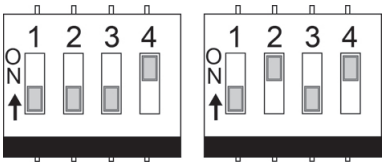
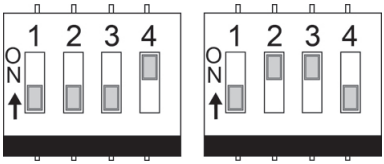
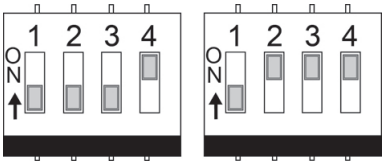
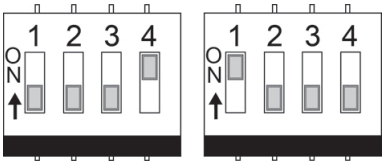
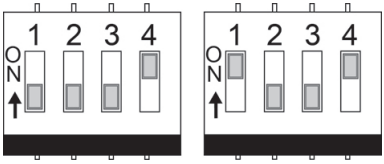
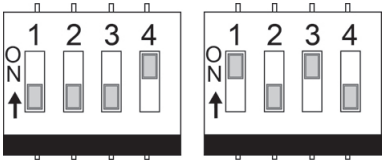
21 K		
22 K		
23 K		
24 K		
25 K		
26 K		

Gradient	DIP switch S1	DIP switch S2
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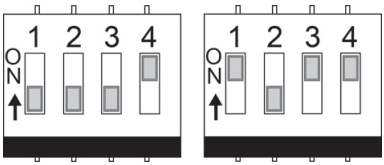
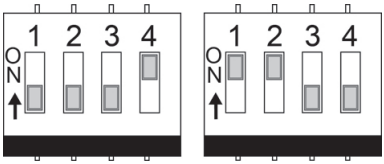
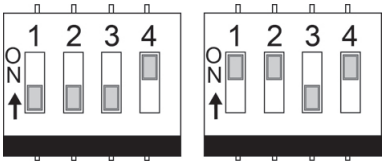
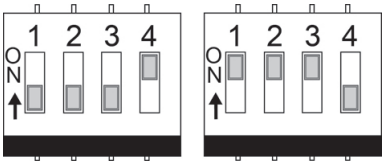
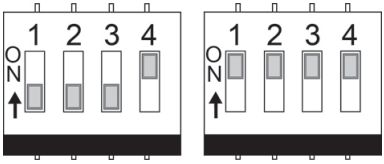
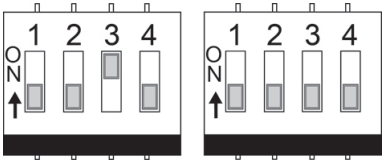
27 K		
28 K		
29 K		
30 K		
31 K		
32 K		

Gradient	DIP switch S1	DIP switch S2
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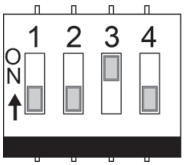
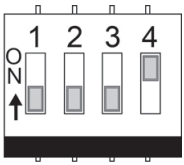
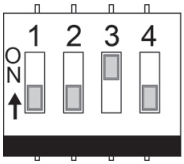
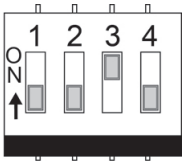
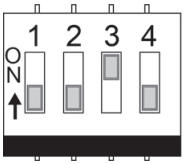
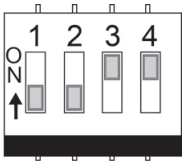
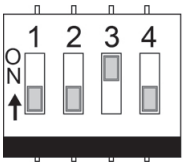
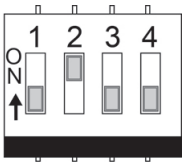
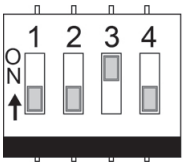
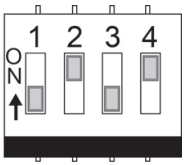
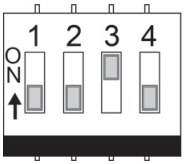
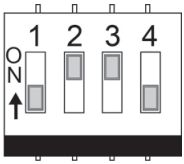
33 K		
34 K		
35 K		
36 K		
37 K		
38 K		

Gradient	DIP switch S1	DIP switch S2
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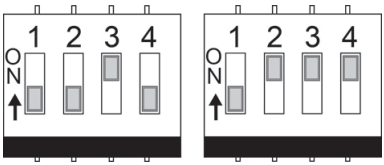
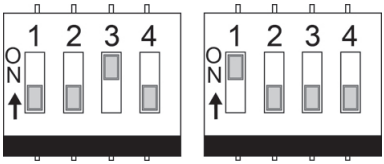
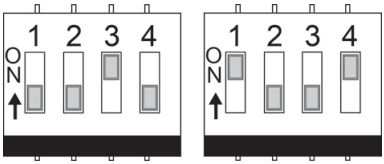
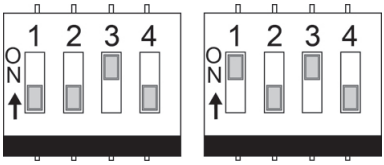
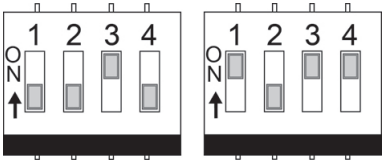
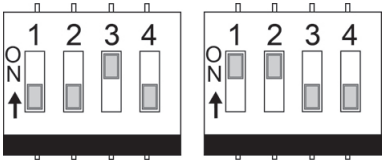
39 K		
40 K		
41 K		
42 K		
43 K		
44 K		

Gradient	DIP switch S1	DIP switch S2
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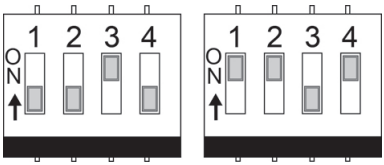
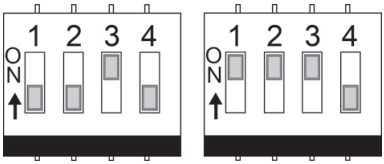
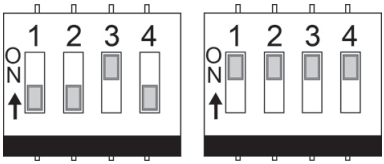
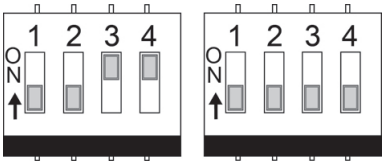
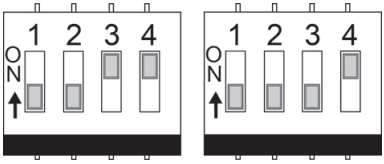
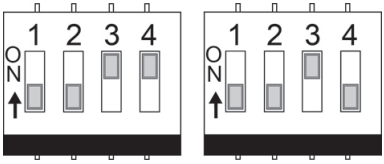
45 K		
46 K		
47 K		
48 K		
49 K		
50 K		

Table 7: Hotspot gradients for 2 A CT nominal current

11.2 Hotspot gradients diagram

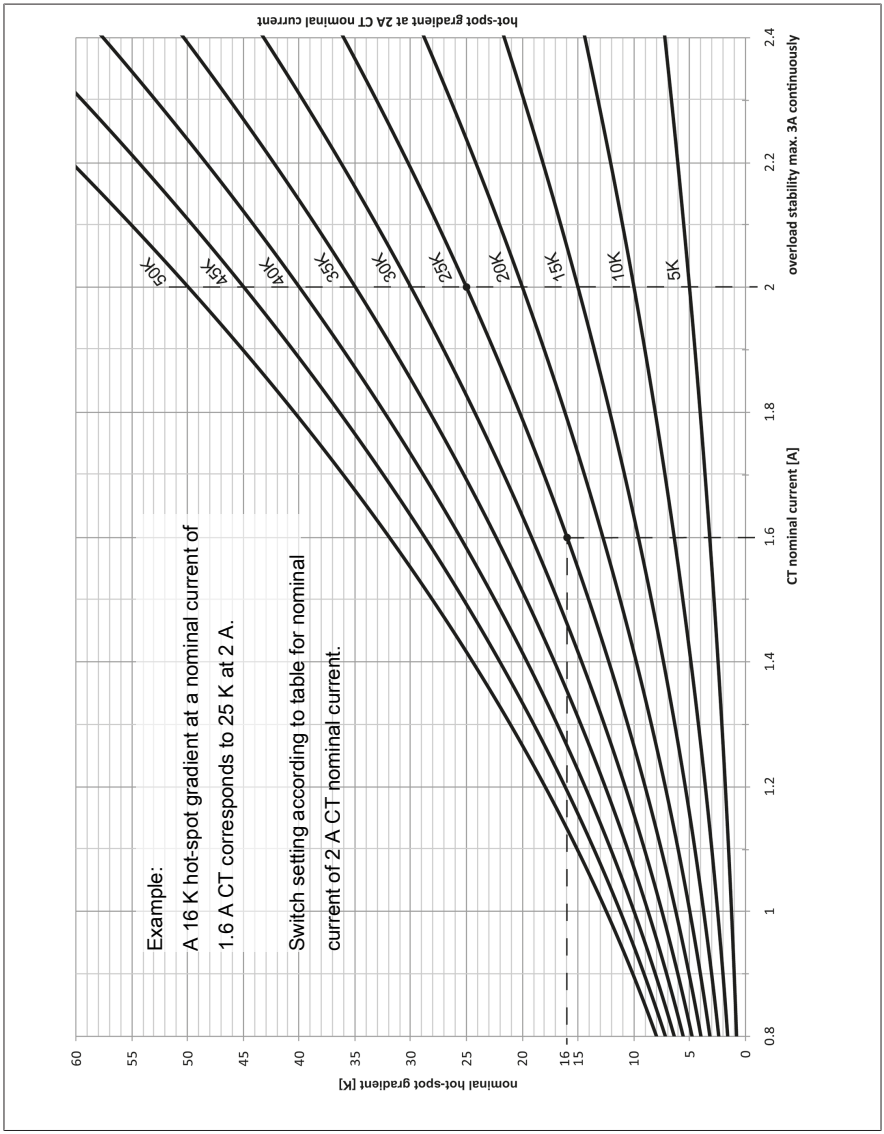


Figure 8: Hotspot gradients diagram

Glossary

Ambient air temperature

Permissible temperature of the air in the surroundings of the equipment in operation on which the device is installed.

Operating temperature

Permissible temperature in the immediate surroundings of the device during operation taking ambient influences, for example due to the equipment and installation location, into consideration.

Storage temperature

Permissible temperature for storing the device in an unmounted state or in a mounted state so long as the device is not in operation.

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Please note:
The data in our publications may differ from the data of the devices delivered. We reserve the right to make changes without notice.
10851779/00 EN - MESSKO® ZT-F2.1 Operating instructions - F0421600 - 07/25
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THE POWER BEHIND POWER.