



Buchholz relay

MESSKO® MSAFE®

Operating instructions

7232312/01 EN



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

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 original operating instructions were written in German.

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# 1 Introduction

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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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E-mail: [sales@reinhausen.com](mailto:sales@reinhausen.com)

Internet: [www.reinhausen.com](http://www.reinhausen.com)

MR Reinhausen customer portal: <https://portal.reinhausen.com>

Further information on the product and copies of this technical file are available from this address if required.

## 1.2 Safekeeping

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

## 1.3 Notation conventions

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

### 1.3.1 Hazard communication system

Warnings in this technical file are displayed as follows.

#### 1.3.1.1 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

### 1.3.1.2 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.

### 1.3.1.3 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

### 1.3.2 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 Introduction

## 1.3.3 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).

► 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).

## 1.3.4 Typographic conventions

Typographic convention	Purpose	Example
UPPERCASE	Operating controls, switches	ON/OFF
[Brackets]	PC keyboard	[Ctrl] + [Alt]
<b>Bold</b>	Software operating controls	Press <b>Continue</b> button
...>...>...	Menu paths	Parameter > Control parameter
<i>Italics</i>	System messages, error messages, signals	<i>Function monitoring</i> alarm triggered



Typographic convention	Purpose	Example
[▶ Number of pages]	Cross reference	[▶ Page 41].
Dotted underscore .....	Glossary entry, abbrevia- tions, definitions, etc.	Glossary entry.....

Table 2: Typographic conventions used in this technical file

## 2 Security

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- 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 Intended use

The Buchholz relay is a protective device for on-load tap-changers, transformers and reactors with an oil conservator. The Buchholz relay is installed in the pipe between the transformer tank and oil conservator on the transformer and/or between the on-load tap-changer head and oil conservator on the on-load tap-changer.

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.

### 2.2 Fundamental safety instructions

To prevent accidents, malfunctions 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 13] 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.

- Keep the work area clean and tidy.
- Make sure that the work area is well lit.
- Observe the applicable laws for accident prevention in the relevant country.

### 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.

## 2 Security

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### 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 repair work is not carried out by our Technical Service department, please ensure that the personnel who carry out the repairs are trained and authorized to do so by Maschinenfabrik Reinhausen GmbH.

### **Maschinenfabrik Reinhausen GmbH**

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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.

## 2 Security

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<b>Protective clothing</b>	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.
<b>Safety shoes</b>	To protect against falling heavy objects and slipping on slippery surfaces.
<b>Safety glasses</b>	To protect the eyes from flying parts and splashing liquids.
<b>Visor</b>	To protect the face from flying parts and splashing liquids or other dangerous substances.
<b>Hard hat</b>	To protect against falling and flying parts and materials.
<b>Hearing protection</b>	To protect against hearing damage.
<b>Protective gloves</b>	To protect against mechanical, thermal and electrical hazards.

Table 3: Personal protective equipment

This chapter contains an overview of the design and function of the product.

### 3.1 Scope of delivery

The product is packaged with protection against moisture and is delivered as follows:

- Buchholz relay
- Technical documents
- Air pump (optional)
- Gas extraction device (optional)

### 3.2 Function description

The Buchholz relay is a protective device for on-load tap-changers, transformers and reactors with an oil conservator. The Buchholz relay is installed in the pipe between the transformer tank and oil conservator on the transformer and/or between the on-load tap-changer head and oil conservator on the on-load tap-changer. The electrical signaling is realized via a maximum of 4 dry-reed magnetic switches (N/C contact, N/O contact, changeover contact).

The Buchholz relay detects the following:

#### **Gas accumulation in the insulating fluid**

The gas migrates upwards in the insulating liquid, collects in the gas chamber of the Buchholz relay and displaces the insulating fluid. As the fluid level drops, the upper float gauge lowers, activating a contact in the dry-reed

### 3 Product description

magnetic switch pipe and triggering a signal. The lower float gauge remains unaffected, because as of a certain volume the gas flows to the oil conservator via the pipe.

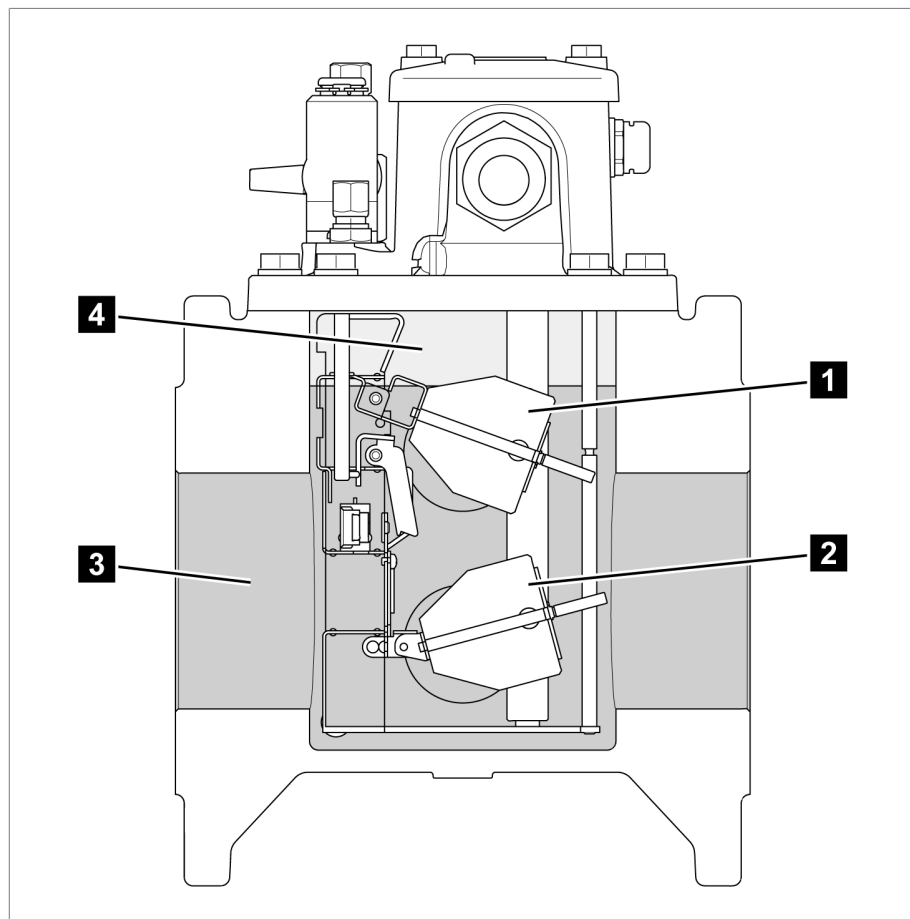


Figure 1: Gas in the Buchholz relay

1 Upper float gauge

2 Lower float gauge

3 Insulating fluid

4 Gas



#### Loss of insulating fluid

As the fluid level drops, the upper float gauge lowers first, activating a contact in the dry-reed magnetic switch pipe and triggering a signal. As the fluid level drops further, the lower float gauge also lowers, activating another contact in the dry-reed magnetic switch pipe and triggering another signal.

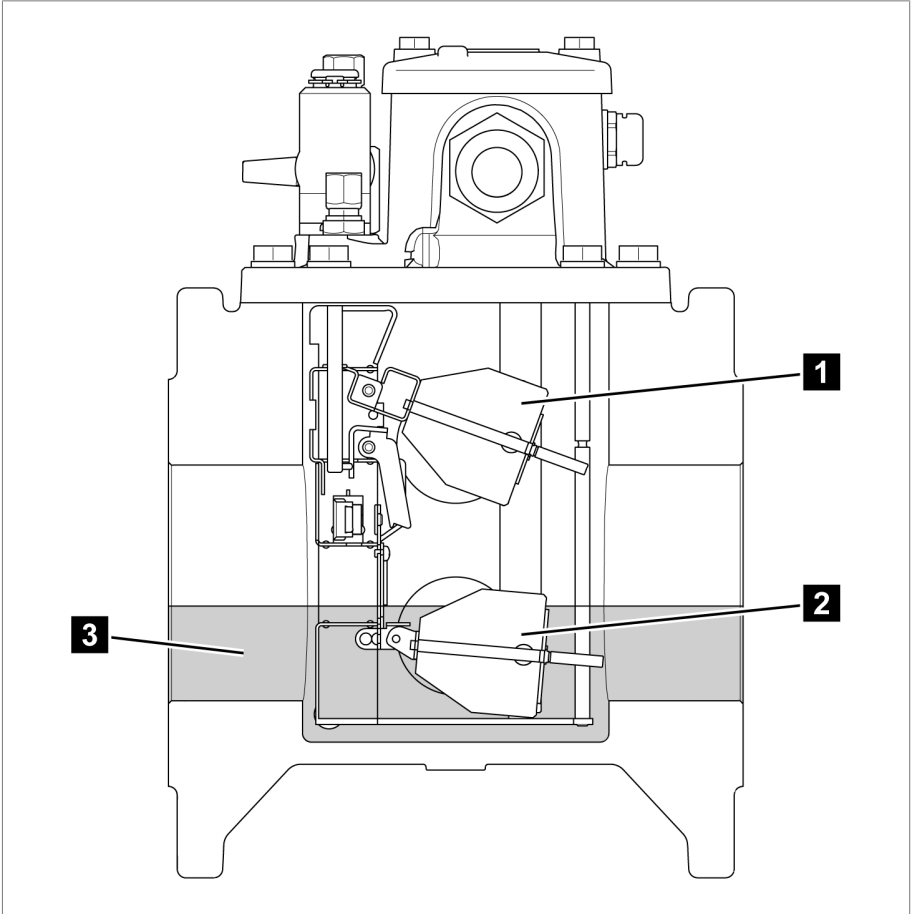


Figure 2: Insufficient insulating fluid

1 Upper float gauge

2 Lower float gauge

3 Insulating fluid

### 3 Product description

#### Insulating fluid flow speed too high

If the specified flow speed towards the oil conservator is exceeded, a flap valve moves in the direction of flow, activating a contact in the dry-reed magnetic switch pipe and triggering a signal.

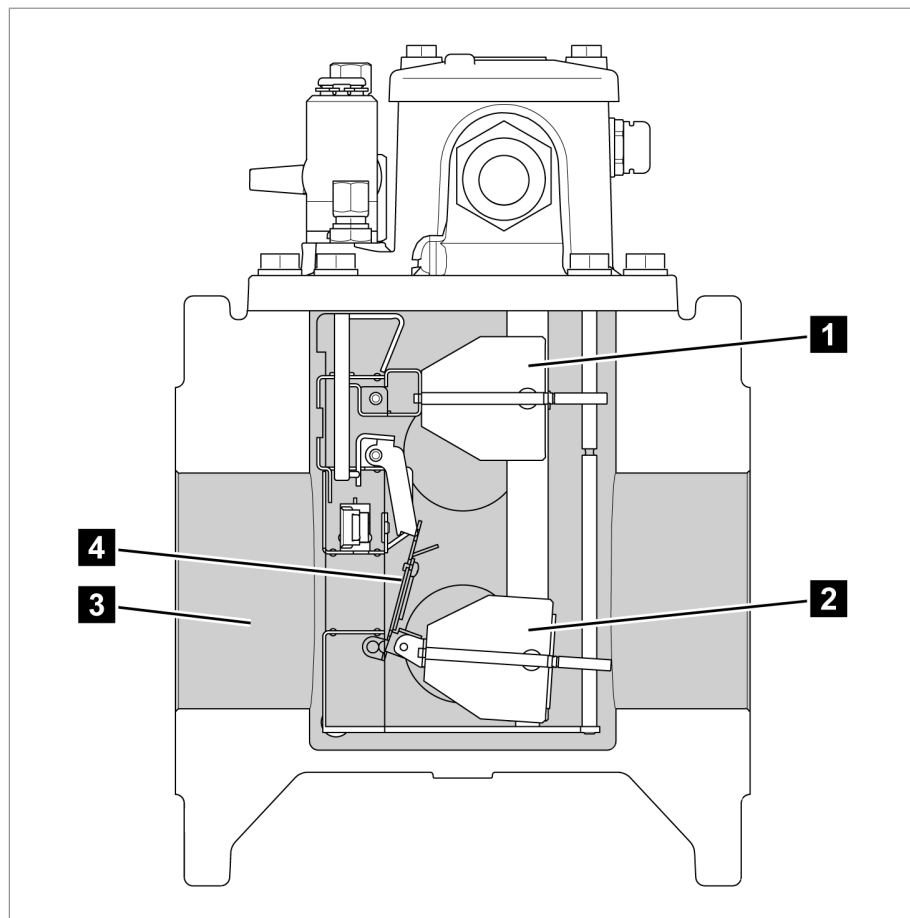


Figure 3: Flow speed too high

1 Upper float gauge

2 Lower float gauge

3 Insulating fluid

4 Flap valve

### 3.3 Design/versions

The Buchholz relay is equipped with 2 float gauges and 1 flap valve, and is available with a G 1 $\frac{1}{2}$ " thread connection or flange connections for nominal pipe diameters of DN25, DN50 or DN80.

The Buchholz relay can be equipped with a maximum of 4 dry-reed magnetic switches (NC contact, NO contact, CO contact) which you can connect electrically via the terminal box.

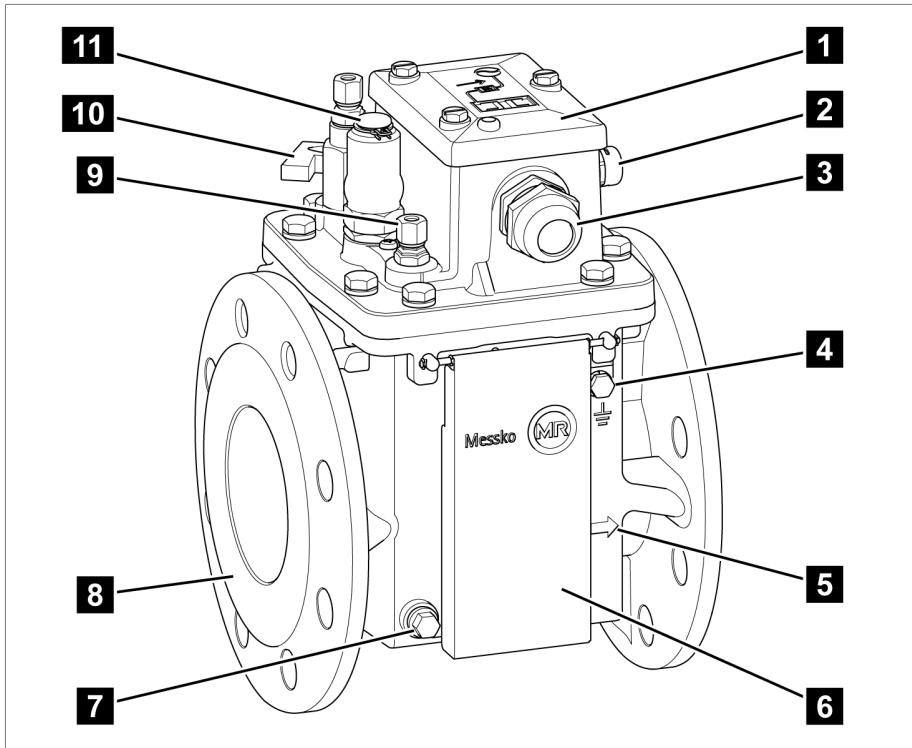


Figure 4: Buchholz relay

1 Terminal box	2 Pressure equalization element
3 Cable gland (also on the opposite side)	4 Grounding screw
5 Marking for mounting position	6 Cover for inspection window (optional)
7 Oil drain screw (also on the opposite side)	8 Flange (also on the opposite side)

### 3 Product description

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9	Connection for pneumatics testing (optional)	10	Gas extraction valve
11	Test button with cover sleeve		

## 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. This ensures 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.

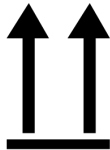
Inlays inside the box stabilize the goods, preventing prohibited changes in position, and protecting them from vibration.

### 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.

## 4 Packaging, transport and storage

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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.

## 5 Mounting

### DANGER



#### **Electric shock!**

Danger of death due to electrical voltage when assembling/disassembling the device.

- ▶ Switch off transformer on high-voltage side and low-voltage side.
- ▶ Lock transformer to prevent unintentional restart.
- ▶ Make sure that everything is de-energized.
- ▶ Visibly connect all transformer terminals to ground (grounding leads, grounding disconnectors) and short circuit them.
- ▶ Cover or cordon off adjacent energized parts.

This chapter describes how to install the flow indicator on a pipe and electrically connect the micro-switches.

### 5.1 Checking the pipe flanges

The pipe flanges must be flush and clean to allow the Buchholz relay to be positioned with the least possible stress. Even slight unevenness on a pipe flange can cause the Buchholz relay flange to be curved too much, leading to cracks in the flange caused by the resulting transverse stress.

Therefore, check the following:

- Pipe flanges
  - Flush and even
  - Evenness deviation  $\leq 0.2$  mm
- Pipe flange sealing surfaces
  - Clean and undamaged
  - Without any damage along the radial surface such as scratches or points of impact
  - The surface quality of the sealing surface must be suitable for the gasket being used
- Installation material (screws, nuts, washers)
  - Clean and undamaged, particularly the threads and contact surfaces
- Gasket
  - Clean, undamaged, dry



### 5.2 Gasket requirements

Observe the following information when selecting the gaskets:

- Ensure that the gasket and sealing groove meet the latest technical standards.
- Use new and clean gaskets.
- Use O-rings or flat gaskets.
- Never use paper gaskets.
- Gasket material:
  - The chemical resistance must be suitable for the insulating fluid in order to prevent later leaks due to chemical degradation.
  - The gasket material must be suitable for use at the specified ambient temperatures and operating temperatures.
  - The gasket material must be suitable for the prevailing relative humidity on site.
  - Elastomer gaskets must occupy a maximum of 80% of the sealing groove when installed. The remaining 20% of the groove is required as expansion space.

### 5.3 Fastening the Buchholz relay to the pipe

Fasten the Buchholz relay to the pipe, taking into consideration the following points:

- The pipe from the Buchholz relay to the oil conservator must be routed with a consistent incline of at least 2% (1.2°) to ensure the switching gases can escape freely. The Buchholz relay is intended for a horizontal operating position in close proximity to the on-load tap-changer head and/

## 5 Mounting

or transformer. A positive inclination of up to  $5^\circ$  from the horizontal is permitted in the direction toward the conservator. An inclination of up to  $5^\circ$  from the vertical to either side is permitted.

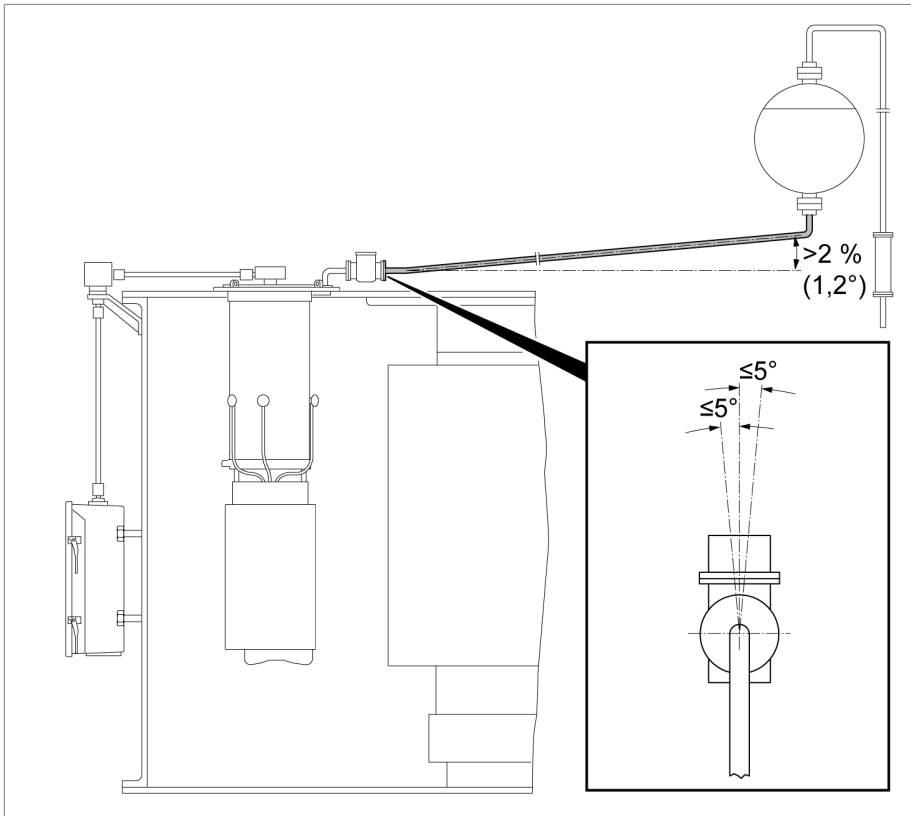


Figure 5: Necessary incline of the pipe and permitted inclination of the Buchholz relay when using the Buchholz relay as a protective device for the on-load tap-changer

- The distance between the Buchholz relay and the next fastening point of the pipe may not exceed 0.5 m with DN25, 0.7 m with DN50 and 1 m with DN80. Otherwise, install a fastening point in close proximity to the Buchholz relay.

To fasten the Buchholz relay on the pipe, proceed as follows:

1. Ensure that there is no insulating fluid in the pipe.

2. Remove the plastic cover on both flanges.

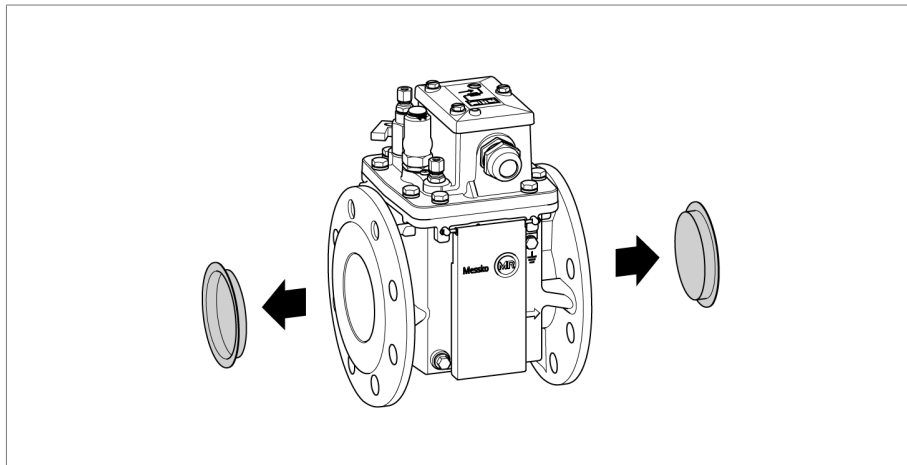


Figure 6: Plastic cover

3. Remove the cover sleeve from the test button, remove the colored plug and reattach the cover sleeve to the test button.

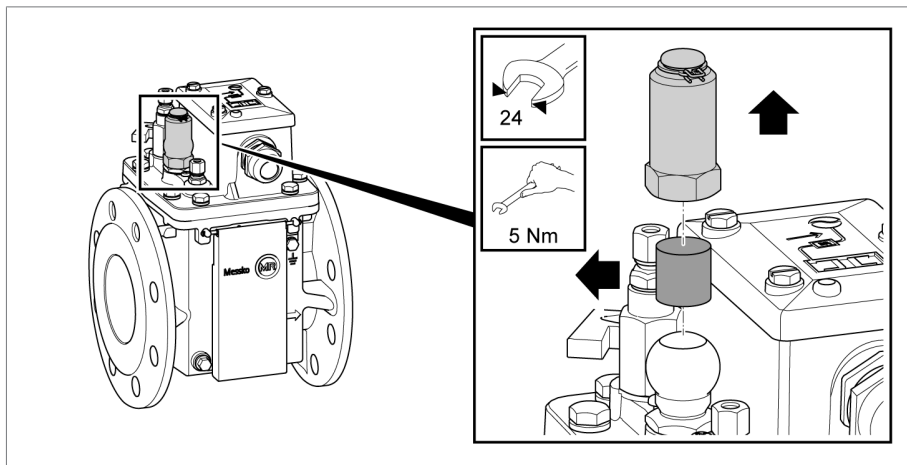


Figure 7: Plugs

## 5 Mounting

4. If the Buchholz relay is equipped with the connection for pneumatics testing: Remove the union nut from the connection. Position the locking cap on the connection, screw on hand-tight and then tighten with max. one half turn.

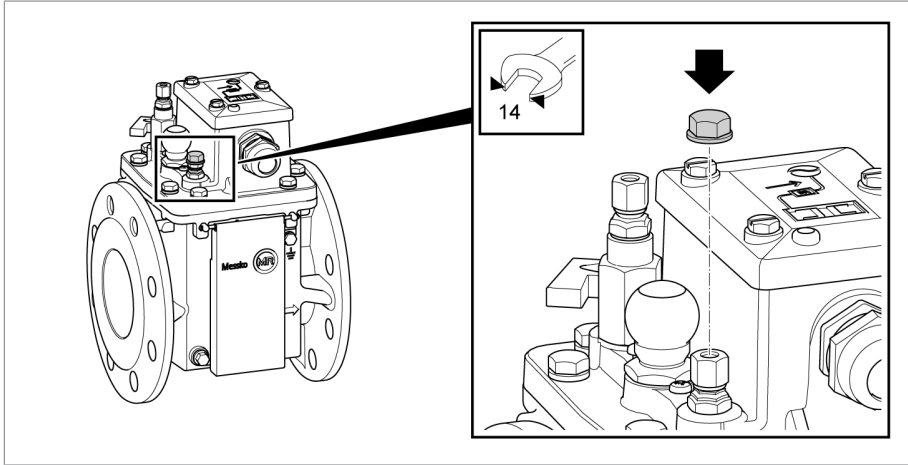


Figure 8: Locking cap for connection for pneumatics testing

5. If a fixed pipe for gas extraction is not connected to the gas extraction valve: Remove the union nut from the gas extraction valve. Position the locking cap on the gas extraction valve, screw on hand-tight and then tighten with max. one half turn.

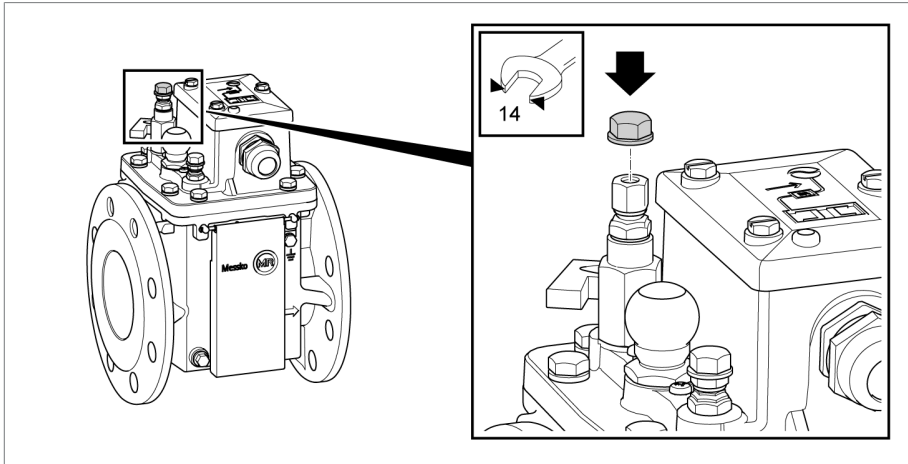


Figure 9: Locking cap for gas extraction valve

6. **NOTICE!** Damage to Buchholz relay housing due to screws that are too long. Fasten the Buchholz relay onto the pipe using suitable screws, nuts and gaskets in such a way that the printed arrow is pointing in the direction of the oil conservator (direction of insulating fluid flow). Only tighten screws by hand.

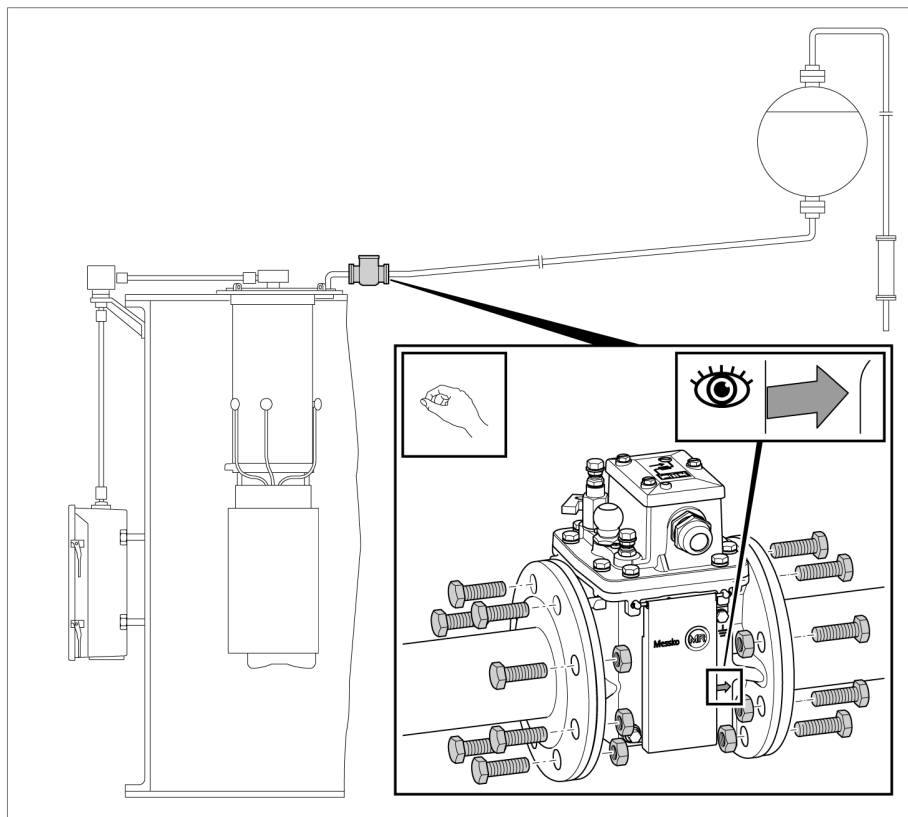


Figure 10: Fastening the Buchholz relay to the pipe

## 5 Mounting

7. **NOTICE!** A residual distance between the flanges caused by a deviation in evenness can cause damage to the flanges. Tighten screws with 10% of the target torque and ensure that there is no gap between the flanges. If there is a gap, repair the affected pipe flanges or, if necessary, detach and re-weld them so that there is no longer a gap.

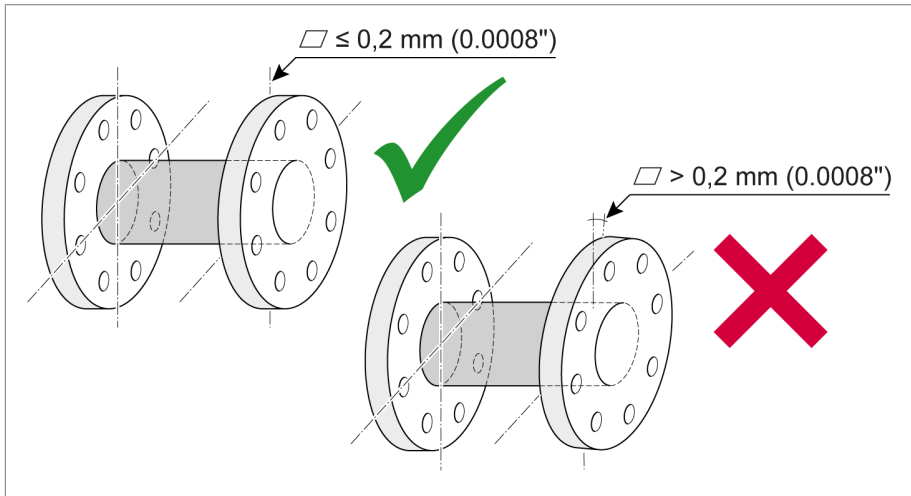


Figure 11: Flanges

8. Tighten the screws crosswise with 30% of the target torque.
9. Tighten the screws crosswise with 60% of the target torque.
10. **NOTICE!** Damage to the flanges due to a torque that is too high. Tighten the screws crosswise with full target torque.

11. Retighten all screws with the full target torque until the screws can no longer be turned under the full torque.

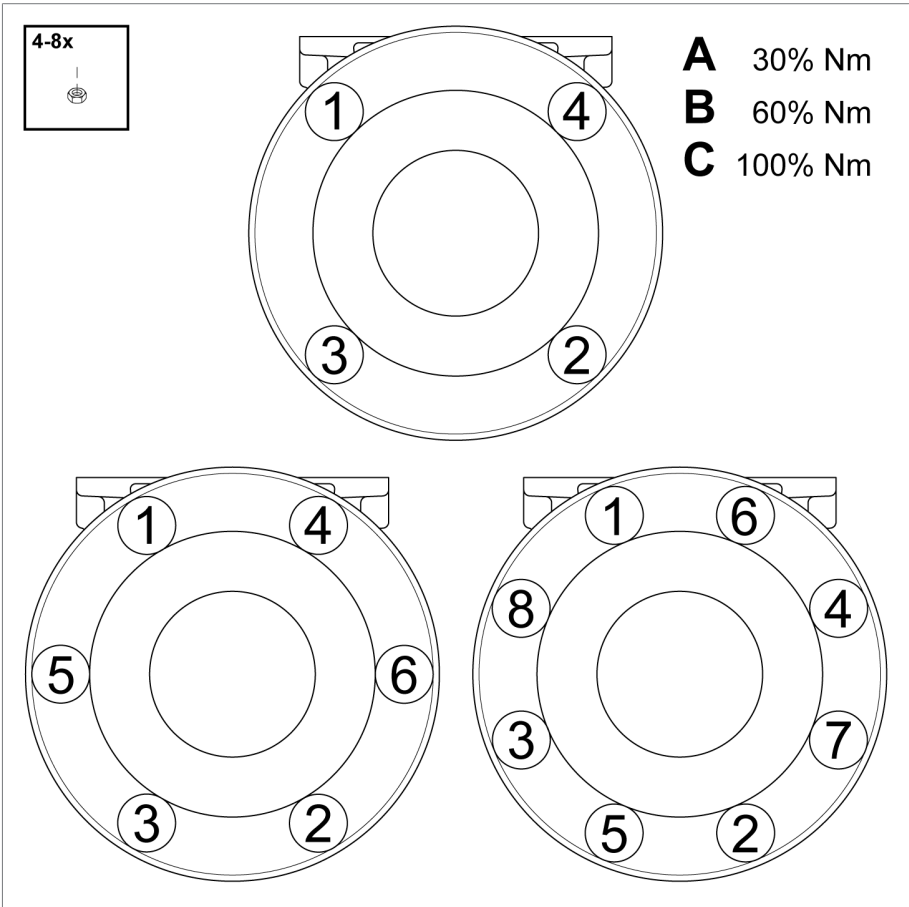


Figure 12: Tighten the screws crosswise

### 5.4 Electrically connecting the dry-reed magnetic switches

#### ⚠ DANGER



#### Electric shock!

Risk of fatal injury due to electrical voltage when connecting the device.

- Ensure that all cables are free of voltage during connection work.

## 5 Mounting

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The dry-reed magnetic switches installed in the Buchholz relay are designed as N/C contacts, N/O contacts or changeover contacts. You can connect these electrically via a terminal strip in the terminal box. The cables are not included in the scope of delivery.

1. Unscrew the screws (3x M6, wrench size 10) on the terminal box and remove the cover.
2. Remove the sheathing of the cable, strip off approx. 7 mm of insulation from the strands and attach ferrules.
3. Open the cable gland (wrench size 30) and feed the cable through. The cable gland is suitable for a cable diameter of 13...20 mm.



4. Connect the strands to the terminal strip. The connection diagram can also be found on the inside of the terminal box cover.

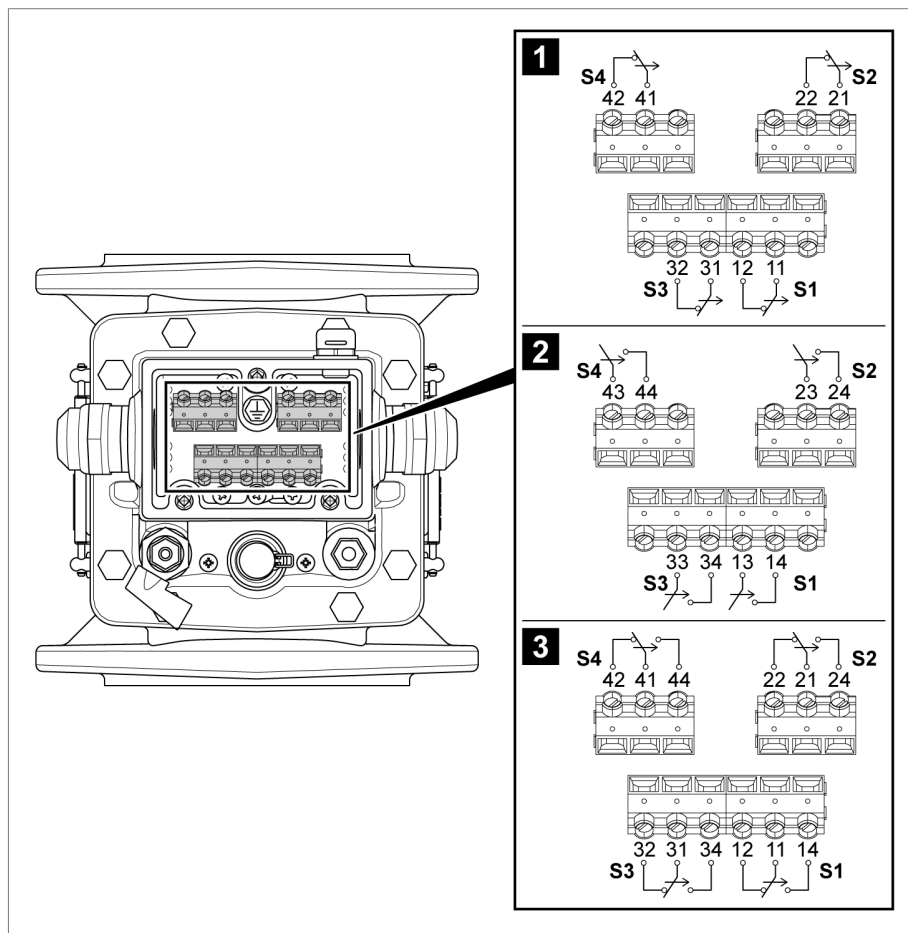


Figure 13: Connection diagram

1 N/C contacts

2 N/O contacts

3 Changeover contacts

5. Tighten the cable gland (wrench size 30, torque 6.7 Nm).
6. Position the cover on the terminal box and screw tight (3x M6, wrench size 10, torque 2 Nm).

## 5 Mounting

---

7. Ground the Buchholz relay using the grounding cable with ring-type cable lug (grounding screw M6, wrench size 10, torque 6 Nm). The aluminum side of the CUPAL washer must be facing the Buchholz relay housing.

Prior to commissioning the transformer, vent the Buchholz relay and perform the checks listed in the following. If anything is unclear regarding the tests or troubleshooting, contact Maschinenfabrik Reinhausen GmbH [► Section 1.1, Page 6].

### 6.1 Venting the Buchholz relay

#### **⚠ WARNING**



#### **Danger of explosion and danger of poisoning!**

Explosive gases in the Buchholz relay can deflagrate or explode and result in death or severe injuries. Inhaling the gases released can lead to poisoning or suffocation.

- ▶ Ensure that there are no ignition sources such as naked flames, hot surfaces or sparks (e.g. caused by the build-up of static charge, electrical devices) in the immediate surroundings and that none occur.
  - ▶ Do not breath in any gas released.
- ✓ The pipes are filled with insulating fluid.
  - ✓ The stop valve to the oil conservator is open.
1. Remove the locking cap (open-end wrench, wrench size 14).
  2. Open the gas extraction valve.
  3. Close the gas extraction valve as soon as insulating fluid begins to escape.
    - ⇒ The Buchholz relay has been vented.
  4. Position the locking cap on the gas extraction valve, screw on hand-tight and then tighten with max. one half turn (open-end wrench, wrench size 14).

### 6.2 Leak test

- ✓ The pipes are filled with insulating fluid.
1. Check the tightness of the flange connection.
  2. If the connection is not tight, check the gasket and replace it if necessary.
- ⇒ The test is complete.

## 6 Commissioning

### 6.3 Function tests

#### ▲ WARNING



#### **Danger of explosion and danger of poisoning!**

Explosive gases in the Buchholz relay can deflagrate or explode and result in death or severe injuries. Inhaling the gases released can lead to poisoning or suffocation.

- ▶ Ensure that there are no ignition sources such as naked flames, hot surfaces or sparks (e.g. caused by the build-up of static charge, electrical devices) in the immediate surroundings and that none occur.
- ▶ Do not breath in any gas released.

#### 6.3.1 Loss of insulating fluid

This test simulates the loss of insulating fluid.

##### **Test without reset function**

- ✓ The pipes are filled with insulating fluid.
- 1. Remove the test button cover sleeve (open-end wrench, wrench size 24).
- 2. Press the test button down and release.
  - ⇒ The upper and lower float gauges are pressed down and the dry-reed magnetic switches of both float gauges issue a signal.
  - ⇒ The float gauges return to their starting position and the signals stop. Check the position of the float gauges via the inspection window.
- 3. Fasten the cover sleeve onto the test button (open-end wrench, wrench size 24, torque 5 Nm).
- ⇒ The test is complete.

##### **Test with reset function**

- ✓ The pipes are filled with insulating fluid.
- 1. Remove the test button cover sleeve (open-end wrench, wrench size 24).

2. Press the test button down and release.

- ⇒ The upper and lower float gauges are pressed down and the dry-reed magnetic switches of both float gauges issue a signal.
- ⇒ The upper float gauge returns to its starting position. The upper float gauge signal stops. Check the position of the float gauge via the inspection window.
- ⇒ The lower float gauge is blocked by the flap valve. The lower float gauge continues issuing a signal until the flap valve is released manually.

3. Turn the test button counterclockwise to the stop.

- ⇒ The flap valve is released and returns to its starting position.
- ⇒ The lower float gauge returns to its starting position. The lower float gauge signal stops. Check the position of the float gauge via the inspection window.

4. Fasten the cover sleeve onto the test button (open-end wrench, wrench size 24, torque 5 Nm).

⇒ The test is complete.

### 6.3.2 Gas accumulation in the insulating fluid

This test simulates the accumulation of gas in the upper part of the Buchholz relay.

- ✓ The Buchholz relay is equipped with the connection for pneumatics testing.
- ✓ The pipes are filled with insulating fluid.

1. Unscrew the locking cap from the connection for pneumatics testing (open-end wrench, wrench size 14).

2. Connect the air pump (available as an option) to the connection for pneumatics testing.

3. Introduce air into the Buchholz relay until the upper float gauge lowers and the dry-reed magnetic switch issues a signal.

4. Release the air via the gas extraction valve.

- ⇒ The upper float gauge returns to its starting position. Check the position of the float gauge via the inspection window.

## 6 Commissioning

---

5. Position the locking cap on the connection for pneumatics testing, screw on hand-tight and then tighten with max. one half turn (open-end wrench, wrench size 14).

⇒ The test is complete.

### 6.3.3 Insulating fluid flow speed too high

This test simulates an excessive insulating fluid flow speed.

- ✓ The Buchholz relay is equipped with the connection for pneumatics testing.

- ✓ The pipes are filled with insulating fluid.

1. Unscrew the locking cap from the connection for pneumatics testing (open-end wrench, wrench size 14).

2. **⚠ DANGER!** Danger of explosion due to flammable gases. Only use nitrogen or compressed air. Connect the gas cylinder to the connection for pneumatics testing. Secure the gas cylinder against falling. Ensure that all devices connected to the gas cylinder are connected correctly and tightly sealed.

3. Introduce nitrogen or compressed air into the Buchholz relay with a pressure of 6.5...8 bar in pulses by briefly opening and immediately closing the valve again until the flap valve falls.

⇒ The lower float gauge coupled with the flap valve lowers and the dry-reed magnetic switch issues a signal.

4. Release the gas via the gas extraction valve.

⇒ The lower float gauge returns to its starting position. Check the position of the float gauge via the inspection window.

5. If the Buchholz relay is equipped with the reset function, turn the test button counterclockwise to the stop to return the flap valve to its starting position. Check the position of the flap valve via the inspection window.

6. Remove the gas cylinder.

7. Position the locking cap on the connection for pneumatics testing, screw on hand-tight and then tighten with max. one half turn (open-end wrench, wrench size 14).

⇒ The test is complete.

## 7.1 Alarm table

















































	N/O contact (NO)	N/C contact (NC)	Changeover contact (CO)	Note	
Normal operating state. All contacts in starting position.	<div><div>43 44</div><div>S4</div><div>33 34</div><div>S3</div></div>	<div><div>23 24</div><div>S2</div><div>13 14</div><div>S1</div></div>	<div><div>42 41</div><div>S4</div><div>32 31</div><div>S3</div></div> <div><div>22 21</div><div>S2</div><div>12 11</div><div>S1</div></div>	<div><div>42 41 44</div><div>S4</div><div>32 31 34</div><div>S3</div></div> <div><div>22 21 24</div><div>S2</div><div>12 11 14</div><div>S1</div></div>	
Gas accumulation in the insulating fluid. Contacts S2 and S4 (optional) have switched.	<div><div>43 44</div><div>S4</div><div>33 34</div><div>S3</div></div>	<div><div>23 24</div><div>S2</div><div>13 14</div><div>S1</div></div>	<div><div>42 41</div><div>S4</div><div>32 31</div><div>S3</div></div> <div><div>22 21</div><div>S2</div><div>12 11</div><div>S1</div></div>	<div><div>42 41 44</div><div>S4</div><div>32 31 34</div><div>S3</div></div> <div><div>22 21 24</div><div>S2</div><div>12 11 14</div><div>S1</div></div>	Check the insulating fluid level via inspection windows.  Check the transformer condition.
Loss of insulating fluid. Contacts S2 and S4 (optional) and S1 and S3 (optional) have switched.	<div><div>43 44</div><div>S4</div><div>33 34</div><div>S3</div></div>	<div><div>23 24</div><div>S2</div><div>13 14</div><div>S1</div></div>	<div><div>42 41</div><div>S4</div><div>32 31</div><div>S3</div></div> <div><div>22 21</div><div>S2</div><div>12 11</div><div>S1</div></div>	<div><div>42 41 44</div><div>S4</div><div>32 31 34</div><div>S3</div></div> <div><div>22 21 24</div><div>S2</div><div>12 11 14</div><div>S1</div></div>	Check the insulating fluid level via inspection windows.  The transformer may have been disconnected via contacts S1 and S3 (optional).
Insulating fluid flow speed too high. The flap valve has been actuated.	<div><div>43 44</div><div>S4</div><div>33 34</div><div>S3</div></div>	<div><div>23 24</div><div>S2</div><div>13 14</div><div>S1</div></div>	<div><div>42 41</div><div>S4</div><div>32 31</div><div>S3</div></div> <div><div>22 21</div><div>S2</div><div>12 11</div><div>S1</div></div>	<div><div>42 41 44</div><div>S4</div><div>32 31 34</div><div>S3</div></div> <div><div>22 21 24</div><div>S2</div><div>12 11 14</div><div>S1</div></div>	The transformer may have been disconnected via contacts S1 and S3 (optional).  Check flap valve position via inspection windows.  Check the transformer condition.

Table 5: Alarm table

## 7 Operation

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### 7.2 Releasing blocked flap valve

If the Buchholz relay is equipped with the reset function, the flap valve is blocked if there is a loss of insulating fluid or the flow speed is too high. In these cases, you have to release the flap valve manually.

1. Remove the test button cover sleeve (open-end wrench, wrench size 24).
2. Turn the test button counterclockwise to the stop.  
⇒ The flap valve is released and returns to its starting position.
3. Check flap valve position via inspection window.
4. Fasten the cover sleeve onto the test button (open-end wrench, wrench size 24, torque 5 Nm).



### Maintenance

The device is maintenance-free.

### Inspection

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.

During each transformer inspection, check the following:

1. Check the external condition of the device for contamination, damage (e.g. glass, electrical connection) and corrosion.
2. Vent the device [► Section 6.1, Page 35].
3. Check the tightness of the flange connection [► Section 6.2, Page 35].
4. Check that the device is functioning correctly [► Section 6.3, Page 36].

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

#### **Maschinenfabrik Reinhausen GmbH**

MR Service & Complaint

Falkensteinstrasse 8

93059 Regensburg, Germany

E-mail: [service@reinhausen.com](mailto:service@reinhausen.com) or [complaint@reinhausen.com](mailto:complaint@reinhausen.com)

### 8.1 Draining the insulation fluid

If you have to drain insulating fluid from the Buchholz relay for inspection work or maintenance work on the transformer, proceed as follows.

1. Remove the oil drain cap (open-end wrench, wrench size 10).
  - ⇒ The insulating fluid flows out of the Buchholz relay.
2. Capture the insulating fluid in a suitable container.
3. Affix the oil drain cap (open-end wrench, wrench size 10, torque 10 Nm).
4. Check tightness.

## 9 Disposal

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Observe the national disposal regulations in the country of use.

### 9.1 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):

- Aluminum alloy
- Brass alloy
- Standard parts with a low property class

Basic materials	
Housing / terminal box	Cast aluminum, RAL 7033 or 7038 (similar to ANSI 70 light gray), powder-coated; seawater-resistant version (offshore) upon request
Inspection window	Hardened glass with UV filter
Specifications	
Setup	Indoors and outdoors, tropic-proof
Ambient air temperature	-50 °C...+80 °C
Storage temperature	-40 °C...+80 °C
Operating temperature	-40 °C...+115 °C
Insulating fluid temperature	-25 °C...+105 °C (up to +115 °C in transformer overload operation) Temperature ranges for alternative insulating fluids on request
Degree of protection	IP 66 in accordance with DIN EN 60529
Weight including terminal box	Approx. 7 kg
Nominal diameter of the pipe, flange version	DN25, DN50, DN80 or G 1½" thread connection
Flap valve triggering pressure (mineral insulating oil)	DN25: 1 m/s, 1.2 m/s, 1.3 m/s, 1.5 m/s, 2 m/s or 2.5 m/s (each ±15%) DN50: 1 m/s, 1.3 m/s, 1.5 m/s or 2 m/s (each ±15%) DN80: 1 m/s, 1.3 m/s, 1.5 m/s, 2 m/s or 2.5 m/s (each ±15%) 3 m/s for DN25, DN50, DN80 on request
Overvoltage category	III; external protection: Miniature circuit breaker max. 16 A, C characteristic
Dry-reed magnetic switches	
Number and type	Max. 4 N/C contacts, N/O contacts and/or changeover contacts Floating; 2 contacts per function
Nominal voltage	24...250 V AC/DC

## 10 Technical data

### Dry-reed magnetic switches

Max. switched current AC/DC	N/C contact: 2 A N/O contact: 2 A Changeover contact: 1 A
Min. switched current	50 mA=1.2 W/24 V 4.8 mA=1.2 W/250 V
Max. continuous current AC/DC	N/C contact: 3 A N/O contact: 3 A Changeover contact: 2 A
Max. AC switching capacity	N/C contact: 1.2 VA...400 VA N/O contact: 1.2 VA...400 VA Changeover contact: 1.2 VA...200 VA
Max. DC switching capacity	N/C contact: 1.2 W...250 W N/O contact: 1.2 W...250 W Changeover contact: 1.2 W...150 W
Rated insulation voltage	2.7 kV AC/2 s contacts to housing; 1 kV AC/2 s open contacts
Insulation resistance	1000 MΩ/500 V DC

### Terminal box

Connection terminals	Min. 0.25 mm <sup>2</sup> / max. 4 mm <sup>2</sup>
Cable gland	M25x1.5 for cable Ø 13...20 mm or ½" NPT

### Insulating fluid

- Unused insulating oils derived from petroleum products<sup>1)</sup> in accordance with IEC 60296 and ASTM D3487 (equivalent standards on request)
- Unused insulating oils derived from other virgin hydrocarbons in accordance with IEC 60296, or blends of these oils with petroleum products<sup>1)</sup> in accordance with IEC 60296, ASTM D3487 or equivalent standards on request
- Alternative insulating fluids, such as natural and synthetic esters or silicone oils, on request

<sup>1)</sup> Gas-to-liquid oils (GTL oils) are understood in this context as petroleum products

Min. density 756 kg/m<sup>3</sup>



DATE	NAME	DOCUMENT NO.	
20.09.2022	KAFFENBERGER	SED	7286610_000_01
CHKD.	REHNEIT	CHANGE NO.	SCALE
11.10.2022	KLEYN	116559	

DIMENSION  
IN mm  
EXCEPT AS  
NOTED



TRANSFORMER ACCESSORIES  
DIMENSION TABLE  
MSAFE-BUCHHOLZ RELAY

SERIAL NUMBER

MATERIAL NUMBER  
101293190M

SHEET  
1 / 1

Maßtabelle / DIMENSION TABLE											
Typ / TYPE	DRAWING NO.	d1	d2	d3 = p.c.d.	d4	φ d5	f	l1	h1	h2	
MBR25-6	SED_8922379_000_0x	φ25/0.98"	φ100/3.94"	φ75/2.95"	φ60/2.36"	4x 12/0.47"	125/0.49"	185/7.28"	244/9.61"	107/4.21"	
MBR25-16	SED_7265391_000_0x	φ25/0.98"	φ115/4.53"	φ85/3.35"	φ68/2.68"	4x 14/0.55"	20/0.78"	200/7.87"	244/9.61"	107/4.21"	
MBR25-G	SED_7264657_000-0x	φ25/0.98"	-	-	G1 1/2"	-	14,5/0.57"	185/7.28"	244/9.61"	107/4.21"	
MBR50-6/4	SED_7277429_000_0x	φ50/1.97"	φ140/5.51"	φ110/4.33"	φ90/3.54"	4x 14/0.55"	19/0.75"	185/7.28"	244/9.61"	95/3.74"	
MBR50-16/4	SED_8950186_000_0x	φ50/1.97"	φ165/6.50"	φ125/4.92"	φ102/4.02"	4x 18/0.71"	19/0.75"	195/7.68"	244/9.61"	95/3.74"	
MBR50-6/6	SED_7275602_000_0x	φ50/1.97"	φ140/5.51"	φ110/4.33"	φ140/5.51"	6x 12/0.47"	14/0.55"	185/7.28"	244/9.61"	95/3.74"	
MBR80-6/4	SED_8950862_000_0x	φ80/3.15"	φ190/7.48"	φ150/5.91"	φ130/5.12"	4x 18/0.71"	15/0.55"	195/7.68"	244/9.61"	95/3.74"	
MBR80-6/6	SED_7283480_000_0x	φ80/3.15"	φ160/6.30"	φ130/6.29"	φ160/6.30"	6x 12/0.47"	14/0.55"	185/7.28"	244/9.61"	95/3.74"	
MBR80-16/4	SED_7286211_000_0x	φ80/3.15"	φ200/7.87"	φ160/6.29"	φ138/5.45"	4x 18/0.71"	15,5/0.61"	195/7.68"	244/9.61"	95/3.74"	
MBR80-16/8	SED_7280977_000_0x	φ80/3.15"	φ200/7.87"	φ160/6.29"	φ138/5.45"	2x M16 6x 18/0.71"	15,5/0.61"	195/7.68"	244/9.61"	95/3.74"	
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DATE	NAME	DOCUMENT NO.
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11.10.2022	REHNELT	CHANGE NO.
11.10.2022	KLEYN	1116559
11.10.2022		12

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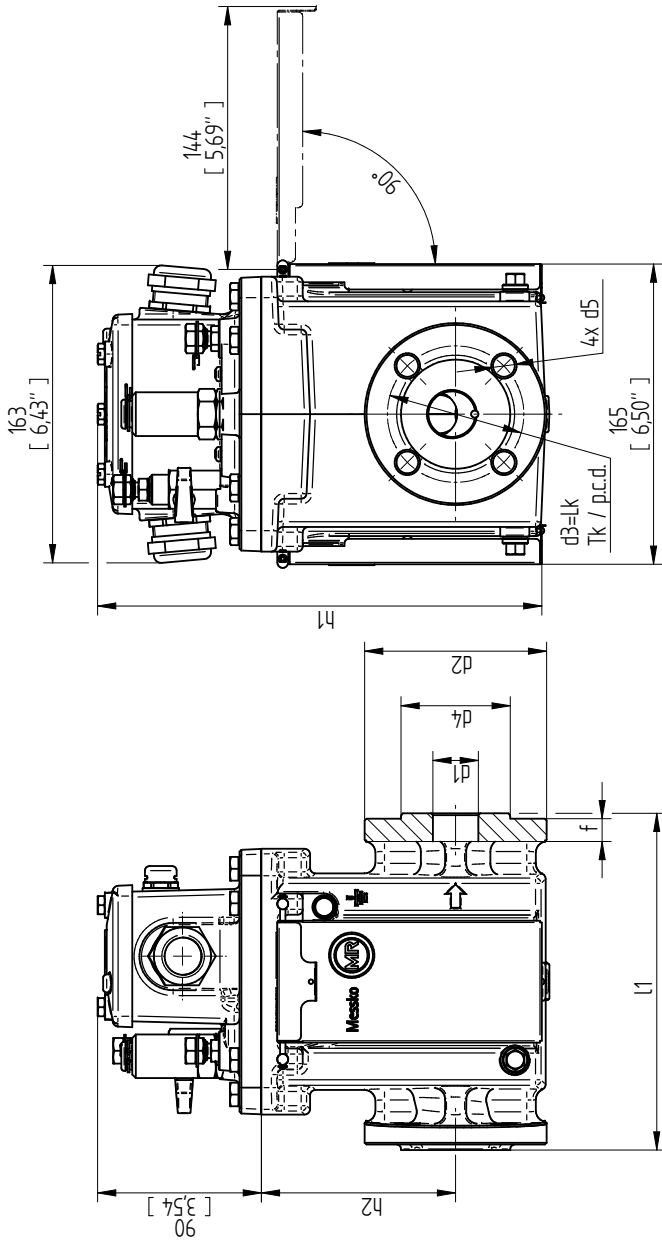


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MSAFE-BUCHHOLZ RELAY  
MBR25-6

SERIAL NUMBER

MATERIAL NUMBER  
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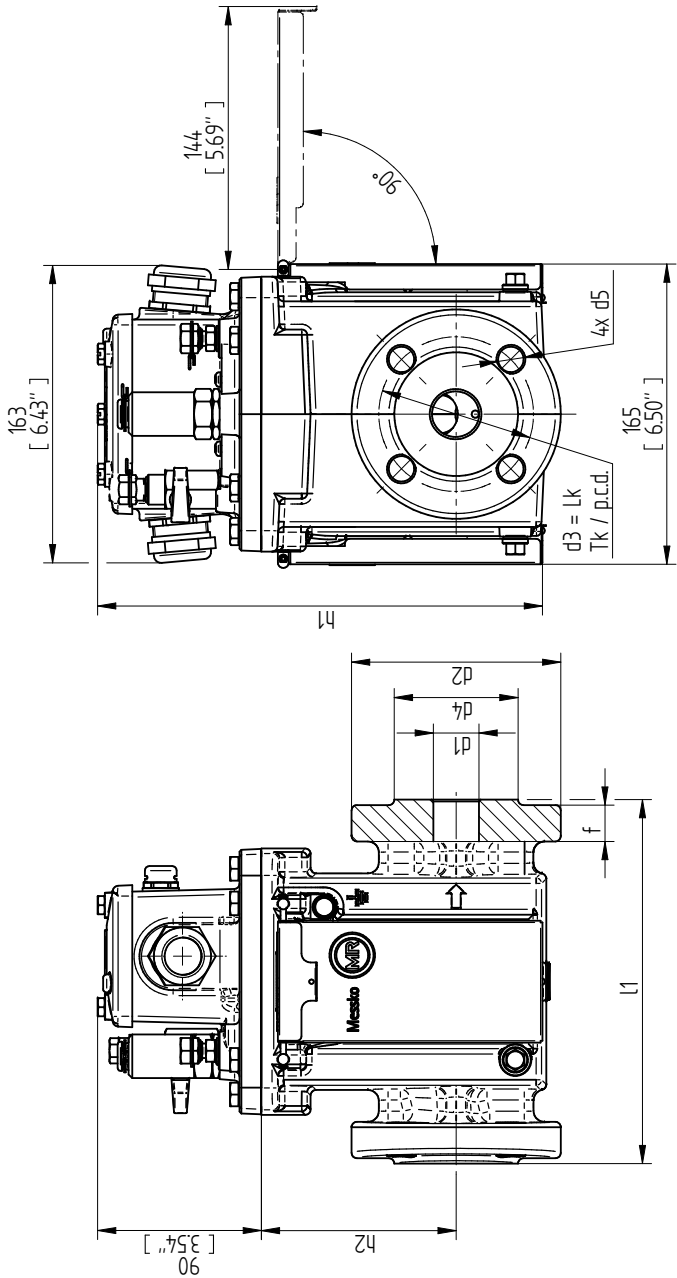


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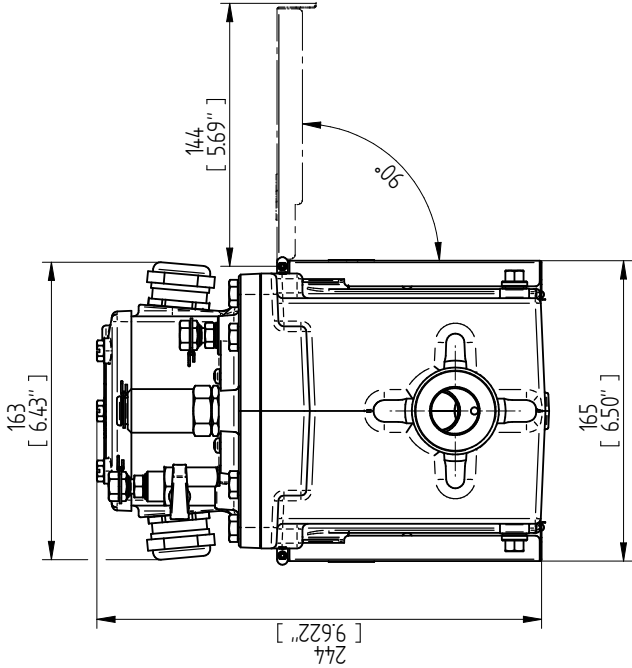
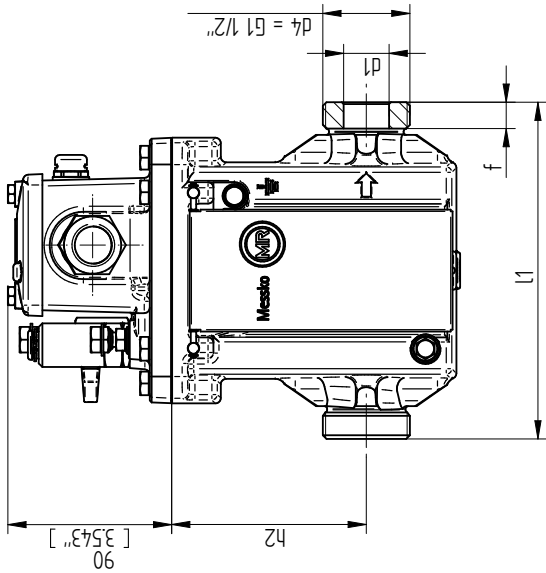
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DIMENSION  
IN mm  
EXCEPT AS  
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TRANSFORMER ACCESSORIES  
MSAFE-BUCHHOLZ RELAY  
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SERIAL NUMBER	
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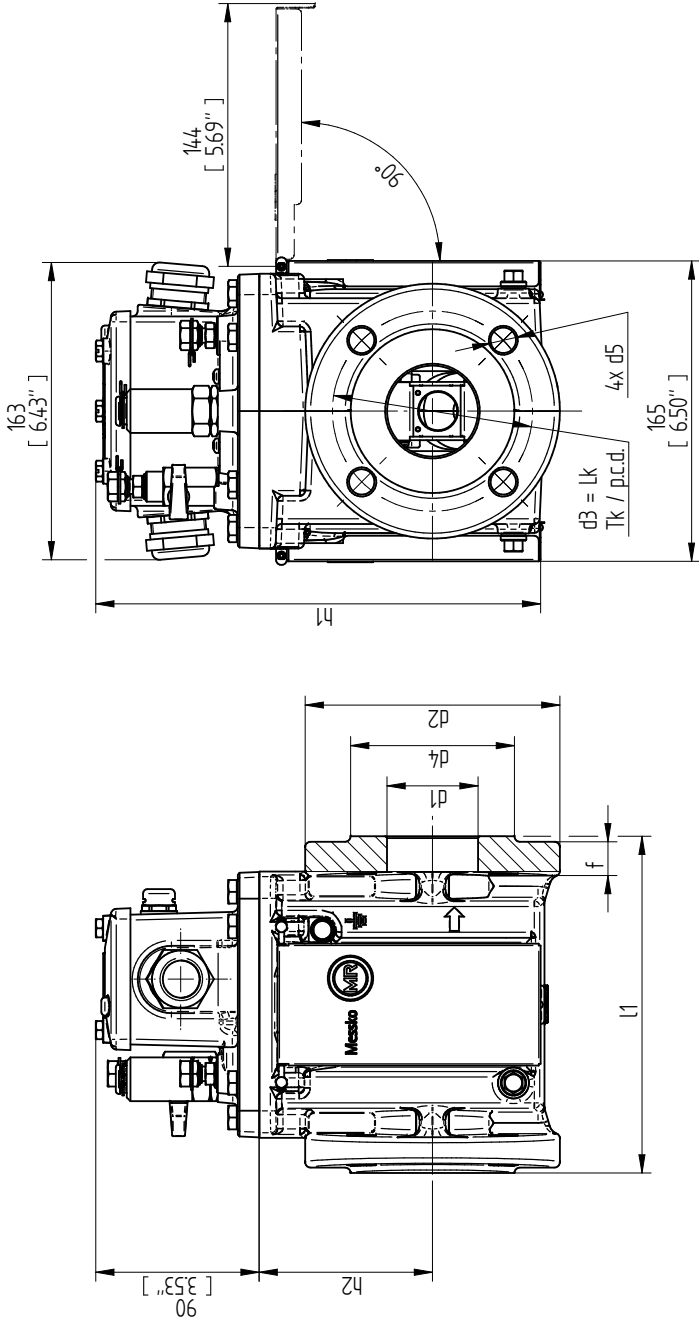


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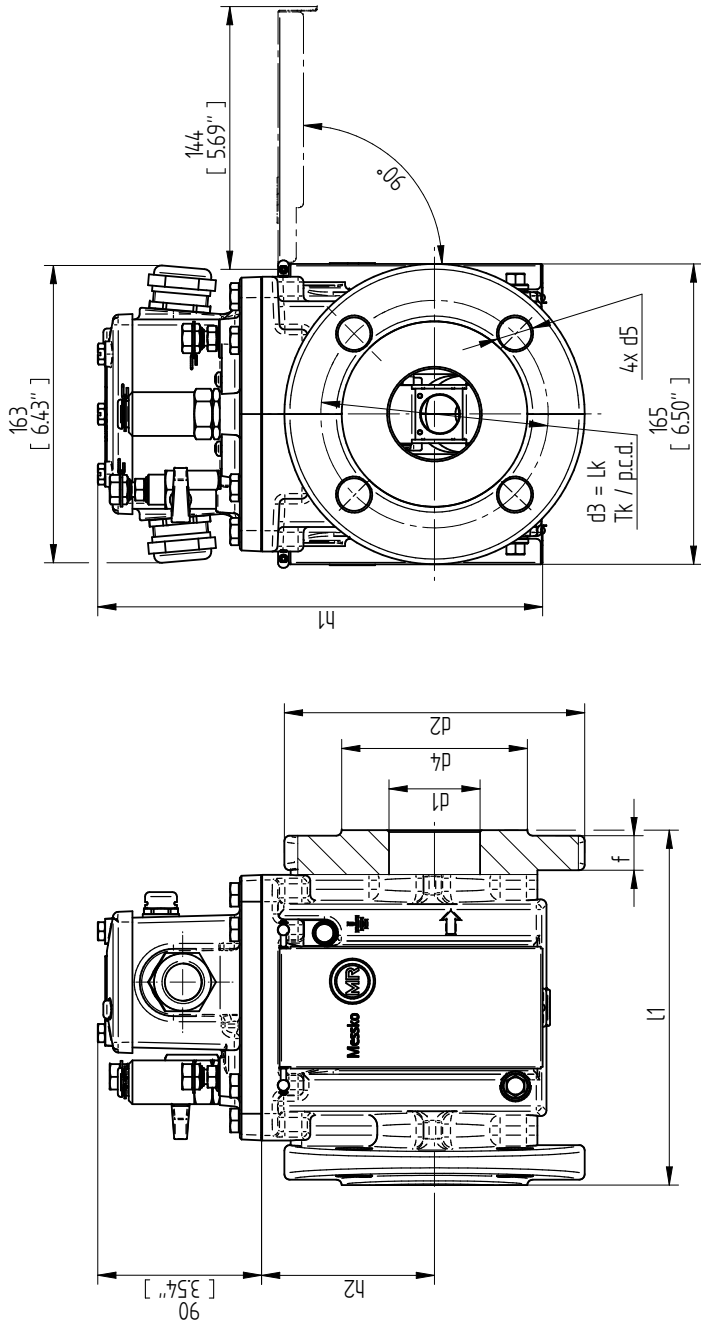


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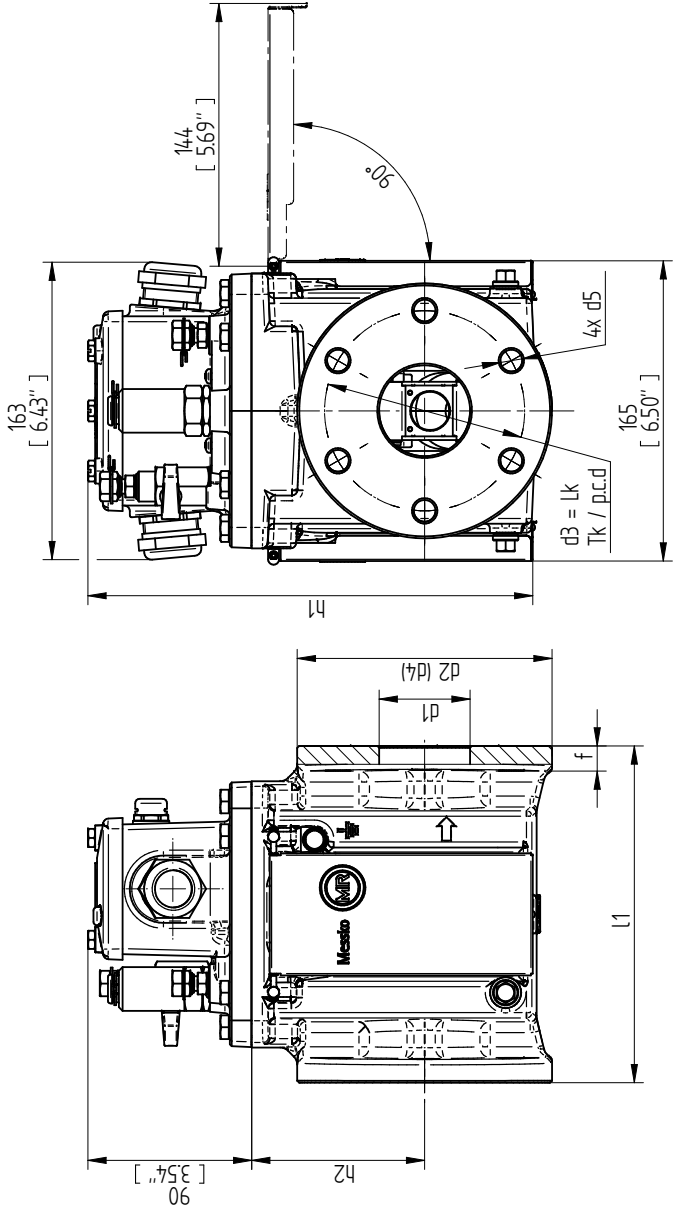
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DIMENSION  
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TRANSFORMER ACCESSORIES  
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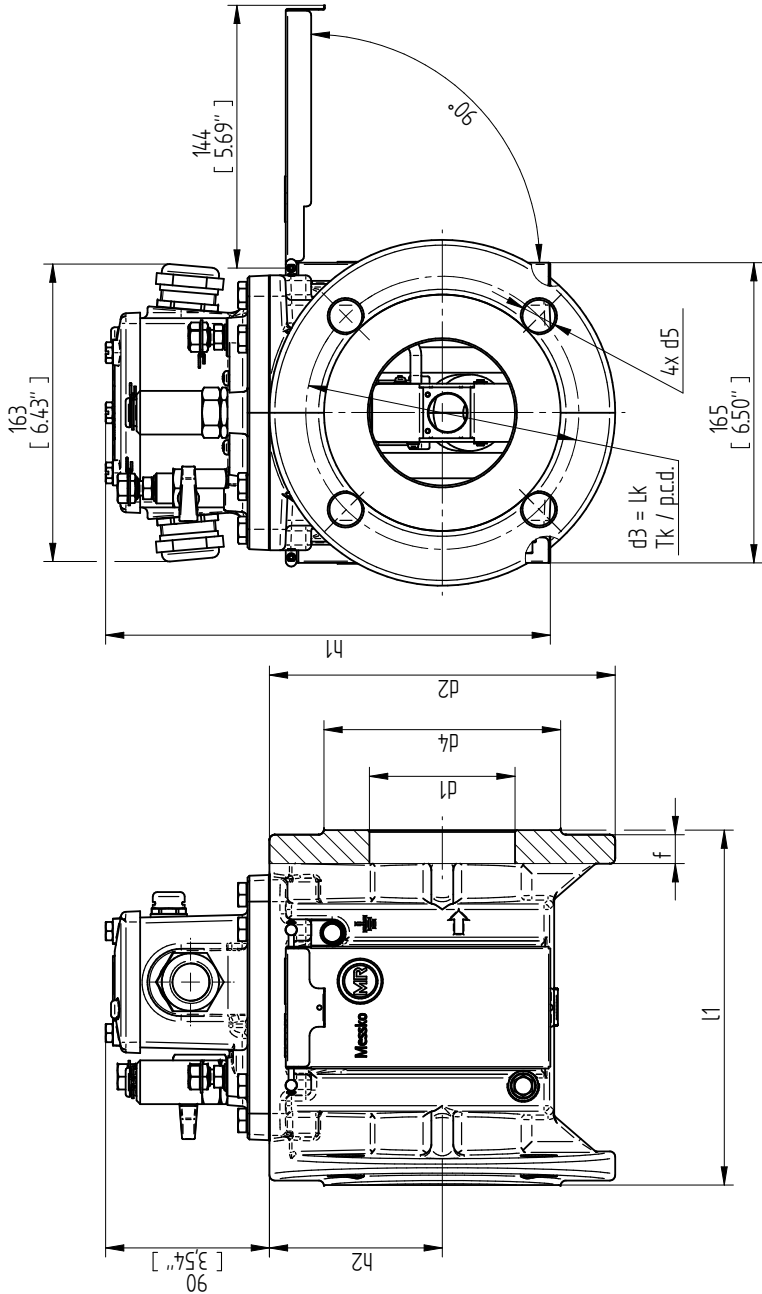
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CHKD.	REHNET	SCALE
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STAND	1110.2022	12

DIMENSION IN mm EXCEPT AS NOTED	
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TRANSFORMER ACCESSORIES  
 MSAFE-BUCHHOLZ RELAY  
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SERIAL NUMBER	—
MATERIAL NUMBER	101719230M
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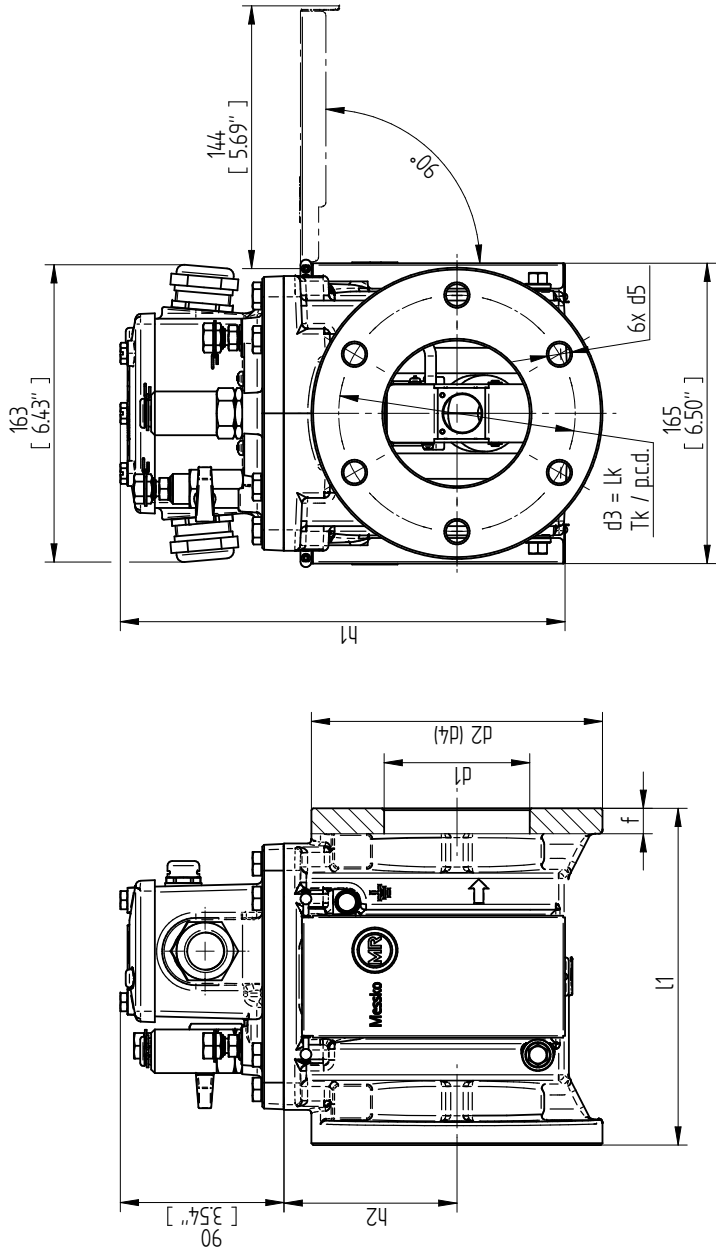
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DIMENSION  
IN mm  
EXCEPT AS  
NOTED



TRANSFORMER ACCESSORIES  
MSAFE-BUCHHOLZ RELAY  
MBR80-6/6

SERIAL NUMBER	SHEET
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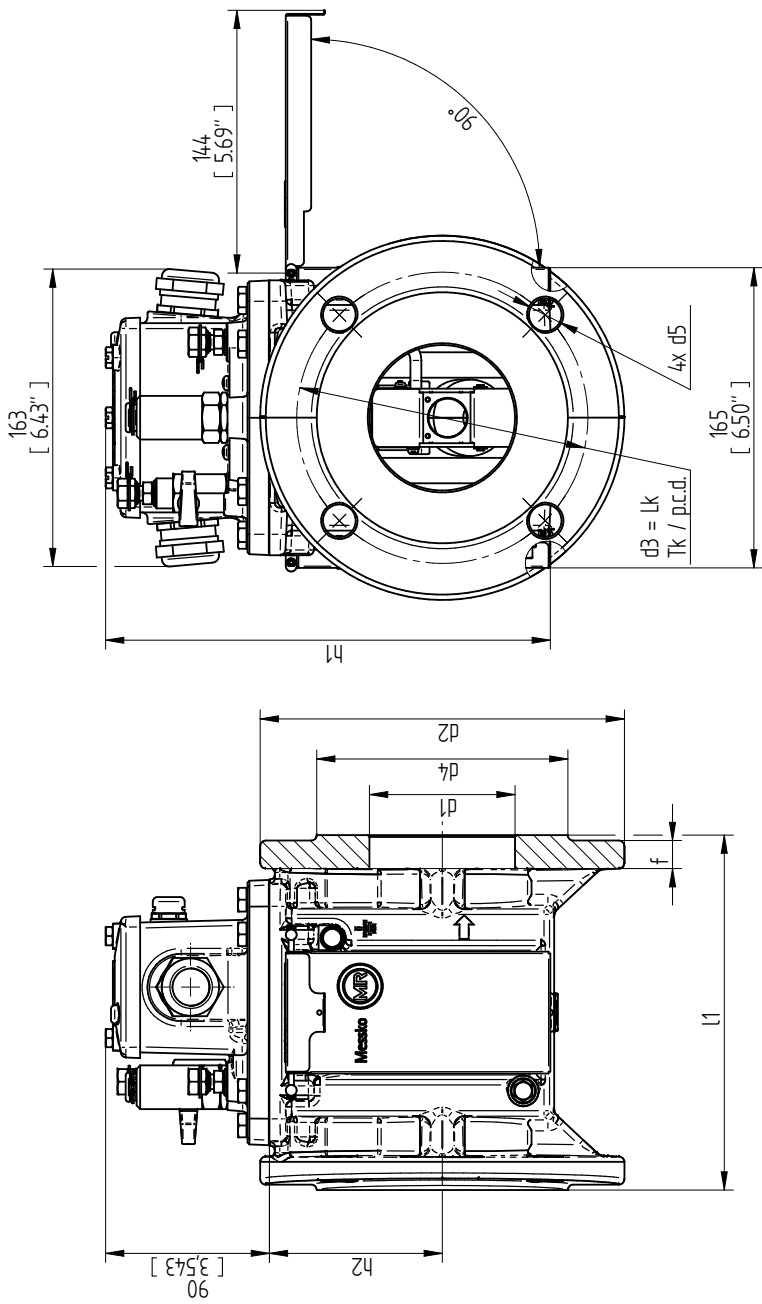
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DIMENSION  
IN mm  
EXCEPT AS  
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TRANSFORMER ACCESSORIES  
MSAFE-BUCHHOLZ RELAY  
MBR80-16/4

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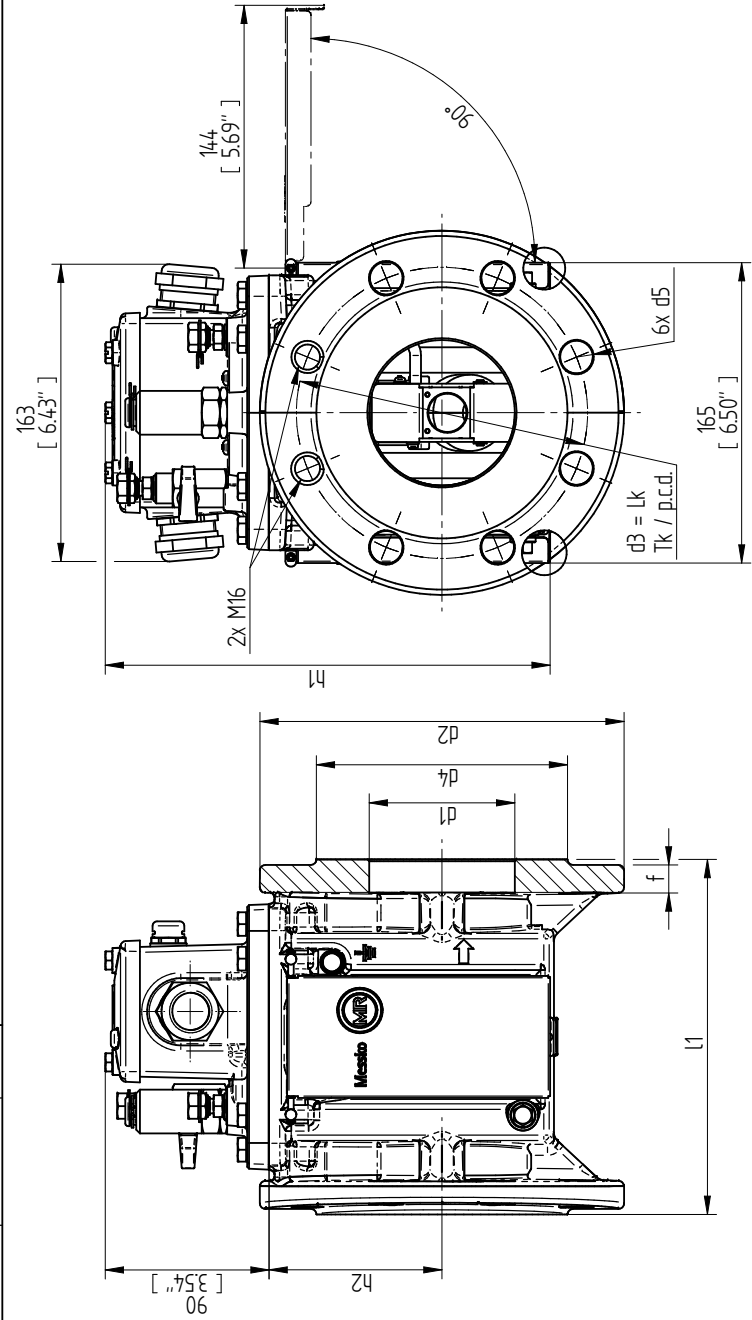
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STAND. 11.10.2022	KLEYN	116559
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DIMENSION  
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EXCEPT AS  
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TRANSFORMER ACCESSORIES  
MSAFE-BUCHHOLZ RELAY  
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SERIAL NUMBER	SHEET
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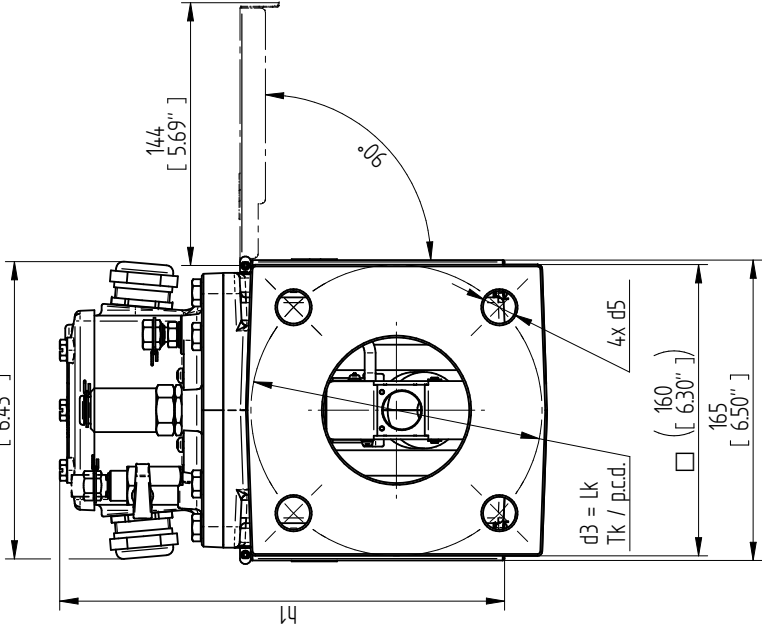
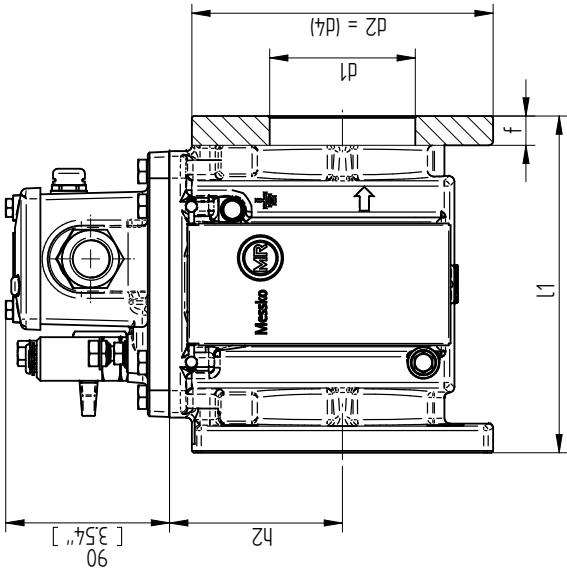
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DIMENSION  
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 EXCEPT AS  
 NOTED



TRANSFORMER ACCESSORIES  
 MSAFE-BUCHHOLZ RELAY  
 MBR80 - CH

SERIAL NUMBER	SHEET
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CHG.	CHANGE NO.	SCALE
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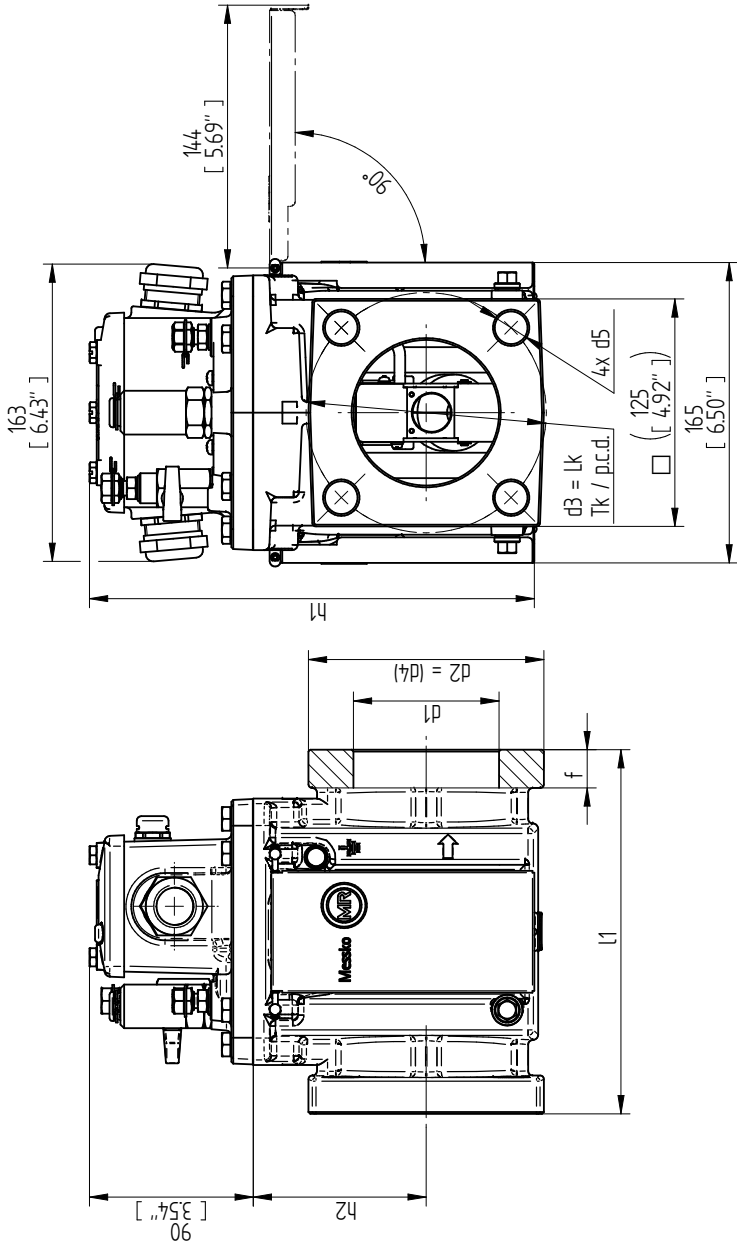


TRANSFORMER ACCESSORIES  
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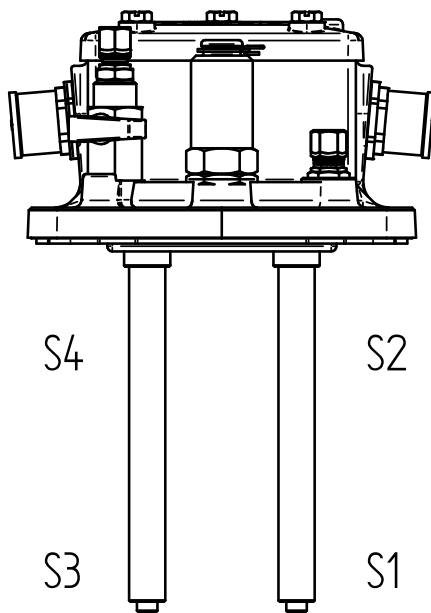
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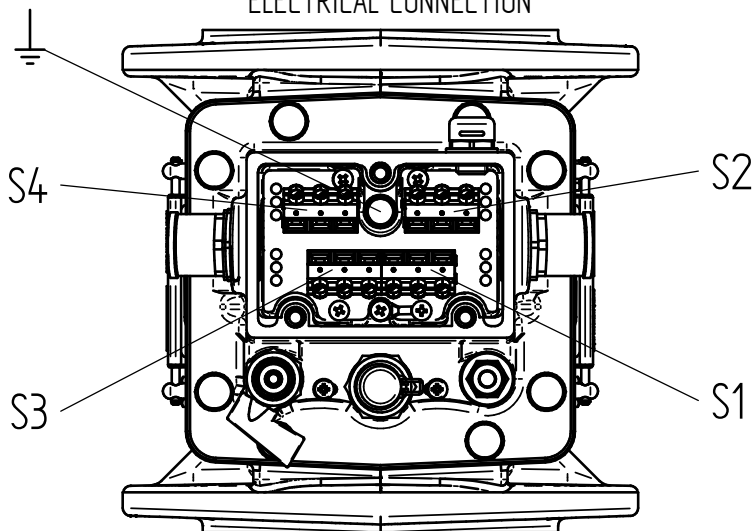
SHEET  
1 / 1



# Position der Schaltkontakte / POSITION CONTACT POINT



# Elektrischer Anschluss / ELECTRICAL CONNECTION



DATE	NAME	DOCUMENT NO.
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CHKD	REHNEIT	CHANGE NO.
11.10.2022	KLEIN	1116559
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DIMENSION  
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TRANSFORMER ACCESSORIES  
MSAFE-BUCHHOLZRELAIS  
POSITION CONTACT POINT / ELECTRICAL CONNECTION

SERIAL NUMBER

MATERIAL NUMBER	SHEET
101719610M	1 / 1

# Glossary

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## **Ambient air temperature**

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

## **Insulating fluid temperature**

Permissible temperature of the insulating fluid in the product or directly on the product.

## **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.

**Maschinenfabrik Reinhausen GmbH**

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✉ [sales@reinhausen.com](mailto:sales@reinhausen.com)

[www.reinhausen.com](http://www.reinhausen.com)

7232312/01 EN - MESSKO® MSAFE® -  
F0384901 - 02/23 - Maschinenfabrik Reinhausen GmbH 2023

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