Operating instructions
CEDASPE® DAROC. Shutter valve

10014218/01 EN

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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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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.

1.3.3 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).
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).

1.3.4 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 Intended use

The shutter valve is a protective device designed for use on oil-filled power transformers with oil conservator.

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:
- Only use the product for oil-filled power transformers.
- 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.

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 ensure that personnel are sufficiently qualified.

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.

Electrically trained persons

An electrically trained person receives instruction and guidance from an electrically skilled person in relation to the tasks undertaken and the potential dangers in the event of inappropriate handling as well as the protective devices and safety measures. The electrically trained person works exclusively under the guidance and supervision of an electrically skilled person.

Operator

The operator uses and operates the product in line with this technical file. The operating company provides the operator with instruction and training on the specific tasks and the associated dangers arising from improper handling.

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 CEDASPE S.r.l. 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 delivered as follows:
- Shutter valve
- O-ring gasket for tank-side mounting flange
- Bypass for resetting (available as an option)

3.2 Function description

The device is a protective device that, in the event of a steady loss of fluid from the tank, stops the flow of fluid from the conservator to the tank, reducing the risk of fire and environmental pollution.

The device works automatically. If the flow rate from the conservator to the tank exceeds a factory-set value, the device closes the pipe leading to the tank.

If the device trips, a signal is sent via up to 2 reed-type switches (normally open contact or change-over contact). The reed-type switches are connected to the electrical controller and the monitoring circuit of the transformer.

Transformer operating phases

The conditions described in the following can arise during normal transformer operation and will not normally lead to the device closing the pipe:
- During the heating phase when the oil temperature increases, oil flows from the tank to the conservator due to the expansion of the oil volume. The flow rate is normally ≤30 dm^3/min.
- During the cooling phase when the oil temperature decreases, oil flows from the conservator to the tank due to the contraction of the oil volume. The flow rate is normally ≤30 dm^3/min.

Transformer error states

The device closes automatically if the following condition arises:

– If a tank leak arises, for example when a bushing fails or a pressure relief device springs open and then does not close again correctly, oil flows back from the conservator to the tank. The expected flow rate is normally >>30 dm^3/min.

The flow of oil from the conservator to the tank must be stopped to prevent a critical loss of oil. This abnormal state is signaled via reed-type switches.

3.2.1 Main valve function

During the normal transformer heating and cooling phases, the main valve is held open by the float pushing upward without the oil flow in the pipe between the tank and conservator slowing down.

The main valve only closes in the event of a hydraulic pressure loss that is greater than the upward force of the float.

> The oil flowing through the device is associated with a hydraulic pressure loss that depends on the following:
> - Oil viscosity
> - Oil flow rate depending on the cooling conditions
> - Oil flow rate that depends on briefly occurring events such as the startup of pumps, the elasticity of the tank or of the cooler, etc.

In the event of an error that causes a flow rate of >>30 dm^3/min, the main valve closes and an electrical signal is sent via the reed switch.

3.3 Design

The device is suitable for installation in the nominal DN50, DN80 or DN100 pipe diameters.

The connecting flanges on the device can have 4 or 8 drill holes (see "Drawings" chapter for available versions).

The device can be equipped with a maximum of two reed-type switches (normally open contact or change-over contact). The reed-type switches are connected electrically via the terminal box.

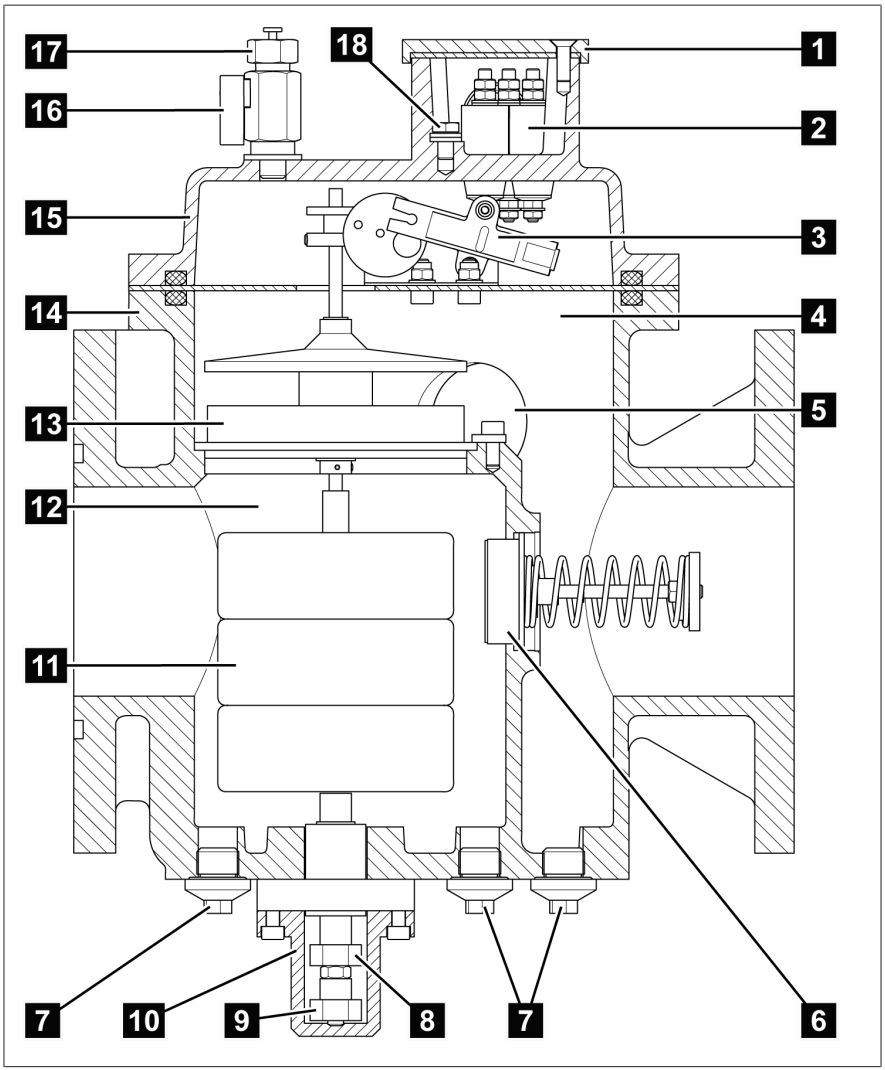


Figure 1: Design

1	Terminal box cover	2	Terminals
3	Reed-type switches	4	Conservator-side chamber
5	Inspection window	6	Vacuum breaker valve
7	Drain plugs	8	Reset screw
9	Test button	10	Cover for test button and reset screw
11	Float	12	Tank-side chamber
13	Main valve	14	Housing
15	Cover	16	Drain valve
17	Drain valve protective cap	18	Grounding screw

3.4 Nameplate

The nameplate is on the cover of the terminal box.

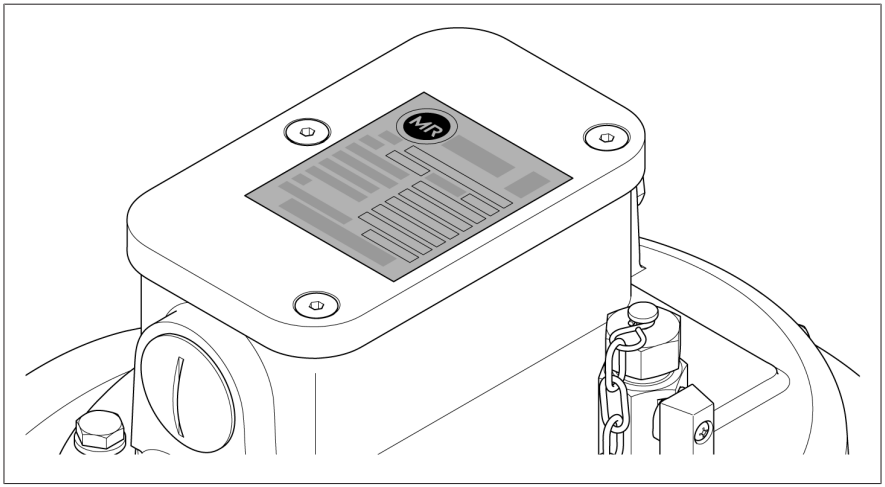


Figure 2: Nameplate

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 and knocks.

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 held securely in the intended transport position.

Inlays inside the box stabilize the goods, preventing impermissible changes of position, and protect 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.

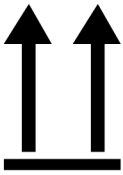
 Protect against moisture	 Top	 Fragile

Table 4: Shipping pictograms

4.4 Transportation, receipt and handling of shipments

In addition to vibrations, jolts must also be expected during transportation. In order 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 CEDASPE S.r.l 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 the installation of the shutter valve as well as the electrical connection of the reed switches.

5.1 Checking the pipe flanges

The pipe flanges must be flush and clean to allow the device to be positioned with the least possible stress.

NOTICE! A residual distance between the flanges caused by a deviation in evenness can cause damage to the flanges.Even slight unevenness can cause the flange of the device 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 ≤ 0.2 mm

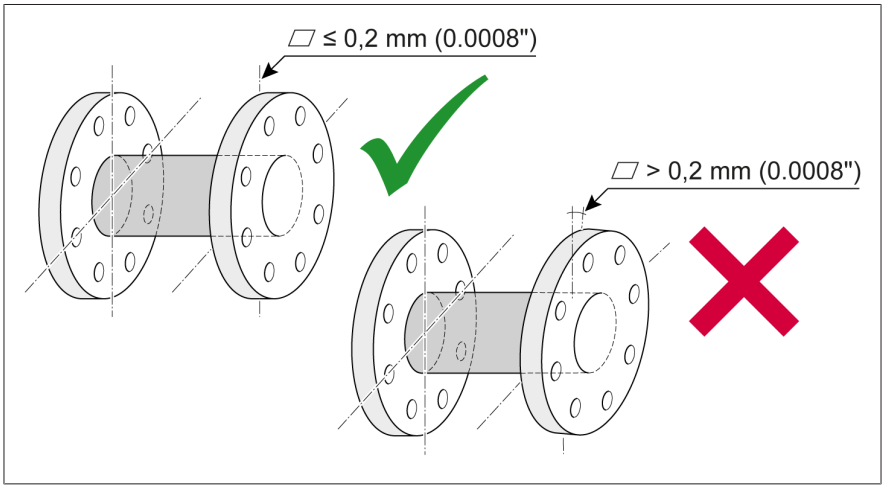


Figure 3: Flanges

- Pipe flange sealing surfaces
  - Clean and undamaged
  - Without any damage along the radial surface such as scratches, dents 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

5.2 Gasket requirements

When selecting the gaskets, observe the following notices:

- Ensure that the design of the gasket and, if applicable, the sealing groove are state-of-the-art.
- Use new and clean gaskets.
- Use O-rings or flat gaskets in accordance with the following mounting description.
- Never use paper gaskets.
- Gasket material:
  - The material must be chemically resistant to the insulating fluid used to prevent later leaks due to chemical degradation.

- The gasket material must be suitable for use at the intended ambient temperatures and operating temperatures.
- The gasket material must be suitable for the relative humidity prevalent on site.
- When mounted, x gaskets must fill a maximum of 80% of the sealing groove. The remaining 20% is required as expansion space.

5.3 Preparation for mounting

1. *NOTICE!* To ensure that the device functions correctly, align the shutter valve to the pipe such that the arrow printed on the cover of the device points in the direction of the conservator tank.

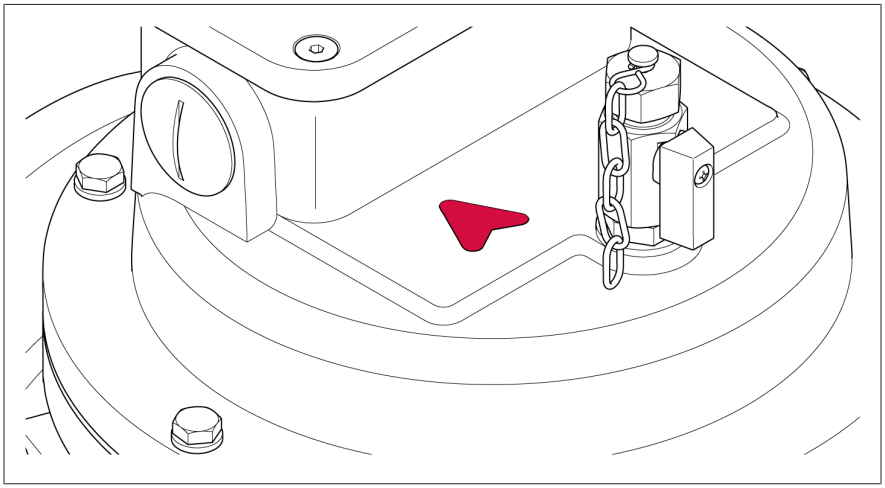


Figure 4: Arrow in the direction of the conservator tank

2. The pipe from the shutter valve to the oil conservator must be routed with a consistent incline of at least 1.2° to ensure the switching gases can escape freely. The shutter valve is intended for a horizontal operating position. A positive inclination of up to 5° from the horizontal is permitted in the direction toward the conservator. An inclination of up to 5° from the vertical to either side is permitted.

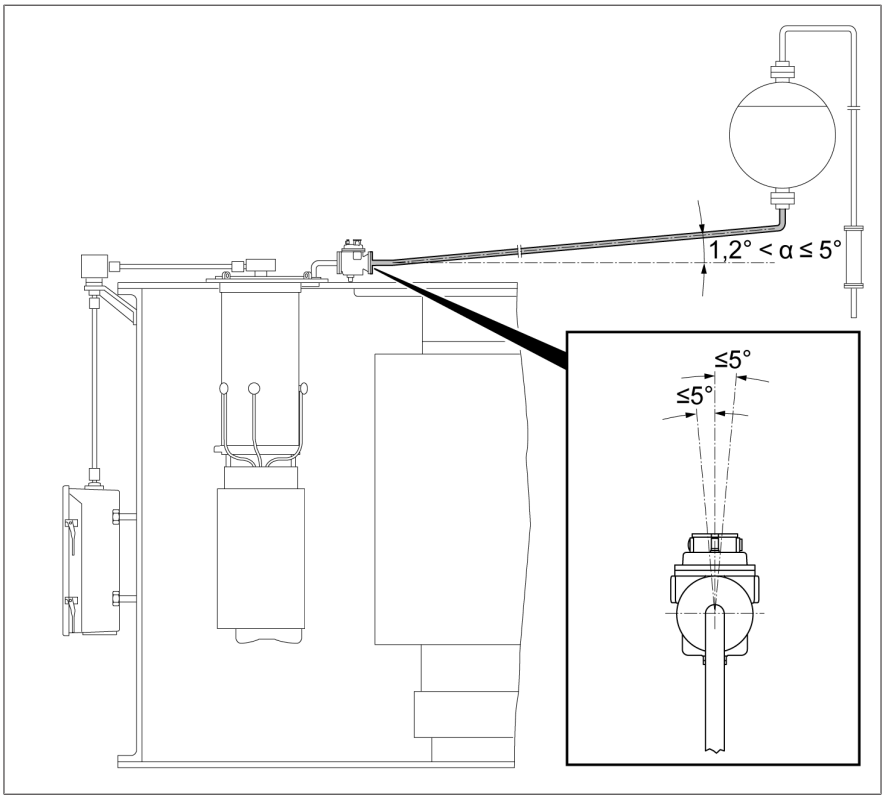


Figure 5: Necessary incline of the pipe and permitted inclination of the shutter valve

3. Remove the plastic covers on both flanges on the shutter valve.

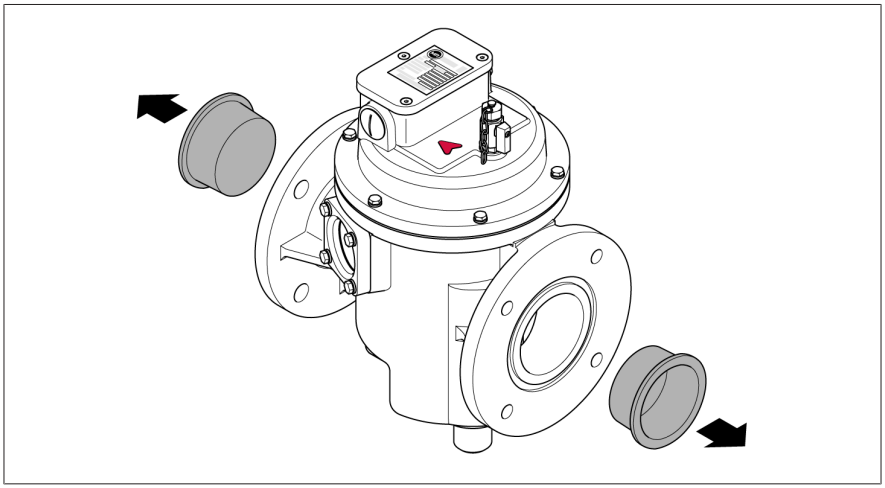


Figure 6: Removing the plastic cover

5.4 Fastening the shutter valve to the pipe

Recommendations

- The parallel use of a Buchholz relay is recommended. Install the shutter valve in series with the Buchholz relay.
- Mount isolation valves on the two outer, pipe-connecting flanges so that the devices can be removed without oil loss in the event of a fault.
- If you intend to use these components, first attach the tank-side isolation valve and Buchholz relay to the pipe in accordance with the associated operating instructions.

The following mounting steps describe the procedure in accordance with the recommendations listed.

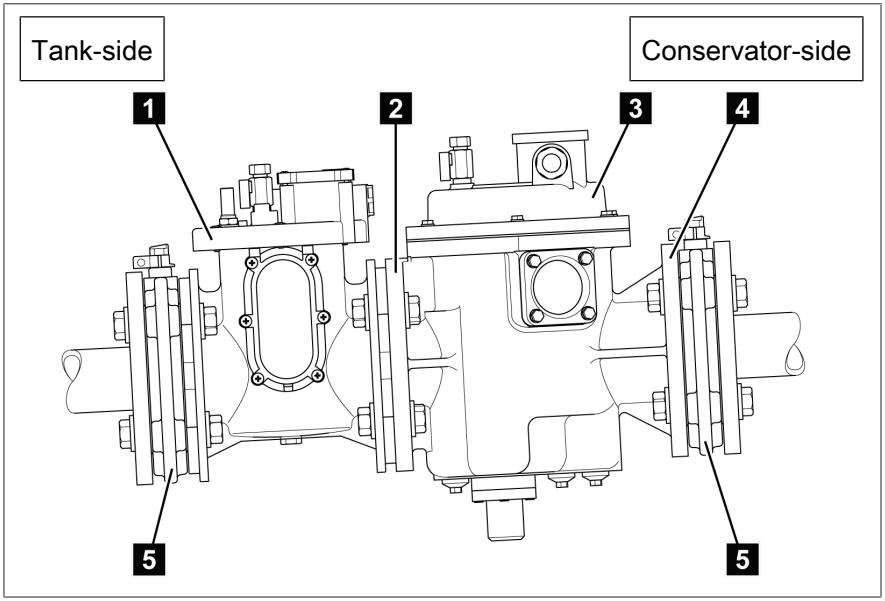


Figure 7: Fastening the shutter valve to the pipe (installation example)

1	Buchholz relay (recommended)	2	Tank-side flange
3	Shutter valve	4	Conservator-side flange
5	Isolation valves (recommended)		

1. Ensure that there is no insulating fluid in the pipe.
2. Insert the two o-ring gaskets supplied into the tank-side isolation valve.
3. Mount the isolation valve on the pipe flange on the tank side in accordance with the operating instructions provided.
4. Affix the Buchholz relay to the isolation valve in accordance with the operating instructions provided.
5. Insert the o-ring gasket supplied into the tank-side flange **2** of the shutter valve.
6. Affix the shutter valve to the Buchholz relay on the tank side using suitable screws (M16), washers and nuts. Only tighten screws by hand.

7. Insert the two o-ring gaskets supplied into the conservator-side isolation valve.
8. Mount the isolation valve on the conservator-side flange **4** and on the pipe flange in accordance with the operating instructions supplied using suitable screws (M16), washers and nuts. Only tighten screws by hand.
9. On both sides of the shutter valve, tighten the screws with 10% of the target tightening torque and ensure that there are no gaps 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.
10. Tighten the screws crosswise with 30% of the target tightening torque.
11. Tighten the screws crosswise with 60% of the target tightening torque.
12. *NOTICE!* Damage to the flanges due to a tightening torque that is too high. Use a torque wrench. Tighten the screws crosswise with 100% of the target tightening torque and continue to retighten the screws with 100% of the target tightening torque until the screws can no longer be turned further.

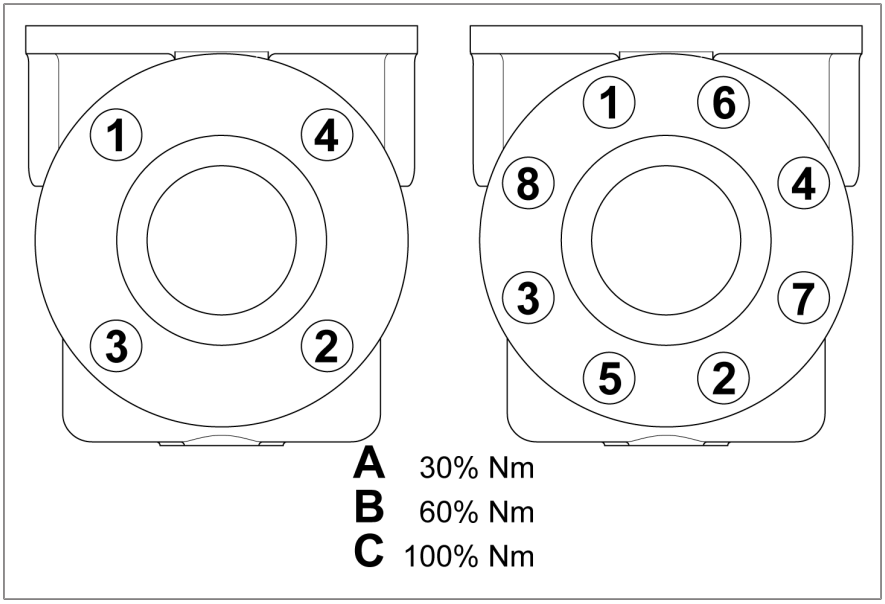


Figure 8: Tightening the screws crosswise

5.5 Installing the bypass (optional)

The bypass options BPR and BPC have to be installed on the device on site.

5.5.1 Installing the BPR (ball valve) bypass (optional)

The BPR bypass is operated via a ball valve.

As the BPR version, the device is equipped with two drain valves that are positioned on the base of the housings. The pipe circuit will be connected to these drain valves via ball valve.

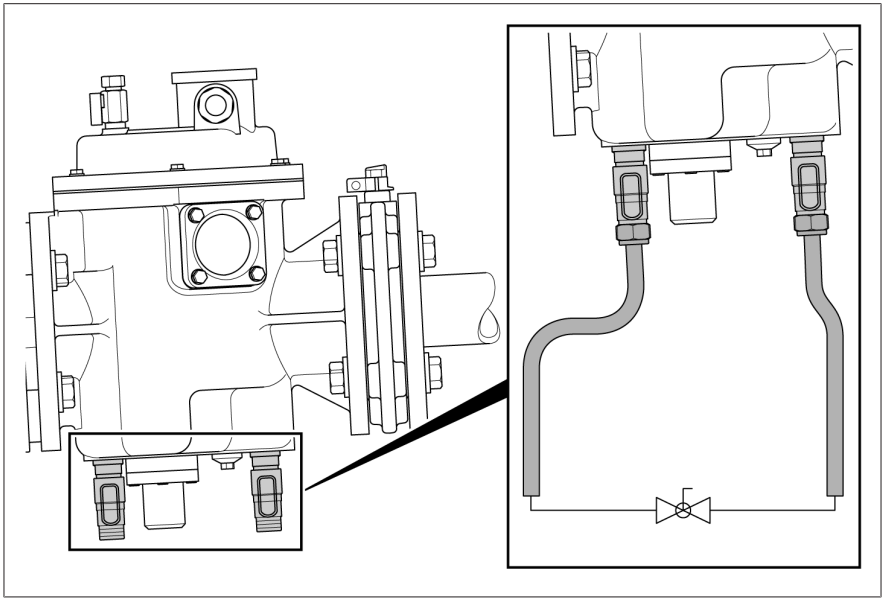


Figure 9: Example BPR pipe bypass

- ✓ The material of the pipes is suitable for the insulating fluid and the temperature range.
- ✓ The length of the pipes have been adjusted to the operating height of the ball valve.

✓ The drain valves on the base of the device are open (normal operating conditions).

1. Position the ball valve so that it can be reached from the floor.
2. *NOTICE!* Ensure that the ball valve is positioned so that the lever can be actuated without hindrance.
3. Cut two pipes (external diameter 14 mm, internal diameter 12 mm) to a length sufficient to connect the ball valve to the drain valves on the base of the device.
4. *NOTICE!* To seal the ermeto joint correctly, cut the pipes at an exact 90° angle and remove the flash on the inside and outside. If the pipes are bent, the upper straight pipe section for connecting to the shutter valve must be twice as long as the ermeto joint.
5. Connect the lower ends of the pipes to the ball valve. Tighten the union nuts of the ermeto joints with a wrench.
6. Connect the upper ends of the pipes to the drain valves. Tighten the union nuts of the ermeto joints with an open-end wrench (wrench size 24, 70 Nm).

5.5.2 Installing the BPC (drive shaft) bypass (optional)

The BPC bypass is operated via a drive shaft with CCC device.

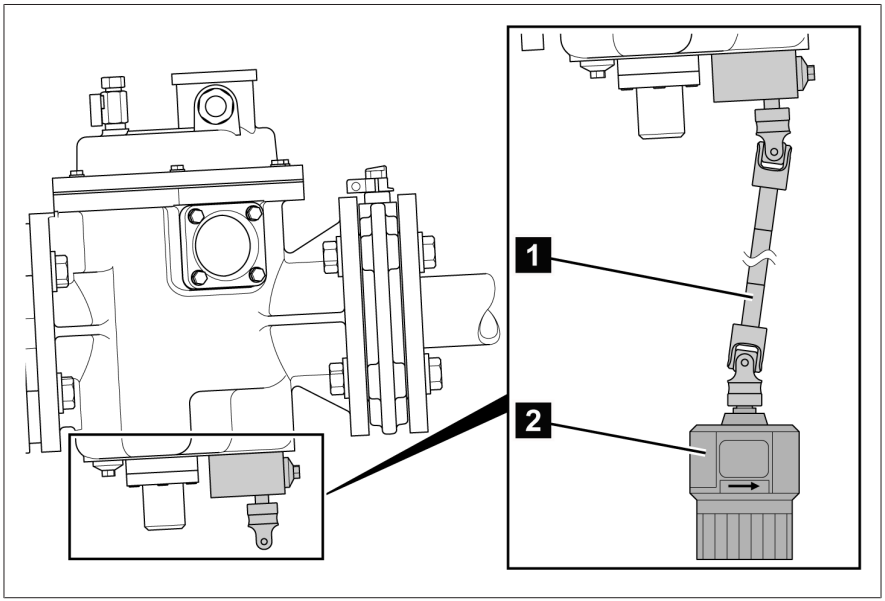


Figure 10: BPC bypass

1	Drive shaft	2	CCC device with knob

✓ The bypass device on the base of the device is closed (factory preset) and the CCC device is closed (normal operating conditions).

✓ The length of the drive shaft (Ø 12 mm) is suitable for the desired operating height of the CCC rotary knob.

1. Position the CCC device so that it can be reached from the floor.
2. Fit the drive shaft into the Cardan joints.
3. Hold the drive shaft in position and drill a hole (Ø 2.9 mm) in each of the Cardan joints.
4. Insert a suitable spiral steel pin (Ø 3 mm) into the drill hole to secure the Cardan joints.
5. *NOTICE!* To ensure the correct function of the drive shaft, the inclination of the drive shaft in relation to its working axis may not exceed 45°. The recommended maximum drive shaft inclination is 30°.

5.6 Electrical connection

⚠ 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.

5.6.1 Cable recommendation

Please note the following recommendation when wiring the device:
- To make the connection, you need suitable ring cable lugs and cable glands that are not included in the scope of delivery.
- The cables used must be flame-resistant in accordance with IEC 60332-1-2 or UL 2556 VW-1.

Cable	Conductor cross-section	Connection
Signal lines	1.5...4 mm^2	M5 thread
Protective conductor	≥ all other lines	M6 screw

Table 5: Cable recommendation

5.6.2 Electrically connecting the reed switches

The reed-type switches installed in the device are either normally open contacts or change-over contacts.

1. Unscrew the screws (3x M5, hex-wrench 4 mm) on the terminal box and remove the cover.
2. Remove the dummy plug from the M20 x 1.5/M25 x 1.5 adapter.

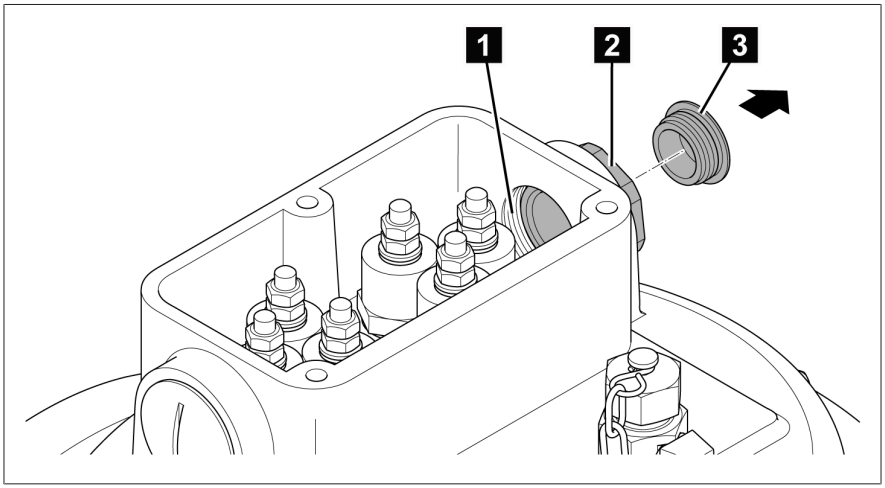


Figure 11: Dummy plug and M20/M25 adapter

1	Housing thread: M25 x 1.5	2	M20 x 1.5/M25 x 1.5 adapter
3	Dummy plug		

3. Fit an M20 cable gland in the adapter or remove the adapter and fasten an M25 cable gland directly in the housing.
4. *NOTICE!* To ensure the IP degree of protection of the device, use a suitable cable gland with at least IP65.

5. The wiring diagram can be found on the inside of the terminal box cover.

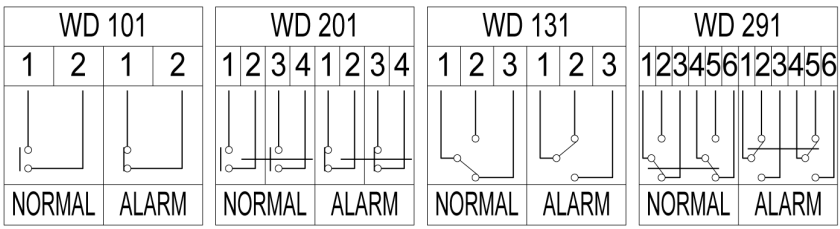


Figure 12: Wiring diagram

6. *NOTICE!* To prevent damage, observe the specified tightening torques.
7. Guide the cable through the cable gland and connect the ring cable lugs to the terminals as follows.

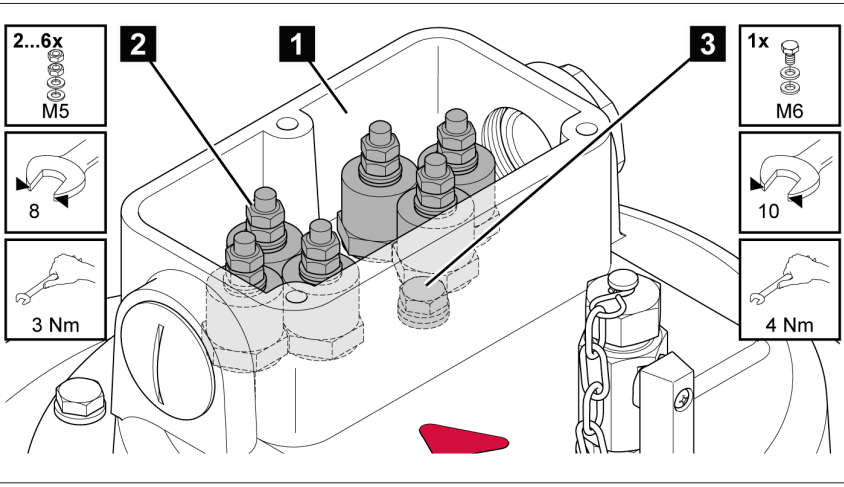


Figure 13: Terminal box

1	Terminal box	2	Reed-type switch connections, 2...6 x M5
3	M6 grounding screw		

8. Loosen the nuts on the reed-type switch connections.

9. Place the ring cable lugs between the two washers and secure them by tightening the nuts.
10. Ground the device via grounding cable with ring cable lug. To do so, loosen the grounding screw.
11. Place the ring cable lug on the grounding screw between the two washers and tighten the grounding screw.
12. Tighten the cable gland.
13. Position the cover on the terminal box and tighten the 3 screws (hex-wrench 4 mm).

6 Commissioning

Prior to commissioning the transformer, perform the following checks. If anything is unclear regarding the checks or troubleshooting, please contact CEDASPE S.r.l [▶Section 1.1, Page 5].

NOTICE

Device malfunction!

The positions of the reset screw and test button must be monitored to ensure the correct functioning of the device.

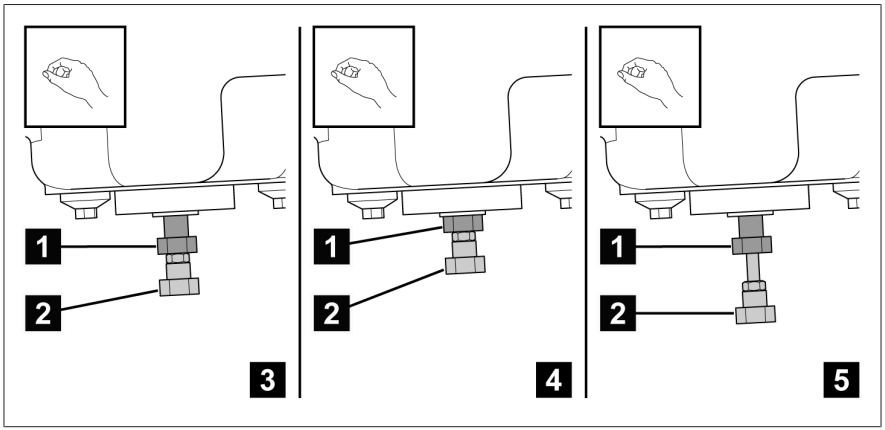


Figure 14: Reset screw and test button positions

1	Reset screw	2	Test button
3	Normal operating conditions: reset screw screwed out, test button pushed in	4	Main valve open: reset screw screwed in
5	Checking the reed-type switches: reset screw screwed out, test button pulled down		

6.1 Filling with oil and performing the venting test

⚠ WARNING

Danger of explosion and danger of poisoning!
Explosive gases in the shutter valve can deflagrate or explode and result in severe injury or death. Inhaling the gases released can lead to poisoning or suffocation.

- Ensure that there are no ignition sources such as open 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.

6.1.1 Filling with oil via transformer tank

If the device is to be filled with oil via the transformer tank, proceed as follows:

✓ The isolation valves are fully open.

1. Loosen the 4 screws (hex-wrench 4 mm) on the cover of the test button and remove the cover.
2. As soon as the maximum oil level is reached in the conservator, vent the Buchholz relay (if installed) in accordance with the operating instructions provided.
3. To vent the shutter valve, remove the protective cap from the drain valve (wrench size 17).
4. Turn the lever of the drain valve counterclockwise to vent the device.
5. As soon as insulating fluid begins to escape, turn the lever of the drain valve clockwise to close the drain valve.
6. Position the protective cap on the drain valve, screw on hand-tight and then tighten with maximum one half turn (wrench size 17).
7. Pull the test button down 3 to 5 times to completely fill the valve with oil.
   » The float moves up due to the oil surrounding it. This upward motion also pulls the test button upwards automatically.

8. If you see air bubbles are rising in the inspection window, repeat steps 2 through 6 until no more air bubbles rise.

» The device is filled with oil and vented.

6.1.2 Filling with oil via conservator

If the device is to be filled with oil via the conservator, proceed as follows:

✓ The isolation valves are fully open.

1. Loosen the 4 screws (hex-wrench 4 mm) on the cover of the test button and remove the cover.
2. *NOTICE!* Damage to the reset screw. Do not use any tools on the reset screw. Screw the reset screw in completely by hand.
   » The float will be forced upward and the main valve opens.
3. Wait until the transformer is filled with oil.
   » Monitor the float position and main valve opening via the inspection window.
4. Vent the Buchholz relay (if installed) in accordance with the operating instructions provided.
5. To vent the shutter valve, remove the protective cap from the drain valve (wrench size 17).
6. Turn the lever of the drain valve counterclockwise to vent the device.
7. As soon as insulating fluid begins to escape, turn the lever of the drain valve clockwise to close the drain valve.
8. Position the protective cap on the drain valve, screw on hand-tight and then tighten with maximum one half turn (wrench size 17).
9. *NOTICE!* Damage to the reset screw. Do not use any tools on the reset screw. As soon as the device is filled with oil, screw the reset screw out completely by hand to reestablish normal operating conditions.
10. Pull the test button down 3 to 5 times to completely fill the valve with oil.
    » The float moves up due to the oil surrounding it. This upward motion also pulls the test button upwards automatically.
11. If you see air bubbles are rising in the inspection window, repeat steps 4 through 8 until no more air bubbles rise.

» The device is filled with oil and vented.

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.

6.3 Testing the reed type switches

This test simulates operation and the electrical signals of the device.

⚠ DANGER! Electric shock! Prior to the test, ensure the device is de-energized.

> **i** During the test you can watch through the inspection window to see whether the float sinks and whether the main valve closes. As soon as you release the test button, the float rises automatically and the main valve opens.

✓ The device is filled completely with insulating fluid.

✓ The cover of the terminal box has been removed.

✓ The cover of the test button has been removed.

✓ The reset screw has been fully screwed out.

✓ The main valve is open and the float can move.

✓ Normal operating conditions have been checked and are in accordance with the wiring diagram [▶Section 7.1, Page 40].

1. Connect a multimeter to the terminals of the switches in the open state.
2. Pull the test button all the way down.
   » The main valve closes and the switches issue a signal.
   » The multimeter receives a signal.
3. Press the test button up to the stop to open the device completely and to restore normal operating conditions.
4. Position the cover on the test button and tighten the screws (hex-wrench 4 mm).

» The test is complete.

7 Operation

7.1 Alarm state

An alarm state shows that the device has tripped and that a signal has been sent to the electrical controller and to the monitoring circuit of the transformer.

The illustration shows the normal operating conditions and the alarm states for all available wiring connection diagrams.

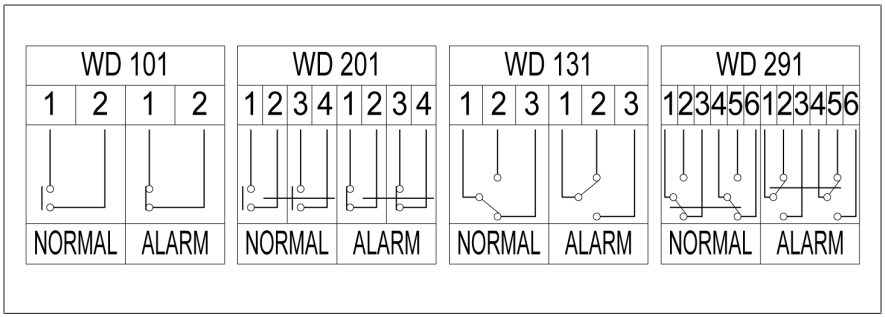


Figure 15: Available wiring connection diagrams

> In the event of an alarm state, you can look through the inspection window to see if the main valve is closed.

7.2 Resetting the shutter valve

At an oil flow rate of >>30 dm^3/min, the main valve closes and the device trips.

When the main valve closes, a pressure difference between the two chambers in the device arises. This pressure difference leads to the main valve remaining closed and the alarm state is triggered.
To fully equalize this pressure difference, oil must be fed from the conservator-side chamber to the tank-side chamber via the bypass.

Once the device has tripped and the error has been corrected, you can reset the device to the normal operating conditions in the following ways:
- Manually directly on the device via the reset screw
- From the ground via the reset bypass (optional; available with the BPR and PBC versions)
- On the device via the reset bypass (optional; available with the BPM version)

7.2.1 Resetting manually

NOTICE

Device malfunction!

The positions of the reset screw and test button must be monitored to ensure the correct functioning of the device.

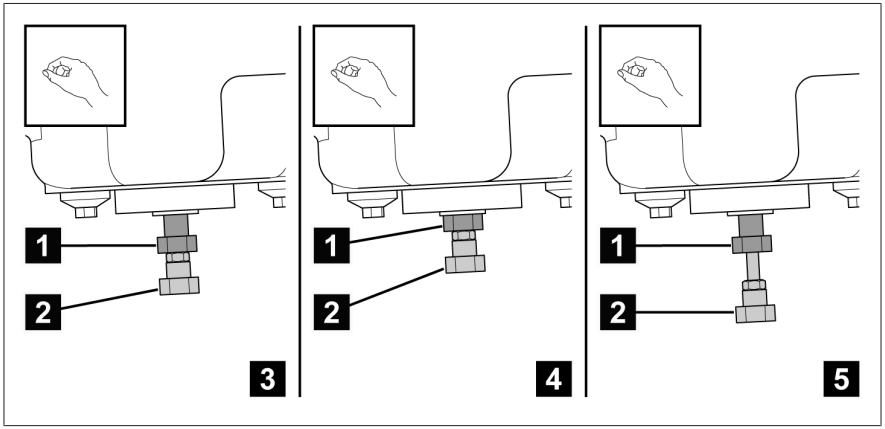


Figure 16: Reset screw and test button positions

1	Reset screw	2	Test button
3	Normal operating conditions: reset screw screwed out, test button pushed in	4	Main valve open: reset screw screwed in
5	Checking the reed-type switches: reset screw screwed out, test button pulled down		

A manual reset is performed directly on the device.

1. Loosen the 4 screws (hex-wrench 4 mm) on the cover of the test button and remove the cover.
2. *NOTICE!* Damage to the reset screw. Do not use any tools on the reset screw. Screw the reset screw in completely by hand.
   » The float will be forced upward and thus cause the main valve to open.
3. Vent the Buchholz relay (if installed) in accordance with the operating instructions provided.
4. To vent the shutter valve, remove the protective cap from the drain valve (wrench size 17).
5. Turn the lever of the drain valve counterclockwise to vent the device.
6. As soon as insulating fluid begins to escape, turn the lever of the drain valve clockwise to close the drain valve.

7. Position the protective cap on the drain valve, screw on hand-tight and then tighten with maximum one half turn (wrench size 17).
8. Pull the test button down 3 to 5 times to completely fill the valve with oil.
   » The float moves up due to the oil surrounding it. This upward motion also pulls the test button upwards automatically.
9. If you see air bubbles are rising in the inspection window, repeat steps 3 through 7 until no more air bubbles rise.
10. *NOTICE!* Damage to the reset screw. Do not use any tools on the reset screw. As soon as the device is filled with oil, screw the reset screw out completely by hand to reestablish normal operating conditions.

7.2.2 Resetting via the BPR (ball valve) bypass (optional)

Resetting via the BPR bypass is performed from the ground.

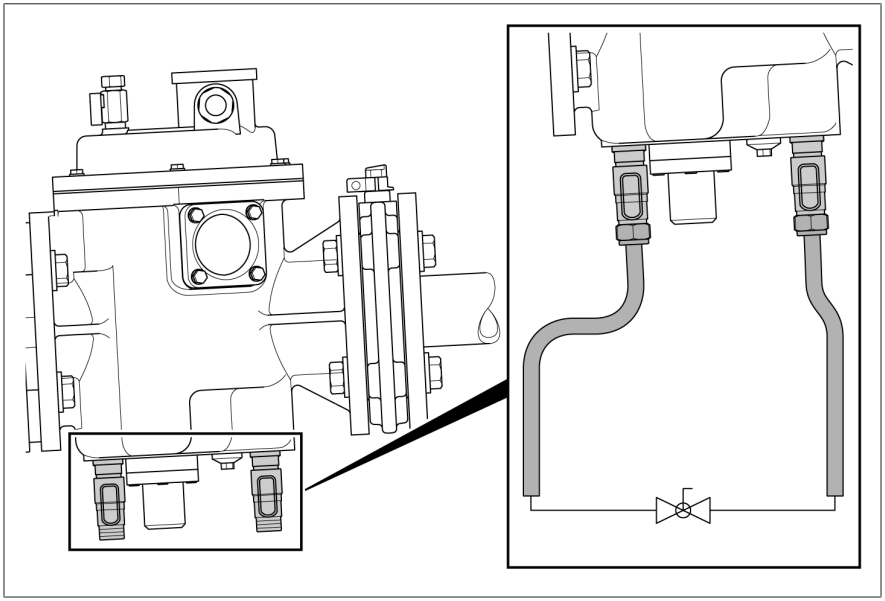


Figure 17: Example BPR pipe bypass

✓ When the transformer is in operation, both drain valves are open and the ball valve is closed.

1. Open the ball valve so that oil flows from the conservator-side chamber into the tank-side chamber via the bypass.
   » As soon as the pressure difference has been equalized fully, the float opens the main valve, the status of the reed-type switch changes and a signal is sent to the monitoring circuit of the transformer.
2. Close the ball valve to establish normal operating conditions.

7.2.3 Resetting via the BPC (drive shaft) bypass (optional)

Resetting via the BPC bypass is performed from the ground.

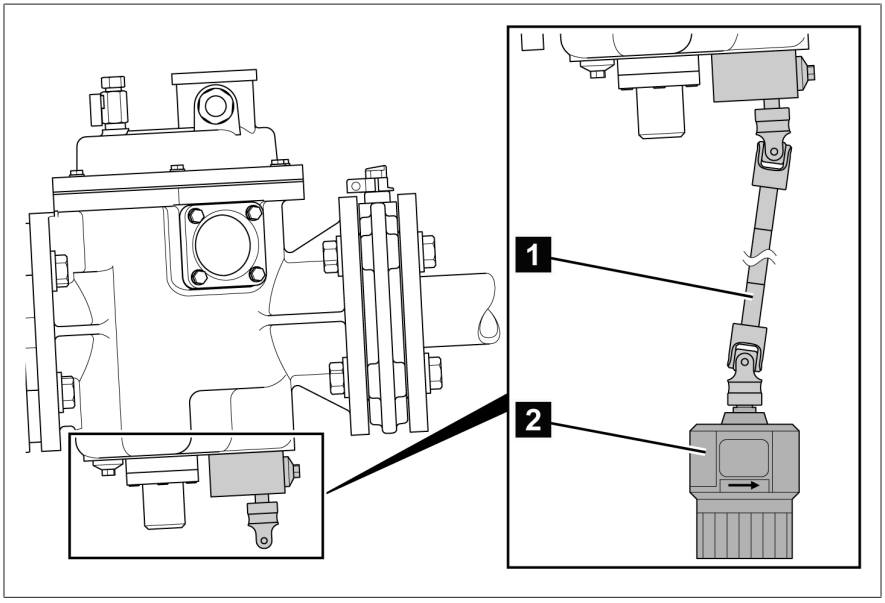


Figure 18: BPC bypass

1	Drive shaft	2	CCC device with knob

✓ The knob on the CCC device is in the normal operating position and the bypass is closed.

1. *NOTICE!* Damage to the pin of the BPC bypass. Do not use force to turn the drive shaft further than is possible.
2. Turn the knob on the CCC device counterclockwise so that oil flows from the conservator-side chamber into the tank-side chamber via the bypass.
   » As soon as the pressure difference has been equalized fully, the float opens the main valve, the status of the reed-type switch changes and a signal is sent to the monitoring circuit of the transformer.
3. Turn the knob on the CCC device clockwise to establish normal operating conditions.

> **i** When the knob on the CCC device is turned, the changeover between normal operating conditions (bypass is closed) and the reset state (bypass is open) is displayed.

7.2.4 Resetting via the BPM (rotary knob) bypass (optional)

Resetting via the BPM bypass is performed directly on the device.

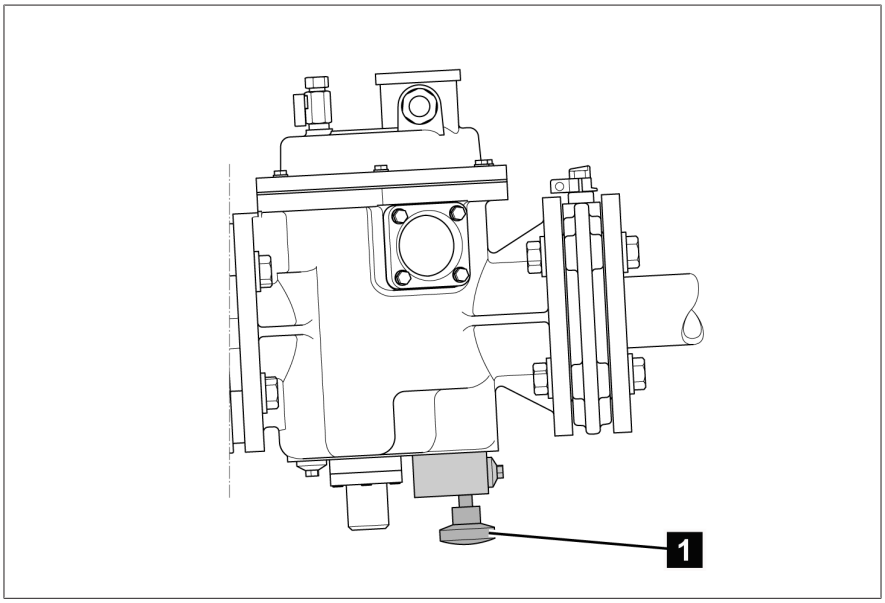


Figure 19: BPM bypass

1	Rotary knob		

✓ Under normal operating conditions, the bypass is closed.

1. *NOTICE!* Damage to the BPM bypass. Do not use force to turn the knob further than is possible.
2. Turn the knob counterclockwise so that oil flows from the conservator-side chamber into the tank-side chamber via the bypass.
   » As soon as the pressure difference has been equalized fully, the float opens the main valve, the status of the reed switch changes and a signal is sent to the monitoring circuit of the transformer.
3. Turn the knob clockwise to establish normal operating conditions.

8 Maintenance and inspection

Maintenance

The device does not require maintenance.

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. broken glass, electrical connection) and corrosion.
2. Vent the device [▶Section 6.1, Page 37].
3. Check the tightness of the flange connection [▶Section 5.1, Page 22].
4. Check that the device is functioning correctly [▶Section 6.3, Page 39].

8.1 Draining the insulation fluid – device version without bypass

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

1. Close the isolation valves to isolate the device.
2. Open the drain valve.
3. Unscrew and remove the drain plugs (wrench size 10).
   » The insulating fluid flows out of the device.
4. Capture the insulating fluid in a suitable container.
5. Tighten the drain plugs (wrench size 10, 5 Nm).
6. Close the drain valve.
7. If necessary, remove the device.

8.2 Draining the insulation fluid – device version with bypass

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

BPC bypass or BPM bypass

1. Close the isolation valves to isolate the device.
2. Open the drain valve and bypass.
3. Unscrew and remove the screw in the block on the base of the device (wrench size 10).

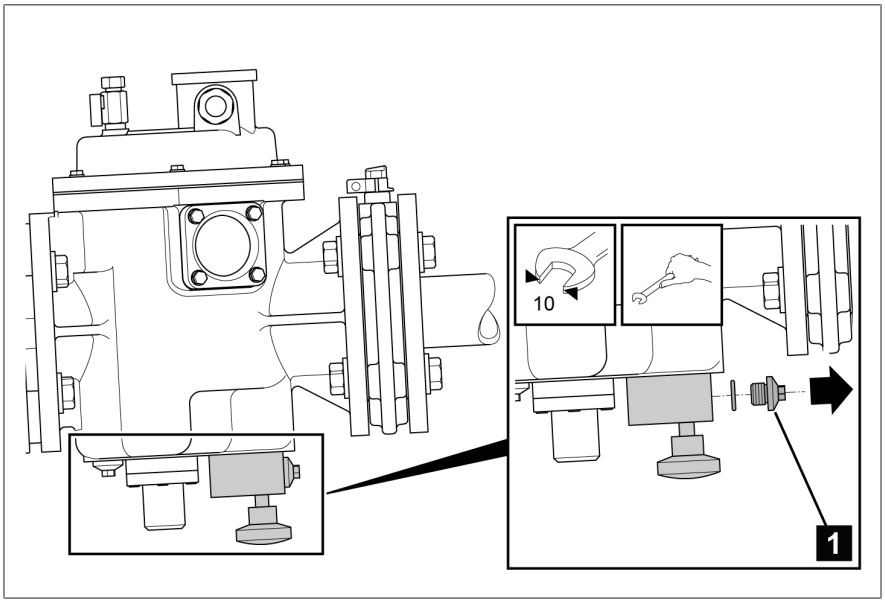


Figure 20: Removing the screw in the block on the base of the device (example – BPM bypass)

1	Screw in the block on the base of the device		

4. Unscrew and remove the drain plug (wrench size 10).

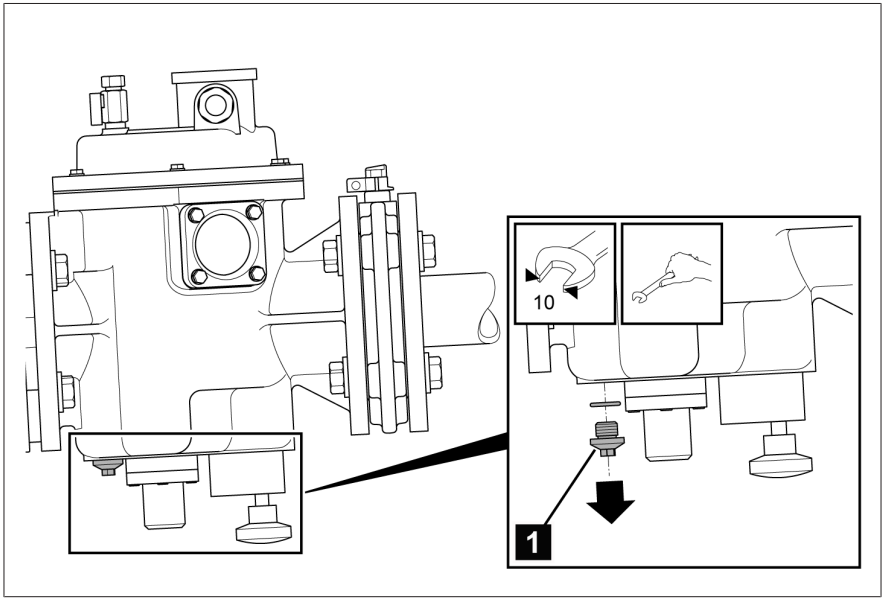


Figure 21: Removing the drain plug (example – BPM bypass)

1	Drain plug		

» The insulating fluid flows out of the device.

5. Capture the insulating fluid in a suitable container.
6. Tighten the drain plug (wrench size 10, 5 Nm) and close the bypass.
7. Tighten the screw in the block on the base of the device (wrench size 10, 5 Nm).
8. Close the drain valve.
9. If necessary, remove the device.

BPR bypass

1. Close the isolation valves to isolate the device.
2. Open the drain valve.
3. Depending on the design of the bypass unit, either loosen the union nuts on the pipe on the ball valve and remove the pipe or, if a three-way valve is used, open it.

» The insulating fluid flows out of the device.

4. Capture the insulating fluid in a suitable container.
5. Close the drain valve.
6. If necessary, remove the device.

9 Disposal

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
- Machining steel

10 Technical data

Basic materials	
Housing / terminal box	Cast aluminum, 2-layer paint system (epoxy and polyurethane), standard RAL 7031 or 7033 (other colors on request); versions for aggressive environmental conditions on request
Inspection window	Hardened glass

Insulating fluid	
– Unused insulating oils derived from petroleum products[1] 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[1] 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 [1] Gas-to-liquid oils (GTL oils) are understood in this context to be petroleum products	
Insulating fluid temperature	-25 °C...+105 °C (up to +115 °C during transformer overload operation) Temperature ranges for alternative insulating fluids on request
Oil flow rate for tripping the shutter valve	>>30 dm^3/min (all pipe diameters)

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
Degree of protection	IP 65 in accordance with DIN EN 60529
Weight including terminal box	Approx. 14 kg (DN100)
Nominal diameter of the pipe, flange version	DN50, DN80 or DN100, flange with 4 or 8 drill holes (see "Drawings" chapter for available versions)

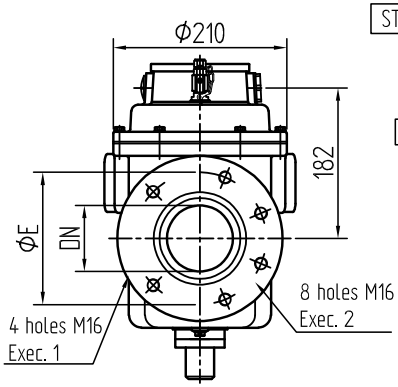
Reed-type switches	
Number and type	Max. 2 normally open contacts or 2 change-over contacts
Nominal voltage	24...240 V DC Up to 230 V AC
Max. current AC/DC	NO contact: 2 A CO contact: 1 A
Min. switched current	Normally open contact: 10 mA Change-over contact: 5 mA
Breaking capacity DC	Normally open contact: 24...240 V DC 250 W L/R < 40 ms Change-over contact: 24...240 V DC 130 W L/R < 40 ms
Breaking capacity AC	Normally open contact: Up to 230 V AC 400 VA cosφ > 0.5 Change-over contact: Up to 230 V AC 250 VA cosφ > 0.5
Insulation resistance	1,000 MΩ/500 V DC

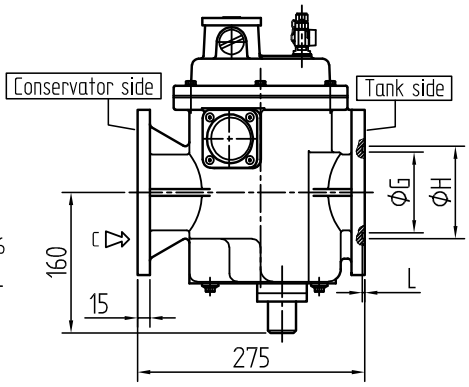
Terminal box	
Cable inlet gland	M20 x 1.5/M25 x 1.5 (adapter)
Connection terminals	M5 thread
Protective conductor connection	M6 screw

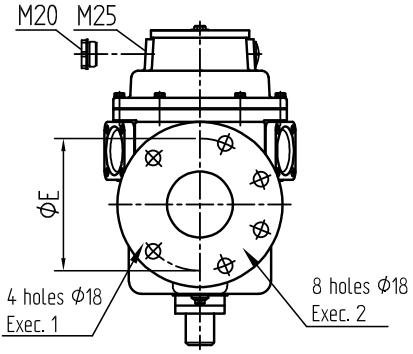
11 Drawings

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

STD EXECUTION







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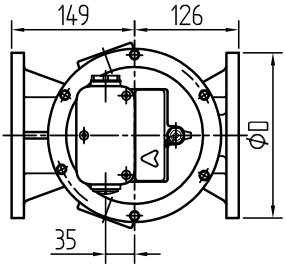
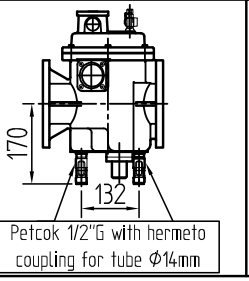
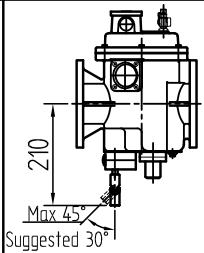
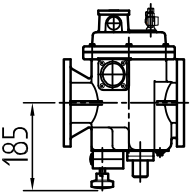


THE FIGURE SHOWS THE VALVE EDS-R 80/80-8

Type	DN	ϕD	ϕE	ϕG	ϕH	L	N	Exec.	Weight (Kg)
EDS-R 50	50	165	125	70	84	3.6	4	1	10
EDS-R 80	80	200	160	98.5	112.5	3.6	4	1	12
EDS-R 80-8	80	200	160	98.5	112.5	3.6	8	2	12
EDS-R 100	100	220	180	114	135	4	8	2	14

BYPASS VARIANTS

BPR EXECUTION	BPC EXECUTION	BPM EXECUTION
		

	DATE	NAME	DOCUMENT NO.	
DFTR.	03/12/21	Curti M.	4847-catalogue	
CHKD.	03/12/21	Giorgi A.	CHANGE NO.	SCALE
STAND.	03/12/21	Giorgi A.	04	1:5

DIMENSION IN mm EXCEPT AS NOTED

SHUTTER VALVE DAROC EDS R2

SERIAL NUMBER

MATERIAL NUMBER

SHEET 1/1

Glossary

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.

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10014218/01 EN - CEDASPE® DAROC Operating instructions - 08/23

THE POWER BEHIND POWER.