THE POWER BEHIND POWER.

Operating instructions
Pressure relief device. CEDASPE® VP series

10679401/00 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

CEDASPE S.r.l.
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20098 S. Giuliano Milanese (MI)
Italy

Tel.: +39 029 820 4411
Internet: www.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.

1.3.3 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 pressure relief device protects oil-filled power transformers and on-load tap-changers against impermissible pressure increases. At a predetermined pressure, the pressure relief device opens, relieves the pressure and closes tightly again once the pressure has dropped.

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 following items are included in the scope of delivery:
- Pressure relief device
- O-ring gasket for assembly

Optional
- O-ring gasket for connection to the oil escape opening

3.2 Function description

The pressure relief device with the device flange is mounted tightly on the top or on the side of transformer tank or on the on-load tap-changer. If the internal pressure of the transformer or the on-load tap-changer exceeds the predefined operating pressure of the pressure relief device, then the spring-loaded valve plate lifts off of its seal seat within a few milliseconds. As a result, the internal pressure is relieved as quickly as possible and the valve plate again closes the pressure relief device tightly.

As an external indication that the valve has tripped, a self-locking signal pin slides out of the housing.

Once the pressure falls below the operating pressure, the valve closes again. The signal pin must be reset to its operating position manually. The signaling contacts installed as an option are automatically reset in the process.

If the device trips (ALARM state), a signal is sent optionally via up to 4 micro-switches (change-over contact) or up to 2 limit-value switches (1-pole or 2-pole, normally open contact and normally closed contact). The switches are connected to the electrical controller and the monitoring circuit of the transformer.

3.3 Design/versions

The pressure relief device is available in various versions, optionally with micro-switches or limit-value switches. The switches are available as Crouzet versions (type K) or as Telemecanique versions (type C). The red signal pin indicates that the device has tripped.

In addition to the current product name, the different versions of the pressure relief device can also be ordered under the historical product name. In the remainder of this technical document, only the current product names are used:

Current product name	Historical product name	Product description
VP50	VSQI50	Mounting via 4-hole flange Optional splash guard available
VP80	VS80	Mounting via 4-hole flange Optional splash guard available Lever for manually resetting the micro-switches on the terminal box
VS100	VS100	
VP150	VS150	Mounting via 8-hole flange Optional splash guard available Lever for manually resetting the micro-switches on the terminal box

Current product name	Historical product name	Product description
VP80-QT	VQT-2 80	Mounting via 4-hole flange Protective cover with integrated terminal box and square 4-hole connection for pipe (Ø 70 mm) for directed oil flow
VP150-QT	VQT-2 150	Mounting via 6-hole flange Protective cover with integrated terminal box and square 4-hole flange connection for pipe (Ø 100 mm) for directed oil flow
VP150-ST	VST-2 150	Mounting via 8-hole flange Protective cover with integrated terminal box and square 4-hole flange connection for pipe (Ø 100 mm) for directed oil flow

Table 4: Versions

It is typical to use several pressure relief devices on transformers that have large volumes of oil.
Take into account the space available for mounting and the amount of oil that escapes upon triggering when selecting the size of the pressure relief device.

3.3.1 VP50 pressure relief device

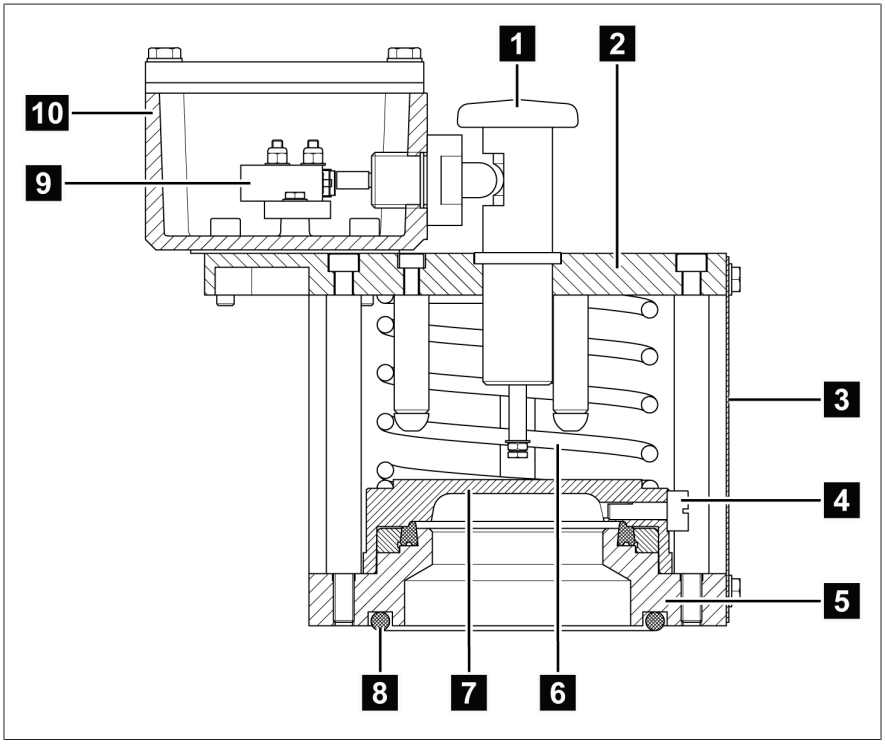


Figure 1: Device version VP50 design

1	Signal pin	2	Counter bearing for spring assembly
3	Splash guard (optional)	4	Vent screw
5	Device flange	6	Spring assembly
7	Valve plate	8	O-ring gasket
9	Micro-switch (optional)	10	Terminal box

3.3.2 VP80, VS100 and VP150 pressure relief device

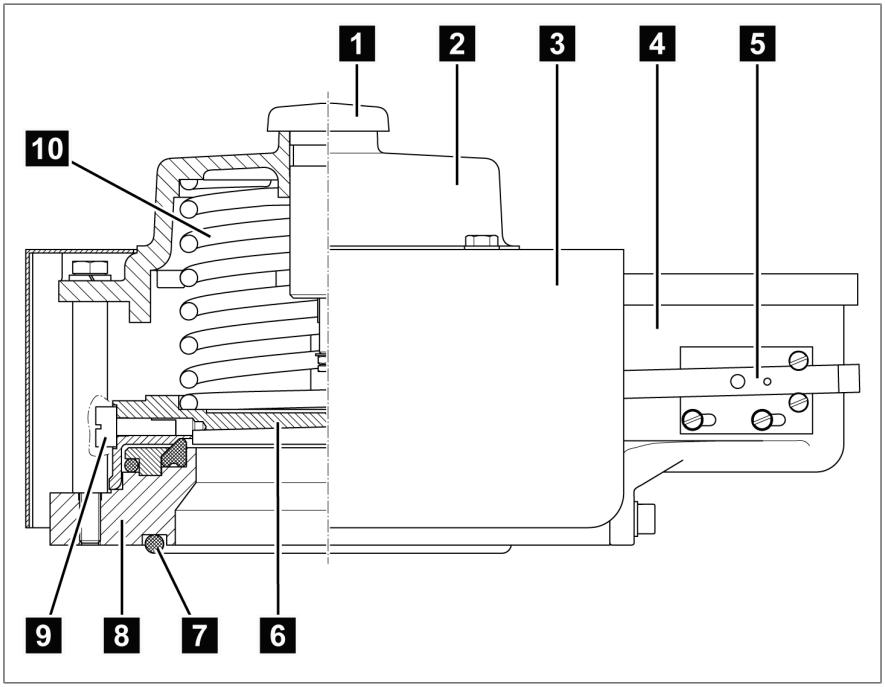


Figure 2: Device versions VP80, VS100 and VP150 design

1	Signal pin	2	Counter bearing for spring assembly
3	Splash guard (optional)	4	Terminal box
5	Lever for manual resetting	6	Valve plate
7	O-ring gasket	8	Device flange
9	Vent screw	10	Spring assembly

3.3.3 VP80-QT pressure relief device

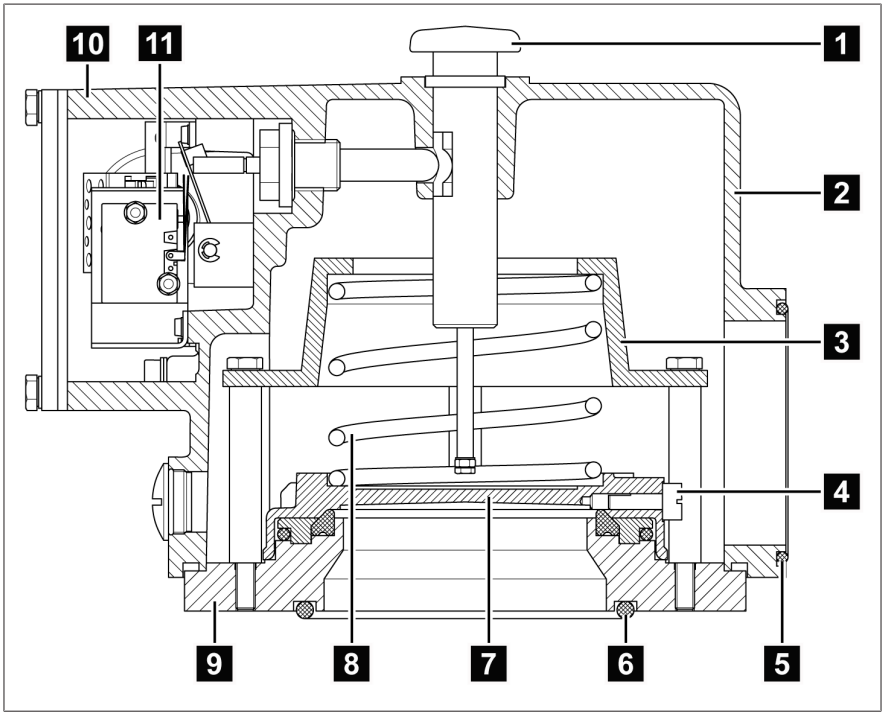


Figure 3: Device version VP80-QT design

1	Signal pin	2	Protective cover with connection for pipe for directed oil flow
3	Counter bearing for spring assembly	4	Vent screw
5	O-ring gasket for connecting the pipe for directed oil flow	6	O-ring gasket
7	Valve plate	8	Spring assembly
9	Device flange	10	Terminal box
11	Micro-switch (optional)		

3.3.4 VP150-QT and VP150-ST pressure relief device

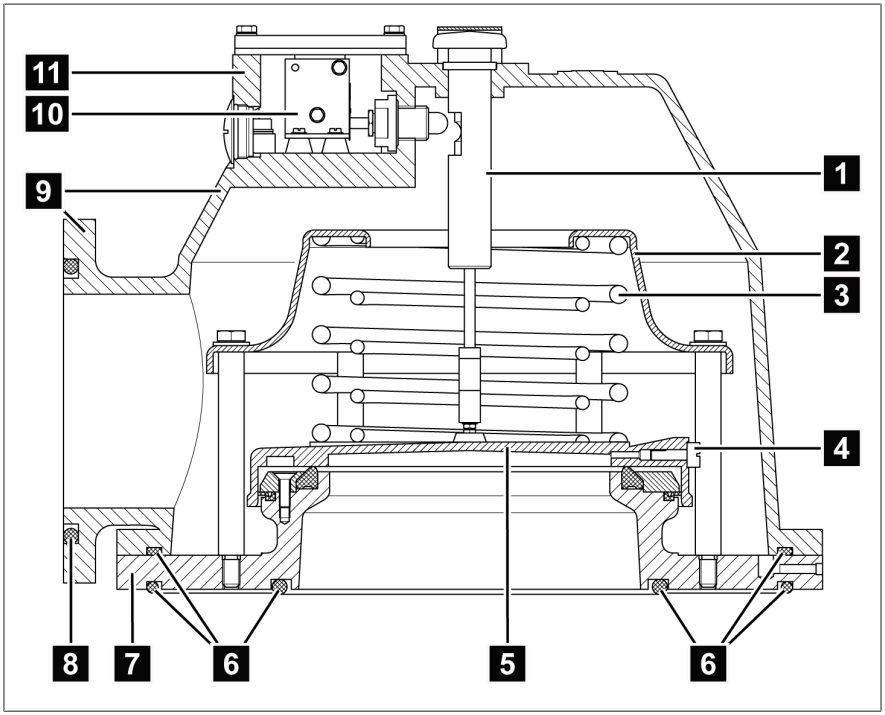


Figure 4: Device versions VP150-QT and VP150-ST design

1	Signal pin	2	Counter bearing for spring assembly
3	Spring assembly	4	Vent screw
5	Valve plate	6	O-ring gaskets, flange and protective cover
7	Device flange	8	O-ring gasket for connecting the pipe for directed oil flow
9	Protective cover with connection for pipe for directed oil flow	10	Micro-switch (optional)
11	Terminal box		

3.4 Safety markings and nameplate

The nameplate is on the device upper side.

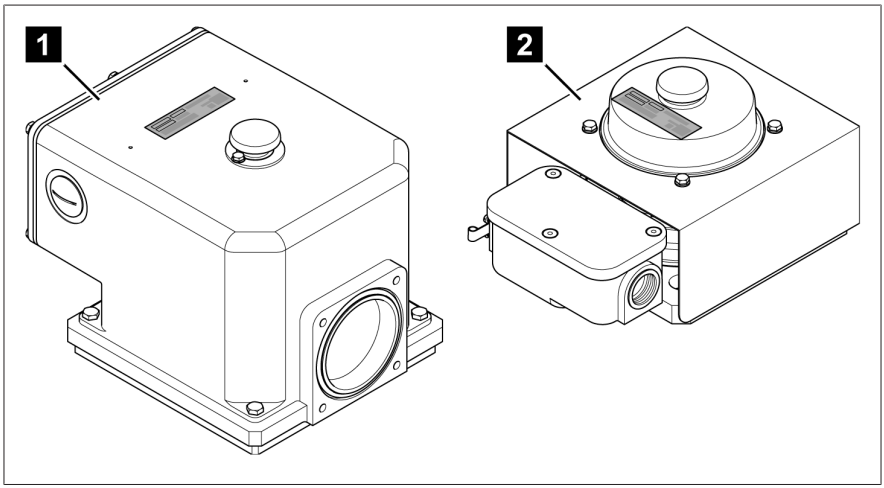


Figure 5: Nameplate (examples)

1	VP80-QT	2	VP80

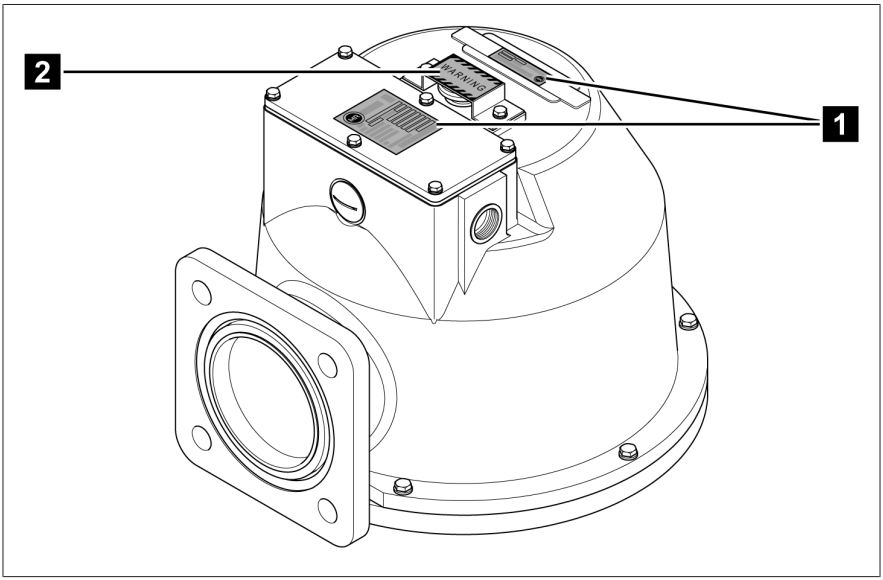


Figure 6: Nameplates and safety marking (device versions VP150-QT and VP150-ST)

1	Nameplates	2	Safety marking Malfunction! Refer to the Commissioning chapter

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.

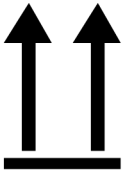
 Protect against moisture	 Top	 Fragile

Table 5: 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

This chapter describes how to correctly mount and connect the device.

The pressure relief device is mounted on a device flange on the transformer or on-load tap-changer.

Note the connection diagrams provided.

⚠ DANGER

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

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

⚠ WARNING

Risk of injury
Danger of serious injury due to springs that are under high tension.

- Never unscrew the fixing screws of the counter bearing.

NOTICE

Property damage!
The function of the device will be impaired due to drying. As a result, the transformer will no longer be protected against impermissible pressure increases.

- Ensure that the device is not dried in the oven.
- Only mount the device once the transformer / on-load tap-changer has been dried.

⚠ CAUTION

Risk of injury and damage to property!

Escaping hot oil and gas can lead to injuries and damage to the device. Direct escaping hot oil and gas away from people and critical transformer parts.

The pressure relief device can be mounted horizontally or vertically, as close as possible to potential error sources.

When installed vertically, depending on the device version, the splash guard or the connection opening of the protective cover must face downwards to ensure complete drainage of the oil in the event of tripping.

When installed vertically or at a slight angle, the vent screw must face upwards or be at the highest point on the device to ensure proper venting.

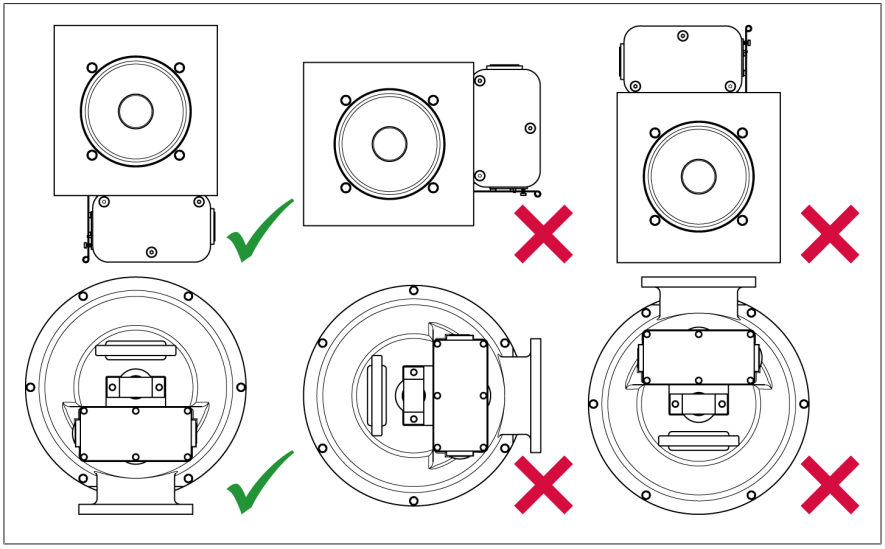


Figure 7: Possible vertical installation positions (using device versions VP80 and VP150-QT as an example)

There must be a minimum clearance above or in front of the device so that the signal pin can be pushed fully out of the housing. Refer to the drawings in the appendix for the minimum clearance necessary.

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

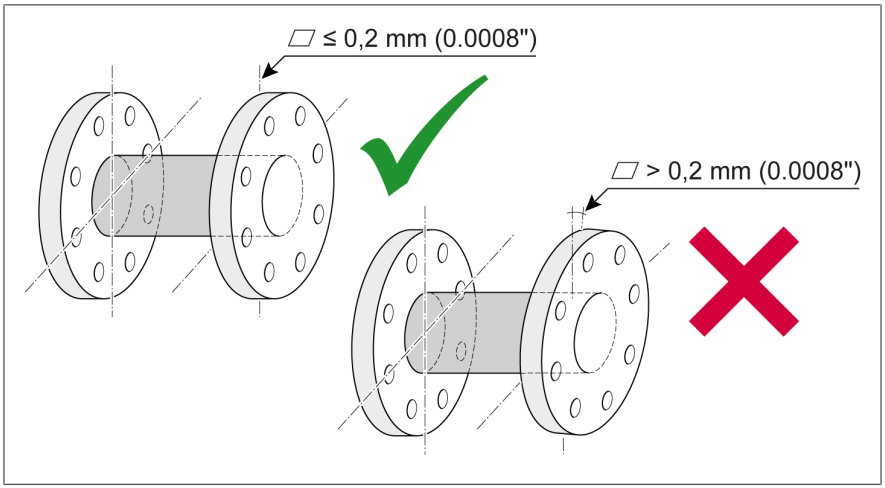


Figure 8: Flanges

- 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 Mounting device versions VP50, VP80, VS100 and VP150

You must first remove the splash guard to mount the device. After mounting, reattach the splash guard to the device.

Removing the splash guard

1. Unscrew and remove the fixing screws on the splash guard.

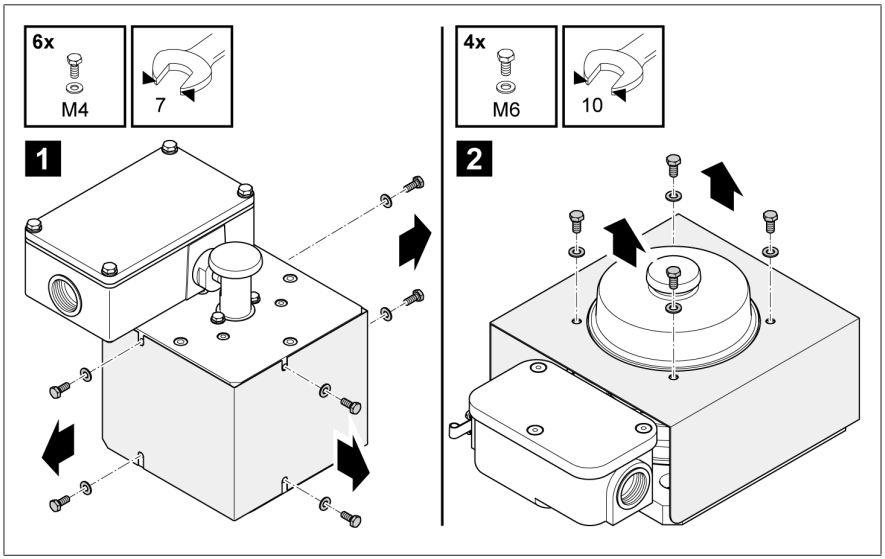


Figure 9: Unscrewing the splash guard fixing screws

1	VP50: 6 x fixing screws M4	2	VP80, VS100, VP150: 4 x fixing screws M6

2. Lift off the splash guard and place it on a stable surface.

Mounting the device

Refer to the Drawings chapter for dimensions and connection data.

1. Insert the o-ring gasket included in the delivery underneath the device in the groove intended for this. *NOTICE!* Malfunction! An incorrectly seated o-ring gasket can result in leaks. When mounting, ensure that the o-ring gasket is seated correctly in the groove intended for this.
2. Mount the device onto the counter flange on the transformer/on-load tap-changer via the drill holes in the device flange using suitable screws (depending on the device version, 4 or 8 x M16, wrench size 24) and washers.
3. *NOTICE!* Damage to the o-ring gasket. Protect the o-ring gasket between the device and the counter flange and, during all intermediate steps, only position the device lightly and do not press it down.
4. Tightening the screws crosswise with 10% of the max. tightening torque.
5. Tightening the screws crosswise with 30% of the max. tightening torque.
6. Tightening the screws crosswise with 60% of the max. tightening torque.

7. *NOTICE!* Damage to the holes due to a tightening torque that is too high. Tighten the screws crosswise with 100% of the tightening torque and continue to retighten the screws with 100% of the tightening torque until the screws can no longer be turned further.

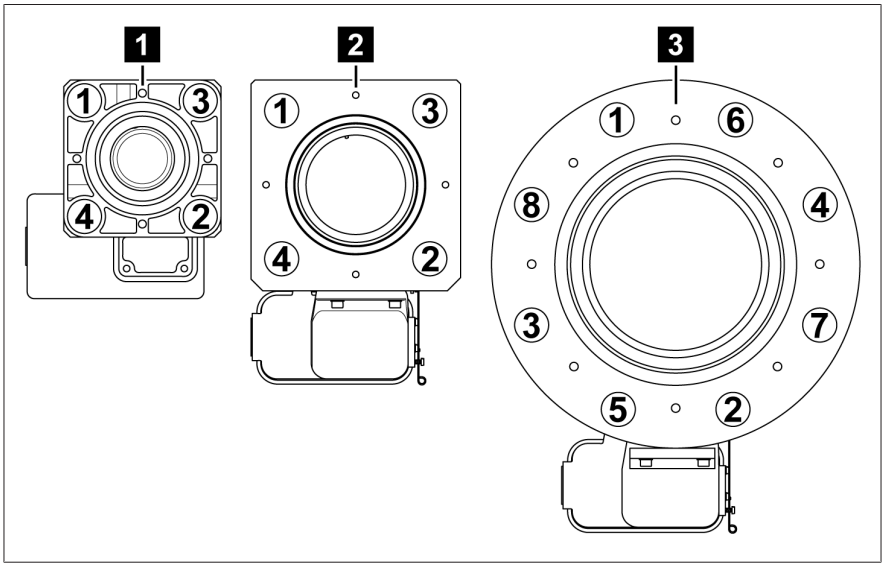


Figure 10: Tightening the screws crosswise

1	VP50	2	VP80, VS100
3	VP150		

Mounting the splash guard

1. Insert the splash guard fixing screws into the intended holes and turn the splash guard gently around its axis until the screws engage in the threads in the splash guard.
2. *NOTICE!* Damage to the o-ring gasket. Protect the o-ring gasket between the device and the counter flange and, during all intermediate steps, only position the device lightly and do not press it down.
3. *NOTICE!* Do not tilt or jam the splash guard! Tighten the fixing screws slightly crosswise several times to prevent the splash guard from tilting or jamming while it is being lowered.

4. Then tighten the fixing screws crosswise up to the maximum tightening torque.

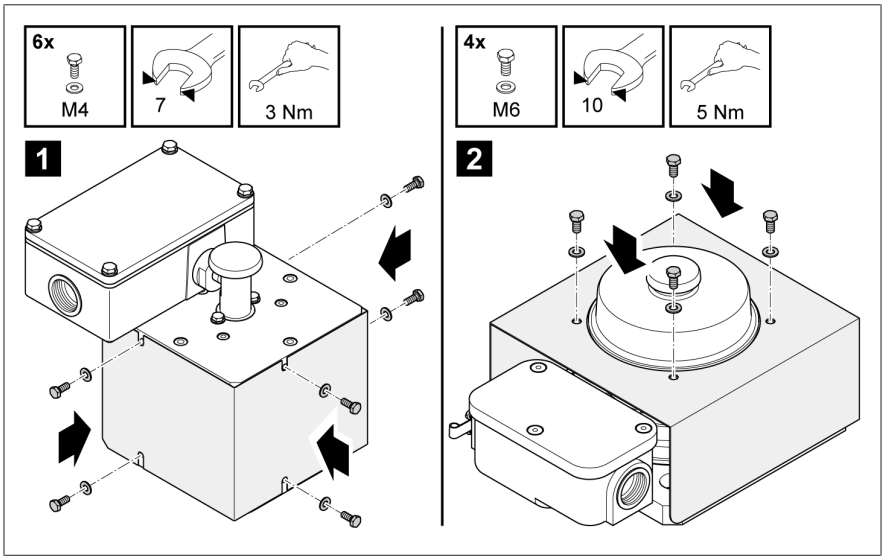


Figure 11: Mounting the splash guard

1	VP50: 6 x fixing screws M4	2	VP80, VS100, VP150: 4 x fixing screws M6

5.3 Mounting device versions VP80-QT, VP150-QT and VP150-ST

You must first remove the protective cover to mount the device. After mounting, reattach the protective cover to the device.

Removing the protective cover

1. Unscrew and remove the fixing screws on the protective cover.

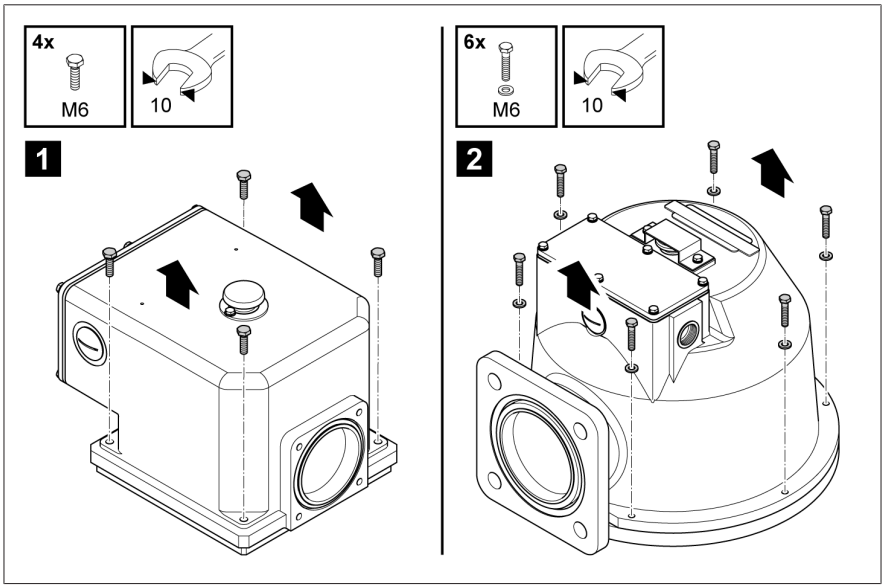


Figure 12: Unscrewing the protective cover fixing screws

1	VP80-QT: 4 x fixing screws M6	2	VP150-QT, VP150-ST: 6 x fixing screws M6

2. Lift off the protective cover and place it on a stable surface.

Mounting the device

Refer to the Drawings chapter for dimensions and connection data.

1. Insert the o-ring gasket (VP80-QT 1 piece, VP150-QT and VP150-ST 2 pieces) included in the delivery underneath the device in the groove intended for this. *NOTICE!* Malfunction! An incorrectly seated o-ring gasket can result in leaks. When mounting, ensure that the o-ring gasket is seated correctly in the groove intended for this.
2. Place the device onto suitable fixing bolts (depending on the device version, 4, 6 or 8 x M16 fixing bolts, wrench size 24) and mount it onto the counter flange of the transformer/on-load tap-changer via the holes in the device flange using suitable nuts and washers.
3. Tightening the nuts crosswise with 10% of the max. tightening torque.

4. Tightening the nuts crosswise with 30% of the max. tightening torque.
5. Tightening the nuts crosswise with 60% of the max. tightening torque.
6. *NOTICE!* Damage to the holes due to a tightening torque that is too high. Tighten the nuts crosswise with 100% of the tightening torque and continue to retighten the nuts with 100% of the tightening torque until the screws can no longer be turned further.

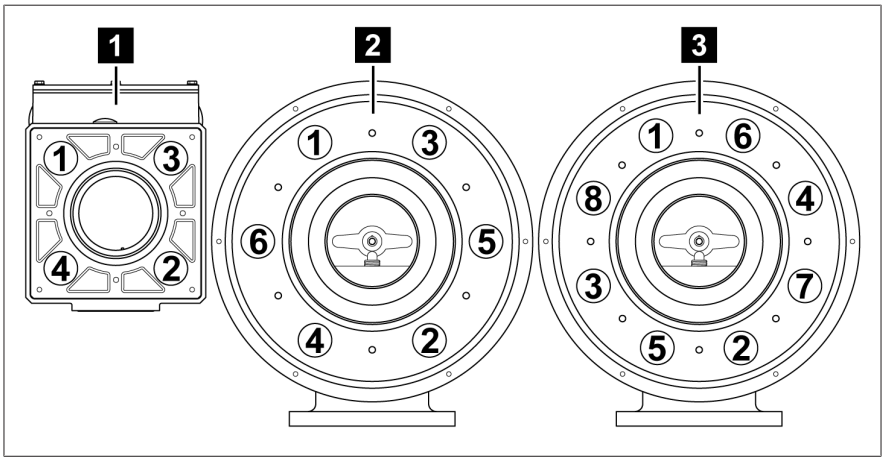


Figure 13: Tightening the screws crosswise

1	VP80-QT	2	VP150-QT
3	VP150-ST		

Mounting the protective cover

1. Insert the protective cover fixing screws into the intended holes and turn the protective cover gently around its axis until the screws engage in the threads in the protective cover.
2. *NOTICE!* Damage to the o-ring gasket. Protect the o-ring gasket between the device and the counter flange and, during all intermediate steps, only position the device lightly and do not press it down.
3. *NOTICE!* Do not tilt or jam the protective cover! Tighten the fixing screws slightly crosswise several times to prevent the protective cover from tilting or jamming while it is being lowered.

4. Then tighten the fixing screws crosswise up to the maximum tightening torque.

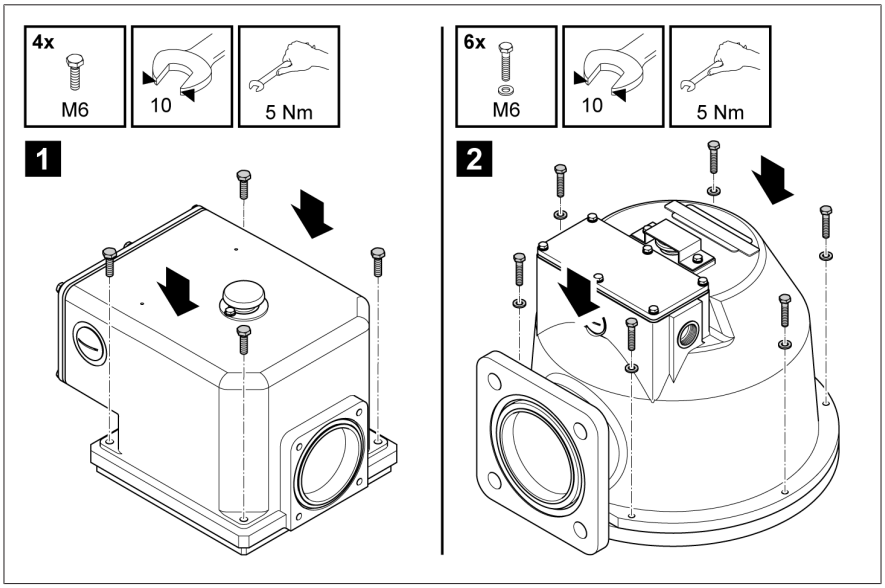


Figure 14: Mounting the protective cover

1	VP80-QT: 4 x fixing screws M6	2	VP150-QT, VP150-ST: 6 x fixing screws M6

Mounting the oil drainage unit on VP150-QT and on VP150-ST

1. Remove the plastic cap from the oil escape opening.
2. Insert the o-ring gasket included in the delivery into the 4-hole flange connection.
3. Align the pipe on the oil drainage unit with the holes on the flange connection.
4. Mount the pipe onto the 4-hole flange connection via the drill holes using suitable screws (M16, wrench size 24), washers and nuts.
5. Tighten the screws crosswise.

Mounting the oil drainage unit on VP80-QT

1. Remove the plastic cap from the oil escape opening.
2. Insert the o-ring gasket included in the delivery into the 4-hole connection.

3. Mount the pipe of the oil drainage unit onto the 4-hole connection via the drill holes using suitable M6x12 screws and washers.
4. Tighten the screws crosswise.

5.4 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.

⚠ WARNING

Danger of death or severe injury!
Danger of death or severe injury due to improper electrical connection of the pressure relief device.

› When the pressure relief device trips, the transformer must be immediately de-energized by the circuit breaker.
› Ensure that the pressure relief device's signaling contact is correctly looped into the tripping circuit of the transformer circuit breaker.

Connecting the micro-switches (optional)

The switches are available as Crouzet versions (type K) or as Telemecanique versions (type C). With the Crouzet version, the device can be equipped with a maximum of 4 micro-switches (change-over contact) that are connected electrically via the terminal strip in the terminal box. With the Telemecanique version, the device can be equipped with a maximum of 2 limit-value switches (1-pole or 2-pole, normally open contact and normally closed contact) that are connected electrically directly to the Telemecanique switch.

5.4.1 Cable recommendation

Please note the following recommendation when wiring the device:
- To make the connection, you need suitable cables, ring cable lugs and cable glands that are not included in the scope of delivery (cable glands are only included in the delivery with devices with Telemecanique version switches (limit-value switches)).
- 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	4 mm^2	M3 screw
Protective conductor	≥ all other conductors	M5 screw

Table 6: Terminal box (Crouzet) cable recommendation

Cable	Conductor cross-section	Connection
Signal lines (ZCKJ1-1)	1 x 0.34 mm^2...2 x 1.5 mm^2	Clamp bolt
Signal lines (ZCKJ2-2)	1 x 0.75 mm^2...2 x 1.5 mm^2	Clamp bolt
Protective conductor	≥ all other conductors	Clamp bolt M4

Table 7: Limit-value switch (Telemecanique) cable recommendation

5.4.2 Connection via connection box (Crouzet version)

Device version	Screws	Wrench size
VP50	4 x M5	Open-end wrench, wrench size 8
VP80, VS100	3 x M5	4 mm Allen key
VP150	6 x M5	Open-end wrench, wrench size 8

Table 8: Terminal box screws

1. Unscrew the screws on the terminal box (see table above) and remove the cover.
2. Mount an M25 x 1.5 cable gland in the terminal box.

3. *NOTICE!* To ensure the IP degree of protection of the device, use a suitable cable gland with at least IP65.
4. Unscrew the screws on the terminal strip (3, 6, 9 or 12 x M3, bladed screwdriver).
5. Remove an amount of sheathing from the double-insulated cable appropriate for the wiring, strip off 7 mm of insulation from the individual wires and cap off with ferrules.
6. *NOTICE!* Do not kink the wires! Connect the signal lines and protective conductor to the labeled terminal strip in loose arcs in accordance with the wiring diagram.
7. *NOTICE!* To prevent damage, observe the specified tightening torques.
8. Guide the cable through the cable gland and connect it to the terminals in accordance with the wiring diagram. The wiring diagram can be found on the inside of the terminal box cover.

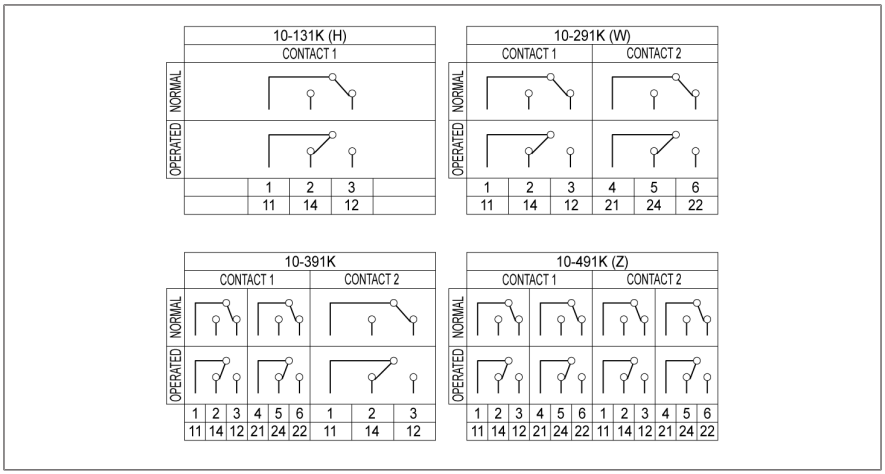


Figure 15: Wiring diagrams K (Crouzet version)

9. Tighten the screws on the terminal strip (M3, bladed screwdriver, 0.6 Nm).
10. Ground the device via a grounding cable with ring cable lug. To do so, loosen the grounding screw (M5, 4 mm Allen key).
11. Place the ring cable lug on the grounding screw between the two washers (M5) and tighten the grounding screw (4 mm Allen key, 3 Nm).
12. Position the cover on the terminal box and tighten the screws.

5.4.3 Connection via limit-value switch (Telemecanique version)

1. Unscrew the screws on the cover of the Telemecanique switch (2 x M4 Phillips screws, crosshead screwdriver) and remove the cover.
2. Unscrew the screws on the terminal strip (depending on the number of switches, 4 or 8 pieces, crosshead screwdriver).
3. Remove the dummy plug from the thread for the cable gland.
4. Mount a PG13.5 or an M20 cable gland in the thread.
5. Remove an amount of sheathing from the double-insulated cable appropriate for the wiring, strip off 7 mm of insulation from the individual wires and cap off with ferrules.
6. *NOTICE!* Do not kink the wires! Connect the signal lines and protective conductor to the labeled terminal strip in loose arcs in accordance with the wiring diagram.
7. *NOTICE!* To prevent damage, observe the specified tightening torques.
8. Guide the cable through the cable gland and connect it to the terminals in accordance with the wiring diagram. The wiring diagram is located under the splash guard.

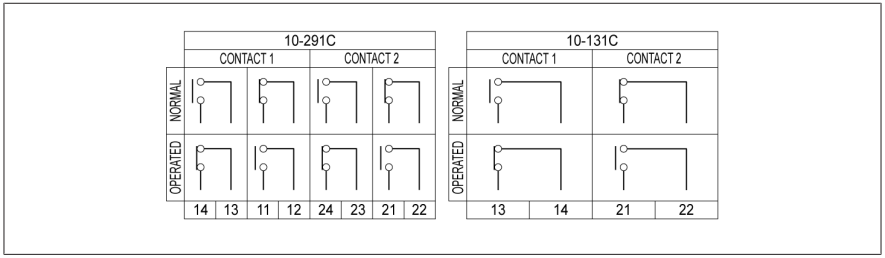


Figure 16: Wiring diagrams C

9. Tighten the screws on the terminal strip (crosshead screwdriver, 1 Nm).
10. Ground the device via a grounding cable with ring cable lug. To do so, loosen the grounding screw (crosshead screwdriver).
11. Place the ring cable lug under the grounding screw and tighten the grounding screw (crosshead screwdriver, 3 Nm).
12. Position the cover on the Telemecanique switch and tighten the screws.

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].

6.1 Filling with oil and performing the venting test

⚠ WARNING

Danger of explosion and danger of poisoning!
Explosive gases in the device 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 inhale any gas released.

i When installed vertically or at a slight angle, the vent screw must face upwards or be at the highest point on the device to ensure proper venting.

✓ The transformer tank is filled with insulating fluid.

✓ The conservator is filled with insulating fluid.

✓ The device is mounted on the top or the side of the transformer tank.

1. Remove the splash guard or protective cover (see Mounting device versions VP50, VP80, VS100 and VP150 [▶Section 5.2, Page 29] or Mounting device versions VP80-QT, VP150-QT and VP150-ST [▶Section 5.3, Page 32]) and place it on a stable surface.
2. Loosen the vent screw (bladed screwdriver) without unscrewing it completely until air audibly flows out of the device and insulating fluid escapes.
3. Tighten the vent screw with a maximum tightening torque of 0.5 Nm.
4. Use a cloth to remove the insulating fluid from the surface of the device.

5. Mount the splash guard or protective cover onto the device (see Mounting device versions VP50, VP80, VS100 and VP150 [▶ Section 5.2, Page 29] or Mounting device versions VP80-QT, VP150-QT and VP150-ST [▶ Section 5.3, Page 32]).

» The device is filled with oil and vented.

6.2 Leak test

✓ The device is 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 Removing the protective panel on the signal pin (VP150-QT and VP150-ST)

NOTICE

Malfunction and property damage!

If the device is operated with the protective panel installed on the signal pin, the signal pin cannot be pushed upwards properly when triggered and the device could become damaged.

1. Unscrew the fixing screws on the protective panel and remove together with the washers.

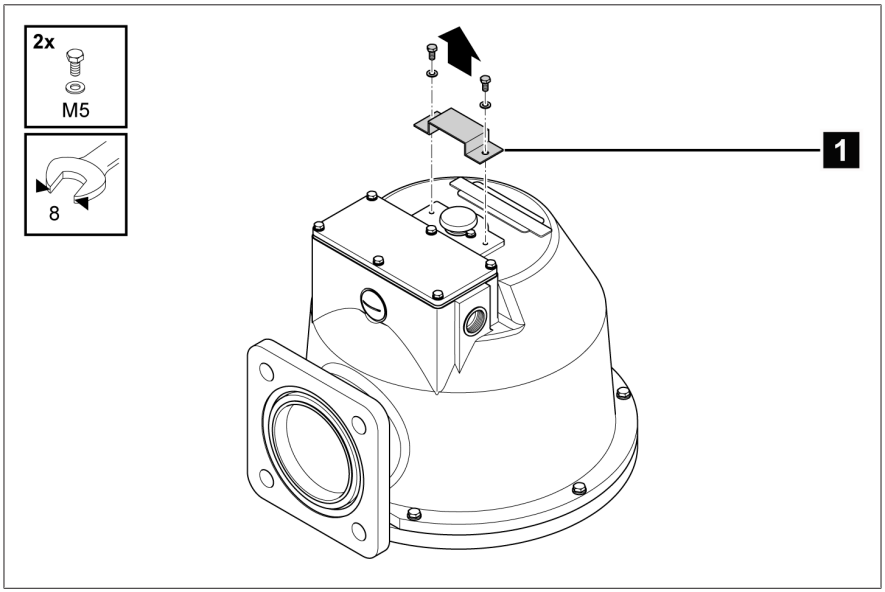


Figure 17: Unscrewing the protective panel fixing screws

1	Protective panel		

2. Remove the protective panel.

6.4 Checking the function of the micro-switches

The test is not possible for devices with limit-value switches.

✓ The cover of the terminal box has been removed.

✓ Normal operating conditions have been checked and are in accordance with the wiring diagram.

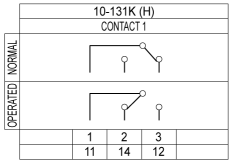
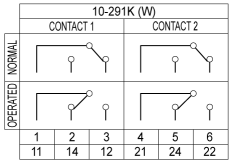
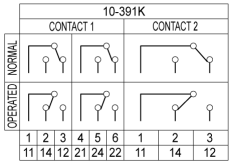
1. Connect a multimeter to the terminals in the open state.

2. Depending on the device version, push the lever for manual resetting to the side (device versions VP80, VS100 and VP150) or pull the signal pin upwards (device versions VP50, VP80-QT, VP150-QT and VP150-ST) to actuate the contact.
   » The multimeter receives a signal.
3. Push the lever for manual resetting back into position or push the signal pin into the device to reinstate normal operating conditions.

» The test is complete.

7 Operation

7.1 Contact signals

Normal operating conditions	Alarm contact description	Note
Wiring diagram 10-131K (H) 	Switches 1-2/11-14 closed.	When the predetermined pressure is exceeded, the device trips, relieves the pressure and closes tightly again once the pressure has dropped.
Wiring diagram 10-291K (W) 	Switches 1-2/11-14 and switches 4-5/21-24 closed.	When the predetermined pressure is exceeded, the device trips, relieves the pressure and closes tightly again once the pressure has dropped.
Wiring diagram 10-391K 	Switches 1-2/11-14 and switches 4-5/21-24 closed.	When the predetermined pressure is exceeded, the device trips, relieves the pressure and closes tightly again once the pressure has dropped.

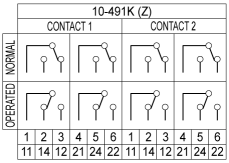
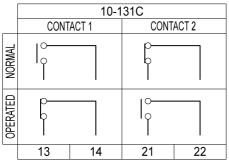
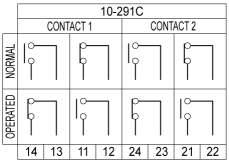
Normal operating conditions	Alarm contact description	Note
Wiring diagram 10-491K (Z) 	Switches 1-2/11-14 and switches 4-5/21-24 closed.	When the predetermined pressure is exceeded, the device trips, relieves the pressure and closes tightly again once the pressure has dropped.
Wiring diagram 10-131C 	Switches 13-14 closed. Switches 21-22 open.	When the predetermined pressure is exceeded, the device trips, relieves the pressure and closes tightly again once the pressure has dropped.
Wiring diagram 10-291C 	Switches 13-14 and switches 23-24 closed. Switches 11-12 and switches 21-22 open.	When the predetermined pressure is exceeded, the device trips, relieves the pressure and closes tightly again once the pressure has dropped.

Table 9: Contact signals

7.2 Pressure relief device operating state

The operating state of the pressure relief device is shown from the outside by the position of the signal pin:

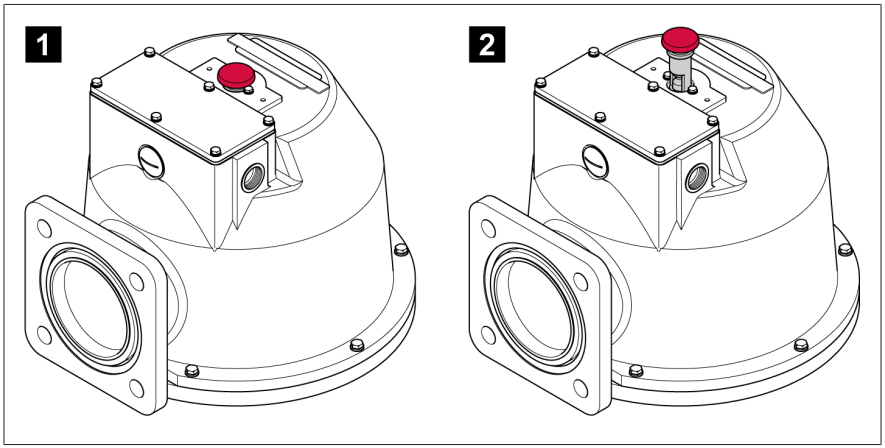


Figure 18: Operating positions of the signal pin (using device version VP150-QT/VP150-ST as an example)

1	Operation	2	ALARM – Pressure relief device has tripped

If the pressure relief device has tripped, the signal pin remains in the ALARM position, even after the pressure in the transformer/on-load tap-changer has normalized again. If the micro-switches inside the housing are connected, a signal is transmitted to the control room at the same time.

› After eliminating the cause, press the signal pin back down manually.

If the signal pin is in the Operation position, the pressure relief device has not tripped mechanically. If a micro-switch has nonetheless issued a signal, the fault may lie in the tripping circuit, see chapter Checking the tripping circuit and tripping reason [▶Section 9.1, Page 49].

7.3 Manually resetting the micro-switches

If the device is equipped with the reset function, the micro-switches can be reset to the normal operating conditions manually after the device has tripped. Resetting manually is performed via the lever for manual resetting or via the signal pin, depending on the device version:

1. Depending on the device version, retract the lever for manual resetting (device versions VP80, VS100 and VP150) or push the signal pin into the device (device versions VP50, VP80-QT, VP150-QT and VP150-ST).

» The micro-switches have been reset.

8 Maintenance and inspection

Maintenance

The product 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.

The following checks are necessary for each transformer inspection:

- Visual inspection for leaks, corrosion and damage
- Check the function of the switches, see [▶Section 6.4, Page 42]

In addition, the following checks are necessary during every second transformer inspection:

- Visual inspection for leaks, corrosion and damage under the splash guard or under the protective cover. To do this, remove the splash guard or protective cover; refer to the chapter Mounting device versions VP50, VP80, VS100 and VP150 [▶Section 5.2, Page 29] or chapter Mounting device versions VP80-QT, VP150-QT and VP150-ST [▶Section 5.3, Page 32] depending on the device version.
- Visual inspection of the compression springs
- Visual inspection of the flange
- Visual inspection of the switches

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

CEDASPE S.r.l
Via Colombara 1
20098 S. Giuliano Milanese (MI)
Italy
Tel.: +39 029 820 4411
Internet: www.reinhausen.com

9 Fault elimination

This chapter describes how to eliminate simple operating faults.

9.1 Testing the tripping circuit and reason for tripping

If the signal pin is in the Operation position, this means that the pressure relief device has not tripped. If a micro-switch has nonetheless issued a signal, the fault may lie in the tripping circuit. If this is the case, check whether the signals in the tripping circuit are transmitted reliably.

If the signal pin is in the Alarm position, this means that the pressure relief device has tripped. If this is the case, clarify the following questions and, if necessary, contact the manufacturer of the transformer/on-load tap-changer so that further measures can be taken:

- Has oil leaked from the pressure relief device?
- Was the transformer exposed to mechanical stress?
- What was the load of the transformer at the instant of tripping?
- Was the on-load tap-changer in operation immediately before or during tripping?
- Were other protective devices activated at the time of tripping?
- Were switching operations in the network being carried out at the time of tripping?
- Were overvoltages registered at the time of tripping?
- How high is the static pressure on the pressure relief device (difference in height between the oil level in the conservator and in the pressure relief device)?

› Only once all potential errors have been eliminated should you push the signal pin back into the device, otherwise the valve cannot be tripped again.

10 Disposal

Observe the national disposal regulations in the country of use.

10.1 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

11 Technical data

Basic materials	
Mounting flange, protective cover	Cast aluminum, 2-layer paint system (epoxy and polyurethane), standard RAL 7031 or 7033 (other colors on request); offshore versions on request
Splash guard	Stainless steel
Valve plate	Cast aluminum and brass
Springs	Spring steel

Operating conditions	
Location of use	Indoors and outdoors; tropic-proof
Ambient air temperature	-50 °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
Storage temperature	-40 °C...+80 °C
Degree of protection	IP 65 in accordance with IEC 60 529
Operating pressure	0.3...1.5 bar (30 kPa...150 kPa), see table below

Operating pressure[1] [bar]	Min. operating pressure[2] [bar]	Max. operating pressure[3] [bar]	Transformer operating pressure[4] [bar]	Min. closing pressure [bar]	Leakage test pressure[5] [bar]
0.3	0.300	0.375	0.2	0.085	0.15 below the min. operating pressure
0.4	0.380	0.460	0.3	0.15	
0.5	0.475	0.575	0.38	0.17	
0.6	0.570	0.660	0.5	0.2	
0.7	0.660	0.770	0.56	0.3	
0.8	0.760	0.864	0.66	0.35	
0.9	0.850	0.970	0.75	0.40	
1.1	1.100	1.180	0.90	0.55	
1.3	1.300	1.400	1.00	0.65	
1.5	1.500	1.600	1.30	0.80	

[1] Nominal pressure of the device is set at the factory.
[2] and [3] Minimum and maximum operating pressure at which the device must trip. The values specified in the table are absolute values.
[4] Maximum permanent operating pressure of the transformer at which no insulating fluid may escape from the device.
[5] Minimum pressure to be set at the start of the leakage test.

Specifications	
Nominal width, flange version	DN50: Flange with 4 drill holes (VP50) DN80: Flange with 4 drill holes (VP80, VP80-QT) DN100: Flange with 4 drill holes (VS100) DN150: Flange with 6 drill holes (VP150-QT) or flange with 8 drill holes (VP150, VP150-ST)
Weight	Approx. 14.5 kg (VP150-QT, VP150-ST)

Micro-switches		
Change-over contact Micro K (Crouzet) ST	Quantity	1...4 (depending on device version)
	Contact material	Nickel-plated silver
	Min. and max. current	1...10 A
	Breaking capacity DC	250 V...5 A
	Breaking capacity AC	125 V...1 A
Low current change-over contact Micro K (Crouzet) BC	Quantity	1...4 (depending on device version)
	Contact material	Gold alloy
	Min. and max. current	1...100 mA
	Min. and max. voltage	4...30 V
Limit-value switch C (Telemecanique) ZCKJ1-1	Quantity	1
	Type	1 normally open contact and 1 normally closed contact
	Breaking capacity AC ($1x10^5$ switching operations)	250 V...3.5 A...24 V...10 A
	Breaking capacity DC ($1x10^5$ switching operations)	DC 24 V...10 W...120 V...4 W
Limit-value switch C (Telemecanique) ZCKJ2-2	Quantity	2
	Type	2 normally open contact and 2 normally closed contact
	Breaking capacity AC ($1x10^5$ switching operations)	250 V...3.5 A...24 V...10 A
	Breaking capacity DC ($1x10^5$ switching operations)	DC 24 V...10 W...120 V...4 W

Connection	Micro-switches (Crouzet)	Limit-value switches (Telemecanique)
Cable inlet gland	M25 x 1.5	PG13 or M20
Signal lines	M3 screw	Clamp bolt
Protective conductor	M5 screw	Clamp bolt M4

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 as petroleum products

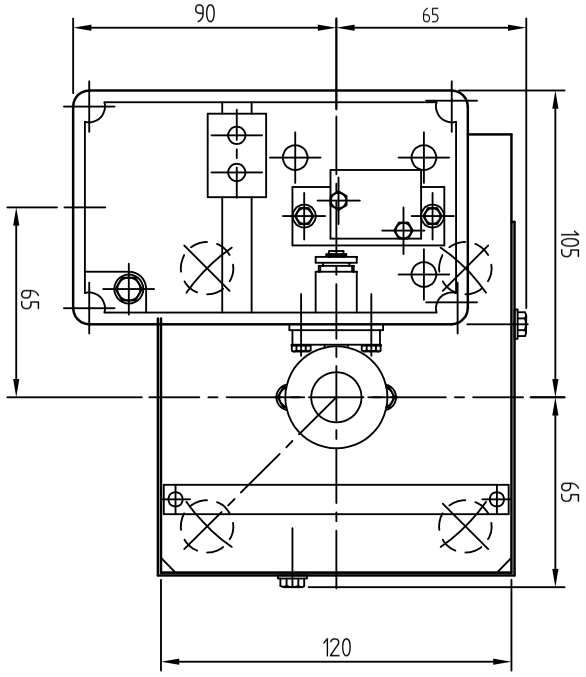
12 Drawings

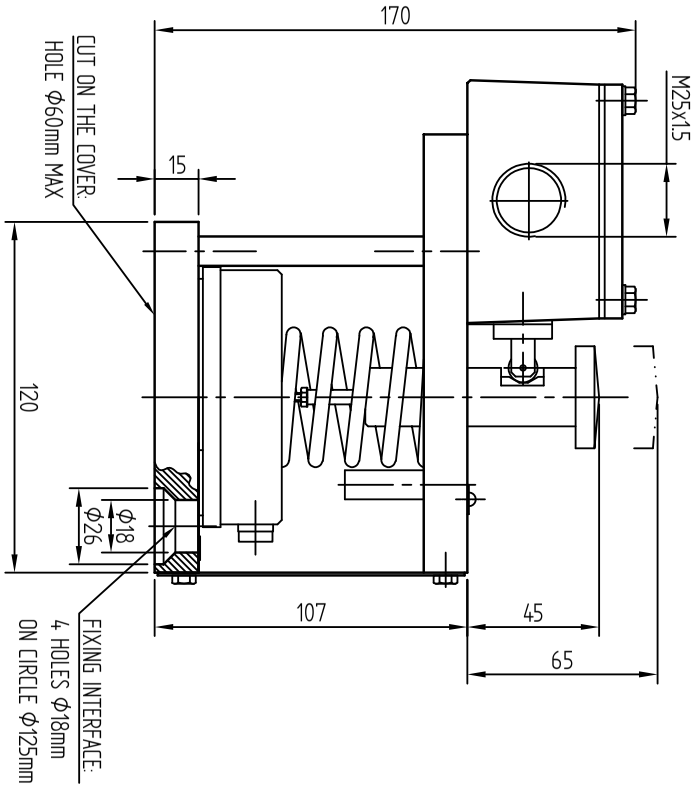
The product may have been altered since this document was published.

	DATE	NAME	DOCUMENT NO.	
DFTR.	25/10/23	Castellini S.	3821 - CATALOGUE	
CHKD.	25/10/23	Tripepi R.	CHANGE NO.	SCALE
STAND.	25/10/23	Giorgi A.	04	1:2

DIMENSION IN mm EXCEPT AS NOTED

PRESSURE RELIEF DEVICE
VP-050 (FORMER VSQI-050 ETI)



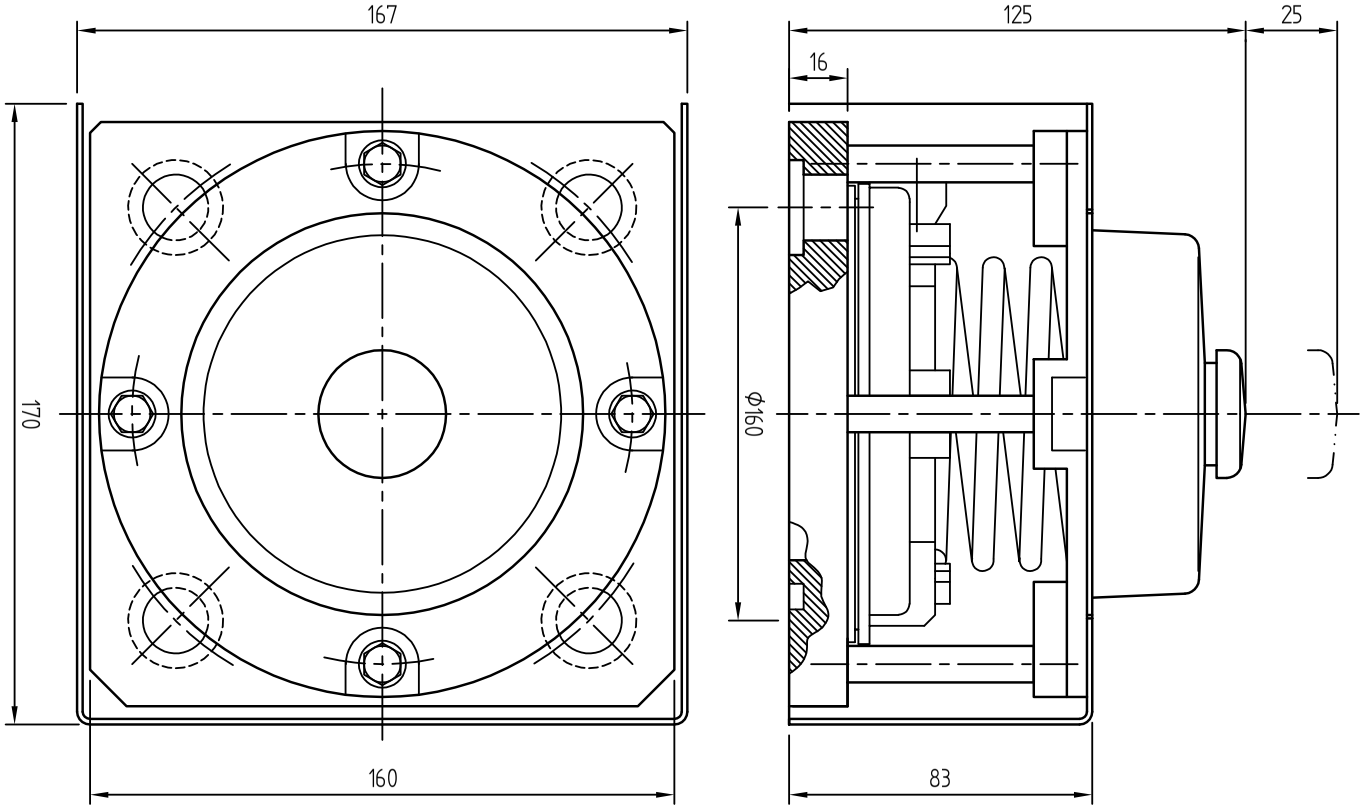


SERIAL NUMBER	MATERIAL NUMBER	SHEET
		1 / 1

	DATE	NAME	DOCUMENT NO.	
DFTR.	25/10/23	Castellini S.	5132 - CATALOGUE	
CHKD.	25/10/23	Tripepi R.	CHANGE NO.	SCALE
STAND.	25/10/23	Giorgi A.	02	1:5

DIMENSION IN mm EXCEPT AS NOTED

PRESSURE RELIEF DEVICE
VP-080 (FORMER VS-080 ETI)



SERIAL NUMBER

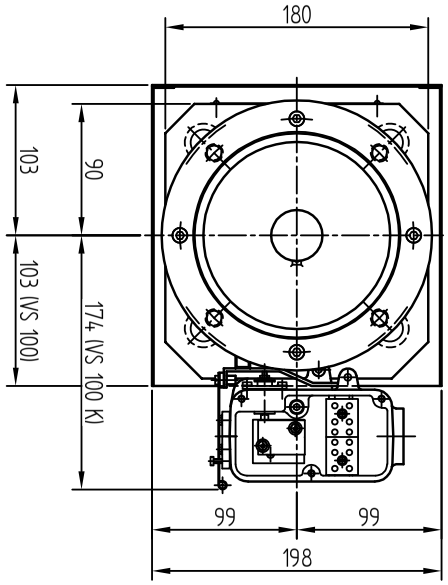
MATERIAL NUMBER

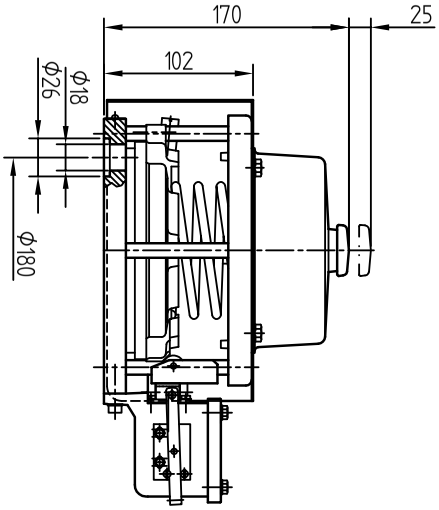
SHEET 1 / 1

	DATE	NAME	DOCUMENT NO.	
DFTR.	25/10/23	Castellini S.	5141 – CATALOGUE	
CHKD.	25/10/23	Tripepi R.	CHANGE NO.	SCALE
STAND.	25/10/23	Giorgi A.	04	1:2

DIMENSION IN mm EXCEPT AS NOTED

PRESSURE RELIEF DEVICE
VS-100 (FORMER VS-100/100 K ETI)

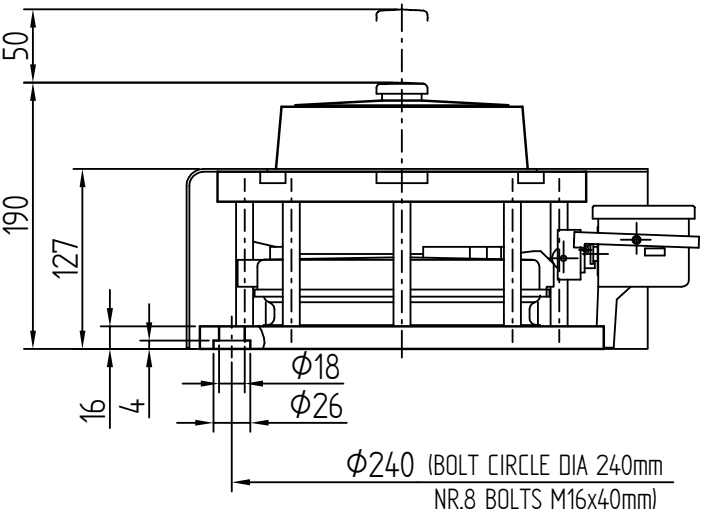


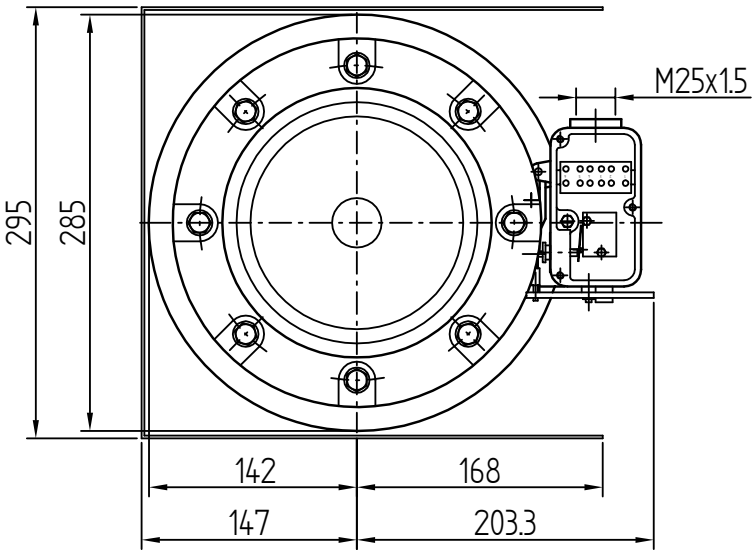


MATERIAL NUMBER

SERIAL NUMBER

SHEET 1 / 1





	DATE	NAME	DOCUMENT NO.	
DFTR.	25/10/23	Castellini S.	3823 - CATALOGUE	
CHKD.	25/10/23	Tripepi R.	CHANGE NO.	SCALE
STAND.	25/10/23	Giorgi A.	04	1:2

DIMENSION IN mm EXCEPT AS NOTED

PRESSURE RELIEF DEVICE
VP-150 (FORMER VS-150 ETI)

SERIAL NUMBER

MATERIAL NUMBER

SHEET 1 / 1

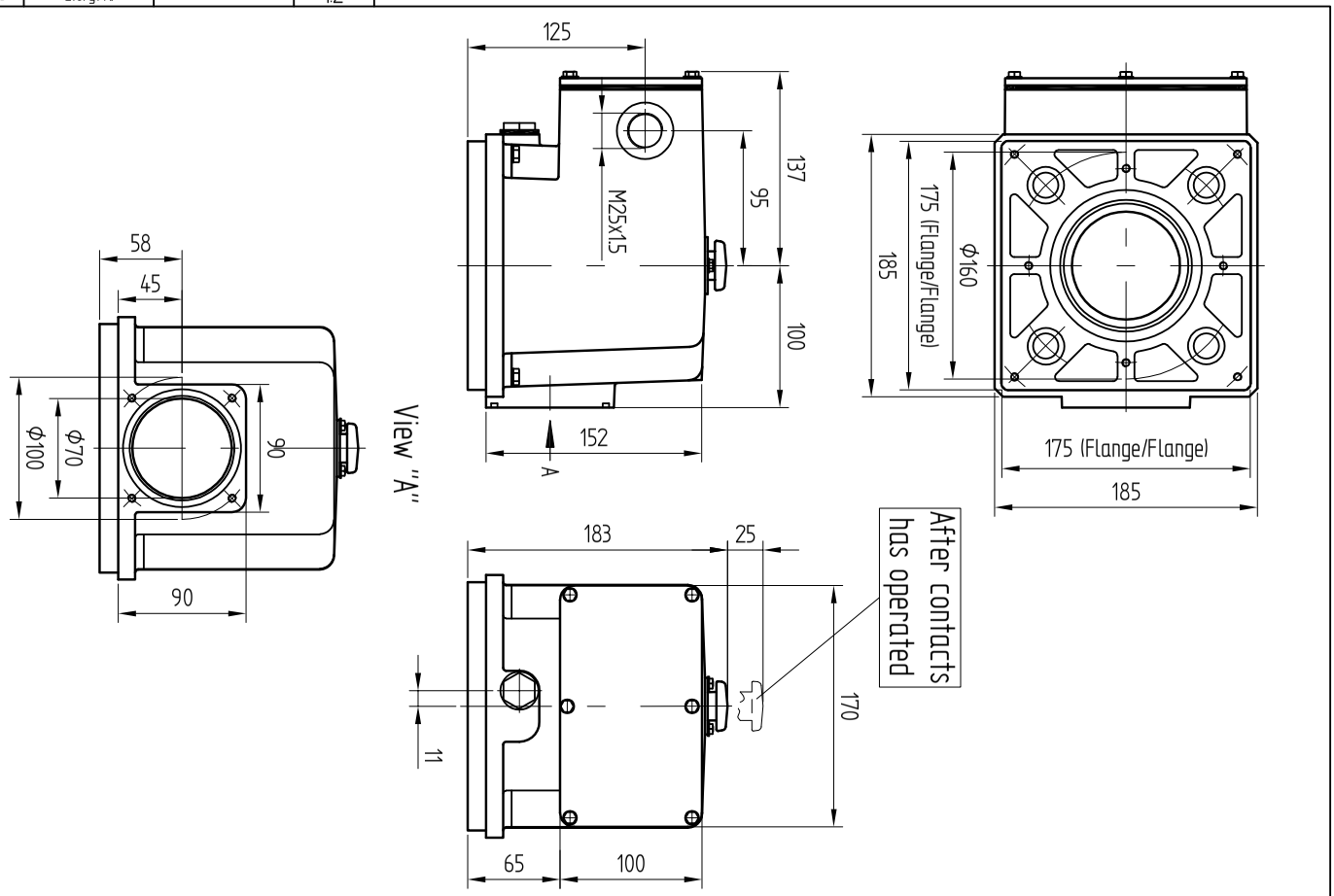
	DATE	NAME	DOCUMENT NO.	
DFTR.	25/10/23	Castellini S.	6424 - CATALOGUE	
CHKD.	25/10/23	Tripepi R.	CHANGE NO.	SCALE
STAND.	25/10/23	Giorgi A.	00	1:2

DIMENSION IN mm EXCEPT AS NOTED

PRESSURE RELIEF DEVICE
VP-080 QT (FORMER VQT-2 080 ETI)

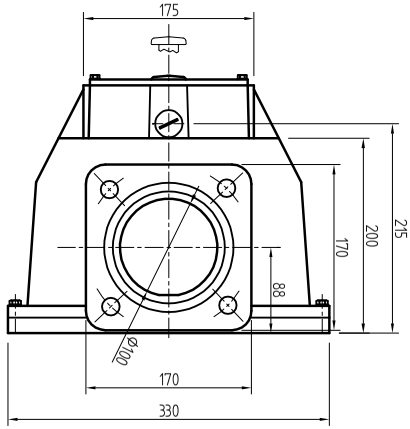
MATERIAL NUMBER | SERIAL NUMBER

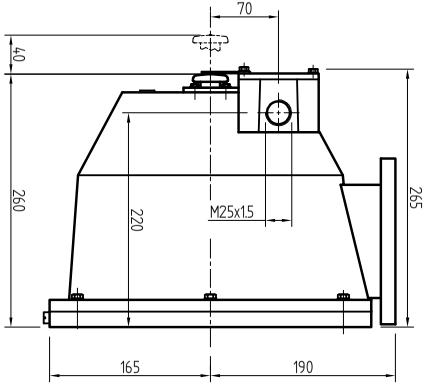
SHEET 1 / 1

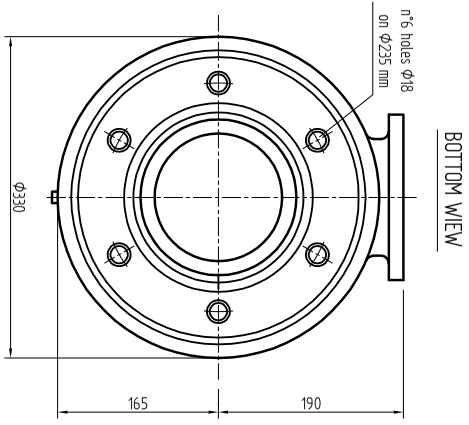


	DATE	NAME	DOCUMENT NO.	
DFTR.	25/10/23	Castellini S.	1373 - CATALOGUE	
CHKD.	25/10/23	Tripepi R.	CHANGE NO.	SCALE
STAND.	25/10/23	Giorgi A.	01	1:5

DIMENSION IN mm EXCEPT AS NOTED







BOTTOM WIEW

PRESSURE RELIEF DEVICE
VP150-QT (FORMER VQT-2 150 ETI)

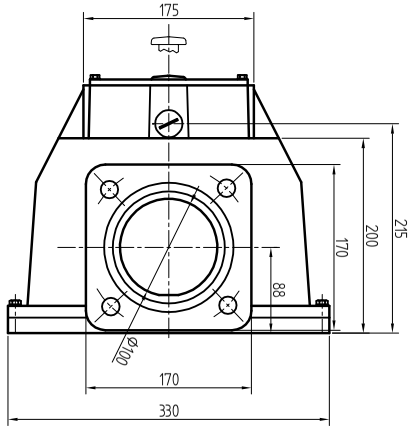
SERIAL NUMBER

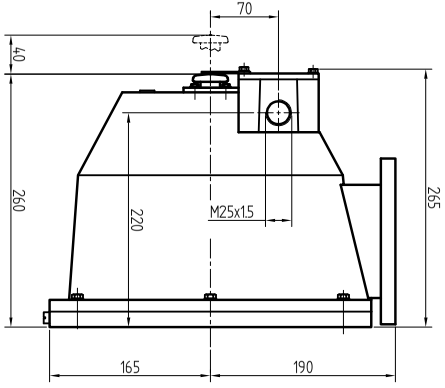
MATERIAL NUMBER

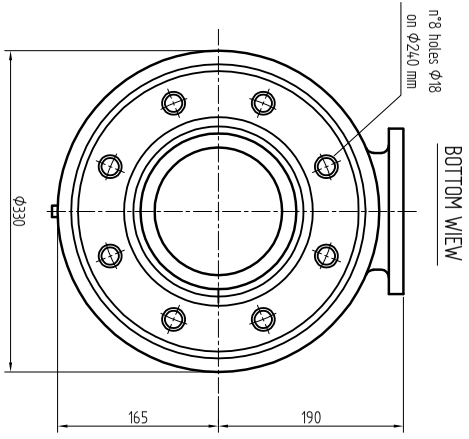
SHEET 1 / 1

	DATE	NAME	DOCUMENT NO.	
DFTR.	25/10/23	Castellini S.	5084 – CATALOGUE	
CHKD.	25/10/23	Tripepi R.	CHANGE NO.	SCALE
STAND.	25/10/23	Giorgi A.	01	1:5

DIMENSION IN mm EXCEPT AS NOTED







PRESSURE RELIEF DEVICE
VP150-ST (FORMER VST-2 150 ETI)

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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10679401/00 EN - Pressure relief device Operating instructions - 12/23

THE POWER BEHIND POWER.