Operating instructions
CEDASPE® DAROC. Shutter valve

10014218/01 EN

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.

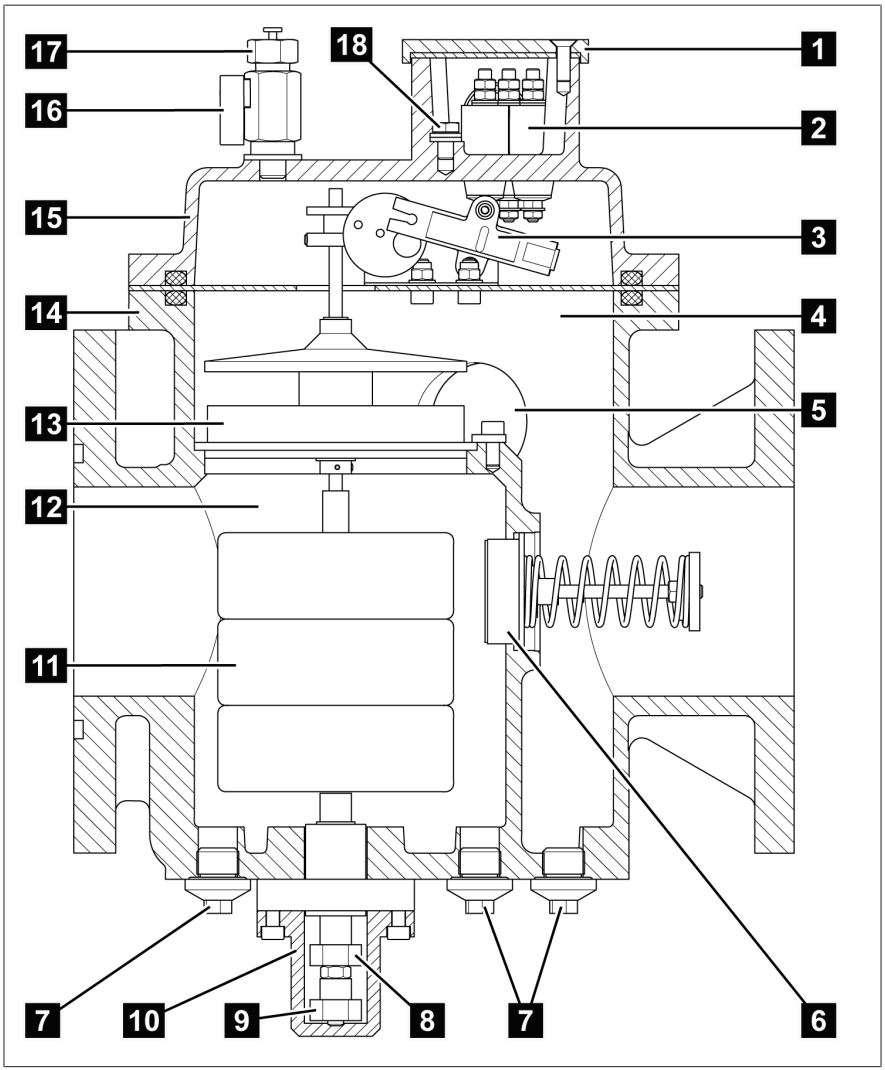

Figure 1: Design

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

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.

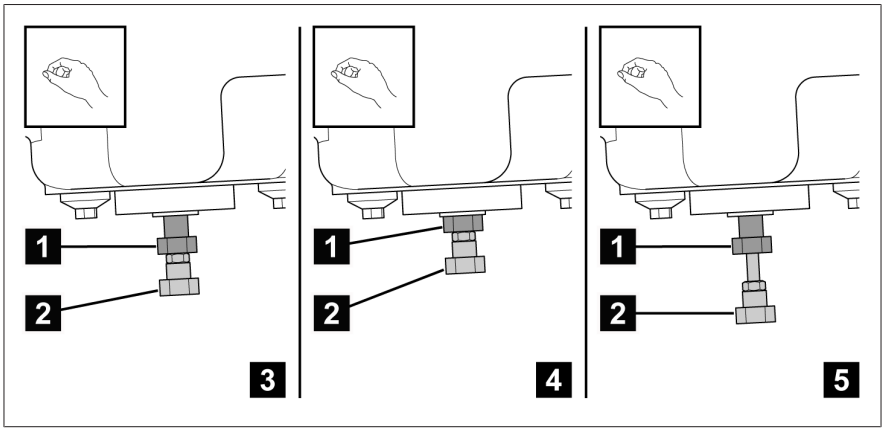

Figure 14: Reset screw and test button positions

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.

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.

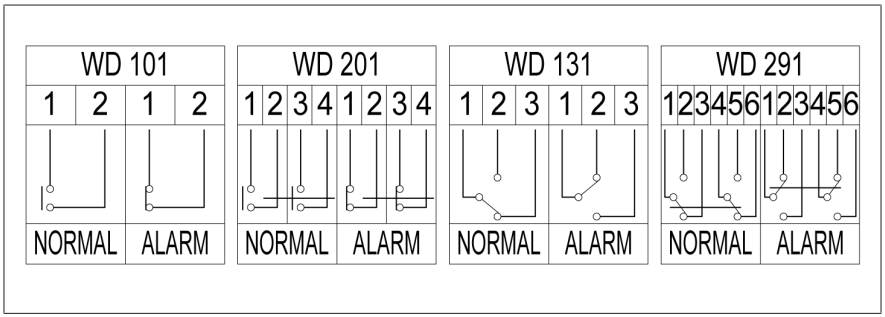

Figure 15: Available wiring connection diagrams

> 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.

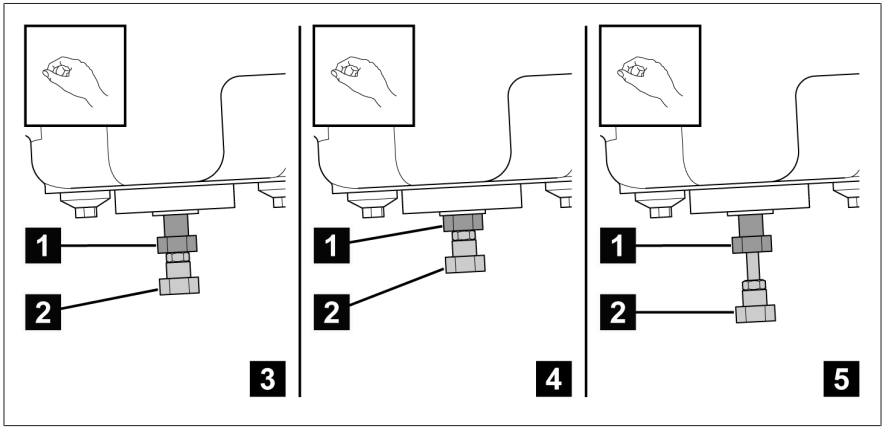

Figure 16: Reset screw and test button positions

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.

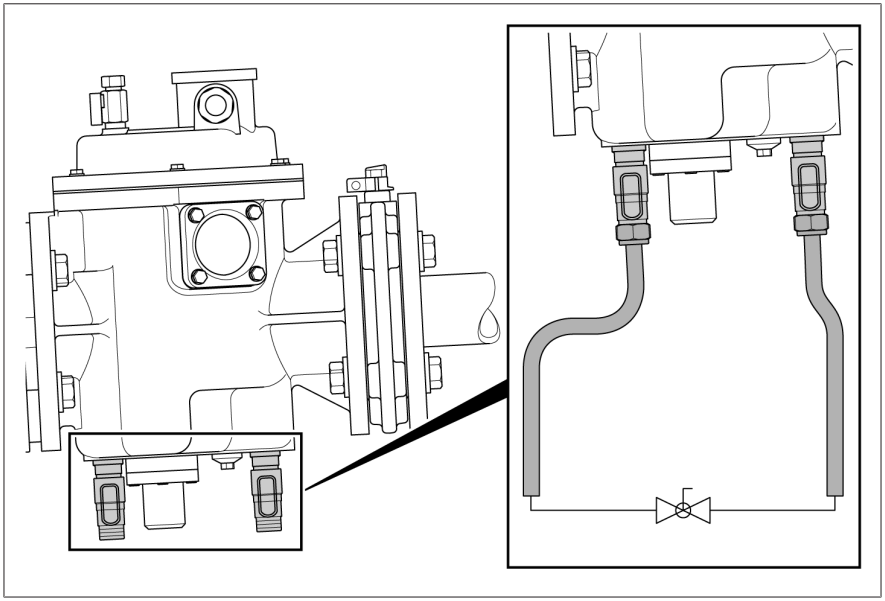

Figure 17: Example BPR pipe bypass

✓ 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.

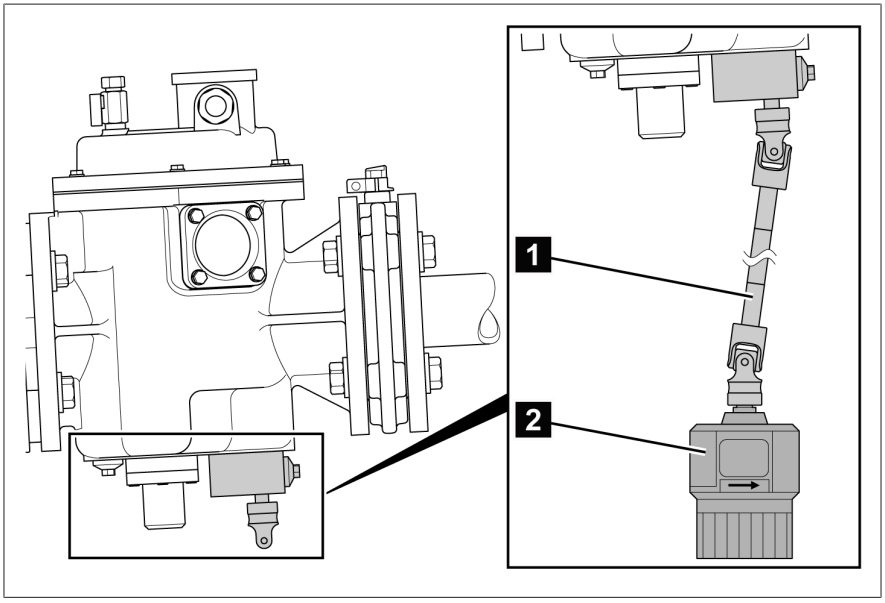

Figure 18: BPC bypass

1	Drive shaft	2	CCC device with knob