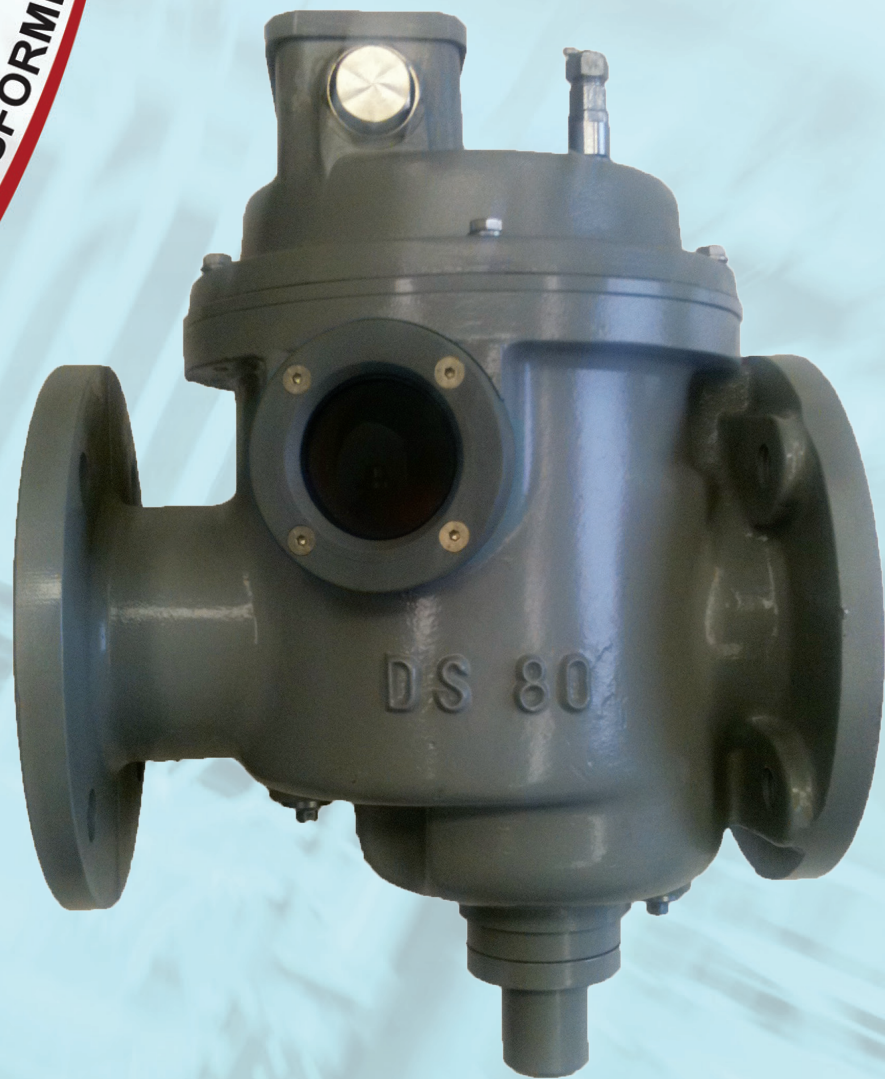


CEDASPE

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ACCESSORIES FOR POWER TRANSFORMERS



**AUTOMATIC CONSERVATOR
OIL CHECK VALVE
"DAROC"
(Model year 2013)**

Made in Italy



Italian Transformer Components



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TELEFONO +39 0298.20.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
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AUTOMATIC CONSERVATOR OIL CHECK VALVES DAROC

1 General Information

Transformer conservators are usually arranged in such a way, that, even at minimum level, the oil is always above the highest point of the transformer lid. Therefore, when a leak occurs in the tank, due for example to a broken bushing, the oil in the conservator pours out, thus considerably increasing the danger of fire and pollution.

The automatic conservator oil check valves CEDASPE DAROC Series EDS-R have been designed to prevent the oil contained in the conservator from flowing out when a leak occurs and to signal this by an electric contact.

Main features of the DAROC check valve Series EDS-R are:

- They are fitted on the pipe from tank to conservator, in series with the Buchholz relay; so they can be used on conservators with free oil surface as well as on conservators with air bag;
- The operation is completely automatic; when, due to a leakage in the tank, the oil flow rate from conservator to tank exceeds a set value, the DAROC valve closes the pipe thus preventing the loss of the conservator oil;
- Should the DAROC valve trip unduly, because of a malfunction or of particular working conditions, a pre-set by-pas valve operates automatically and prevents the internal depression in the tank from becoming excessive;
- The DAROC check valve need to be reset manually after tripping; if requested an additional by-pass pipe allows to reset the valve from ground level.

The shutting-off of the pipe between tank and conservator is always an abnormal operating condition; it is therefore preferable to choose the DAROC Series EDS-R check valve in order to have a warning by electric contact that the valve has tripped.

2 Production Range and Operating Conditions

DAROC Series EDS-R check valves can be fitted to pipelines of nominal diameter 50, 80 or 100 mm; they can have one or two electric contacts and can operate under following conditions:

- Operating conditions – standard execution
 - ◊ Oil and ambient temperature range - 25°C to + 120°C
 - ◊ Relative humidity 95% at 20°C - 80% at 40°C - 50% at 50°C
- Oil features – standard execution
 - ◊ Mineral oil
 - ◊ Oil viscosity 30 cStk at 20°C
 - ◊ Please note: with other oil viscosity the flow rates change according to the setting diagram
- Vibration resistance 3 g on all axis
- Chock resistance 10 g on all axis
- Maximum operating pressure 1,5 bars
- Maximum test pressure 3 bars
- By-pass valve setting – standard execution 0,4 bars
- Degree of protection of terminal box IP 65

3 Construction

With reference to drawings N° 6.650.20 and N° 6.500.10 and nomenclature in paragraph 10, (which also indicates the materials), the device's construction is as follows:

- Casing 1.0 is made of cast aluminium and has two flanges 1.0.1 and 1.0.2 to assemble it onto the piping which connects the tank to the conservator. Flange 1.0.1 has threaded holes and a gasket groove so that the device can be fitted directly to the Buchholz relay, as show in drawing N° 6.500.001. On casing 1.0 two visors 1.2 allow to check the operation of the device visually and two oil drain screws 1.3 and 1.4 allow to empty the casing of oil if needed. The adjusting device 2.0 and the resetting by-pass cocks 1.3&4 are also assembled on casing 1.0;



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- Casing 1.0 is closed by head 6.0, which includes the terminal box 6.0.1 for DAROC valves series EDS-R. Gas drain cock 6.1 and nameplate 6.2, which shows also the direction in which to mount the DAROC valve on the pipe, are attached to head 6.0;

Inside casing 1.0 following components can be found:

- Adjusting device 2.0 which allows to adjust the stroke of main valve 3.3 and to open it after it has tripped to reset the device;
- The assembly of the main valve 3.3, which consists of the main valve 3.3, the valve seat 3.2 and the float 3.1; the valve 3.3 is guided by rod 3.4 and closes the oil passage between chambers C1 (1.0.3) and C2 (1.0.4) when resting on valve seat 3.2, thus closing the pipe to oil passage from conservator to tank;
- The contact mounting frame 5.1 holds the contact's assembly which includes the contacts 5.2 and the driving magnet 5.3; the contacts are connected through the bushings 5.2.1 mounted in terminal box 6.0.1;
- Overpressure valve 4.0, which opens the oil passage from chamber C2 to chamber C1 if the pressure difference between the two chambers reaches the setting value of valve 4.0, after the main valve 3.3 has closed.

4 Operation

During the operation of an electric transformer several conditions may occur which cause an oil flow in the pipe between tank and conservator:

- During the **heating phase** an oil flow from tank to conservator is observed, due to oil expansion as the transformer heats up; the flow rate is usually $\leq 30 \text{ dm}^3/\text{min}$;
- During the **cooling phase** an oil flow from conservator to tank is observed, due to oil shrinking as the transformer cools down; again the flow rate is usually $\leq 30 \text{ dm}^3/\text{min}$;
- If a **leakage from the tank** occurs, for instance if a bushing breaks or a pressure relief valve pops up and doesn't close correctly, a flow from conservator to tank is observed, which has a flow rate usually $\gg 30 \text{ dm}^3/\text{min}$.

The first two conditions occurs in normal operating conditions and should not cause the DAROC Series EDS-R valve to trip.

The DAROC check valve is designed to trip automatically when the third condition occurs, thus stopping the oil flow from conservator to tank and preventing the loss of the oil in the conservator, slowing down the rate at which the oil seeps out at the leak.

The DAROC check valve doesn't operate when the oil flows from tank to conservator; it trips when the oil flow from conservator to tank exceeds a preset value.

4.1 Main Valve Operation

4.1.1 Main Valve Tripping

Main valve 3.3 is placed between chamber C1 (1.0.3), connected to the pipe towards the tank, and chamber C2 (1.0.4), connected to the pipe towards the conservator; when the device is operating and therefore full of oil, main valve 3.3 is kept open by float 3.1. The stroke of the float can be adjusted using device 2.0 in the range 0 to 11 mm.

During the **heating phase**, the oil flowing from tank to conservator enters chamber C1 and pushes open valve 3.3 completely; the oil flow is not slowed down in any way by the valve.

During the **cooling phase** and if a **leakage occurs in the tank**, the oil flowing from conservator to tank enters chamber C2 and passes through valve 3.3, **which is held open by the float 3.1**. The oil flow through valve 3.3 is associated with a loss of hydraulic load, which depends on:

- the oil viscosity;
- the flow speed, which depends from cooling conditions and, for short periods of time, from accidental occurrences, such as start up of pumps, elasticity of the tank or the radiators etc.;
- the setting of the valve's stroke, regulated by float 3.1.

When the hydraulic loss increases over the force of the float, the valve 3.3 closes, stopping the flow from conservator to tank. For any given oil viscosity and instant oil flow speed there exists a setting of the valve's stroke, which will close the valve 3.3.

4.1.2 Damping System



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To take into account peaks of flow speed caused by accidental occurrences such as start up of pumps, elasticity of the tank or the radiators, the closing of the main valve 3.3 is retarded by a hydraulic damping system, which stops the valve from closing for flow speed peaks.

4.1.3 Main Valve opening after tripping

After tripping due to an oil leak from the tank, the main valve 3.3 has to be reset manually, either by the adjusting device 2.0 or by the optional by-pass pipe 7.0. With the device 7.0 the opening of the valve can be effected also from the ground by the ground level reset device 8.0.

If the valve trips during the cooling phase, notwithstanding the damping system described above, the valve will open again automatically during the heating phase, when the oil will start to flow from tank to conservator.

4.2 Overpressure Valve Operation

As already said, the main valve 3.3 may close even in absence of a leak in the tank, for example when the oil in the pipe is very cold and therefore has a viscosity much higher than expected, or if the initial regulation has not been correctly done.

In this case, the shrinking of the oil due to the cooling will cause an increasing negative pressure in the tank, while the cooling phase lasts. To limit the value of this negative pressure the overpressure valve 4.0 has been built into the DAROC check valve.

Overpressure valve 4.0, which is usually set at 0,4 bars, will open when the pressure difference between chambers C1 and C2 reaches this value and will allow an oil flow from conservator to tank to feed the oil shrinkage.

When the overpressure valve 4.0 is operating, the oil in the tank is submitted to a negative pressure and may release gasses which will collect in the Buchholz relay; the alarm for gas accumulation of the Buchholz relay is likely to be tripped. It is therefore even more advisable to install the DAROC valve Series EDS-R which will permit to evaluate the situation by showing with it's electric contact that the main valve 3.3 is closed.

5 Installation, Setting and Putting in Service

5.1 Installation

The DAROC check valve must be fitted onto the pipe between tank and conservator as shown by drawing 6.500.001. Flange 1.0.1 has a gasket groove and threaded holes in order to be able to fit it directly to the Buchholz relay. The gasket is supplied with the valve.

The connections to the terminals 5.2.1 must be made according to the wiring diagram attached inside the cover 6.0.2 of terminal box 6.0.1.

5.2 Setting

The DAROC check valve is supplied set to the maximum stroke of main valve 3.3. In fact, when there is a leak in the tank, the flow rate is usually considerable higher than the flow rate admitted by the valve at full stroke with oil of normal viscosity.

Usually it is not necessary to reduce the calibration of the stroke of the main valve 3.3.

We advice to change this setting only if absolutely necessary; in this event please ask the recalibration procedures separately by mail.

5.3 Putting in operation

After installation and setting it is possible to put the device in operation by filling it up with oil.

If the filling up is done by pumping oil into the tank, the oil will enter the DAROC valve from chamber C1 (1.0.3) and the float 3.1 will open main valve 3.3 as soon as chamber C1 is filled.

If the filling up is done from the conservator, the oil will enter the DAROC valve from chamber C2 (1.0.4) and it is necessary to force the main valve open in order to fill also chamber C1; to do so:

- Remove cover 2.1;
- Tighten screw 2.3 down completely into mount 2.2; the screw 2.3 will push open float 3.1 and main valve 3.3.

After filling the DAROC valve, release the air through drain tap 6.1 on head 6.0 and check that the valve operates correctly as follows:



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- Unscrew screw 2.3 completely right to the stop to free float 3.1;
- Push nut 2.6 against screw 2.3 to give float 3.1 the set stroke;
- Through visors 1.2 check that the float 3.1 keeps main valve 3.3 open;
- Pull nut 2.6 downwards and thus float 3.1; check through visors 1.2 that the main valve 3.3 closes too; the electric contacts of DAROC valve Series EDS-R have to operate too;
- Replace cover 2.1; the cover will push nut 2.6 against screw 2.3 so freeing again float 3.1;
- Check through visors 1.2 that the main valve 3.3 has been pushed open by float 3.1.

The DAROC valve is now ready to work.

5.4 Maintenance

The DAROC check valve doesn't need any particular maintenance; it is however advisable to check the correct operation regularly with the procedure described at the chapter "Putting in Service".

6 Resetting of Main Valve 3.3

If main valve 3.3 closes accidentally during the cooling phase of the transformer, it may be necessary to reset it without having to wait for the heating phase. This can be done either by the forced opening screw 2.3 or by the resetting by-pass cocks 1.3&1.4 from ground level by the by-pass valve (see sketch in drg 6.500.001)

6.1 Resetting by Opening Screw 2.3

To reset the main valve 3.3 by resetting screw 2.3 proceed as follows:

- Remove cover 2.1;
- Tighten screw 2.3 down completely into mount 2.2; the screw 2.3 will push open float 3.1 and main valve 3.3;
- Follow the procedure described at the chapter "5 Installation setting, putting in Service" to check the correct operation of the valve;
- Replace cover 2.1.

6.2 Resetting with Resetting By-pass cocks 1.3&1.4

In normal operating conditions the cocks 1.3&1.4 must be left in open position while the resetting by-pass valve (10, drg 6.500.001) at human height is closed

When during the cooling phase, the shrinking of the oil creates a pressure difference between chambers C1 and C2 that will keep the main valve closed, opening the by-pass valve (10) the oil will flow from chamber C2 to C1 so feeding the shrinkage of the cooling oil and gradually reducing the pressure difference between the two chambers. When the pressure difference is reduced to zero, the float 3.1 will open the main valve 3.3. Now you can shut again the by-pass valve (10)

7 Finish

In standard execution, all cast parts are protected by one coat of two-pack epoxy primer and one coat of two-pack polyurethane paint, final colour RAL 7030 and screws and washer are of stainless steel; the protection level of the device is IP 65. Therefore the device is suitable for fitting in the open even in tropical climate and with high industrial pollution. Special versions are available for particularly severe climatic and/or aggressive atmospheric conditions.

8 Wiring Diagrams

8.1 Identification by numbering of the wiring diagrams

The identification numbering of the wiring diagrams follows criteria that allow to identify the type and approximate operation of the wiring diagram from its number.

8.1.1 Key to numbering of wiring diagrams

Every position in the number identifying a wiring diagram is related to a function.



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Taking as an example the standard wiring diagram 06-101, the numbering has the following meaning:

- 06-xxx** = Wiring diagram of oil check valve DAROC EDSR;
- 06-Xxx** = Total number of contacts;
- 06-xXx** = Type of contacts;
 0 = Normally open contact; 1 = normally closed contact; 3-9 = changeover contact
- 06-xxX** = Function of contacts; 1 = Contacts show operation of main valve.

8.1.2 Notes on tables of function and performance of wiring diagrams

The most commonly used wiring diagrams are described in detail in the following tables; they make use of some acronyms; for a full understanding they are explained in the following:

- NE** = Normal exercise; the DAROC valve is full of oil and the main valve is open;
- Contact NO** = Contact open in normal exercise
- Contact NC** = Contact closed in normal exercise
- Contact SC** = Changeover contact
- N° Terminals** = Numbers that identify the terminals
- Pos. in NE** = State of the contact in normal exercise.

8.2 Tables of function and performance of wiring diagrams

The most commonly used wiring diagrams are described in detail in the following tables.

8.2.1 Wiring diagram N° 06-101

Terminal N°	Contact in NE	Functional description of wiring diagram
1-2	Open	1 normally open contact, closes at closing of main valve

8.2.2 Wiring diagram N° 06-111

Terminal N°	Contact in NE	Functional description of wiring diagram
1-2	Closed	1 normally closed contact, opens at closing of main valve

8.2.3 Wiring diagram N° 06-131

Terminal N°	Contact in NE	Functional description of wiring diagram
1-2	Open	1 changeover contact, switches at closing of main valve
1-3	Closed	

8.2.4 Wiring diagram N° 06-201

Terminal N°	Contact in NE	Functional description of wiring diagram
1-2/3-4	Open	2 normally open contacts, close at closing of main valve

8.2.5 Wiring diagram N° 06-211

Terminal N°	Contact in NE	Functional description of wiring diagram
1-2/3-4	Closed	2 normally closed contact, open at closing of main valve

8.2.6 Wiring diagram N° 06-291

Terminal N°	Contact in NE	Functional description of wiring diagram
1-2/4-5	Open	2 changeover contacts, switch at closing of main valve
1-3/4-6	Closed	



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9 Performance of contacts

Magnetically operated, normally open, normally closed or changeover contacts.

- Contacts, material gold
- Operating temperature - 50 °C - + 125 °C
- Breaking power 150 W – 400 VA
- Insulation to earth at 20 °C 2.500 V
- Insulation of the open contact at 20 °C:
 - ◊ Normally open or normally closed contact 1.200 V
 - ◊ Changeover contact 1.000 V
- Insulation of the open contact at 20 °C – special execution 2.500 V
- Maximum current 2 A
- Maximum admitted current for 1 sec 100 A
- Minimum and maximum tension 24 –240 V
- Contact resistance 500 mΩ

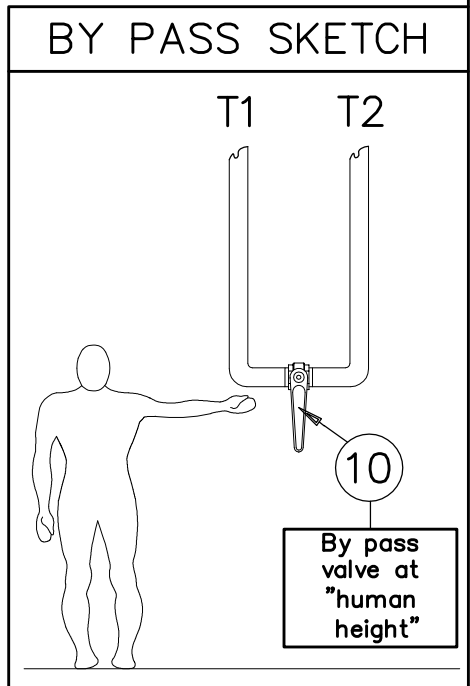
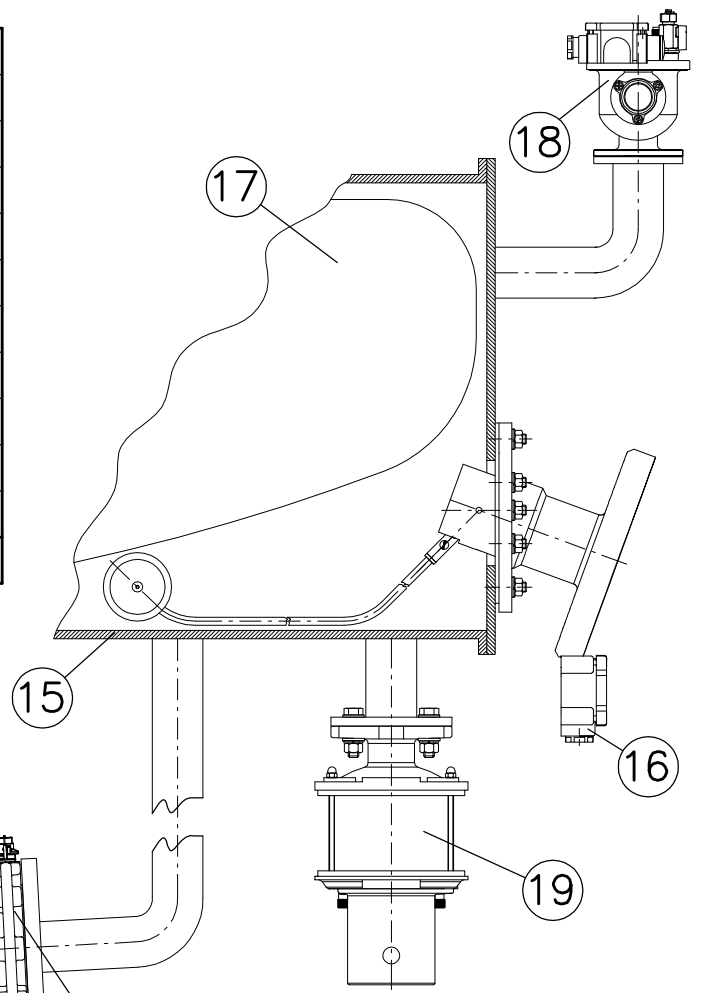
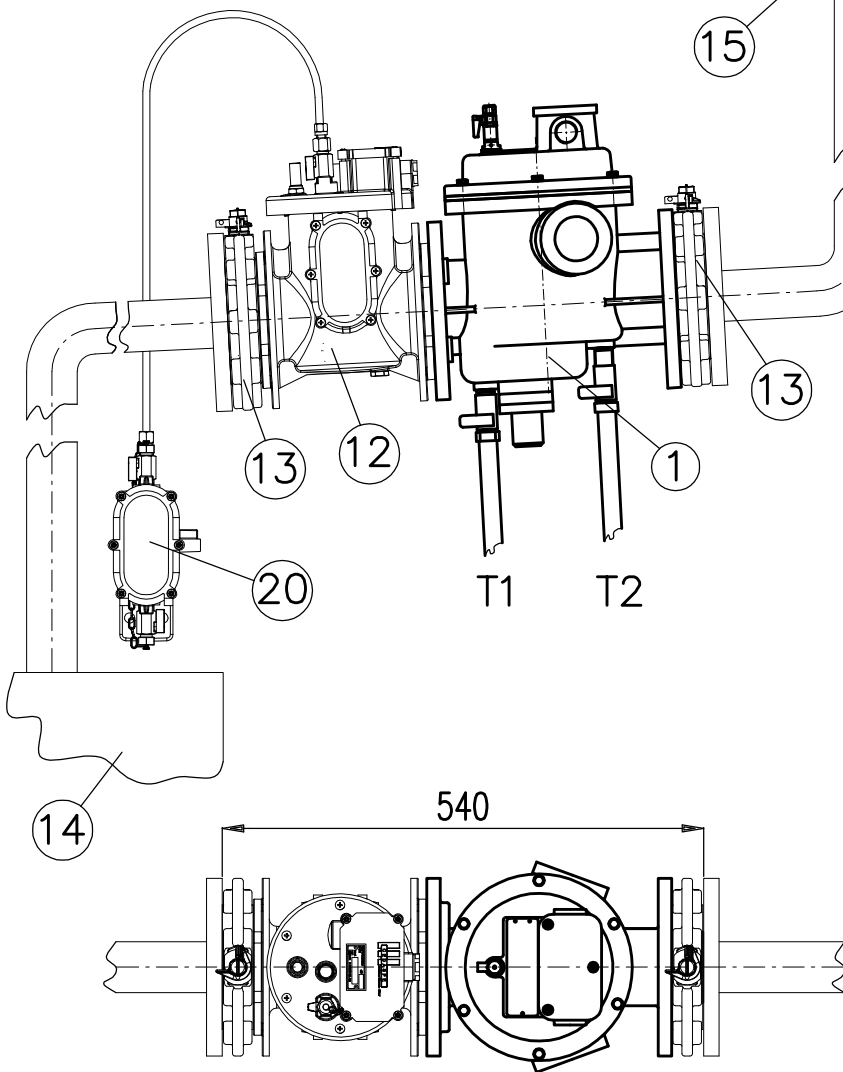


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10 Nomenclature

Pos.	Part denomination	N°	Material
1.0	Casing	1	Aluminium
1.0.1	Mounting flange towards tank		
1.0.2	Mounting flange towards conservator		
1.0.3	Chamber C1		
1.0.4	Chamber C2		
1.2	Visor holes	2	Glass
1.2.1	Visor holes frame	2	Nylon + 30% glass fibre
1.3	By-pass cock of chamber C1	1	Nickel coated brass
1.4	By-pass cock of chamber C2	1	Nickel coated brass
2.0	Setting and blocking device	1	
2.1	Cover	1	Aluminium
2.2	Mount	1	Aluminium
2.3	Forced opening screw	1	Brass
2.4	Tie rod	1	Stainless steel
2.5	Locking nut	1	Brass
2.6	Nut	1	Brass
3.1	Float	1	Closed cell ebonite
3.2	Valve seat of main valve 3.3	1	Brass
3.3	Main valve	1	Aluminium
3.4	Contacts operating rod	1	Stainless steel
4.0	Overpressure valve	1	
5.1	Contact mounting frame	1	Steel galvanised
5.2	Magnetically operated electric contact	1/2	
5.2.1	Terminals for electrical connection	2-6	
5.3	Magnet	1	Magnetic steel
5.4	Magnet operating fork	1	Aluminium
6.0	Head	1	Aluminium
6.0.1	Terminal box with cable entries		
6.0.2	Terminal box cover	1	Aluminium
6.1	Gas or air drain tap	1	Nickel coated brass
6.2	Identification plate	1	
10.0	By-pass valve (at human height) – <i>not supplied by us</i>	1	

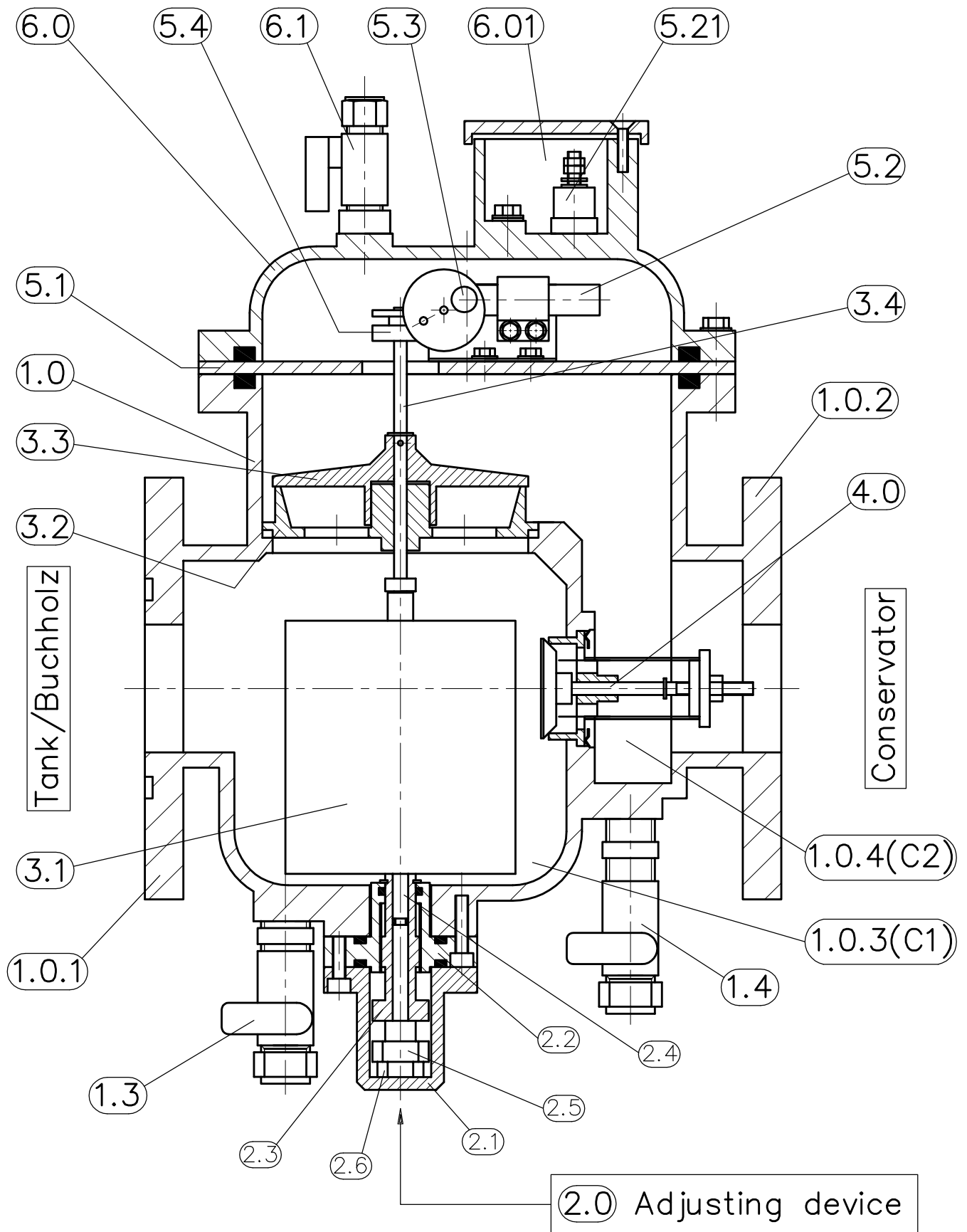
20	Gas collecting device RG3
19	Breather VEL01
18	Protective relay CPR
17	Rubber Bag
16	Oil level gauge IFG
15	Conservator
14	Transformer Tank
13	Butterfly valve DN80
12	Relay Buchholz EB079
10	By pass valve
1	Valve Daroc EDS-R 80
Pos.	Description



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	Mounting Sketch		Scala ====		6.500.001	
	DAROC		Dis.			
			Visto			



CEDASPE

Titolo

**Cross section
DAROC EDS series**

Data **22/07/11**

Scala **====**

Dis.

Visto

Dis. Nr

6.500.10

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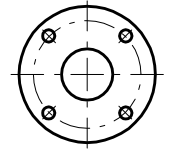
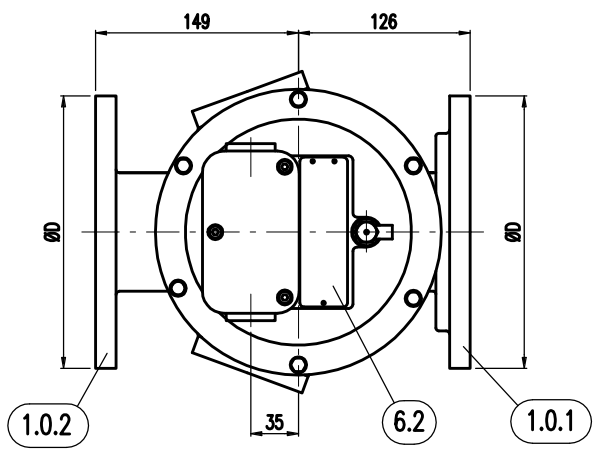
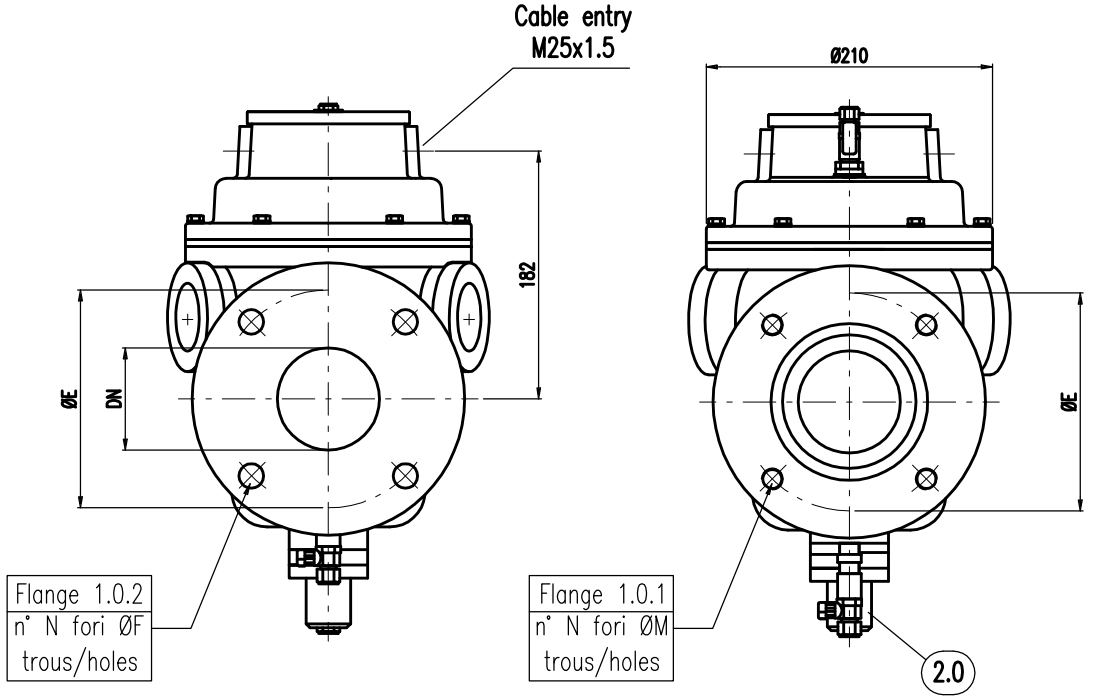
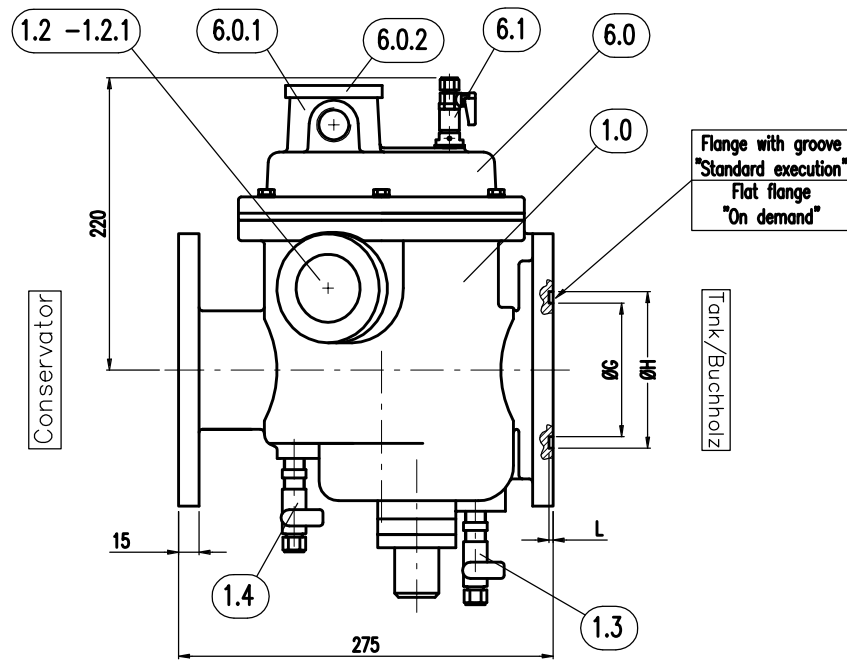


Fig. 1
4 Holes flange
"Standard execution"

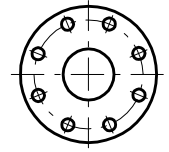


Fig. 2
8 Holes flange
"On demand"

(*)
Con rubinetti by-pass (1.3 & 1.4)
With by-pass cocks (1.3 & 1.4)
Avec by-pass de réamorçage (1.3 & 1.4)

Tipo-Type	DN	ØD	ØE	ØF	ØG	ØH	L	ØM	N	Fig.
EDS-R 50	50	165	125	18	69	86	3	M16	4	1
EDS-R 80	80	200	160	18	98	115	3	M16	4	1
EDS-R 80-8	80	200	160	18	98	115	3	M16	8	2
EDS-R 100	100	220	180	18	114	135	4	M16	8	2

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		Finito		kg Codice =	
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				Data 20/04/12	Dis. Nr 6.650.20
				Scala 1:2	
				Dis.	
				Visto	



