

GAS-ACTUATED RELAYS
BUCHHOLZ TYPE
ACCORDING TO
CENELEC EN 50216-2 STANDARD
AND
GAS SAMPLING DEVICE



comell[®]

GAS-ACTUATED RELAYS *BUCHHOLZ* TYPE



BG 25



BR 25



BR 50



BR 80



BS 25

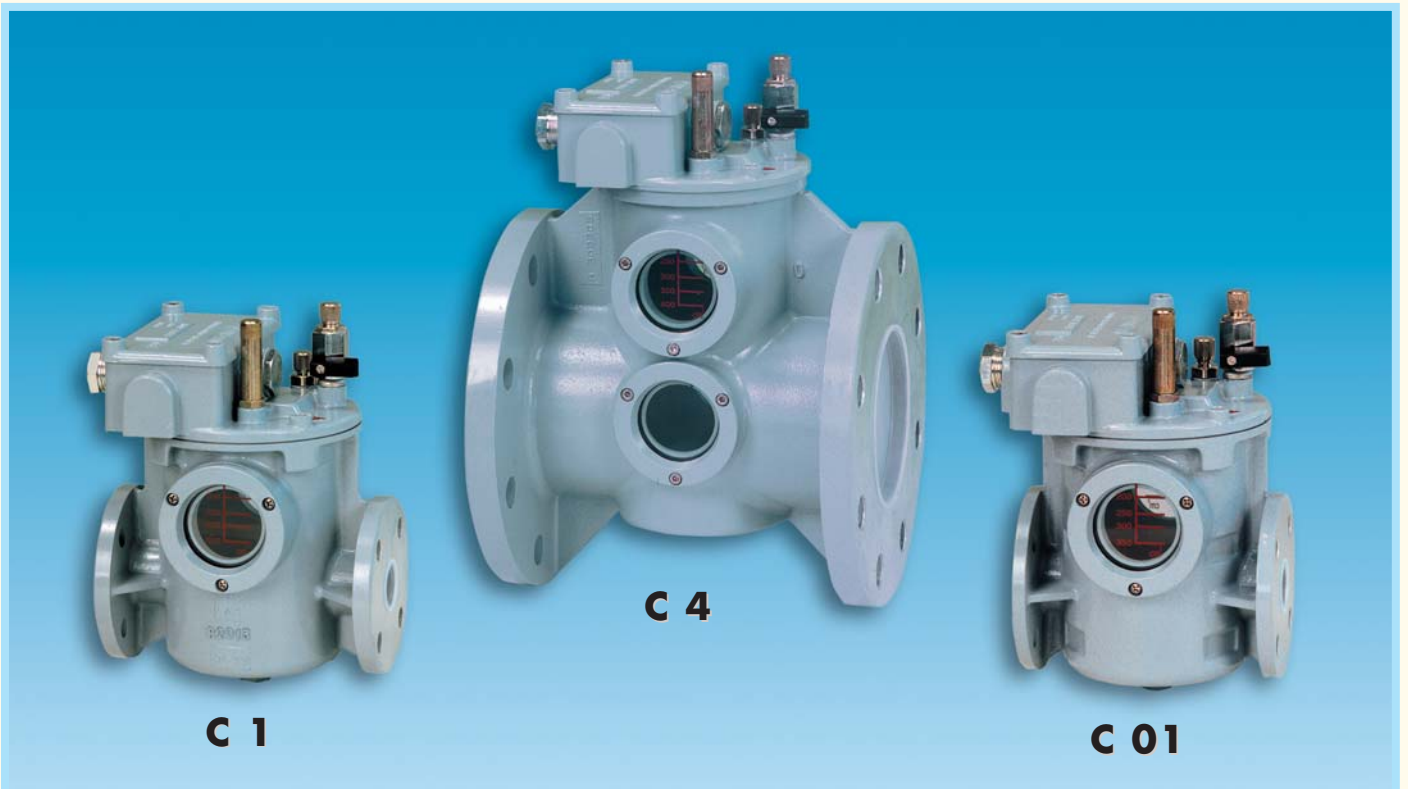
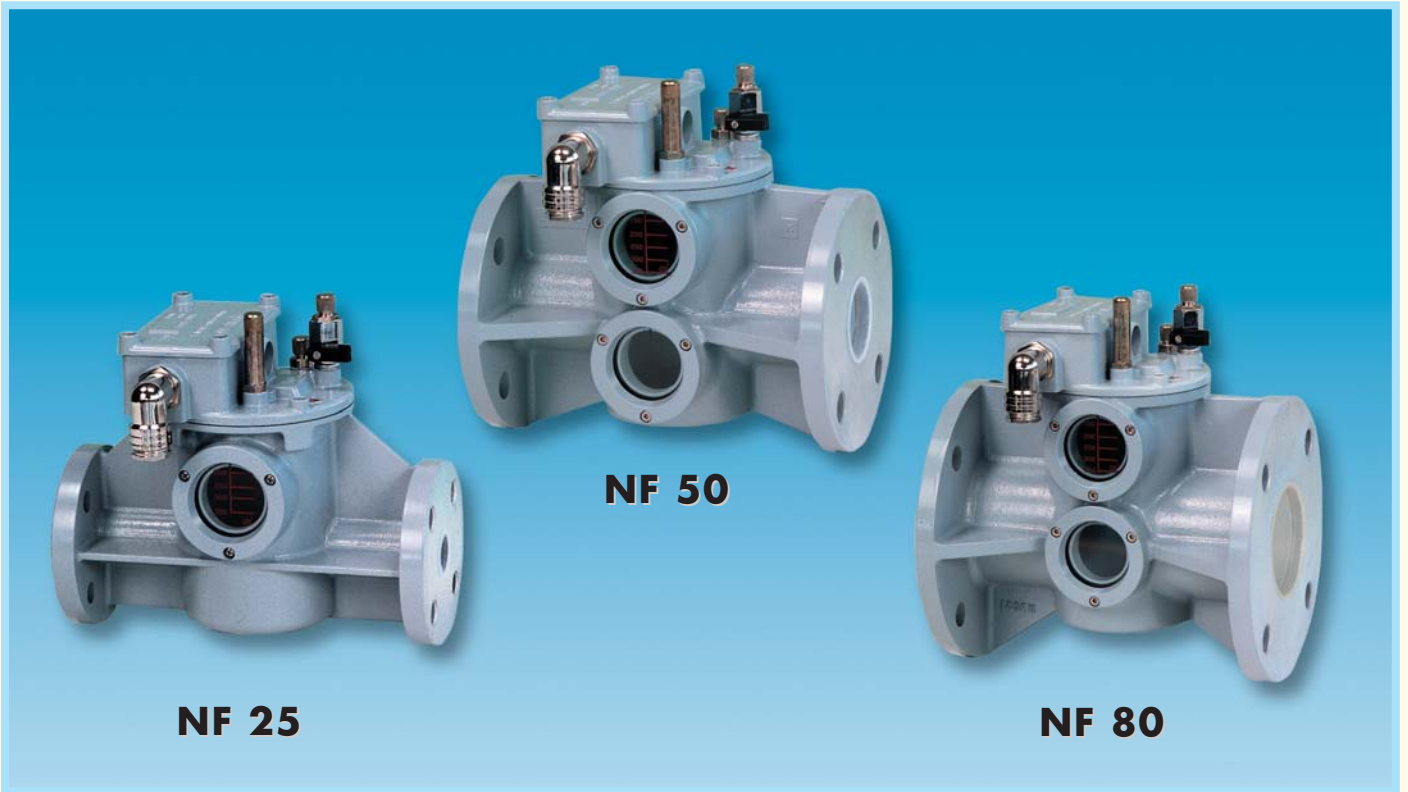


BS 50

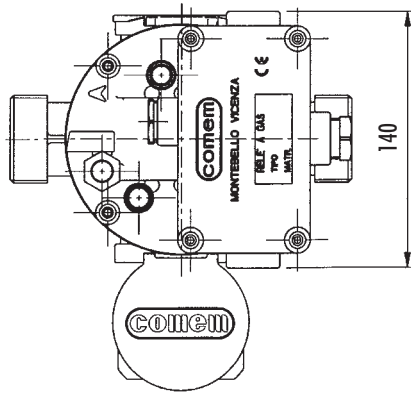
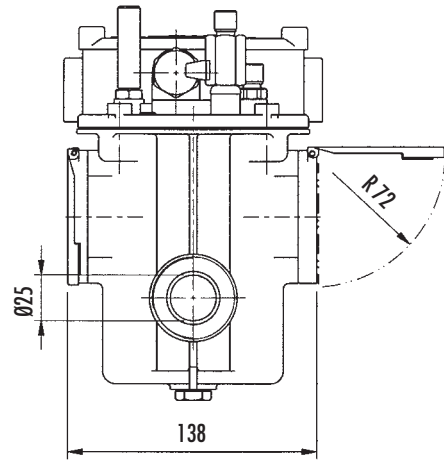
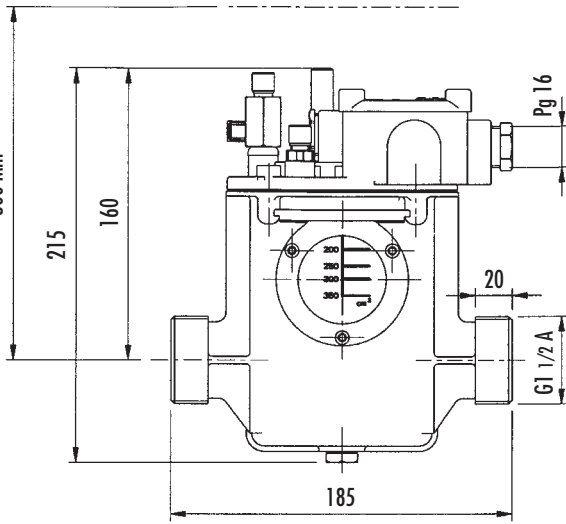


BS 80

GAS-ACTUATED RELAYS *BUCHHOLZ* TYPE



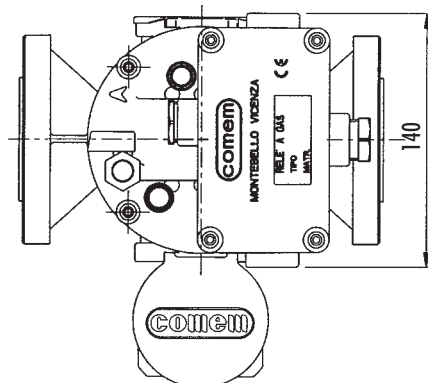
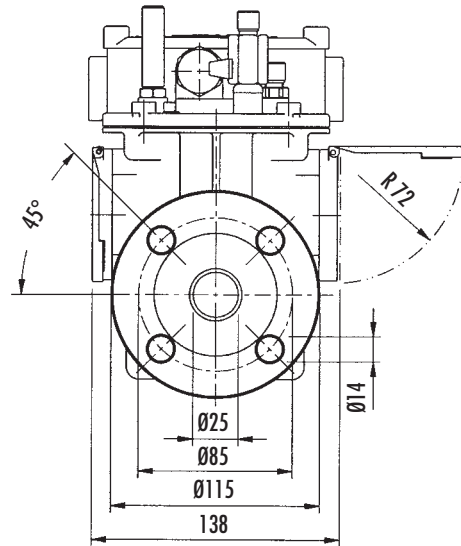
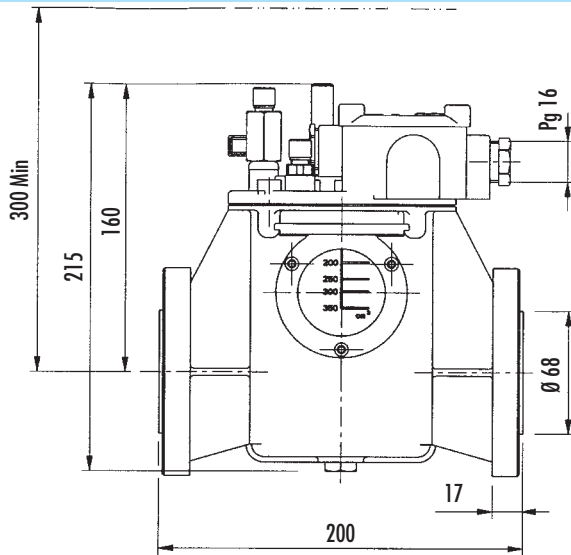
Minimum clearance to remove
the mechanism from the body
300 Min



BG 25

Weight **2.1 kg**

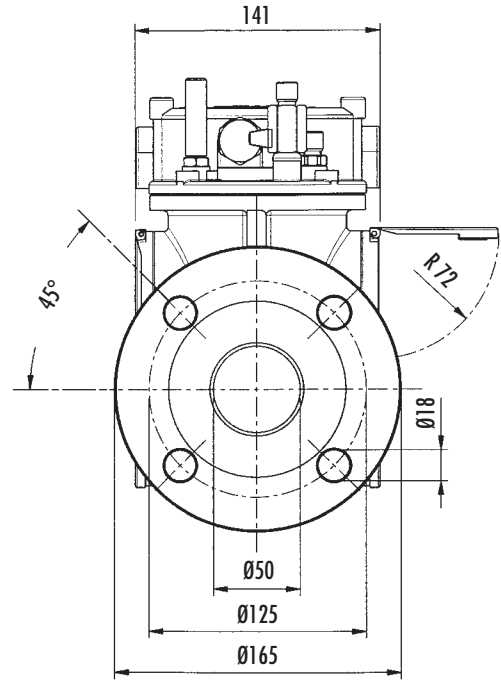
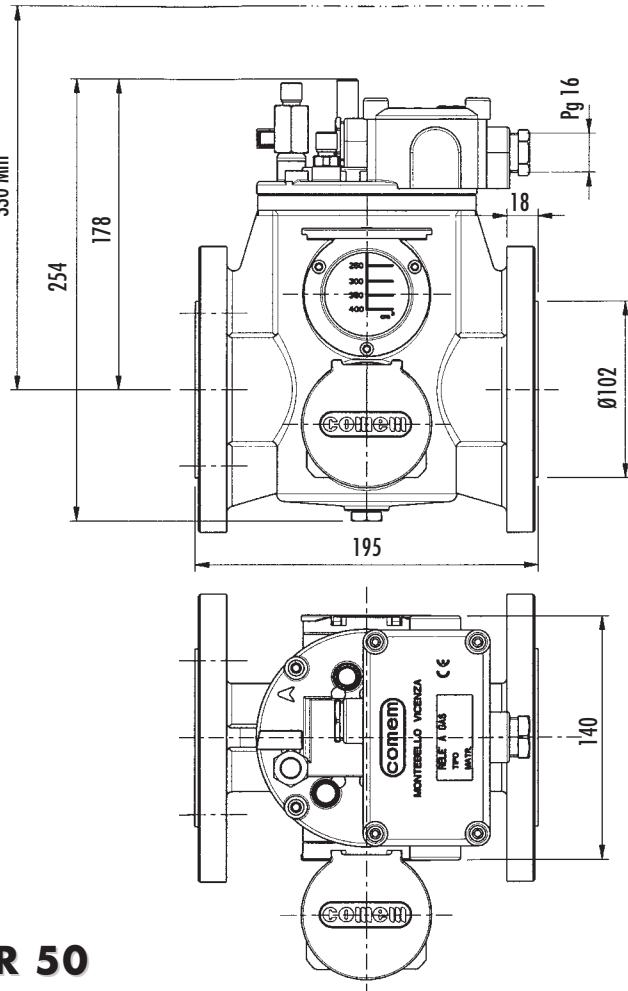
Minimum clearance to remove
the mechanism from the body
300 Min



BR 25

Weight **2.9 kg**

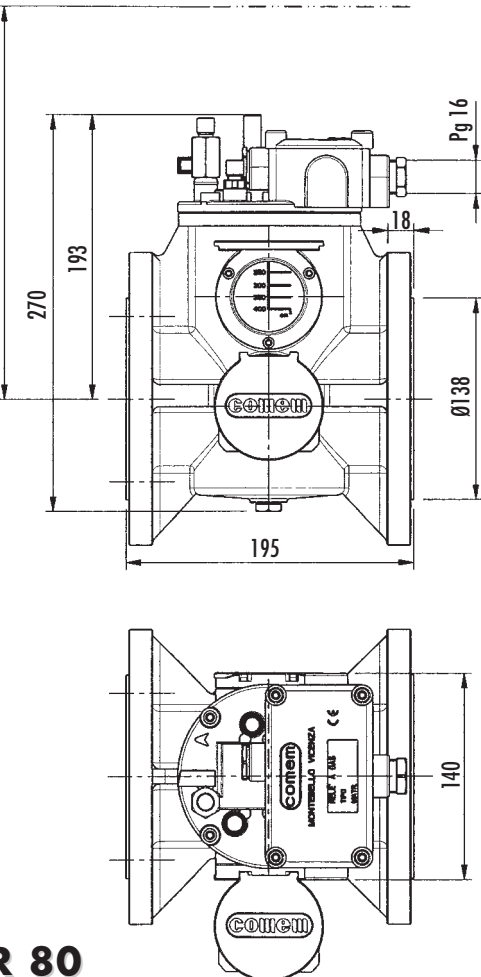
Minimum clearance to remove the mechanism from the body
330 Min



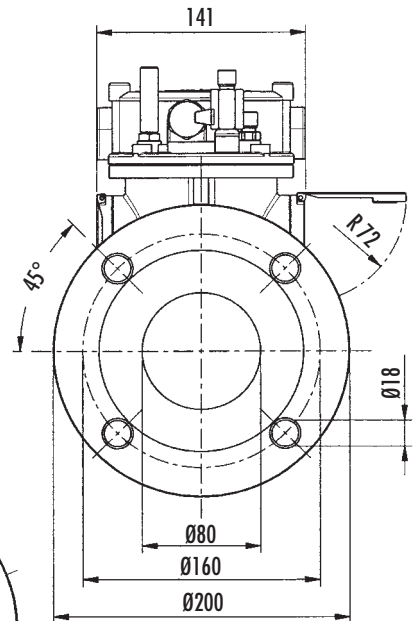
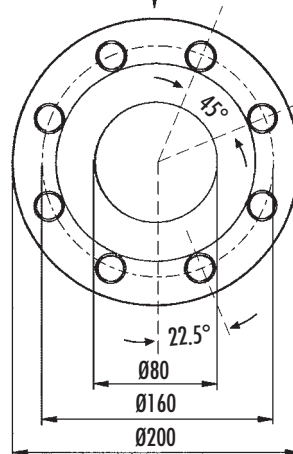
Weight **4.9 kg**

BR 50

Minimum clearance to remove the mechanism from the body
400 Min



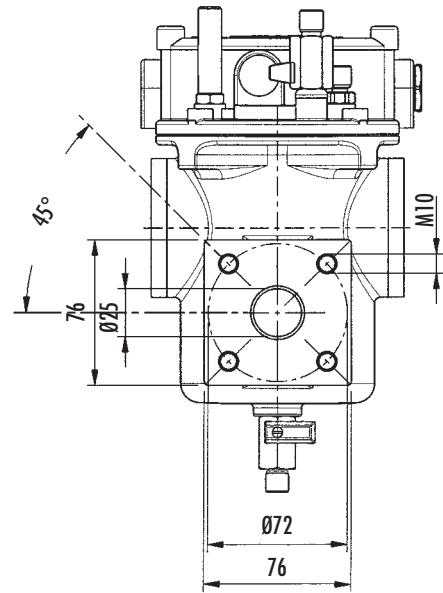
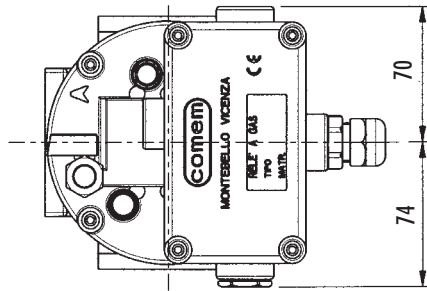
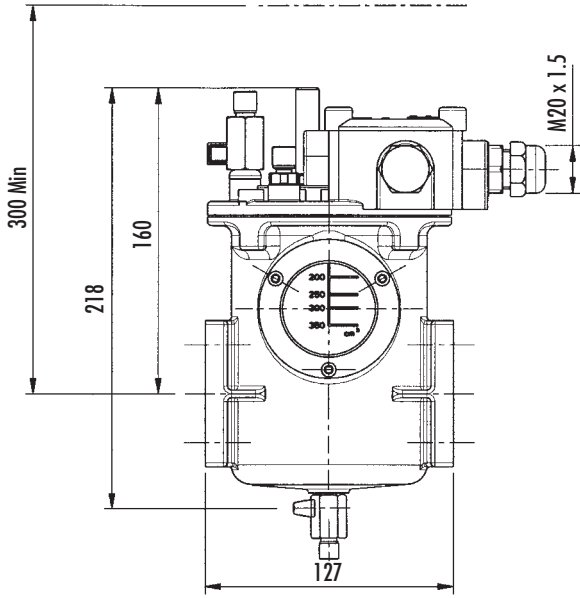
AVAILABLE WITH N° 8 HOLES



Weight **5.8 kg**

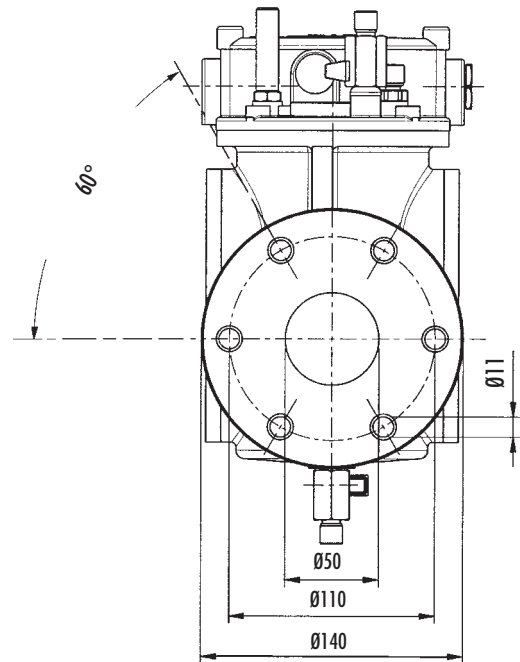
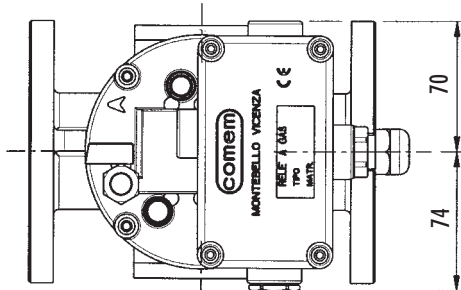
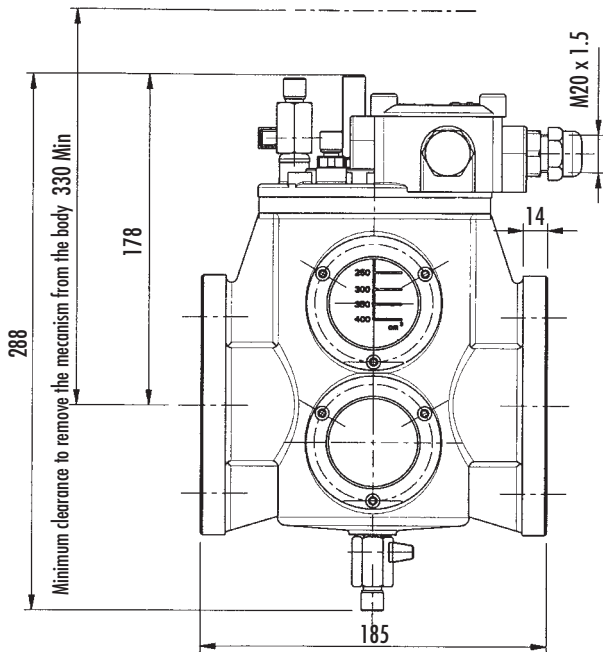
BR 80

Minimum clearance to remove the mechanism from the body



Weight **2.2 kg**

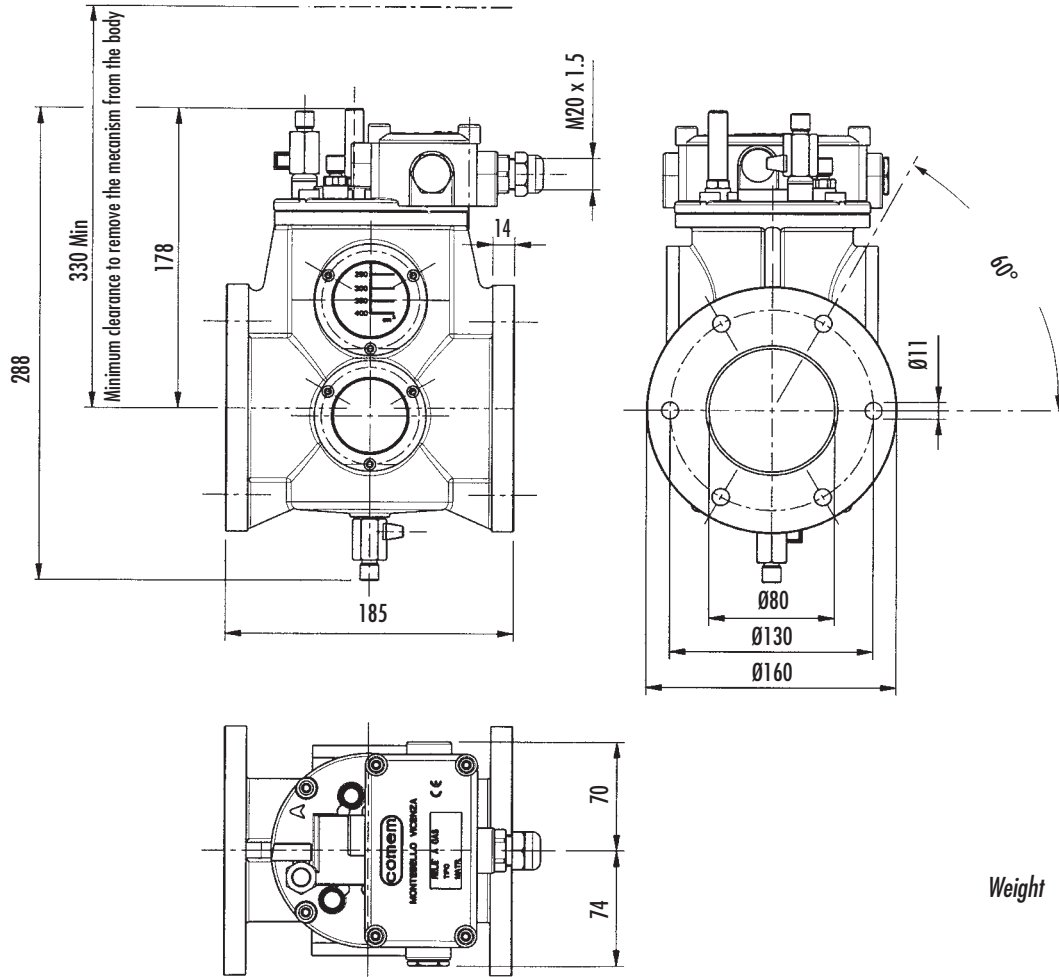
BS 25



Weight **4.1 kg**

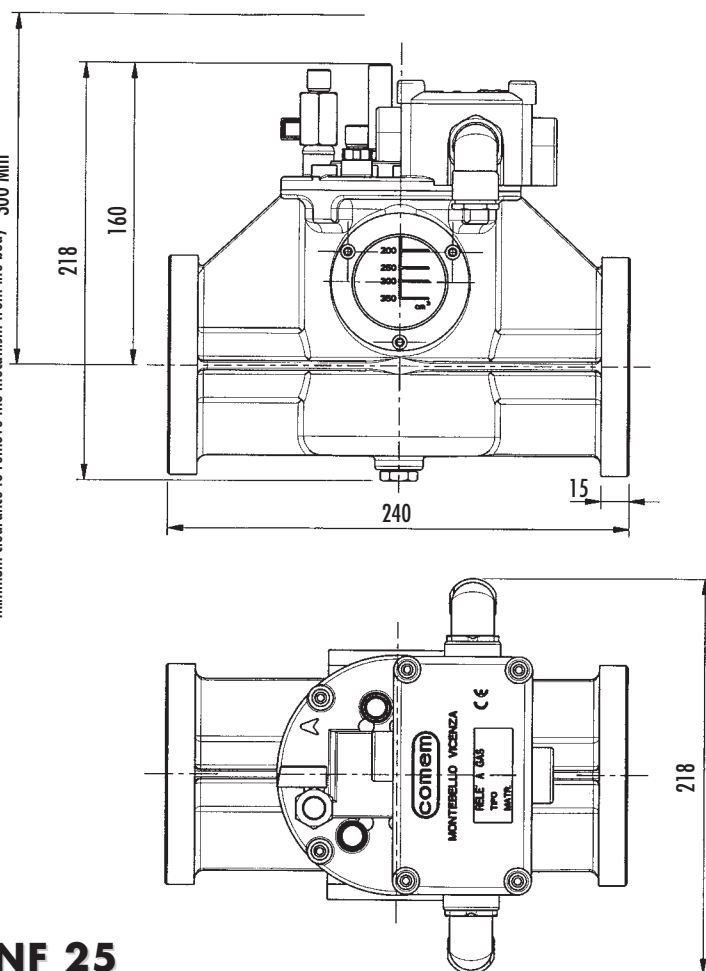
BS 50

BS 80



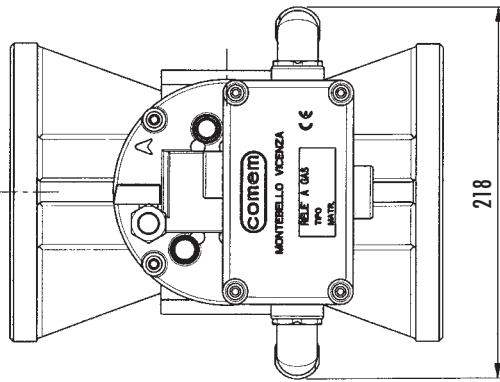
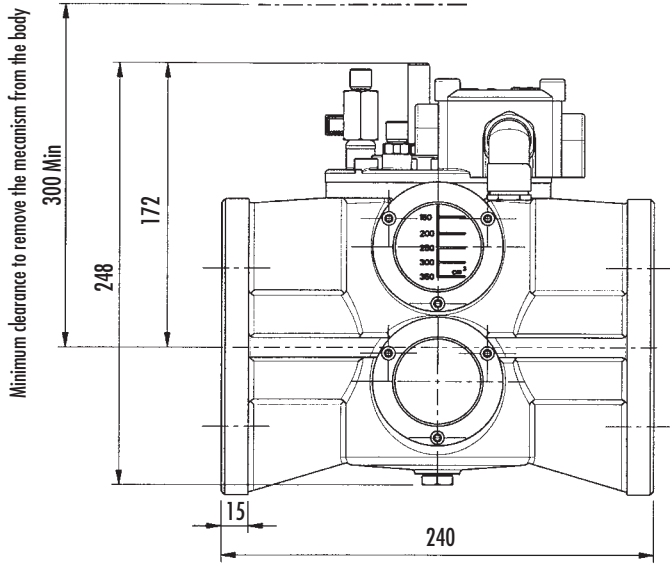
Weight **4.3 kg**

Minimum clearance to remove the mechanism from the body 300 Min

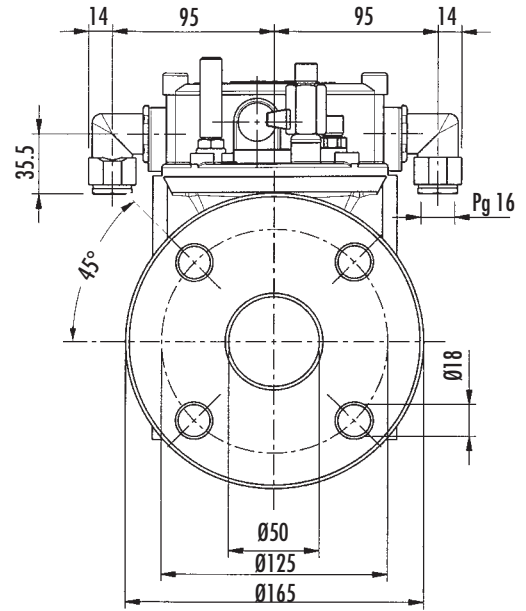


NF 25

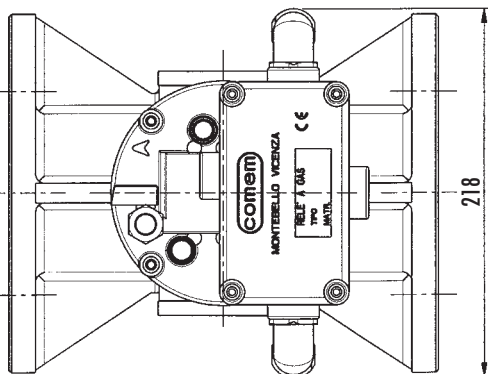
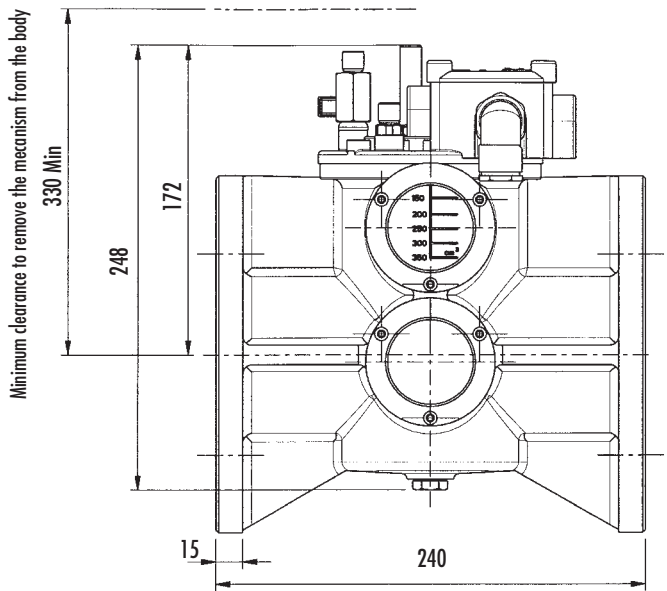
Weight **3.0 kg**



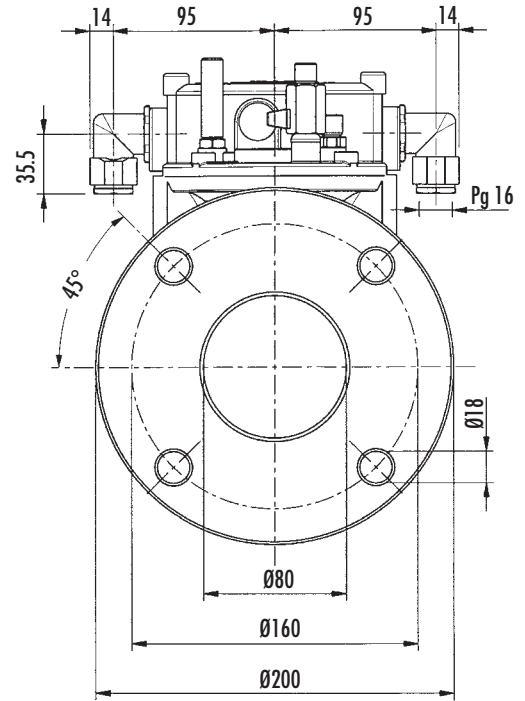
NF 50



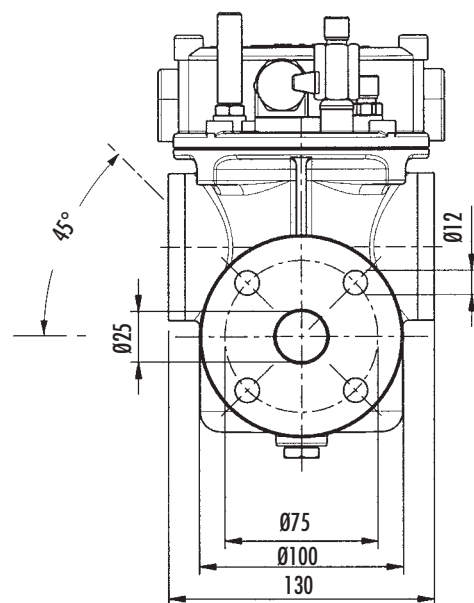
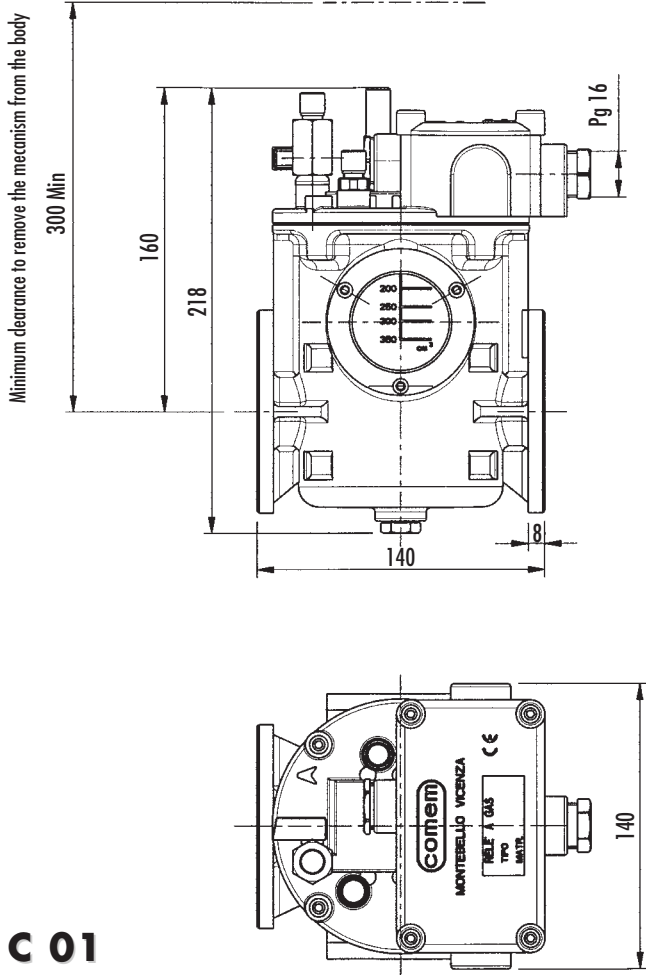
Weight **4.8 kg**



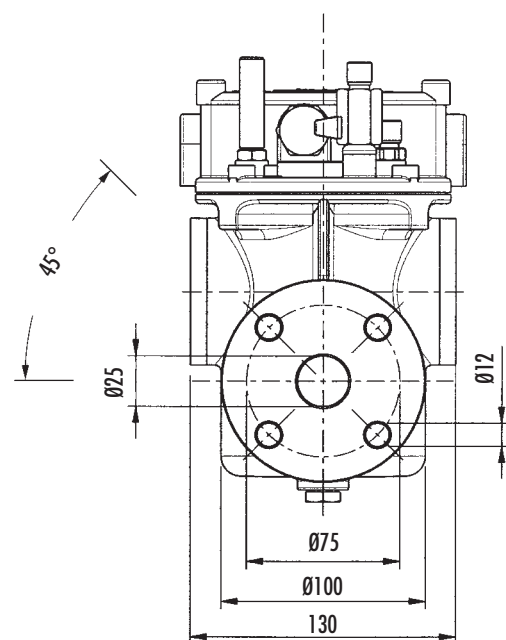
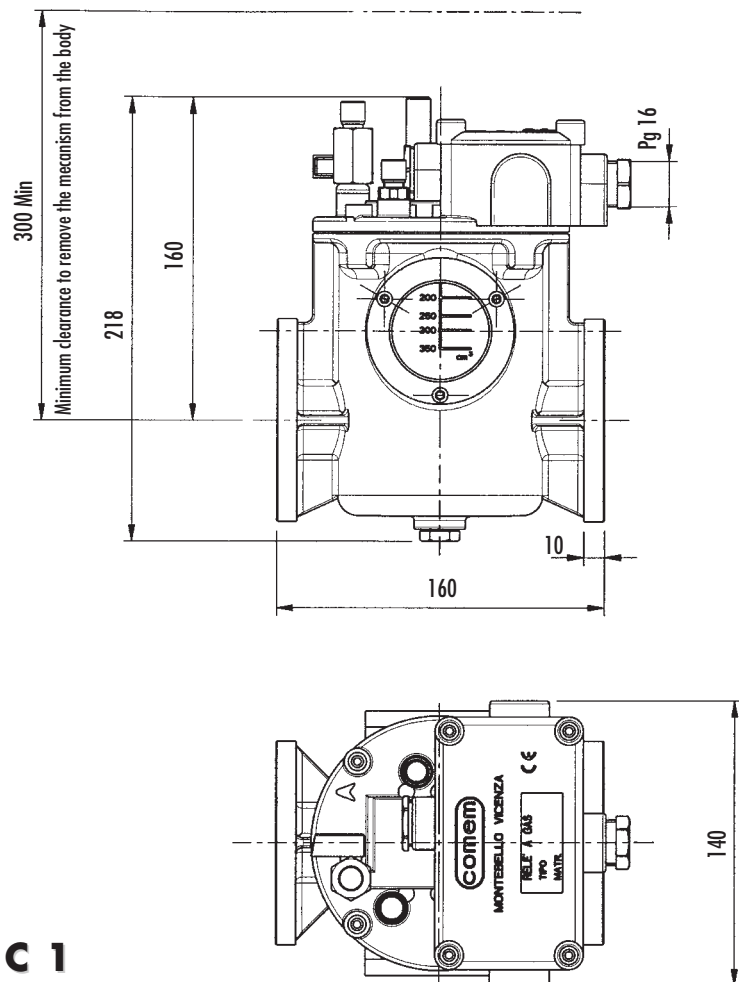
NF 80



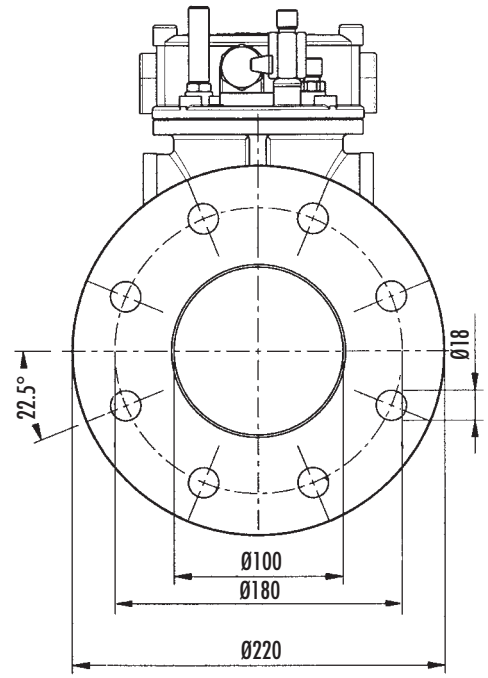
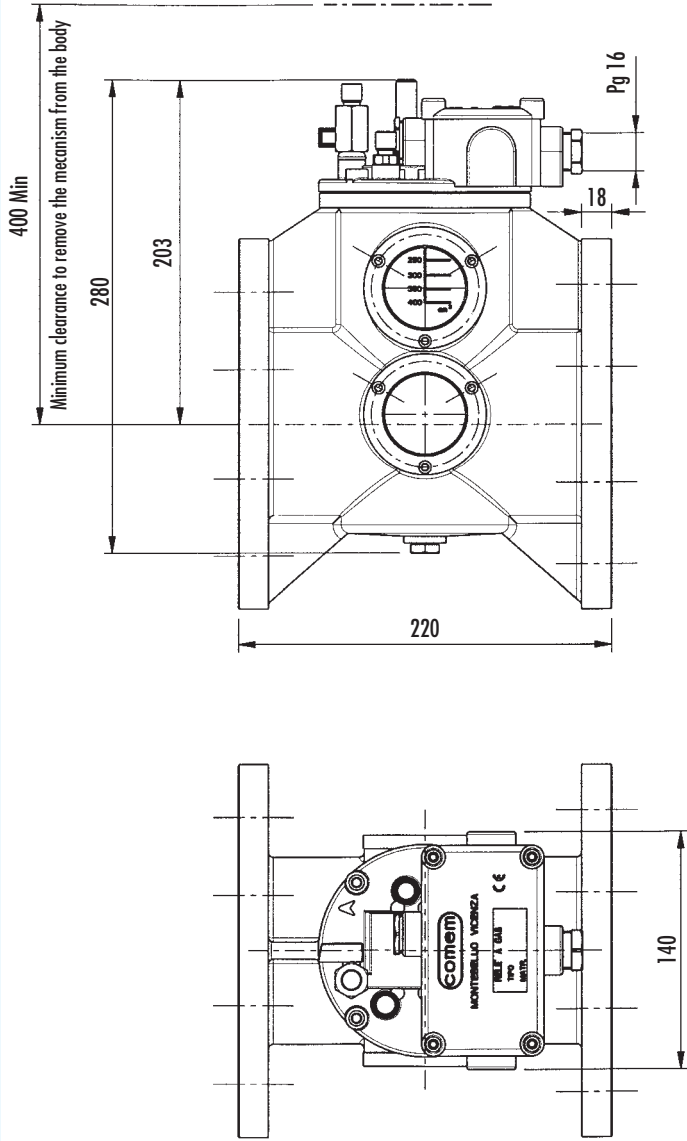
Weight **5.5 kg**



Weight **2.2 kg**



Weight **2.3 kg**



Weight **5.9 kg**

C 4

BUCHHOLZ GAS-ACTUATED RELAY to CENELEC EN 50216-2 standard

The generation of gas in an oil filled transformer is a clear indication of a problem. The gas may be a result of the following:

- Decomposition/degradation of solid, or liquid insulation inside the transformer due to overheating, or arcing.
- From the outside towards the pipeline.
- From the oil itself due to unsatisfactory de-gassing prior to filling.

Rapid oil movement in the pipeline towards the conservator is caused by an internal arc, short circuit, or hot spot which must be correctly addressed.

Oil leaks from the transformer are environmentally unacceptable and a fire hazard will lead to transformer failure.

To indicate any of the above malfunctions Comem as the result of 40 years experience with these products has developed a new "Buchholz" relay to comply fully with the latest CENELEC EN 50216-1 and EN 50216-2 standards.

The new relay incorporates the very latest technology in its construction.

PRINCIPLE OF OPERATION

The Buchholz relay is sited in the pipework between the transformer and its conservator and it is filled with oil during normal transformer operation. When gas is generated in the transformer it rises towards the conservator and collects in the upper chamber of the relay.

The oil level drops and the top float triggers alarm switch.

Gas shall not freely pass from the relay body and escape into the pipework before the alarm contact has operated.

The trip contact shall operate at a steady oil flow as indicated in Table 3.

This operation shall not be adversely affected when the alarm contact has already closed and gas is escaping freely.

In the event of an oil leak the Buchholz relay will only operate after the conservator has exhausted all of its oil. In order to check this eventuality it is recommended that an RDR MK II automatic shutter valve is fitted between the Buchholz and the conservator.

Specific information on this product are available on request.

CONSTRUCTION

The new Comem Buchholz relay is an assembly of two machined aluminium alloy castings that effect a perfect oil seal.

1) The main body of the relay is fitted with tempered glass inspection windows with graduated scale markings in cubic centimetres to indicate the internal volume. The oil drain plug is located at the bottom of the main body.

2) The top cover carries the frame which contains the moving parts of the relay. These comprise the two floats and their associated switches encapsulated in glass bulbs, one calibrated flow valve and two permanent magnets.

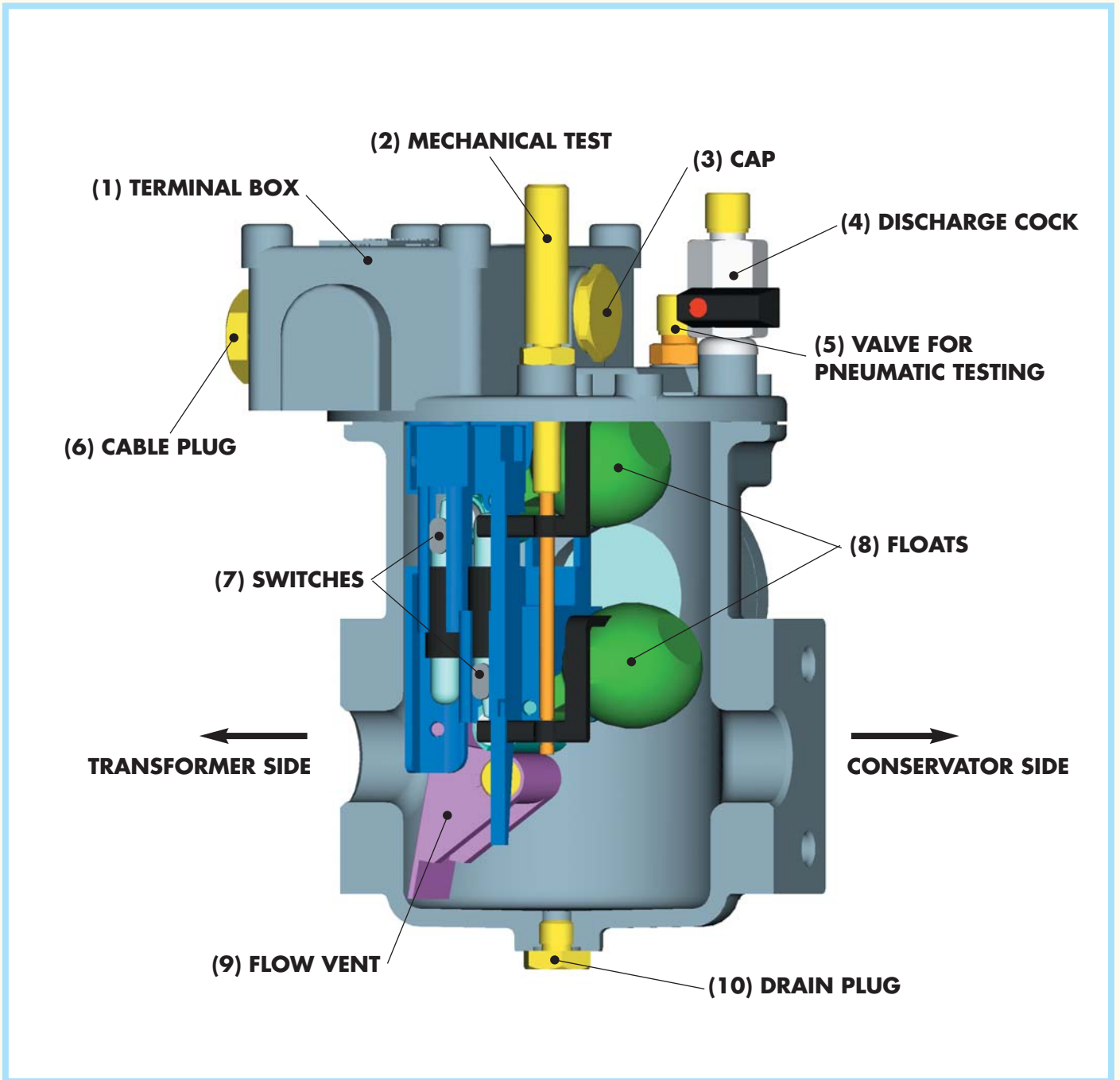
The cover also carries:

(4) a gas discharge valve with G1/8" in male thread with protective cap.

(5) A valve for pneumatically testing the alarm and insulation circuits, with protective cap.

(2) A push rod for mechanically tripping the alarm and the insulation circuits, with protective cap.

A terminal box which as standard contains 4 numbered M6 terminals and one earth terminal.



EXTERNAL COATING AND PROTECTION

To the external aluminium alloy parts is given a phosphate treatment prior to applying one coat of vinyl enamel, colour RAL 7001. This treatment has proved more than satisfactory over the years for the majority of applications including desert and tropical situations. However, in particularly severe applications (>500h salt fog) such as applications in corrosive atmospheres (acids) a suitable epoxy primer is recommended. (This should be discussed at the time of selection). All external brass fittings are plated and all nuts are made in stainless steel.

RELAY SELECTION

The size and type of relay to be used will depend on the transformer rating and oil volume. Suggestions are given in the following table but the final choice is often as a result of the transformer manufacturers experience.

MVA TRANSFORMER POWER	NOMINAL DIAMETER
Up to 5	25
From 5 up to 20	50
From 20 up to 50	80
Over 50	100

tab. 1

TECHNICAL DATA

- The relay pipework is typically mounted at 2,5 degrees to the horizontal. A positive inclination of up to 5 degrees to the horizontal axis is admissible.
- Operating pressure - 1 bar, tested to 2,5 bar for 2 minutes at 100 deg C.
- Gas volume to trip alarm:

BUCHHOLZ RELAY TYPE	GAS VOLUME NECESSARY TO TRIP THE ALARM
BG 25, BR 25, NF 25, C 01, C 1	100÷200
NF 50, NF 80	100÷200
BR 50, BR 80, C 4	150÷250
BS 25	170÷230
BS 50, BS 80	250÷300

tab. 2

- Rate of oil flow in m/s to trip insulation. In the following table standard values are highlighted with an 'O' available, on request with an 'X' and not available with a '//'. +/- 15% tolerance at 20°C with oil viscosity according to IEC296.

INSIDE PIPE DIAMETER	1,0 m/s	1,5 m/s	2,0 m/s
25	O	X	X
50	O	X	X
80	O	X	X
100	//	O	X

tab. 3

- The relay operates within 0,5 seconds.
- Oil temperature between -25 and +115 deg C.
- Ambient temperature between -25 and +60 deg C.
- Degree of Protection IP65 to EN 60529.

SWITCH ELECTRICAL DATA

Rated switch current is **2 A r.m.s.** with max. **10 A r.m.s.** as short term 30 ms current value.

Breaking power is specified in the following table:

VOLTAGE	CURRENT	BREAKING POWER	
220 V d.c. (min. 12 V)	2 A for 10000 maneuvers	250 W	L/R < 40 ms
230 V a.c. (min. 12 V)	6 A for 1000 maneuvers	400 VA	cos φ > 0,5

tab. 4

Dielectric contact voltage as specified in the following table:

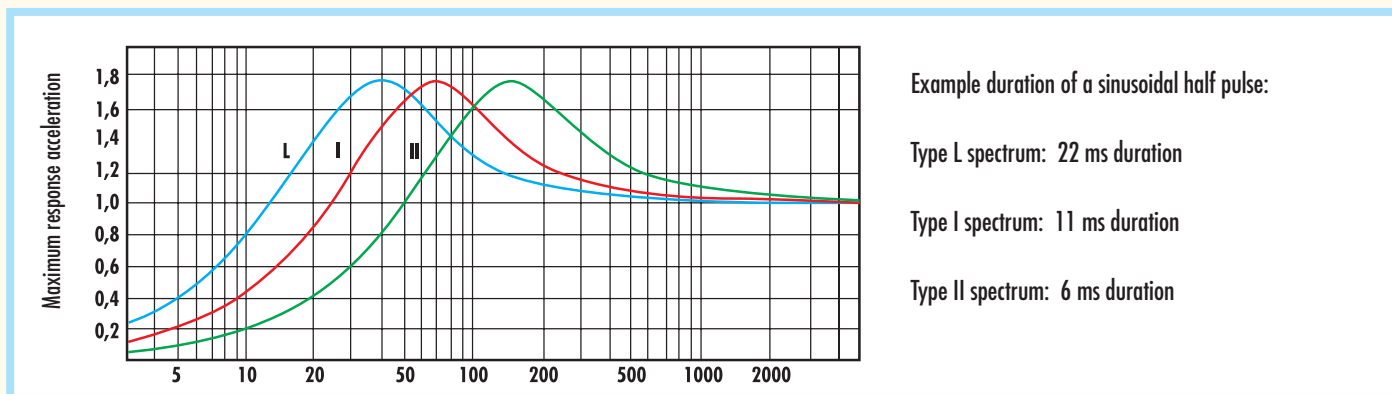
	SHORT TERM INDUSTRIAL FREQUENCY LEAKAGE TEST kV/1 min. (r.m.s)	RESISTANCE VOLTAGE PER PULSE kV (peak)
Between circuits and ground	2,5	5
Across open contacts	1	3

tab. 5

TESTING

The following Type Tests have been performed on the relay.

- Measurement of the volume of gas necessary to trip the alarm.
- 500 hr salt fog.
- Electromagnetic Field Test. Relay does not trip in field strength up to **25 mT** (ref EN 50216-2).
- Stationary sinusoidal mechanical vibrations. Tests according to EN 60721-3-4 standards have been performed.
 - a) class **4M4** (4M6 on request) vibration test applied in sites where vibrations are transmitted from machinery and vehicles. Not suitable for machines exposed to high vibration and shock levels. Three-axis movement was impressed to the relay using special equipment with stationary sinusoidal vibrations from **2 to 200 Hz**. Movement had a constant **3 mm** (6 mm peak-peak) amplitude in the range from **2 to 9 Hz** whereas above this frequency it had constant **10 m/s²** acceleration. The alarm and release switches did not trip.
 - b) non-stationary vibration tests with vertical shock with **100 m/s²** acceleration with type I spectrum (duration 11 ms) as shown in the graph below. Alarm and release contacts did not trip. On demand we are able to manufacture Buchholz relays with special features and test values higher than the ones stated above.



- A seismic test was also performed according to EN 50216-1 standards that refers to EN 60068-3-3 class 0, level 2 standards. The test consists of application of a **9 m/s²** horizontal acceleration and a **4.5 m/s²** vertical acceleration, increasing frequency one octave per minute. No activation of alarm or release switches was encountered.
- Pressure Withstand Test 2.5 bar for 2 minutes with oil at 100 deg C.
- Vacuum Withstand Test of 2500 Pa for 24 hrs.
- Rate of oil flow test to operate trip contacts, (as shown in table 3).
- Test to show the relay is insensitive to oil flow from conservator to transformer.
- Electrical tests per table 5.

ROUTINE TESTS

The following Routine Tests are applied to all relays.

- Hydraulic seal test in mineral oil at 90 deg C and 100 kpa pressure for 30 minutes.
- Contact operation via mechanical push rod.
- Contact operation by lowering the oil.
- Rate of oil flow to trip contacts.
- Electrical withstand test between contacts (as table 5).
- Electrical withstand test between contacts and earth (as table 5).

An individual routine Test Report is shipped with each relay

RELAY OPERATING TEST

The following site Tests can be performed when the relay is installed on the transformer

The Alarm and Trip contacts can be tested manually by the push rod (2) - mechanical test, or (only for alarm contact) by the introduction of air into the relay through valve (5) - pneumatic test.

A bicycle pump can be utilised for this test or a kit article n° **5400806002** is available from Comem.

To effectively test the rate of flow of oil is a complex test requiring specialised equipment. Should this test be required other than as a type test then Comem can perform this on request at the time of the order.

INSTALLATION INSTRUCTIONS

The following installation procedures must be observed for proper relay operation:

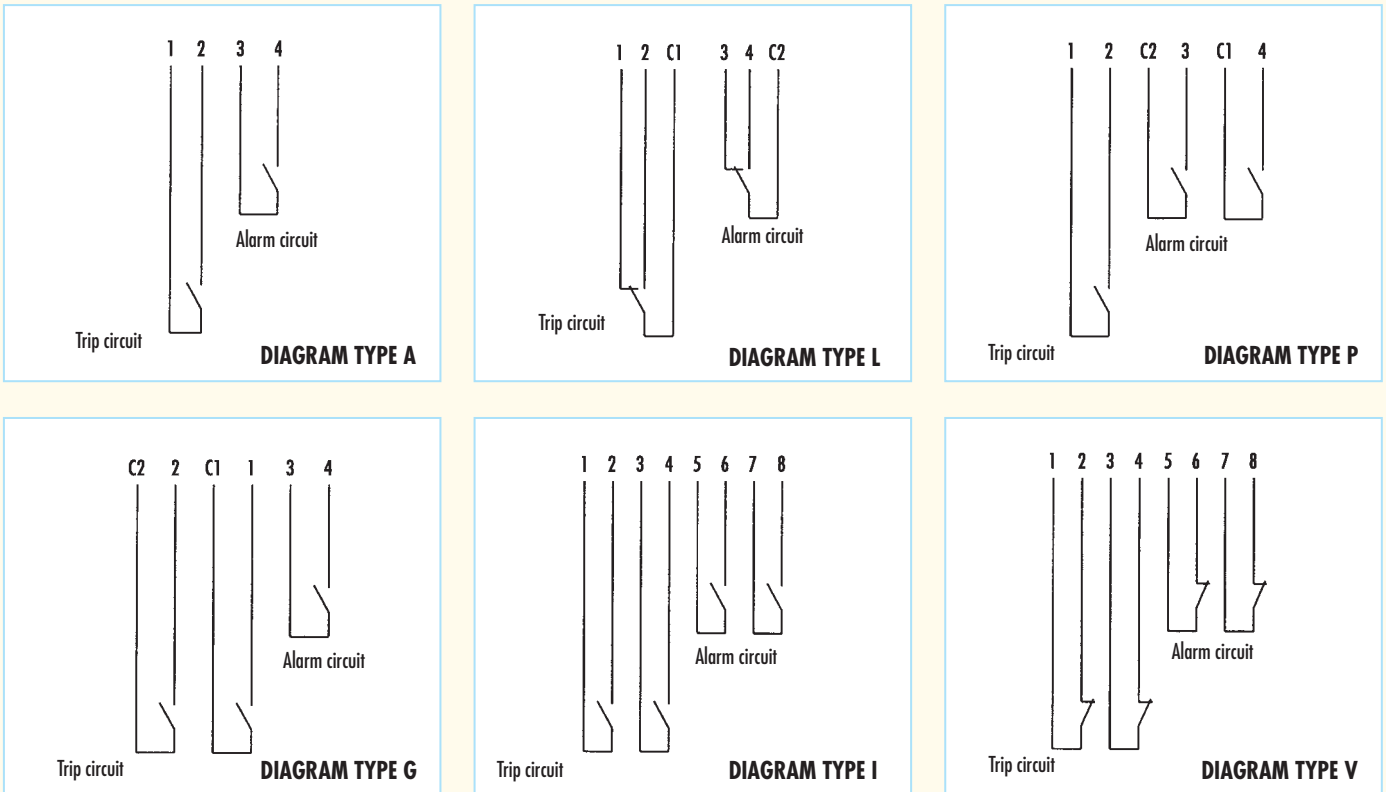
- The red arrow on the relay must point towards the conservator.
- The relay must always be full of oil, which means that the minimum oil level in the conservator must be higher than the relays breather valve.
- The recommended inclination of the relay pipework is 2.5 degrees from the horizontal.
- The pipe from the transformer to the relay must exit the transformer at the highest point.
- The pipeline upstream from the relay has to be straight and with a length equal to **5-10 times** the pipeline diameter, at least. Down stream from the relay, pipeline length has to be **3 times** the pipeline diameter, only. It must rise up towards the conservator.

RELAY ORDER FORM

Chosen size and model (see drawings and table 1):

BG 25	BR 25	BR 50	BR 80	BR 80 8 holes	BS 25	BS 50	BS 80	NF 25	NF 50	NF 80	C 01	C 1	C 4
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Electric contact layout (meaning with relay filled with oil and operating):



A	L	P	G	I	V	Other
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____

Chosen seals:

A	B	C	Other
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	TYPE OF DIELECTRIC			
	MINERAL	SILICONE	ESTERIZED	
AMBIENT TEMPERATURE/OIL				
A	Ambient -25° ÷ 60° C Oil -25° ÷ 115° C Standard version	NBR	VITON/NBR	//
B	Ambient -10 ÷ 60° C Oil -10° ÷ 115° C Special version	//	VITON	VITON
C	Ambient -40° ÷ 60° C Oil -40° ÷ 115° C Special version	NBR/VITON	NBR/VITON	NBR/VITON

(NBR/VITON: meaning: parts in contact with oil in VITON, parts not in contact with oil in NBR)

tab. 6

Paint finish:

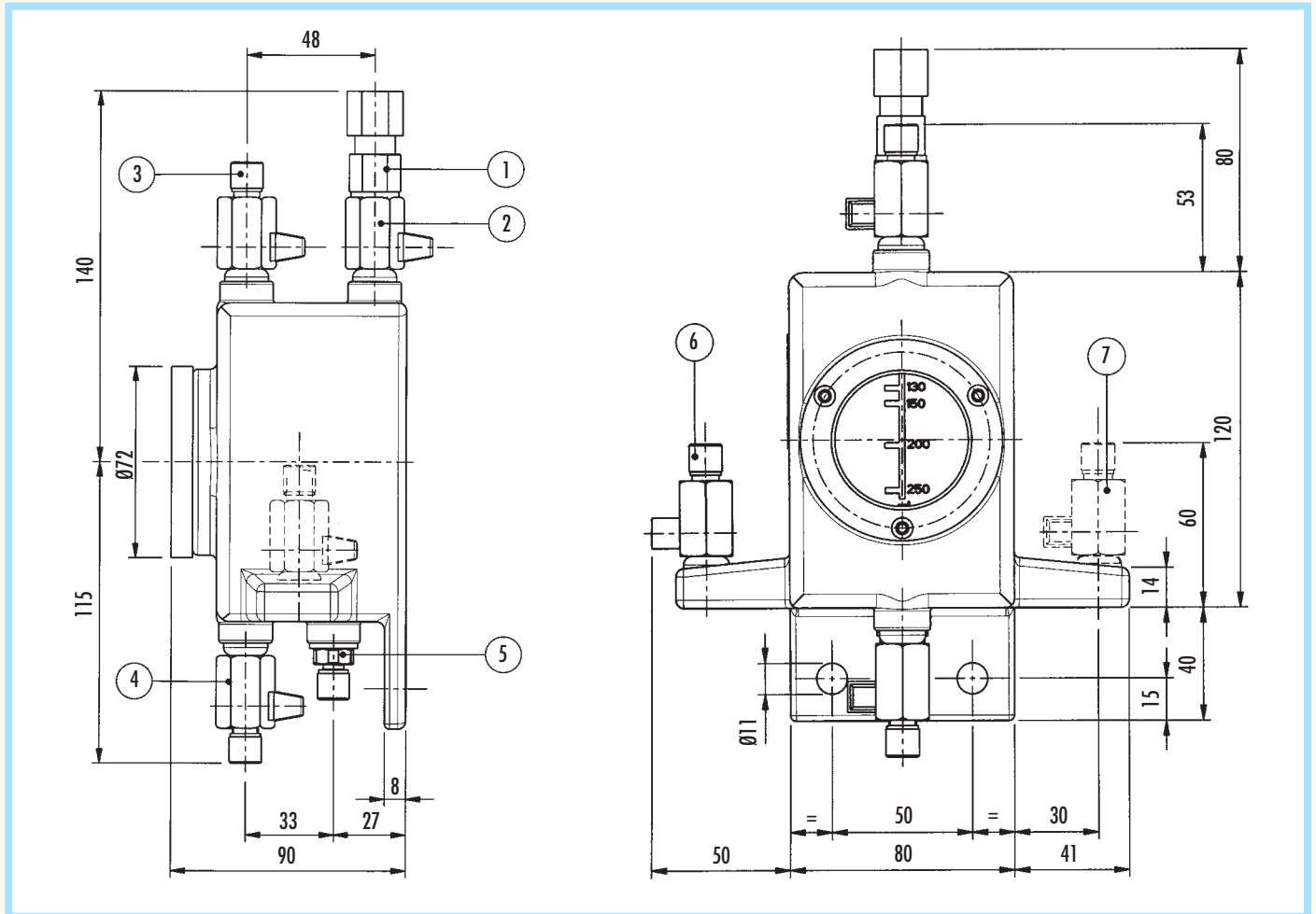
Standard	Corrosive environments	Other special finishes
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____

GAS SAMPLING DEVICE WITH APPLICATION OF THE BUCHHOLZ RELAY OIL DRAIN COCK

PRINCIPLE OF OPERATION

The presence of gas inside an oil filled transformer is always a sign of malfunction and one of the tasks of the Buchholz relay is to signal this presence. Analysis of the evolved gas can often give good indication of the type of malfunction but accessing the Buchholz relay during live operation of the transformer can be hazardous.

The gas sampling device has been designed to overcome this problem by siting the unit remote from the Buchholz and in a readily accessible position typically on the side of the transformer.



CONSTRUCTION

The Comem gas sampling device is manufactured from an aluminium alloy casting with the following fittings:

- A tempered glass inspection window with graded markings for volume indication.
- A gas sampling valve (2).
- A bleed valve (3).
- A gas inlet valve for pneumatic testing (5).
- A valve for draining oil from the relay (this can be mounted on the right or left hand side of the body (6) or (7).

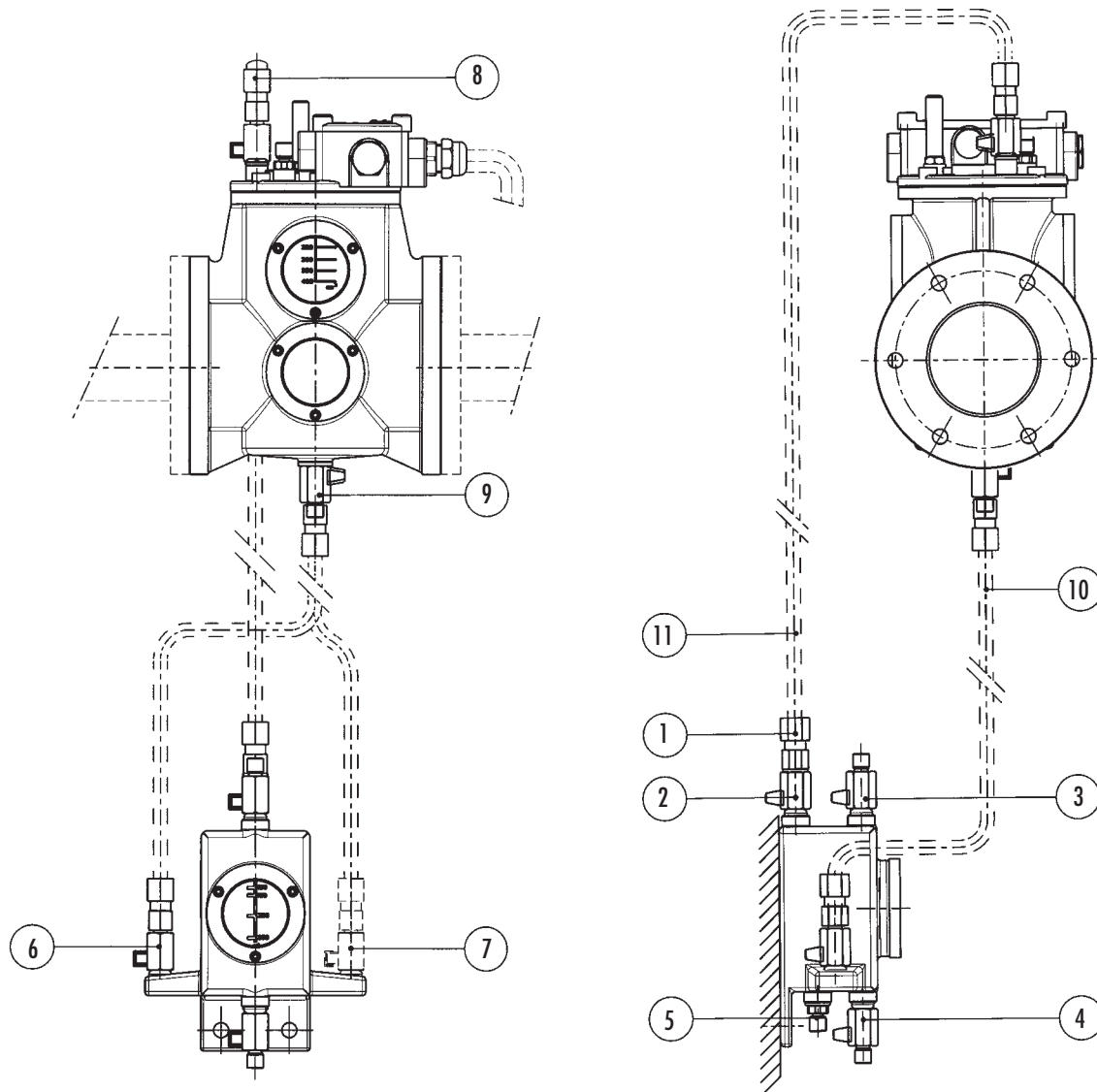
As a routine test all castings are tested by injecting ambient air at 2.5 bar for 2 minutes.

A certificate to this effect is supplied with the unit.

For the sake of standardisation the device is fitted with the left and right hand valve supports but only one valve.

Customer can then choose which side he prefers.

- With fittings for outside dia. 10 tubes, code **1RDPG00005** (standard);
- with fittings for outside dia. 6 tubes, code **1RDPG00006** (on request);
- with fittings for outside dia. 8 tubes, code **1RDPG00007** (on request).



DESCRIPTION OF OPERATION

During normal operation the Buchholz relay is full of oil and is connected to the gas sampling device via pipelines 10 and 11. Valves (8), (2) and (9) are open.

Valves (3), (4), (6) or (7) are closed.

The gas sampling device is consequently also full of oil.

Sampling procedures are as follows:

A- To sample oil: open valve (6) or (4).

B- To sample gas if the relay has signalled alarm or tripped the transformer:

Open valve 4 and let the oil in the device flow out. This draws any gas from the relay via valve (8), tube (11) and valve (2) into the body of the gas. The progress of this operation can be checked through the inspection window. When the desired amount of gas has been collected close valves (2) and (4) and open valve (3) to take the sample.

C- To test satisfactory operation of the alarm and trip circuits proceed as follows:

Close valve (2) then drain all the oil from the device by opening valves (3) and (4). Attach an air pump (bicycle pump) or kit from Comem 5400806002) to valve (5). Close valves (3) and (4) and pump fast whilst simultaneously opening valve (2). The air will then pass into the upper chamber of the Buchholz relay via pipeline (11) lowering the floats and consequently closing their contacts. If you wish to test the lower float then first the valve between the relay and the conservator must be closed to prevent air from flowing directly into the conservator.

OPERATION STARTING

Caution: After commissioning ensure the Buchholz relay and the sampling device are both filled with oil.