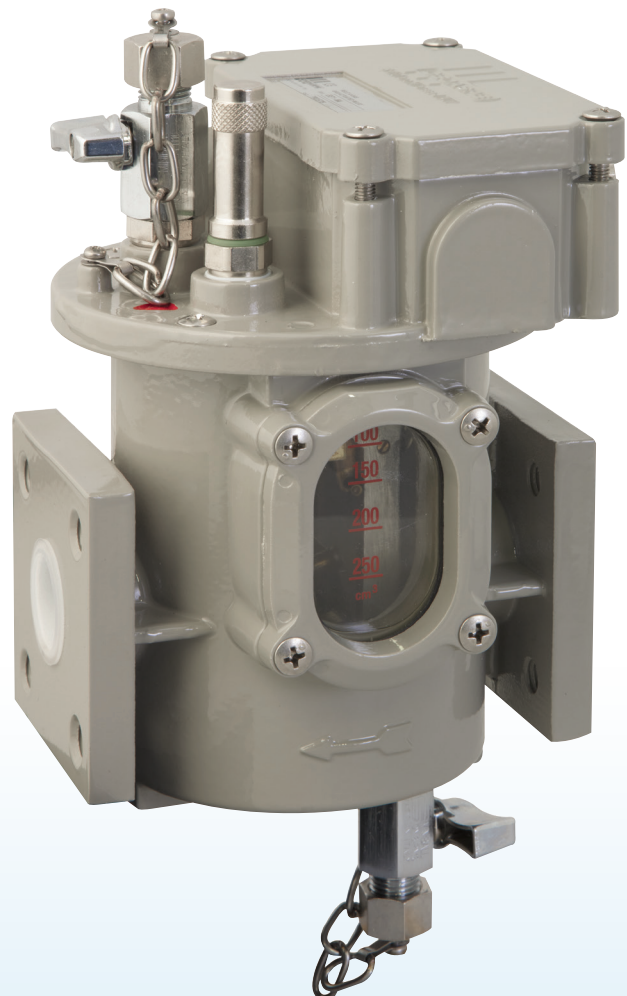


# BUCHHOLZ RELAYS EE Series



The newest Buchholz relay release for use  
in oil-immersed power transformers



## 1. General Features

### 1.1 Characteristics

The gas-actuated protective relay is designed to detect faults as well as to minimise the propagation of any damage, which might occur within oil-filled transformers.

The relay is therefore particularly effective in case of:

- short-circuited core laminations
- broken-down core bolt insulation
- overheating of some part of the windings
- bad contacts
- short circuits between phases, turns
- earth faults
- puncture of bushing insulators inside tank

Furthermore the relay can prevent the development of conditions leading to a fault in the transformer, such as the falling of the oil level due to leaks, or the penetration of air as a result of defects in the oil circulating system.

The adoption of other forms of protection does not therefore exclude the use of the gas-actuated Buchholz relay, as this device is the only means of detecting incipient faults, which if unnoticed, can cause heavy failures.

### 1.2 Operating principle

The operation of the Buchholz relay is based upon the fact that every kind of fault in an oil-filled transformer causes a decomposition of the insulating material, be it liquid or solid, due to overheating in the fault zone or to the action of an intense electric field, and a generation of bubble of gas.

These reach the relay (normally filled with oil) through the pipe connecting the transformer to the conservator where the buchholz relay is mounted

## 2. Operating features

### 2.1 Slight faults

When a slight or incipient fault occurs in the transformers, the small bubbles of gas, which pass upwards towards the conservator, are trapped in the relay housing, thus causing a decrease of the oil level inside the relay.

As a result, the upper float closes its magnetic switch, thus completing the alarm circuit and operating an external alarm device.

### 2.2 Serious faults

#### 2.2.1 Gas generation

When a serious fault occurs in the transformer, the gas generation is violent and causes the oil to rush through the connecting pipe to the conservator.

In the relay, this oil surge impinges on the flap fitted on the lower part (located in front of the hole for the oil passage) and causes the closing of its magnetic switch, completing the tripping circuit to the circuit-breaker and disconnecting the transformer.

The value of the oil speed required to operate the tripping device can be varied by changing a counterweight fitted on the device itself or changing its size.

#### 2.2.2 Oil leak

An oil leak in the transformer causes the fall down of the oil level inside the relay, thus operating first the alarm (upper) float and then the tripping (lower) float, which will close their own circuits

#### 2.2.3 Air inlet

The ingress of air into the transformer, arising from defects in the oil circulating system or from other causes, operates the alarm float first and after the trip contact.

### 3. Construction feature, Finish and Accessories

#### 3.1 Construction features

The body and the cap of the buchholz relay are made of aluminium alloy casting, oil tight weatherproof; the compact design, that means low weight, small sizes, efficiency, is the result of a very long experience in manufacturing relays. Two flanges on the body permit an easy connection of the relay to the tubes; two large inspection windows made in trogamid (on request made in tempered glass), with graduated scale, are fitted on both sides of the relay housing (on request windows can be provided with sun shield protection).

A flat surface on the cap of the relay make it possible, using a spirit level, to mount the relay with the proper inclination

#### 3.2 Accessories

On the cap of the relay are provided a petcock for the release of the gas, a push-button for testing the electrical circuits, a small valve for pneumatic test (standard on Buchholz size 2" & 3" on request on Buchholz size 1") and a cable box (which is cast integrally to the cap) with 2 cable entry size M25x1.5.

On the bottom of the relay is provided a device for oil draining.

#### 3.3 Finish

In standard execution, all cast parts are protected by one coat of epoxy primer and one coat of polyurethane paint (total thickness 80 µm), final colour RAL 7030; fittings made are in stainless steel (A2). Therefore the device is suitable for outdoor installation in tropical climate and normal industrial pollution.

### 4. Contacts

#### 4.1 General

The magnetic switches consist of two thin reed contact blades hermetically sealed inside a glass capsule in an atmosphere of dry inert gas.

The reeds are made of a ferromagnetic material and are cantilevered into the end of the capsule.

The tips of the reeds overlap and are separated by an air gap. The tips, forming the contact surfaces, are coated with a contact material.

The switches are operated by a permanent magnet.

The operating principle of the magnetic switches is very simple: when a magnet approaches the switch, the reeds close the circuit; when the magnets moves away from the switch, the contact gets open.

#### 4.2 Rated current

The rated current for normally open contacts is 2 A r.m.s. and 1 A for changeover contacts;

The short time current is 10A r.m.s. for 30 ms

#### 4.3 Breaking and making capacity

Normally Open Contacts			
Voltage	Max Current	Breaking capacity	
24V d.c. to 240V d.c.	2A	250W	L/R<40ms
230V a.c.	2A	400VA	cosφ>0,5

Change over Contacts			
Voltage	Max Current	Breaking capacity	
24V d.c. to 240V d.c.	1A	130W	L/R<40ms
230V a.c.	1A	250VA	cosφ>0,5

## 5. Wiring diagrams

### 5.1 Standard wiring diagrams

Standard wiring diagram available are:

- Type "A" – 2 N/O contacts (1 for alarm; 1 for trip signalling for oil loss and oil surge)
- Type "L" – 2 change-over (SPDT) contacts (1 for alarm; 1 for trip signalling for oil loss and oil surge)
- Type "G" – 3 N/O contacts (1 for alarm; 2 for trip signalling for oil loss and oil surge)

### Special wiring diagrams

Special wiring diagram are available on demand on relays EE2 and EE3 mm like

- Type S4 - 4 contacts N/O; (2 for alarm; 2 for trip signalling for oil loss and oil surge)
- Type "Z" – 3 N/O contacts (1 for alarm; 1 for trip signalling for oil loss  
1 for trip for oil surge; in this case there is a separation of the trip signals  
between oil loss and oil surge)

For other special wiring diagrams please look onto dedicated page

## 6. Service conditions

### 6.1 Environmental conditions

Relays comply with following environmental conditions as classified in EN60721-3-4

K	Climatic conditions	4K2
Z	Special climatic conditions	4Z2+4Z4+4Z7
B	Biological conditions	4B1
C	Chemically active substances	4C2
S	Mechanically active substances	4S3

### 6.2 Special mechanical conditions

Our buchholz relay can withstand to mechanical stresses without unattended operation to the following stresses acc to EN 60721-3-4

- stationary sinusoidal vibration class 4M4
- non stationary vibration : a vertical shock of 100m/s<sup>2</sup>, with type 1 spectrum

### 6.3 Protection degree

Protection degree of the terminal box is IP65 acc to EN60529

### 6.4 Corrosion

The relay is designed to withstand to corrosion test acc to ASTM B 117 in salty fog chamber for 200h

### 6.5 Pressure and vacuum resistance

The relay is designed to work continuously with an internal pressure of 50kPa but is capable to withstand an overpressure of 250 kPa for 2 min and to vacuum pressure of 2.5 kPa for 24h

### 6.6 Insulating liquid

The relay is designed for operate with transformer oil with viscosity range from 1 mm<sup>2</sup>/s to 1100 mm<sup>2</sup>/s

### 6.7 Working temperature

The relay is suitable for operation in transformer oil over temperature range from minimum minus 40 °C to plus 115 °C

The relay is suitable for operation in ambient air temperature range from minimum minus 40 °C to plus 70 °C

Special execution are available on demand

### 6.8 Mounting position

The relay is designed to operate properly on a pipe having an inclination from horizontal between 2 and 5 degrees

## 7. Operational performance

### 7.1 Operating characteristics

Typical values of the oil speed required to operate the tripping element under surge conditions and the volume of accumulated gas required to operate the alarm float and trip contact, are:

Relay	Alarm Gas Collection cm <sup>3</sup>	Trip Oil Leakage	Trip Oil Surge cm/sec	Transformer Oil kg
EE 25 (OLD EE1)	150 ± 50	Before reaching the lowest point of the pipe and after alarm for gas collection contact is activated.	100±15	Up to 1000
EE2	200 ± 100			1000 ÷ 10.000
EE3				
EE3/3			150±35	Above 50.000
EE3/4	200±35			
EE2/H (ESKOM SPECS)	200 ± 100	Before reaching the highest point of the pipe and after alarm for gas collection contact is activated.	100±15	1000 ÷ 10.000
EE3/H (ESKOM SPECS)				10000 ÷ 50.000
EE3E/H (ESKOM SPECS)			200±35	Above 50.000

## 8. Installation

### 8.1 Mounting

The gas actuated relay is mounted on the connecting pipe between the transformer and the conservator.

The pipe has to allow the easy flow to the relay of the gas arising from faults inside the transformer, starting from the highest point on the transformer cover and must not protrude inside into the transformer.

The pipe should not contain any right-angle elbows. Its diameter should correspond to the diameter of the hole for the passage of oil of the relay.

The pipe must be arranged to slope upwards towards the conservator at an angle of about 2 to 4 degrees to the horizontal (max 5 degrees).

The part of the pipe preceding the relay should be straight for a length equal to at least five pipe diameters; the part of the pipe leading to the conservator immediately adjacent to the relay should be straight for a length equal to at least three pipe diameters.

A flat surface on the cap of the relay make it possible, using a spirit level, to mount the relay with the proper inclination

The petcock at the top of the relay must be at a level below the bottom of the conservator.

When mounting, the arrow engraved on the body of the relay must point in the direction from the transformer tank to the conservator.

If the transformer is provided with an explosion vent or similar attachment, this must be sealed in such a way that any gas liberated by the transformer does not accumulate in the vent, otherwise the operation of the alarm float will be delayed.

### 8.2 Setting to work

Once the relay has been mounted, unscrew the knurled cap which covers the push-button for checking the circuits and remove the small wood spacer which immobilises the alarm and tripping floats in their lower position, thereby preventing their movement during transport.

Open up the gas release cock, located on the relay cover, to allow the relay to fill up with oil.

The filling up and the position of the floats can be seen through the inspection windows.

When the relay is filled with oil, close the gas release cock.

The electrical circuits must be connected as shown in the diagram accompanying the relay.

### 8.3 Test of contacts

The relay is provided with a push-button, self resetting, for checking the continuity of the electrical circuits.

The procedure for testing is very simple: unscrew the knurled cap pos.3 (see drawing) which protect the push-button and press it slowly in order to activate first the alarm contact and after the trip contact. When the push-button end his stroke, release it slowly, in order to turn off the trip contact and after the alarm contact.

It is possible to see the movement of the float through the inspection windows.

It is possible also to test the contacts using a bottle of compressed air.

To execute pneumatic test of contacts operate as follows:

#### 8.3.1 Test of alarm contact

Inflate air through pneumatic test device (pos. 8) located on the cover till the contact operated.

It is possible to see the movement of the float and read the value of gas that operate the contact through the inspection windows.

At the end of the test, drain out the air from the relay.

#### 8.3.2 Test of trip contact (only for sizes EE2 & EE3)

Inflate air from the petcock (pos. 11) that is located on the bottom of the relay very quickly by opening very fast the petcock. At the end of the test drain out the air from upper petcock.

### 8.4 Maintenance

The buchholz relay does not need periodic maintenance; however it is advisable to check regularly the electric contact and the freely movement of float.

## 9. Check after actuation of relay

### 9.1 Alarm signal

When the alarm signal is given, the colour of the gas should be observed through the inspection-windows.

The gas may be released or samples can be taken for analysis. (If the relay is supplied with our "Buchholz gas sampling apparatus RG3.3, this operation can be carried out at eye-level).

It should be noted that:

- whitish gas : it is caused by electric arcing in contact with paper, cotton and silk
- yellowish gas : it is caused by wood and cardboard
- greyish gas : it is caused by from a breakdown of the magnetic circuit
- black gas : it is caused by from free arcing in the oil

Note that there may be air in the transformer during commissioning or after an operation of oil refilling

In similar cases the alarm is only temporary and should end in a short period of time.

### 9.2 Trip signal

If the relay disconnects the transformer, similar checks on the gas should be made to determine the colour and the quantity of gas collected.

It is always good practice to make a gas analysis.

In any case, the transformer should not be immediately re-energized, as this would increase the seriousness of the fault.

Note that tripping contact can be actuated also by oil leak; in that case refill oil into conservator after discovered the cause of the oil fall before re-energizing the transformer.

#### **10. Test of gas on site**

It can be executed only if a gas analyser is available

#### **11. Order instructions**

When ordering a relay it is necessary to indicate (see table)

- Type
- Size
- Wiring diagram
- Oil flow rate
- Special requirements

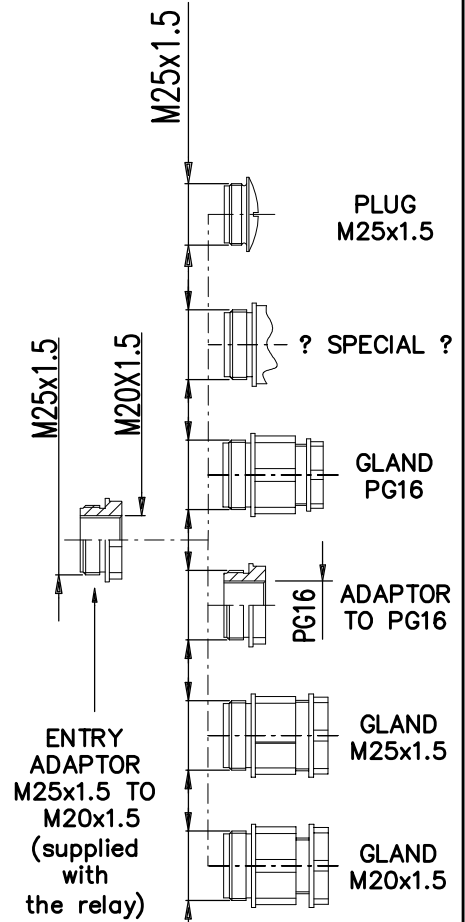
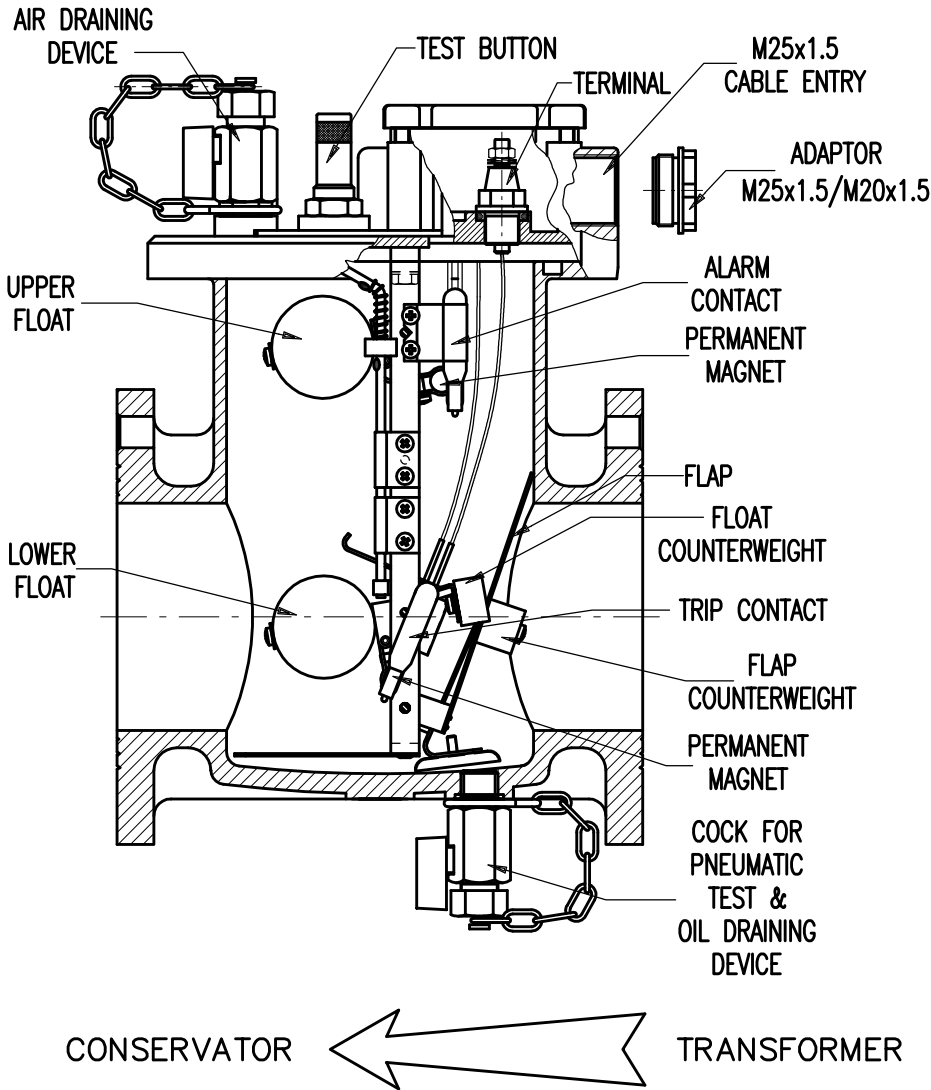
Example :

To order nr 3 buchholz relay type EE 3 wiring diagram G; standard flow rate (100cm/sec); please indicate the following :

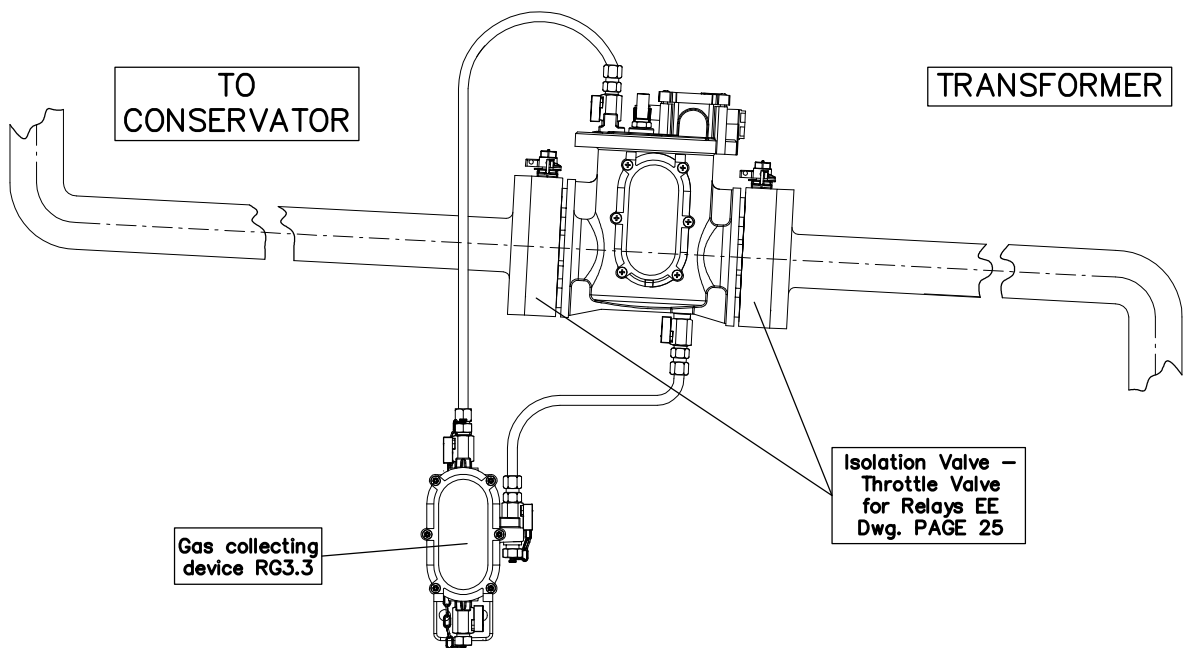
“Nr. 3 Buchholz relay type EE3-MG“

CROSS SECTION

ACCESSORIES UPON CUSTOMER REQUEST



MOUNTING SKETCH WITH ISOLATION VALVE





# STANDARD WIRING DIAGRAM

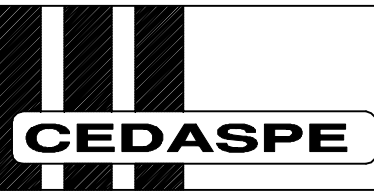
<b>FLOAT AND SWITCHES DESIGN</b> <b>WD A</b>					<b>FLOAT AND SWITCHES DESIGN</b> <b>WD L</b>							<b>FLOAT AND SWITCHES DESIGN</b> <b>WD G</b>						
	<b>NUMBER OF INSULATOR</b>	1	2	3		4	<b>NUMBER OF INSULATOR</b>	1	2	5	3		4	6	<b>NUMBER OF INSULATOR</b>	1	2	5
<b>WIRING DIAGRAM</b> <b>A</b>					<b>WIRING DIAGRAM</b> <b>L</b>							<b>WIRING DIAGRAM</b> <b>G</b>						
	<b>NUMBER OF INSULATOR</b>	1	2	3		4	<b>NUMBER OF INSULATOR</b>	5	1	2	6		3	4	<b>NUMBER OF INSULATOR</b>	1	2	5
<b>SIGNALLING</b>	<b>TRIP</b>		<b>ALARM</b>		<b>SIGNALLING</b>	<b>TRIP</b>		<b>ALARM</b>				<b>SIGNALLING</b>	<b>TRIP</b>		<b>ALARM</b>			

# SPECIAL WIRING DIAGRAM

<b>FLOAT AND SWITCHES DESIGN</b> <b>WD Z</b>					<b>FLOAT AND SWITCHES DESIGN</b> <b>WD S2</b>									<b>FLOAT AND SWITCHES DESIGN</b> <b>WD S3</b>								
	<b>NUMBER OF INSULATOR</b>	5	2	3		4	<b>NUMBER OF INSULATOR</b>	1	2	5	6	7	3		4	8	<b>NUMBER OF INSULATOR</b>	1	2	5	3	4
<b>WIRING DIAGRAM</b> <b>Z</b>					<b>WIRING DIAGRAM</b> <b>S2</b>									<b>WIRING DIAGRAM</b> <b>S3</b>								
	<b>NUMBER OF INSULATOR</b>	5	2	3		4	<b>NUMBER OF INSULATOR</b>	7	6	5	1	2	8		3	4	<b>NUMBER OF INSULATOR</b>	5	1	2	8	3
<b>SIGNALLING</b>	<b>TRIP (oil surge)</b>		<b>TRIP (loss of oil)</b>		<b>ALARM</b>	<b>SIGNALLING</b>	<b>TRIP</b>				<b>ALARM</b>				<b>SIGNALLING</b>	<b>TRIP</b>		<b>ALARM</b>				

<b>FLOAT AND SWITCHES DESIGN</b> <b>WD S4</b>									<b>FLOAT AND SWITCHES DESIGN</b> <b>WD S5</b>									<b>FLOAT AND SWITCHES DESIGN</b> <b>WD S8</b>							
	<b>NUMBER OF INSULATOR</b>	1	2	5	6	3	4	7		8	<b>NUMBER OF INSULATOR</b>	1	2	5	8	6	7		3	4	<b>NUMBER OF INSULATOR</b>	1	2	7	8
<b>WIRING DIAGRAM</b> <b>S4</b>									<b>WIRING DIAGRAM</b> <b>S5</b>									<b>WIRING DIAGRAM</b> <b>S8</b>							
	<b>NUMBER OF INSULATOR</b>	1	2	5	6	3	4	7		8	<b>NUMBER OF INSULATOR</b>	5	1	2	7	8	6		3	4	<b>NUMBER OF INSULATOR</b>	1	2	7	8
<b>SIGNALLING</b>	<b>TRIP</b>		<b>ALARM</b>						<b>SIGNALLING</b>	<b>TRIP</b>				<b>ALARM</b>				<b>SIGNALLING</b>	<b>TRIP</b>		<b>ALARM</b>				

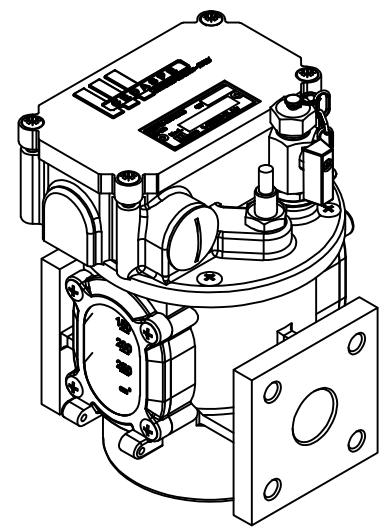
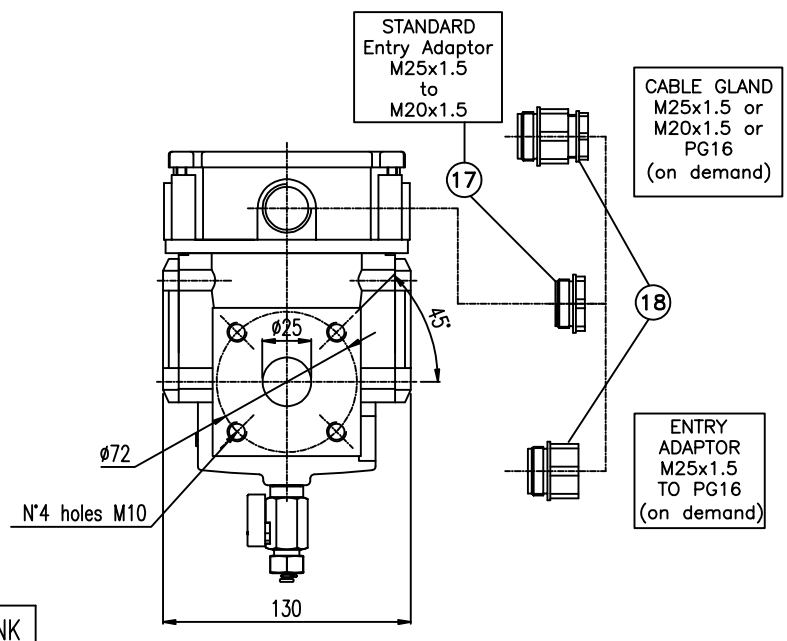
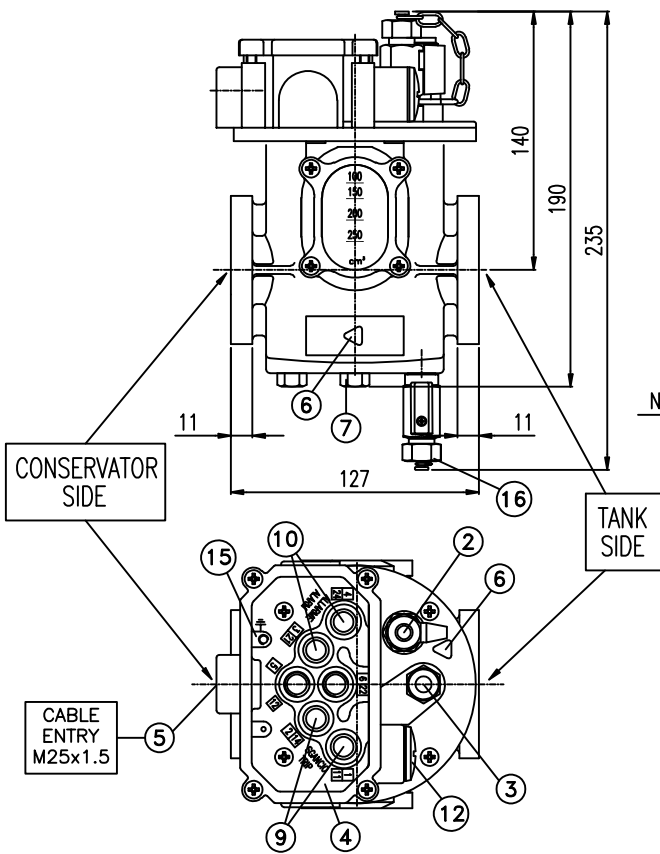
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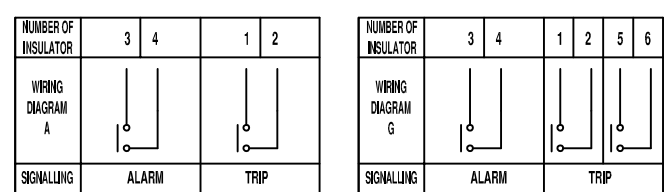
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Data 12/03/13  
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 Dis.  
 Visto

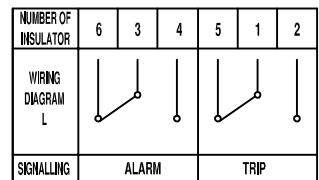
Dis. Nr  
**3851**



**STANDARD WIRING DIAGRAM**



Normally open contacts		
Voltage	Max current	Breaking capacity
24V d.c. to 240V d.c.	2A	250W L/R<40ms
up to 230V a.c.	2A	400VA cosφ>0.5



Change over contacts		
Voltage	Max current	Breaking capacity
24V d.c. to 240V d.c.	1A	130W L/R<40ms
up to 230V a.c.	1A	250VA cosφ>0.5

Pos.	Description
18	Optionals
17	Entry adaptor M25x1.5 to M20x1.5 (supplied with the relay)
16	1/4"G Cock for air injection test
15	Earth screw
12	Plug M25x1.5
10	Alarm terminals
9	Trip terminals
7	Oil drain plug
6	Oil flow direction (from tank to conservator)
5	Cable gland entry M25 - M20
4	Terminal box
3	Push button for checking electric circuits
2	1/4"G Gas release cock
1	Inspection window

Average weight : ~3 Kg

This relay replace old EE1 series drg 3852



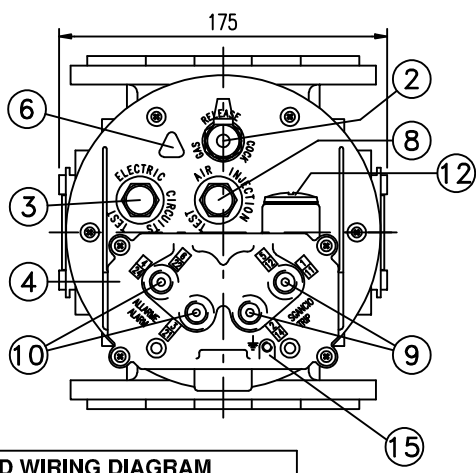
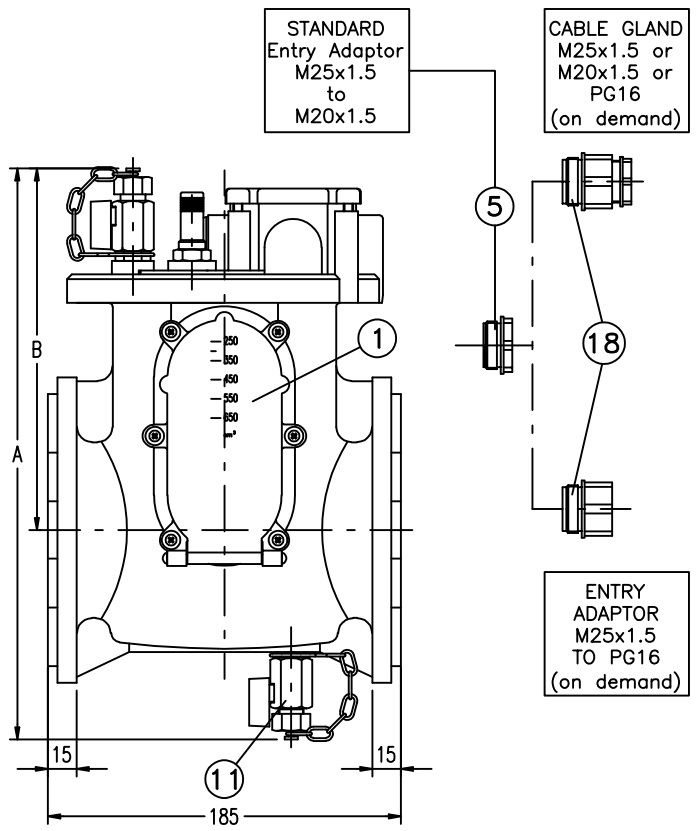
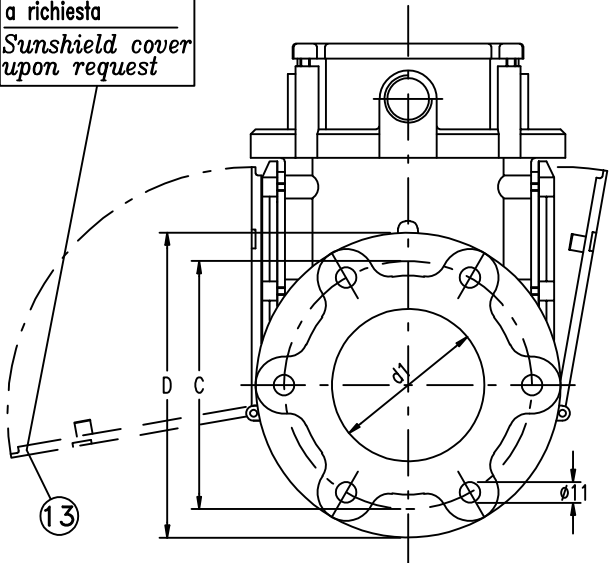
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**New relay  
EE25 (M.Y. 2020)**

Data 29/06/20  
Scala 1:4  
Dis.  
Visto

Dis. Nr  
**4721**

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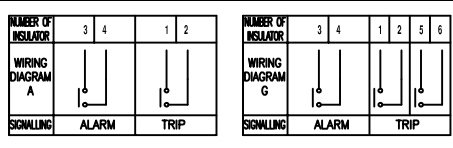
Protezione finestra a richiesta  
 Sunshield cover upon request



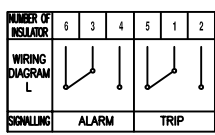
CONSERVATOR ← TRANSFORMER

Pos	Descrizione / Description
1	Finestra vetro per ispezione Glass inspection window
2	Rubinetto prelievo gas Gas release cock
3	Pulsante prova meccanica circuito Push button for checking circuit
4	Scatola morsetti Cable box
5	Adattatore M25/M20 Adaptor M25/M20
6	Direzione olio (da cassa verso conservatore) Oil flow direction (from tank to conservator)
7	Tappo scarico olio Oil drain plug
8	Valvola prova pneumatica Pneumatic test device
9	Morsetti segnale sgancio Trip terminals
10	Morsetti segnale allarme Alarm terminals
11	Rubinetto per prova con aria compressa Cock for air injection test
12	Tappo M25x1.5 Plug M25x1.5
13	Protezione finestra Window sunshield cover
15	Morsetto di terra Ground terminal
18	Opzionali Optionals

**STANDARD WIRING DIAGRAM**



Normally open contacts		
Voltage	Max current	Breaking capacity
24V d.c. to 240V d.c.	2A	250W L/R<40ms
up to 230V a.c.	2A	400VA cosφ>0.5



Change over contacts		
Voltage	Max current	Breaking capacity
24V d.c. to 240V d.c.	1A	130W L/R<40ms
up to 230V a.c.	1A	250VA cosφ>0.5

\* schema elettrico wiring diagram

Mod./Size	d1	A	D	C	B	Peso (Kg)
EE2-M *	51	288	140	110	180	≈ 4,5
EE3-M *	76	310	160	130	195	≈ 5

dim in mm.

La figura mostra il Relè EE3 Scala 1:4  
 The figure shows the relay EE3 Scale 1:4



Titolo  
 Gas actuated relay  
 type EE2/EE3

Data	12/03/13	Dis. Nr	3852
Scala	=====		
Dis.			
Visto		1	2

## 12. Accessories

### 12.1 Gas sampling device RG3.3

#### 12.1.1 General features

The body is made of aluminium alloy casting; in order to check gas and oil two large inspection windows made in trogamid (on request made in tempered glass and with sunshield), are fitted on either side of the casting.

Two petcock complete with hermeto joints are present for connection to relay and one pneumatic valve for test and another petcock draining oil complete the apparatus

#### 12.1.2 Installation

The Buchholz gas sampling device "RG3.3" must be fitted on the transformer tank, from the ground level, within handy height.

A copper tube size OD 8 mm / ID 6 mm (supplied upon request) shall be used to connect the "RG3" device from the cock "12" to the top of the Buchholz relay (cock R) and from the cock "15" to the drain cock (pos.T) located at the bottom of relay body. Special ermeto joints "14" are provided with each device (q.ty: 4/EA).

To fill up the RG3.3 device with oil open first the cocks "R" and "12". Now open cock "2" until oil has entirely filled up the device and then close it when filling up is completed; you can check oil level rising up inside the device through the inspection sight window located on the front side of the same.

After the gas sampling device RG3 has been oil filled the cock "R" top of the relay and "T" at the bottom of the body must be left in open position.

During the normal operation condition the gas sampling device, the Buchholz relay and the tubes which connect the two devices shall be oil filled.

#### 12.1.3 Operating instruction

##### 12.1.3.1 Gas sampling from the Buchholz relay

The RG3 device allows to perform three different functions:

- Sampling the gas off Buchholz relay and release the gas off system
- Test the circuits of Buchholz relay
- Draining oil off Buchholz relay

##### Gas sampling off Buchholz relay

1. Open cock "11" located underneath the RG3 to drain oil and await until the gas collected in the relay fills the device (you can observe this through the window).
2. Close the cocks "11" and "12" when the amount of gas needed for sampling is inside the RG3.

Now the gas formerly accumulated in the Buchholz relay, due to some electrical failures inside the transformer, may be drawn off for laboratory analysis or released by opening the cock "2".

##### 12.1.3.2 Checking of alarm circuits

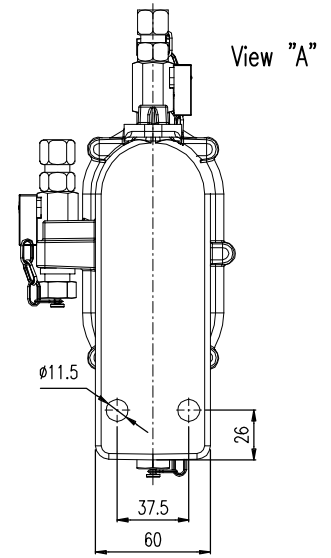
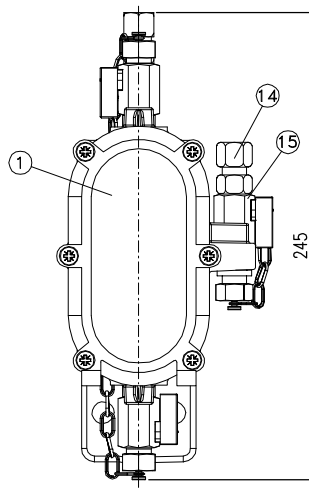
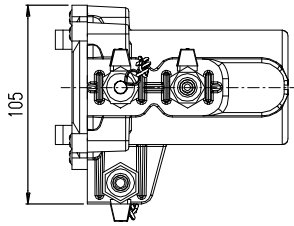
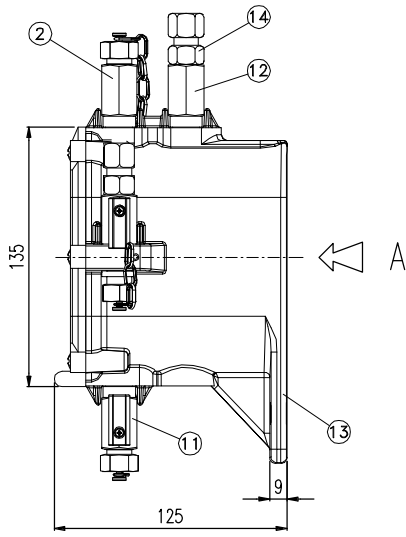
### Alarm test

1. Cock "R" top of relay cover shall be open.
2. Unscrew the protective cap of cock "2".
3. Connect a compressed air bottle, a pump for bicycle tires or our pneumatic test device (supplied upon request – view booklet enclosed in this manual) to the cock "2".
4. Open cock "2" and inject air inside RG3 slowly until you get ALARM contact operation.
5. Close cock "2"
6. **RESET TO OPERATION:** the testing medium inflated in the system must be fully released (i.e. until the RG3 is completely filled up again with oil) to reset the Buchholz relay to normal operating conditions: open cock "2" keeping a cloth top of cock until oil leaks out and then close the cock.

### 12.1.3.3 Checking trip circuits

#### Trip test

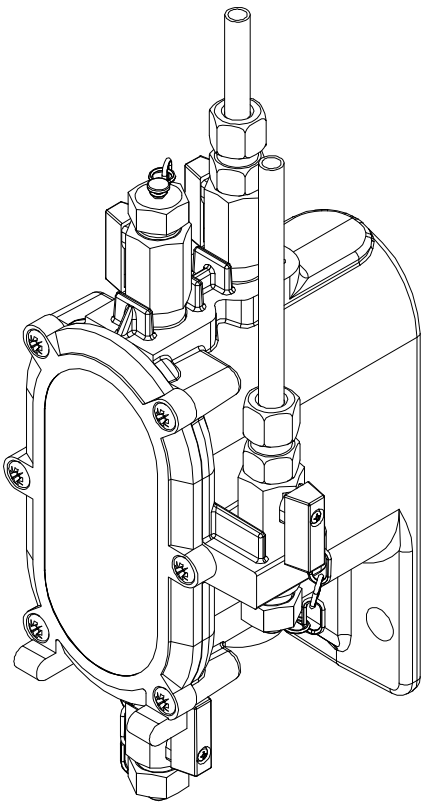
1. Cock "R" top of relay cover and "T" underneath the body shall be open.
2. Unscrew the protective cap of cock "15".
3. Connect a compressed air bottle, a pump for bicycle tires or our pneumatic test device (supplied upon request – view booklet enclosed in this manual) to the cock "15".
4. Open cock "15" and inject air inside RG3 until you get TRIP contact operation.
5. Close cock "15" where pneumatic test device is connected to.
6. **RESET TO OPERATION:** the testing medium inflated in the system must be fully released (i.e. until the RG3 is completely filled up again with oil) to reset the Buchholz relay to normal operating conditions: open cock "2" keeping a cloth top of cock until oil leaks out and then close the cock.



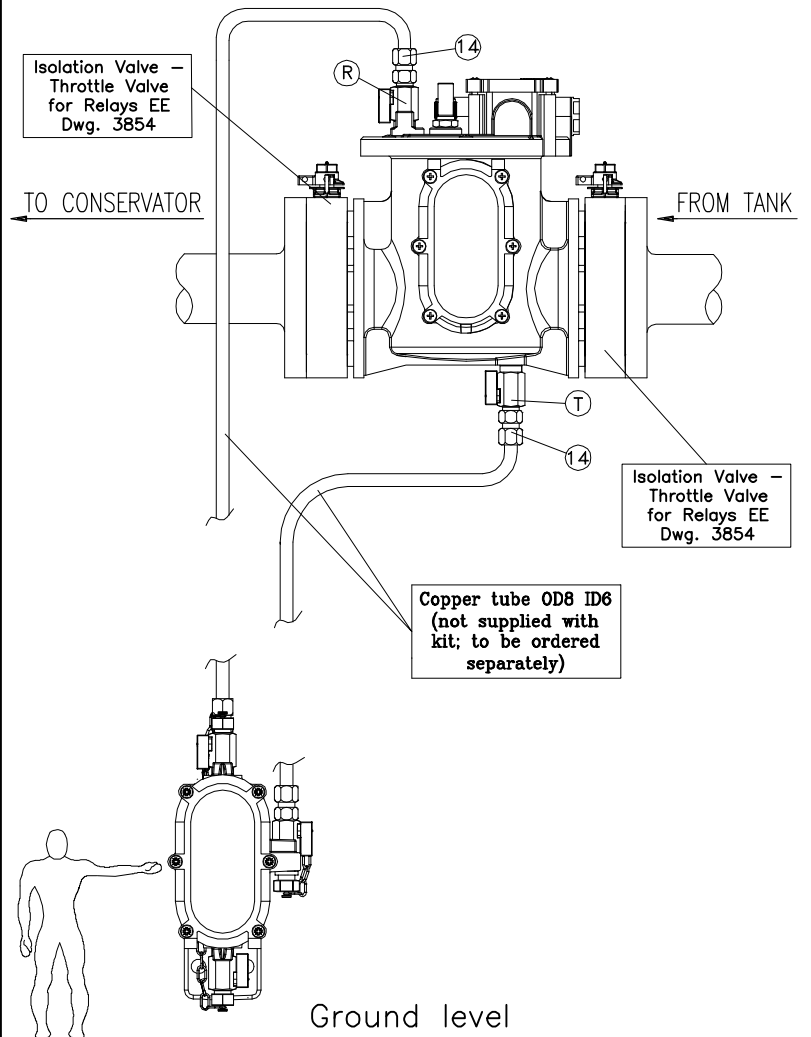
ORDERING CODES		
MODEL	WINDOW MATERIAL	CODE
RG3.3	TEMPERED GLASS	AB9DPG0171
RG3.3	TROGAMID	AB9DPG0101

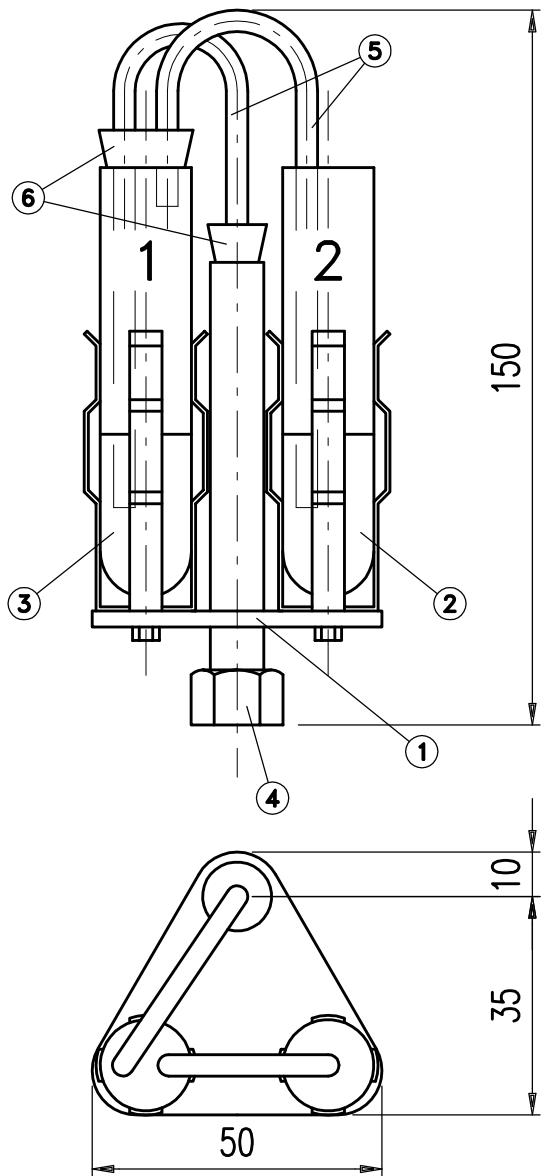
Pos	Description
1	Inspection window
2	Gas release cock
11	Oil drain cock
12	Stop cock
13	Fixing plate
14	Hermeto joint
15	Stop cock

Average weight : ~2.5 Kg



Mounting sketch





Pos	Descrizione/Description
1	Supporto Support
2	Provetta 2 Test probe 2
3	Provetta 1 Test probe 1
4	Ghiera 1/4"GF Revolving nut 1/4" BSP
5	Tubi vetro Glass tubes
6	Tappi in gomma silconica Rubber plugs

Schema di montaggio  
Mounting sketch

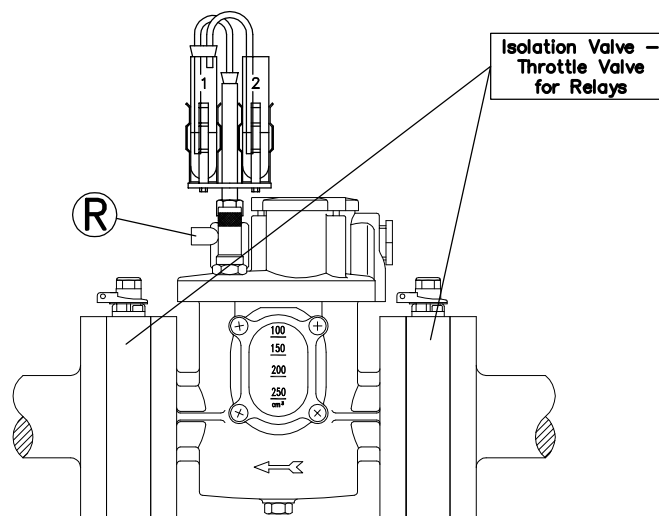


Fig. A: direttamente su rele'  
Fig. A: directly on relay

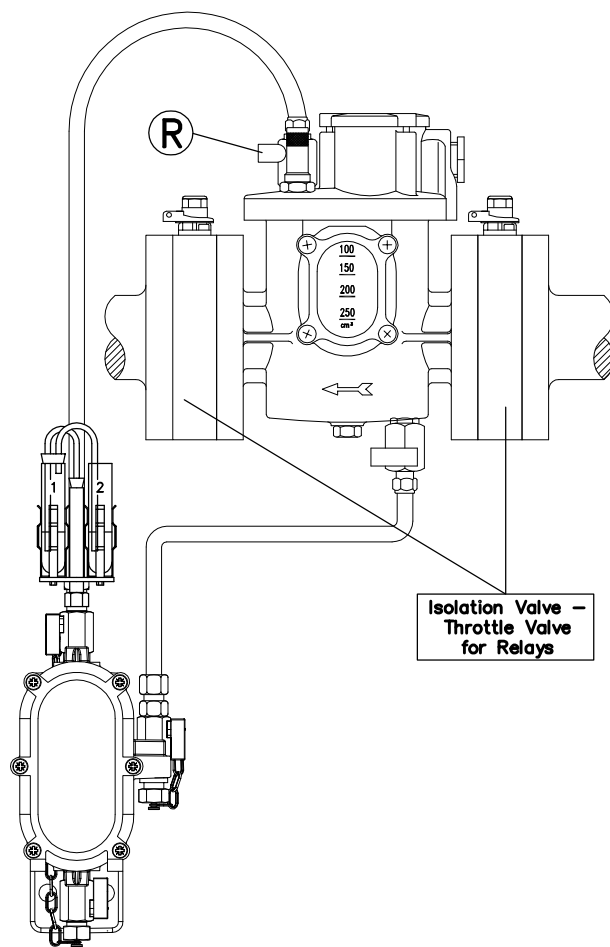
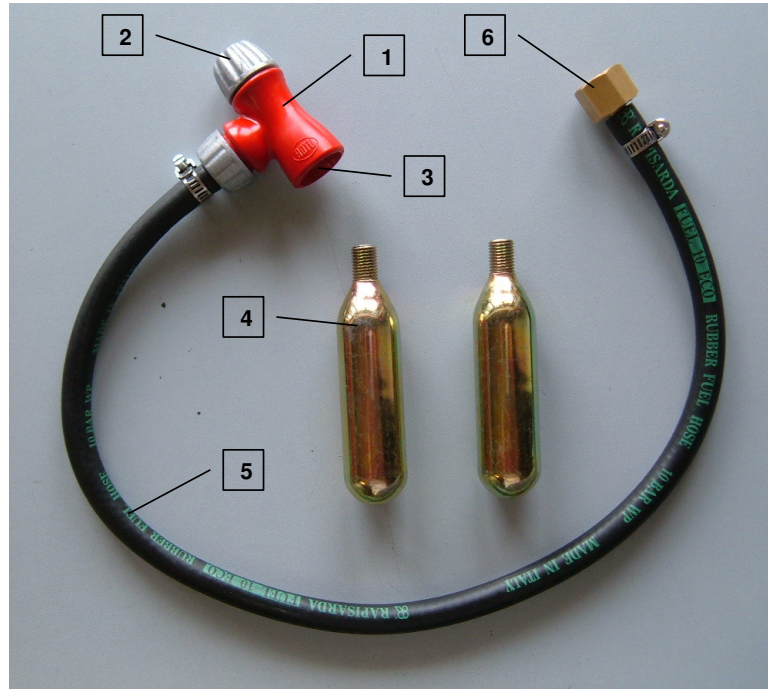


Fig B: con apparato RG3  
Fig. B: With RG3 apparatus

## Instruction booklet for the use of Buchholz relays testing device.



**Fig.1**

### CONTENT OF THE PACKAGING

- no.1 relay testing device
- no.2 16 g CO<sub>2</sub> cartridges

### DESCRIPTION (Fig. 1)

- 1. valve body (where to insert cartridges)
- 2. output cock
- 3. cartridge insertion
- 4. 16 g CO<sub>2</sub> cartridge
- 5. high pressure flexible tube
- 6. 1/4" G revolving screw joint

### ALARM TEST (for all models)

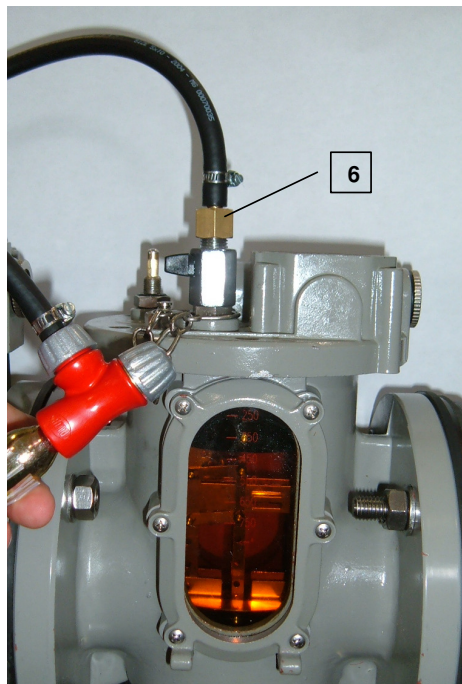
- a) Hold the valve body 1 and make sure that output cock 2 is shut (turn clockwise)
- b) Carefully screw the cartridge 4 on threaded hole 1/8" G (3) of the valve body till a slight resistance (strength) is perceived
- c) Than, to perforate it start quickly screwing the cartridge till it completely stops (*fig.2*)





**Fig.2**

- d) Make sure that vent cock on relay (fig. 3) is closed (black cock handle in horizontal position) before removing the protective plug
- e) Unscrew the protective plug of the vent cock and screw joint 6 on the same (fig.3)



**Fig.3**

- f) Open vent cock (black handle in vertical position)
- g) Hold the testing device by avoiding to touch cartridge 4 with hands (use a glove or a cloth)

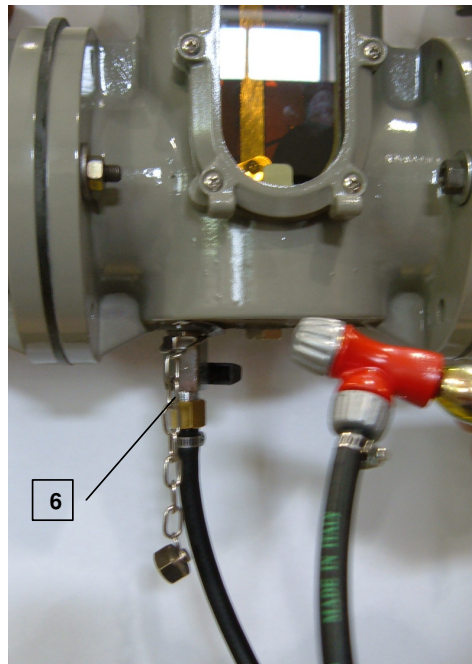
*Since the testing device is under pressure the sudden exit of CO<sub>2</sub> from the cartridge (gas expansion stage) make cool the metal outside surface of the cartridge.*

- h) Carefully open the output cock 2 of the testing device (turn it anti-clockwise) to check alarm is working properly. Then, from the inspection window of the relay, verify the progressive emptying of its upper part, and consequently, the corresponding oil level lowering . As soon as the alarm is operated, close completely the output cock 2 (turn it clockwise).

#### **TRIP TEST (only for EE models, English standard)**

EE models relays have a second cock on their lower part. Trip contact proper functioning can be tested by connecting the test device to this cock.

Make sure that the cock is shut (black handle in horizontal position), then remove the protective plug and screw at its place the joint 6 and re open the cock (black handle in vertical position). Quickly open output cock 2 (fig.3). When the sudden gas injection releases trip contact, close the output cock.



**Fig.3**

## REMOVAL OF TESTING DEVICE

- A) Close the vent cock (black cock handle on horizontal position) on which the device is connected (this will prevent oil leakage when joint 6 will be removed)
- B) Unscrew joint 6 from the vent cock
- C) Screw the protective plug (the one on the lower part of the relay) if it has previously been used
- D) Carefully open the upper vent cock to allow the exit of the gas inside the relay ; when the relay is full, the oil will start to flow out from the cock: shut the cock
- E) Screw the protective plug of the vent cock.

## NOTES

- F) In case of alarm test (partial emptying of of the relay ) the charge inside cartridge 4 doesn't run completely out, the cartridge can be re-used for further alarm tests. In this case, please keep the cartridge inside the testing device. The level of the charge can easily be verified by opening the output cock 2 till some gas comes out. To perform a new alarm test with the cartridge still on site, please start from point d) onwards. If the cartridge is exhausted: open the output cock to run completely out of the possible remaining charge, then unscrew cartridge 4 from its site and replace it starting from point a).
- G) In case of trip & alarm test (EE relays) the charge inside the cartridge is enough only for one test. To perform a new test of both contacts (trip & alarm) open the output cock 2 to run completely out the remaining charge, unscrew the cartridge and proceed from point a).