GAS ACTUATED RELAYS FOR OIL FILLED TRANSFORMERS
EN 50216-2
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 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 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. Special features
   2.1 Design of active part
   The active part of relay is designed in order to permit the free passage of the
   oil flow through the body, not any obstacle (except the flap that detects the oil
   flow rate) such as the floats or any other apparatus is present between the
   entry and the exit of the oil inside the relay.
   The lower and the upper floats are isolated from flux of oil thus unattended
   operation due to turbulence of oil are avoided.
   On demand, a special device permit, in case of oil surge, to hold the trip
   contact in his operated position making possible the relay be resettable only
   manually.

   2.2 Design of contacts
   The relays are provided with magnetic switches instead of the traditional
   mercury switches in which the high mobility of the mercury makes it necessary
   to fit expensive adjustments to avoid unattended closing of the contacts and
   the consequent mal-functioning of the relay, whenever this is subject to severe
   vibrations.
   Moreover, each contact is operated by 2 magnets displaced in a such way that
   make a constant magnetic field around the contact itself, in this way contact is
   is not influenced by external magnetic fields that are present on a transformer
3. Operating features

3.1 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.

3.2 Serious faults

3.2.1 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.

3.2.2 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.

3.2.3 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.

4. Construction feature, Finish and Accessories

4.1 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.

4.2 Accessories

On the cap of the relay are provided 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 gland entry size M25x1.5.

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

4.3 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 and screws and washer are in stainless steel; the protection degree of the device is IP 55. Therefore the device is suitable for outdoor installation in tropical climate and with industrial pollution.
5. Contacts

5.1 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.

5.2 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

5.3 Breaking and making capacity

<table>
<thead>
<tr>
<th>Normally Open Contacts</th>
<th>Voltage</th>
<th>Max Current</th>
<th>Breaking capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24V d.c. to 240V d.c.</td>
<td>2A</td>
<td>250W L/R&lt;40ms</td>
</tr>
<tr>
<td></td>
<td>230V a.c.</td>
<td>2A</td>
<td>400VA cosφ&gt;0,5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Change over Contacts</th>
<th>Voltage</th>
<th>Max Current</th>
<th>Breaking capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24V d.c. to 240V d.c.</td>
<td>1A</td>
<td>130W L/R&lt;40ms</td>
</tr>
<tr>
<td></td>
<td>230V a.c.</td>
<td>1A</td>
<td>250VA cosφ&gt;0,5</td>
</tr>
</tbody>
</table>

6. Wiring diagrams

6.1 Standard wiring diagrams
Standard wiring diagram available are:
Type “A” – 2 N/O contacts (1 for alarm; 1 for trip signalling)
Type “L” – 2 change-over contacts (1 for alarm; 1 for trip signalling)
Type “G” – 3 N/O contacts (1 for alarm; 2 for trip signalling)

6.2 Special wiring diagrams
Special wiring diagram are available on demand on relays NB 50 & 80 mm are
Type S2 - 1 changeover contacts for alarm and 1 changeover contact plus 1 N/O contact for trip
Type S3 - 1 changeover contacts plus 1 N/O contact for alarm and 1 changeover contact for trip
Type S4 - 4 contacts N/O; 2 for alarm and 2 for trip
Type R - 2 changeover contacts with a device which hold the trip contact in its position in case of oil surge operation; manual reset of the contact by pushing the test button on top of relay (same as TU system).
7. Service conditions

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

<table>
<thead>
<tr>
<th>K</th>
<th>Climatic conditions</th>
<th>4K2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>Special climatic conditions</td>
<td>4Z2+4Z4+4Z7</td>
</tr>
<tr>
<td>B</td>
<td>Biological conditions</td>
<td>4B1</td>
</tr>
<tr>
<td>C</td>
<td>Chemically active substances</td>
<td>4C2</td>
</tr>
<tr>
<td>S</td>
<td>Mechanically active substances</td>
<td>4S3</td>
</tr>
</tbody>
</table>

7.2 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/s², with type 1 spectrum

7.3 Protection degree
Protection degree of the terminal box is IP65 acc to EN60529

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

7.5 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

7.6 Insulating liquid
The relay is designed for operate with transformer oil with viscosity range from 1 mm²/s to 1100 mm²/s

7.7 Working temperature
The relay is suitable for operation in transformer oil over temperature range from minimum minus 25°C to plus 115 °C
The relay is suitable for operation in ambient air temperature range from minimum minus 45°C to plus 70 °C
Special execution are available on demand

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

8. Operational performance

8.1 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:

<table>
<thead>
<tr>
<th>Oil pipe connection internal diameter</th>
<th>Alarm for gas accumulation</th>
<th>Trip for steady oil flow</th>
<th>Trip for gas accumulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 mm</td>
<td>150±50 cm³</td>
<td>100±15 cm/s</td>
<td>after alarm contact is operated and before the oil reaches lowest point of pipe</td>
</tr>
<tr>
<td>50 mm</td>
<td>200±100 cm³</td>
<td>100±15 cm/s (standard)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>150±25 cm/s (upon request)</td>
<td></td>
</tr>
<tr>
<td>80 mm</td>
<td></td>
<td>200±35 cm/s (upon request)</td>
<td></td>
</tr>
</tbody>
</table>
9. Installation

9.1 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 same direction as the oil flow 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.

9.2 Setting to work

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

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.

9.3 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.
10. Check after actuation of relay

10.1 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, 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.

10.2 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.

11. Test of gas on site
It can be executed only if a gas analyser is available
12. Order instructions

When ordering a relay it is necessary to indicate (see table)
- Type
- Size
- Wiring diagram
- Oil flow rate
- Operating conditions
- Special requirements

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SIZE</th>
<th>WIRING DIAGRAM</th>
<th>OIL FLOW RATE</th>
<th>OPERATING CONDITIONS</th>
<th>CTRL CHAR</th>
<th>LEGENDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>EE</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>ET</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N</td>
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<tr>
<td>EU</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

| N   | STANDARD |
| X   | SPECIAL  |
| 5   | LOW TEMPERATURE |
| 7   | TROPICAL CONDITIONS |
| 6   | CORROSIVE AMBIENT |
| 0   | NORMAL AMBIENT |

| 2   | 100 cm/sec |
| 3   | 150 cm/sec |
| 4   | 200 cm/sec |

| A   | 2 N/O CONTACTS |
| L   | 2 SPDT CONTACTS |
| G   | 3 N/O CONTACTS |
| 2   | SPECIAL W.D. S2 |
| 3   | SPECIAL W.D. S3 |
| 4   | SPECIAL W.D. S4 |
| R   | 2 SPDT contacts with manual resetting |

Example:
To order nr 3 Buchholz relay type EB080 wiring diagram G; standard flow rate (100 cm/sec); tropical conditions please indicate the following:

Nr 1 Buchholz relay type EB080G27N
### 13. Part denomination of relay

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Part denomination</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inspection window</td>
<td>Trogamid</td>
</tr>
<tr>
<td>2</td>
<td>Gas release cock</td>
<td>Brass</td>
</tr>
<tr>
<td>3</td>
<td>Push button for checking electric circuits</td>
<td>Brass</td>
</tr>
<tr>
<td>4</td>
<td>Terminal box</td>
<td>Aluminium alloy</td>
</tr>
<tr>
<td>5</td>
<td>Cable gland entry M25x1.5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Oil flow direction (from tank to conservator)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Oil drain plug</td>
<td>Brass</td>
</tr>
<tr>
<td>8</td>
<td>Pneumatic test device</td>
<td>Brass</td>
</tr>
<tr>
<td>9</td>
<td>Trip terminals</td>
<td>Brass</td>
</tr>
<tr>
<td>10</td>
<td>Alarm terminals</td>
<td>Brass</td>
</tr>
<tr>
<td>12</td>
<td>Plug M25x1.5</td>
<td>Brass</td>
</tr>
<tr>
<td>13</td>
<td>Window sunshield cover</td>
<td>Aluminium</td>
</tr>
<tr>
<td>15</td>
<td>Earth screw</td>
<td>Brass</td>
</tr>
<tr>
<td>16</td>
<td>Cock for air injection test</td>
<td>Brass</td>
</tr>
</tbody>
</table>
STANDARD WIRING DIAGRAM

FLOAT AND SWITCHES DESIGN

WIRING DIAGRAM
A
N/O CONTACT N/O CONTACT

SIGNALLING ALARM TRIP
NUMBER OF ISOLATOR 3 4 1 2

WIRING DIAGRAM
L
CHANGEVER CONTACT CHANGEVER CONTACT

SIGNALLING ALARM TRIP
NUMBER OF ISOLATOR 6 3 4 5 1 2

WIRING DIAGRAM
G
N/O CONTACT N/O CONTACT N/O CONTACT

SIGNALLING ALARM TRIP
NUMBER OF ISOLATOR 5 4 1 2 5 6

SPECIAL WIRING DIAGRAM

FLOAT AND SWITCHES DESIGN

INSULATOR 6 4 3 7 6 3 4 8
SIGNALLING TRIP ALARM

WIRING DIAGRAM
S2
CHANGEVER CONTACT

SIGNALLING TRIP ALARM
NUMBER OF ISOLATOR 5 1 2 7 6 8 3 4

WIRING DIAGRAM
S3
CHANGEVER CONTACT

SIGNALLING TRIP ALARM
NUMBER OF ISOLATOR 8 3 4 5 1 2 7 6

WIRING DIAGRAM
S4
N/O CONTACT N/O CONTACT N/O CONTACT

SIGNALLING TRIP ALARM
NUMBER OF ISOLATOR 3 4 7 8 1 2 5 6

Wiring diagram
Float and switch design
The figure shows the relay EB025 Scale 1:4

<table>
<thead>
<tr>
<th>TYPE</th>
<th>EB025</th>
<th>TYPE</th>
<th>EE025</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>85</td>
<td>A</td>
<td>72</td>
</tr>
<tr>
<td>B</td>
<td>14</td>
<td>B</td>
<td>M10</td>
</tr>
<tr>
<td>C</td>
<td>115</td>
<td>C</td>
<td>76</td>
</tr>
<tr>
<td>L</td>
<td>200</td>
<td>L</td>
<td>127</td>
</tr>
<tr>
<td>S</td>
<td>18</td>
<td>S</td>
<td>12</td>
</tr>
<tr>
<td>WEIGHT Kg</td>
<td>1.70</td>
<td>WEIGHT Kg</td>
<td>1.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE</th>
<th>EU025</th>
<th>TYPE</th>
<th>ET024</th>
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</thead>
<tbody>
<tr>
<td>A</td>
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<td>A</td>
<td>75</td>
</tr>
<tr>
<td>B</td>
<td>14</td>
<td>B</td>
<td>11.5</td>
</tr>
<tr>
<td>C</td>
<td>115</td>
<td>C</td>
<td>100</td>
</tr>
<tr>
<td>L</td>
<td>140</td>
<td>L</td>
<td>140</td>
</tr>
<tr>
<td>S</td>
<td>15</td>
<td>S</td>
<td>11</td>
</tr>
<tr>
<td>WEIGHT Kg</td>
<td>1.60</td>
<td>WEIGHT Kg</td>
<td>1.50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE</th>
<th>EB024</th>
<th>TYPE</th>
<th>ET025</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>==</td>
<td>A</td>
<td>75</td>
</tr>
<tr>
<td>B</td>
<td>==</td>
<td>B</td>
<td>11.5</td>
</tr>
<tr>
<td>R</td>
<td>1 1/2&quot;G</td>
<td>C</td>
<td>100</td>
</tr>
<tr>
<td>L</td>
<td>185</td>
<td>L</td>
<td>160</td>
</tr>
<tr>
<td>S</td>
<td>16</td>
<td>S</td>
<td>11</td>
</tr>
<tr>
<td>WEIGHT Kg</td>
<td>1.40</td>
<td>WEIGHT Kg</td>
<td>1.50</td>
</tr>
</tbody>
</table>

Gas actuated relay NB 25   EN50216–2
$Z = \text{Nr of holes}$

| Tipo / Type | NB | A  | D  | C  | B  | s  | L  | $\alpha$ | d  | Z  | Peso (kg) |
|-------------|----|----|----|----|----|----|----|         |----|----|-----------|
| EB050       | 50 | 230| 165| 125| 160| 18 | 195| 45°      | 102| 4  | $\sim 4.60$ |
| EB079       | 80 | 285| 200| 160| 190| 18 | 195| 45°      | 138| 4  | $\sim 5.50$ |
| EB080       | 80 | 285| 200| 160| 190| 18 | 195| 22.5°    | 138| 8  | $\sim 5.50$ |
| ET050       | 50 | 185| 140| 110| 160| 13 | 183| 45°      | /  | 4  | $\sim 4.50$ |

dim in mm.

The figure shows the relay EB080 Scale 1:4

Gas actuated relay type EB    EN50216–2
Cas actuated relay type EE
EN500216-2

The figure shows the relay EE080 Scale 1:4

<table>
<thead>
<tr>
<th>Tipo</th>
<th>Type</th>
<th>NB</th>
<th>A</th>
<th>B</th>
<th>D</th>
<th>Peso (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE050</td>
<td>Type</td>
<td></td>
<td>50</td>
<td>270</td>
<td>160</td>
<td>140</td>
</tr>
<tr>
<td>EE080</td>
<td>Weight</td>
<td></td>
<td>80</td>
<td>300</td>
<td>190</td>
<td>160</td>
</tr>
</tbody>
</table>
Mounting Sketch

Conserver

Throttle Valve

Transformer

Max 5°

Cable entry arrangement

OIL FLOW DIRECTION
(from tank to conservator)

Plug M25x1.5

Cable Entry M25x1.5
Entry Adaptor
M25x1.5 TO M20x1.5
(supplied with the relay)

Cable Gland PG16
(on demand)

Entry Adaptor
M25x1.5 TO PG16
(on demand)

Cable Gland M25x1.5
(on demand)

Tank Side

Conservator Side

IMPORTANT NOTICE:
THIS SOLUTION OF CABLE ENTRY IS AVAILABLE ONLY FOR RELAY HAVING SIZE 050; 079; 080. RELAY HAVING SIZE 024 & 025 ONLY PG16 CABLE ENTRY IS AVAILABLE

Buchholz relay EN50216-2
14. Accessories

14.1 Gas sampling device RG3.2

14.1.1 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.

14.1.2 Installation
The Buchholz gas sampling device "RG3" must be fitted on the transformer tank, from the ground level, within handy height.
A copper tube (size 8 mm OD/ 6 mm ID) must be used to connect the “RG3.2” device, from the cock “12”, to the top of the Buchholz relay, cock “R”; for connecting the tube to the cocks, special unions “14” shall be used. If using RG3.3 a second copper tube has to be used for connecting cock “T” to cock “15”.
When the RG3 apparatus has been mounted cocks “R” and “T” have to remain open position
For filling the device with oil, open the cocks “R”; “T”; “15” and “12”, open the cock “2” and wait until oil has entirely filled the «RG3» device, then close cock “2” and “15”; oil level inside «RG3» may be controlled through the inspection windows located on the two sides.
In the normal operating conditions, the gas sampling device, the Buchholz relay and the connecting tube between them should be oil filled.
14.1.3 Operating instruction

14.1.3.1 Gas sampling from the Buchholz relay
Open oil drain cock "11" and watch through the «RG3» windows until gas is seen to have flown into the «RG3» device; then close "11".
Now, the gas, formerly accumulated inside the Buchholz relay due to some electrical failure inside the transformer, may be sampled for examination or released, by opening the cock "2".
The gas should be totally released (i.e. until the «RG3» is completely filled again with oil) to reset the Buchholz relay in normal operating conditions; in the case it is necessary to maintain the gas inside the «RG3», the shut-off cock "12" and "2" must be closed; cock "2" may be reopened for sampling the gas for examination, or for gas release.

14.1.3.2 Checking of alarm circuits
Cock "12" in open position.
Inject air inside «RG3.2» through the bottom valve "8" (after removing the knurled protecting cap), using a bottle of compressed air or a normal bicycle tyre pump, until the alarm signal (or signals) have been set in operation.
To reset the Buchholz relay in normal operating conditions, follow above instructions for gas sampling and release.

14.1.3.3 Checking trip circuits
Cock "12" in open position. Inject air inside «RG3.2» through the bottom valve "8" (after removing the knurled protecting cap), using a bottle of compressed air or a normal bicycle tyre pump, until the trip signal (or signals) have been set in operation.
To reset the Buchholz relay in normal operating conditions, follow above instructions for gas sampling and release.
If test is executed on Buchholz relay EE type (NB 50 or 80 mm) an RG3.3 is used and trip contact has to be checked as follows:
Cock "12" in closed position; cock "15" in open position. Inject air inside «RG3.3» through the bottom valve "8" (after removing the knurled protecting cap), using a bottle of compressed air or a normal bicycle tyre pump, until the trip signal (or signals) have been set in operation.
To reset the Buchholz relay in normal operating conditions, follow above instructions for gas sampling and release.
14.2 Throttle valves for buchholz relays

This kind of valves, metal to metal sealing, are used on power transformers with the scope to allow the disconnection of the Buchholz relay from the conservator or from the cover; they are preferred to the conventional gate valves for their compact overall dimensions in the direction of the oil flow. The throttle design and an accurate machining of all the components minimise the oil leakage from the throttle in close position, during the operations of disconnection of the relay with the transformer oil filled, it is necessary to put small containers on the ground to collect the small quantity of oil which flow out from the throttle; once the disconnection is terminated, blind flanges must be put on the throttle valves.

All these valves have bodies made in steel ASTM A105 zincplated, painted and carefully tooled; the design and the execution of the throttle ensures a good oil proof; once the throttle is closed, the oil losses are very small (< 5 cc/60" every 25mm of the nominal diameter of the throttle); the drive shaft can be locked by means of a small padlock in both the close/open positions, which are also indicated by a label; the sealing gaskets on the drive shaft can be easily changed, if necessary, as shown on the sketch in the drawings.

All those valves are supplied with flange NBR sealing gaskets.
14.3  Gas analyser for buchholz relays

If a gas analyser kit is available it is possible to have an idea of the cause that generated the gas by checking the precipitate inside the test tube of the gas analyser.

If gas is due only to oil decomposition, in the test tube 1 a white precipitate is formed which, exposed to the light, slowly turns brown.

Should, however, in the test tube "2" a black precipitate be formed, this means that the gases contain decomposition products of solid insulation, such as cotton, paper, wood and the like.

In such a case, a coil deficiency has taken place.

In the case the Buchholz relay operation is caused by air (first installation into work, total oil refilling, defect in the cooling system) there isn't any formation of precipitate inside the tubes.

After the sample of the gases has been drawn, the cock should be closed again, and the analyser housed in its container.
Gas draining device type RG3
THROTTLE VALVE
TYPE DN25 / DN50 / DN80
PROGRAMMA DI PRODUZIONE
Isolatori passanti BT/MT
Relé ad accumulo di gas
Indicatori livello olio
Essiccatori d’aria
Valvole a farfalla per radiatori e relè
Valvole di sovrapressione
Termometri con e senza contatti elettrici
Conmutatori di prese a vuoto
Muffole per entrata in cavo (BS2562)

PROGRAMMA DE PRODUCCIÓN
Pasatapas BT/AT
Relés Buchholz
Indicadores de nivel de aceite
Deshumedadores de aire
Valvulas mariposa para radiadores
Valvulas de subpresión
Termómetros con y sin contactos electricos
Conmutadores
Cajas de bornas AT (BS2562)

MANUFACTURING PROGRAM
LV and HV Transformer Bushings
Gas actuated Relays
Oil Level Gauges
Dehydrating Breathers
Radiator throttle valves
Pressure Relief Devices
Thermometers with/without electric contacts
Off-load Tap Changers
Cable boxes (BS2562)

PROGRAMME DE PRODUCTION
Traversée isolée BT/HT
Buchholz Relais
Indicateur de niveau d’huile
Assécheur d’air
Vannas a papillon pour radiateurs
Soupape de sureté
Thermomètres avec/sans contacts
Conmutateurs des prises
Bôite à cable MT (BS2562)

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