

# GAS ACTUATED RELAY (Buchholz Relay)

With Magnetic Reed Switch For Oil Filled Transformer

Size : 25, 50 and 80mm



## FEATURES

- Mounting dimensions and test parameters to DIN standard.
- Aluminium alloy housing.
- Functional test of alarm and trip contact possible even without filling the relay with oil.
- Unique internal design of housing prevents false air traps on top of the relay.
- Well designed internal layout gives clear view of colour of gas inside the relay through glass window for fault analysis.
- Bucket type float design with inherent ability to withstand vacuum treatment of transformers.
- Built in test facility for checking continuity of both alarm and trip circuits.
- Anti vibration mounting pads and magnetic switches gives high stability against mechanical shocks and vibrations.
- Normally open/normally closed/change over contacts.

**VIAT**

**INSTRUMENTS**

VI-08(R1)



## GENERAL

Power transformers are considered to be a highly reliable type of equipment, yet, in order to ensure the continuity of service that modern conditions demand, protective devices are required. The purpose of such devices is to disconnect faulty apparatus before large-scale damage is caused by a fault to the apparatus or to other connected apparatus. Such devices generally respond to a change in the current or pressure arising from the faults and are used for either signaling or tripping circuits.

Protective devices in the ideal case must be sensitive to all faults, simple in operation, robust for service and economically feasible. Considering liquid immersed transformers, a near ideal 'protective device' is available in the form of Gas and oil relay described here. The relay operates on the well known fact that almost every type of electrical fault in a 'liquid immersed transformers' gives rise to gas. This gas is collected in the body of the relay and is used in some way or other to cause the alarm or the tripping circuit to operate.

The principle of the gas and oil relay was first successfully demonstrated and utilized by "Buchholz" many years back. In a series of experiments carried out extensively in Germany it was provided that the relay is capable of bringing to light incipient fault thereby preventing further spreading of the fault and extensive damage and thus saving expensive and protracted repairs. So successful is the principle of this relay that despite the continued search for better protective devices in other electrical field the Gas and Oil relay is still on its own in providing protection against a variety of faults.

## WORKING

The function of a double element relay will be described here. During normal operation of a transformer the buchholz relay is completely filled with oil. Buoyancy and the moment due to counterweights keep the floats in their original top positions. In the event of some fault in the interior of the transformer tank, gas bubbles are produced which accumulate in the buchholz relay on the way to the conservator. In consequence, the oil level in the relay enclosure drops which in turn lowers the upper bucket.

This causes the magnetic switch to operate an alarm signal.

The lower bucket does not change its position, because when the gas reaches the upper inside wall of the pipe it can escape into the conservator. Hence, minor fault in the transformer tank will not trigger the lower switching assembly and will not trip the transformer.

In case the liquid continues to drop due to loss of oil, the lower bucket also goes down. In consequence, the lower switching system operates if the level of oil goes below the bottom level of the pipe connected to the relay. Alternately in the event the liquid flow exceeds a specific value the lower bucket is forced down, thus triggering the lower switching system to operate.

As the liquid flow rate decreases, or the level of the liquid rises, the bucket returns to its original position. The single element relay has only trip element. and it responds to only oil surges. The method of operation is similar to that described for double element relay. Single element relays are suitable for potential transformers and on load tap changers.

The single element oil surge relay has been specifically designed for use with on load tap change equipment and it will by pass normal amounts of gas which are generated by tap change operations and will only respond to oil surges and loss of oil.

## APPLICATIONS

Double element relays can be used in detecting minor or major faults in a transformer. The alarm element will operate, after a specified volume of gas has collected to give an alarm indication. Examples of incipient faults are :

- a) Broken down core bolt insulation.
- b) Shorted laminations.
- c) Bad contacts.
- d) Over-heating of part of windings.

The alarm element will also be operated in the event of oil leakage, or if air gets into the oil system.

The trip element will be operated by an oil surge in the event of more serious faults such as :

- a) Earth faults.
- b) Winding short circuits.
- c) Puncture of bushings.
- d) Short circuit between phases.

The trip element will also be operated if a rapid loss of oil occurs. Single element relays can be used to detect either incipient or major faults in oil filled potential transformers, reactors, capacitors etc. A special single element relay is available for the protection of on load tap change equipment.

## BASIC CHARACTERISTICS

The gas and oil relay provides protection against a number of internal faults and is also able to indicate in several cases the type of fault. This is possible because the gas collected in relay can, from its colour, odour and composition, indicate where the fault may be and what its nature is. By examining the gases collected it is possible to infer the nature of fault. Thus:

- a) If the gas is colourless and odourless or with only a faint odour of oil, the gas is air trapped in the oil or the insulation.
- b) If the gas is greyish white with sharp and penetrating odour and non inflammable it is due to overheated or faulty insulation.
- c) If the gas is yellowish in colour and inflammable it may be due to surface leakage on material like wood.
- d) If the gas is dark grey and inflammable it may be due to a flashover in oil or due to excessive overheating of the oil caused by a fault in the winding or the core.

On the operation of the alarm if investigation of the collected gas does not indicate a serious fault it is possible to leave the transformer in service till it is convenient to carry out a thorough inspection. This occurrence is possible on the newly commissioned transformer due to air trapped in the oil or the insulation. On repeated and frequent alarm signals the transformer should be taken out of service for thorough checkup.

## ELECTRICAL CONNECTION

To allow installation open the terminal box cover comprising of the name plate and the instruction sticker on the backside. Then pass the wire through one of the conduit screwings into the terminal box. The upper two studs are terminals for the alarm switching circuit and are denoted by A. Likewise, the lower two studs are terminals for the trip switching circuit and are denoted by T.

## INSTALLATION & MAINTENANCE

**Installation into pipeline :** For installing the relay into pipe line proceed as follows:

- See that the Buchholz Relay is positioned with the arrow pointing towards the conservator, the connection box is the Y plan (vertical) and the Test cock and air vent cock are at the top.
- Mount the Buchholz Relays as close as possible to the tank in the pipeline between transformer and conservator.
- Keep pipe bends as wide as possible. Avoid close bends.
- Make sure pipe ascends to the conservator at angle between two degrees to five degrees.
- See that the relay enclosure is not subjected to stress. If necessary, use expansion compensators.
- Ensure that the Test button key is in locked position during storage or loose transportation of the relay.
- Ensure that the test button remains in the Service position (remove spacer below knurled cap) before commissioning of the relay.

## Filling with Insulation Liquid :

To fill the Buchholz Relay, proceed as described below:

- Remove the protective nut from the air vent cock.
- Open the air vent cock to let air escape until insulation liquid emerges.
- Shut the air vent cock.
- Check liquid level in conservator.

## MAINTENANCE

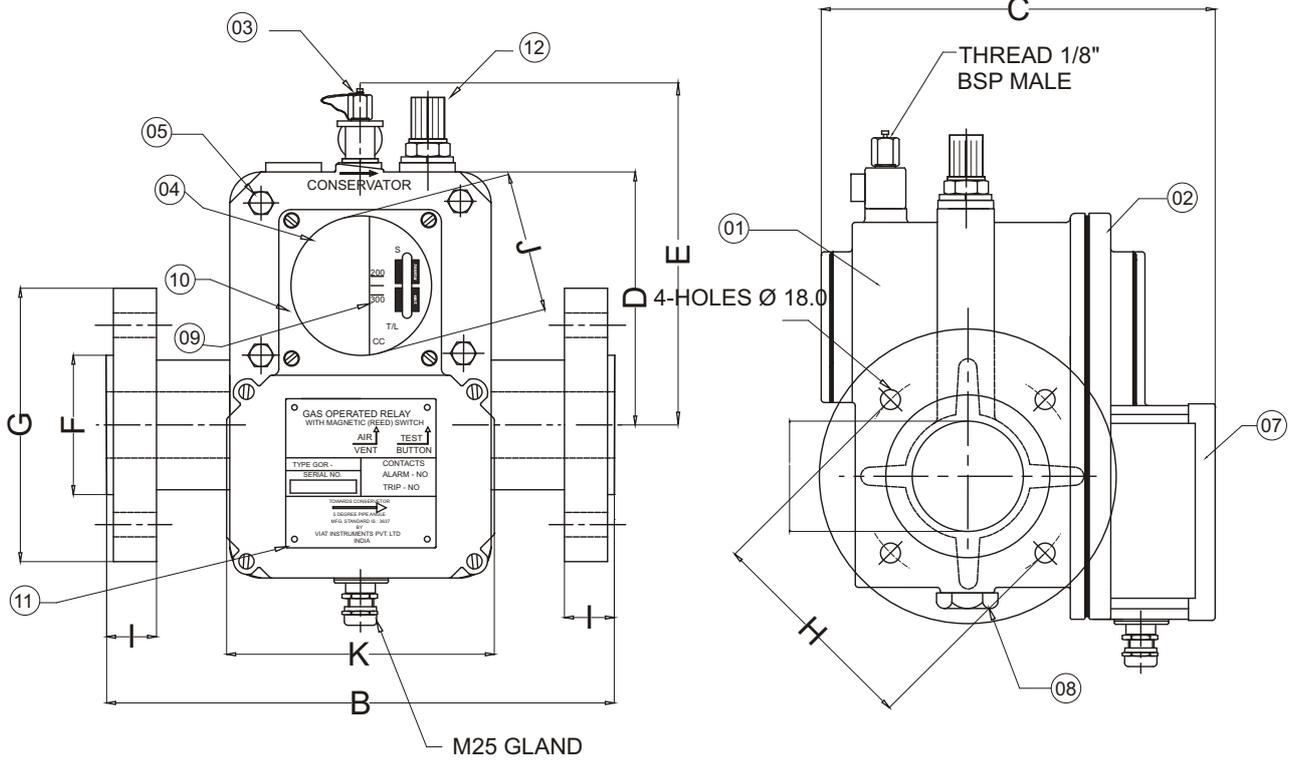
The Buchholz Relays are not sensitive to external influences. No servicing is needed during operation. On routine inspections of the protection equipment, test the function of the Buchholz Relay as described earlier and check the alarm and trip devices connected to them.

## FUNCTIONAL TEST

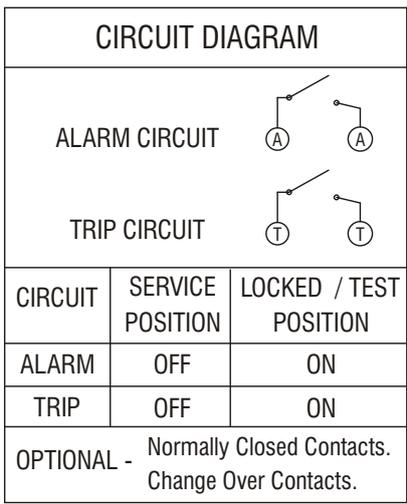
Unscrew the knurled cap which covers the push button for checking the continuity of alarm and trip contacts. Remove the small spacer which locks the alarm and trip floats when the relay is in transit. Push the test button down to check continuity of contacts. Release the test button to bring the contacts back to the normal open position. While checking the continuity ensure the relay is kept between 2° to 5° inclined position as in the pipeline of a transformer.

## TECHNICAL SPECIFICATION

Parameter	Size GOR-1M 25mm	Size GOR-2M 50mm	Size GOR-3M 80mm
Alarm for gas accumulation	100±50cc	200±100cc	200±100cc
Trip for steady oil flow	100±15cm/sec	100±15cm/sec or 150±25cm/sec optional	100±15cm/sec or 150±25cm/sec optional
High voltage test	2000V at 50 Hz. for 1 minute		
Porosity test	No leakage with air at 3kg/cm		
Current rating of switch	2 Amps at 230V AC / DC. Max load AC - 400V A DC - 250V A		
Vibration sensitivity	6g in all three axis		
Type of contacts	Normally open type/Normally closed/change over		
Housing strength	250Kpa for 2 minutes		
Magnet used	Rare earth.		
Paint finish	80-100 microns electrostatic powder coated		
Mounting position	2° to 5° ascending towards conservator		
Ambient temperature	-40 to +80°C		
Working temperature in oil	-25°C to +115°C viscosity 1mm <sup>2</sup> /sec to 1100mm <sup>2</sup> /sec		
Protection degree	IP 65		



MODEL	SIZE / NOM. PIPE BORE 'A'	ALL DIMENSIONS ARE IN MM.										MOUNTING HOLE	APPROX Wt. in (Kgs)
		B	C	D	E	F	G	H PCD	I	J	K		
GOR - 1MA	Ø25	200	196	140	195	Ø68	Ø115	85	16	Ø52	125	4 HOLES Ø14	< 2 KG.
GOR - 2MA	Ø50	195	187	130	195	Ø102	Ø165	125	18	Ø52	125	4 HOLES Ø18	< 5 KG.
GOR - 3MA	Ø80	195	207	130	195	Ø138	Ø200	160	18	Ø52	125	4 HOLES Ø14 OR 8 HOLES Ø18	< 7 KG.



**Parts List**

SL. NO.	DESCRIPTION	MATERIAL
01	BODY	AL. ALLOY
02	B/R LID	AL. ALLOY
03	BALL VALVE	BRASS
04	WINDOW GLASS	TOUGHENED GLASS
05	HARDWARE ITEM FOR ASSEMBLY	BRASS & SS.
07	TERMINAL COVER	AL. ALLOY
08	DRAIN PLUG	STEEL
09	MEASURING SCALE	AL.
10	WINDOW GLASS COVER	AL. ALLOY
11	NAMEPLATE	BRASS NICKEL PLATED
12	TEST BUTTON	BRASS

Due to our policy of continuous product improvement, dimensions and designs are subject to change.



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