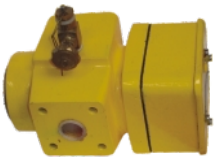
BUCHHOLZ RELAY (Gas & Oil Operated)
With Magnetic Switches
Size 25 mm, 50 mm & 80 mm

Allow us to protect your Transformers
from faults and maloperation.
Change to Buchholz Relays with Magnetic Switches

Buchholz Relay with Mercury Switches

- Uses mercury in switches which is toxic and also a carcinogen substance. Mercury is now prohibited in most parts of the world.
- Relays with mercury switches are not accepted internationally by utilities and OEMs in most countries of the world.
- May maloperate in one or more of the following conditions :
  a. External shocks to a transformer resulting in vibration.
  b. Turbulence of oil due to starting of pump in forced cooled transformer.
  c. Variation in angle of mounting of the Relay.
  d. Earthquake of minor intensity.
- Huge variation in gas volume and surge velocity readings from one relay to another.
- Mercury susceptible to oxidations resulting in no/false signal upon prolonged use.
- Switch activated by flow of mercury.
- Un-branded locally made mercury switches prone to rejections in incoming, process and final inspection as well as transit.



Buchholz Relay with Magnetic Switches

- No use of mercury.
- Worldwide acceptance.
  a. Immune to such vibrations.
  b. Highly stable and resistant and will not operate due to oil pump operation.
  c. Immune to variations of angle as experienced in transformer mounting.
  d. Vibration proof to 6g accelerations.
- Consistent readings of gas volume and surge velocity.
- No affect of ageing.
- Switch activated by a magnet.
- Branded switches imported from USA/Japan are free from rejection in all stages.

FEATURES

- Castings treated against porosity through a special process.
- 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 a toughened 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 give high stability against mechanical shocks and vibrations.
- ATVUS relays are approved by most of the consultants, Power Projects and Electricity Boards in India.

ATVUS®

IN SERVICE TO THE TRANSFORMER INDUSTRY SINCE 1971

BSI REGISTERED UKAS QUALITY MANAGEMENT 003

ISO 9001:2000

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 the 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 electric fault in a 'liquid immersed transformer' 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 proved 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 fields 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 t he moment due t o 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 (which is continuously adjustable, by means of a flap) 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 lap 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-downcore bolt insulation

(b) Shorted laminations

(c) Bad contacts

(d) Ove rheating of part of windings

The alarm element will also operate 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 (fuller board etc.)

(c) If the gas is Yellowish in colour and inflammable it maybe 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 a 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.

FUNCTIONAL TEST & ELECTRICAL CONNECTION

Testing the relay Function with the Test Key : A test system is provided in the Buchholz relay that allows the functional test of the upper and lower switching system.

To test the relay function loosen the nut on the Test Key and rotate the key with a screwdriver in the anticlockwise direction till the SLOT on the Test Key points towards the T/L position. Both the alarm (upper switching system) and Trip (lower switching system) will show continuity.

On bringing the SLOT on the Test Key to S (service) position by rotating the key clockwise the Alarm and Trip circuits will not show continuity. The circuits will be actuated to 'ON' position only when there will a fault in the transformer.

Repeat the functional test each time a relay is started or maintenance completed.

Testing the relay function with the Test Pump : Screw the test pump to the test cock.

Open the test cock and pump air gently into the Buchholz relay until the upper switching system operates.

For operating the lower switching system air has to be pumped suddenly with a jerk which will in turn operate the lower switching system. The Trip element may not operate with a cycle pump.

Electrical Connection : To allow installation of the 'single wire' 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 three 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

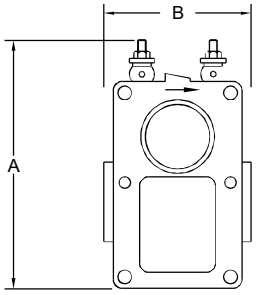
Installation into pipeline : For installing the relay into pipe-line proceed as follows :

- 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. (1.7) and air vent cock (1.8) 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 three degrees to seven degrees.
- See that the relay enclosure is not subjected to stress. If necessary, use expansion compensators.
- Ensure that the slot on the Test Key remains in the T/L (Test/Locking) position during storage or loose transportation of the relay.
- Ensure that the slot on the Test Key remains in the 'S' (Service) position and the Test Key Bolt is Tightened just before commissioning of the relay.

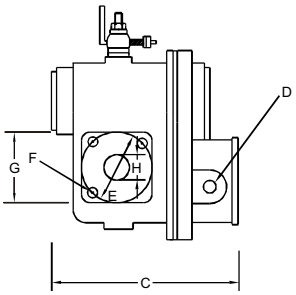
Filling with Insulation Liquid : To fill the Buchholz relay, proceed as described below:

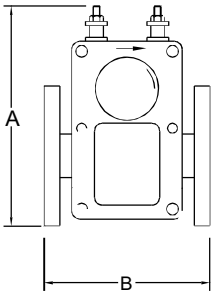
- Remove the protective nut from the air vent cock.
- Open the air vent cock to let air escape until insulation liquid emerges.
- Shut the air vent cock.
- Check liquid level in conservator.

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.

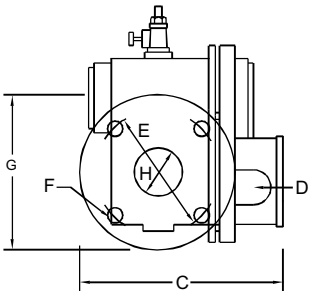


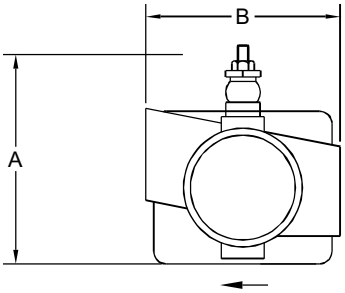
RELAY TYPE
GOR 1M



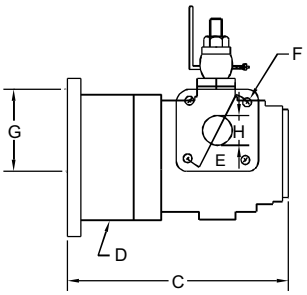


RELAY TYPE
GOR 2M & 3M





RELAY TYPE
OSR 1M



RELAY TYPE			GOR 1M	GOR 2M	GOR 3M	OSR 1M
No.Of Switching Systems			2	2	2	1
Transformer Rating (MVA)			below 1	1 to 10	above 10	OLTC
Main Dimensions (mm)		A	250	250	270	170
		B	128	184 or 215	215	119
		C	205	205	220	200
		D	1"Conduit	1" Conduit	1" Conduit	3/4" Conduit
Flange Dimensions (mm)	P.C.D.	E	72	115	145	72
	Holes /Thread	F	M 10	18	18	M 10
	Flange Dia.	G	78 square	150	185	78square
Pipe Bore (mm)		H	25	50	80	25
Surge Test(TRIP)(cm/s)	IS 3637, Clause 7.6		70 to130	75 to140	90 to160	45to60
Gas Volume(ALARM)(cc)	IS 3637, Clause 7.5		90 to165	175 to225	200 to300	N.A.
Velocity Test(cm/s)	IS 3637, Clause 7.8		70 to130	75 to140	90 to160	45to60
Element Test	IS 3637, Clause 7.4		With oil, at 1.4Kg/cm ^{2} for 15 minutes			
High Voltage Test	IS 3637, Clause 7.3		2000 V at 50 Hz for 1 minute			
Insulation Resistance Test	IS 3637, Clause 7.3		Greater than 10 megaohms with 500 V meggar			
Porosity Test	IS 3637, Clause 7.2		With oil, at 1.5Kg/cm^2 for 4 hours			
Mechanical Strength Test	IS 3637, Clause 7.7		With oil, at 8 Kg/cm^2 for 1 minute			
Current Rating of Switch	IS 3637, Clause 3.3		3 Amps at 240V AC/DC Max Load AC : 400W DC : 250VA			
Resistance of The Switch	IS 3637, Clause 3.3		Not to exceed 0.1ohm across the electrodes of magnetic switch			
Vibration Sensitivity			Acceleration 6g. Frequency 3 to 35 MHz across all 3 axis			

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

ATVUS® INDUSTRIES

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