OPERATING INSTRUCTIONS
FOR MAINTENANCE-FREE DEHYDRATING BREATHERS
MRZ-AB2.0
FOR TRANSFORMERS WITH CONSERVATORS



1.1 Purpose of the instructions

These instructions are intended to familiarize the user with the operation of an air breather used in power transformers.

1.2 Scope of application

These instructions apply to users of transformers equipped with breathers.

1.3 Size of the maintenance-free breather

For power transformers, 3-litre breathers are used. They can be fitted to tap changers and power transformers.

Type	Installation location	Oil volume	Silica gel mass	Used in transformers
AB2.0	OLTC (on-load tap changer)	2-20	2.4 kg (3 litres)	Tap changer and transformer rated up to 25 MVA

2. Operation

2.1 Intended use

The purpose of the air breather is to absorb moisture from the air entering the conservator. The oil level in the transformer conservator is not constant, as it changes with ambient temperature and transformer load. When the oil level rises as the temperature increases, air is expelled from the conservator. Conversely, when the oil level falls as the temperature decreases, air is drawn into the conservator.
Moist air drawn into the conservator is absorbed very intensively by the heated oil. This reduces the oil's insulating properties and, consequently, the dielectric strength of the transformer's insulation system, potentially resulting in transformer damage. In conservators with a rubber diaphragm, moisture condensing on the surface where the diaphragm contacts the air can accumulate in an uncontrolled quantity. The water collected in this way may damage the diaphragm and suddenly enter the oil, which may result in transformer damage. To prevent unrestricted air exchange between the conservator and the surroundings, a component known as an air breather is installed in the air path.

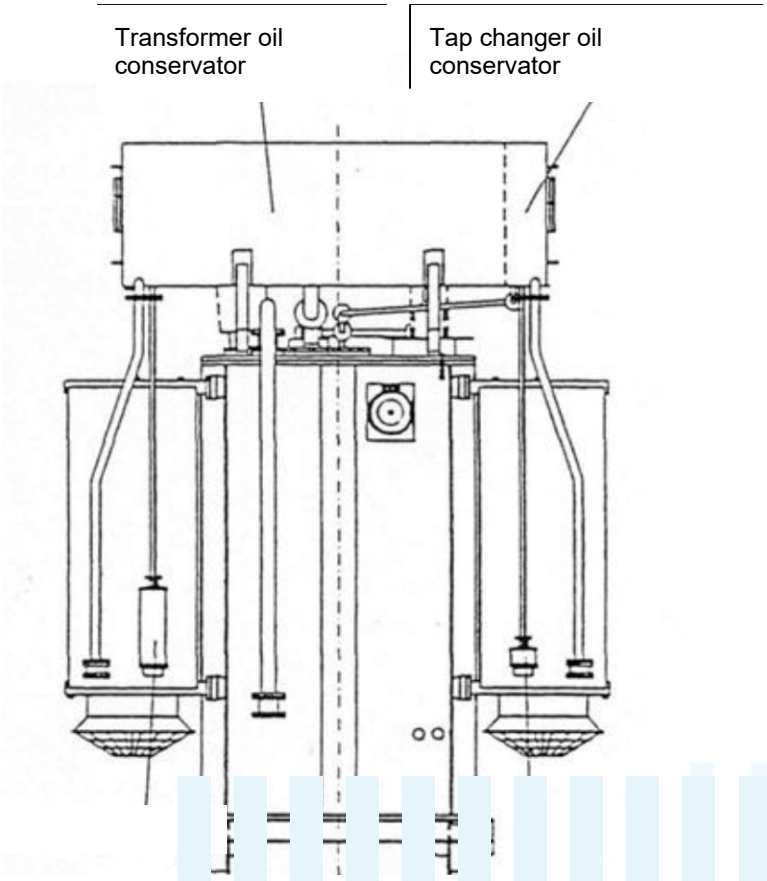


Fig. 1 Location of breathers on the transformer

2.2 Construction

The air breather consists of:

a) a cylinder,
b) upper and lower aluminium covers,
c) a humidity and temperature controller,
d) a mesh installed inside the glass cylinder,
e) a flange enabling connection to the pipes routed from the conservator,
f) rubber seals located:
- at the top, between the cover and the cylinder,
- at the bottom, between the cylinder and the base.

The principal part of the breather is the cylinder, inside which a tube made of dense mesh is installed. A heating element is located inside the cylinder. The cylinder is mounted between the upper and lower aluminium covers. Rubber seals are fitted between the cylinder and the covers. The entire assembly is fastened with screws. The temperature and humidity controller is mounted on the side of the breather.

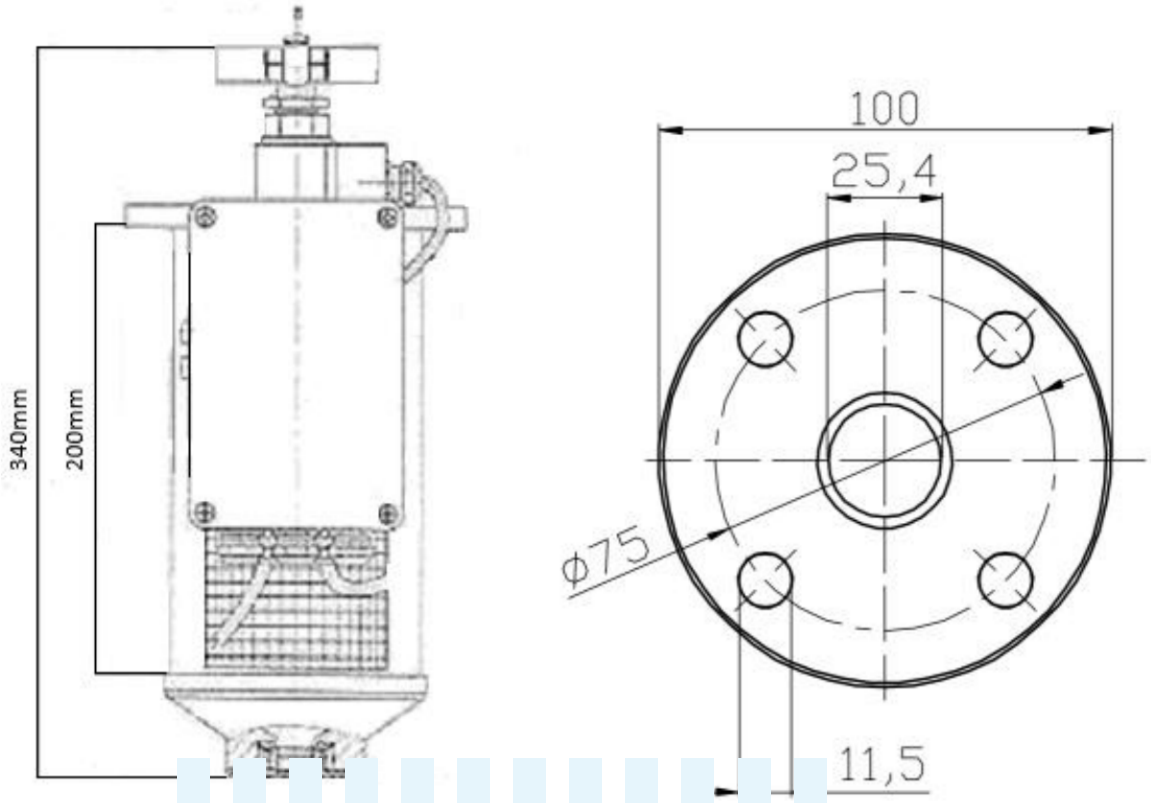


Fig. 2 View of the breather and mounting flange

2.3 Silica gel and its regeneration

Silica gel is a silicon dioxide gel that has undergone annealing and drying. It is used in transformers as a moisture absorber. Regeneration of damp gel consists of simply drying it at a suitable temperature for a sufficient period until it regains its original properties.
The drying temperature should be increased gradually and must not exceed 150°C, as this may destroy the gel or eliminate its regenerative properties.
Once completely dry, the gel may be reused.
In maintenance-free breathers, the regeneration process is carried out automatically.

2.4 Filling the breather with silica gel

The breather is supplied with silica gel.
If the gel needs to be replaced, proceed as follows:

a) disconnect the breather from the pipe connecting it to the conservator,
b) unscrew and remove the upper breather cover together with the connection flange,
c) remove the cylinder,
e) pour out the silica gel,
f) refit the cylinder,
g) fill the breather with new silica gel,
h) reassemble the breather in the reverse order of disassembly.

2.5 Operation

When the oil volume decreases as its temperature falls, air from the surrounding atmosphere flows to the conservator through the breather. The air enters the breather from below through a dust-retaining filter mesh. After passing through the filter, it meets the silica-gel bed, which absorbs the moisture it contains. The now-dry air travels through the pipe to the conservator and occupies the space vacated by the oil. The parameters of the air leaving the upper part of the breather are monitored by a sensor installed in the upper cover.
If the parameters of the outgoing air deteriorate, indicating that the silica gel is exhausted, the heaters installed inside the breather are switched on automatically to regenerate the silica gel.
After regeneration, heater operation is programmatically inhibited for a period so that the heaters cannot restart immediately after the regeneration process has finished.

2.6 Heater control

A humidity and temperature controller is used to control the heater.
In the breathers, the condition of the air leaving the breather is monitored by the humidity controller. When the outgoing-air parameters deteriorate below 50% humidity, the heaters in the breather are switched on automatically.
The operating time is factory-set to 70 minutes.
To prevent another drying cycle from starting while the silica gel is cooling, the controller's dead time can be set from 1 to 14 days. The recommended period is 1 day, and this is the factory setting.

2.7 Meaning of indicator lights and buttons



a) LED indicator functions

LED (designation)	Description
■ 1 ■ 2 ■ 3	Indicates activation of outputs P1/SSR1, P2/SSR2, P3/SSR3
■ %RH ■ °C	Measurement-unit indicators: green on = %RH; off = g/m3; red = °C

CAUTION:
Illumination of indicator 1 means that the silica-gel regeneration process in the breather has started.

b) Button functions in the parameter configuration menu and quick-access menu

Button	Description [and notation used in these instructions]
	**[SET]:** - select the displayed item in the configuration menu (enter a lower level) - edit the selected parameter (the displayed value starts flashing) - confirm and save the edited parameter value
	**[UP] or [DOWN]:** - move to the next or previous parameter (submenu) - change the value of the parameter being edited
 or 	**[UP] and [DOWN] (simultaneously) or [F]:** - return to the previous menu (one level up) - cancel changes to the edited value (stop flashing) - return to measurement display mode (only [UP] and [DOWN], held for more than 0.5 s)

2.8 Technical data of the controller

Probe measuring range		0-100% RH
Measurement accuracy	Humidity	±3% RH over 20-80% RH ±3-5% RH over the remaining range
Additional errors	Hysteresis	±1% RH
	Stability	<0.5% RH/year
Measurement resolution		Programmable: 0.1% RH

2.9 Settings

The humidity controller is factory-set and starts automatically when power is applied.
The following parameters have been set in the controller:
1. Humidity setpoint at which the heater providing automatic silica-gel regeneration is switched on automatically: 50% RH
2. Heater operating time: 70 minutes
3. Dead time: 1 day
The breather is programmed with a system that regenerates it when air flows out of the conservator. This solution prevents moist air from entering the conservator during regeneration.
To ensure that the temperature in the breather stabilizes completely after regeneration, the response to humidity changes is disabled for 1 day.
After this period the breather is ready for operation again; if the preset humidity is exceeded, regeneration restarts.
The controller is not sensitive to sudden parameter changes because electronic averaging circuits are used.
To avoid frequent controller switching, the contacts are set with a hysteresis of 10% RH.

2.10 Viewing and programming parameters

If the factory settings need to be changed, the breather operation can be adapted to the user's requirements. To do this, enter the controller settings.
All controller configuration parameters are stored in non-volatile (permanent) internal memory.
Using the membrane keypad on the front panel of the device:
- from measurement display mode, enter the configuration menu (press [UP] and [DOWN] simultaneously for longer than 1 s). If parameter 45: Prt = on (password protection enabled), the display shows Cod followed by 000 with the first digit flashing. Enter the access password using [UP] or [DOWN] (factory setting, parameter 44: PAS = 111). Use [SET] to move to successive positions and confirm the code;
- after entering the main configuration menu (message CnF), the main display shows the mnemonic name of the submenu (parameter groups: chH <-> chL <-> ot1 <-> etc.);
- use [UP] or [DOWN] to move to the required submenu and confirm the selection with [SET] (the parameter name is now shown on the upper display and its value on the lower display);
- [UP] moves to the next parameter and [DOWN] to the previous parameter (e.g. dPH <-> dtH <-> FLH <-> etc.);
- to change the current parameter value, briefly press [SET] (the display flashes in edit mode);
- use [UP] or [DOWN] to change the value of the edited parameter;
- confirm the changed parameter value with [SET], or cancel with [F] or by briefly pressing [UP] and [DOWN] simultaneously. Pressing [UP] and [DOWN] or [F] again returns to the main configuration menu (one level up);
- exit configuration by holding [UP] and [DOWN] or waiting approximately 2 minutes.

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CAUTION:
The maintenance-free breather is ready for operation; only the supply voltage needs to be applied. Changing the breather operating parameters without thoroughly reviewing these instructions and the operating conditions may cause incorrect operation or damage, for which the manufacturer accepts no responsibility.