Eskom	Standard	Technology

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1. Introduction

Each transformer and reactor fitted with an air-cell shall be provided with a bag leak detector. The function of the bag leak detector is to detect a leaking air bag or leaking conservator tank above the oil level. The abnormality will be detected by this detector and an alarm will be signalled to the control panel of the respective transformer or reactor. A contact will provide an alarm signal that the bag leak detector has operated to alert maintenance staff.

2. Supporting clauses

2.1 Scope

This specification covers the technical requirements for the selection and purchase of bag leak detector relays fitted to Transformers and Reactors. The purpose of this document is to ensure that the requirements of these relays are standardised within Eskom during the procurement stage.

This document shall be used as a minimum requirement for the purchase and selection of bag leak detector relays fitted to transformers and reactors.

- Bag leak detector relays fitted to new Transformers and Reactors
- Bag leak detector relays fitted to in-service Transformers and Reactors
- Bag leak detector relays purchased as Spare Parts

2.1.1 Purpose

This document was produced to record the standardized requirements that shall be applied across-divisional Transmission, Generation and Distribution.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions.

2.2 Normative/informative references

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] ISO 9001, Quality Management Systems.

2.2.2 Informative

None

2.3 Definitions

2.3.1 General

None

2.3.2 Disclosure classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

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2.4 Abbreviations

Abbreviation	Description
°C	Degrees Celsius
ID	Internal diameter
kV	Kilo volts
L	Litres
mm	Millimetre
mm/s	Millimetre per second
MVA	Mega Volt Ampere
OD	Outside diameter
PCD	Pitch circle diameter
UV	Ultra violet

2.5 Roles and responsibilities

Not applicable.

2.6 Process for monitoring

Not applicable.

2.7 Related/supporting documents

Not applicable.

3. Requirements

3.1 General

The leak detector shall be installed on the conservator tank at a point 100 mm below the top.

The bag leak detector shall not operate under natural expansion and contraction caused by temperature change, vibration, mechanical shock or surges.

The detector shall be fitted with a float arrangement that will operate if air is collected because of a bag failure or leak on the conservator tank. The leak detector shall be fitted with windows for visual inspection of float level and oil/air trapped. No covers are allowed on the windows.

Note: Liquid sensor type detectors are not acceptable as it does not allow visual oil level indication.

The relay shall withstand the internal pressure of 100 kPa and full vacuum at sea level without damage. Expected design life of the bag leak detector relay shall match the design life of a transformer, at least 40 years.

3.2 Environmental Conditions

Outdoor installation

Altitude above sea level – 1800 m

Ambient temperatures

- Maximum + 40°C

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- Monthly average + 28°C
- Yearly average + 25°C
- Minimum – 10°C

Average relative humidity 90%

Solar radiation 2500 W/m²

Atmospheric UV radiation - High

Seismic conditions at a maximum of 3g

Pollution level – High marine and industrial (C5)

3.3 Corrosion Protection

Corrosion shall be eliminated using non-corrodible materials, and by avoiding the contact of dissimilar metals. Where cast components are used, they shall be of high quality and non-porous castings. Bare metal or aluminium castings shall be epoxy powder coated (exterior grade) or anodised.

Corrosion protection used shall be suitable for use in high marine and industrial polluted environments with a C5 classification.

Fasteners used shall be metric hexagon or Allen key type. All fasteners shall be stainless steel – grade 304 is acceptable. Electro galvanising or electro plating of parts and fasteners is not acceptable.

Adequate lubrication shall be applied to all threaded areas of bolts, studs, and screws. Any good quality high temperature grease may be used.

3.4 Alarm and Tripping Contacts

One normally open contact shall be provided for alarm signalling. Only reed type switches approved by Eskom shall be used. Mercury switches are not acceptable. Contacts shall be pre-set and rated for 1 A at 220 V DC.

The device's electrical circuits shall withstand an applied voltage of 2 kV DC for 60 seconds, applied in turn, between electrically independent circuits and the casing of the device, and between the separate independent electrical circuits. The open contact shall withstand an applied voltage of 2 kV DC for 60 seconds.

3.5 Alarm Signalling

Alarm signalling shall be with accumulation of 450 ± 100 cm^3 gas.

3.6 Relay Stability

The equipment shall withstand the effects of vibration, earth tremors and blasting and shall comply with IEC 255-21-3.

The relay shall not operate for through fault conditions or be influenced by the magnetic fields around the transformer under normal or external fault conditions.

3.7 Mounting and Relays

The relay connection flange shall be round with and OD of 100 mm and 4 x 12 mm holes on a PCD of 75 mm.

The bag leak detector shall be mounted on a 25 mm double flanged ball valve – only ball valves approved by Eskom shall be used. The valve shall be horizontally mounted with the bag leak detector on a 90° elbow.

3.8 Functional Testing

Each bag leak detector shall have an approved mechanical device that operates the float mechanism (not only the switch contacts) for simulating of the air alarm.

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Gas injection to operate the alarm signal is not allowed.

3.9 Windows

At least one window shall be provided on the detector and so arranged to allow visibility of the oil level and the position of the float.

Tempered glass shall be used as the only acceptable gauge glass material. Windows shall not be fitted with protective covers.

3.10 Gas Release Point

As indicated in the transformer specification, power transformer manufacturers must note that all bag leak detectors shall be fitted with a single gas release point. This point shall be provided with a SAE 45-degree flared 90° pipe connection installed directly into the top casting of the relay. The hole shall be sealed for transportation and storage and no valve shall be fitted.

During installation copper tubing with an ID of 8 mm and an OD of 10 mm shall be installed from the bag leak detector to ground level. All fittings used shall be brass or stainless steel. Only SAE 45-degree flares shall be used on the copper tubing - compression fittings are not acceptable. The tubing shall be protected against physical damage by appropriate routing, fastening and / or protective conduit.

A gas release needle valve shall be provided and secured approximately 1,5 m above ground level and be easily accessible from the transformer plinth.

The valve shall be a needle type valve of 10 mm size – ball valves shall not be used. Only brass or stainless steel needle valves shall be used. A stopper plug shall be provided to seal the open end of the valve.

The valve shall be fitted with a removable cover to prevent accidental opening. The cover shall be labelled “BAG LEAK DETECTOR AIR-RELEASE” on a permanently engraved stainless steel or chromadek label.

3.11 Electrical Connections and Terminal Box

A terminal box with IP 55 rating shall be provided for electrical connections on the relay. Nitrile rubber gasket shall be used on the terminal box cover. Terminal box cover screws shall be hexagon or Allen key type stainless steel with thread lubrication applied. Plug-in connectors are not allowed.

Terminal boxes shall be mounted to allow cable entry from the side or the bottom – cable entry from the top is not acceptable. Terminal boxes and terminal strips shall allow sufficient space for fitting and securing of 2.5 mm control wiring and cabling. Termination strips shall be numbered, and basic wiring diagrams shall be provided inside the lid of the terminal box and in the installation instructions.

The relay contacts shall be cabled to the Marshalling Kiosk by means of steel wired armoured cabling that is heat, oil and UV resistant.

All terminal boxes shall be provided with an earth connection point and shall be effectively earthed.

3.12 Floats

The buoyancy of the floating elements shall be due to their specific gravity and shall not depend on the sealing of a hollow float. The floats shall not absorb oil if punctured. The float material shall not be affected by hot transformer oil.

3.13 Documentation and Packaging

A standard test card bearing the manufacturer's serial number of the relay shall be included with each of the operating instruction manuals required for the relays. Each relay shall be supplied with a calibration certificate and all relevant test information as required by this document. Calibration of bag leak detector relays shall be carried out SANAS approved laboratories.

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Original and fully detailed instructions for assembly, operation and maintenance of the relay shall be included with each relay. The relay shall be securely packed and properly protected against damage and moisture ingress during shipping and storage.

The flange openings and oil sample pipe connection point shall be suitably sealed to prevent ingress of dirt and moisture during shipment and long-term storage.

3.14 Technical Evaluation and Final Approval

The OEM / Supplier shall be responsible to supply a bag leak detector relay for technical evaluation. The equipment shall be supplied to Eskom and will be subjected to destructive testing. The sample shall be supplied in accordance with this specification, and it will remain the property of the supplier.

This specification serves as a minimum requirement for manufacturers that supply bag leak detector relays. Any deviation from this specification has to be approved by Eskom in writing before ordering or manufacturing of the relay.

Final written approval shall be provided once a technical evaluation has been completed and equipment found in compliance with this specification and Eskom requirements.

Any changes to the approved product will be subjected to re-evaluation and approval.

4. Authorization

The stabilisation of this document was seen and accepted by the following experts:

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5. Revisions

Date	Rev	Compiler	Remarks
April 2024	3	M. Hlakudi	Document stabilised with: • Updates on corrosion requirements. • Exclusion of liquid detectors and plug in connectors. • Section 3.10 was expanded to clone the transformer specification requirements.
Feb 2018	2	M Ngubane	Document revised to include upgraded corrosion protection and micro switches. New document number and template.
Aug 2013	1	A Smit	Document revised to cater for Gx, Tx and Dx requirements

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6. Development team

The following people were involved in the development of this document:

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7. Acknowledgements

Final document compiled by Generation, Transmission and Distribution

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