Eskom	Standard	Technology

Title: **TRANSFORMER AND REACTOR RAPID PRESSURE RISE RELAY STANDARD**

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1. Introduction

This document consists of transformer and reactor rapid pressure rise relay standard.

2. Supporting Clauses

2.1 2.1Scope

This standard covers the technical requirements for the selection and purchase of rapid pressure rise relays fitted to transformers and reactors. The purpose of the document is to ensure that the requirements of these relays are standardised within Eskom during the procurement stage.

The document shall be used as a minimum requirement for the selection and purchase of rapid pressure rise relays fitted to transformer and reactors when:

- Pressure rise relays fitted to new transformers and reactors.
- Purchase of new rapid pressure rise relays.
- Replacement of rapid pressure rise relays for transformers repaired in workshops.

2.1.1 Purpose

The document was produced to record the standardised 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
A	Amps
kPa	Kilo Pascal
UV	Ultraviolet
PCD	Pitch Circle Diameter

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

Each new or repaired transformer and reactor rated ≥ 80 MVA and ≥ 132 kV shall be provided with at least one rapid pressure rise relay. In the case of large units ≥ 500 MVA and ≥ 400 kV, two units, one on each of the longitudinal ends shall be fitted.

The function of the rapid pressure rise relay is to detect dynamic over-pressure conditions caused by abnormal activity inside the main tank and to provide a trip signal to remove the equipment from service.

3.2 Environmental Conditions

Outdoor installation

Altitude above sea level up to 1800 m;

Ambient air temperatures:

- maximum +40°C
- monthly average +28°C
- minimum -10°C

Average humidity 90%

Solar radiation 2500 W/m^2

Atmospheric UV radiation – High

Seismic conditions at a maximum of 3g

Pollution level – High marine and industrial (C5)

Enclosures and terminal boxes shall have an IP55 protection class

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3.3 Basic Construction and Operation

The relay shall withstand the effects of full vacuum at sea level and positive pressure of at least 100 kPa. The vibration of the transformer tank shall not produce wear and damage to the internal mechanism of the relay.

The relay shall not operate under normal pressure variations caused by temperature change, vibration, mechanical shock or surges caused by starting and stopping of oil circulation pumps. The relay shall be pressure calibrated and the operating pressure shall be stated on the nameplate. The operating pressure of the relay shall be provided by the transformer or reactor manufacturer.

The relay enclosures shall have a protection class of IP55. Nitrile rubber shall be used as sealing material for "O" rings and flat rubber seals.

Each relay shall be installed on a 50 mm double flanged gate or ball valve to enable replacement without having to drain the oil from the transformer. The relay flange shall allow for the installation of 4 x 12 mm bolts on a PCD of 110 mm.

Construction of the relay shall prevent collection of gas bubbles inside the casing as far as possible. A bleed screw situated at the highest point on the relay shall be provided to vent trapped air bubbles.

Each relay shall be supplied with a permanent nameplate (stick-on labels are not acceptable) with the following information: Make, Type, Operating Pressure Range and Serial Number.

3.4 Corrosion Protection

Relay shall be protected against the effects of high levels of industrial and marine corrosive environments with a classification of C5.

Corrosion shall be eliminated by the use of non-corrodible materials, and by avoiding the contact of dissimilar metals.

Fasteners used shall be metric hexagon or Allen key type stainless steel grade 304 or better. Electro galvanising or electro plating of parts and fasteners is not acceptable. Adequate thread lubrication shall be applied to all threaded areas on bolts, studs and screws. Any good quality high temperature grease is acceptable.

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 treatment of metal parts and castings shall be subject to written approval from Eskom.

3.5 Trip Signalling and Termination Boxes

One normally open contact shall be provided to close in case of operation. The relay's dynamic operating pressure shall be pre-selected as per the transformer manufacturer's specifications and verified by Eskom. Electrical contacts shall be rated for 0.25 A at 220 V DC.

A seal-in relay with a manual reset facility shall be provided inside the Marshalling Kiosk to prevent re-energising of equipment after the device operation.

The relay electrical circuits shall withstand an applied voltage of 2 kV DC for a duration of 60 seconds, applied in turn, between each electrically independent circuit and the casing of the relay, and between the separate independent electrical circuits.

A suitable watertight and weather resistant electrical conduit threaded cable entry shall be provided. Each instrument shall be provided with at least 1 compression type gland for fitting of control wiring. Stoppers shall be provided to block the gland holes when not in use. Plug-in cable 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.

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

3.6 Installation

Rapid pressure rise relay shall be installed on the side of the transformer or reactor main tank at a level not higher than 1.5 m from the base of the tank. Installation shall not be directly to the main tank, but shall be fitted to a double flanged gate or ball valve that can be closed to replace the relay if defective. Where two units are fitted they shall be installed on opposite sides of the main tank.

3.7 Routine Testing

Routine testing of the relay shall be possible with the relay installed. Manual operation of the electrical contact shall be achieved by injecting air into a test plug provided for this purpose. Venting of injected air shall be via the air vent plug. Testing by shorting of electrical circuits is not acceptable.

3.8 Documentation and Packing

Each relay shall be individually packed inside a cardboard box. The relay shall be securely packed and protected against damage and moisture ingress during shipping and storage.

Original and fully detailed instructions for installation, testing, wiring and maintenance shall be included.

3.9 Technical Evaluation and Final Approval

The OEM / Supplier shall be responsible to supply a rapid pressure rise 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 rapid pressure rise 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. Authorisation

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.
Feb 2020	2	M. Ngubane	Technical Evaluation and Final Approval 3.2 Corrected the first sentence from affects to effects 3.4 The duration of the 2kV test was corrected from 60 Hz to 60 seconds 3.8 Type of component corrected from buchholz to rapid pressure relay
June 2013	1	S. Mtetwa	Final Document for Publication
0secondsNov 2012	0	S. Mtetwa	Draft Document for review created from 41-898

6. Development team

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

- Andries Smit
- Michael Ngubane
- Mohamed Mukuddem

7. Acknowledgements

Final document compiled by Generation, Transmission and Distribution

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