

 Eskom	Standard	Technology
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Title: **INDUCTIVE VOLTAGE  
TRANSFORMERS ESKOM  
SPECIFIC REQUIREMENTS UP  
TO 132KV IN ACCORDANCE  
WITH NRS 030 STANDARD**

Unique Identifier: **240-56062765**

Alternative Reference Number: **<n/a>**

Area of Applicability: **Engineering**

Next Review Date: **STABILISED**

#### COE Acceptance



**Bheki Ntshangase**  
**Senior Manager HV Plant Engineering**

Date: 21 September 2020

#### DBOUS Acceptance



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**Senior Manager DBOUS**

Date: 21 September 2020

This document is **STABILISED**. The technical content in this document is not expected to change because the document covers: *(Tick applicable motivation)*

1	A specific plant, project or solution	
2	A mature and stable technical area/technology	X
3	Established and accepted practices.	

PCM Reference: **<xxxxxxx>**

SCOT Study Committee Number/Name: **<Number or name>**

	<b>Standard</b>	<b>Technology</b>
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Alternative Reference Number: **34-1688**

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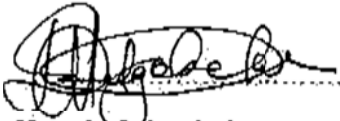

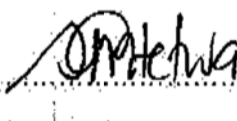

Documentation Type: **Standard**

Revision: **1**

Total Pages: **9**

Next Review Date: **July 2019**

Disclosure Classification: **Controlled  
Disclosure**

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## **1. Introduction**

This document consists of inductive voltage transformers Eskom specific requirements up to 132kV in accordance with NRS 030.

## **2. Supporting clauses**

### **2.1 Scope**

This specification details the Eskom-specific requirements applicable to Inductive Voltage Transformers (VTs) used in systems with nominal voltages of up to 132 kV.

#### **2.1.1 Purpose**

None

#### **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] SANS 60044-2 [Equivalent to IEC] Instrument Transformers - Part 2: Inductive Voltage Transformers
- [2] SANS 60815 [Equivalent to IEC] Selection and Dimensioning of High-voltage Insulators Intended for Use in Polluted Conditions
- [3] NRS 030 Inductive Voltage Transformers National Workgroup
- [4] DSP\_34-1658 Corrosion Protection Specification for New Indoor and Outdoor Distribution Equipment, Components, Materials and Structures Manufactured from Steel D Janse van Rensburg
- [5] DSP\_34-224 KIPTS Natural Ageing and Pollution Performance Test Procedure for Outdoor Insulation Products Section 0 - General Requirements W Vosloo

### **2.2.2 Informative**

- [6] 32-9 Definition of Eskom Documents Eskom Document Centre
- [7] 32-644 Eskom Documentation Management Standard Eskom Document Centre
- [8] 474-65 Operating Manual of the Steering Committee of Wires Technologies (SCOWT) Vinod Singh

## **2.3 Definitions**

### **2.3.1 General**

Definition	Description
<b>Standard reference atmospheric conditions</b>	The standard reference atmosphere is defined as reference temperature ( $t_0 = 20\text{ }^{\circ}\text{C}$ ), absolute pressure ( $p_0 = 1\text{ }013\text{ hPa}$ or $1\text{ }013\text{ mbar}$ ) and absolute humidity ( $h_0 = 11\text{ g/m}^3$ ).

### **2.3.2 Disclosure classification**

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

## **2.4 Abbreviations**

<b>Abbreviation</b>	<b>Description</b>
<b>AMSL</b>	Above Mean Sea Level
<b>CAP</b>	Committee for Accepted Products
<b>HV</b>	High Voltage
<b>IARC</b>	Industry Association Resource Centre (formerly 'Distribution Technology')
<b>KIPTS</b>	Koeberg Insulator Pollution Test Station
<b>LAP</b>	List of Accepted Products
<b>MV</b>	Medium Voltage
<b>n/a</b>	not applicable
<b>rms</b>	root mean square
<b>SCD</b>	Specific Creepage Distance
<b>SCOWT</b>	Steering Committee of Wires Technologies
<b>STP</b>	Standard Temperature and Pressure
<b>VT</b>	Voltage Transformer

## **2.5 Roles and responsibilities**

None

## **2.6 Process for monitoring**

None

## **2.7 Related/supporting documents**

None

### 3. Inductive Voltage Transformers Eskom Specific Requirements up to 134kv in accordance with nrs 030

#### 3.1 Requirements

##### 3.1.1 General

VTs shall comply with the requirements of [3] NRS 030 and Eskom's specific requirements as set out in Schedule A of an enquiry document. Model technical schedules are contained in **Error! Reference source not found.** Where there are discrepancies between the two, Schedule A shall take precedence.

VTs shall comply with the environmental operating conditions set out in [3] NRS 030. The items listed in Table 1 are to be used in Eskom applications:

**Table 1: Summary of Voltage Transformer Items Required by Eskom**

Item	Short Description	Maximum Continuous Rating (kV rms)	Lightning Impulse Withstand (kV peak at 1 000 m AMSL <sup>2</sup> )	Short Duration Power Frequency Withstand (kV rms at 1 000 m AMSL <sup>2</sup> )
1	VT 1PH 6,6 kV/110 V 100/50 VA	7,2	75	22
2	VT 1PH 11 kV/110 V 100/50 VA	12	95	28
3	VT 1PH 22 kV/110 V 100/50 VA	24	150	50
4	VT 1PH 33 kV/110 V 100/50 VA	36	200	70
5	VT 1PH 44 kV/110 V 100/50 VA	52	250	95
6	VT1PH 66 kV/110 V 100/50 VA	72,5	350	140
7	VT 1PH 88 kV/110 V 100/50 VA	100	450	185
8	VT 1PH 132 kV/110 V 100/50 VA	145	650	275

**Notes:**

- If a larger burden is required for refurbishment of existing stations, it shall be specified in Schedule A of an enquiry document (refer to paragraph 3.1.5).
- The rated insulation withstand levels for lightning impulse and short time power frequency withstand are specified in Table 1. The service conditions for South Africa are rationalized for altitudes up to 1 800 m. Although the insulation levels in Table 1 are specified at an altitude of 0 m to 1 000 m, the values have been selected for appropriate insulation coordination for altitudes up to 1 800 m and need not be corrected for altitude. The VTs should be supplied with standard values as per Table 1. Test values must, however, be corrected for deviations from the standard reference atmospheric conditions.

##### 3.1.2 Primary Terminal connections

The primary terminals shall be aluminium or stainless steel round section studs ('stems') with dimensions of 26 mm diameter x 125 mm long, unless otherwise stated in an enquiry document.

##### 3.1.3 Corrosion Protection

Corrosion protection shall be in accordance with [4] DSP\_34-1658.

##### 3.1.4 External Insulation Pollution Performance

###### 3.1.4.1 Minimum creepage distances

The external insulation creepage for inductive voltage transformers for nominal voltages up to 132 kV has been rationalized to the 'very heavy pollution class', specified as a Specific Creepage Distance (SCD) of 31 mm/kV as defined in [2] SANS 60815 [Equivalent to IEC].

**3.1.4.2 Pollution performance and ageing test requirements**

VTs shall be tested to comply with the requirements of the Koeberg Insulator Pollution Test Station (KIPTS) in accordance with [5]. The test commencement date and test duration shall be as defined in [5] DSP\_34-224.

**3.1.5 Secondary Core Accuracy Class and Marking Requirements**

The VT shall meet the following accuracy class requirements as prescribed in Table 2.

**Table 2: Voltage Transformer Accuracy Class and Terminal Marking Requirements**

Winding Number	1	2
Terminal markings	1a – 1n	2a – 2n
Rated Burden/Accuracy Class	50 VA 3P/0,2 <sup>1</sup>	50 VA 3P/0,2 <sup>1</sup>
	100 VA 3P/0,5 <sup>2</sup>	Not used <sup>1 2</sup>

**Notes:**

- a) Winding 1 and winding 2 shall be identical, and shall fulfil both protection and measurement accuracy class requirements as indicated in row 1 of Table 2.
- b) If only one winding is used in order to obtain increased output, i.e. 100 VA, the accuracy class for metering will be reduced to class 0,5, and other winding shall not be used due to limitations of the core as indicated in row 2 of Table 2.
- c) As per [1] SANS 60044-2 [Equivalent to IEC], each winding shall fulfil its respective accuracy requirements within its output range (25% to 100% of rated burden), whilst at the same time the other winding has an output of any value from 0% to 100% of the rated burden of that winding.
- d) If so specified in an enquiry document, one core shall be rated for 200 VA 3P/0,2, when the other core is not used

**3.2 Tests**

Type and routine tests shall be carried out in accordance with [3] NRS 030.

**3.2.1 Test certificates**

Single copies of all certificates of type tests performed by a test authority acceptable to Eskom shall be submitted with a tender offer, unless Eskom waives this requirement due to a previous evaluation of the product. The test certificate for any insulator shall be easily traceable by reference to the insulator markings. The test certificates shall be in English.

Although routine test certificates are not required for submission and approval, Eskom reserves the right to request duplicate copies of routine test certificates within a period of one year after the date of delivery.

**3.2.2 Work Inspections and Witnessing of Tests**

Eskom reserves the right to appoint a representative to inspect the post insulators at any stage of manufacture, or to be present at any of the tests specified.

**3.3 Marking, labelling and packaging**

The marking, labelling and packaging details are to be submitted for approval during enquiries.

Imported VTs shall be packaged in robust wooden crates and suitably supported in order to protect the VTs from the stresses of normal handling that can be expected from the point of despatch to the point of construction. The crates must be designed such that inspection can be effected without opening or damaging the crate. The crate must be able to be lifted by slings, with lifting points clearly marked. Any special handling requirements shall be clearly specified to the purchaser before delivery and shall be clearly specified on the packaging.

The packaging shall not disintegrate due to exposure to rain and direct sunlight during outdoor storage and the construction period of 18 months in total. The manufacturer/supplier shall notify the purchaser of any special methods recommended for storage prior to delivery, and on packaging materials.

If VTs are packed in crates on pallets, the gross weight of the pallets shall not exceed 1 800 kg. Pallets shall be suitable for handling by forklift trucks, capable of entry from both sides. All boxes, pallets or containers shall be clearly marked in accordance with the following example, or similar approved template:

Eskom Order No.:  
Eskom SAP No.:  
Project Name:  
Project Number:  
Delivery Address:  
Supplier's Name:  
Supplier's Serial No.:  
Description of Material:  
Gross Weight:

### **3.4 Spares**

No spares are applicable for hermetically sealed voltage transformers.

A full set of drawings, as specified in [3] NRS 030, shall be submitted at tendering. The drawing shall contain, as a minimum, the information specified in [3] NRS 030. The following additional information shall be included in the outline drawings:

- a) Type of insulating material
- b) Shed profile.
- c) Creepage distance
- d) Centre of gravity.
- e) Allowance for the inclusion of:
  - Eskom contract number;
  - Eskom SAP number; and
  - Eskom drawing number.

**Note:** the numbers shall be incorporate in the drawing upon issue.

## **4. Authorisation**

This document has been seen and accepted by:

Name & Surname	Designation
Prince Moyo	General Manager Power Delivery Engineering
Bheki Ntshangase	Senior Manager HV Plant
Phineas Tlhatlhetji	Senior Manager Substation Engineering
Vinod Singh	Standards Implementation Manager



## **5. Revisions**

<b>Date</b>	<b>Rev.</b>	<b>Compiler</b>	<b>Remarks</b>
July 2014	1	Mogale Sekgobela Hans Boshoff	Final Document approved on SCOT template. No content change from 34-1688.
March 2013	0.2	Hans Boshoff	Draft Document for review by TDAC. No content change from 34-1688.
Nov 2012	0.1	Hans Boshoff	Draft Document for review created from 34-1688.

## **6. Development team**

This specification was originally compiled by the HV/MV Substation Design Work Group in 1996.

This specification was then revised by the following persons in order to combine the requirements of distribution and transmission groups:

- Gavin Strelec Eskom Distribution Group, Instrument Transformers
- Hans Boshoff Eskom Transmission Group, Instrument Transformers
- Stuart van Zyl IARC, Protection Specialist Representing Control Plant

Transmission protection discipline represented by:

- Bongani Qwabe
- Vincent Jansen van Rensburg
- Joe Fischer
- Prince Kara
- Mohamed Omar
- Mzwakhe Msimango

## **7. Acknowledgements**

None

## **Annex A – Technical Schedules**

(See excel spreadsheet on Web site Part 7 Substations)