

 Eskom	Task Manual	Technology
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Title: **Standard for Current and Voltage Transformer Test Blocks**

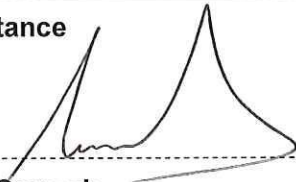
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This document is **STABILISED**. The technical content in this document is not expected to change because the document covers: *(Tick applicable motivation)*

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

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AND VOLTAGE TRANSFORMER  
TEST BLOCKS**

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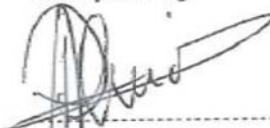

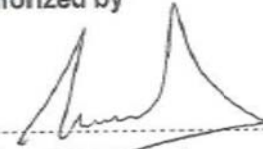
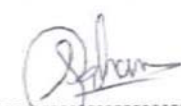
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## **1. Introduction**

Current and Voltage Transformer test blocks of the GE PK2 4-way design have been supplied to Eskom by a single local manufacturer since the mid 1990's. In recent times, at least two additional suppliers have sought Eskom acceptance of their test blocks of similar design.

This specification serves to describe the detailed technical requirements for PK2 type test blocks for use by Eskom, and provide a degree of standardisation between test blocks, to ensure the inter-changeability of test block covers from different manufacturers.

Note: whilst this specification seeks to ensure inter-changeability of test block covers from different manufacturers, the preferred and recommended practice is to match the cover to the corresponding base from the specific supplier. The test block base and cover are to be marked with the manufacturer's name for this purpose (see Section 3.5.8).

## **2. Supporting clauses**

### **2.1 Scope**

This document describes the detailed technical and type tests requirements for type PK2 Current- and Voltage Transformer test blocks for use by Eskom.

#### **2.1.1 Purpose**

This standard details the specification for Test Blocks that would typically be installed on Metering and Protection schemes and modules. As Test Blocks are deemed a component for such Metering and Protection equipment, this standard is thus a supplement document to the detailed specification standards for metering and protection schemes/modules.

#### **2.1.2 Applicability**

This standard shall apply to PTM&C within Eskom Group Technology.

### **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] IEC 60068-2-1: Environmental testing — Part 1: Cold
- [3] IEC 60068-2-2: Environmental testing — Part 2: Dry Heat
- [4] IEC 60068-2-78: Environmental testing — Part 2-78: Tests – Test Cab Damp heat, steady state
- [5] IEC 60255-5: Electrical relays Part 5: Insulation coordination for measuring relays and protection equipment – Requirements and tests
- [6] NRS 000: Rationalised user definitions for use in the electricity supply industry
- [7] SANS 60947-1: Low-voltage switchgear and control gear – Part 1: General rules
- [8] Low-voltage switchgear and control gear – Part 1: General rules: Ancillary equipment – Terminal blocks for copper conductors

#### **2.2.2 Informative**

- [1] Galvanic Compatibility: [http://www.engineersedge.com/galvanic\\_capatability.htm](http://www.engineersedge.com/galvanic_capatability.htm)

## 2.3 Definitions

### 2.3.1 General

Definition	Description
<b>Test block</b>	A device by virtue of its design, permits “isolated” access to the meter / Intelligent electronic device (IED) side of voltage and current circuits, for testing purposes, whilst the installation is in normal service (NRS 000).
<b>Intelligent electronic device</b>	A microprocessor-based device that encompasses all or some of the following functionalities: protection, control and automation, metering, telecontrol, substation DC and auxiliary supply systems, quality of supply monitoring, and disturbance and event recording.

### 2.3.2 Disclosure classification

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

## 2.4 Abbreviations

Abbreviation	Description
<b>ac</b>	alternating current
<b>dc</b>	direct current
<b>r.m.s</b>	root mean square
<b>IED</b>	Intelligent electronic device

## 2.5 Roles and responsibilities

N/A

## 2.6 Process for monitoring

N/A

## 2.7 Related/supporting documents

N/A

## 3. Requirements

### 3.1 General

The test blocks shall be of the type PK2 4-way design, meeting the requirements below in both panel and semi-flush mounting arrangements (i.e. with the base mounted at the front of the panel, or with the base at the rear of the panel and the cover protruding from the front). For semi-flush mounting, the panel thickness shall be taken to be 3mm.

### 3.2 Ratings

The test block shall:

- a) be rated for 10A ac r.m.s., 250 V ac r.m.s per phase continuously,
- b) be rated for 100A ac r.m.s. for 1 second per phase,
- c) be rated for operation in the ambient temperature range from -10°C to +55°C,
- d) Sustain without damage or flashover, an over voltage of 2 kV ac r.m.s for 1 minute. The over voltage shall be applied between the terminals and earth, and between adjacent terminals both with the cover inserted and Current Transformer shorting strips applied, and with the cover removed.

### 3.3 Construction

- a) The test block base shall feature a locking post suitable for securing the cover in both panel- and semi-flush mounting arrangements (i.e. the locking post shall feature two locking holes).
- b) The outer plating applied to the contacts and fastening nuts shall have an anodic index (V) within 0.25 V of tin plate (0.60 V) (see Bibliography).
- c) With the cover inserted in both panel- and semi-flush mounting arrangements, the moving contacts of the base shall be separated from an internal shorting strip by at least 1.5mm. A clearance of at least 1mm shall be maintained in the event that the cover is twisted relative to the base. The springs within the base of the test block shall return the clearance to at least 1.5mm once the cover is released (see Fig. 1).
- d) The contacts mounted in the test block cover shall compress to a total width of at most 19mm but not less than 17mm when inserted into the base in either a panel- or semi-flush mounting arrangement (see Fig. 1).
- e) Contact between the cover contacts and the moving contacts in the test block base shall be made at the outer extremity of the cover contact (see Fig. 1).
- f) The contact manufacturing process shall be such as to ensure that the base and cover contacts are of near identical profile. Visual alignment of contacts shall be checked along the axis of the base and of the cover.
- g) The springs within the base of the test block shall not be fully compressed when, in the semi-flush mounting position, the cover is inserted and the cover contact expanded to a width of 19mm.

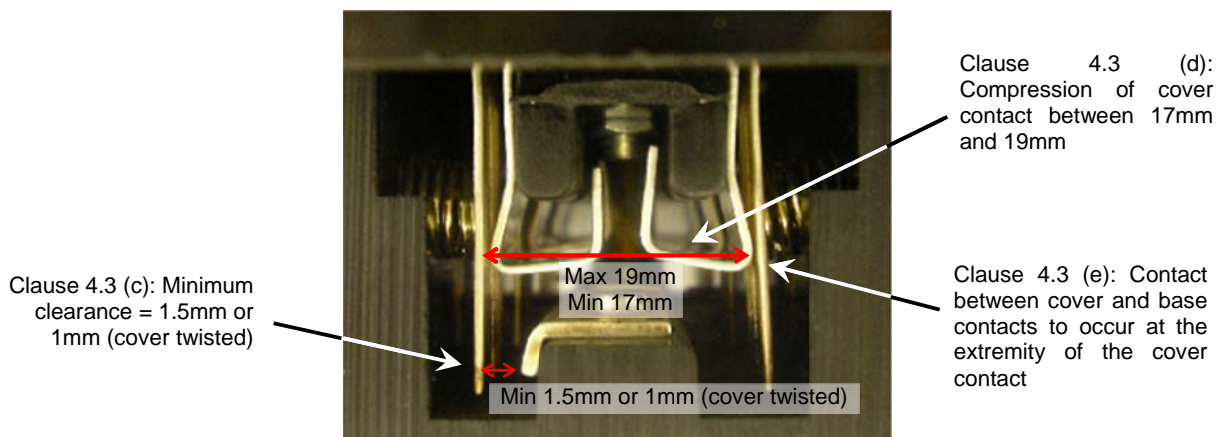


Figure 1 Internal view of PK2 test block illustrating internal clearances and contact points

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- h) The test block design shall render it unlikely that the cover could be accidentally dislodged from a panel- or semi-flush mounted base.
  - i) The studs to which external wiring is connected shall be M4 with two 10mm (across flat) fastening nuts supplied per stud.

### **3.4 Accessories**

- a) The test blocks shall be supplied with removable strips of the original GE pattern for shorting all four of the bottom-most contacts when applied as a Current Transformer test block. Additional links shall be provided so as to render it possible, in both Current- and Voltage Transformer test block applications, to prevent the neutral circuit (the right-most terminal when viewed from the front) from being permanently interrupted when the test block cover is removed.
- b) In addition to the requirements of Section 3.3 (f), the test block shall be provided with a re-usable spring steel clip for application with the locking post of Section 3.3 (a), to prevent the cover from being accidentally dislodged from the base.

The spring steel locking clips shall be available for purchase as loose items.

### **3.5 Tests**

The following type tests shall be conducted on a specimen test block prior to possible acceptance of the make and type by Eskom.

#### **3.5.1 Mechanical**

The test block shall be subjected to a mechanical test whereby the cover is inserted and removed 200 times prior to subsequent type tests being performed. There shall be no sign of damage to the plating of the contacts or sign of contact fatigue following completion of this test.

#### **3.5.2 Temperature rise**

The temperature rise test shall be conducted as per IEC 60947-7-1 Section 8.4.5. The test shall be conducted both with the cover inserted and with the cover removed. For testing with the cover inserted, the four "ways" shall be wired in series. For testing with the cover removed, the test current shall be injected via the outermost "ways" that have been bridged via the standard internal shorting strip.

The test current shall be 10A ac r.m.s. The temperature rise of any terminal shall not exceed 45°K.

#### **3.5.3 Cold and heat**

Cold and dry heat tests shall be conducted in accordance with IEC 60068-2-1 and IEC 60068-2-2 respectively. The test block shall pass the voltage drop test of Section 3.5.6 after at least 16 hours at -10°C and after at least 16 hours at (+55 + x)°C where x is the temperature rise measured in the test of Section 3.5.2.

#### **3.5.4 Short time current withstand**

The short time current withstand test shall be conducted as per IEC 60947-7-1 Section 8.4.6. The test current shall be 100A ac r.m.s. for 1 second.

#### **3.5.5 Dielectric test**

The temporary over voltage withstand test shall be conducted as per IEC 60947-7-1 Section 8.4.3. The test voltage shall be 2 kV ac r.m.s.

The dielectric test method of IEC 60255-5 may be used as an alternative, again with a 2kV ac r.m.s. test voltage.



**3.5.6 Voltage drop**

The voltage drop test shall be conducted as per IEC 60947-7-1 Section 8.4.4. The test current shall be 1 A dc.

**3.5.7 Ageing test**

The ageing test (for screwless-type terminal blocks) of IEC 60947-7-1 Section 8.4.7 shall be conducted. The maximum service temperature shall be taken as 40 °C. A test current of 10A ac r.m.s. shall be applied.

The voltage drop test shall be conducted at the intervals specified. The initial and final voltage drop tests shall be conducted both with the cover installed and with the cover removed (as per Section 3.3.5.6). Tests conducted within the 192 temperature cycles shall be performed with the test block cover installed.

Upon completion of the ageing test, the test block shall remain in compliance with the clearance requirements of Section 3.3.

Alternative to the ageing test is to conduct the steady state damp heat test of IEC 60068-2-78 (Test Cab). The test condition is +40°C ± 2°C and 93% relative humidity for 56 days. A test current of 10A ac r.m.s. will be applied for the duration of the test. The voltage drop and internal clearances will be tested at the start and end of the test.

**3.5.8 Marking, labelling and packaging**

The manufacturer's name and company logo shall be embossed into the outside front of the test block cover.

The manufacturers name and/or company logo shall be repeated on the front and rear of the test block base. The front label shall be visible with the base in a semi-flush mounting.

**4. Authorization**

This document has been seen and accepted by:

<b>Name and surname</b>	<b>Designation</b>
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Humbulani Mutasah	Secondary Plant Manager Free State
Nombuso Ramaite	Secondary Plant Manager Apollo



## **5. Revisions**

This document cancels and replaces document no. DSP- 34-1975 revision no. 0, (March 2009).

<b>Date</b>	<b>Rev.</b>	<b>Compiler</b>	<b>Remarks</b>
March 2014	1	P Almeida	New Document based on DSP- 34-1975. Document number changed to 240-70975231

## **6. Development team**

This new document by P. Almeida is based on 34-1974 of the same, originally done by Stuart van Zyl (CoE) with input from Paul Gerber (SI- GOU).

## **7. Acknowledgements**

The authors acknowledge the comments received from the following test block manufacturers:

John Allen (Allbro)

Pieter Hill (IST)

Manie Malan (IST)