 Eskom	Standard	Technology
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Title: SPECIFICATION FOR SURGE  
ARRESTERS FOR THE  
PROTECTION OF ELECTRICITY  
DISPENSERS

Unique Identifier: 240-75660532

Alternative Reference Number: <n/a>

Area of Applicability: Engineering

Next Review Date: STABILISED

COE Acceptance

DBOUS Acceptance



Bheki Ntshangase

HV Plant Senior Manager



Amelia Mtshali

DBOUS Senior Manager

Date: 19/9/2017

Date: 27/09/2017

This document is STABILISED. The technical content in this document is not expected to change because the document covers:

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

PCM Reference: N/A

SCOT Study Committee Name: MV/LV

Document Classification: **Controlled Disclosure**

Title: <b>SPECIFICATION FOR SURGE ARRESTERS FOR THE PROTECTION OF ELECTRICITY DISPENSERS</b>	Reference: <b>34-312</b>
	Document Type: <b>DSP</b>
	Revision: <b>A</b>
	Effective date: <b>SEPTEMBER 2006</b>
	Total pages: <b>8</b>
	Revision date: <b>SEPTEMBER 2009</b>

COMPILED BY

APPROVED BY

FUNCTIONAL RESP

AUTHORISED BY

-----

**T S MOLOKO**  
Engineer

-----

**B MCLAREN**  
MV SC Chairman

-----

**A BEKKER**  
for TESCO

-----

**MN BAILEY**  
CMDT for MD (Dx)

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**SPECIFICATION FOR SURGE ARRESTERS  
FOR THE PROTECTION OF ELECTRICITY  
DISPENSERS**Reference: **34-312**Revision: **A**Page: **2 of 8****Foreword**

This specification covers Eskom's requirements for low voltage metal oxide varister (MOV) surge arresters used in electricity dispensers (ED). These surge arresters are also referred to as surge protection devices (SPD), however, in Eskom they are commonly known as LV surge arresters. The surge arresters are applicable to low voltage (230 V) single phase supply system to a residential load.

The arresters are classified in accordance to SANS 61643-, as follows:

- indoor;
- single port;
- fixed;
- MOV;
- voltage limiting;
- class 2; and
- 5 kVA (discharge current).

**Revision history**

<b>Date</b>	<b>Rev.</b>	<b>Remarks</b>
SEPT 2005	0	Original version.
AUGUST 2006	A	Revision

**CLAUSES**

Added an introduction to document

1 Changed class of surge arrester from class 1 to 2.

Reduced the  $I_{peak}$  current to 30 kA to  $I_{max} = 20kA$ .

4.6.1 Type test: Removed Safety Test and Short-circuit capability test requirement as it applies to an outdoor surge arrester and arresters with disconnectors respectively.

Added Temperature Test. This is an additional test. Not part of SANS 61643. This test is aimed at evaluating the mechanical integrity of the surge arrester.

Document re-formatted and new reference number issued, changed from DSP0002 to 34-312.

**Authorisation**

This document has been seen and accepted by:

<b>Name</b>	<b>Designation</b>
M N Bailey	Corporate Divisional Technology Manager
A Bekker	Plant Technologies Manager
B McLaren	MV Study Committee Chairman

## 1. Scope

This specification covers Eskom's requirements for low voltage metal oxide varistor (MOV) surge arresters used in electricity dispensers (ED). The surge arresters are applicable to low voltage (230 V) single phase supply system to a residential load.

## 2. Normative references

The following documents contain provisions that, through reference in the text, constitute requirements of this specification. At the time of publication the editions indicated were valid. All standards are subject to review and parties to agreements based on this specification are encouraged to investigate the possibility of applying the most recent revisions of the standards listed below. Information on currently valid national and international standards may be obtained from the Information Centre at Megawatt Park and Technology Standardization Department.

SANS 61643-1:2003 Surge protective devices connected to low-voltage power distribution systems.

SCSSCAAJ1 Rev.2: Standard passive units for single-phase 230V service connections.

## 3. Definitions and abbreviations

### 3.1 Definitions

The definitions in SANS 61643-1 shall apply to this specification. The following definitions have been included for ease of read.

**3.1.1 Surge Protective Devices:** a device that is intended to limit transient overvoltages and divert surge currents. It contains at least one nonlinear component.

**3.1.2 One-port ARRESTER:** an arrester connected in shunt with the circuit to be protected. A one port device may have separate input and output terminals without a specific series impedance between these terminals

**3.1.3 Residual voltage ( $U_{res}$ ):** the peak value of voltage that appears between the terminals of an ARRESTER due to the passage of discharge current

### 3.2 Abbreviations

**3.2.1. ED:** Electricity Dispenser

**3.2.2. LV:** Low Voltage

**3.2.3. MOV:** Metal Oxide Varistor

**3.2.4. SPD:** Surge Protective Devices

**3.2.5. TOV:** Temporary Overvoltages

## 4. Requirements

### 4.1 General

4.1.1. The arresters shall be suitable for use under the following system conditions:

4.1.1.1. nominal system voltage ( $U_n$ ) (r.m.s.) — 400V;

4.1.1.2. maximum system voltage ( $U_m$ ) (r.m.s.) — 460V;

4.1.1.3. system frequency (f) — 50Hz;

4.1.1.5. earthing — effectively earthed.

Note: The maximum system voltage is based on dual-phase systems.

4.1.2. The arrester shall be suitable for use under the following service conditions:

4.1.2.1. ambient air temperature —  $-40^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ ;

4.1.2.2. altitude not exceeding — 1800m;

4.1.2.3. average humidity not exceeding — 95%;

4.1.2.5. lightning activity — high.

4.1.3. The arresters shall be installed in the passive base of the ED (as per SCSSCAAJ1), and hence shall be inaccessible (no access to live parts without the use of tools).

### 4.2 Electrical requirements

The major electrical performance requirements will be set out in schedule A of an enquiry document; in addition the following electrical characteristics are required.

#### 4.2.1 Electrical connections

Terminals of the arrester shall be solid copper cables having a minimum cross-sectional area of  $2,5\text{mm}^2$ . The terminals shall be welded to the arrestor in such a way that they will not work loose for intended purposes of the surge arrester.

#### 4.2.2. Air clearances and creepage distances

The arrester shall have sufficient air clearances and creepage distances. The minimum required creepage distance and air clearance are specified in table 1.

**Table 1: Creepage and clearance**

Creepage	Air clearance
Distance (mm)	
6	3
Note: If metal parts are covered with self-hardening resin of at least 2 mm thickness, or if they are covered with an insulation, withstanding a test voltage, creepage distances and air clearances are not necessary.	

#### **4.2.3. Tracking resistance**

Insulating materials necessary to retain live parts in their position shall be composed of non-tracking material, or they shall be sufficiently dimensioned. The arrester shall be tested in accordance to category indoor.

#### **4.2.4. Dielectric withstand**

The dielectric withstand of the housing of the arrester shall be sufficient with respect to insulation breakdown and protection against direct contact. The arrester shall be tested in accordance to category indoor.

### **4.3 Mechanical requirements**

#### **4.3.1. Mechanical connections**

Terminals shall be **attached** to the arrester in such a way that they will not work loose if the clamping screws are tightened or loosened.

#### **4.3.2. Mounting**

**4.3.2.1.** The arrester shall be mounted between the "LIVE" and "NEUTRAL" terminals in ED socket. The terminals of the arrester shall be long enough to connect to the terminals of the ED socket.

**4.3.2.2.** The arrester shall be able to fit in the volume reserved for this purpose as shown in figure 1 of annex A (area: 8mm x 8mm).

## **5. Tests**

All tests shall be performed in accordance with SANS 61643.

### **5.1. Type tests**

**5.1.1** Identification of marking test

**5.1.2** Terminal and connection test

**5.1.3** Measured limiting voltage test (Residual voltage measurement test)

**5.1.4** Operating duty test

**5.1.5** Temperature test:

The manufacture of the arrester shall furnish Eskom with the V-I characteristics at a temperature ranging from 20°C to 200°C.

**5.1.6** TOV tests

**5.1.7** Mechanical tests (Impact test)

### **5.2. Routine tests**

**5.2.1.** Power frequency/rated or reference test

**5.2.2.** Lightning impulse residual voltage test

## **6. Marking**


**6.1** The following markings are mandatory on the body, or permanently attached to the body, of the arrester:

- a) Manufacturer's name or trade mark and model number
- b) Maximum continuous operating voltage  $U_c$  (one value for each mode of protection) and nominal/rated frequency
- c) Test classification
- d) Voltage protection level  $U_p$
- e) Degree of protection provided by the enclosure
- f) Maximum recommended ratings of overcurrent protection
- g) Type of current: a.c. frequency or d.c

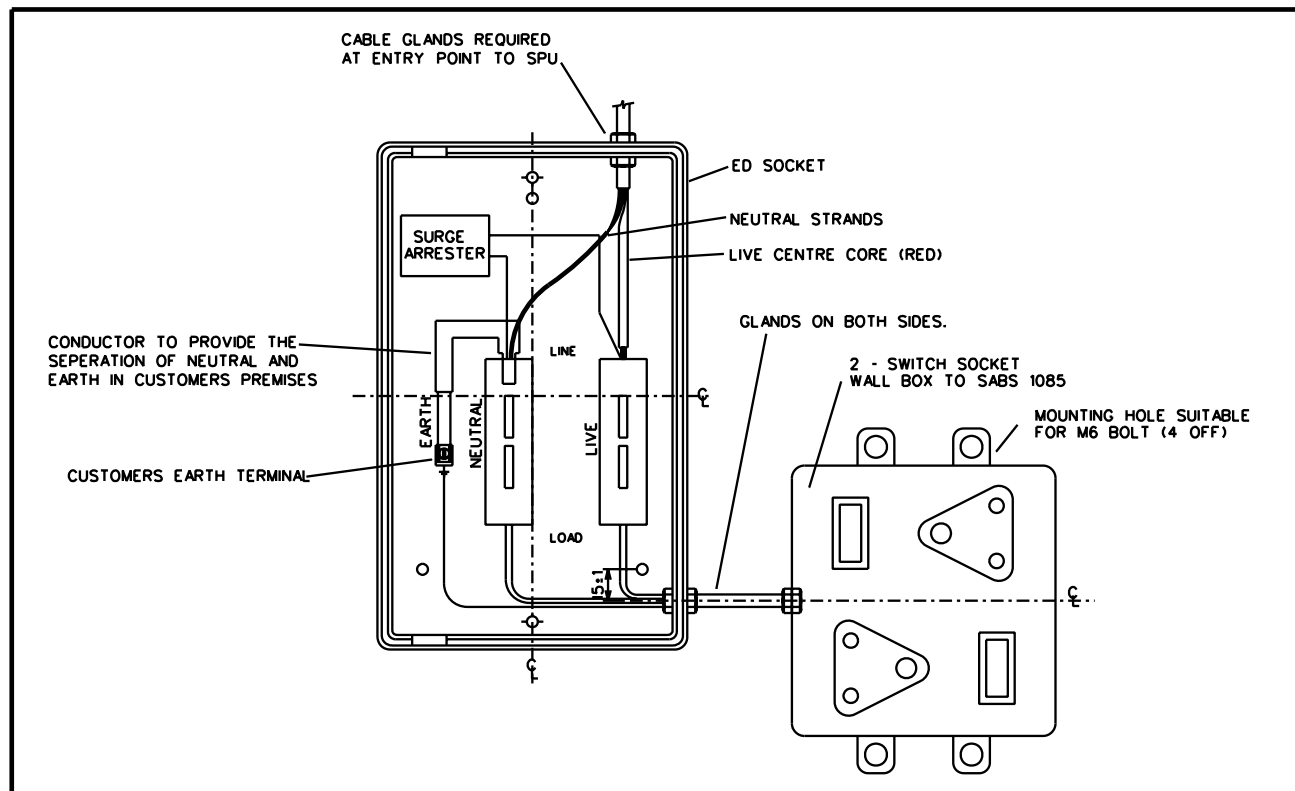
**6.2** Marking shall be indelible and legible and shall not be placed on screws and removable washers. Compliance is in accordance with the test of 7.2.

NOTE: Where space is limited, the manufacturer's name or trade mark and model number will appear on the device; other markings should appear on the smallest package.

**SPECIFICATION FOR SURGE ARRESTERS  
FOR THE PROTECTION OF ELECTRICITY  
DISPENSERS**Reference: **34-312**Revision: **A**Page: **7 of 8****Annex A****Impact assessment**

	Impact assessment		
	Document title:	<b>Specification for surge arresters for the protection of electricity dispensers</b>	
	Document no:	<b>34-312</b>	Revision no: <b>A</b>
<b>Activity</b>			<b>Detail</b>
What training is required to implement this document? (e.g. Awareness training, practical / on job, module.)			No
Who will require training? (State designations.)			None
What prerequisites are needed for students?			None
What equipment will be required for training? (Computers etc.)			None
What special tools will be required for training?			None
What special requirements are needed for the trainer?			None
Time period for training to be completed?			None
What special tools / equipment will be needed to be purchased by the Region to effectively implement?			None
Are there stock numbers available for the new equipment?			Yes
Does the document affect the budget?			No
Time period for implementation of requirements after training is completed?			No
Does the Buyers Guide or Buyers List need updating?			Yes
What Buyer's Guides have been created?			None
Was Training & Development consulted w.r.t training requirements?			No
Were the critical points in the document determined?			Yes
Is any training material available on the subject in this document?			No
Was the document SCSPVABE0 adhered to?			Yes
		Total implementation period	
		Total training cost	
		Total cost of tools / equipment	
		Total cost involved	
Comments:			
Assessment Compiled by:		Recommended by (Functional Responsibility):	
Name:	T S Moloko	Name:	B McLaren
Designation:	Engineer	Designation:	Technologist
Dept:	Plant Technologies IARC	Dept:	Project Engineering (SR)
Date:	August 2005	Date:	August 2005



**SPECIFICATION FOR SURGE ARRESTERS  
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Enquiry No.: ..... Tenderer's name: .....

Tenderer's signature: .....Date:.....

## Technical schedules A and B for Surge Arresters

Schedule A: Purchaser's specific requirements

Schedule B: Particulars of equipment to be supplied

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
1		<b>Identification</b> a) Supplier's name b) Manufacturer's name c) Type designation	xxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxx	_____ _____ _____
2	4.1.2	<b>Site conditions</b> a) Altitude m b) Maximum, weighted average, ambient temperature °C c) Minimum, weighted average, ambient temperature °C d) Maximum diurnal variation °C	up to 1800 40 -10 30	xxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxx
3	4.1.1	<b>Electrical conditions</b> a) Nominal system voltage ( $U_n$ ) V b) Maximum system voltage ( $U_m$ ) V c) Supply frequency Hz d) System earthing	400 460 50 Effective	xxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxx
4		<b>SPD Classification</b> a) Number of ports b) Design topology c) Operating duty class kA d) Impulse test classification class e) Location f) Accessibility g) Mounting method	1 Voltage limiting 5 2 Indoor Inaccessible Fixed	xxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxx
5	4.3.1	<b>Ratings</b> a) MCOV $U_c$ V b) Rated voltage V c) Nominal discharge current (8/20μs) $I_n$ kA d) Impulse/Peak current $I_{imp}$ ( $I_{peak}$ ) kA e) Peak residual voltage kV	440 440 5 20 2.5	xxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxx _____ _____

Enquiry No.: ..... Tenderer's name: .....

Tenderer's signature: .....Date:.....

**Technical schedules A and B for****Surge Protective Devices****Schedule A: Purchaser's specific requirements****Schedule B: Particulars of equipment to be supplied**

1	2	3	4	5
Item	Sub-clause	Description	Schedule A	Schedule B
6		<b>Insulation level</b> Impulse withstand (1,2/50 Ph-to-ground) kV	5	_____
7	4.3.3	<b>Design</b> Isolating distance mm	>3	_____
8		<b>Insulation</b> Creepage mm	>6	_____
9	5.1	<b>Type tests</b> a) Identification of marking test b) Terminal and connection test c) Residual voltage test d) Operating duty test e) Safety performance test f) Mechanical test	Report no. Report no. Report no. Report no. Report no. Report no.	_____ _____ _____ _____ _____ _____

Enquiry No.: ..... Tenderer's name: .....

Tenderer's signature: .....Date:.....

**Deviation schedule**

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by Eskom.

Item	Clause	Proposed deviation