

Title: **ACCESSORIES FOR MEDIUM-VOLTAGE POWER CABLES FOR SYSTEMS WITH NOMINAL VOLTAGES OF 11KV TO 33KV STANDARD**

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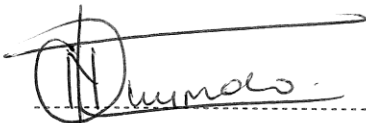
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Executive Summary

This Eskom specification is based on SANS 1332. Where any conflicting requirements exist; this document will take precedence. This revision will include the Eskom MV cable accessories requirements for heat shrink, cold shrink and cold applied (push on) technologies. Resin type insulation technologies are not included in the specification as Eskom standardised on non-resin insulation solutions.

1. Introduction

This Eskom specification has been compiled in order to promote the standardisation, rationalisation and testing of medium voltage cable accessories for the distribution networks in Eskom. Eskom distribution networks have the following MV voltages: 3.3 kV, 6.6 kV, 11 kV, 22 kV and 33 kV, but for standardization: 11 kV cable systems will be used for networks with voltages 3.3 kV and 6.6 kV.

2. Supporting clauses

2.1 Scope

This specification covers Eskom's requirements for the testing and supply of medium-voltage accessories for power cables used on a.c. systems with nominal voltages of 3.3 kV, 6.6 kV, 11 kV up to and including 33 kV. This specification includes the following types of technologies: heat shrink, cold shrink, cold applied, and mixed cold and heat applied technologies.

2.1.1 Purpose

The purpose of this specification is to specify the technical requirements for MV accessories to be supplied to Eskom for distribution network (3.3 kV, 6.6 kV, 11 kV, 22 kV and 33 kV) application.

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] SANS 60099-4, Surge arresters Part 4: Metal-oxide surge arresters without gaps for a.c. systems
- [3] SANS 876, Cable terminations and live conductors within air-filled enclosures (insulation co-ordination) for rated a.c. voltages from 7,2 kV and up to and including 36 kV
- [4] SANS 1332, Accessories for medium-voltage power cables (3,8/6,6 kV to 19/33 kV)
- [5] SANS 60815, Selection and dimensioning of high-voltage insulators intended for use in polluted conditions
- [6] SANS 62217, Polymeric HV insulators for indoor and outdoor use — General definitions, test methods and acceptance criteria
- [7] IEC / TR 62730, HV polymeric insulators for indoor and outdoor use tracking and erosion testing by wheel test and 5000 h test
- [8] 240- 82789539 (34-211), KIPTS natural ageing and pollution performance test procedure for outdoor insulator products Section 5 - Particular requirements for outdoor MV cable terminations
- [9] 240-56063792 (ESP 32-1272), Specification for 11 kV and 22 kV impregnated paper and XLPE insulated cables
- [10] 240 – 56030403 (DSP 34- 1936), Specification for 11 kV, 22 kV, and 33 kV rubber insulated flexible cables for use with mobile equipment
- [11] D-DT-8005, MV cable terminations – Impregnated paper insulated cable
- [12] D-DT-8006, MV cable terminations – XLPE insulated cable

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- [13] D-DT-8007, MV cable joints – impregnated paper insulated cable
- [14] D-DT-8008, MV cable joints – XLPE insulated cable
- [15] D-DT-8010, MV indoor surge arresters
- [16] D-DT-8011, MV straight shrouds
- [17] D-DT-8015, Cable end caps
- [18] D-DT-8016, MV unscreened separable connectors
- [19] D-DT-8017, MV screened separable connectors and tri-furcating kits
- [20] D-DT-8021, MV transition cable joints (PILC to XLPE)
- [21] D-DT-8077, Cable repair sleeve
- [22] TBA, Buyer’s guide for Type 5 MV XLPE cable terminations
- [23] TBA, Buyer’s guide for MV XLPE 3 core to 1 core cable trifurcating joints kits

2.2.2 Informative

None

2.3 Definitions

2.3.1 General

The definitions in SANS 1332, SANS 876, NRS 000 and the following shall apply.

Definitions	Description
Cold applied/ push on technologies	Joints, terminations and any part thereof that is constructed with components not pre-expanded and that can be pushed to fit into position without applying any heat or factory fitted pre-expansion.
Cold shrink	Joints, terminations and any part thereof that is constructed with pre-expanded components that require mechanical plastic pull tab tubes to be removed to fit and shrink into position. No heat required for the components to shrink into position. Additional fillers may also be required.
Heat shrink	Joints, terminations and any part thereof that is constructed with pre-expanded components that require heat to fit and shrink into position. Excluding cold shrink components.
Indoor terminations	Terminations that is intended for use where it is not exposed to either solar radiation or weathering.
Mixed cold and heat applied technologies	Joints, terminations and any part thereof that is constructed with both cold and heat applied components. i.e. cold applied insulation and screen materials, heat shrink outer-sheath, or if applicable resin fillers.
Outdoor terminations	Termination that is intended for use where it is exposed to either solar radiation or weathering (or both).

2.3.2 Disclosure classification

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

2.4 Abbreviations

The abbreviations in SANS 1332, SANS 876, NRS 000 and the following shall apply. The abbreviations in SANS 1332, SANS 876, NRS 000 and the following shall apply.

Abbreviation	Description
KIPTS	Koeberg Insulator Pollution Test Site
LAP	List of Accepted Products
OEM	Original Equipment Manufacturer
PILC	Paper Insulated Lead Covered
TBA	To be Announced
XLPE	Cross Linked Poly Ethylene

2.5 Roles and responsibilities

All Eskom employees and/or appointed bodies involved in the procurement of MV accessories shall ensure that the product meets the requirements as specified in this document.

Note: Any deviation from these requirements shall constitute non-conformance, unless evaluated and approved by a delegated cable systems specialist based on sound engineering judgement at the time of tender evaluations or after tender award.

2.6 Process for monitoring

The MV accessories acceptance shall be based on the relevant technical evaluation criteria at the time of tender and based on factory acceptance testing requirements as per this standard.

2.7 Related/supporting documents

Refer to clause/ section 2.2.

3. Medium-voltage power cables accessories

3.1 Requirements

3.1.1 General

Cable accessories shall comply with the requirements of SANS 1332 and this specification. Where conflicting requirements arise, the requirements of this specification shall take precedence.

3.1.1.1 Standardised cable accessories

Standardised cable accessories for use on medium voltage systems in Eskom are given in the buyer's guide drawings listed in clause 2.2.1.

3.1.1.2 Cable construction and specification

Cable accessories shall be designed for medium voltage cables in accordance with 240-56063792 for XLPE and PILC cable and 240-56030403 for rubber cables where applicable.

3.1.2 Additional specific requirements

3.1.2.1 Standard ranges for accessories

Standard ranges for accessories shall be in accordance with SANS 1332, unless otherwise specified in the relevant buyers guide or technical schedules used at the time of tender enquiry.

For inner cone Type 5 terminations: the range requirements will be as per the relevant buyer's guide descriptions or technical schedules used at the time of tender enquiry.

3.1.2.2 Accessory earthing

- 1) Unless otherwise specified in schedule A, the cable terminations main earthing conductors shall be terminated with a tinned copper connector that has an M12 fixing hole in accordance with the lengths as stated in SANS 1332 for indoor three core and single core terminations, and as per the below values for the other types of terminations:
 - a) The main earthing conductor for outdoor three-core cable terminations shall be of length 1600 mm.
 - b) The main earthing conductor for outdoor single-core terminations shall be 1000 mm.
 - c) The main earthing conductor for indoor trifurcating terminations that have 800 mm tails shall be 1000 mm.
 - d) The main earthing conductor for indoor trifurcating terminations that have 2500 mm tails shall be 2500 mm. It shall be insulated and sealed at both ends with the M12 fixing hole connection ends exposed. The break out boot arrangement for the trifurcating kit shall include a fourth leg for the connection and the insulation of the earth conductor. The environmental sealing of the breakout boot and insulated tail end is required to be proven by a manufacturer designed test procedure for Eskom consideration.
 - e) If specified, the main earthing conductor for indoor single-core cable type 4 and type 5 terminations shall be a 1000 mm.
 - f) An insulated 185 mm² bonding lead main earthing conductor connection will be required to be ordered and jointed by Eskom for three core to single core trifurcating joint kits. This main earthing conductor length shall be designed on each project to be the same length as the single core cable lengths jointed to the three core cable. The trifurcating joint kit break out arrangement for the trifurcating joint kit therefore shall include a fourth leg to allow the connection and the insulation of this separately supplied 185 mm² bonding lead main earth conductor onto the 3 core cable primary and secondary earthing connection. The dimensions for the bonding leads procured by Eskom will be supplied at the time of tender.
 - g) The main earthing connection for three core to single core trifurcating kits and trifurcating joint kits shall always be performed with a main earth connection between the three core cable in the breakout boot and the single core cable connected equipment earth bar.
 - h) If specified, the main earthing conductor for indoor Type 2 single-core terminations shall be a 1000 mm.

- 2) For armoured three core cable to armoured single core cables trifurcating joints; it is required that the main earthing conductor and the secondary earthing conductors are sufficiently combined and connected for both the three core and single core cable ends to be jointed. These combined earthing connections shall be connected and continued from the three core cable to the single core cables using suitably rated tinned copper braids and constant force springs. The earth braids shall be sized in accordance with SANS 1332 for the main and secondary earth connections. In addition the joints shall be designed for the earth connection to the switchgear end in accordance with clause 1 f). For armoured three core cable to copper wire screened un-armoured single core cable trifurcating joints; it is required that the main earthing conductor and the secondary earthing conductors are sufficiently combined and connected. This combined earthing connection shall be connected and continued from the three core cable to the single core cables using suitably rated tinned copper braids and constant force springs. The earth braids shall be sized in accordance with SANS 1332 for the main and secondary earth connections. In addition the joints shall be designed for the earth connection to the switchgear end in accordance with clause 1 f).

3.1.2.3 Terminations

- a) The minimum specific creepage distance for all terminations shall be in accordance with Table 1.

Table 1: Minimum Specific Creepage Distance for Terminations

Application		Minimum specific creepage (mm/kV)			
		Single-core	Three-core		
		All voltage ratings	≤ 6,35/11 kV	≥ 12,7/22 kV	≥ 19,1/33 kV
Type 1	Outdoor	31	31	31	31
	Indoor	20	20	20	20
Type 2	Outdoor	31	31	31	31
	Indoor	20	20	20	20

Notes:

1. All outdoor cable terminations are Type 1 in accordance with SANS 876.
2. Indoor three-core terminations rated up to and including 6,35 /11 kV are either Type 2 or Type 3 in accordance with SANS 876.
3. Indoor single-core terminations up to and including 6,35 /11 kV are Type 2 in accordance with SANS 876.
4. Indoor three-core terminations of rating 12,7 /22 kV and above are Type 2 in accordance with SANS 876.

- b) Outdoor three-core cable terminations shall have:
- Tail lengths of 1600 mm.
 - The stress control tube positioned so that the top of the tube is at a dimension of “X + 600 mm” from the bottom of the lug barrel.

Note: The reason for positioning the stress control tube at “X + 600 mm” is to allow for the 1600 mm termination to be trimmed back to 1000 mm where necessary. Outdoor three-core cable termination tail lengths shall be 1600 mm.

- c) Outdoor single-core cable terminations supplied without a main earth braid for earthing connection shall be provided with a leakage current collector located at the bottom of the outer insulating tube, where applicable, alternatively a primary earthing conductor earth braid shall be supplied as per the Eskom buyers guide SAP number description. The purpose of the leakage current collector is to provide an electrical path to drain the surface leakage current to the armour or lead-sheath, if no earth braid connection is required. All outdoor single-core cable terminations for armoured single-core XLPE-insulated cables shall be supplied with a secondary earthing conductor to connect the metallic core screen to the armour wires in accordance with the requirements of SANS 1332.

Notes:

- 1) Single core cables used for distribution networks in Eskom are earthed at one end only.
- 2) For applications where the single core cable is terminated onto indoor equipment; the earthing connection is normally performed at the indoor equipment termination end (i.e. indoor switchgear). The main earthing conductor of outdoor single core cable terminations in this application is therefore not required.
- d) Outdoor single-core cable terminations supplied with a main earth braid for earthing connection shall be provided with a 1000 mm long earth braid connection.

Notes:

- 1) Single core cables used for distribution networks in Eskom are earthed at one end only.
- 2) For applications where only outdoor single core terminations will be performed, a main earthing conductor shall be required at any one of the termination ends for performing the single end point earthing.

3.1.2.4 Unscreened separable connectors (USCs)

- a) Unscreened separable connectors (USCs) for indoor terminations shall be supplied with a stainless steel or brass M16 x 2 pitch x 35 mm long set screw, spring washer and washer (3 off per set). See Figure 1.

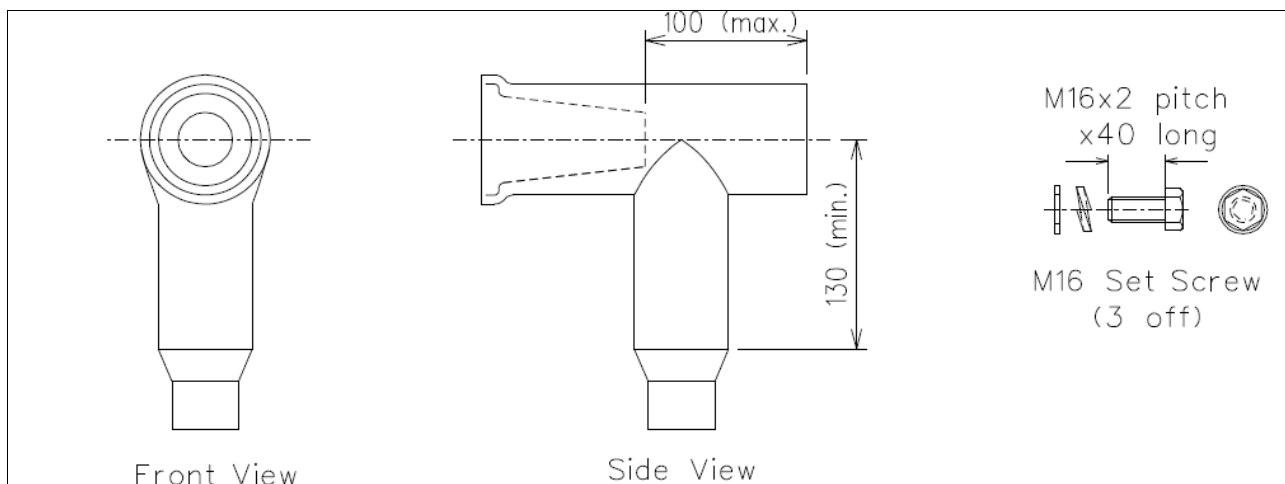


Figure 1: Unscreened separable connectors for a single cable termination (3 off)

3.1.2.5 Extensible screened separable connectors (SSCs)

- a) Screened separable connectors for a single cable termination (i.e. set of 3 connectors) shall be either non-extensible or extensible. See Figure 2.
- b) Extensible and non-extensible SSC shall be supplied as per SANS 1332.
- c) Extensible screened separable connectors (SSCs) shall be supplied for two back to back cable terminations (i.e. set of 3 back-to-back connectors – giving a total of 6 SSCs) including the intermediate bushing in accordance with SANS 1332. See Figure 3 and figure 4.

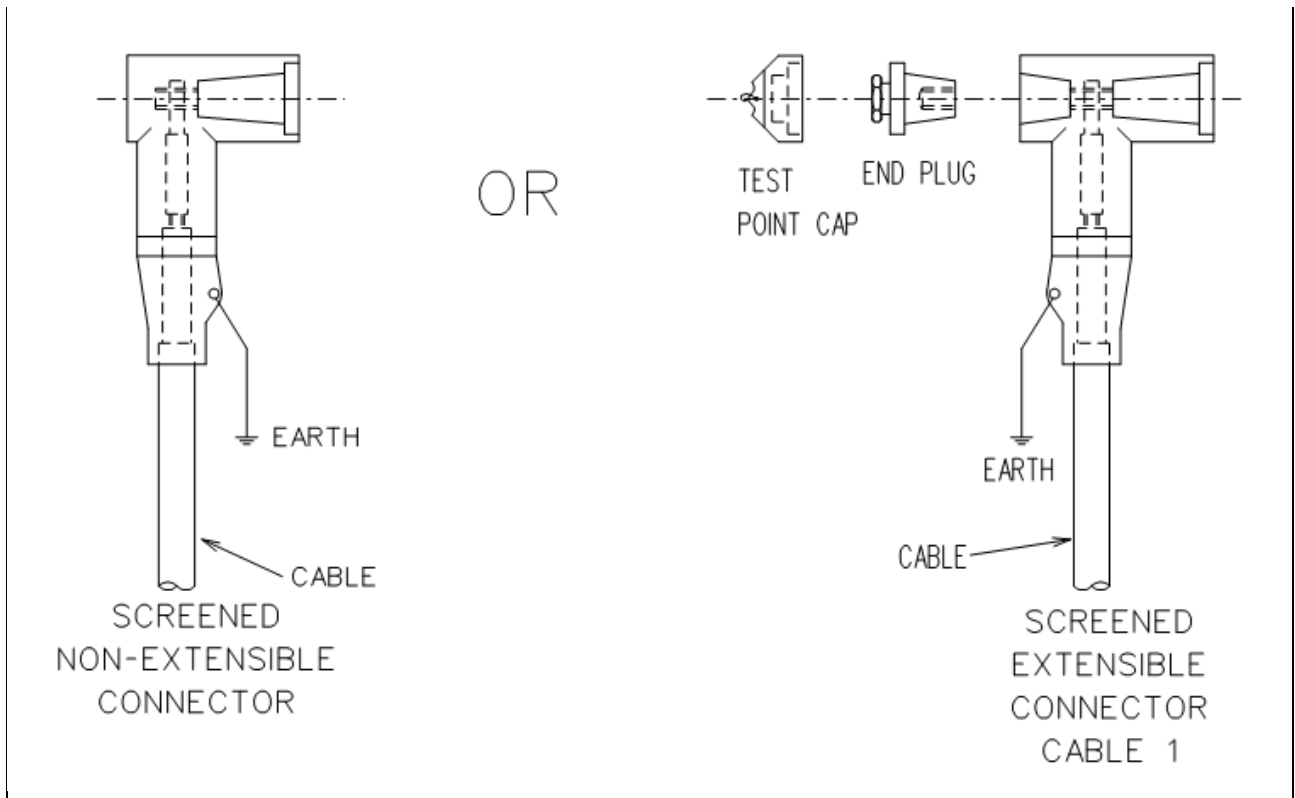


Figure 2: Unscreened separable connectors for a single cable termination (3 off)

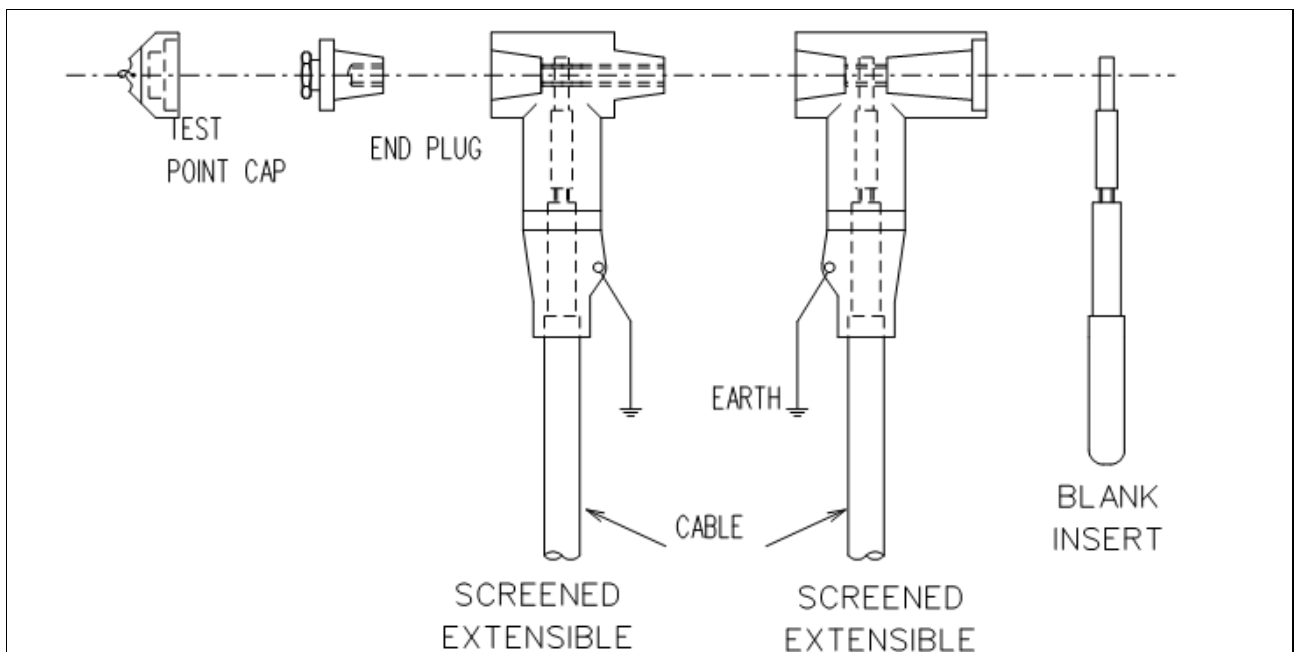


Figure 3: Screened separable connectors for a double cable termination (3 off)

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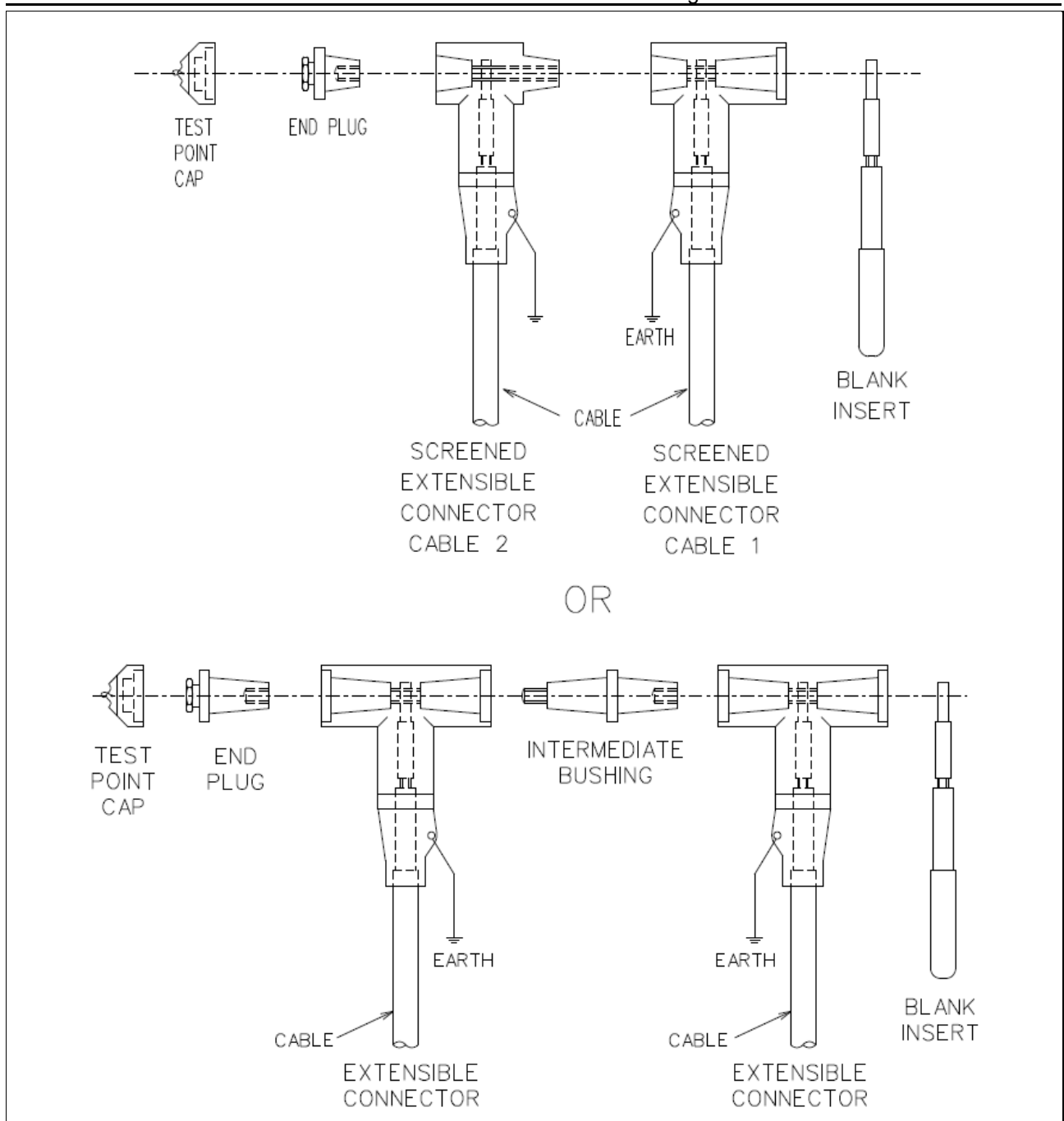


Figure 4: Screened separable connectors for a double cable termination with intermediate bushing

3.1.3 Indoor surge arresters

3.1.3.1 General requirements

- a) Indoor surge arresters shall comply with the requirements of SANS 60099-4 and Table 2.

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Table 2: Electrical requirements for surge arresters

System voltage	Minimum MCOV kV	Maximum residual voltage kV	Discharge current kA	SANS / IEC Line- discharge class
6,35/11 kV	10 kV	40 kV	10 kA	Class 1
12,7/22 kV	19,2 kV	80 kV	10 kA	Class 1
19/33 kV	28,8 kV	120 kV	10 kA	Class 1

Note: The electrical requirements given in this table are in accordance with Eskom's requirements for 'distribution class' surge arresters. The minimum MCOV is equal to 80 % of U_m .

Note: The electrical requirements given in this table are in accordance with Eskom's requirements for 'distribution class' surge arresters. The minimum MCOV is equal to 80 % of U_m .

- b) Surge arresters shall withstand short-circuit currents without violent shattering and shall have the ability to self-extinguish any fire caused by the arc.
- c) Surge arresters shall be polymer housed.

3.1.3.2 Surge arresters for Type 2 cable terminations

- a) Surge arrestors supplied for use with Type 2 cable terminations (i.e. withdrawable MV indoor metal enclosed switchgear panels) in accordance with SANS 876 shall be supplied with the relevant switchgear OEM tail and tail length requirements and a tinned copper lug (or equivalent) with an M16 fixing hole.
- b) The lead shall be connected to the 'live' end of the arrester.
- c) The lead and arrester shall be insulated / covered with anti-track material and shall have a minimum specific creepage of 20 mm/kV.
- d) The base of the arrester (earthed end) shall have a M12 x 35 mm stainless steel threaded stem with a nut, spring washer and washer.
- e) The diameter of the surge arrester and housing shall not exceed 60 mm.
- f) Surge arrestors shall be supplied as individual items. See Figure 5.

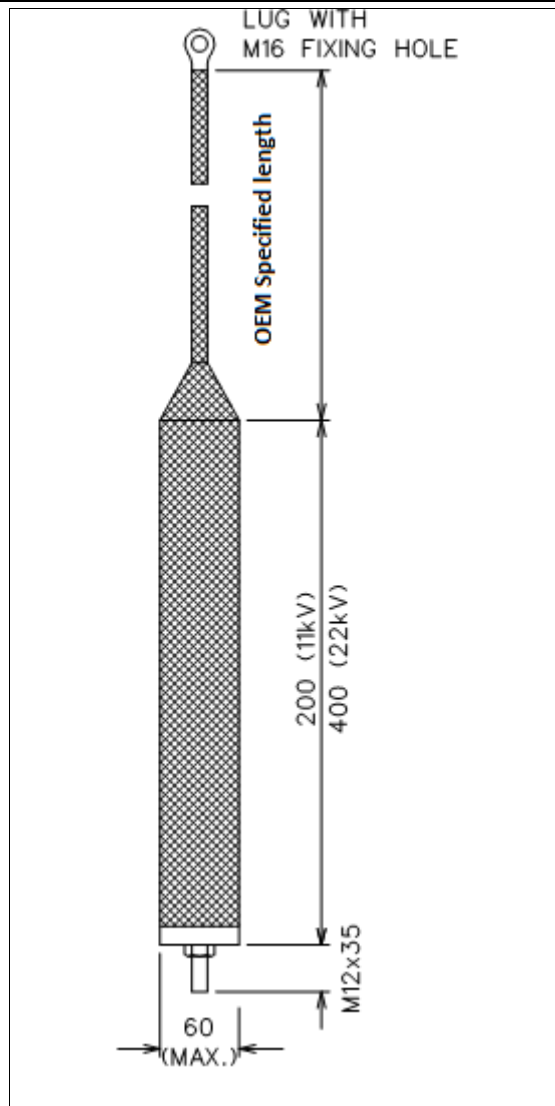


Figure 5: Indoor surge arrester details (Type 2 connection)

3.1.4 Surge arresters for Type 4 and Type 5 cable terminations

- a) SSCs shall be connected in tandem (i.e. back to back) with the separable connectors and shall comply with the insulation requirements of Type 4 cable terminations in accordance with SANS 876.
- b) The depth of the cable termination enclosure (i.e. front to back) shall be assumed to be 300 mm.
- c) Suitable means shall be provided for earthing the base of the surge arresters. Earthing leads shall be at least 800 mm long and shall be fitted with a lug having an M12 fixing hole.
- d) Where applicable, the earthing conductor for the arrester housing (i.e. for a Type 4 and Type 5 cable termination) shall comply with the requirements of SANS 1332.
- e) If different to the preference for self-supporting surge arresters, the method of supporting the arresters in the cable termination enclosure shall be given at the time of enquiry. Preference shall be given to self-supporting surge arresters – i.e. those requiring only the separable connector to which they are attached as the means of support.
- f) The method used for disconnecting the surge arresters for the purpose of cable testing shall be given at the time of enquiry.

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Note: Cable testing is done by means of a separate cable test facility that does not require the removal of the cable termination separable connectors.

- g) Surge arrestors shall be supplied in sets of three – i.e. allowing for the termination of one three-core cable or three single core cables.
- h) The surge arresters and all the required interfacing components (including end plugs and test point caps if applicable) shall be supplied as a single item together with the set of separable connectors. Figure 5 shows an example of screened separable connectors supplied with surge arresters.

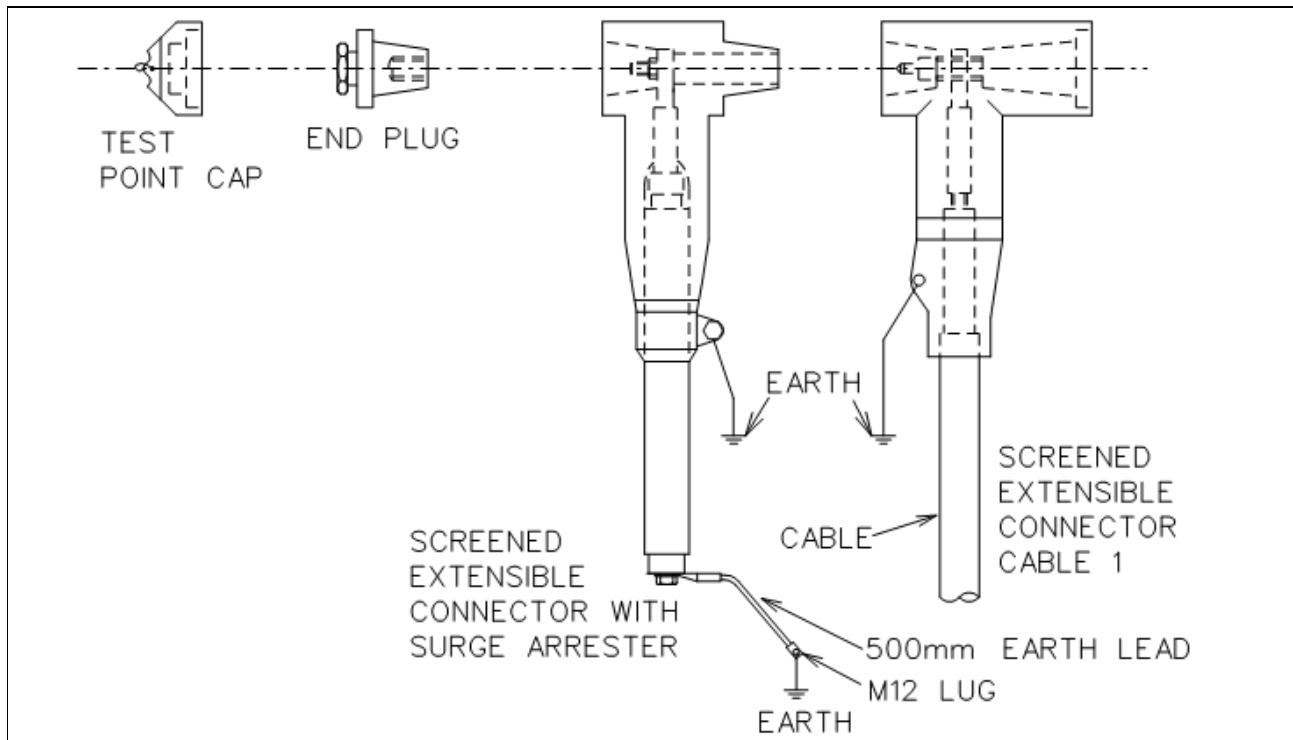


Figure 6: Screened separable connectors with surge arresters for a single cable termination (3 off)

3.1.5 Quality management system

- a) The supplier (deemed to be an organization that undertakes any manufacturing or assembly operation) shall have a formally documented and implemented quality management system (QMS), which as a minimum meets with the requirements of the international code of practice for quality systems ISO 9001:2008. Eskom reserves the right to audit quality management systems for suitability and effectiveness, and to verify all goods for conformance prior to delivery.
- b) Foreign and third party manufacturers shall, in addition, hold valid certification of their quality management system. Such certification shall be from a national quality systems certification body (Registrar), duly accredited by a QMS accreditation body, which is signatory to a mutual recognition agreement with South Africa.
- c) Additional quality requirements may apply when Eskom enters into a term contract. Specific requirements will be specified therein.

3.2 Documentation

3.2.1 Tests

- a) Cable accessories shall be type tested in accordance with SANS 1332.
- b) Outdoor cable terminations shall be subjected to a natural ageing test in accordance with 240-56062812 at the Koeberg Insulator Pollution Test Site (KIPTS) or shall be subjected to a 1000 hour salt fog test to be pre-qualified as minimum, where after a 5000 hour salt fog test shall be mandatory to be performed prior to any Eskom allowance for orders or LAP listing.
- c) All required type test report shall be submitted to Eskom on the time of tender.
- d) The supplier shall at the time of tender submit the manufacturer, manufacturing location and component description of each type tested component. This shall be traceable and auditable for the type test report listed product drawing and description.
- e) The supplier shall at the time of tender submit the final assembly manufacturing location of the offered product.
- f) The supplier shall include a jointer training proposal or offer as part of any tender submission.

3.2.2 Drawings and instructions

All drawings and installation instruction or manuals shall be submitted to Eskom on the time of tender.

Installation instructions shall be compliant with the terminology used in SANS 10198, SANS 1332 and SANS 876.

Installation instructions for each item supplied shall include the Eskom provided water blocking removal instruction for the cables to be jointed or terminated from all Eskom approved cable suppliers. These documents will be provided during Eskom tenders

3.3 Marking, Labelling and Packaging

Marking labelling and packaging shall be in accordance with SANS 1332.

3.4 Spares

Not applicable

4. Authorization

This document has been seen and accepted by:

Name and surname	Designation
Prince Moyo	Power Delivery Engineering GM
Bheki Ntshangase	HV Plant: Senior Manager

5. Revisions

Date	Rev	Compiler	Remarks
Feb 2017	2	Q. Khumalo	New document template was used. Resin type insulation technologies have been removed 1: Requirements for 3.3 kV and 6.6 kV were added. 3.1.2.1: The requirements for Type 5 terminations have been added. 3.1.2.2: Accessory earthing requirements have been revised. 3.1.2.3: The BIL requirements for 33 kV Type 1 and Type 2 terminations have been added. 3.1.4: Surge arrester requirements for Type 4 and Type 5 cable terminations have been added. 3.2: Added an option for 1000 hour salt fog test for prequalification requirement. 3.2: Option for 5000 hour salt fog test was included as an option instead of KIPTS test.
May 2013	1	B. Mwarehwa	Final Document for Publication
Nov	0	B. Mwarehwa	Draft Document for review created from 34-1622

6. Development team

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

- Q Khumalo: Senior Engineer (HV Plant)
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- D. Ntombela: Consultant (DBOUS)
- N. Booyens: Senior Engineer (SI KZNOU)
- J. Paulse: Senior Engineer (SI WCOU)
- R. Hill: Engineering Technologist (NED WCOU)

7. Acknowledgements

Not applicable.

Annex A – Impact Assessment

Impact assessment form to be completed for all documents.

1) Guidelines

- All comments must be completed.
- Technical Change Information Forum to discuss the impact assessment, and if necessary give feedback to the compiler of any omissions or errors.

2) Critical points

2.1 Importance of this document. E.g. is implementation required due to safety deficiencies, statutory requirements, technology changes, document revisions, improved service quality, improved service performance, optimised costs.

Comment: Revised according to SCOT revision cycle.

2.2 If the document to be released impacts on statutory or legal compliance - this need to be very clearly stated and so highlighted.

Comment: None changed.

2.3 Impact on stock holding and depletion of existing stock prior to switch over.

Comment: None

2.4 When will new stock be available?

Comment: No change to technology.

2.5 Has the inter-changeability of the product or item been verified - i.e. when it fails is a straight swap possible with a competitor's product?

Comment: N/A

2.6 Identify and provide details of other critical (items required for the successful implementation of this document) points to be considered in the implementation of this document.

Comment: The document has been revised to align with the requirements of the latest SANS 1332.

2.7 Provide details of any comments made by the OUs regarding the implementation of this document.

Comment: None

3) Implementation timeframe

3.1 Time period for implementation of requirements.

Comment: Immediately

3.2 Deadline for changeover to new item and personnel to be informed of Dx wide change-over.

Comment: No change over required. Type 5 cable terminations have now been added.

4) Buyers Guide and Power Office

4.1 Does the Buyers Guide or Buyers List need updating?

Comment: Yes

4.2 What Buyer's Guides or items have been created?

Comment: All new items will be added as part of contract evaluations.

4.3 List all assembly drawing changes that have been revised in conjunction with this document.

Comment: None

4.4 If the implementation of this document requires assessment by CAP, provide details under 5.

4.5 Which Power Office packages have been created, modified or removed?

Comment: Changes required to PO packages.

5) CAP / LAP Pre-Qualification Process related impacts

5.1 Is an ad-hoc re-evaluation of all currently accepted suppliers required as a result of implementation of this document?

Comment: Yes, will be performed as part of the new CORP evaluation registered for MV accessories.

5.2 If NO, provide motivation for issuing this specification before Acceptance Cycle Expiry date.

Comment: N/A

5.3 Are ALL suppliers (currently accepted per LAP), aware of the nature of changes contained in this document?

Comment: No, will only be informed as part of the new CORP evaluation process.

5.4 Is implementation of the provisions of this document required during the current supplier qualification period?

Comment: Yes

5.5 If Yes to 1.5d, what date has been set for all currently accepted suppliers to comply fully?

Comment: N/A

5.6 If Yes to 1.5d, have all currently accepted suppliers been sent a prior formal notification informing them of Eskom's expectations, including the implementation date deadline?

Comment: N/A

5.7 Can the changes made, potentially impact upon the purchase price of the material/equipment?

Comment: N/A

5.8 Material group(s) affected by specification: (Refer to Pre-Qualification invitation schedule for list of material groups)

Comment: N/A

6) Training or communication

6.1 Is training required?

Comment: (If NO then 6.2 – 6.6 will be N/A) Yes – See specification requirements.

6.2 State the level of training required to implement this document. (E.g. awareness training, practical / on job, module, etc.)

Comment: See specification requirements.

6.3 State designations of personnel that will require training.

Comment: See specification requirements.

6.4 Is the training material available? Identify person responsible for the development of training material.

Comment: See specification requirements.

6.5 If applicable, provide details of training that will take place. (E.G. sponsor, costs, trainer, schedule of training, course material availability, training in erection / use of new equipment, maintenance training, etc.).

Comment: See specification requirements.

6.6 Was Technical Training Section consulted w.r.t module development process?

Comment: N/A

6.7 State communications channels to be used to inform target audience.

Comment: Commercial processes and TCIF

7) Special tools, equipment, software

7.1 What special tools, equipment, software, etc will need to be purchased by the OUs to effectively implement?

Comment: N/A

7.2 Are there stock numbers available for the new equipment?

Comment: To be created if required

7.3 What will be the costs of these special tools, equipment, software?

N/A

8) Finances

8.1 What total costs would the Regions be required to incur in implementing this document?

Identify all cost activities associated with implementation, e.g. labour, training, tooling, stock, obsolescence

Comment: To be established during tenders

Impact assessment completed by:

Name: Queeneth Khumalo _____

Designation: Senior Engineer _____