

Title: **ACCESSORIES FOR LOW-VOLTAGE POWER CABLES FOR SYSTEMS WITH NOMINAL VOLTAGES UP TO AND INCLUDING 1 KV**

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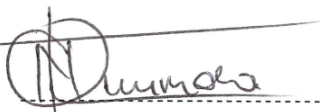
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1. Introduction

This specification has been compiled in order to promote the standardisation, rationalisation and testing of LV cable accessories used in Eskom.

2. Supporting clauses

2.1 Scope

This specification covers Eskom's requirements for the testing and supply of low-voltage accessories for power cables used on a.c. systems with nominal voltages up to and including 1 kV.

2.1.1 Purpose

The purpose of this document is to specify the requirements for LV cable accessories to be used in Eskom.

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 1507: Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V).
- [3] ESP 32-1272 : Specification for LV power and control cable with rated voltage 600/1000V
- [4] 240-56227443: Requirements for control and power cables for power stations
- [5] NRS 074 -2: Low-voltage (600/1 000 v) cable systems for underground electrical distribution

2.2.2 Informative

- [6] 32-9: Definition of Eskom documents.
- [7] 32-644: Eskom documentation management standard.
- [8] 474-65: Operating manual of the Steering Committee of Technologies (SCOT).

2.3 Definitions

2.3.1 General

The definitions in NRS 074-2, and NRS 000 shall apply.

2.3.2 Disclosure classification

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

2.4 Abbreviations

The abbreviations in NRS 074-2 and listed in the table below shall apply.

| Abbreviation | Description |
|--------------|------------------------------|
| LV | Low Voltage |
| MCB | Miniature Circuit Breaker |
| MCCB | Moulded Case Circuit Breaker |
| PVC | Polyvinyl Chloride |
| XLPE | Cross-Linked Poly Ethylene |

2.5 Roles and responsibilities

All Eskom employees and/or appointed bodies involved in the procurement of LV cable accessories shall ensure that the product deliverable meets the requirements of this standard.

All suppliers of LV cable accessories to Eskom must be conversant with the requirements of this standard, and shall ensure that all products offered comply with these requirements.

2.6 Process for monitoring

The following monitoring process shall be used:

- a) Procurement tender technical evaluations in accordance with this document.
- b) Continuous monitoring of product compliance in accordance with this document.

2.7 Related/supporting documents

See normative references, and any documents evaluated and approved in accordance with this standard

3. Requirements

3.1 General

LV cable accessories shall comply with the requirements of NRS 074-2 and this specification. Joints shall be the cold pour resin (cast resin) and or heat shrink type. Where conflicting requirements arise, the requirements of this specification shall take precedence.

3.1.1 Installation condition

All accessories shall be suitable for use in the following installation conditions:

- Ambient air temperature: –10 °C to 45 °C,
- Maximum solar radiation: 1000 watts/m²,
- Ultraviolet radiation: high,
- Relative humidity: 10 % to 95 %, and
- Joints shall be suitable for buried or above ground installation.

3.1.2 Joints

- a) Heat shrink or resin joints shall be suitable for use with single or multi-core 600/1000 V PVC or XLPE insulated, PVC bedding, steel wire armoured and PVC sheathed cable complying with SANS 1507 as described in NRS 074-2. Single core armoured cables have aluminium wire armouring.
- b) Where applicable, for resin joints the shell/mould shall have the minimum dimensions as specified in NRS 074-2 and Table 1 of this document:

Table 1: Cable sizes/ranges with corresponding shell dimensions not covered in NRS 074-2

| Cable cross-sectional area (mm ²) | Minimum shell length (mm) | Minimum shell diameter (mm) | Number of cores |
|---|---------------------------|-----------------------------|-----------------|
| 400 to 630 | 400 | 68 | 1 |

- c) For single core armoured cables earth braids are required for earth continuity in the joint, the number and size of earth braids shall be 3X70 mm².
- d) For resin joints the shell/mould shall be transparent to allow for visual inspection of clearances.
- e) Mechanical torque shear connectors suitable for the range specified in NRS 074-2 shall be provided with joint kits where the conductor size is equal to or bigger than 16 mm².
- f) Mechanical torque shear connectors shall be suitable for jointing copper and aluminium conductors.
- g) For joint kits where conductor sizes are smaller than 16 mm², suitable copper crimp ferrules shall be supplied by the user for the size of copper conductor to be jointed.

3.1.3 Terminations

Sealing of terminations shall be in accordance with NRS 074-2.

3.1.3.1 Outdoor terminations

All outdoor terminations shall comply with the requirements specified in NR 074- 2.

- a) The preferred accessory ranges for outdoor terminations are specified in NRS 074-2 and as per below list:
 - 400 mm², 500 mm² and 630 mm².
- b) Mechanical torque shear connectors suitable for the range specified in NRS 074-2 shall be provided with outdoor termination kits where the conductor size is equal to or bigger than 16 mm².
- c) Mechanical torque shear connectors shall be suitable for terminating copper and aluminium conductors onto brass or copper equipment terminals.
- d) For termination kits where conductor sizes are smaller than 16 mm², suitable copper crimp lugs shall be supplied by the user for the size of conductor to be terminated.

3.1.3.2 Indoor termination

The crimp lugs for indoor terminations shall be ordered and supplied separately.

Note: Crimp lugs are used for terminations intended for use in moulded case and miniature circuit breakers.

These crimp lugs are only allowed for terminating copper conductor cables.

3.1.3.3 Aluminium cable Indoor terminations for MCBs and MCCBs

For aluminium cables used on moulded case and miniature circuit breakers; a transition joint shall be required to ensure a copper conductor connection to the circuit breaker. This shall be achieved by using equivalent current rated copper conductor extensions that is connected to the aluminium phase cores with torque shear ferrules. These extensions shall be insulated using suitably rated and colour coded heat shrink sleeves.

This termination kit shall consist of the following items:

- 3 x 200 mm, 1000 V insulated in accordance with SANS 1507, colour coded, suitably rated copper tails,
- 3 x insulated sleeves, and

- 3 x mechanical torque shear ferrules.

Note: For non-standard maintenance applications without gland plates, a suitably sized outdoor termination in accordance with 3.1.3.1 shall be used.

3.1.4 Glands

All cable glands shall comply with NRS 074- 2. The gland sizes shall also comply with the sizes specified.

3.2 Marking, packaging, storage and documentation

The marking, packaging, storage and documentation shall be in accordance with NRS 074-2. Installation instructions shall be individually printed in colour and not photo-copied.

3.3 Sample

Where so specified in schedule A; a sample of the accessory shall be supplied with the tender.

4. Type testing

All joint and terminations supplied to Eskom shall comply with the Type Test requirements specified in NRS074-2. For single cable joints where 3X70mm² earth braids connections are required: a 30 kA for 1s type test shall be performed.

5. Authorization

This document has been seen and accepted by:

| Name and surname | Designation |
|-------------------------|-----------------------------|
| Bheki Ntshangase | Senior Manager HV Plant COE |
| Thinus du Plessis | HV Plant: Chief Engineer |

6. Revisions

| Date | Rev | Compiler | Remarks |
|-------------|------------|-----------------|--|
| Feb 2018 | 1 | Q. Khumalo | The specification revised to align with the latest template. This document supersedes DSP 34-1626. Requirements for accessories for 400 mm ² to 630 mm ² PVC cables. LV cable terminations have been included |
| March 2009 | 1 | A J Maudu | Archived revision history on DSP 34-1626. |

7. Development team

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

- Thinus du Plessis HV Plant: Chief Engineer
- Queeneth Khumalo HV Plant: Senior Engineer
- Taelo Phali SI ECOU: Engineering Technologist
- Randy Hill NED WCOU: Engineering Technologist
- Jacques Paulse SI WCOU: Senior Engineer

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- Prishen Pather Electrical Plant CoE: Engineer
- Frikkie van Niekerk SI FSOU: Technologist
- Sandi Mtshaulana SI GOU: Engineer
- Malusi Mathonsi SI MOU: Senior Engineer
- Pieter Vink SI FSOU: Technologist
- Winston Seima Electrical Plant CoE: Chief Technologist

8. Acknowledgements

The author acknowledges the team which developed the previous revision of the specification (DSP 34-1626).

Annex A – Impact assessment

Impact assessment form to be completed for all documents.

1) Guidelines

Indicate actions to be taken, persons or organisations responsible for actions and deadline for action.

Technical Change Implementation Forum (TCIF) 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: This document has been revised due to document revision process and additional requirement see revision history for added requirements.

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: N/A – no impact on statutory or legal compliance.

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

Comment: Yes, where heat shrink LV joints are to be introduced relevant material management shall be implemented by SI and or relevant department in the Grids or OUs.

2.4 When will new stock be available?

Comment: N/A – Appropriate material management material management shall be implemented by the OU SI and or relevant department..

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 – no impact in inter-changeability.

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: None.

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

Comment: None

3) Implementation timeframe

3.1 Time period for implementation of requirements.

Comment: As soon as the National Contract or Regional Contract is concluded.

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

Comment: All changes to be discussed at TCIF.

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?

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Comment: The relevant buyer's guides will be revised to include new items.

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

Comment: The relevant drawings will be revised to include new items.

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: All affected Power Office packages will be revised.

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: No.

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

Comment: This standard is revised due to the SCOT process. DSP 34-1626 expired in March 2014 thus it was due for revision.

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

Comment: No – They will be notified once the specification is published.

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

Comment: NA

5.5 If Yes to 5.4, what date has been set for all currently accepted suppliers to comply fully?

Comment: N/A

5.6 If Yes to 5.4, 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: Yes, This can only be determined on conclusion of contract

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

Comment: Accessories for LV Power cables

6) Training or communication

6.1 Is training required?

Comment: NO (If NO then 6.2 – 6.6 will be N/A)

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

Comment: N/A

6.3 State designations of personnel that will require training.

Comment: N/A

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

Comment: N/A

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: N/A

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

Comment: No.

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

Comment: Technical Change Implementation Forum (TCIF)

7) Special tools, equipment, software

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

Comment: None.

7.2 Are there stock numbers available for the new equipment?

Comment: No. The new stock numbers will be published on the relevant buyer's guide.

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

Comment: NA.

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: Cost per item will be available on contract award.

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.....
Impact assessment completed by:

Name: Queeneth Khumalo

Designation: Chief Engineer