IEC 60684-3-282

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# INTERNATIONAL STANDARD

**Flexible insulating sleeving –**
**Part 3: Specifications for individual types of sleeving – Sheet 282: Heat-shrinkable, polyolefin sleeving – Stress control**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# FLEXIBLE INSULATING SLEEVING –

# Part 3: Specifications for individual types of sleeving – Sheet 282: Heat-shrinkable, polyolefin sleeving – Stress control

## FOREWORD

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IEC 60684-3-282 has been prepared by IEC technical committee 15: Solid electrical insulating materials. It is an International Standard.

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The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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# INTRODUCTION

This document is one of a series of standards which deals with flexible insulating sleeving for electrical purposes.

The series consists of three parts:

IEC 60684-1: Definitions and general requirements

IEC 60684-2: Methods of test

IEC 60684-3: Specifications for individual types of sleeving

This document comprises one of the sheets of IEC 60684-3 as follows:

Sheet 282: Heat-shrinkable, polyolefin sleeving – Stress control

This sleeving is normally supplied in the colour black.

Materials which conform to this specification meet established levels of performance. However, the selection of a material by a user for a specific application will be based on the actual requirements necessary for adequate performance in that application and not based on this specification alone.

This sleeving is designed to be used in MV cable accessories and as such electrical performance will be proven as part of the assembly. Examples of this are described in HD 629 and IEC 60502 (all parts).

# FLEXIBLE INSULATING SLEEVING –

## Part 3: Specifications for individual types of sleeving – Sheet 282: Heat-shrinkable, polyolefin sleeving – Stress control

## 1 Scope

This part of IEC 60684 gives the requirements for two types of heat-shrinkable, polyolefin sleeving, stress control, not flame retarded, with a nominal shrink ratio up to 3:1.

This sleeving has been found suitable for use up to temperatures of 100 °C.

– Type A: Medium wall Internal diameter up to 65,0 mm typically
– Type B: Thick wall Internal diameter up to 95,0 mm typically

~~These sleevings are normally supplied in colour black.~~

Since these types of sleevings cover a significantly large range of sizes and wall thicknesses, Annex A provides guidance to the range of sizes available. The actual size ~~shall~~ will be agreed between the user and the supplier.

~~Materials which conform to this specification meet established levels of performance. However, the selection of a material by a user for a specific application should be based on the actual requirements necessary for adequate performance in that application and not based on this specification alone.~~

~~This sleeving is designed to be used in MV cable accessories and as such electrical performance must be proven as part of the assembly. Examples of this are described in HD 629 and the IEC 60502 series.~~

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60296~~:2003~~, *Fluids for electrotechnical applications –~~ Unused Mineral insulating oils for transformers and switchgear~~ Mineral insulating oils for electrical equipment*

~~IEC 60502 (all parts), Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV)~~

IEC 60684-1~~:2003~~, *Flexible insulating sleeving – Part 1: Definitions and general requirements*

IEC 60684-2:~~1997~~2025, *Flexible insulating sleeving – Part 2: Methods of test*
~~Amendment 1 (2003)~~
~~Amendment 2 (2005)~~

IEC 60757~~:1983~~, *Code for designation of colours*

~~HD 629, *Test requirements on accessories for use on power cables of rated voltages from 3,6/6(7,2)KV up to 20,8/36 (42)KV – Part 1: Cables with extruded insulation*~~

## 3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

## 4 Designation

The sleeving shall be identified by the following designation:

| Description | IEC publication number | IEC part number | IEC sheet number | Type | Size (expanded and recovered internal diameter in millimetres) | Colour |
|---|---|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| Sleeving | IEC 60684 | -3 | -282 | -A | -45,0/20,0 | -BK |

Colour abbreviation shall comply with IEC 60757.

NOTE This information is for labelling only in accordance with IEC 60684-1.

## 5 Conditions of test

Unless otherwise specified, the sleeving shall be shrunk in a forced air circulation oven for (10 ± 1) min at 200 °C ± 3 K prior to testing.

## 6 Requirements

In addition to the general requirements given in IEC 60684-1, the sleeving shall conform to the requirements of Table 1 and Table 2.

## 7 Sleeving conformance

Conformance to the requirements of this specification shall normally be based on the results from typical sizes.

– Type A: Recovered ID 25 mm to 30 mm
– Type B: Recovered ID 25 mm to 30 mm

**Table 1 – Property requirements**

| Property | IEC 60684-2:2025 clause or subclause | Units | Max. or min. | Requirements | Remarks |
|---|---|---|---|---|---|
| Dimensions | 5 | | | To be agreed between the purchaser and the supplier | |
| – Internal diameter | 5.2 | mm | | | |
| – Wall thickness | 5.3 | mm | | | |
| – Concentricity | 5.4 | % | | | |
| – expanded | | | Min. | 60 | |
| – recovered | | | Min. | 85 | |
| Heat shock | 8 | | | | Heat at 150 °C ± 5 K. |
| Tensile strength | 21.2 and 21.3 | MPa | Min. | 8 | Use a jaw separation rate of 100 mm/min. |
| Elongation at break | 21.2 and 21.3 | % | Min. | 175 | For internal diameters < 6,5 mm, use sleeving samples for testing. On 6,5 mm and larger diameter sleeving, use dumbbell samples cut from the sleeving. |
| Longitudinal change | 11 | % | Max. | +5<br>-10 | |
| Bending at low temperature | 16 | – | – | No cracking shall be visible. | Test at –40 °C. For strips, the mandrel shall be between 20 and 22 times the wall thickness. Full section sleeving is tested unfilled and the mandrel shall be between 20 and 22 times the outer diameter. |
| Dimensional stability on storage | 18 | – | – | The dimensions shall remain as agreed. | See Scope. |
| Tensile strength | 21.2 and 21.3 | MPa | Min. | 10 | Use a jaw separation rate of 100 mm/min. |
| Elongation at break | 21.2 and 21.3 | % | Min. | 200 | ~~Below 6,5 mm ∅ as sleeving. At 6,5 mm ∅ and above as dumbbells.~~ For internal diameters < 6,5 mm, use sleeving samples for testing. On 6,5 mm and larger diameter sleeving, use dumbbell samples cut from the sleeving. |
| Secant modulus at 2 % elongation | 21.5 | MPa | Max. | 100 | |

| Property | IEC 60684-2:2025 clause or subclause | Units | Max. or min. | Requirements | Remarks |
|---|---|---|---|---|---|
| Resistance to selected fluids | 38 | | | | Use the fluids and test temperatures specified in Table 2. |
| Tensile strength | 21.2 and 21.3 | MPa | Min. | 4 | Use a jaw separation rate of 100 mm/min. |
| Elongation at break | 21.2 and 21.3 | % | Min. | 150 | For internal diameters < 6,5 mm, use sleeving samples for testing. On 6,5 mm and larger diameter sleeving, use dumbbell samples cut from the sleeving. |
| Heat ageing | 41 | | | | Heat at 135 °C ± 3 K. |
| Tensile strength | 21.2 and 21.3 | MPa | Min. | 5 | Use a jaw separation rate of 100 mm/min. |
| Elongation at break | 21.2 and 21.3 | % | Min. | 200 | For internal diameters < 6,5 mm, use sleeving samples for testing. On 6,5 mm and larger diameter sleeving, use dumbbell samples cut from the sleeving. |
| Relative permittivity | 26 | | Min. | 5 or as agreed between user and supplier | ~~See note.~~ These values are set so as to define the tube as stress controlling and do not indicate any guarantee of suitable performance in an accessory. Further testing by the supplier will be needed to prove this. The values can change with applied voltage. |
| Volume resistivity at room temperature | 25<br>23.5.2 | Ω·m | Min. | $10^8$ or as agreed between user and supplier | |
| Long term ageing | 52 | | | | The ageing temperature shall be 100 °C ± 3 K. |
| Elongation at break | 21.2 and 21.3 | % | Min. | 100 | Use a jaw separation rate of 100 mm/min Below 6,5 mm diameter as sleeving. At 6,5 mm diameter and above as dumbbells. |

**Table 2 – Resistance to selected fluids**

| Test fluid No. | Fluids | Type | Standard or symbol | Immersion temperature °C ± 2 K |
|---|---|---|---|---|
| 1 | Insulating oil | Mineral based | IEC 60296 | 23 |
| 2 | | | Isopropyl alcohol | 23 |
| 3 | - | Water | De-ionized | 85 |

Other fluids and/or temperatures may be specified for customers with specific needs. These additional fluids and/or temperatures shall be applicable when incorporated into agreements between the supplier and the customer.

# Annex A
(informative)

## Guidance on the available sizes and wall thicknesses

Table A.1 and Table A.2 provide guidance on the range of sizes and wall thicknesses available.

**Table A.1 – Type A, medium wall**

| Internal diameter | | Wall |
|---|---|---|
| **Expanded** Min. mm | **Recovered** Max. mm | **Recovered wall thickness** mm |
| 16,0 | 8,0 | 1,8 |
| 20,0 | 10,0 | 1,8 |
| 26,0 | 12,0 | 2.5 |
| 30,0 | 15,0 | 2,9 |
| 45,0 | 20,0 | 3,0 |
| 50,0 | 25,0 | 3,3 |
| 65,0 | 30,0 | 3,3 |

**Table A.2 – Type B, thick wall**

| Internal diameter | | Wall |
|---|---|---|
| **Expanded** Min. mm | **Recovered** Max. mm | **Recovered wall thickness** mm |
| 30,0 | 10,0 | 2,5 |
| 36,0 | 12,0 | 3,0 |
| 45,0 | 15,0 | 3,0 |
| 55,0 | 22,0 | 3,0 |
| 66,0 | 22,0 | 3,0 |
| 75,0 | 28,0 | 3,0 |
| 85,0 | 28,0 | 3,0 |
| 95,0 | 45,0 | 3,6 |

## Bibliography

IEC 60502 (all parts), *Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m$ = 1,2 kV) up to 30 kV ($U_m$ = 36 kV)*

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# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Flexible insulating sleeving –**
**Part 3: Specifications for individual types of sleeving – Sheet 282: Heat-shrinkable, polyolefin sleeving – Stress control**

**Gaines isolantes souples –**
**Partie 3: Spécifications pour types particuliers de gaines – Feuille 282: Gaines thermorétractables en polyoléfine – Contrôle de contrainte**

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