

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Flexible insulating sleeving –
Part 3: Specifications for individual types of sleeving –
Sheet 214: Heat-shrinkable, polyolefin sleeving, not flame retarded,
thick and medium wall**

**Gaines isolantes souples –
Partie 3: Spécifications pour types particuliers de gaines –
Feuille 214: Gaines thermorétractables en polyoléfine, non ignifugées,
à paroi épaisse et moyenne**



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CONTENTS

| | |
|--|----|
| FOREWORD..... | 3 |
| INTRODUCTION..... | 5 |
| 1 Scope..... | 6 |
| 2 Normative references..... | 6 |
| 3 Designation..... | 6 |
| 4 Conditions of test..... | 7 |
| 5 Requirements..... | 7 |
| 6 Sleeving conformance..... | 7 |
| Annex A (informative) Guide to the available sizes and wall thicknesses..... | 11 |
| Bibliography..... | 13 |
| Table 1 – Property requirements (1 of 2)..... | 8 |
| Table 2 – Requirements for breakdown voltage..... | 10 |
| Table 3 – Resistance to selected fluids..... | 10 |
| Table A.1 – Type A medium wall..... | 11 |
| Table A.2 – Type B thick wall..... | 12 |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FLEXIBLE INSULATING SLEEVING –

**Part 3: Specifications for individual types of sleeving –
Sheet 214: Heat-shrinkable, polyolefin sleeving,
not flame retarded, thick and medium wall**

FOREWORD

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International Standard IEC 60684-3-214 has been prepared by IEC technical committee 15: Solid electrical insulating materials.

This third edition cancels and replaces the second edition published in 2005. This edition constitutes a technical revision.

This edition includes the following significant technical change with respect to the previous edition:

Alignment with IEC 60684-3-247 (dual wall) since this Part 3 specification represents a single wall option using identical material.

The text of this standard is based on the following documents:

| FDIS | Report on voting |
|-------------|------------------|
| 15/718/FDIS | 15/721/RVD |

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60684 series, published under the general title *Flexible insulating sleeving*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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Withhold

INTRODUCTION

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

The series consists of three parts:

Part 1: Definitions and general requirements (IEC 60684-1)

Part 2: Methods of test (IEC 60684-2)

Part 3: Specifications for individual types of sleeving (IEC 60684-3)

This standard gives one of the sheets comprising Part 3 as follows:

Sheet 214: Heat-shrinkable, polyolefin sleeving, not flame retarded, thick and medium wall.

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FLEXIBLE INSULATING SLEEVING –

Part 3: Specifications for individual types of sleeving – Sheet 214: Heat-shrinkable, polyolefin sleeving, not flame retarded, thick and medium wall

1 Scope

This standard gives the requirements for two types of heat-shrinkable, polyolefin sleeving, not flame retarded, thick and medium wall with a nominal shrink ratio of 3:1.

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

Type A: Medium wall – internal diameter up to 200 mm typically.

Type B: Thick wall – internal diameter up to 200 mm typically.

These sleeveings are normally supplied in colour black.

Since these types of sleeveings cover a significantly large range of sizes and wall thicknesses, Tables A.1 and A.2 of this document provides a guide to the range of sizes available. The actual size will be agreed between the user and 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.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60296:2012, *Fluids for electrotechnical applications – Unused mineral insulating oils for transformers and switchgear*

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

IEC 60684-2:2011, *Flexible insulating sleeving – Part 2: Methods of test*

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

ISO 868:2003, *Plastics and ebonite – Determination of indentation hardness by means of a durometer (Shore hardness)*

ISO 11358:1997, *Plastics – Thermogravimetry (TG) of polymers– General principles*

3 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 mm) | Colour |
|-------------|------------------------|-----------------|------------------|------|---|--------|
| ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| Sleeving | IEC 60684 | - 3 | - 214 | - B | - 85,0/25,0 | - BK |

Any colour abbreviation shall comply with IEC 60757, where applicable. Non-standard colours shall be written out in full.

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

4 Conditions of test

Unless otherwise specified, the sleeving shall be shrunk in a forced air circulation oven for (10 ± 1) min at $200 \text{ }^\circ\text{C} \pm 3 \text{ K}$ prior to testing.

5 Requirements

In addition to the general requirements given in IEC 60684-1, the sleeving shall comply with the requirements of Tables 1, 2, and 3, where applicable.

6 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 – 30 mm

Type B: Recovered ID 25 mm – 30 mm

Table 1 – Property requirements (1 of 2)

| Property | IEC 60684-2:2011 clause or subclause | Units | Max. or Min. | Requirements | Remarks |
|----------------------------------|--------------------------------------|-------|--------------|---|--|
| Dimensions | 3 | | | | |
| Internal Diameter | 3.1.2 | mm | | To be agreed between purchaser and supplier | |
| Wall thickness | 3.3.2 | mm | | | |
| Concentricity expanded | 3.3.3 | % | Min. | 50 | |
| recovered | | | Min. | 85 | |
| Heat shock | 6 | | | | Heat at 200 °C ± 5 K |
| Tensile strength | 19.1 and 19.2 | MPa | Min. | 10 | |
| Elongation at break | 19.1 and 19.2 | % | Min. | 200 | |
| Longitudinal change | 9 | % | Max. | - 10 + 5 | Heat expanded sleeving at 200 °C ± 3 K for (10 ± 1) min |
| Bending at low temperature | 14 | - | - | No cracking shall be visible | Test at - 20 °C For strips, the mandrel shall be between 20 and 22 times the wall thickness. Full section sleeving is tested and the mandrel shall be between 20 and 22 times the outer diameter. |
| Dimensional stability on storage | 16 | - | - | The dimensions shall remain as agreed | See Clause 1 (Scope) |
| Tensile Strength | 19.1 and 19.2 | MPa | Min. | 13 | Use a jaw separation rate of 100 mm/min. Below 6,5 mm Ø as sleeving. |
| Elongation at break | 19.1 and 19.2 | % | Min. | 350 | At 6,5 mm Ø and above as dumbbells |
| Secant modulus at 2 % elongation | 19.5 | MPa | Min. Max. | 80 160 | |

Table 1 (2 of 2)

| Property | IEC 60684-2:2011 clause or subclause | Units | Max. or Min. | Requirements | Remarks |
|--------------------------------|--------------------------------------|------------------|--------------|---|--|
| Breakdown voltage | 21 | kV | Min. | Table 2 | |
| Volume resistivity | 23 | | | | |
| at room temperature | 23.5.2 | $\Omega \cdot m$ | Min. | 10^{12} | |
| after damp heat | 23.5.4 | $\Omega \cdot m$ | Min. | 10^{11} | |
| Colour fastness to light | 34 | | | The colour standard contrast between the exposed and unexposed parts of the specimen shall be equal to or less than that of the fastness standard | Fastness standard 5 |
| Standard identification Number | | | Min. | | |
| Resistance to selected fluids | 36 | | | | Use the fluids and test temperatures specified in Table 3. |
| Tensile strength | 19.1 and 19.2 | MPa | Min. | 10 | |
| Elongation at break | 19.1 and 19.2 | % | Min. | 250 | |
| Heat ageing | 39 | | | | Heat at 150 °C ± 3 K Jacket only |
| Tensile strength | 19.1 and 19.2 | MPa | Min. | 10 | |
| Elongation at break | 19.1 and 19.2 | % | Min. | 200 | |
| Long term heat ageing | 50 | | | | The ageing temperature shall be 100 °C ± 3 K |
| Elongation at break | 19.2 | % | Min. | 175 | |
| Carbon black content | ISO 11358 | % | Min. | 2,5 | |
| Hardness | ISO 868 | Shore D | Min. | 40 | |
| Water Absorption | 40 | % | Max. | 0,5 | |

Table 2 – Requirements for breakdown voltage

| Expanded wall thickness mm | Dielectric strength ^a Min. | |
|---|--|------------------------------|
| | Expanded ID | Dielectric strength kV/mm |
| All dimensions | Type A | |
| | 10-25 | 14 |
| | 26-50 | 12 |
| | 51-120 | 10 |
| | 121 and above | 8 |
| | Type B | |
| | 10-25 | 12 |
| | 26-50 | 10 |
| | 51-120 | 8 |
| | 121 and above | 6 |
| <p>The breakdown voltage shall be determined by the method described in 21.4 of IEC 60684-2:2011. The central value shall comply with the minimum value in this table.</p> <p>The sleeving shall be tested in the expanded condition.</p> <p>The rate of application of the voltage shall be 500 V/s.</p> <p>Care should be taken on selection of sizes based on these values. Refer to the manufacturer for actual values on installed conditions</p> <p>^a Measure the expanded wall thickness and calculate the dielectric strength by dividing the breakdown voltage by this value.</p> | | |

Table 3 – Resistance to selected fluids

| Test fluid No. | Fluids | Type | Standard or symbol | Immersion temperature °C ± 2 K |
|----------------|-----------------|-----------------|--------------------|-----------------------------------|
| 1 | Insulating Oil | Transformer oil | IEC 60296 | 23 |
| 2 | Cleaning fluids | | Iso propyl 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 customer.