IEC 60684-3-214

Edition 4.0 2019-08
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

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

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FOREWORD

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

This fourth edition cancels and replaces the third edition published in 2013. This edition constitutes a technical revision.

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

a) removal of colour fastness to light test, as this is covered by the test for carbon black content.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
15/889/FDIS	15/899/RVD

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

This document 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 document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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:

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 document comprises one of the sheets of Part 3 as follows:

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

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 part of IEC 60684 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 sleevings are normally supplied in colour black.

Since these types of sleeving cover a significantly large range of sizes and wall thicknesses, Annex A (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~~ will 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 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 60296:2012, *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 11358-1:~~1997~~2014, *Plastics – Thermogravimetry (TG) of polymers – Part 1: General principles*

3 Terms and definitions

No terms and definitions are listed in this document.

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

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://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 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.

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 comply with the requirements of Tables 1, 2, and 3, where applicable.

7 Sleeving conformance

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

- Type A: Recovered ~~ID~~ internal diameter 25 mm to 30 mm
- Type B: Recovered ~~ID~~ internal diameter 25 mm to 30 mm

Table 1 – Property requirements *(1 of 2)*

Property	IEC 60684-2:2011 clause or subclause	Units	Max. or Min.	Requirements	Remarks
Dimensions Internal Diameter Wall thickness Concentricity expanded recovered	3 3.1.2 3.3.2 3.3.3	 mm mm %	 Min. Min.	To be agreed between purchaser and supplier 50 85	
Heat shock Tensile strength Elongation at break	6 19.1 and 19.2 19.1 and 19.2	 MPa %	 Min. Min.	 10 200	Heat at 200 °C ± 5 K
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 Elongation at break	19.1 and 19.2 19.1 and 19.2	MPa %	Min. Min.	13 350	Use a jaw separation rate of 100 mm/min. Below 6,5 mm ∅ as sleeving. At 6,5 mm ∅ and above as dumbbells
Secant modulus at 2 % elongation	19.5	MPa -	Min. Max.	80 160	

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

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	3.3.3	%			
expanded			Min.	50	
recovered			Min.	85	
Heat shock	6				Heat at 200 °C ± 5 K
Tensile strength	19.2 and 19.3	MPa	Min.	10	Use a jaw separation rate of 100 mm/min. For internal diameters < 6,5 mm, use sleeving samples for testing. On 6,5 mm and larger diameter sleeving, use dumb-bell samples cut from the sleeving
Elongation at break	19.2 and 19.3	%	Min.	200	
Longitudinal change	9	%	Max.	- 10 + 5	
Bending at low temperature	14	-	-	No cracking shall be visible	Test at –20 °C For strips, the mandrel shall be between 20 times and 22 times the wall thickness. Full section sleeving is tested and the mandrel shall be between 20 times and 22 times the outer diameter.
Dimensional stability on storage	16	-	-	The dimensions shall remain as agreed	See Clause 1
Tensile strength	19.2 and 19.3	MPa	Min.	13	Use a jaw separation rate of 100 mm/min. Below 6,5 mm ø as sleeving At 6,5 mm ø and above as dumbbells
Elongation at break	19.2 and 19.3	%	Min.	350	
Secant modulus at 2 % elongation	19.5	MPa	Min. Max.	80 160	