IEC 60684-3-271

Edition 3.0 2011-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Flexible insulating sleeving –
Part 3: Specifications for individual types of sleeving – Sheet 271: Heat-shrinkable elastomer sleevings, flame retarded, fluid resistant, shrink ratio 2:1

Gaines isolantes souples –
Partie 3: Spécifications pour types particuliers de gaines – Feuille 271: Gaines thermorétractables en élastomère, retardées à la flamme, résistant aux fluides, rapport de rétreint 2:1

IEC 60684-3-271:2011

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FLEXIBLE INSULATING SLEEVING –

Part 3: Specifications for individual types of sleeving – Sheet 271: Heat-shrinkable elastomer sleevings, flame retarded, fluid resistant, shrink ratio 2:1

FOREWORD

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International Standard IEC 60684-3-271 has been prepared by IEC technical committee 15: Solid electrical insulating materials.

This third edition cancels and replaces the second edition published in 2004, and constitutes a technical revision. It includes the following significant technical change from the previous edition: the addition of a type of sleeving suitable for use at temperatures up to 150 °C.

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

FDIS	Report on voting
15C/627/FDIS	15C/639/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 the parts in the IEC 60684 series, 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- withdrawn,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.

INTRODUCTION

This International Standard is part 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 is one of the sheets comprising Part 3, as follows:

Sheet 271: Heat-shrinkable elastomer sleevings, flame retarded, fluid resistant, shrink ratio 2:1.

FLEXIBLE INSULATING SLEEVING –

Part 3: Specifications for individual types of sleeving – Sheet 271: Heat-shrinkable elastomer sleevings, flame retarded, fluid resistant, shrink ratio 2:1

1 Scope

This part of IEC 60684 gives the requirements for four types of heat-shrinkable, flame retarded, fluid resistant, elastomer sleevings, nominal shrink ratio of 2:1.

Type A: standard wall thickness for use at temperatures up to 120 °C

Type B: thin wall thickness for use at temperatures up to 120 °C

Type C: standard wall thickness for use at temperatures up to 150 °C

Type D: thin wall thickness for use at temperatures up to 150 °C

These sleevings are normally supplied with internal diameters up to 102 mm for the standard wall thickness and up to 51 mm for the thin wall thickness. The standard colour is black.

Sizes or colours other than those specifically listed in this standard may be available as custom items. These items are considered to comply with this standard if they comply with the property requirements listed in Tables 1, 2, 3, 4, 5 and 6 except for dimensions and mass.

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 referenced documents are indispensable for the application 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 60684-1:2003, *Flexible insulating sleeving – Part 1: Definitions and general requirements*

IEC 60684-2:1997, *Flexible insulating sleeving – Part 2: Methods of test*

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

ISO 846:1997, *Plastics – Evaluation of the action of micro-organisms*

ISO 1817:2005, *Rubber, vulcanized – Determination of the effect of liquids*

3 Designation

The sleeving shall be identified by the following designation:

Description	IEC publication number		IEC part number		IEC sheet number		Type		Size (expanded/ recovered internal diameter, in mm)	Colour	Table 6* Code
↓	↓		↓		↓		↓		↓	↓	↓
Sleeving	IEC 60684	-	3	-	271	-	A	-	12,7/6,4	BK	X

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

* The addition of “X” at the end of the designation indicates that the properties contained in Table 6 have been agreed upon between the user and supplier.

4 Conditions of test

Unless otherwise specified, the sleeving shall be shrunk in a forced air circulation oven for (5 ± 1) min at 200 °C ± 5 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, 3, 4, 5 and 6 where applicable.

6 Sleeving conformance

Product conformance shall normally be based on the results from size 12,7/6,4 mm black sleeving. The colour fastness to light shall be qualified for all colours.

Table 1 – Dimensional and mass requirements for Type A and C

Size code	Internal diameter mm		Recovered wall thickness mm	Mass per unit length Max. g/m
	Expanded Min.	Recovered Max.		
3,2/1,6	3,2	1,6	0,75 ± 0,15	10,3
4,8/2,4	4,8	2,4	0,85 ± 0,20	16,5
6,4/3,2	6,4	3,2	0,90 ± 0,20	21,6
9,5/4,8	9,5	4,8	1,00 ± 0,20	32,8
12,7/6,4	12,7	6,4	1,20 ± 0,30	54,0
19,0/9,5	19,0	9,5	1,45 ± 0,35	92,8
25,4/12,7	25,4	12,7	1,80 ± 0,45	154
38,0/19,0	38,0	19,0	2,40 ± 0,50	290
51,0/25,4	51,0	25,4	2,80 ± 0,50	432
76,0/38,0	76,0	38,0	3,20 ± 0,60	724
102,0/51,0	102,0	51,0	3,60 ± 0,70	1 083

Table 2 – Dimensional and mass requirements for Type B and D

Size code	Internal diameter mm		Recovered wall thickness mm	Mass per unit length Max. g/m
	Expanded Min.	Recovered Max.		
2,4/1,2	2,4	1,2	0,50 ± 0,10	5,0
3,2/1,6	3,2	1,6	0,50 ± 0,10	6,0
4,8/2,4	4,8	2,4	0,50 ± 0,10	8,2
6,4/3,2	6,4	3,2	0,65 ± 0,15	14,6
9,5/4,8	9,5	4,8	0,65 ± 0,15	20,4
12,7/6,4	12,7	6,4	0,65 ± 0,15	26,2
19,0/9,5	19,0	9,5	0,75 ± 0,15	42,7
25,4/12,7	25,4	12,7	0,90 ± 0,15	65,8
31,5/15,0	31,5	15,0	1,00 ± 0,20	88,6
38,0/19,0	38,0	19,0	1,00 ± 0,20	111
51,0/25,4	51,0	25,4	1,15 ± 0,25	171

Table 3 – Property requirements

Property	IEC 60684-2 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.	 Tables 1 and 2 Tables 1 and 2 65 85	
Heat shock Tensile strength Elongation at break	6 19.1 and 19.2 19.1 and 19.2	 MPa %	 Min. Min.	 8 200	Heat at 215 °C ± 5 K.
Longitudinal change	9	%	Max.	0 –10	Heat the expanded sleeving at 200 °C ± 5 K for (5 ± 1) min.
Bending at low temperature	14	–	–	There shall be no signs of cracking.	Condition at –75 °C ± 3 K. For strips, the mandrel shall be no more than 10 times the wall thickness. Full section sleeving is tested unfilled and the mandrel shall be no more than 10 times the outer diameter.
Dimensional stability on storage	16	–	–	The dimensions shall be as specified in Tables 1 and 2.	
Tensile strength Elongation at break	19.1 and 19.2 19.1 and 19.2	MPa %	Min. Min.	12 350	Use a jaw separation rate of 100 mm/min. Below 6,5 mm diameter as sleeving; at 6,5 mm diameter and above as dumb-bells.
Secant modulus at 2 % elongation	19.4	MPa MPa	Min. Max.	15 35	
Breakdown voltage	21	kV	Min.	Table 4	
Volume resistivity – at room temperature – after damp heat	23 23.4.2 23.4.4	 Ω·m Ω·m	 Min. Min.	 10^8 10^7	
Flame propagation Time of burning Length burned	26 Method C	 s mm	 Max. Max.	 30 75	

Table 3 *(continued)*

Property	IEC 60684-2 clause or subclause	Units	Max. or min.	Requirements		Remarks
Copper corrosion	33	%	Max.	None above the allowable 8 %		Heat for (16 ± 0,5) h at 150 °C ± 3 K.
Colour fastness to light	34			The colour contrast between the exposed and unexposed parts of the specimens shall be equal to or less than that of the fastness standard.		Fastness standard No. 5
Resistance to selected fluids Tensile strength Elongation at break	36 19.1 and 19.2 19.1 and 19.2	 MPa %	 Min. Min.	 8 250		Use the fluids and test temperatures specified in Table 5. Immersion time (24 ± 1) h
Mass per unit length	38	g/m	Max.	Table 1		
Heat ageing Tensile strength Elongation at break	39 19.1 and 19.2 19.1 and 19.2	 MPa %	 Min. Min.	 10 200		Test temperature 160 °C ± 3 K
Water absorption	40	%	Max.	Type A/C 2,0	Type B/D 3,5	
Long-term ageing Elongation	50 19.1 and 19.2	%	Min	Type A/B 175	Type C/D 75	The ageing temperature shall be 120 °C ± 2 K for Types A and B. The ageing temperature shall be 150 °C ± 3 K for Types C and D.