

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

Flexible insulating sleeves – **STANDARD PREVIEW**  
Part 3: Specifications for individual types of sleeves –  
Sheet 216: Heat-shrinkable, flame-retarded, limited-fire-hazard sleeves

Gaines isolantes souples – <https://standards.iteh.ai/catalog/standards/sist/cd29ff52-78f1-42e8-aea9-202555000000>  
Partie 3: Spécifications pour types particuliers de gaines –  
Feuille 216: Gaines thermorétractables, ignifugées, au risque de feu limité



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IEC 60684-3-216

Edition 2.0 2019-08

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FLEXIBLE INSULATING SLEEVING –****Part 3: Specifications for individual types of sleeving –  
Sheet 216: Heat-shrinkable, flame-retarded,  
limited-fire-hazard sleeving****FOREWORD**

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International Standard IEC 60684-3-216 has been prepared by IEC technical committee 15: Solid electrical insulating materials.

This second edition cancels and replaces the first edition published in 2001, Amendment 1:2005 and Amendment 2:2013. This edition constitutes a technical revision.

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

- a) the temperature at which the sleeving is shrunk in a forced-air circulation oven for  $(5 \pm 1)$  min has been increased from  $(150 \pm 5)^\circ\text{C}$  to  $(200 \pm 5)^\circ\text{C}$ .

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

FDIS	Report on voting
15/888/FDIS	15/902/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

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- withdrawn,
- replaced by a revised edition, or
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## 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 document comprises one of the sheets of Part 3 as follows:

Sheet 216: Heat-shrinkable, flame-retarded, limited-fire-hazard sleeving

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## FLEXIBLE INSULATING SLEEVING –

### Part 3: Specifications for individual types of sleeving – Sheet 216: Heat-shrinkable, flame-retarded, limited-fire-hazard sleeving

#### 1 Scope

This part of IEC 60684-3 gives the requirements for four types of heat-shrinkable, flame-retarded, limited-fire-hazard sleeving with a thermal endurance rating of 105 °C as shown below.

Class A:	thin wall	shrink ratio 2:1	internal diameter up to 102,0 mm
Class B:	medium wall	shrink ratio 2:1	internal diameter up to 60,0 mm
Class C:	thick wall	shrink ratio 2:1	internal diameter up to 51,0 mm
Class D:	medium wall	shrink ratio 3:1	internal diameter up to 40,0 mm

These sleeveings are normally supplied in the following colours: black, red, green, blue, white, yellow and green/yellow.

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Sizes or colours other than those listed in this document are available as custom items. These items are considered to comply with this document if they comply with the property requirements listed in Tables 5, 6, 7 and 8, excluding dimensions and mass.

[IEC 60684-3-216:2019](#)

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.

#### 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 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 846:2019, *Plastics – Evaluation of the action of microorganisms*

ISO 1817:2015, *Rubber, vulcanized or thermoplastic – Determination of the effect of liquids*

### 3 Terms and definitions

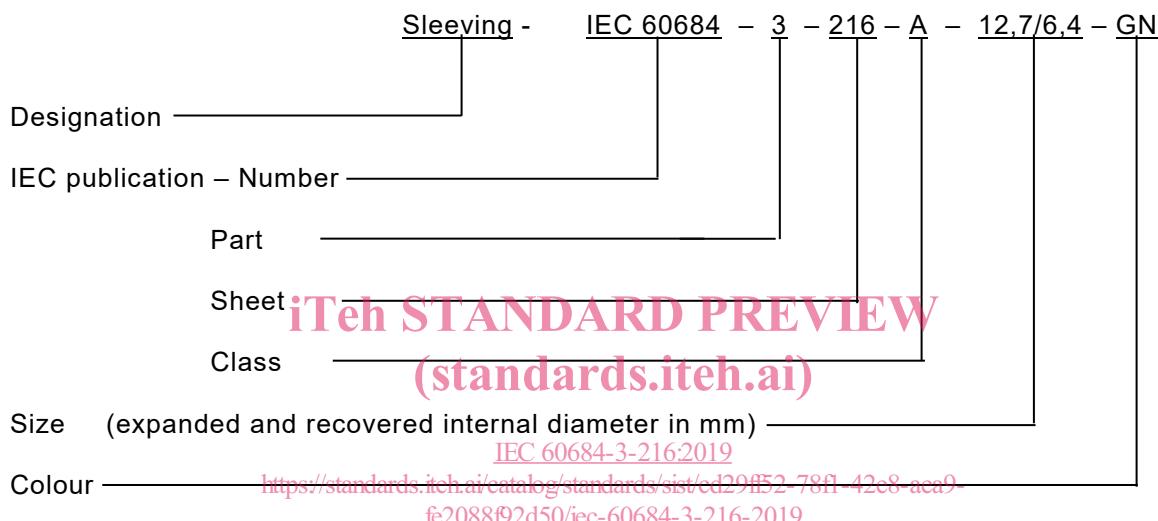
No terms and definitions are listed in this document.

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

This sleeving shall be identified by the following designation:



Any abbreviation of colour shall comply with IEC 60757. Where no abbreviation is given, the colour shall be written in full.

### 5 Conditions of test

Unless otherwise specified, the sleeving shall be shrunk in a forced-air circulation oven for  $(5 \pm 1)$  min at  $(200 \pm 5)$  °C, prior to testing.

### 6 Requirements

In addition to the general requirements given in IEC 60684-1, the sleeving shall comply with the requirements in Tables 1 through 8.

### 7 Sleeving conformance

Conformance to the requirements of this specification shall normally be based on the results for black colour of the following sizes:

- Class A: 12,7 mm/6,4 mm
- Class B: 12,0 mm/6,0 mm
- Class C: 12,7 mm/6,4 mm
- Class D: 18,0 mm/6,0 mm

The colour fastness to light shall be determined for all colours.

**Table 1 – Dimensional and mass requirements – Class A**

<b>Size code</b>	<b>Internal diameter</b> mm		<b>Recovered wall thickness</b> mm	<b>Mass per unit length</b> g/m Max.
	<b>Expanded</b> Min.	<b>Recovered</b> Max.		
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	13,5
9,5/4,8	9,5	4,8	0,65 ± 0,15	19,5
12,7/6,4	12,7	6,4	0,65 ± 0,15	25,0
19,0/9,5	19,0	9,5	0,75 ± 0,15	43,0
25,4/12,7	25,4	12,7	0,90 ± 0,15	67,0
38,0/19,0	38,0	19,0	1,00 ± 0,20	112
51,0/25,4	51,0	25,4	1,15 ± 0,25	175
76,0/38,0	76,0	38,0	1,25 ± 0,25	281
102,0/51,0	102,0	51,0	1,40 ± 0,25	404

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**Table 2 – Dimensional and mass requirements – Class B**

<b>Size code</b>	<b>Internal diameter</b> mm <a href="https://standards.iteh.ai/catalog/standards/sist/cd29ff52-87f4-426aea9-6208892d50/icc-60684-3-216-2019">https://standards.iteh.ai/catalog/standards/sist/cd29ff52-87f4-426aea9-6208892d50/icc-60684-3-216-2019</a>		<b>Recovered wall thickness</b> mm	<b>Mass per unit length</b> g/m Max.
	<b>Expanded</b> Min.	<b>Recovered</b> Max.		
3,0/1,5	3,0	1,5	0,70 ± 0,10	8,5
5,0/2,5	5,0	2,5	0,75 ± 0,15	13,5
8,0/4,0	8,0	4,0	0,80 ± 0,15	21,0
12,0/6,0	12,0	6,0	0,90 ± 0,15	33,0
18,0/9,0	18,0	9,0	1,00 ± 0,20	54,0
24,0/12,0	24,0	12,0	1,10 ± 0,20	77,0
40,0/20,0	40,0	20,0	1,30 ± 0,25	146
60,0/30,0	60,0	30,0	1,50 ± 0,30	250

**Table 3 – Dimensional and mass requirements – Class C**

Size code	Internal diameter mm		Recovered wall thickness mm	Mass per unit length g/m Max.
	Expanded Min.	Recovered Max.		
3,2/1,6	3,2	1,6	0,75 ± 0,15	9,9
4,8/2,4	4,8	2,4	0,85 ± 0,20	15,8
6,4/3,2	6,4	3,2	0,90 ± 0,20	21,0
9,5/4,8	9,5	4,8	1,00 ± 0,20	32,0
12,7/6,4	12,7	6,4	1,20 ± 0,30	53,6
19,0/9,5	19,0	9,5	1,45 ± 0,35	91,6
25,4/12,7	25,4	12,7	1,80 ± 0,45	155
38,0/19,0	38,0	19,0	2,40 ± 0,50	294
51,0/25,4	51,0	25,4	2,80 ± 0,50	435

**Table 4 – Dimensional and mass requirements – Class D**

Size code	Internal diameter mm		Recovered wall thickness mm	Mass per unit length g/m Max.
	Expanded Min.	Recovered Max.		
3,0/1,0	3,0	1,0	0,60 ± 0,10	5,5
6,0/2,0	6,0	2,0	0,70 ± 0,10	10,5
9,0/3,0	9,0	3,0	0,80 ± 0,15	17,0
12,0/4,0	12,0	4,0	0,85 ± 0,15	23,0
18,0/6,0	18,0	6,0	1,00 ± 0,20	39,0
24,0/8,0	24,0	8,0	1,20 ± 0,20	61,0
40,0/13,0	40,0	13,0	1,25 ± 0,20	98,5

**Table 5 – Property requirements (1 of 3)**

<b>Property</b>	<b>IEC 60684-2:2011 clause or subclause</b>	<b>Units</b>	<b>Max. or Min.</b>	<b>Requirements</b>	<b>Remarks</b>
Dimensions – internal diameter – wall thickness – concentricity • expanded • recovered	3 3.1.2 3.3.2 3.3.3	mm mm %	Min.	Tables 1 to 4 Tables 1 to 4 65 85	
Heat shock – tensile strength – elongation at break	6 19.2 and 19.3 19.2 and 19.3	MPa %	Min. Min.	6 100	Heat the expanded sleeving at $(150 \pm 5)^\circ\text{C}$ for $(5 \pm 1)$ min 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
Longitudinal change	9	%	Max. $+10$ $+5$	PREVIEW	The test is done on expanded sleeving
Bending at low temperature	14			No cracking shall be visible <a href="#">IEC 60684-3-216:2019</a> <a href="https://standards.iteh.ai/catalog/standards/sist/cd29ff52-78f1-42e8-aef9-fe2088f92d50/iec-60684-3-216-2019">https://standards.iteh.ai/catalog/standards/sist/cd29ff52-78f1-42e8-aef9-fe2088f92d50/iec-60684-3-216-2019</a>	Test at $-30^\circ\text{C}$ after conditioning at that temperature for 4 h. For strips, the mandrel shall be between 20 times and 22 times the wall thickness. Full section sleeving is tested unfilled and the mandrel shall be between 20 times and 22 times the outer diameter