



**SLOVENSKI STANDARD**  
**SIST EN 60684-3-145 to 147:2002**  
**01-oktober-2002**

**Flexible insulating sleeving - Part 3: Specifications for individual types of sleeving  
 - Sheets 145 to 147: Extruded PTFE sleeving (IEC 60684-3-145 to 147:2001)**

Flexible insulating sleeving -- Part 3: Specifications for individual types of sleeving --  
 Sheets 145 to 147: Extruded PTFE sleeving

Isolierschläuche -- Teil 3: Anforderungen für einzelne Schlauchtypen -- Blätter 145 bis  
 147: Extrudierte PTFE-Schläuche

Gaines isolantes souples -- Partie 3: Spécifications pour types particuliers de gaines --  
 Feuilles 145 à 147: Gaines en PTFE extrudé

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**Ta slovenski standard je istoveten z: EN 60684-3-145 to 147:2001**

**ICS:**

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EUROPEAN STANDARD

**EN 60684-3-145 to 147**

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2001

ICS 29.035.20

English version

**Flexible insulating sleeving**  
**Part 3: Specifications for individual types of sleeving**  
**Sheets 145 to 147: Extruded PTFE sleeving**  
(IEC 60684-3-145 to 147:2001)

Gaines isolantes souples  
Partie 3: Spécifications pour types  
particuliers de gaines  
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PTFE extrudé  
(CEI 60684-3-145 à 147:2001)

Isolierschläuche  
Teil 3: Bestimmungen für einzelne  
Schlauchttypen  
Blätter 145 bis 147: Extrudierte  
PTFE-Schläuche  
(IEC 60684-3-145 bis 147:2001)

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This European Standard was approved by CENELEC on 2001-09-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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# CENELEC

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

### Foreword

The text of document 15C/1216/FDIS, future edition 1 of IEC 60684-3-145 to 147, prepared by SC 15C, Specifications, of IEC TC 15, Insulating materials, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60684-3-145 to 147 on 2001-09-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-06-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2004-09-01

Annexes designated "normative" are part of the body of the standard.  
In this standard, annex ZA is normative.  
Annex ZA has been added by CENELEC.

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### Endorsement notice

The text of the International Standard IEC 60684-3-145 to 147:2001 was approved by CENELEC as a European Standard without any modification.

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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: Specification requirements for individual types of sleeving (IEC 60684-3).

This standard contains three of the sheets comprising part 3 as follows:

- Sheet 145: Extruded PTFE sleeving – Thin wall
- Sheet 146: Extruded PTFE sleeving – Standard wall
- Sheet 147: Extruded PTFE sleeving – Thick wall

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## FLEXIBLE INSULATING SLEEVING –

### Part 3: Specifications for individual types of sleeving – Sheets 145 to 147: Extruded PTFE sleeving

#### 1 Scope

These sheets of IEC 60684-3 give the requirements for three types of non-heat-shrinkable sleeving, extruded from PTFE.

Sleeving of this type is normally available with internal diameters up to 8,53 mm and in a range of wall thicknesses between 0,15 mm and 0,51 mm.

This specification covers three levels of wall thickness: “thin wall”, “standard wall” and “thick wall” related to nominal internal diameter and with corresponding differences in requirements for breakdown voltage.

Experience of product performance indicates that PTFE sleeving may be suitable for inclusion in systems for operation at temperatures up to 250 °C.

These sleeveings are normally available in the following opaque colours: black, brown, red, orange, yellow, green, blue, violet, grey, white, pink and turquoise. It is also available as non-coloured.

Sizes or colours other than those specifically listed in this standard may be available as custom items. These items shall be considered to comply with this standard if they comply with the other property requirements listed in tables 1 and 2.

#### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60684. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60684 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60216 (all parts), *Guide for the determination of thermal endurance properties of electrical insulating materials*

IEC 60304:1982, *Standard colours for insulation for low-frequency cables and wires*

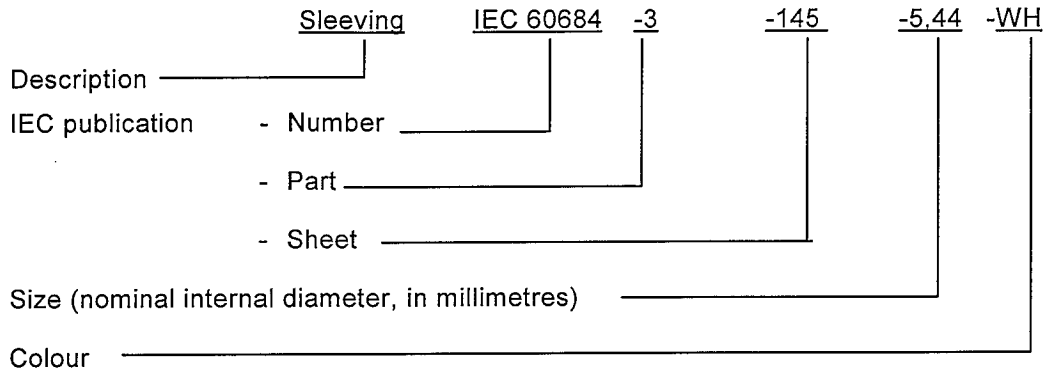
IEC 60684-1:1980, *Specification for flexible insulating sleeving – Part 1: Definitions and general requirements*

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

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

### 3 Designation

The sleeving shall be identified by the following designation:



Any abbreviation used for colour shall comply with IEC 60757 where applicable. The abbreviation for non-coloured shall be "NC". Non-standard colours shall be written out in full.

### 4 Requirements

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

### 5 Product qualification

[SIST EN 60684-3-145 to 147:2002](https://standards.iteh.ai/catalog/standards/sist/b6cd099c-aeaa-4bb7-8253-d61d5c012436/sist-en-60684-3-145-to-147-2002)

Product qualification shall normally be based on results from 6,07 mm nominal internal diameter black sleeving. Colour and colour fastness to light shall be qualified for all colours.

### 6 Thermal classification

The procedures described in IEC 60216 for evaluation of thermal endurance are not readily applicable to PTFE.

Table 1 – Typical dimensions <sup>1)</sup>

Internal diameter mm		Wall thickness mm					
		Sheet 145 Thin wall		Sheet 146 Standard wall		Sheet 147 Thick wall	
Nominal	Tolerance ±	Nominal	Tolerance ±	Nominal	Tolerance ±	Nominal	Tolerance ±
0,33	0,06	0,15	0,05	0,20	0,07	0,25	0,07
0,38	0,06	0,15	0,05	0,23	0,07	0,25	0,07
0,51	0,06	0,15	0,05	0,25	0,07	0,30	0,07
0,58	0,09	0,15	0,05	0,25	0,07	0,30	0,07
0,71	0,09	0,15	0,05	0,25	0,07	0,30	0,07
0,89	0,09	0,15	0,05	0,30	0,07	0,41	0,07
1,02	0,09	0,15	0,05	0,30	0,07	0,41	0,07
1,14	0,12	0,15	0,05	0,30	0,07	0,41	0,07
1,27	0,12	0,15	0,05	0,30	0,07	0,41	0,07
1,40	0,12	0,15	0,05	0,30	0,07	0,41	0,07
1,58	0,12	0,15	0,05	0,30	0,07	0,41	0,07
1,73	0,12	0,20	0,05	0,30	0,07	0,41	0,07
1,91	0,12	0,20	0,05	0,30	0,07	0,41	0,07
2,16	0,12	0,20	0,05	0,30	0,07	0,41	0,07
2,41	0,12	0,20	0,05	0,30	0,07	0,41	0,07
2,72	0,12	0,20	0,05	0,30	0,07	0,41	0,07
3,05	0,12	0,20	0,05	0,38	0,07	0,51	0,10
3,43	0,15	0,20	0,05	0,38	0,07	0,51	0,10
3,84	0,15	0,25	0,05	0,38	0,07	0,51	0,10
4,29	0,15	0,25	0,07	0,38	0,07	0,51	0,10
4,83	0,25	0,25	0,07	0,38	0,07	0,51	0,10
5,44	0,25	0,25	0,07	0,38	0,07	0,51	0,10
6,07	0,25	0,25	0,07	0,38	0,07	0,51	0,10
6,81	0,25	0,25	0,07	0,38	0,07	0,51	0,10
7,62	0,25	0,25	0,07	0,38	0,07	0,51	0,10
8,53	0,25	0,25	0,07	0,38	0,07	0,51	0,10

<sup>1)</sup> For sizes not included in the table the nominal wall thickness and the tolerance for the next lower (or higher) size shall be used.



Table 2 – Property requirements

Property	IEC 60684-2 clause or subclause	Units	Max. or min.	Requirements	Remarks
Colour	–	–	–	Shall be a reasonable match to IEC 60304, where applicable	See part 1
Dimensions	3	mm	–	Table 1	
Density	4	g/cm <sup>3</sup>	Max.	±0,05 tolerance	Maximum permitted deviation from manufacturer's declared values
Resistance to heat followed by:	6	–	Max.	No sign of dripping, flowing or cracking	Heating temperature 350 °C ± 5 K Cut lengths of 150 mm
Density	4	g/cm <sup>3</sup>	Max.	±0,05 tolerance	Maximum permitted deviation from original density in clause 4
Longitudinal change	9	%	Min.	±10	
Bending at low temperature	14	–	Min.	There shall be no cracking	Test temperature –65 °C or lower. For cut strips use a mandrel with diameter 9-10 times the nominal wall thickness. For sleeving use a mandrel with a diameter 18-20 times the nominal wall thickness
Tensile strength	19.1 or 19.2	MPa	Min.	25	For nominal internal diameter of 6 mm and above use dumb-bells. Rate of jaw separation (250 ± 50) mm/min
Elongation at break	19.1 or 19.2	%	Min.	300	Speed of separation of jaws (250 ± 50) mm/min.
Breakdown voltage	21	kV	Min.	See table 3	Test at room temperature only
Volume resistivity at room temperature	23.4.2	Ωm	Min.	10 <sup>15</sup>	Where absolute values are not obtained, report the results as greater than the highest measurable value
Colour fastness to light	34	–	–	The colour contrast between the exposed and unexposed parts of the specimen shall be equal to or less than that of the fastness standard	Fastness standard No. 5