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**Flexible insulating sleeving - Part 3: Specifications for individual types of sleeving  
- Sheet 218: Heat-shrinkable polyolefin sleeving, not flame retarded, shrink ratio  
3:1 (IEC 60684-3-218:1998)**

Flexible insulating sleeving -- Part 3: Specifications for individual types of sleeving --  
Sheet 218: Heat-shrinkable polyolefin sleeving, not flame retarded, shrink ratio 3:1

Isolierschläuche -- Teil 3: Anforderungen für einzelne Schlauchtypen -- Blatt 218:  
Wärmeschrumpfende Polyolefinschläuche, nicht-flammwidrig, Schrumpfverhältnis 3:1

Gaines isolantes souples -- Partie 3: Spécifications pour types particuliers de gaines --  
Feuille 218: Gaines thermorétractables en polyoléfine non retardée à la flamme, rapport  
de rétreint 3:1

**Ta slovenski standard je istoveten z: EN 60684-3-218:1998**

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**ICS:**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

EN 60684-3-218

August 1998

ICS 29.035.01

Descriptors: Solid electrical insulating materials, protection sleeveings, heat-shrinkable materials, polyolefins, flexible conductors, designation, individual specifications, dimensions, mass, characteristics, tables of data, breakdown voltage

English version

Flexible insulating sleeving  
Part 3: Specifications for individual types of sleeving  
Sheet 218: Heat-shrinkable polyolefin sleeving, not flame  
retarded, shrink ratio 3 : 1

(IEC 60684-3-218:1998)

Gaines isolantes souples	Isolierschläuche
Partie 3: Spécifications pour types particuliers de gaines	Teil 3: Anforderungen für einzelne Schlauchtypen
Feuille 218: Gaines thermorétractables en polyoléfine, non retardée à la flamme, rapport de rétreint 3 : 1	Blatt 218: Wärmeschrumpfende Polyolefinschläuche, nicht-flammwidrig, Schrumpfverhältnis 3 : 1
(CEI 60684-3-218:1998)	(IEC 60684-3-218:1998)

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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

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Ref. No. EN 60684-3-218:1998 E

## Foreword

The text of document 15C/958/FDIS, future edition 1 of IEC 60684-3-218, 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 60684-3-218 on 1998-08-01.

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) 1999-05-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2001-05-01

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.

## Endorsement notice

The text of the International Standard IEC 60684-3-218:1998 was approved by CENELEC as a European Standard without any modification.

## Contents

	Page
Foreword	2
Introduction	3
1 Scope	3
2 Normative references	3
3 Designation	3
4 Conditions of test	4
5 Requirements	4
6 Product qualification	4
Annex ZA (normative) Normative references to international publications with their corresponding European publications	8
Table 1 — Dimensional and mass requirements	4
Table 2 — Property requirements	5
Table 3 — Requirements for breakdown voltage	6
Table 4 — Resistance to selected fluids	7
Table 5 — Additional property requirements	7

## 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 for individual types of sleeving (IEC 60684-3).*

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

Sheet 218: Heat-shrinkable polyolefin sleeving, not flame retarded, shrink ratio 3 : 1.

## 1 Scope

This sheet of IEC 60684-3 gives the requirements for one type of heat-shrinkable polyolefin sleeving with a temperature index of 135 and a nominal shrink ratio of 3 : 1. The sleeving is not flame retarded.

This sleeving is normally supplied with internal diameter up to 39 mm and is transparent.

Sizes 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 property requirements listed in Table 1, Table 2, Table 3, Table 4 and Table 5.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this sheet of IEC 60684-3. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreement based on this sheet of IEC 60684-3 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below<sup>1)</sup>. Members of IEC and ISO maintain registers of currently valid International Standards.

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

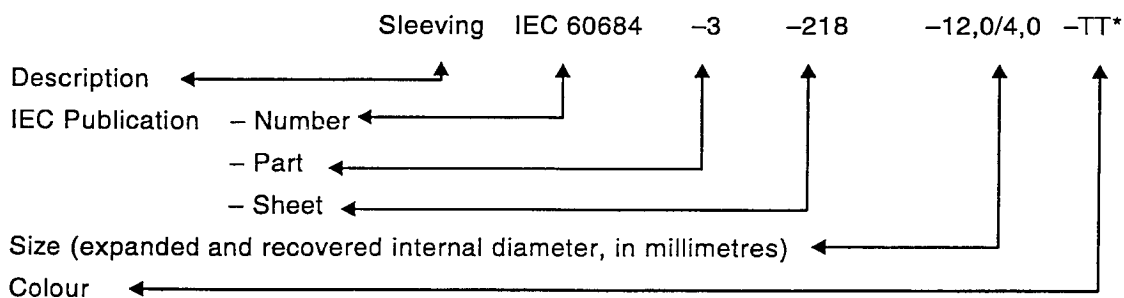
IEC 60684-2:1997, *Flexible insulating sleeving — Part 2: Methods of test.*

ISO 846:1978, *Plastics — Evaluation of the action of micro-organisms.*

ISO 1817, — *Rubber, vulcanized — Determination of the effects of liquids*<sup>2)</sup>.

## 3 Designation

The sleeving shall be identified by the following designation:



\* TT designates transparent sleeving.

<sup>1)</sup> In case of dispute, the referenced edition is applicable.

<sup>2)</sup> To be published (revision of ISO 1817:1985).

#### 4 Conditions of test

Unless otherwise specified, the sleeving shall be shrunk in a forced air circulation oven for  $(5 \pm 1)$  min at  $200 \text{ }^\circ\text{C} \pm 5 \text{ K}$  prior to testing.

#### 5 Requirements

In addition to the general requirements given in IEC 60684-1, the sleeving shall comply with the requirements of Table 1, Table 2, Table 3, Table 4 and Table 5.

#### 6 Product qualification

Product qualification shall normally be based on results from sleeving having the size of 12,0/4,0 mm.

**Table 1 — Dimensional and mass requirements**

Size code	Internal diameter mm		Recovered wall thickness mm	Mass per unit length g/m Max.
	Expanded Min.	Recovered Max.		
1,5/0,5	1,5	0,5	$0,45 \pm 0,10$	1,8
3,0/1,0	3,0	1,0	$0,55 \pm 0,10$	3,4
6,0/2,0	6,0	2,0	$0,65 \pm 0,10$	6,5
9,0/3,0	9,0	3,0	$0,75 \pm 0,15$	11,0
12,0/4,0	12,0	4,0	$0,75 \pm 0,15$	13,9
18,0/6,0	18,0	6,0	$0,85 \pm 0,20$	23,2
24,0/8,0	24,0	8,0	$1,00 \pm 0,20$	34,7
39,0/13,0	39,0	13,0	$1,10 \pm 0,20$	60,8

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Table 2 — Property requirements

Property	IEC 60684-2 clause or subclause	Units	Max. or min.	Requirement	Remarks
Dimensions — internal diameter — wall thickness — concentricity • expanded • recovered	<b>3</b> <b>3.1.2</b> <b>3.3.2</b> <b>3.3.3</b>	mm mm %	Min.	Table 1 Table 1 50 85	
Heat shock Tensile strength Elongation at break	<b>6</b> <b>19.1 and 19.2</b> <b>19.1 and 19.2</b>	MPa %	Min. Min.	10 200	Heat at 200 °C ± 5 K
Longitudinal change	<b>9</b>	%	Max.	+ 5 - 10	Heat the expanded sleeving at 200 °C ± 5 K for (5 ± 1) min
Bending at low temperature	<b>14</b>	—	—	There shall be no signs of cracking	Condition at - 55 °C ± 3 K. For strips, the mandrel shall be no more than 10 × the wall thickness. Full section sleeving is tested unfilled and the mandrel shall be no more than 10 × the outer diameter.
Dimensional stability on storage	<b>16</b>	—	—	The dimensions shall be as specified in Table 1	
Tensile strength Elongation at break	<b>19.1 and 19.2</b> <b>19.1 and 19.2</b>	MPa %	Min. Min.	10 250	Rate of jaw separation 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	<b>19.4</b>	MPa MPa	Min. Max.	50 175	
Breakdown voltage	<b>21</b>	kV	Min.	Table 3	
Volume resistivity — at room temperature — after damp heat	<b>23</b> <b>23.4.2</b> <b>23.4.4</b>	Ωm Ωm	Min. Min.	10 <sup>13</sup> 10 <sup>12</sup>	
Transparency	<b>28</b>	—	—	Printing shall be legible	Transparent only
Copper corrosion	<b>33</b>	%	Max.	None above the allowable 8 %	Heat for (16 ± 0,5) h at 175 °C ± 3 K

Table 2 — Property requirements

Property	IEC 60684-2 clause or subclause	Units	Max. or min.	Requirement	Remarks
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 After this test transparent sleeving shall meet the requirement for transparency	Fastness standard No. 5
Resistance to selected fluids	36				Use the fluids and test temperatures specified in Table 4
Tensile strength	19.1 and 19.2	MPa	Min.	8	
Elongation at break	19.1 and 19.2	%	Min.	200	
Thermal endurance	37		Min.	135	The test to establish failure shall be elongation at break; the end point shall be 50 % absolute elongation at break
Temperature index					
Mass per unit length	38	g/m	Max.	Table 1	
Heat ageing	39				Test temperature 150 °C ± 3 K
Tensile strength	19.1 and 19.2	MPa	Min.	10	
Elongation at break	19.1 and 19.2	%	Min.	150	
Water absorption	40	%	Max.	0,5	

Table 3 — Requirements for breakdown voltage

The breakdown voltage shall be determined by any of the methods described in 21.2, 21.3 or 21.4 of IEC 60684-2. The central value shall comply with the minimum value in this table.

The rate of application of the voltage shall be 500 V/s.

Nominal recovered wall thickness <sup>a</sup> mm	Breakdown voltage Min. kV
0,45	9,0
0,55	10,5
0,65	12,0
0,75	13,5
0,85	15,0
1,00	17,5
1,10	18,5

<sup>a</sup> For non-standard wall thicknesses, the electric strength shall be at least that of the next smaller standard wall thickness. For wall thicknesses smaller than 0,45 mm, the electric strength shall be at least 20,0 kV/mm.



Table 4 — Resistance to selected fluids

Fluids	Type	Standard or symbol	Immersion temperature °C ± 2 K
Fuels	Gasoline	ISO 1817 Liquid B	23
	Kerosene	ISO 1817 Liquid F	23
Hydraulic fluids	Phosphate base	ISO 1817 Liquid 103	23
	Silicone base	S-1714 <sup>a</sup>	23
	Mineral base	H-520 <sup>a</sup>	23
Oils	Synthetic base	ISO 1817 Liquid 101	23
	Mineral base	ISO 1817 Oil No. 2	23
	Mineral base	O-1176 <sup>a</sup>	23
	Mineral base	O-142 <sup>a</sup>	23
Cleaning fluids	Solvent	Isopropyl alcohol	23
		Propanol 25 % White spirit 75 %	23
		Methylethylketone	23
De-icing fluids	Runway de-icers	Inhibited potassium acetate in water, 50 %	23
		Ethylene glycol 80 % Water 20 %	23

NOTE 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.

<sup>a</sup> These are commercially available fluids which can be identified in aviation fluid guides.

Table 5 — Additional property requirements

Property	IEC 60684-2 subclause	Units	Max. or min.	Requirements	Remarks
Fungus resistance					
Tensile strength	19.1 and 19.2	MPa	Min.	10	The test method shall be ISO 846 method B. 56 days exposure
Elongation at break	19.1 and 19.2	%	Min.	250	
Shelf life <sup>a</sup>				The dimensions shall be as specified in Table 1	Condition the sleeving for 60 months at ambient temperature prior to testing; interim measurements are to be made every 12 months

<sup>a</sup> Due to the duration of this test, lack of completion of this test shall not preclude certification of this specification. Additional evidence of compliance with this requirement in the interim shall be as agreed between the supplier and/or the approval authority and/or the customer.