
**Aeronavtika - Toplotno skrčljiva cev za utrjevanje, izolacijo in identifikacijo - 105.
del: Delno upogibljiv poliviniliden fluorid (PDVF) - Temperaturno območje od -55
oC do 150 oC - Standard za proizvod**

Aerospace series - Sleeving, heat-shrinkable, for binding, insulation and identification -
Part 105: Semi-flexible polyvinylidene fluoride (PDVF) - Temperature range -55 °C and
150 °C - Product Standard

Luft- und Raumfahrt - Wärmeschrumpfender Schlauch zur Befestigung, Isolierung und
Identifizierung - Teil 105: Halbsteif Polyvinylidenfluorid (PVDF), Temperaturbereich -55°
C bis 150°C - Produktnorm

Série aérospatiale Manchons thermoretractables, de jonction, isolement et identification
Partie 105 : Polyfluorure de vinylidene (PVDF) semi-flexible polyvinylidene fluoride
Températures d'utilisation 55 °C à 150 °C Norme de produit

Ta slovenski standard je istoveten z: EN 4708-105:2019

ICS:

49.025.40	Guma in polimerni materiali	Rubber and plastics
49.060	Letalska in vesoljska električna oprema in sistemi	Aerospace electric equipment and systems

SIST EN 4708-105:2019**en,fr,de**

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EUROPEAN STANDARD

EN 4708-105

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ICS 49.060

English Version

**Aerospace series - Sleeving, heat-shrinkable, for binding,
insulation and identification - Part 105: Semi-flexible
polyvinylidene fluoride (PVDF) - Temperature range - 55
°C to 150 °C - Product standard**

Série aérospatiale - Manchons thermorétractables, de
jonction, isolement et identification - Partie 105 : Semi-
flexible polyfluorure de vinyldène (PVDF) -
Températures d'utilisation - 55 °C à 150 °C - Norme de
produit

Luft- und Raumfahrt - Wärmeschrumpfender Schlauch
zur Befestigung, Isolierung und Identifizierung - Teil
105: Halbsteif, Polyvinylidenfluorid (PVDF) -
Temperaturbereich -55° C bis 150°C - Produktnorm

This European Standard was approved by CEN on 14 January 2019.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 4708-105:2019) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2020, and conflicting national standards shall be withdrawn at the latest by March 2020.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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EN 4708-105:2019 (E)**1 Scope**

This document specifies the required characteristics for a heat-shrinkable, semi-flexible polyvinylidene sleeving for use in aircraft electrical systems at operating temperatures between – 55 °C and 150 °C. This sleeving is basically transparent, but may be tinted. It is semi-flexible tough and abrasion resistant, and is suitable for use where strain relief and mechanical protection are required, or where their transparent properties are desirable.

It is not suitable for use where contamination from phosphate ester based hydraulic fluid is possible.

These sleeveings are normally supplied with internal diameters up to 25,4 mm for shrink ratios of 2:1.

Sizes other than those specifically listed in this standard may be available. These items shall be considered to comply with this standard if they comply with the property requirements listed in Tables 2, 3 and 4 except for dimensions and mass.

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.

EN 3909, *Aerospace series — Test fluids and test methods for electrical and optical components and sub-assemblies*

EN 4708-001, *Aerospace series — Sleeving, heat-shrinkable, for binding, insulation and identification — Part 001: Technical specification*

IEC 60684-1, *Flexible insulating sleeving — Part 1: Definitions and general requirements* ¹⁾

IEC 60684-2, *Flexible insulating sleeving — Part 2: Methods of test* ¹⁾

IEC 60757, *Code for designation of colours* ¹⁾

ISO 846, *Plastics — Evaluation of the action of micro-organisms* ²⁾

ISO 1817, *Rubber, vulcanized — Determination of the effect of liquids* ²⁾

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60684-1 apply.

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>

1) Published by : International Electrotechnical Commission (IEC), <http://www.iec.ch/>

2) Published by : International Organization for Standardization (ISO), <http://www.iso.ch/>

4 Required characteristics

4.1 Dimensions and mass

See Table 1.

Table 1 — Dimensional and mass requirements

Size code	Internal diameter mm		Recovered wall thickness mm	Mass per unit length max. g/m
	Expanded min.	Recovered max.		
1,2/0,6	1,2	0,6	0,25 ± 0,05	1,5
1,6/0,8	1,6	0,8	0,25 ± 0,05	1,9
2,4/1,2	2,4	1,2	0,25 ± 0,05	2,5
3,2/1,6	3,2	1,6	0,25 ± 0,05	3,2
4,8/2,4	4,8	2,4	0,25 ± 0,05	4,6
6,4/3,2	6,4	3,2	0,30 ± 0,10	8,1
9,5/4,8	9,5	4,8	0,30 ± 0,10	11,8
12,7/6,4	12,7	6,4	0,30 ± 0,10	15,4
19,0/9,5	19,0	9,5	0,45 ± 0,10	31,2
25,4/12,7	25,4	12,7	0,50 ± 0,10	45,1

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4.2 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 °C prior to testing.

4.3 Tests

See Table 2.

Table 2 — Tests (1 of 3)

Designation of the test	IEC 60684-2 Clause or subclause	Requirements	Remarks
Dimensions	3		—
– internal diameter	3.1.2	Table 1	
– wall thickness	3.3.2	Table 1	
– concentricity	3.3.3		
• expanded		65 % min.	
• recovered		85 % min.	
Density	4	Not applicable	See Clause 38.
Heat shock	6		Heat at 275 °C ± 5 °C
Tensile strength	19.1 and 19.2	15 MPa min.	
Elongation at break	19.1 and 19.2	75 % min.	
Longitudinal change	9	0 % to – 10 % max.	Heat the expanded sleeving at 200 °C ± 5 °C for (5 ± 1) min
Bending after heating	13	Not applicable	See Clauses 6, 39 and 50.
Bending at low temperature	14	No cracks shall be visible	Condition at – 55 °C ± 3 °C. 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 during storage	16	The dimensions shall be as specified in Table 1.	—
Tensile strength	19.1 and 19.2	24 MPa min. 200 % min.	Use a jaw separation rate of 50 mm/min. Below 6,5 mm diameter test as sleeving, at 6,5 mm diameter and above test as dumb-bells
Elongation at break			
Secant modulus at 2 % elongation	19.5	Between 170 MPa and 750 MPa	—
Breakdown voltage	21	Table 3	—
Volume resistivity	23		—
– at ambient temperature	23.5.2	10 ⁹ Ω m min.	
– after damp heat	23.5.4	10 ⁸ Ω m min.	
Flame propagation	26		—
Time of burning	Method C	15 s max.	
Length burned		75 mm max.	
Oxygen Index	27	Not applicable	—
Transparency (24 ± 0,25) h at 225 °C	28	Print shall be eligible	Transparent only

Table 2 — Tests (2 of 3)

Designation of the test	IEC 60684-2 Clause or subclause	Requirements	Remarks
Corrosion resistance (Tensile strength and Elongation)	32	Not applicable	See Clause 33.
Copper corrosion	33	None above the allowable 8 % max.	Heat for (16 ± 0,5) h at 160 °C ± 3 °C
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	24 MPa min. 200 % min.	Use the fluids and test temperatures specified in Table 4. Immersion time (24 ± 1) h
Thermal endurance	37	Not applicable	See Clause 50.
Mass per unit length	38	Table 1	—
Heat ageing Tensile strength Elongation at break	39 19.1 and 19.2	15 MPa min. 75 % min.	Heat at 225 °C ± 5 °C
Water absorption	40	0,5 % max.	—
Restricted shrinkage Visual	41	No cracking or splitting	Heat at 200 °C ± 5 °C Perform the visual determination only
Colour stability to heat	42	Not applicable	See Clause 34.
Smoke Index	43	Not applicable	—
Toxicity	44	Not applicable	—
Halogen content	45	Not applicable	—
Acid gas generation	46	Not applicable	—
Long term ageing Elongation	50 19.1 and 19.2	100 % min.	Ageing temperature shall be 175 °C ± 3 °C
Dynamic shear at ambient temperature	51	Not applicable	—
Dynamic shear at elevated temperature	52	Not applicable	—
Dynamic shear after heat shock and heat ageing	53	Not applicable	—
Rolling drum peel to aluminium	54	Not applicable	—