
Aeronavtika - Toplotno skrčljiva cev za utrjevanje, izolacijo in identifikacijo - 104. del: Poltogi poliviniliden fluorid (PVDF) - Delovna temperatura –55 °C do 175 °C - Standard za proizvod

Aerospace series - Sleeving, heat-shrinkable, for binding, insulation and identification - Part 104: Semi-rigid polyvinylidene fluoride (PDVF) - Operating temperature - 55 °C to 175 °C - Product Standard

Luft- und Raumfahrt - Wärmeschrumpfender Schlauch zur Befestigung, Isolierung und Identifizierung - Teil 102: Sehr flexibler Polymer, Temperaturbereich -75°C und 150°C

Série aérospatiale - Manchons thermo rétractables de jonction, isolement et identification - Partie 104 : Semi-rigide polyvinylidène fluoride (PVDF) - Température d'utilisation □ 55 °C à 175 °C - Norme de produit

Ta slovenski standard je istoveten z: EN 4708-104:2017

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EUROPEAN STANDARD

EN 4708-104

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2017

ICS 49.060

English Version

**Aerospace series - Sleeving, heat-shrinkable, for binding,
insulation and identification - Part 104: Semi-rigid
polyvinylidene fluoride (PVDF) - Operating temperature -
55 °C to 175 °C - Product Standard**

Série aérospatiale - Manchons thermorétractables, de
jonction, isolement et identification - Partie 104 : Semi-
rigide polyvinylidene fluorure (PVDF) - Température
d'utilisation - 55 °C à 175 °C - Norme de produit

Luft- und Raumfahrt - Wärmeschrumpfender Schlauch
zur Befestigung, Isolierung und Identifizierung - Teil
104: Halbsteif, Polyvinylidenfluorid (PVDF) -
Betriebstemperatur - 55 °C bis 175 °C - Produktnorm

This European Standard was approved by CEN on 18 September 2017.

CEN 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 CEN-CENELEC Management Centre or to any CEN 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 CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (EN 4708-104:2017) 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 European 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 May 2018, and conflicting national standards shall be withdrawn at the latest by May 2018.

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.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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EN 4708-104:2017 (E)**1 Scope**

This European Standard specifies the required characteristics for a heat-shrinkable, semi-rigid polyvinylidene sleeving for use in aircraft electrical systems at operating temperatures between – 55 °C and 175 °C.

This sleeving is basically transparent, but may be tinted. It is semi-rigid, tough and abrasion resistant, and is suitable for use where strain relief and mechanical protection are required, or where their transparent properties are desirable.

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 European Standard may be available. These items shall be considered to comply with this European 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, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

EN 60684-1:2003, *Flexible insulating sleeving — Part 1: Definitions and general requirement (IEC 60684-1:2003)*

EN 60684-2:2011, *Flexible insulating sleeving — Part 2: Methods of test (IEC 60684-2:2011)*

EN ISO 846:1997, *Plastics — Evaluation of the action of microorganisms (ISO 846:1997)*

HD 457 S1:1985, *Code for designation of colours (IEC 60757:1983)*

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

MIL-PRF-87937, *Performance specification: cleaning compound, aerospace equipment* ¹⁾

AMS 1476B:2004, *Deodorant, Aircraft Toilet* ²⁾

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 60684-1:2003 apply.

1) Published by: Department of Defense (DoD). <http://www.defenselink.mil/>

2) Published by: SAE National (US) Society of Automotive Engineers. <http://www.sae.org/>

4 Required characteristics

4.1 Dimension and mass

See Table 1.

Table 1 — Dimensional and mass requirements

Size code	Internal diameter		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

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

Designation of the test	EN 60684-2:2011 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 250 °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	35 MPa min.	Use a jaw separation rate of 100 mm/min. Below 6,5 mm diameter test as sleeving, at 6,5 mm diameter and above test as dumb-bells.
Elongation at break	19.1 and 19.2	150 % min.	
Secant modulus at 2 % elongation	19.4	Between 250 MPa and 750 MPa	—
Breakdown voltage	21	Table 3	—
Volume resistivity	23		
— at ambient temperature	23.4.2	10 ⁹ Ω m min.	—
— after damp heat	23.4.4	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	—

Designation of the test	EN 60684-2:2011 Clause or subclause	Requirements	Remarks
Transparency	28	Print shall be eligible	Transparent only
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 175 °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	36		Use the fluids and test temperatures specified in Table 4. Immersion time (24 ± 1) h
Tensile strength	19.1 and 19.2	25 MPa min.	
Elongation at break	19.1 and 19.2	50 % min.	
Thermal endurance	37	Not applicable	See Clause 50.
Mass per unit length	38	Table 1	—
Heat ageing	39		Heat at 200 °C ± 5 °C
Tensile strength	19.1 and 19.2	15 MPa min.	
Elongation at break	19.1 and 19.2	75 % min.	
Water absorption	40	0,5 % max.	—
Restricted shrinkage Visual	41	No cracking or splitting	Heat at 225 °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	50		Ageing temperature shall be 175 °C ± 3 °C
Elongation	19.1 and 19.2	100 % min.	
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	—
Aluminium rod dynamic shear	55	Not applicable	—