

BS EN 4708-001:2014



BSI Standards Publication

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

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**National foreword**

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A list of organizations represented on this committee can be obtained on request to its secretary.

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## **Foreword**

This document (EN 4708-001:2014) 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of an identical text or by endorsement, at the latest by October 2014, and conflicting national standards shall be withdrawn at the latest by October 2014.

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## 1 Scope

This European Standard specifies the required characteristics, test methods, qualification and production routine testing of heat shrinkable sleeving for binding, insulation and identification.

## 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 3475-100, *Aerospace series - Cables, electrical, aircraft use - Test methods - Part 100: General*

EN 9133, *Aerospace series - Quality management systems - Qualification procedure for aerospace standard parts*

EN ISO 846, *Plastics - Evaluation of the action of microorganisms (ISO 846)*

EN ISO 4892-2, *Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps (ISO 4892-2)*

IEC 60304<sup>1)</sup>, *Standard colours for insulation for low-frequency cables and wires*

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

## 3 Definitions and symbols

For the purposes of this document, the definitions and symbols given in EN 3475-100 apply.

## 4 Materials and characteristics

### 4.1 General

Sleeving shall be made from materials that ensure the finished sleeveings conform to the product standard.

### 4.2 Material types

See product standards.

### 4.3 Finish

The sleeving, both before and after unrestricted shrinkage, shall be free from bubbles, pinholes, creases and other defects that may affect performance.

### 4.4 Dimensions

See product standard.

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

#### 4.5 Shrink ratio

See product standard.

#### 4.6 Temperature range

See product standard.

#### 4.7 Shelf life

NOTE The use by date is the shelf life when stored under the conditions recommended in Annex A.

The use by date shall be the guaranteed minimum storage time for which the sleeving retains the “as supplied” internal diameter. Following unrestricted shrinkage in accordance with the product standard, the sleeving shall conform to the internal diameter, wall thickness and longitudinal change requirements as specified in the product standard.

#### 4.8 Colours

See product standards for available colours. The colours shall be a reasonable match to one of those specified in IEC 60304.

#### 4.9 Standard cutting tolerances for cut lengths of sleeving

See Table 1.

**Table 1 — Standard cutting tolerances for cut lengths of sleeving**

<b>Cut length</b> mm	<b>Standard cutting tolerances</b>
0 to 9,9	± 0,5
10 to 24,9	± 1,0
25 to 49,9	± 1,5
50 to 100	± 3,0
101 to 150	± 4,0
151 to 250	± 5,0
251 to 1 200	± 12,0
1 201 and over	± 1 %

### 5 Required properties

The properties of the sleeves, tested according to the methods described hereafter shall comply with the values given in the product standards.

### 6 Test methods

See Table 2.

Table 2 — Tests: methods, frequency, requirements

Description	Test method IEC 60684-2 Clause	Qualification 8.1	Routine 8.2	Periodic 8.3	Requirements
Test conditions	2	X	X	X	—
Measurements of bore, wall thickness and concentricity	3	X	X	X	Product standard
Density <sup>a</sup>	4	X	X	X	Product standard
Heat shock (resistance to heat)	6	X	X	X	Product standard
Longitudinal change	9	X	X	X	Product standard
Bending after heating	13	X	—	X	Product standard
Bending at low temperature	14	X	—	X	Product standard
Dimensional stability on storage	16	X	—	X	Product standard
Tensile strength, tensile stress at 100 % elongation, elongation at break and secant modulus at 2 % elongation	19	X	X	X	Product standard
Breakdown voltage	21	X	X	X	Product standard
Volume resistivity	23	X	—	X	Product standard
Flame propagation tests <sup>a</sup>	26	X	—	X	Product standard
Oxygen index <sup>a</sup>	27	X	—	X	Product standard
Transparency <sup>b</sup>	28	X	—	X	Product standard
Corrosion resistance (tensile and elongation)	32	X	—	X	Product standard
Copper corrosion (presence of corrosive volatiles) <sup>a</sup>	33	X	—	X	Product standard
Colour fastness to light <sup>a c</sup>	34	X	—	X	Product standard
Resistance to selected fluids <sup>a</sup>	36	X	—	X	Product standard
Thermal endurance <sup>a</sup>	37	X	—	—	Product standard
Mass per unit length	38	X	—	X	Product standard
Heat ageing	39	X	—	X	Product standard



Water absorption <sup>a</sup>	40	X	–	X	Product standard
Restricted shrinkage	41	X	–	X	Product standard
Colour stability to heat <sup>a c</sup>	42	X	–	X	Product standard
Smoke index <sup>a</sup>	43	X	–	X	Product standard
Toxicity index <sup>a</sup>	44	X	–	X	Product standard
Halogen content <sup>a</sup>	45	X	–	X	Product standard
Acid gas generation <sup>a</sup>	46	X	–	X	Product standard
Long term ageing (3 000 h) <sup>a</sup>	50	X	–		Product standard
Dynamic shear at ambient temperature	51	X	–	X	Product standard
Dynamic shear at elevated temperature	52	X	–	X	Product standard
Dynamic shear after heat shock and heat ageing	53	X	–	X	Product standard
Rolling drum peel to aluminium	54	X	–	X	Product standard
Aluminium rod dynamic shear	55	X	–	X	Product standard
Sealing	56	X	–	X	Product standard
Adhesive T peel strength of two bonded heat shrinkable substrates	57	X	–	X	Product standard
Fungus resistance <sup>a</sup>	In accordance with EN ISO 846 method B, 56 days exposure, followed by the measurement of tensile strength and elongation at break	X	–	–	Product standard
Artificial weathering <sup>a</sup>	In accordance with EN ISO 4892-2, Table 3 method A cycle 1 relative humidity (565 ± 10) % duration 720 h	X	–	–	Product standard

X = Test applicable.

<sup>a</sup> Only one size of sleeving needs to be tested.

<sup>b</sup> Test the greatest wall thickness.

<sup>c</sup> All colours are to be tested.

## **7 Printed sleeves**

See product standards.

## **8 Quality assurance**

### **8.1 Qualification**

#### **8.1.1 General requirements**

See EN 9133.

#### **8.1.2 Qualification conditions**

The sleeveings shall be submitted for qualification tests on spools, in coils or sufficient cut lengths.

Each spool, coil or sufficient cut lengths shall have a label containing information given in 9.1.

#### **8.1.3 Qualification tests**

Qualification tests shall be performed on sizes taken from the top, middle and bottom of the manufacturer or supplier's range for each different material, unless otherwise indicated in Table 2.

### **8.2 Production routine tests**

#### **8.2.1 Delivery conditions**

The production routine tests shall be applied to samples, taken at random, from every batch, and shall consist of the tests listed in Table 2.

#### **8.2.2 Batch**

A batch of sleeving shall consist of sleeving of the same type, dimensions and colour produced from a single mix at any one time, provided that the cross-linking conditions are maintained constant throughout. For continuous processing a single mix shall be defined by the manufacturer or supplier to the satisfaction of the approving authority.

#### **8.2.3 Random sampling retest**

In the event of a failure of the sleeving to conform to the requirements of a test, the batch shall be re-sampled and the test repeated using two further sets of test-pieces. Both sets shall conform to the appropriate test requirements, otherwise the sleeving shall be deemed not to conform to this standard.

### **8.3 Periodic tests**

They shall be carried out by sampling at least every five years. The "X" means applicable at the same condition specified for qualification.

See Table 2.

## **9 Labelling and packaging**

### **9.1 Labelling**

Each package of sleeves/sleeving shall be labelled with the following information.

- manufacturer's name and designation;
- sleeving designation according to the EN product standard;
- batch number;
- date of manufacture (month, year);
- the use by date (If shorter than five years);
- the length and quantity of sleeves/sleeving;
- the characters/legend printed on the sleeves, if applicable.

### **9.2 Packaging**

Sleeving shall be supplied in a way which ensures adequate protection during transport, handling and storage. Sleeving shall be wound evenly and compactly on reels or in coils suitably secured unless an alternative form of packaging such as containers or dispensers is required by the contract. If a unit pack contains more than one length of sleeving, the purchaser may require this to be indicated. The following items are subject to agreement between purchaser and supplier.

- number of lengths;
- minimum lengths;
- marking requirements.

## **Annex A** (informative)

### **Storage recommendations**

The following recommendations are intended to assist the prevention of sleeving degradation caused by conditions existing in the storage area.

- a) Sleeving should be stored between 18 °C and 35 °C.
- b) Sleeving should be stored under dry conditions.
- c) No sleeving should be stored in direct sunlight or strong artificial light.
- d) Sleeving should not be stored within 2 m of a direct ultraviolet (e.g. fluorescent) light source.
- e) Sleeving delivered in packages should remain packaged until required.
- f) Material used in packaging should preferably be of an opaque material.
- g) Packages which are opened for removal of part of their contents should be adequately resealed.



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