BS EN 6049-009:2016

BSI Standards Publication

Aerospace series — Electrical cables, installation — Protection sleeve in meta-aramid fibres

Part 009: Self-wrapping fire protection sleeve, flexible, post installation, operating temperature from -55 °C to 260 °C — Product standard

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National foreword

This British Standard is the UK implementation of EN 6049-009:2016.

The UK participation in its preparation was entrusted to Technical Committee ACE/6, Aerospace avionic electrical and fibre optic technology.

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

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Published by BSI Standards Limited 2016

ISBN 978 0 580 86335 6

ICS 49.060

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 April 2016.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 6049-009

April 2016

ICS 49.060

English Version

Aerospace series - Electrical cables, installation - Protection sleeve in meta-aramid fibres - Part 009: Self-wrapping fire protection sleeve, flexible, post installation, operating temperature from -55 °C to 260 °C - Product standard

Série aérospatiale - Câbles électriques, installation - Gaine de protection en fibres méta-aramides - Partie 009 : Gaine de protection auto-fermable, souple, montage après installation, température d'utilisation -55 °C à 260 °C - Norme de produit

Luft- und Raumfahrt - Elektrische Leitungen, Installation - Schutzschläuche aus Meta-Aramidfasern - Teil 009: Selbstverschließender Feuerschutzschlauch, flexibel, nachträglich montierbar, Betriebstemperatur von -55 °C bis 260 °C - Produktnorm

This European Standard was approved by CEN on 28 June 2014.

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

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

Ref. No. EN 6049-009:2016 E

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European foreword

This document (EN 6049-009:2016) 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 October 2016, and conflicting national standards shall be withdrawn at the latest by October 2016.

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1 Scope

This European Standard specifies the characteristics of post installation flexible self-wrapping fire protection sleeves for electrical cable and cable bundles, providing 360° fire protection to electrical harnesses. The sleeve assembly gives fire resistance protection to the internal electrical harness against fire for five minutes, and ensures that the electrical characteristics of cables will not be degraded.

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 2825, *Aerospace series — Burning behaviour of non metallic materials under the influence of radiating heat and flames — Determination of smoke density*

EN 2826, *Aerospace series — Burning behaviour of non metallic materials under the influence of radiating heat and flames — Determination of gas components in the smoke*

EN 3844-1, *Aerospace series — Flammability of non metallic materials — Part 1: Small burner test, vertical — Determination of the vertical flame propagation*

EN 6049-001, *Aerospace series — Electrical cables, installation — Protection sleeve in meta-aramid fibres — Part 001: Technical specification*

EN 6059 (All parts), *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods*

ISO 2685, *Aircraft — Environmental test procedure for airborne equipment — Resistance to fire in designated fire zones* [1)]

AMS-DTL-23053E, *Insulation sleeving, electrical, heat-shrinkable, general specification for* [2)]

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 6049-001 and the following apply.

3.1
overlap angle
sleeve overlap angle for maximum wire bundle diameter

1) Published by: ISO International Organization for Standardization http://www.iso.org/

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

4 Required characteristics

4.1 Requirements

The sleeve shall protect the internal electrical harness against fire for five minutes, and will ensure that the electrical characteristics of cables will not be degraded. The composition of the sleeve shall be such that a uniform circular cross-section is maintained throughout the length of the harness to be protected. The material used in the manufacture of the sleeve shall have no corrosive effects upon the harness, and shall not be susceptible to attack by mould or other microorganisms.

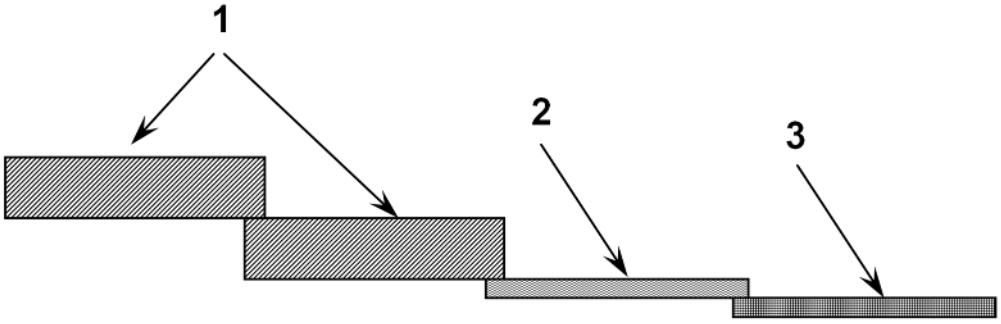
4.2 Composition

The multi-layer, thick wall sleeve is self-wrapping and openable and is of one continuous width made up of three different materials attached edge to edge. See Table 1 and Figure 1, Figure 2 and Figure 3. Where the sleeve is to be fitted to branched harnesses, the sleeve junctions may be protected by wrapping with a similar flat-sectioned multi-layer, thick wall tape made up of three different materials attached face to face. See Table 2 size code 00 and Figure 4.

Table 1 — Composition

Item number [a]	Layer when wrapped	Function	Material	Colour
1	Inner	Thermal protection	Oxidized polyacrylonitrile (PANOX) fibres	Black
2	Centre	Thermal protection	Silica fibres	White
3	Outer	Mechanical and fire protection	Textured meta-aramid continuous yarn and polyetheretherketone (PEEK) monofilament. A specific feature avoids excessive fraying of the sleeving after cutting.	Olive drab

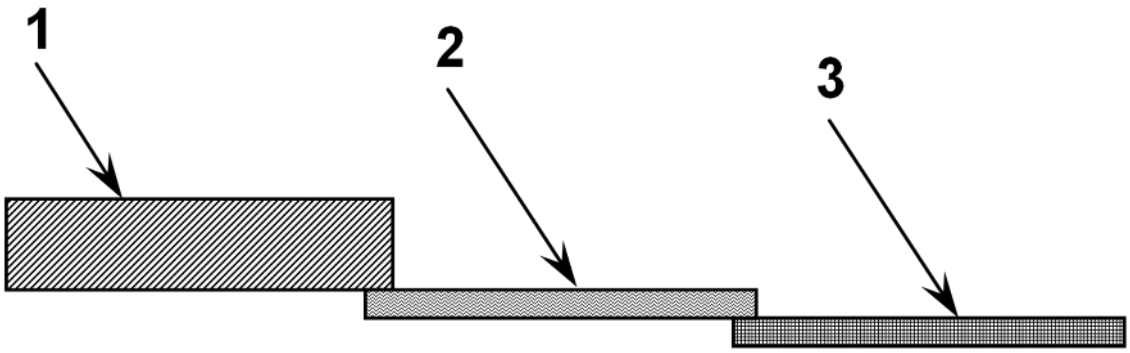
[a] See Figure 1, Figure 2 and Figure 4.



Key

1 Inner layer
2 Centre layer
3 Outer layer

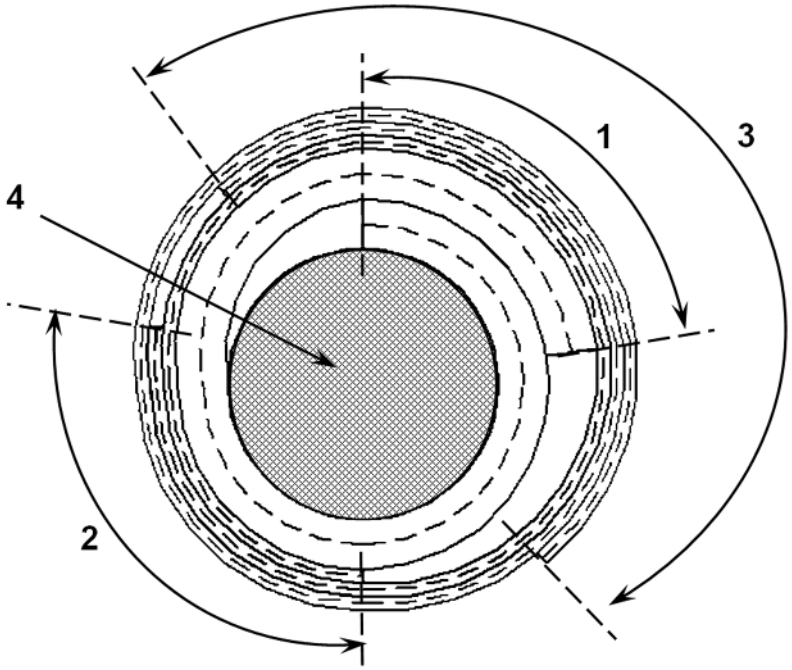
Figure 1 — Sleeve composition – size code 10 (not to scale – sleeve shown opened flat)



Key

1 Inner layer
2 Centre layer
3 Outer layer

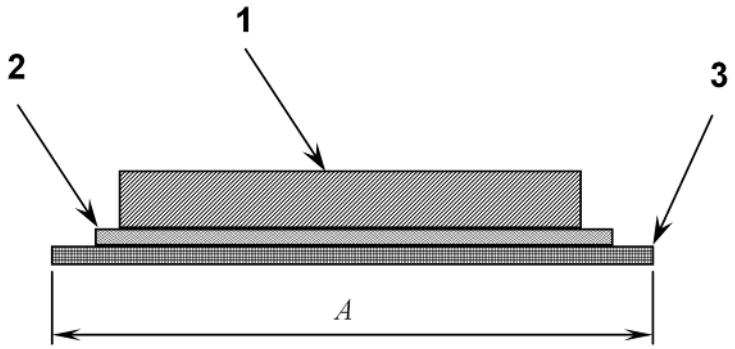
Figure 2 — Sleeve composition – size codes 16, 24, and 32 (not to scale – sleeve shown opened flat)



Key

1 Inner layer overlap
2 Centre layer overlap
3 Outer layer overlap
4 Cable bundle

Figure 3 — Self-wrapping sleeve installed on a cable bundle (not to scale)



Key

1 Inner layer
2 Centre layer
3 Outer layer

Figure 4 — Tape composition – size code 00 (not to scale)

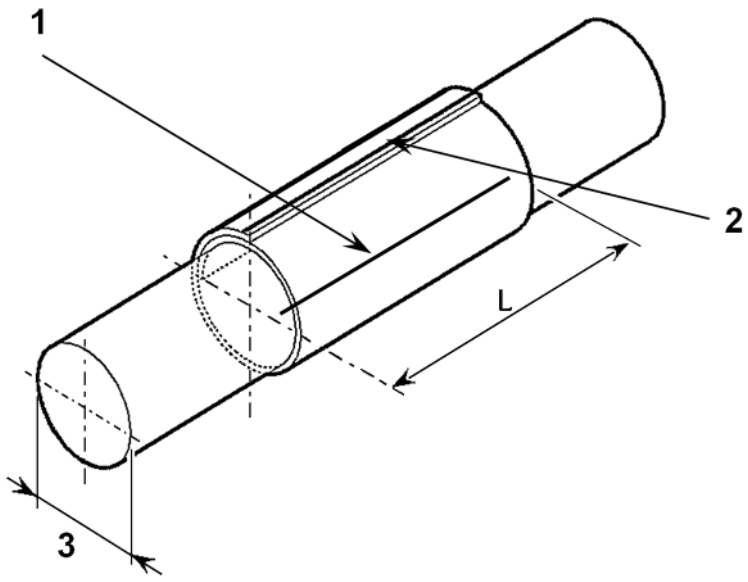
4.3 Dimensions and mass

See Table 2 and Figure 5.

Table 2 — Dimensions and mass

Size code	Inner layer overlap angle [a] min.	Centre layer overlap angle [a] min.	Outer layer overlap angle [a] min.	Wall thickness ± 0,4 mm	Bundle diameter mm	Width *A* max. mm	Procurement length m	Mass max. g/m
00	–	–	–	4,0	–	150,0	25	338
10	130	130	160	7,2	5 – 10	–		336
16	70	90		4,4	10 – 16	–		
24				4,0	16 – 24	–	15	361
32			70		24 – 32	–		436

[a] Angle in degree measured on a mandrel of the maximum bundle diameter (see Figure 3).



Key

1 Sleeve identification by longitudinal red tracers always visible when the sleeve is wrapped

2 White tracer indicating the maximum operating diameter

3 Mandrel diameter = Maximum bundle diameter. Indicated per internal ivory line for maximum permissible bundle diameter

Figure 5 — Sleeve identification (coloured tracer thread woven into item 3)

4.4 Colour, materials and tracer line identification

4.4.1 Colour

In accordance with Table 1.

4.4.2 Materials

In accordance with Table 1.

4.4.3 Tracer line identification

The sleeve will be delivered with a red "tracer line" marked to identify the fine protection.

4.4.4 Temperature range

The operational temperature of the fire protection sleeves shall be from -55 °C to 260 °C. Resistance to fire according to the EN 6059-309 test method at 1 100 °C for 5 min.

5 Test methods

The tests shall be carried out as shown in Table 3.

For the number of samples to be tested, see EN 6049-001.

Table 3 — Test methods and details *(1 of 2)*

Test method	Title	Details
EN 6059-201	Visual inspection	See 4.1 and 4.2.
EN 6059-202	Dimensions and mass	See 4.3.
EN 6059-203	Coverage	Not applicable.
EN 6059-301	Sun light exposure	After 40 hours exposure, the retention of the tensile strength shall be 45 % minimum. Applicable only on the outer layer.
EN 6059-302	High temperature exposure	The specimen shall be within the overwrap tolerances, see Figure 2, and tensile strength test, according to EN 6059-404, shall be carried out. The value shall not be less than 0,010 N per dTex for the outer layer.
EN 6059-303	Resistance to fluids	The specimen must show no evidence of deformation swelling, shrinking, cracking or rupture and a tensile strength test according to EN 6059-404 shall be carried out. The value shall not be less than 0,010 N per dTex for the outer layer.
EN 3844-1 B	Flammability	After burn, length (average) shall not exceed 203 mm (8 inches). After flame, time (average) shall not exceed 15 s. After flame time drips (average) shall not exceed 5 s.
EN 6059-305	Fluid absorption	The specimen shall repel water for six hours after test according to EN 6059–302.
EN 6059-306	Mould growth	There shall no external deterioration that would affect service use and no mould growth visible to the naked eye.
EN 6059-309	Fire resistance when fitted on a cable bundle	Fire resistance = five minutes test. Cable bundles shall be manufactured using cables from the DR family. Test on sleeve size 10 or 16 which ever fits the test bundle
EN 6059-401	Expansion range	Not applicable.
EN 6059-402	Bending properties	A medium size specimen installed on aerospace cable, twisted two turns per metre tied every 10 cm, loaded with 10 N must not show any evidence of deformation, swelling, cracking or rupture after 1 000 cycles.
EN 6059-403	Scrape abrasion	Needle load shall be 10 N.
EN 6059-404	Tensile strength	The tensile force to be applied per dTex shall not be less than 0,02 N for the outer layer. Degradation of the tensile strength after environmental tests shall be within the limits as mentioned in the relevant paragraph. For this test, unwoven tows of the batch, which have been used for weaving of the sleeves, may be used.
EN 6059-405	Dynamic cut-through	The test shall be carried out at ambient temperature. Load shall be 30 N.
EN 6059-406	Vibration	After the endurance test performed in accordance with EN 6059-406, no evidence of wear or defect must be visible on the wires.
EN 2825 B	Smoke density	The test duration shall be 4 min. The maximum specific optical smoke density (average) shall not exceed. Ds = 200 (flaming mode) Ds = 150 (non-flaming mode)

Table 3 — Test methods and details *(2 of 2)*

Test method	Title	Details		
EN 2826 B	Toxicity	**Gas component**		Limit of concentration (ppm) (duration 4 min)
		Hydrogen fluoride	HF	100
		Hydrogen chloride	HCI	150
		Hydrogen cyanide	HCN	150
		Sulfur dioxide	SO_2/H_2S	100
		Nitrous gases	NO/NO_2	100
		Carbon monoxide	CO	1 000
AMS-DTL-23053E	Low temperature flexibility	Applicable		

6 Designation

EXAMPLE

Description block	**Identity block**
SELF-WRAPPING PROTECTION SLEEVE	**EN 6049-009–10**

Number of this standard

Size code (see Table 2)

7 Marking

See EN 6049-001.

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