SLOVENSKI STANDARD
oSIST prEN 6049-004:2022

01-december-2022

Aeronavtika - Električni kabli, namestitev - Zaščitna obojka iz metaaramidnih vlaken - 004. del: Opletena, cevasta, dobro raztegljiva - Standard za proizvod

Aerospace series - Electrical cables, installation - Protection sleeve in meta-aramid fibres - Part 004: Braided, tubular, high expandable - Product standard

Luft- und Raumfahrt - Elektrische Leitungen, Installation - Schutzschläuche aus Meta-Aramidfasern - Teil 004: Geflecht, röhrenförmig, hochdehnbar - Produktnorm

Série aérospatiale - Câbles électriques, installation - Gaine de protection en fibres méta-aramides - Partie 004 : Tresse, tubulaire, très expansible - Norme de produit

Ta slovenski standard je istoveten z: **prEN 6049-004**

ICS:

29.060.20	Kabli	Cables
49.060	Letalska in vesoljska električna oprema in sistemi	Aerospace electric equipment and systems

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

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English Version

Aerospace series - Electrical cables, installation - Protection sleeve in meta-aramid fibres - Part 004: Braided, tubular, high expandable - Product standard

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee ASD-STAN.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (prEN 6049-004:2022) 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 document 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 document is currently submitted to the CEN Enquiry.

This document will supersede EN 6049-004:2019.

1 Scope

This document defines the characteristics of high expandable braided tubular mechanical protection sleeves for electrical cable and cable bundles made from meta-aramid fibres and provided with a water repelled protection.

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 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 6059-201, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 201: Visual inspection*[1]

EN 6059-202, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 202: Dimensions and mass*

EN 6059-203, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 203: Coverage*[1]

EN 6059-301, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 301: Sun light exposure*

EN 6059-302, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 302: High temperature exposure*

EN 6059-303, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 303: Resistance to fluids*

EN 6059-305, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 305: Fluid absorption*

EN 6059-306, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 306: Mould growth*[1]

EN 6059-401, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 401: Expansion range*

[1] Published as ASD-STAN Standard by AeroSpace and Defence industries Association of Europe — Standardization (ASD-STAN), https://www.asd-stan.org/. In preparation at the date of publication of this document.

EN 6059-402, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 402: Bending properties*

EN 6059-403, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 403: Scrape abrasion*[1]

EN 6059-404, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 404: Tensile strength*[1]

EN 6059-405, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 405: Dynamic cut-through*[1]

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at https://www.iso.org/obp
- IEC Electropedia: available at https://www.electropedia.org/

4 Required characteristics

4.1 Composition, dimensions and mass

4.1.1 Composition of the tows

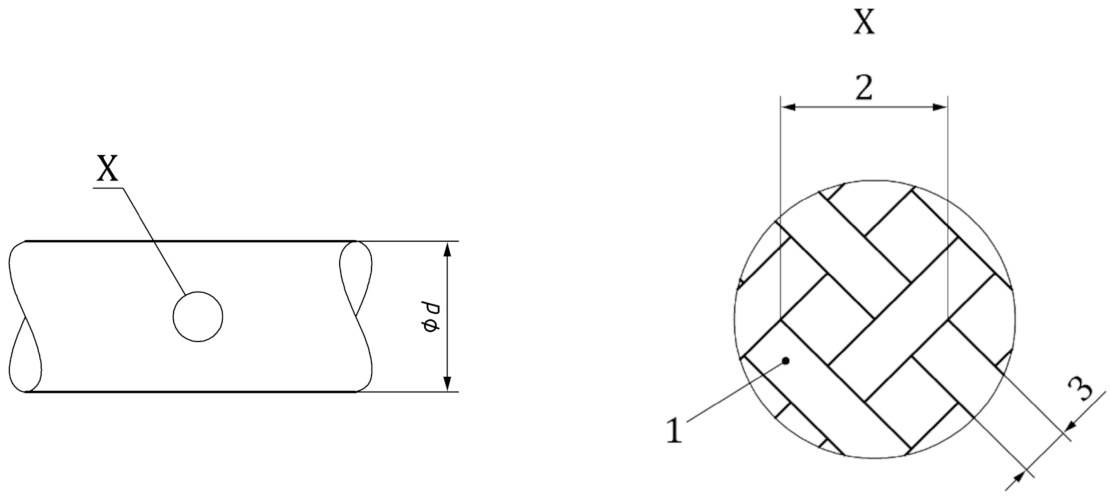
Each tow shall be built-up of several groups of multifilament continuous fibres made from meta-aramid.

The number of groups which forms a tow and the width of the tow depends on the braiding configuration (braiding figure and braiding angle) of the sleeve, see 4.1.2. The thickness of the tow shall be so that the finished sleeve meets the mechanical and environmental requirements. One length of sleeve shall be built-up of one type of tow.

4.1.2 Composition, dimensions and mass of the sleeve

The composition of the sleeve (braiding figure, braiding angle and tow width) shall be so that the sleeve meets the requirements for dimensions, coverage, expansion range and mass. The coverage shall be 75 % minimum. The braiding figure shall consist of two groups of tows in two directions. The braiding angle between the two groups shall be equal over the length of the sleeve. The maximum difference in length of a sleeve, measured in the delivered condition and measured on a mandrel with the delivered diameter in accordance with EN 6059-202, is ± 3 %.

Figure 1 and Table 1 give the composition and the dimensions of the sleeve.



Detail X

Key

1 Braiding pattern
2 Pitch
3 One tow
d = Inner diameter

Figure 1 — Composition of the sleeve

Table 1 — Dimensions and mass

Size code	*D* Delivered mm	mm min.	mm max.	Nominal [a] mm	Mass max. [b] g/m
05	2	2	6	5	6,5
10	5	5	15	10	13
15	8	8	24	15	18
25	12	12	36	25	24
40	22	22	60	40	32

[a] In practice, approximately the maximum diameter of a cable bundle.
[b] At the delivered diameter.

4.2 Colour and materials

4.2.1 Colour

Colour shall be olive green, code 5.

4.2.2 Materials

The material shall be meta-aramid and meet the requirements as specified in this document.

4.3 Mechanical properties

4.3.1 Sun light exposure

After testing according to EN 6059-301 for 40 h, the retention of the tensile strength shall be 45 % minimum with respect to the determined values of non-tested tows.

4.3.2 Temperature range

The operation temperature of the protection sleeves shall be:

- maximum: + 240 °C;
- minimum: - 55 °C.

NOTE Above + 175 °C: loss of water repellent properties.

The retention of the tensile strength after thermal ageing at 240 °C shall be 85 % minimum.

4.3.3 Resistance to fluids

After testing according to EN 6059-303, the retention of the tensile strength shall be 90 % minimum with respect to the determined values of non-tested tows.

4.3.4 Water absorption

To fulfil the requirements for water absorption, the sleeve shall repel water as tested in EN 6059-305 for 6 h. This test shall be executed after a high temperature exposure test according to EN 6059-302 at + 175 °C.

4.3.5 Mould growth

After tested in accordance with EN 6059-306, there shall be no external deterioration which would affect service use and no mould growth visible to the naked eye.

4.3.6 Tensile strength of tows

The tensile force to be applied per dTEX shall not be less than 0,03 N. Degradation of the tensile strength after environmental tests shall be within the limits as mentioned in the relevant paragraph. For this test, unbraided tows of the batch which have been used for braiding of the sleeves may be used.

5 Test methods

The tests shall be carried out as shown in Table 2. For the number of samples to be tested, see EN 6049-001.

Table 2 — Test methods and sanctions

<table>
<tr><th>Test method</th><th>Title</th><th colspan="2">Remarks</th></tr>
<tr><td>EN 6059-201</td><td>Visual inspection</td><td colspan="2">See 4.1 and 4.2.1.</td></tr>
<tr><td>EN 6059-202</td><td>Dimensions and mass</td><td colspan="2">See 4.1.2.</td></tr>
<tr><td>EN 6059-203</td><td>Coverage</td><td colspan="2">See 4.1.2.</td></tr>
<tr><td>EN 6059-301</td><td>Sun light exposure</td><td colspan="2">See 4.3.1.</td></tr>
<tr><td>EN 6059-302</td><td>High temperature exposure</td><td colspan="2">At maximum operating temperature (continue)
See 4.3.2.</td></tr>
<tr><td>EN 6059-303</td><td>Resistance to fluids</td><td colspan="2">See 4.3.3.</td></tr>
<tr><td>EN 3844-1, b)</td><td>Flammability</td><td colspan="2">Application time of 12 s.</td></tr>
<tr><td>EN 6059-305</td><td>Fluid absorption</td><td colspan="2">See 4.3.4.</td></tr>
<tr><td>EN 6059-306</td><td>Mould growth</td><td colspan="2">See 4.3.5.</td></tr>
<tr><td>EN 6059-401</td><td>Expansion range</td><td colspan="2">See 4.1.2.</td></tr>
<tr><td>EN 6059-402</td><td>Bending properties</td><td colspan="2">Not applicable.</td></tr>
<tr><td>EN 6059-403</td><td>Scrape abrasion</td><td colspan="2">Needle load shall be 10 N and the hexagonal mandrel for which the radius is equal to the nominal diameter with abrasion being made onto a flat area on size 10 and before ageing only.</td></tr>
<tr><td>EN 6059-404</td><td>Tensile strength</td><td colspan="2">See 4.3.6.</td></tr>
<tr><td>EN 6059-405</td><td>Dynamic cut through</td><td colspan="2">Load shall be 30 N.</td></tr>
<tr><td>EN 2825</td><td>Smoke density</td><td colspan="2">—</td></tr>
<tr><td rowspan="7">EN 2826</td><td rowspan="7">Toxicity</td><td>Gas component</td><td>Limit of concentration (ppm)
(duration 4 min)</td></tr>
<tr><td>Hydrogen fluoride HF</td><td>100</td></tr>
<tr><td>Hydrogen chloride HCI</td><td>150</td></tr>
<tr><td>Hydrogen cyanide HCN</td><td>150</td></tr>
<tr><td>Sulfur dioxide SO_2/H_2S</td><td>100</td></tr>
<tr><td>Nitrous Gases NO/NO_2</td><td>100</td></tr>
<tr><td>Carbon Monoxide CO</td><td>1 000</td></tr>
</table>