



SLOVENSKI STANDARD
oSIST prEN 6059-203:2023
01-julij-2023

Aeronavtika - Električni kabli, namestitvev - Zaščitne obojke - Preskusne metode - 203. del: Pokritost

Aerospace series - Electrical cables, installation - Protection sleeves - Test methods - Part 203: Coverage

Luft- und Raumfahrt - Elektrische Leitungen - Schutzschläuche - Prüfverfahren - Teil 203: Gewebebedeckungsgrad

Série aérospatiale - Câbles électriques, installation - Gainses de protection - Méthodes d'essais - Partie 203 : Taux de couverture

Ta slovenski standard je istoveten z: prEN 6059-203

ICS:

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

oSIST prEN 6059-203:2023

en,fr,de

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 6059-203

May 2023

ICS 49.060

English Version

Aerospace series - Electrical cables, installation - Protection sleeves - Test methods - Part 203: Coverage

Série aérospatiale - Câbles électriques, installation -
Gaines de protection - Méthodes d'essais - Partie 203 :
Taux de couverture

Luft- und Raumfahrt - Elektrische Leitungen -
Schutzschläuche - Prüfverfahren - Teil 203:
Gewebebedeckungsgrad

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.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.

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.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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

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

Contents		Page
European foreword		3
1	Scope	4
2	Normative references	4
3	Terms and definitions	4
4	Preparation of specimens	4
5	Apparatus	4
6	Methods	4
6.1	General	4
6.2	Method 1 - Theoretical calculation	4
6.3	Method 2 - Optical method	7
7	Requirements	7
Bibliography		8

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[oSIST prEN 6059-203:2023](https://standards.iteh.ai/catalog/standards/sist/91df7e90-e8bf-4193-ad12-656ca2c75615/osist-pren-6059-203-2023)

<https://standards.iteh.ai/catalog/standards/sist/91df7e90-e8bf-4193-ad12-656ca2c75615/osist-pren-6059-203-2023>

European foreword

This document (prEN 6059-203:2023) 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-STAN, prior to its presentation to CEN.

This document is currently submitted to the CEN Enquiry.

This document will supersede prEN 6059-203:1997¹.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[oSIST prEN 6059-203:2023](https://standards.iteh.ai/catalog/standards/sist/91df7e90-e8bf-4193-ad12-656ca2c75615/osist-pren-6059-203-2023)

<https://standards.iteh.ai/catalog/standards/sist/91df7e90-e8bf-4193-ad12-656ca2c75615/osist-pren-6059-203-2023>

¹ Published by ASD-STAN.

prEN 6059-203:2023 (E)

1 Scope

This document specifies methods for measuring and calculating the coverage of protection sleeve for electrical cable and cable bundles. It is presupposed to be used together with EN 6059-100.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology 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 Preparation of specimens

The specimen shall have a length of at least 200 mm.

For tubular sleeves other than expandable braids, the specimen shall be prepared as a flat part by cutting through the sleeve in the longitudinal direction. The cutting area shall be secured by application of tape or adhesive to avoid fraying of the specimen (if applicable).

5 Apparatus

See 6.2.2 and 6.3.2.

6 Methods

6.1 General

Depending on the complexity of the textile fabric of the sleeve, two different methods can be applied:

- **Method 1: Theoretical calculation** after measurement of the characteristics of the sleeve.

This method shall be used for braids and woven sleeves having a plain weave structure.

- **Method 2: Optical method**

This method shall be used for all other textile fabrics.

For woven sleeves having a plain weave structure, this method can be applied to confirm the percent coverage obtained according to Method 1.

6.2 Method 1 – Theoretical calculation

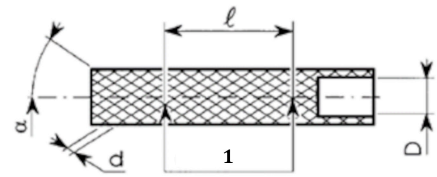
6.2.1 Sleeve characteristics

K is the coverage in %

l is constant 25,4 mm

Case of a braid

dx is the diameter of the yarn numbered 'x' in mm
 (d1, d2, ... if the sleeve is made of different yarns)
Nx is the number of yarns 'x' per carrier
P is the number of crossovers per l
α is the braid angle in °
D is the diameter under braid in mm
C is the number of carriers

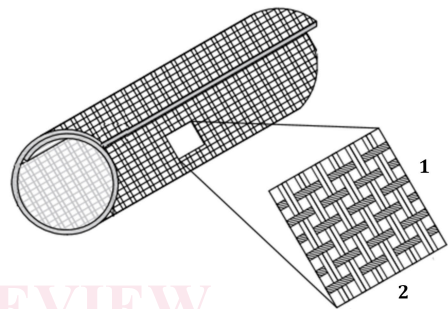


Key
 1 Crossovers

Figure 1

Case of a woven sleeve (plain weave structure)

d_fx is the diameter of the fill yarn numbered 'x' in mm
 (d_f1, d_f2, ... if the sleeve is made of different fill strands)
d_wy is the diameter of the warp yarn numbered 'y' in mm
 (d_w1, d_w2, ... if the sleeve is made of different warp strands)
E_fx is the number of fill ends 'x' per carrier
E_wy is the number of warp ends 'y'
PPI is the number of picks per inch in the warp direction
W is the lay-flat width of the sleeve



Key
 1 Fill direction
 2 Warp direction

Figure 2

6.2.2 Measurements of the sleeve characteristics

Table 1

Characteristic	Measurement/Test equipment
Nx, C, E_fx, E_wy	Visual counting
dx, d_fx, d_wy	For a mono-filament strand: measurement using a micrometer
	For a multi-filament strand: measurement using an optical device (binocular or microscope)
P	After installation of the braid over the diameter D, visual counting over a length of 10 cm using a ruler and calculation per inch
PPI	Visual counting using a pick counter (in inch)
W	Measurement using a ruler

6.2.3 Percent coverage calculation

Case of a braid

$$K = 100(2F - F^2)$$

Where

prEN 6059-203:2023 (E)

$$F = \frac{(N_1 d_1 + N_2 d_2 + \dots) P}{l \sin \alpha}$$

And

$$\tan \alpha = \frac{2\pi DP}{C\ell}$$

EXAMPLE Example of a braid made of one single strand per carrier, protecting a core diameter of 10 mm:

$N_1 = 1, D = 10 \text{ mm}, P = 21, d_1 = 0,8 \text{ mm}, C = 80$

$$\tan \alpha = \frac{2\pi \times 10 \times 21}{80 \times 25} = 0,66$$

$\alpha = 33,4^\circ$

$\sin \alpha = 0,55$

$$F = \frac{1 \times 21 \times 0,8}{25 \times 0,55} = 1,22$$

$$K = 100(2 \times 1,22 - 1,22^2) = 95\%$$

Coverage is 95 % for a core diameter of 10 mm.

Case of a woven sleeve (plain weave structure)

$$K = 100 \frac{\text{PPI}(E_f 1 d_f 1 + E_f 2 d_f 2 + \dots)(E_w 1 d_w 1 + E_w 2 d_w 2 + \dots)}{Wl}$$

EXAMPLE Example of a woven sleeve made of 2 different fill yarns and 1 warp yarn:

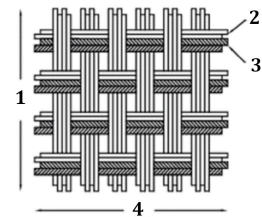
$d_{f1} = 0,25 \text{ mm}, d_{f2} = 0,70 \text{ mm}, E_{f1} = 2, E_{f2} = 2$

$d_{w1} = 0,22 \text{ mm}, E_{w1} = 200$

$\text{PPI} = 15$

$W = 60 \text{ mm}$

$$K = \frac{100 \times 15 \times (2 \times 0,25 + 2 \times 0,70) \times (200 \times 0,22)}{60 \times 25,4} = 82,3\%$$

**Key**

- 1 Warp
- 2 Fill yarn 1
- 3 Fill yarn 2
- 4 Fill

Figure 3

6.3 Method 2 – Optical method

6.3.1 Characteristics

K is the coverage of the sleeve in %

A_x is the un-covered area (void between the yarns and crossings of yarns) numbered 'x' in mm²

S is the area of the window of measurement in mm²

6.3.2 Measurement of the characteristics

Table 2

Characteristic	Measurement/test equipment
A_x	Microscope controlled by an operating software capable of measuring dimensions and areas (magnification to be adjusted so that the window of measurement be at least of 45 mm ²).

6.3.3 Procedure

The following shall be conducted on 3 specimens:

- the specimen is laid flat under the microscope;
- the microscope parameters (light, focus, contrast) are adjusted so that the textile fabric and the void between the yarns and crossing of yarns can be distinguished by the software (light/white vs dark/black);
- the area of each void, **A_x**, is measured.

6.3.4 Percent coverage calculation

$$K = 100 - 100 \times (A_1 + A_2 + \dots) / S$$

The final percent coverage is the average value of the 3 specimens.

EXAMPLE

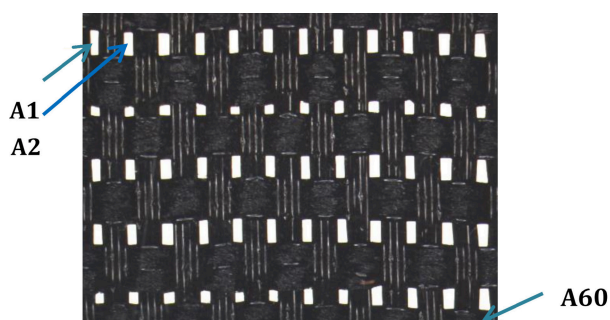


Figure 4

60 white areas (void)
 $(A_1 + A_2 + \dots + A_{60}) = 10,82 \text{ mm}^2$
 $K = 78,3 \%$

7 Requirements

The coverage of the specimen shall comply with the product standard.

prEN 6059-203:2023 (E)

Bibliography

EN 6059-100, *Aerospace series - Electrical cables, installation - Protection sleeves - Test methods - Part 100: General*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[oSIST prEN 6059-203:2023](https://standards.iteh.ai/catalog/standards/sist/91df7e90-e8bf-4193-ad12-656ca2c75615/osist-pren-6059-203-2023)

<https://standards.iteh.ai/catalog/standards/sist/91df7e90-e8bf-4193-ad12-656ca2c75615/osist-pren-6059-203-2023>