



SLOVENSKI STANDARD

oSIST prEN 2235:2021

01-junij-2021

Aeronavtika - Eno- in večžilni električni kabli, oklopljeni in oplaščeni - Tehnična specifikacija

Aerospace series - Single and multicore electrical cables, screened and jacketed - Technical specification

Luft- und Raumfahrt - Ein- und mehradrige geschirmte und ummantelte elektrische Leitungen - Technische Lieferbedingungen

Série aérospatiale - Câbles électriques, mono et multiconducteurs, blindés et gainés - Spécification technique

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Ta slovenski standard je istoveten z: prEN 2235

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

DRAFT
prEN 2235

April 2021

ICS 49.060

Will supersede EN 2235:2015

English Version

**Aerospace series - Single and multicore electrical cables,
screened and jacketed - Technical specification**

Série aérospatiale - Câbles électriques, mono et
multiconducteurs, blindés et gainés - Spécification
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und ummantelte elektrische Leitungen - Technische
Lieferbedingungen

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.

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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

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European foreword

This document (prEN 2235:2021) 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 EN 2235:2015.

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1 Scope

This document specifies the required characteristics, test methods, qualification and acceptance conditions of single and multicore cables, screened, jacketed and multicore jacketed cables for use in aircraft electrical systems.

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 2083, *Aerospace series — Copper and copper alloys conductors for electrical cables — Product standard*

EN 2084, *Aerospace series — Cables, electrical, general purpose, with conductors in copper or copper alloy — Technical specification*

EN 3475, *Aerospace series — Cables, electrical, aircraft use — Test methods*¹⁾

EN 3838, *Aerospace series — Requirements and tests on user-applied markings on aircraft electrical cables*

EN 4434, *Aerospace series — Copper or copper alloy lightweight conductors for electrical cables — Product standard (Normal and tight tolerances)*

ISO 2574, *Aircraft — Electrical cables — Identification marking*²⁾

ISO 8815, *Aircraft — Electrical cables and cable harnesses — Vocabulary*²⁾

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8815 and EN 3475-100 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 <http://www.electropedia.org/>

4 Materials and construction of cables

4.1 General

The individual cores shall be qualified to EN 2083 or EN 4434, EN 2084 and the product standards.

4.2 Materials

The materials shall conform to the product standard.

¹⁾ And all its parts quoted in this document.

²⁾ Published by: ISO International Organization for Standardization <http://www.iso.ch/>.

4.3 Construction of cables

4.3.1 General

The permissible operating temperature of conductors shall not be lower than the maximum operating temperature of the cable as a whole.

4.3.2 Cabled cores

The lay length of the outer lay shall not be less than eight times and not more than 16 times the nominal diameter of the cabled cores.

The core shall not be spliced.

Where filler cores are used, this shall be specified in the product standard.

4.3.3 Screened cables

4.3.3.1 General

The individual strands used for the screen shall be free from kinks, loops or breaks; their surface shall be free from corrosion and other contamination. They shall satisfy the mechanical tests in EN 3475-505 to EN 3475-508 before use.

The screen shall be in contact with all the cabled cores.

Where spiral screening is used, the lay direction shall be contrary to that of the cabled cores.

4.3.3.2 Joints

Joints in the individual strands of the screen shall be made by soldering or by laying the individual strands together over a length of at least 10 mm.

There shall be no more than one joint per 3 m cable length (measured between different individual strands).

4.3.3.3 Braid screen pushback capability

In accordance with Table 1, test 6.48.

4.3.3.4 Angle of spiral screening or braiding

The angle γ of spiral screening or braiding (as shown in Figure 1), measured against the longitudinal axis of the cable shall be at least 10°.

4.3.3.5 Screen coverage

The screen shall have a coverage β of at least 90 % for spiral screening and at least 85 % for braiding.

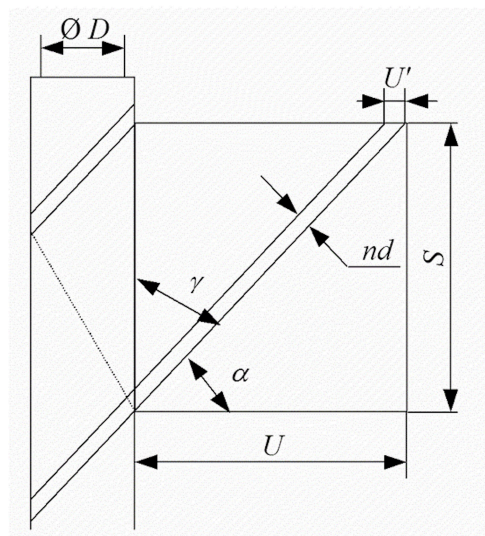


Figure 1 — Screen coverage

The cable covering is calculated using the following formula:

— for spirals:

$$U = \pi (D + d) \quad \text{and} \quad S = \pi (D + d) \tan \alpha \quad F = U' Z / U = n d Z / [\pi (D + d) \sin \alpha] \quad \beta = F \times 100 (\%)$$

— for braids:

$$U = \pi (D + 2 d) \quad \text{and} \quad S = \pi (D + 2 d) \tan \alpha$$

— for spiral screen:

$$F = U' Z / U = n d Z / [\pi (D + 2 d) \sin \alpha]$$

the maximum length T of the non-covered area is 2 mm, and

the relative aperture (versus lay length) of the screening $100 T/L$ shall be less than 5 % (see Figure 2).

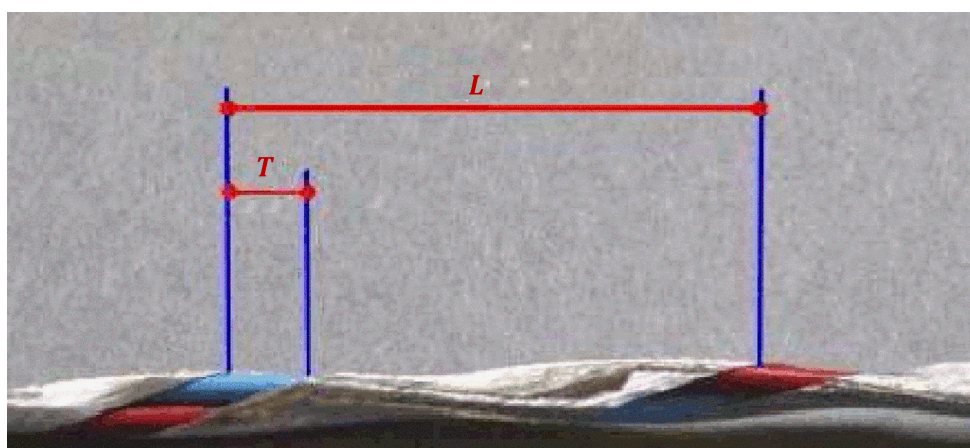


Figure 2

For braids, the filling factor F and coverage β , taking into account both braiding directions and a symmetrical braiding pattern are:

$$F = (U' / U) (Z / 2) = \left\{ n d / \left[\pi (D + 2 d) \sin \alpha \right] \right\} (Z / 2) \quad \text{and} \quad \beta = F (2 - F) \times 100 (\%)$$

where:

S = lay length of screen in mm;

D = diameter under screen in mm (for cables with two or more cores without fillers:

$$D = (\pi + N) b / \pi$$

d = diameter of screen strands in mm;

N = number of cores;

n = number of strands per carriers;

b = diameter of core in mm;

Z = total number of carriers;

F = filling factor;

β = optical coverage;

U = see Figure 1;

$U' = n d / \sin \alpha$;

γ = strand angle;

$\alpha = \pi / 2 - \gamma$.

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5 Required characteristics

The characteristics of the cables, tested according to the methods described hereafter, shall comply with the values given in the product standard.

6 Tests methods

See Table 1.

Table 1 — Tests, methods, application, requirements

§ No.	Tests							Requirements (and/or particulars)
	Description	EN 3475- (and/or particulars)	Qualification ^a (see 7.1)	First article (see 7.1.5)	Each delivery		Periodic every three years (7.2.4)	
					On all cables (7.2.1 and 7.2.2)	Prior to delivery (7.2.1 and 7.2.2)		
6	Test conditions	100	X	X	X	X	X	-
6.1	Coverage	-	X	X	-	X	-	See 4.3.3.5.
6.2	Spiral screening or braiding angle	-	X	X	-	-	X	See 4.3.3.4.
6.3	Visual examination	201	X	X	X	X	-	Marking: According to Clause 8.
6.4	Mass	202 min. length: 0,5 m	X	X	-	X	-	Product standard
6.5	Dimensions (all) outer diameter	203	X	X	X	X	-	Product standard
6.6	Ohmic resistance per unit length	301	X	X	-	X	-	Product standard
6.7	Voltage proof test:	302	-	-	-	-	-	-
	— immersion test;	-	X	X	-	-	-	500 V a.c.
	— dry test;	-	-	-	X	-	-	1 kV a.c.
	— dry impulse test;	Alternative to dry test	X	X	X	-	-	1,5 kV a.c. peak voltage
	— dielectric strength of cores.	-	-	-	X	-	-	1,5 kV a.c.

§ No.	Tests							Requirements (and/or particulars)
	Description	EN 3475- (and/or particulars)	Qualification ^a (see 7.1)	First article (see 7.1.5)	Each delivery		Periodic every three years (7.2.4)	
					On all cables (7.2.1 and 7.2.2)	Prior to delivery (7.2.1 and 7.2.2)		
6.8	Insulation resistance at (20 ± 2) °C:	303	X	X	-	-	-	For a length of 1 km:
	— dry test;	-	-	-	-	X	-	1 500 MΩ
	— immersion test at (20 ± 2) °C.	-	-	-	-	-	X	500 MΩ
	at (95 ± 2) °C:	-	-	-	-	-	X	15 MΩ
	— immersion test.	-	-	-	-	-	X	15 MΩ
6.9	Surface resistance	304	X	-	-	-	-	Min.: 1 250 MΩ mm
6.10	Overload resistance	305	Not applicable	-	-	-	-	-
6.11	Continuity of conductors	306	X	X	X	-	-	-
6.12	Corona extinction voltage	307	Not applicable	-	-	-	-	-
6.13	Accelerated ageing	401 Mandrel diameter and test load: Table 2 Temperature: Product standard	X	-	-	-	X	-
6.14	Shrinkage and delamination	402 Temperature: Product standard	X	X	-	X	-	Product standard