SLOVENSKI STANDARD
oSIST prEN 4681-003:2023

01-april-2023

Aeronavtika - Kabli, električni, za splošne namene, z vodniki iz aluminija ali pobakrenega aluminija - 003. del: Družina AD, enojni, z možnostjo UV-laserskega tiskanja - Standard za proizvod

Aerospace series - Cables, electric, general purpose, with conductors in aluminium or copper-clad aluminium - Part 003: AD family, Single, UV laser printable - Product standard

Luft- und Raumfahrt - Elektrische Leitungen, zur allgemeinen Verwendung, mit Leitern aus Aluminium oder kupferbeschichtetem Aluminium - Teil 003: AD-Familie, einadrig, mit UV-Laser bedruckbar, Produktnorm

Série aérospatiale - Câbles électriques, d'usage général, avec conducteurs en aluminium ou en aluminium chemisé cuivre - Partie 003 : Famille AD, fil simple, marquable au laser UV - Norme de produit

Ta slovenski standard je istoveten z: **prEN 4681-003**

ICS:

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

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English Version

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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 4681-003:2023) 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 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 document is currently submitted to the CEN Enquiry.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

1 Scope

This document specifies the characteristics of UV laser printable electrical lightweight wires AD family for use in the on-board 115 V (phase to neutral) or 200 V (phase to phase) AC, 28 Vdc electrical systems of aircraft at operating temperatures between −65 °C and 180 °C. These cables are demonstrated to be arc resistant in sizes AWG 24 to 14 (115/200 Vac).

In addition, these cables may be suitable for use at 230/400 Vac in pressurised zones only when installed to take account of possible short circuit effects.

Other electrical system configurations are the responsibility of the users.

It is also possible to mark these cables by qualified compatible marking which satisfies the requirements of EN 3838.

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 3475 (all parts), *Aerospace series — Cables, electrical, aircraft use — Test methods*

EN 3719, *Aerospace series - Aluminium or aluminium alloy conductors for electrical cables - Product standard*

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

EN 4651, *Aerospace series - Copper-clad aluminium alloy conductors for electrical cables - Product standard*

EN 4681-001, *Aerospace series - Cables, electric, general purpose, with conductors in aluminium or copper-clad aluminium - Part 001: Technical specification*

EN 4681-002, *Aerospace series - Cables, electric, general purpose, with conductors in aluminium or copper-clad aluminium - Part 002: General*

EN 9133, *Aerospace series - Quality Management Systems - Qualification Procedure for Aerospace Standard Products*

TR 6058,[1] *Aerospace series — Cable code identification list*

3 Terms, definitions and symbols and abbreviations

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

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/

[1] Published as ASD-STAN Technical Report at the date of publication of this European Standard by AeroSpace and Defence industries Association of Europe - Standardization (ASD-STAN) (www.asd-stan.org).

— IEC Electropedia: available at https://www.electropedia.org/

4 Materials and construction

4.1 Materials

All retained materials shall be compatible with a life time of 10 000 hours at +180°C and 140 000 hours at +150°C, in accordance with tests EN 3475-410 (insulation) and EN 3475-418 (conductor).

Conductor:

These cable conductors shall be made of:

— nickel plated copper-clad aluminium (NPCCA), Material code D;

— according to EN 4651 for 002 to 220 section codes; and

— unplated aluminium alloy (UPA), Material code A;

— according to EN 3719 for 280 to 850 section codes.

Insulation:

All size codes shall be defined to satisfy all required characteristics of Clause 5.

It shall be possible to mark the outer layer of the insulation by UV laser printing for cable size codes 002 to 220.

4.2 Construction

4.2.1 Number of cores

This shall be according to EN 4651, EN 3719 and Table 1.

Table 1

Code for nominal section	Nominal section mm²	AWG[1]	Elastic limit[2] N min.	Breaking load[2] N min.	Linear resistance at 20 °C ∧/km max.	External diameter mm min.	External diameter mm max.	Mass kg/km max.
002	0,25	24	38	67	145,00	0,85	0,96	1,75
004	0,4	22	41	71	90,20	1,00	1,10	2,50
006	0,6	20	51	111	49,60	1,22	1,34	3,65
010	1	18	87	172	33,20	1,46	1,61	5,45
012	1,2	16	108	210	23,00	1,76	1,92	7,75
020	2	14	158	285	15,50	2,04	2,24	10,94
030	3	12	246	483	10,90	2,50	2,70	15,50
051	5	10	412	750	5,80	3,09	3,33	24,02
090	9	8	593	> 1 000	3,80	4,10	4,40	39,00
140	14	6	> 1 000	> 1 000	2,30	5,30	5,70	63,70
220	22	4	> 1 000	> 1 000	1,50	6,60	7,40	96,30
280	28,6	3	—	—	1,18	7,28	7,74	94,00
340	34,7	2	—	—	0,94	8,07	8,57	116,50
420	42,9	1	—	—	0,75	8,94	9,50	143,50
530	55,2	0	—	—	0,60	10,29	10,93	181,00
680	73,5	00	—	—	0,43	11,65	12,37	230,00
850	89,9	000	—	—	0,36	12,91	13,71	276,00

[1] AWG: closest American Wire Gauge.

[2] The value is for the finished wire (conductor + insulation). The elastic limit is defined as the elastic limit of the finished wire for a 0,2 % wire elongation.

4.3 Number of cores

This shall be according to EN 4681-002.

4.4 Colour coding of cores

This shall be according to EN 4681-002.

5 Required characteristics

This shall be according to EN 4681-001 and EN 3475-100.

This shall be according to Table 2 and Table 3.

Table 2

EN 3475-	Test	Details
201	Visual examination	Applicable
202	Mass	Applicable; see Table 1
203	Dimensions	Applicable; see Table 1
301	Electrical resistance per unit length	Applicable; see Table 1
302	Voltage proof test	Applicable
303	Insulation resistance	Applicable
304	Surface resistance	Applicable
305	Overload resistance	Applicable T_1 = (230 ± 5) °C; T_2 = (280 ± 5) °C
306	Continuity of conductors	Applicable
307	Corona extinction voltage	Not applicable
401	Accelerated ageing	Applicable Temperature (230 ± 5) °C
402	Shrinkage and delamination	Applicable Temperature (230 ± 5) °C Maximum shrinkage at each end of cable: 0,15 mm² to 0,60 mm²: 0,80 mm 1,00 mm² to 1,20 mm²: 1,00 mm 2,00 mm² to 5,00 mm²: 1,20 mm 9 mm²: 1,5 mm 14 mm² to 34 mm²: 2,0 mm 42 mm² to 68 mm²: 2,5 mm 85 mm²: 3,0 mm
403	Delamination and blocking	Applicable temperature (230 ± 5) °C

EN 3475-	Test	Details
404	Thermal shock	Applicable but (-65 ± 2) °C instead of (-55 ± 2) °C Temperature (180 ± 5) °C Maximum shrinkage at each end of cable: 0,15 mm² to 0,60 mm²: 0,80 mm 1,00 mm² to 1,20 mm²: 1,00 mm 2,00 mm² to 5,00 mm²: 1,20 mm 9 mm²: 1,5 mm 14 mm² to 34 mm²: 2,0 mm 42 mm² to 68 mm²: 2,5 mm 85 mm²: 3,0 mm
405	Bending at ambient temperature	Applicable
406	Cold bend	Applicable Temperature (-65 ± 2) °C
407	Flammability	Applicable Extinguishing time: 3 s max.
408	Fire resistance	Not applicable
409	Air excluded ageing	Not applicable
410	Thermal endurance (insulation)	Applicable Test: 10 000 h (temperature +180 °C) Curve extrapolation: 140 000 h (temperature +150 °C)
411	Resistance to fluids	Applicable
412	Humidity resistance	Applicable Method B - temperature (95 ± 5) °C Duration 360 h
413	Wrap back test	Applicable
414	Differential scanning calorimeter test	Applicable (only if PTFE in the construction)
415	Rapid change of temperature	Not applicable
416	Thermal stability	Not applicable
417	Fire resistance inside harness	Not applicable