SLOVENSKI STANDARD
SIST EN 2083:2002

01-januar-2002

Aerospace series - Copper and copper alloys conductors for electrical cables - Product standard

Aerospace series - Copper and copper alloys conductors for electrical cables - Product standard

Luft- und Raumfahrt - Leiter aus Kupfer oder Kupferlegierung für elektrische Leitungen - Produktnorm

Série aérospatiale - Conducteurs en cuivre ou en alliage de cuivre pour câbles électriques - Norme de produit

Ta slovenski standard je istoveten z: **EN 2083:2001**

ICS:

49.060	Letalska in vesoljska elektriļ na oprema in sistemi	Aerospace electric equipment and systems

SIST EN 2083:2002 **en**

EUROPEAN STANDARD

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EN 2083

April 2001

ICS 49.060

English version

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This European Standard was approved by CEN on 28 May 2000.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 2083:2001 E

Foreword

This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).

After inquiries 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 AECMA, 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 2001, and conflicting national standards shall be withdrawn at the latest by October 2001.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard specifies the dimensions, linear resistance, mechanical characteristics, construction and mass of conductors in copper or copper alloy for electrical cables for aerospace applications.

It applies to stranded conductors, with a nominal cross-sectional area of 0,15 mm^2 to 107 mm^2 inclusive.

The conductors for thermocouple extension and fire-resistant cables are not covered by this standard.

2 Normative references

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

IEC publication 28 (1925)	International standard of resistance for copper
IEC publication 344 (1980)	Guide to the calculation of resistance of plain and coated copper conductors of low-frequency cables and wires
EN 3475-100	Aerospace series - Cable, electrical, aircraft use - Test methods - Part 100: General [1)]
EN 3475-301	Aerospace series - Cable, electrical, aircraft use - Test methods - Part 301: Electrical resistance per unit length [1)]
EN 3475-506	Aerospace series - Cable, electrical, aircraft use - Test methods - Part 506: Plating continuity [1)]
EN 3475-507	Aerospace series - Cable, electrical, aircraft use - Test methods - Part 507: Adherence of plating [1)]

3 Definitions and symbols

For the purposes of this standard, the definitions and symbols given in EN 3475-100 for conductors apply.

4 Conductor materials and construction

4.1 Materials

Conductors complying with this standard are made from strands in high conductivity annealed electrolytic copper (see IEC 28) or copper alloy.

The conductors for nominal cross-sectional areas 0,15 mm^2 and 0,25 mm^2 shall be made from copper alloy.

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1) Published as AECMA Prestandard at the date of publication of this standard

4.2 Metal plating

The individual strands may be:

- uncoated (code A);
- or provided with uniform platings of tin (code B) or silver (code C) or nickel (code D).

Plating thicknesses shall be at least 1,0 μm for silver and 1,3 μm for nickel.

When tin plating is authorized, the thickness shall be sufficient to comply with the tests specified in EN 3475-506 and EN 3475-507.

4.3 Electrolytic copper

The elongation prior to rupture, for each copper strand, shall not be less than 10 %.

The tensile strengh, for each copper strand, shall be at least 220 MPa.

4.4 Copper alloy

For cross-sectional areas 0,15 mm^2 and 0,25 mm^2 in copper alloy, use an alloy with the following characteristics:

- maximum resistivity: $2{,}46 \times 10^{-8}$ Ω.m [2)];
- minimum tensile strength: 350 MPa;
- minimum elongation: 6 %.

4.5 Construction of conductors

4.5.1 Lay length

Up to 9 mm^2 cross-section inclusive (code 090), concentric conductors are used. The lay for the strands of a concentric conductor, checked over the outside layer of a test piece 1 m long, shall be between 8 times and 16 times the maximum diameter of this conductor.

For sectional areas between 14 mm^2 and 107 mm^2 (codes 140 to 107), the conductor comprises concentric or bunched conductors twisted together. The lay of the strands for the basic concentric or bunched conductors shall not exceed 30 times the diameter of the concentric or bunched conductor in question.

The lay for concentric (or bunched) conductors, measured over the outer layer of the conductor, shall be between 8 times and 16 times the maximum conductor diameter.

In all cases the lay of the outer layer shall be left-hand.

4.5.2 Joints

The conductors shall be free from any joints. Each strand comprising the conductors may, however, include soldered or brazed joints. For strands with a diameter of 0,25 mm or greater, butt joints shall be used.

The distance between two joints in individual strands shall exceed 3 m, measured between differents strands.

4.5.3 Compaction

Compaction of the conductor, causing deformation of the strands or damage to the plating, is not permitted.

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2) or 24,6 Ω.mm^2/km

5 Required characteristics

See table 1.

Table 1

Code	Nominal section mm²	Number of strands	Nominal diameter of strands mm	Diameter of conductor mm min.	Diameter of conductor mm max.	Linear resistance max. at 20 °C [a] Ω/km A and C	Linear resistance max. at 20 °C [a] Ω/km B and D	Breaking load N min.	Mass of conductor kg/km [b] min.	Mass of conductor kg/km [b] max.	AWG [c]	Number of missing strands
001	0,15	19	0,10	0,45	0,53	149	160 [d]	46	1,20	1,60	26	0
002	0,25	19	0,12	0,55	0,62	106	114 [d]	67	1,77	2,18	24	0
004	0,40	19	0,15	0,70	0,80	55,3	60	71	2,83	3,43	22	0
006	0,60	19	0,20	0,94	1,04	31,0	33,2	127	5,15	5,95	20	0
010	1	19	0,25	1,18	1,29	19,6	21,1	198	8,16	9,16	18	0
012	1,20	19	0,30	1,39	1,53	13,6	14,5	285	11,63	13,20	16	0
020	2	37	0,25	1,68	1,82	10,2	10,9	385	16,02	18,00	14	0
030	3	37	0,32	2,12	2,28	6,4	6,8	645	26,06	28,50	12	0
050	5	37	0,40	2,69	2,88	4,0	4,2	1000	41,23	46,00	10	0
051	5 [e]	61	0,32	2,72	2,94	3,9	4,1	1000	43,25	48,00	10	0
090	9 [f]	127	0,30	–	4,40	2,1	2,3	–		87	8	0
140	14	27×7	0,30	–	5,50	1,44	1,58	–		133	6	0
220	22	37×12	0,25	–	6,80	0,88	0,97	–		216	4	0
340	34	37×19	0,25	–	8,60	0,56	0,61	–		342	2	2
420	42	37×23	0,25	–	9,50	0,46	0,51	–		414	1	2
530	53	37×29	0,25	–	10,70	0,36	0,40	–		522	0	3
680	68	37×37	0,25	–	12,10	0,29	0,32	–		666	00	3
850	85	48×36	0,25	–	13,60	0,23	0,25	–		841	000	4
107	107	61×36	0,25	–	15,20	0,18	0,20	–		1069	0000	5

[a] The linear resistance at other temperatures may be calculated using the formulas given in EN 3475-301.

[b] Not taking into consideration metal platings, assuming that their effect is minimal.

[c] AWG: closest American Wire Gage

[d] Not available as code letter B

[e] This gives a more flexible construction which may be used as an alternative.

[f] Codes ≥ 090:

a) Linear resistance calculated in accordance with the procedure in IEC 344;

where

k_1 is 1,04 (A and C) and 1,145 (B and D);

k_2 is 1,04 (code 090) and 1,02 (codes ≥ 140);

k_3 is 1 (code 090) and 1,05 (codes ≥ 140).

b) Maximum mass:

$M = \delta \times S \times k_2 \times k_3 \times kt$

where

δ is 8,9 (Cu);

S is actual nominal section in mm²;

k_2 and k_3 are the same coefficients as those for linear resistance;

kt is 1,04 (coefficient of strand diameter at maximum: based on a strand of 0,25 mm nominal and 0,255 mm maximum: $0,255^2/0,25^2$).

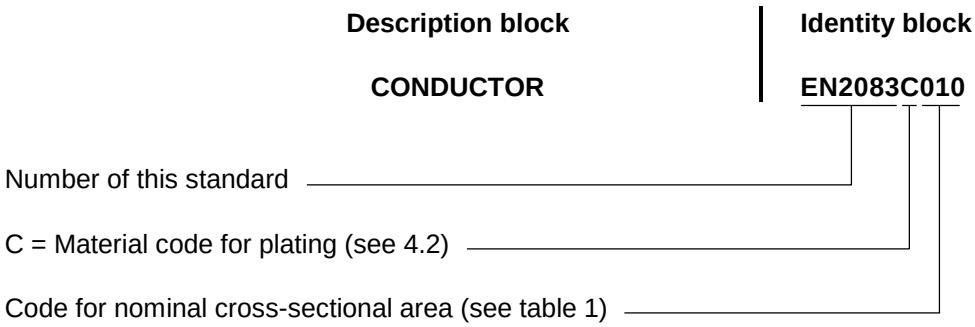
Code 090: M is 9,62S Codes ≥ 140: M is 9,91S

6 Test methods

See EN 3475-100.

7 Designation

EXAMPLE:



NOTE: If necessary, the code I9005 shall be placed between the description block and the identity block.

8 Marking, packaging and delivery lengths

On delivery the identification reference shall be completed by the length, date and inspection mark.

The conductors shall be delivered on spools or reels.

They shall be wound in a regular and uniform manner and require an appropriate protection, not affecting the product delivered.

Each unit delivered may contain one or several lengths as specified by the purchaser.