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**Aeronavtika - Kabli, električni, za splošne namene, eno- in večžilni - Družina XLETFE - 008. del: Ponikljani baker - Obratovalne temperature med -65 °C in 150 °C - Dvojna ekstrudirana izolacija za zunanjo uporabo z dodatno zaščito na območjih z velikimi vibracijami (nihanjem), zvijanjem in v stiku s tekočinami - Potiskljiva z UV-laserjem - Standard za izdelek**

Aerospace series - Cables, electrical, for general purpose, single and multicore assembly - XLETFE Family - Part 008: BP - Nickel plated copper - Operating temperatures, between – 65 °C and 150 °C - Dual extruded wall for open applications with additional protection in areas of high vibration, cable flexing and fluid contamination - UV laser printable - Product standard

Luft- und Raumfahrt - Ein- und mehradrige elektrische Leitungen für allgemeine Verwendung - XLETFE Familie - Teil 008: BP - Kupfer vernickelt - Betriebstemperaturen zwischen – 65 °C und 150 °C - Doppelt extrudierte Isolierung für externe Verwendung, mit zusätzlichem Schutz in Gebieten mit hoher Vibration (Schwingung), bei Bewegung und bei Kontakt mit Flüssigkeiten - UV-Laser bedruckbar - Produktnorm

Série aérospatiale - Câbles, électriques, d'usage général, mono et multiconducteurs - Famille XLETFE - Partie 008 : BP - Cuivre nickelé - Températures de fonctionnement comprises entre – 65 °C et 150 °C - Fil double isolé pour applications externes avec protection additionnelle pour zones à hautes vibrations, flexion de câbles et pollution des fluides - Marquable au laser UV - Norme de produit

**Ta slovenski standard je istoveten z: EN 4611-008:2012**

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**ICS:**

49.060	Letalska in vesoljska električna oprema in sistemi	Aerospace electric equipment and systems
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**SIST EN 4611-008:2012****en,fr,de**

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EUROPEAN STANDARD

EN 4611-008

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2012

ICS 49.060

English Version

**Aerospace series - Cables, electrical, for general purpose, single and multicore assembly - XLETFE Family - Part 008: BP - Nickel plated copper - Operating temperatures, between -65 °C and 150 °C - Dual extruded wall for open applications with additional protection in areas of high vibration, cable flexing and fluid contamination - UV laser printable - Product standard**

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Luft- und Raumfahrt - Ein- und mehradrige elektrische Leitungen zur allgemeinen Verwendung, XLETFE-Familie - Teil 008: BP, Kupfer vernickelt, Betriebstemperaturen zwischen -65 °C und 150 °C, doppelt extrudierte Isolierung für offene Anwendungen, mit zusätzlichem Schutz für Bereiche mit hoher Vibration, Bewegung der Leitung und Kontakt mit Flüssigkeiten, UV-Laser bedruckbar - Produktnorm

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This European Standard was approved by CEN on 17 September 2011.

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 CEN-CENELEC 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 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

**Management Centre: Avenue Marnix 17, B-1000 Brussels**

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## Foreword

This document (EN 4611-008:2012) 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 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 August 2012, and conflicting national standards shall be withdrawn at the latest by August 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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**EN 4611-008:2012 (E)****1 Scope**

This European Standard specifies the characteristics of UV laser printable, nickel plated copper conductor, electrical cables Crosslinked Ethylene Tetra Fluoro Ethylene co-polymer XLETFE family for use in the on-board electrical systems of aircraft at operating temperatures between – 65 °C and 150 °C, operating at voltages not exceeding 600 V r.m.s and frequencies not exceeding 2 000 Hz. These cables are intended for use with additional protection in areas where combinations of high vibration, cable flexing and fluid contamination are normal e.g. undercarriage harnesses. In case of conflict between this European Standard and other referenced documents the requirements of this European Standard should take precedence.

**2 Normative references**

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 2084, *Aerospace series – Cables, electric, single-core, general purpose, with conductors in copper or copper alloy – Technical specification*

EN 2235, *Aerospace series – Single and multicore electrical cables, screened and jacketed*

EN 3475-100<sup>1</sup>, *Aerospace series – Cables, electrical, aircraft use – Test methods – Part 100: General*

EN 4611-002, *Aerospace series – Cables, electrical, for general purpose, single and multicore assembly – XLETFE Family – Part 002: General*

EN 9133, *Aerospace series – Quality management systems – Qualification procedure for aerospace standard parts*

**3 Terms, definitions, symbols and abbreviations**

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

**4 Materials and construction****4.1 Materials****Conductor**

The cable conductors shall be made of nickel plated copper according to EN 4611-002.

**Insulation** for conductor all size codes

- first insulator extruded XLETFE, coloured blue;
- second insulator extruded XLETFE. Coloured White for sizes 002, 006 and 010. Coloured light green for size 004

For single core, it shall be possible to mark the outer insulation by UV laser printing.

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<sup>1</sup> And all its parts

## 4.2 Construction

See EN 4611-002, Table 1 and Table 2.

**Table 1 – Single core cables**

Code for nominal section	Nominal section  mm <sup>2</sup>	AWG <sup>a</sup>	Linear resistance at 20 °C	Maximum external diameter  mm	Mass  kg/km	Minimum insulation thickness  mm
			Ω/km  max.			
002 <sup>b</sup>	0,25	24	114,0	1,07	3,12	0,20
004	0,4	22	60,0	1,21	4,29	0,20
006	0,6	20	33,2	1,45	7,02	0,20
010	1	18	21,1	1,70	10,75	0,20

<sup>a</sup> AWG = Closest American Wire Gauge.  
<sup>b</sup> Nickel plated copper alloy conductor

**Table 2 – Multicore without screen or jacket**

Size	AWG <sup>a</sup>	2 core			3 core		
		Max. dia. mm	Mass kg/km	DC Res. Ω/km	Max. dia. mm	Mass kg/km	DC Res. Ω/km
002 <sup>b</sup>	24	2,14	6,43	117,4	2,31	9,64	117,4
004	22	2,43	8,84	61,8	2,62	13,25	61,8
006	20	2,90	14,46	34,2	3,13	21,69	34,2
010	18	3,40	22,15	21,7	3,67	33,22	21,7

<sup>a</sup> AWG = Closest American Wire Gauge.  
<sup>b</sup> Nickel plated copper alloy conductor

## 4.3 Number of cores

See EN 4611-002.

See EN 2235 for cabling.

## 4.4 Colour coding of cores

See EN 4611-002.

## EN 4611-008:2012 (E)

## 5 Required characteristics

According to EN 2084 and EN 3475-100

See Table 3.

NOTE Tests EN 3475-302 to EN 3475-706 should be performed on the single core cables.

Table 3

EN 3475-	Test	Details
201	Visual examination	Applicable
202	Mass	Applicable; see Table 1 and Table 2.
203	Dimensions	Applicable; see Table 1 and Table 2.
301	Ohmic resistance per unit length	Applicable; see Table 1 and Table 2.
302	Voltage proof test	Applicable
303	Insulation resistance	Applicable (20 ± 2) °C, 500 MΩ.km minimum (95 ± 2) °C, 1 MΩ.km minimum
304	Surface resistance	Applicable 12 500 MΩ.mm minimum
305	Overload resistance	Applicable $T_1 = (250 \pm 5) \text{ °C}$ ; $T_2 = (380 \pm 5) \text{ °C}$
401	Accelerated ageing	Applicable Temperature (200 ± 3) °C
402	Shrinkage and delamination	Applicable Temperature (150 ± 5) °C Maximum shrinkage at each end of cable: 0,80 mm on size code 002 to 006 1,00 mm on size code 010
403	Delamination and blocking	Applicable Temperature (150 ± 5) °C
404	Thermal shock	Applicable Temperatures (– 65 ± 2) °C and (260 ± 5) °C Maximum shrinkage at each end of cable: 1,00 mm
405	Bending at ambient temperature	Applicable
406	Cold bend test	Applicable Temperature (– 65 ± 2) °C
407	Flammability	Applicable Methods 1 and 2 Flame application 15 s Extinguishing time: 3 s max.
408	Fire resistance	Not applicable
409	Air-excluded ageing	Not applicable
410	Thermal endurance	Applicable 60 000 hours Temperature 150 °C
411	Resistance to fluids	Applicable No crazing or delamination, 5 % maximum swell, colour changes or removal of marking

(continued)



Table 3 (continued)

EN 3475-	Test	Details															
412	Humidity resistance	Applicable Method B Temperature (90 ± 2) °C Duration 672 hours															
413	Wrap back test	Not applicable															
414	Differential scanning calorimeter (DSC test)	Not applicable															
501	Dynamic cut-through	Not applicable															
502	Notch propagation	Applicable Notch depth 40 µm															
503	Scrape abrasion	Applicable Temperature (20 ± 3) °C Minimum number of cycles for size 24 > 100 All other sizes > 150 <table border="1" data-bbox="970 808 1433 1059"> <thead> <tr> <th>Size code</th> <th>Nominal section mm<sup>2</sup></th> <th>Load N</th> </tr> </thead> <tbody> <tr> <td>002</td> <td>0,25</td> <td>8,0</td> </tr> <tr> <td>004</td> <td>0,4</td> <td>8,0</td> </tr> <tr> <td>006</td> <td>0,6</td> <td>8,0</td> </tr> <tr> <td>010</td> <td>1</td> <td>8,0</td> </tr> </tbody> </table>	Size code	Nominal section mm <sup>2</sup>	Load N	002	0,25	8,0	004	0,4	8,0	006	0,6	8,0	010	1	8,0
Size code	Nominal section mm <sup>2</sup>	Load N															
002	0,25	8,0															
004	0,4	8,0															
006	0,6	8,0															
010	1	8,0															
504	Torsion	Not applicable															
505	Tensile test on conductors and strands	Applicable															
506	Plating continuity	Applicable															
507	Adherence of plating	Applicable															
508	Plating thickness	Applicable															
509	Solderability	Not applicable															
510	Tensile strength and elongation of extruded insulation, sheath and jacket material	Applicable 35 MPa and 75 %															
511	Cable-to-cable abrasion	Applicable size code 006 Load 1 kg – 6 000 000 cycles															
512	Flexure endurance	Applicable code 006 Mandrel Ø 15 mm Weight 0,75 kg – 750 cycles															
601	Smoke density	Applicable code 006 D <sub>s</sub> < 50, 4 minutes															
602	Toxicity	Applicable code 006															
603	Resistance to wet arc tracking	Applicable or use EN 3475-605 as an alternative Wire damage ≤ 70 mm 75 % of collateral wires shall not be open circuit wet dielectric voltage proof test (EN 3475-302) not applicable															

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