



# SLOVENSKI STANDARD

## SIST EN 4681-005:2019

01-september-2019

Nadomešča:

SIST EN 4681-005:2015

---

**Aeronavtika - Kabli, električni, za splošne namene, z vodniki iz aluminija ali pobakrenega aluminija - 005. del: Družina AZ, enožilni, za uporabo v nizkotlačnih atmosferah - Standard za proizvod**

Aerospace series - Cables, electric, general purpose, with conductors in aluminium or copper-clad aluminium - Part 005: AZ family, single, for use in low pressure atmosphere - Product standard

**iTeh STANDARD PREVIEW**

Luft- und Raumfahrt - Elektrische Leitungen, zur allgemeinen Verwendung, mit Leitern aus Aluminium oder kupferbeschichtetem Aluminium - Teil 005: AZ-Familie, einadrig, zur Anwendung bei niedrigem Luftdruck - Produktnorm

<https://standards.iteh.ai/catalog/standards/sist/380ddeb8-235d-4feb-814a-ec570f77416c/sist-en-4681-005-2019>

Série aérospatiale - Câbles, électriques, d'usage général, avec conducteurs en aluminium ou en aluminium chemisé cuivre - Partie 005: Famille AZ, fil simple, pour emploi en basse pression - Norme de produit

**Ta slovenski standard je istoveten z: EN 4681-005:2019**

---

**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

**SIST EN 4681-005:2019**

**en,fr,de**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 4681-005:2019](#)

<https://standards.iteh.ai/catalog/standards/sist/380ddeb8-235d-4feb-814a-ec570f77416c/sist-en-4681-005-2019>

EUROPEAN STANDARD

EN 4681-005

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2019

ICS 49.060

Supersedes EN 4681-005:2015

English Version

**Aerospace series - Cables, electric, general purpose, with  
conductors in aluminium or copper-clad aluminium - Part  
005: AZ family, single, for use in low pressure atmosphere  
- Product standard**

Série aérospatiale - Câbles, électriques, d'usage  
général, avec conducteurs en aluminium ou en  
aluminium chemisé cuivre - Partie 005: Famille AZ, fil  
simple, pour emploi en basse pression - Norme de  
produit

Luft- und Raumfahrt - Elektrische Leitungen, zur  
allgemeinen Verwendung, mit Leitern aus Aluminium  
oder kupferbeschichtetem Aluminium - Teil 005: AZ-  
Familie, einadrig, zur Anwendung bei niedrigem  
Luftdruck - Produktnorm

This European Standard was approved by CEN on 6 August 2018.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

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

<b>Contents</b>	<b>Page</b>
European foreword .....	3
1 Scope.....	4
2 Normative references.....	4
3 Terms, definitions and symbols.....	4
4 Materials and construction .....	5
5 Required characteristics .....	6
6 Quality assurance.....	8
7 Designation .....	9
8 Identification and marking.....	9
9 Packaging, labelling and delivery lengths.....	9
10 Technical specification .....	9

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 4681-005:2019](https://standards.iteh.ai/catalog/standards/sist/380ddeb8-235d-4feb-814a-ec570f77416c/sist-en-4681-005-2019)

<https://standards.iteh.ai/catalog/standards/sist/380ddeb8-235d-4feb-814a-ec570f77416c/sist-en-4681-005-2019>

## European foreword

This document (EN 4681-005:2019) 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 December 2019, and conflicting national standards shall be withdrawn at the latest by December 2019.

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

This document supersedes EN 4681-005:2015.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

ITEH STANDARD PREVIEW

(standards.iteh.ai)

[SIST EN 4681-005:2019](https://standards.iteh.ai/catalog/standards/sist/380ddeb8-235d-4feb-814a-ec570f77416c/sist-en-4681-005-2019)

<https://standards.iteh.ai/catalog/standards/sist/380ddeb8-235d-4feb-814a-ec570f77416c/sist-en-4681-005-2019>

**EN 4681-005:2019 (E)****1 Scope**

This European Standard specifies the characteristics of electrical wires AZ family for use in the on board:

- 115 V (phase to neutral) or 200 V (phase to phase) electrical network of aircraft.
- 230 V (phase to neutral) or 400 V (phase to phase) electrical network of aircraft and particularly use in non-pressurized areas.

This cable family is used at operating temperature between – 65 °C and 180 °C.

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

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 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, *Aerospace series — Cable code identification list* <sup>2)</sup>

**3 Terms, definitions and symbols**

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

---

1) All its parts quoted in this European Standard.

2) Published as ASD-STAN Technical Report at the date of publication of this standard by AeroSpace and Defence industries Association of Europe - Standardization (ASD-STAN), <http://www.asd-stan.org/>

## 4 Materials and construction

### 4.1 Materials

#### Conductor:

These cable conductors shall be made of:

- Nickel plated aluminium alloy (code D) 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.

The use of foamed insulation material is forbidden.

To minimize partial discharges effect:

- size and number of cavities (gas trap) inside the insulation shall be as low as possible.
- at minimum bend radius there shall be no wrinkles outside the insulation (EN 3475-405).

Minimum bend radius shall be in accordance with bending diameter given in Table 4 of the technical specification EN 4681-001.

### 4.2 Construction

See EN 3719 and Table 1.

SIST EN 4681-005:2019  
<https://standards.iteh.ai/catalog/standards/sist/380ddeb8-235d-4feb-814a-ec570f77416c/sist-en-4681-005-2019>  
**Table 1**

Code for nominal section	Nominal section mm <sup>2</sup>	AWG <sup>a</sup>	Elastic limit <sup>b</sup>	Breaking load <sup>b</sup>	Linear resistance at 20 °C Ω/km min. max.	External diameter		Mass kg/km max.
			N min.	N min.		mm min.	mm max.	
280	28	3	–	–	1,18	7,5	8,4	109
420	42	1	–	–	0,75	9,3	10,2	175
680	68	00	–	–	0,43	12,1	13,0	271

<sup>a</sup> AWG: closest American Wire Gauge.

<sup>b</sup> 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 standard specifies single cores.

### 4.4 Colour coding of cores

See EN 4681-002.

## EN 4681-005:2019 (E)

## 5 Required characteristics

According to EN 4681-001 and EN 3475-100.

See Table 2.

Table 2 (1 of 3)

EN 3475-	Test	Details
201	Visual examination	Applicable
202	Mass	Applicable, see Table 1.
203	Dimensions	Applicable, see 4.2 and Table 1.
301	Ohmic resistance per unit length	Applicable with: — immersion test 2,5 kV r.m.s (non delivered samples), — dry spark test 2,5 kV r.m.s, — dry impulse test 4,0 kV r.m.s.
302	Voltage proof test	Applicable
303	Insulation resistance	Applicable
304	Surface resistance	Applicable
305	Overload resistance	Not applicable
306	Continuity of conductors	Applicable
307	Corona extinction voltage	Applicable prior to each delivery Method B at 45.000 feet (145 mbar) and 150 °C — PDIV $\geq$ 566 Vr.m.s. (800 V peak), — PDEV $\geq$ 509 Vr.m.s. (720 V peak).
401	Accelerated ageing	Applicable Temperature (230 $\pm$ 5) °C
402	Shrinkage and delamination	Applicable Temperature (230 $\pm$ 5) °C Maximum shrinkage at each end of cable: — 28 mm <sup>2</sup> to 34 mm <sup>2</sup> : 2,0 mm, — 42 mm <sup>2</sup> to 68 mm <sup>2</sup> : 2,5 mm.
403	Delamination and blocking	Applicable temperature (230 $\pm$ 5) °C
404	Thermal shock	Applicable but (– 65 $\pm$ 2) °C instead of (– 55 $\pm$ 2) °C Temperature (180 $\pm$ 5) °C Maximum shrinkage at each end of cable: — 28 mm <sup>2</sup> to 34 mm <sup>2</sup> : 2,0 mm, — 42 mm <sup>2</sup> to 68 mm <sup>2</sup> : 2,5 mm.
405	Bending at ambient temperature	Applicable
406	Cold bend test	Applicable Temperature (– 65 $\pm$ 2) °C
407	Flammability	Applicable Extinguishing time: 3 s max.



Table 2 (2 of 3)

EN 3475-	Test	Details
408	Fire resistance	Not applicable
409	Air-excluded ageing	Not applicable
410	Thermal endurance (insulation)	Applicable 10 000 h at 180 °C with curve extrapolation 140 000 h at 150 °C with curve reading
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 (DSC test)	Applicable (only if PTFE in the construction)
415	Rapid change of temperature	Not applicable
416	Thermal stability	Not applicable
417	Fire resistance of cables confined inside a harness	Not applicable
418	Thermal endurance for conductors	Not applicable
501	Dynamic cut-through	Not applicable
502	Notch propagation	Applicable notch depth: 40 µm
503	Scrape abrasion	Applicable Test force on needle for cables 28 mm <sup>2</sup> to 68 mm <sup>2</sup> = 15 N
504	Torsion	Applicable $T_3 = (180 \pm 5) \text{ °C}$ ; $T_4 = (230 \pm 5) \text{ °C}$
505	Tensile test on conductors and strands	Applicable For qualification: See EN 3719 for tensile and elongation requirements for individual strand requirements. Measurement shall be done on minimum 10 samples in total taken from the conductor in (5 samples) outer and (5 samples) inner layers. Median test results of inner and outer strand measurements shall be compliant with the EN 3719 requirements (including elongation).
506	Plating continuity	Applicable
507	Adherence of plating	Applicable
508	Plating thickness	Applicable (Test methods 4 and 5 are preferred)