

# SLOVENSKI STANDARD

## SIST EN 3475-514:2014

01-julij-2014

Nadomešča:

SIST EN 3475-514:2007

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**Aeronavtika - Električni kabli za uporabo v zračnih plovilih - Preskusne metode - 514. del: Poroznost bakrene obloge na aluminijevih žicah**

Aerospace series - Cables, electrical, aircraft use - Test methods - Part 514: Porosity of copper cladding on aluminium strands

Luft- und Raumfahrt - Elektrische Leitungen für Luftfahrtverwendung - Prüfverfahren - Teil 514: Porosität von Einzeldrähten aus Aluminium mit einer Kupferauflage

Série aérospatiale - Câbles électriques à usage aéronautique - Méthodes d'essais - Partie 514: Porosité d'un revêtement cuivre sur des brins aluminium

**Ta slovenski standard je istoveten z: EN 3475-514:2014**

**ICS:**

|           |  |  |
|-----------|--|--|
| 49.025.20 | Aluminij   | Aluminium                                |
| 49.060    | Letalska in vesoljska električna oprema in sistemi | Aerospace electric equipment and systems |

**SIST EN 3475-514:2014**

**en,fr,de**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 3475-514**

April 2014

ICS 49.060

Supersedes EN 3475-514:2007

English Version

**Aerospace series - Cables, electrical, aircraft use - Test methods  
- Part 514: Porosity of copper cladding on aluminium strands**

Série aérospatiale - Câbles électriques à usage  
aéronautique - Méthodes d'essais - Partie 514: Porosité  
d'un revêtement cuivre sur des brins aluminium

Luft- und Raumfahrt - Elektrische Leitungen für  
Luftfahrtverwendung - Prüfverfahren - Teil 514: Porosität  
von Einzeldrähten aus Aluminium mit einer Kupferauflage

This European Standard was approved by CEN on 12 October 2013.

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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

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

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## Foreword

This document (EN 3475-514:2014) 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 October 2014, and conflicting national standards shall be withdrawn at the latest by October 2014.

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.

This document supersedes EN 3475-514:2007.

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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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**EN 3475-514:2014 (E)****1 Scope**

This European Standard specifies an assessment method of the copper porosity on copper clad aluminium strands with or without external coating or on nickel or silver copper clad aluminium conductors.

It shall be used together with EN 3475-100.

**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 3475-100, *Aerospace series - Cables, electrical, aircraft use - Test methods - Part 100: General*

ASTM B 298<sup>1)</sup>, *Standard specification for silver-coated soft or annealed copper wire*

ASTM B 355<sup>1)</sup>, *Standard specification for nickel-coated soft or annealed copper wire*

ASTM B 566-93<sup>1)</sup>, *Standard specification for copper-clad aluminum wire*

**3 Applicability**

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This test method is applicable to any copper-clad aluminium wire or strand, that is to say:

- applicable to any class of copper-clad aluminium wire (class as defined by ASTM B 566-93).
- applicable to:
  - a strand during its manufacturing process or before stranding;
  - a complete conductor;
  - a strand taken for a stranded conductor;
  - a strand taken from a member belonging to a rope-lay conductor.
- it is applicable to any nickel or silver-coating class (class as defined respectively by ASTM B 298 or ASTM B 355).

**4 Preparation of specimens**

Test specimen shall be of  $2,30 \text{ m} \pm 10 \%$  length and shall not be touched with bare fingers.

The surface of the sample shall be free of oil or other contaminants. If necessary, clean it by wiping the specimen using a clean lint free material and an organic solvent (such as alcohol/ether 50/50).

In order to limit curve stress, wrap it:

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<sup>1)</sup> Published by: ASTM National (US) American Society for Testing and Materials <http://www.astm.org/>.

- on a mandrel of 40 mm for strands alone and then remove the mandrel, or
- around a minimum diameter of about 200 times its strand diameter for a stranded conductor.

The ends should be removed from the windings in a length of about 0,15 m.

## 5 Method (see note)

NOTE This method is coming from works lead separately by the Company **FSP-one** and above all by **Drahtwerk Waidhaus GmbH** at the origin of the "equation" bubbles = troubles.

The 2 m centre part of the specimen shall be immersed in a pure solution of hydrochloric acid which has a density of 1,088 g/cm<sup>3</sup> at 20 °C:

- For strand:  $\left( \begin{matrix} 60 & + & 10 \\ & & 0 \end{matrix} \right)$  s;
- For complete conductor:  $\left( \begin{matrix} 5 & + & 1 \\ & & 0 \end{matrix} \right)$  s.

In no circumstances shall the specimen ends be immersed in the solution.

During the immersion the specimen shall be examined carefully with the naked eye.

If the copper is porous the hydrochloric acid solution will come in contact with the aluminium metal and, as consequence of an active reaction, bubbles will appear immediately rising from the specimen surface to the surface of the test solution.

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The presence of some visible adherent bubbles on the conductor surface might already be caused by a bad handling of the samples or surface contaminant and is not enough evidence that the nickel and copper layers of the sample have been damaged down to the aluminium core.

## 6 Requirements

There shall be no bubbles rising from the specimen surface to the surface of the test solution.