



# SLOVENSKI STANDARD SIST EN 3475-505:2023

01-maj-2023

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**Aeronavtika - Električni kabli za uporabo v zračnih plovilih - Preskusne metode - 505. del: Natezni preskus vodnikov in žic**

Aerospace series - Cables, electrical, aircraft use - Test methods - Part 505: Tensile test on conductors and strands

Luft- und Raumfahrt - Elektrische Leitungen für Luftfahrtverwendung - Prüfverfahren - Teil 505: Zugfestigkeit der Einzeldrähte und Leiterseile

Série aérospatiale - Câbles électriques à usage aéronautique - Méthodes d'essais - Partie 505 : Résistance à la traction des conducteurs et des brins

**Ta slovenski standard je istoveten z: EN 3475-505:2023**

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**ICS:**

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

**SIST EN 3475-505:2023**

**en,fr,de**



EUROPEAN STANDARD

EN 3475-505

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2023

ICS 49.060

Supersedes EN 3475-505:2012

English Version

## Aerospace series - Cables, electrical, aircraft use - Test methods - Part 505: Tensile test on conductors and strands

Série aérospatiale - Câbles électriques à usage  
aéronautique - Méthodes d'essais - Partie 505 :  
Résistance à la traction des conducteurs et des brins

Luft- und Raumfahrt - Elektrischen Leitungen für  
Luftfahrt-Verwendung - Prüfverfahren - Teil 505:  
Zugfestigkeit der Einzeldrähte und Leiterseile

This European Standard was approved by CEN on 2 October 2022.

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.

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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 (EN 3475-505:2023) 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 document 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 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2023, and conflicting national standards shall be withdrawn at the latest by September 2023.

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 3475-505:2012.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

**Table 1 — Main changes to previous edition**

prEN/EN Number	Edition	Publication Date	Modification
prEN 3475-505	P3	04/2010	3 – Terms and definitions: Complete revision of the Clause. Merging of Figures 1 and 2. 4 – Apparatus: Complete revision of the Clause. Initial length is now 250 mm (was 200 mm). 5 – Method: Complete revision of the Clause. The former Annex A is moved to 5.3.

**EN 3475-505:2023 (E)****1 Scope**

This document specifies a method of measuring the tensile properties of stranded conductors, single strands, solid conductors and braids.

When required, it can be used also on insulated wires and cables after removing the insulation.

It is intended to be used together with EN 3475-100.

**2 Normative references**

There are no normative references in this document.

**3 Terms and definitions**

For the purposes of this document, the following terms and definitions 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/>
- IEC Electropedia: available at <https://www.electropedia.org/>

**3.1****breaking load**

limit load at which material actually breaks, with sudden release of the stored elastic energy (released as noise and/or heat and/or more cracks, e.g., for brittle materials)

Note 1 to entry: this point is marked "Fracture" on the Figure 1.

**3.2****maximum load**

maximum load obtained while performing the tensile test

Note 1 to entry: this point is marked "Max." on the Figure 1.

**3.3****tensile strength (or ultimate tensile strength)**

tensile strength is calculated by dividing the load by the cross-sectional area

**3.4****elongation at break, or ultimate elongation or total elongation**

elongation at break also called total elongation or ultimate elongation is the elongation of material at rupture under tensile loading and is defined as a percentage of the original length as per formula:

$$\text{Elongation (\%)} = \Delta L / L_0$$

**3.5****elastic limit**

maximum stress that can be developed in a material without causing plastic deformation

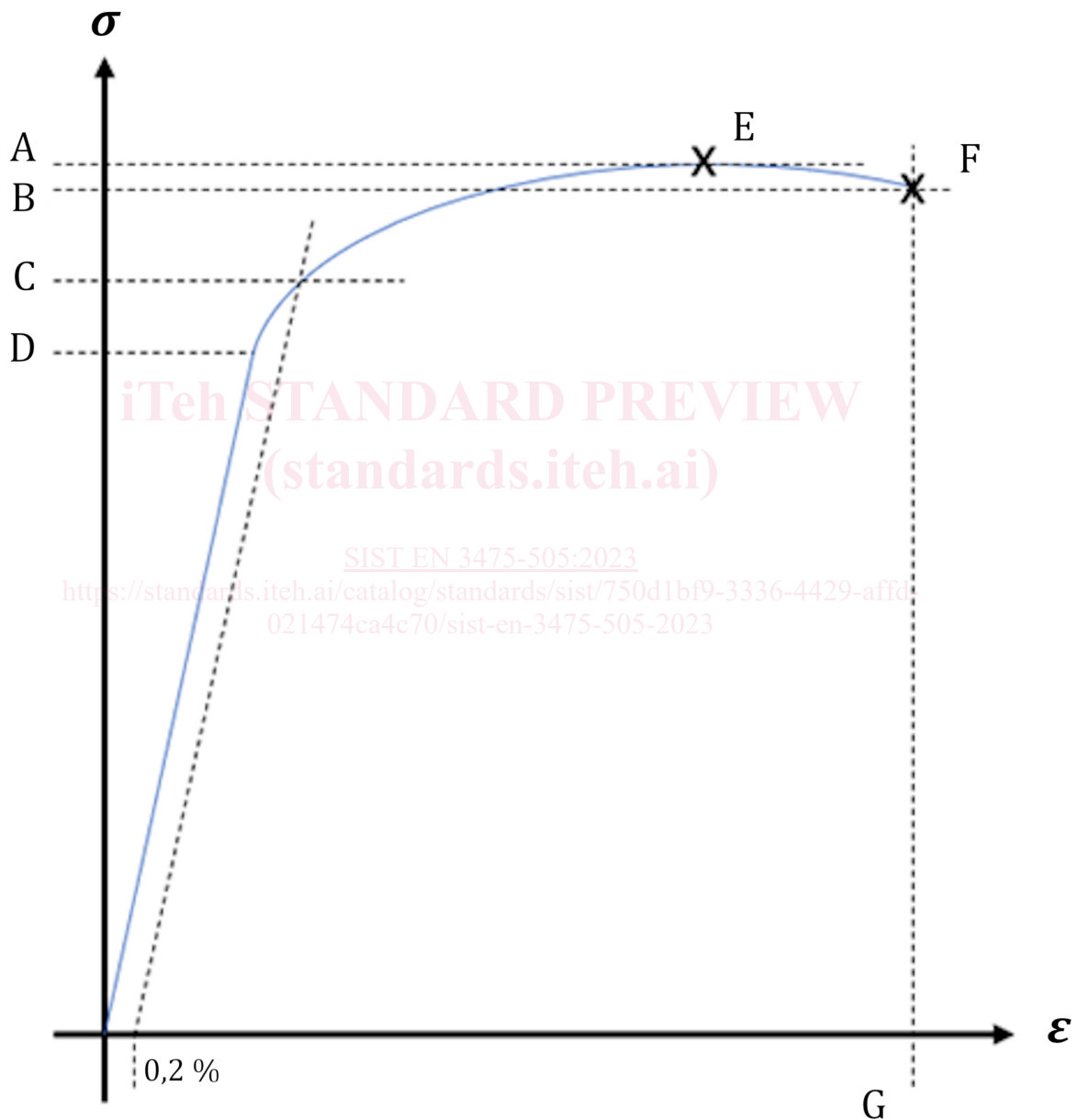
Note 1 to entry: it is the stress at which a material starts to exhibit a permanent deformation.

### 3.6 yield strength

stress at which a material exhibits a predefined permanent (plastic) deformation and is a practical approximation of elastic limit.

Yield strength is determined from a stress-strain diagram and is determined at the intersection of the stress-strain curve and a line parallel to its elastic portion offset by a specified strain.

Offset for metals is specified as 0,2 % ( $R_{p0,2}$  %)



#### Key

$\sigma$	Stress (force)	B	Breaking load	E	Max.
$\epsilon$	Strain (deformation)	C	Yield load	F	Fracture
A	Maximum load	D	Elastic limit	G	Elongation at break

Figure 1

**EN 3475-505:2023 (E)****4 Apparatus**

The test shall be carried out with the aid of a tensile tester capable of measuring the specified load and elongation with an accuracy of 1 %.

The pulling speed shall be  $(50 \pm 10)$  mm/min.

The initial length of the test specimen between the jaws shall be  $(250 \pm 5)$  mm.

All slack in the conductor must be removed before starting tensile strength and elongation measurement.

These samples shall be firmly gripped and pulled at a uniform speed as defined above.

The jaws or grips' weight shall not disrupt the measurement.

The jaws or grips shall be designed to produce a break in the middle of the test specimen. The fracture shall be between jaws, and not closer than 25 mm to either jaw.

**5 Method****5.1 Stranded conductor**

For cross-section  $\leq 9$  mm<sup>2</sup>, the whole stranded conductor shall be tested.

For cross-sections  $> 9$  mm<sup>2</sup>, measurement of elongation and tensile strength shall be applied on three strands of each stranding layer (inner, intermediate and outer) or group of strands.

Measure three samples per size.

Report the average value of the elongation, load and tensile strength.

The breaking load is measured at the first strand breaking.

For qualification only (Qualification shall be stated in the product standard when required):

Measure three strands per size, taken from the complete conductor.

Exception for:

- copper and copper alloy sizes 1 mm<sup>2</sup> and smaller;
- aluminium or copper clad aluminium sizes 5 mm<sup>2</sup> and smaller.

Where the whole conductor shall be tested.

Unless otherwise specified in the technical specification or product standard.

**5.2 Single strand or solid conductor**

Measure three samples per size.

Report the average value of the elongation, load and tensile strength.



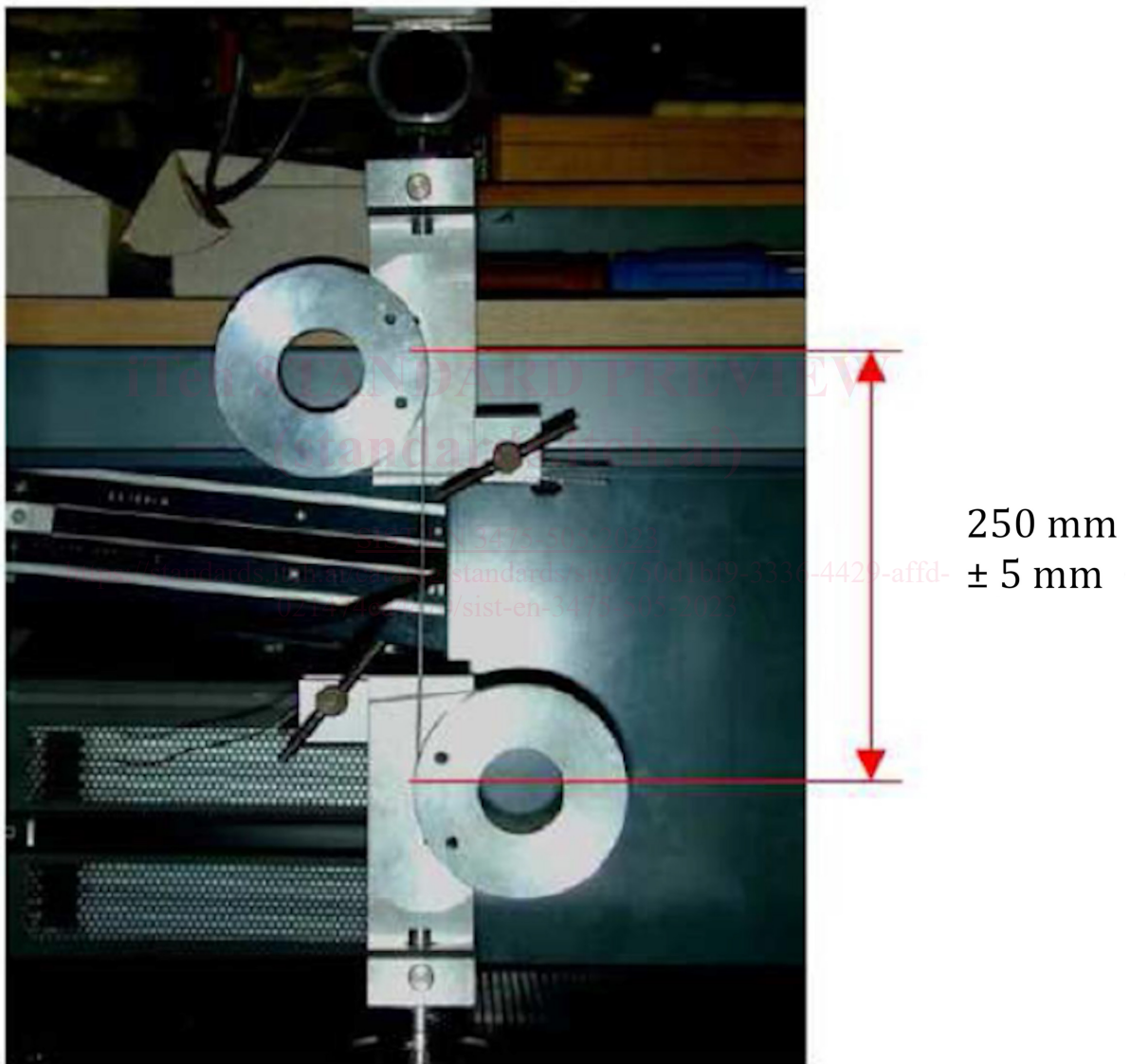
### 5.3 Braid

The whole braid shall be tested.

The cable jacket is carefully stripped on a length of 500 mm minimum without any damage to the shield(s) strands.

Then, the braid(s) is/are fully pulled off from three samples.

Each of these three samples is firmly gripped and pulled without jerking. A preload shall be applied onto the sample in order to tighten it before starting tensile strength and elongation measurement. The recommended test equipment is shown in Figure 2.



**Figure 2**

The applied tensile force shall be monitored and recorded.

Measure three samples per size.

Report the average value of the elongation, load and tensile strength.

The breaking load is measured at the first strand breaking.

EN 3475-505:2023 (E)

## 6 Requirements

The values for elongation at break (or total elongation or ultimate elongation), load, tensile strength and yield strength (when required) shall conform to those given in the product standard.

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