



**SLOVENSKI STANDARD**  
**SIST EN 2812:2019**

**01-september-2019**

**Nadomešča:**  
**SIST EN 2812:2009**

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**Aeronavtika - Odstranjevanje izolacije pri električnih kablilih**

Aerospace series - Stripping of electric cables

Luft- und Raumfahrt - Abisolieren von elektrischen Leitungen

Série aérospatiale - Dénudages des câbles électriques

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**Ta slovenski standard je istoveten z: EN 2812:2019**

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**ICS:**

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**SIST EN 2812:2019**

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EUROPEAN STANDARD

EN 2812

NORME EUROPÉENNE

EUROPÄISCHE NORM

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ICS 49.060

Supersedes EN 2812:2009

English Version

## Aerospace series - Stripping of electric cables

Série aérospatiale - Dénudages des câbles électriques

Luft- und Raumfahrt - Abisolieren von elektrischen  
Leitungen

This European Standard was approved by CEN on 8 January 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.

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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 2812:2019) 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.

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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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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**EN 2812:2019 (E)****1 Scope**

This document specifies the conditions for stripping and inspection of stripping tools and the stripped ends of electric cables for aerospace applications.

Various stripping processes exist. The choice of a process depends upon the properties of the particular cables to be stripped and/or on the specific requirements for the end product to be achieved.

The processes specified today in this document are:

- a) manual stripping;
- b) mechanical stripping;
- c) laser stripping;
- d) thermal stripping.

**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 2083, *Aerospace series — Copper or copper alloy conductors for electrical cables — Product standard*

EN 3475-701, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 701: Strippability and adherence of insulation to the conductor*

<https://standards.iteh.ai/catalog/standards/sist/2a8ed951-67ec-41e5-a007-800000000000/EN-2812-2019>

EN 3719, *Aerospace series — Aluminium or aluminium alloy conductors for electrical cables — Product standard*

EN 4434, *Aerospace series — Copper or copper alloy lightweight conductors for electrical cables — Product standard (Normal and tight tolerances)*

EN 4651, *Aerospace series — Copper-clad aluminium alloy conductors for electrical cables — Product standard*

**3 Terms and definitions**

For the purposes of this document, the following terms and definitions 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>

## 4 Stripping processes and associated tools

### 4.1 General recommendations

Precise definition of tools to use on a particular wire or cable standard is under the responsibility of the user.

It is particularly important to know from which ASD Product Norm conductors are coming (for examples: EN 2083, EN 3719, EN 4434, EN 4651) for the mechanical stripping process.

Availability of a common tool able to strip different gauges or cable sizes is recommended.

If tools are designed for particular applications, differentiation by colours is recommended.

Size and weight of tools has to be appropriate for the envisaged use.

When it is essential to control the length of insulation to be removed an adjustable abutment must be part of the tool.

### 4.2 Manual stripping

#### 4.2.1 Use

The use of this process must be strictly limited to insulations and jackets of the cables for which other methods are impractical. Nevertheless, with thermal stripping and the arrival of small laser machines, this manual practice must be progressively eliminated for aerospace use and stay permissible only for small batches.

#### 4.2.2 Application

Manual stripping by scalpel, razor blade or other cutting tool is carried out on cables over 5 mm<sup>2</sup> cross-section, sheaths of shielded cables, fire-resistant cables and coaxial cables, unless another stripping process is specified.

### 4.3 Mechanical stripping

#### 4.3.1 Use

This process is generally the most used in particular for single wires. Various power tools are also adapted to strip round cables, such as single wire screened jacketed and coaxial, and flat cables.

The simplicity of manual pliers makes these tools ideal for work in the field.

For illustration, see Annex B (informative).

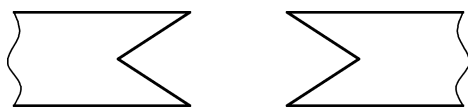
#### 4.3.2 Stripping with manual tools

The blades of tools can have different profiles and dimensions. Various assembly shapes are now available.

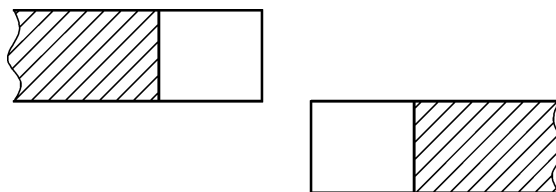
A blade can have several marked cavities of different sizes. When the tool is closed, the edges of the blades shall be in the same plane and form a cutting circumference whose diameter is greater than the maximum diameter of the conductor of the cable to be stripped. Blades must be replaced as pairs.

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The manual stripping tools with V shaped cutting blades or shearing type blades are forbidden (see Figure 1 and Figure 2).



**Figure 1 — V shaped cutting blades**



**Figure 2 — Shearing type blades**

### 4.3.3 Stripping with power tools

These tools use blades with the same general characteristics as those defined in 4.3.2.

Particular care is necessary during the use of rotating blades, and their depth shall be adjustable to adapt the cutting diameter to the need.

## 4.4 Laser stripping

### 4.4.1 Use

Laser wire stripping can be carried out on wires and cables of any gauge and on jackets. This process is particularly suitable for use in applications where damage of any sort to the conductor or the screen is unacceptable and when the external geometry of the cable to strip is incompatible with mechanical processes.

More specifically, laser wire stripping is recommended:

- 1) To process single core wires where the batch-to-batch variation in conductor diameter exceeds the tight cutting tolerances compatible with mechanical stripping tools
- 2) To process the jackets of multi-core shielded cables having a non-circular cross section
- 3) To provide operator-independent high stripping quality with a high level of repeatability.

For illustration, see Annex C (informative).

### 4.4.2 Application

Two technologies are currently available: Carbon Dioxide (CO<sub>2</sub>) laser technology and blue-violet semiconductor lasers technology. Other laser types may be applicable for certain applications.

Low power RF excited CO<sub>2</sub> laser and CW (continuous wave) laser types are recommended. In this context "low power" typically means < 30 Watts average power.

The system shall be designed to guarantee that the laser beam cannot cause damage to the plated metallic conductor or shield at any time.

Beam power and displacement speed shall be adjustable to be able to cut properly all various types of insulation and shapes.



## 4.5 Thermal stripping

### 4.5.1 Use

Thermal wire stripping can be carried out on wires and cables of any gauge and on jackets. This process is particularly suitable when the external geometry of the cable to strip is incompatible with mechanical process and when the size of tooling equipment investment must be limited. This process may not be suitable for all types of insulation or in particular environmental conditions such as where flammable vapours may be present.

For illustration, see Annex D (informative).

### 4.5.2 Application

Generally the tool is in two parts, a generator to control the required temperature and a hand unit.

The hand unit can be equipped with various shapes of blades.

## 5 Identification, inspection and calibration

### 5.1 Manual stripping tools

#### 5.1.1 Identification

An identification number marked on the main body is recommended in order to facilitate the follow-up of the inspection of the cutting blade.

#### 5.1.2 Inspection

The inspection of cutting area is carried out visually at regular intervals.

The inspection shall be completed by inspection of samples of stripped cable ends, see 6.3.1.

### 5.2 Mechanical stripping tools

#### 5.2.1 Identification

An identification number shall be permanently marked on the main body of the tool and on the blade.

In addition, each stripping tool shall have an individual inspection sheet including:

- its identification number;
- date of first commissioning;
- dates of successive inspections;
- dates of rectification or repair;
- numbers of associated blades.

#### 5.2.2 Inspection

The inspection of blades is carried out with the aid of measuring gauges, shadowgraph, calipers or other means permitting confirmation that the cavities are in accordance with the dimensions specified.

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The inspection shall be completed by checking the mechanical condition of the manual tool or power tool and by stripping tests, followed by inspection of samples of stripped cable ends, see 6.3.2.

For the routine inspection of production tools, the gauging of blades may be omitted, provided double stripping is used for the inspection of stripped cable ends.

Stripping tools shall be inspected at least every 90 days.

If a worn blade requires replacement, the complete blade assembly shall always be replaced together.

**5.2.3 Calibration**

Some particular tools, for coaxial cables for example, may require calibration to obtain the necessary diameter to strip.

**5.3 Laser stripping tools****5.3.1 Identification**

An identification number shall be permanently marked on the main body of the tool.

In addition, each tool shall have an individual inspection sheet including:

- its identification number;
- date of first commissioning;
- dates of successive inspections;
- dates of rectification or repair;
- numbers of associated parts.

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**5.3.2 Inspection**

The inspection shall be completed by checking the general behaviour of the laser tool accordingly to the laser tool manufacturer instructions and by stripping tests, followed by inspection of samples of stripped cable ends, see 6.3.3.

Laser tools shall be inspected at least every 90 days.

**5.3.3 Calibration**

Periodic system stripping parameter checks shall be made to ensure they remain within the limits as defined by the manufacturer's specification.

These checks can consist in the carrying out of a control sample according to the system manufacturer recommendations.

**5.4 Thermal stripping tools****5.4.1 Identification**

An identification number shall be permanently marked on the main body of the tool.

In addition, each stripping tool shall have an individual inspection sheet including:

- its identification number;
- date of first commissioning;
- dates of successive inspections;
- dates of rectification or repair;
- numbers of associated parts.

#### 5.4.2 Inspection

The inspection shall be completed by checking the general behaviour of the thermal tool according to the thermal tool manufacturer instructions and by stripping tests, followed by inspection of samples of stripped cable ends, see 6.3.4.

Thermal tools shall be inspected at least every 90 days.

#### 5.4.3 Calibration

Periodic calibration checks of the tool shall be made to ensure power levels, and consequently temperature at the tip of the respective blade remain within the limits as defined by the manufacturer's specification.

## 6 Qualification iTeh STANDARD PREVIEW (standards.iteh.ai)

### 6.1 General

Wires and cables must be strippable as normally defined in their technical specification or product standard. The test method generally used to assess this is EN 3475-701.

The stripping operation must remove the insulator from the conductor over a length defined with tolerances, to allow correct connection of cables, without:

- damaging the core strands or the insulator when stripping a single conductor wire;
- damaging the screen or the inner wire(s) when stripping a shielded cable or coaxial cable.

The stripping operation must not reduce the original performances of the wire or cable as defined in its technical specification.

The stripping length depends on the length required to connect the conductor into the end component.

Each process must be applied by trained operators.

For qualification to a wire and cable standard, there must be an agreement between the wire and cable manufacturer and the qualifying authority on exact tool reference to use. The exact reference of this tool must be written in the associated test report.

### 6.2 Method

Qualification of a dedicated tool to strip a wire or cable type will be performed by stripping of samples coming from at least two (2) different batches (ideally for manual stripping pliers used for single wires, batches shall have conductors not coming from the same conductor batch, and if possible one at the maximum conductor diameter and the other at the minimum).