SLOVENSKI STANDARD
SIST EN 4875:2020

01-marec-2020

Aeronavtika - Površinske prevleke - Preskusna metoda za merjenje električne kontaktne upornosti

Aerospace series - Surface treatments - Test method for measurement of electrical contact resistance

Luft- und Raumfahrt - Oberflächenbehandlungen - Prüfverfahren zur Messung von elektrischer Kontaktwiderstand

Série aérospatiale - Traitements de surface - Méthode de mesure de la résistance électrique de contact

Ta slovenski standard je istoveten z: **EN 4875:2020**

ICS:

25.220.99	Druge obdelave in prevleke	Other treatments and coatings
49.040	Prevleke in z njimi povezani postopki, ki se uporabljajo v letalski in vesoljski industriji	Coatings and related processes used in aerospace industry

SIST EN 4875:2020 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 4875

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ICS 25.220.99; 49.040

English Version

Aerospace series - Surface treatments - Test method for measurement of electrical contact resistance

Série aérospatiale - Traitements de surface - Méthode d'essai de mesure de la résistance électrique de contact

Luft- und Raumfahrt - Oberflächenbehandlungen - Prüfverfahren zur Messung von elektrischer Kontaktwiderstand

This European Standard was approved by CEN on 11 November 2019.

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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 4875:2020) 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 document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2020, and conflicting national standards shall be withdrawn at the latest by July 2020.

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1 Scope

This document describes the electrical contact resistance testing method applicable to conductive and non-conductive coatings applied on test specimens made of conductive materials (unless otherwise specified) for aerospace applications. An objective of this practice is to define and control many of the known variables in such a way that valid comparisons of the contact properties of materials can be made.

This test may be locally destructive depending on the process tested.

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 terminological databases for use in standardization at the following addresses:

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

3.1
contact resistance
resistance to current flow between two touching bodies, consisting of constriction resistance and film resistance

4 Principle

The principle of the method involves applying a known current I to the coating, measuring the voltage V, and calculating the resistance $R_{measured}$ according to Ohm's law:

$$R_{measured} = \frac{V}{I}$$

NOTE Inner resistance of electrodes and cables is negligible.

5 Apparatus

5.1 Electrical equipment

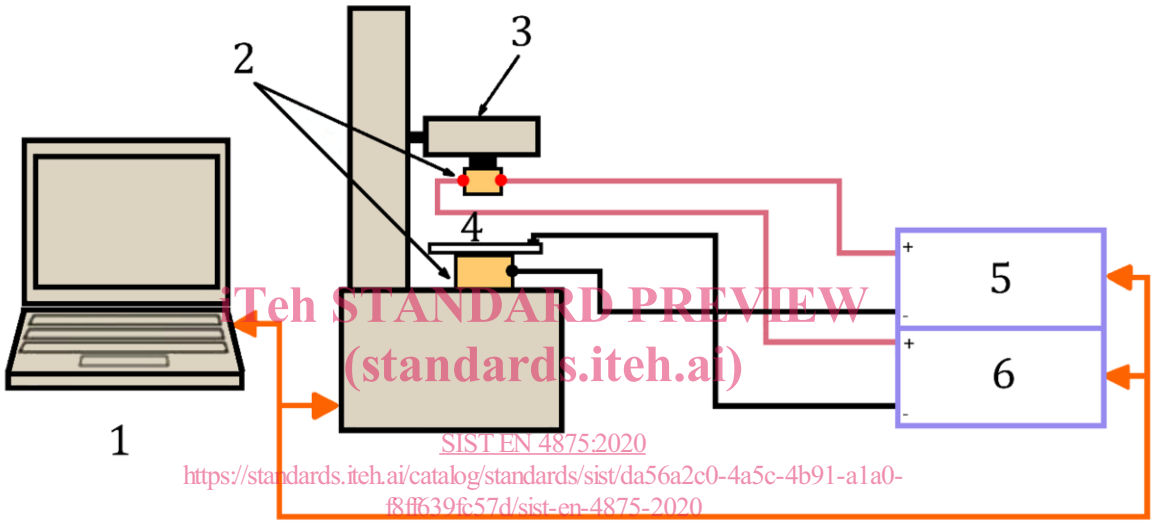
Ohmmeters or multimeters with the ohmic measuring range at least corresponding to the expected value shall be used. The instruments shall be controlled and calibrated regularly.

5.2 Electrode equipment

Test equipment and electrical circuit as shown on Figure 1 shall be used for measuring the electrical resistance of test specimens.

Table 1 — Data related to the assembly of electrodes according to Figure 1

Material:	Copper electrode or pure silver plated copper electrode.
Lower electrode diameter (*dl*): Upper electrode diameter (*du*):	> 30 mm 28,6 mm (without connecting radius)[a]
Pressure:	The reference value of pressure is specified in the process specification. The use of another value of pressure is authorized, but the results obtained with this value cannot be compared with those obtained with the reference value of pressure.
[a] shall be implemented on the measurement electrode to avoid any coating damage.	



Key

1 control computer
2 copper electrode or pure silver plated copper electrode
3 calibrated pressure meter
4 test specimen under test
5 DC power supply set to (1,0 ± 0,1) A
6 multimeter

NOTE Flat clips are recommended for electrical contact on test specimen to avoid any damage to the coating.

Figure 1 — Circuit diagram for contact resistance measurements

6 Test specimen

The recommended dimensions of the test specimens are 100 mm x 250 mm with a nominal thickness of not less than 1 mm. Other dimensions of test specimens can be used provided that at least 30 measurements are taken.

The 2 (two) faces of the test specimens shall be processed.

The surface roughness of the test specimen impacts the contact resistance result. Test specimens having rough surfaces will yield to lower resistance values when subjected to a contact electrode pressure due to coating fracture. This reasoning can also be applied to the contact electrode.

Before testing, the test specimens shall be cleaned with materials that remove soil without damaging the coating (e.g with isopropyl alcohol and soft cloth).

Test specimens shall be stored under clean and dry conditions.

7 Procedure

7.1 Measuring conditions

Measurements shall be performed after the coating is in a steady state according to the process specification (some process specifications may specify times between processing and testing). The ambient temperature and relative air humidity should be between 15 °C and 35 °C and less than 70 % respectively.

The measurement shall not be carried out at a distance less than 5 mm from the edges of the specimen.

The measurement shall be performed on an area free of drilling, marking, identification and scratches.

7.2 Electrodes

The contact electrodes shall be in copper or pure silver plated copper (use of pure silver plated copper electrode is recommended).

For copper electrode, the polishing shall be done as a minimum with a P1200 metallographic abrasive paper.

For pure silver plated copper electrode, the polishing shall be done cautiously.

In both cases, the electrodes shall exhibit a polish mirror surface.

The measurement of the roughness is mandatory when specified by the OEM/manufacturer.

Due to the risk of loss of the flatness of the surface/parallelism of plots due to the wear of the electrode during preparations/measurements, it is recommended to check the flatness of the surface/parallelism of plots using a calibrated thin film (50 µm max.) which allows to identify a deviation of measurement.

The electrodes shall be cleaned with materials that remove soil without damaging the plating (e.g with isopropyl alcohol). The electrodes shall be handled during all cleaning and subsequent operations so that mechanical damage or contamination is avoided.

The functioning of the assembly of electrodes is controlled by pressure on a reference specimen in gold or silver plated sheet, with an electrical surface resistance ≤ 0,05 mΩ. The deviation shall be checked at the beginning of each day of test and after 50 measurements.

When using an ohmmeter, a measured value of 0 Ω shall be indicated on the measuring apparatus. If necessary, the measuring apparatus is adjusted to 0, otherwise the indicated value should be deducted.

After having removed the assembly of electrodes from the surface, the ohmmeter should be adjusted to ∞.

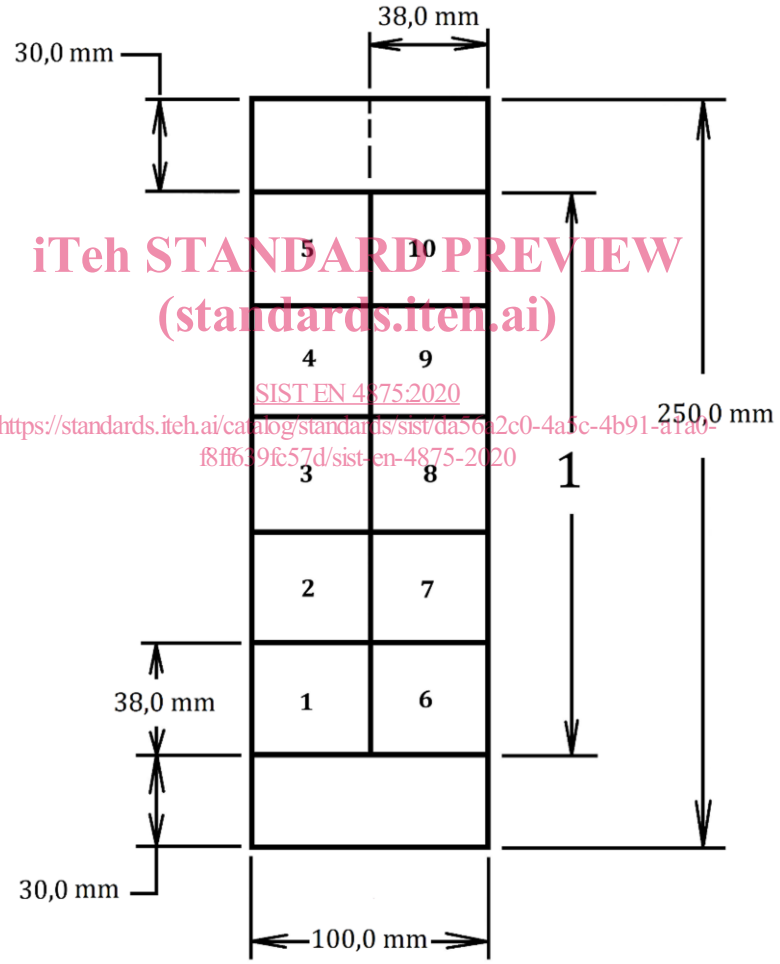
7.3 Measuring the electrical contact resistance on specimen

Arrangement of current and voltage connections to electrode and specimen shall be as mentioned in Figure 1.

The electrical contact resistance is measured after 10 s minimum of pressure application and with a test current of (1,0 ± 0,1) A.

The applied load shall be as described in Table 1. For specific applications, other requirements can be agreed between purchaser and supplier.

Unless otherwise specified in the process specification, the minimum number of specimens for electrical contact resistance testing is 3 (three) (corresponding to 30 measurements) before and 3 (three) others (corresponding to 30 measurements) after ageing. All test specimens have to be processed in the same batch. Each measurement area will be identified according to Figure 2.



Key

1 test areas

Figure 2 — Test areas identification for measurements of electrical contact resistance on test specimens