SLOVENSKI STANDARD
SIST EN 2349-001:2022

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Aeronavtika - Zahteve in preskusni postopki za stikalne naprave

Aerospace series - Requirements and test procedures for switching devices

Luft- und Raumfahrt - Anforderungen und Prüfverfahren für Schaltelemente

Série aérospatiale - Exigences et procédures d'essais des appareils de commutation

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

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Aerospace series - Requirements and test procedures for switching devices

Série aérospatiale - Exigences et procédures d'essais des appareils de commutation

Luft- und Raumfahrt - Anforderungen und Prüfverfahren für Schaltelemente

This European Standard was approved by CEN on 14 October 2018.

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

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European Foreword

This document (EN 2349-001:2022) 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of an identical text or by endorsement, at the latest by January 2023, and conflicting national standards shall be withdrawn at the latest by January 2023.

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1 Scope

This document specifies the requirements and test procedures of switching devices for use in aircraft electrical systems to EN 2282.

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 2242, *Aerospace series — Crimping of electric cables with conductors defined by EN 2083, EN 4434 and EN 2346*

EN 2282, *Aerospace series — Characteristics of aircraft electrical supplies*

EN 2591-303, *Aerospace series — Elements of electrical and optical connection — Test methods — Part 303: Cold/low pressure and damp heat*

EN 2591-315, *Aerospace series — Elements of electrical and optical connection — Test methods — Part 315: Fluid resistance*

EN 2591-409, *Aerospace series — Elements of electrical and optical connection — Test methods — Part 409: Contact retention in insert*

EN 2591-412, *Aerospace series — Elements of electrical and optical connection — Test methods — Part 412: Contact insertion and extraction forces*

EN 2591-415, *Aerospace series — Elements of electrical and optical connection — Test methods — Part 415: Test probe damage (female contacts)*

EN 2591-417, *Aerospace series — Elements of electrical and optical connection — Test methods — Part 417: Tensile strength (crimped connection)*

EN 2591-418, *Aerospace series — Elements of electrical and optical connection — Test methods — Part 418: Gauge insertion/extraction forces (female contacts)*

EN 3155-001, *Aerospace series — Electrical contacts used in elements of connection — Part 001: Technical specification*

EN 4232, *Aerospace series — Contactors — Terminal strength* [1)]

EN 9133, *Aerospace series — Quality Management Systems — Qualification Procedure for Aerospace Standard Products*

EN 60068-2-17, *Environmental testing — Part 2: Tests — Test Q: Sealing*

1) In preparation at the date of publication of this document.

ISO 2669, *Environmental tests for aircraft equipment — Steady-state acceleration* 2)

ISO 2678, *Environmental tests for aircraft equipment — Insulation resistance and high voltage tests for electrical equipment* 2)

ISO 7137:1987, *Aircraft — Environmental conditions and test procedures for airborne equipment* 2)

ISO 2859-1, *Sampling procedures for inspection by attributes — Part çi1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection* 2)

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
switching devices
relays with plug-socket holders and/or contactors

The switching devices are designed for the rated voltage specified. All test voltages are related to the rated voltage specified.

The switching devices are designed for the rated current specified, related to a resistive load.

3.2
data relating to currents and voltages
unless otherwise stated, all data on a.c. values are effective values

A no load circuit is any combination of loads up to 10 mA, 50 mV.

4 Characteristics

4.1 Construction

4.1.1 Metal parts

All metal parts used in the construction of switching components shall be resistant to or protected against corrosion. Dissimilar metals which are in direct contact shall be protected against electrochemical corrosion.

2) Published by: ISO International Organization for Standardization http://www.iso.ch/

4.1.2 Insulants

Insulants shall be of non-inflammable or self-extinguishing materials and shall not emit any noxious or explosive vapours which could cause an explosion.

In addition, the insulating materials shall be resistant to mould.

Insulating materials and protective coatings which may possibly break, crack or splinter shall not be used.

4.1.3 Leakage current paths

The leakage paths between live parts which are insulated from each other shall be such that no arcing or other damage arising from the application or from environmental conditions can occur.

4.1.4 Mounting

Mounting of the switching devices shall conform to the product standard.

4.2 Description

4.2.1 Function

The switching devices shall be designed for rated voltages to EN 2282.

They shall be designed in such a way that they will switch the contact loads described in the product standards without failure throughout their service life.

The environmental conditions required shall in no way lead to impairment or reduction of the performance of the switching device.

The product standards shall state that switching devices with changeover contacts are suitable for changing over the loads of unrelated a.c. circuits.

4.2.2 Electrical connections

4.2.2.1 Relays and contactors

The construction, form and surface characteristics of the contact pins shall comply with the requirements of the product standard.

4.2.2.2 Plug-socket holders

The construction, form and function of the socket shall comply with the requirements of the product standard.

The plug-socket holder shall be provided with a suitable holding device to ensure fit and retention of the socket contact. The socket contact shall be designed so that the electric wiring specified in the product standards can be connected.

The contact connections of relays and plug-socket holders shall comply with the electrical and mechanical requirements of the product standards.

4.2.2.3 Earth connections

Mounting of the switching devices shall provide a perfect physical connection with the housing of the switching device.

4.2.2.4 Type designation

See product standard.

5 Requirements and test procedures

5.1 General requirements

The switching device shall meet the requirements of the product standard.

Relays with plug-socket holders shall be regarded as a unit.

5.1.1 Normal environmental conditions for tests

Ambient temperature: (23 ± 5) °C (unless otherwise specified):

- Pressure: 84 kPa to 106 kPa;
- Relative humidity: 45 % to 75 %.

5.1.2 Electric wiring

5.1.2.1 Relays with plug-socket holders

For qualification testing the wiring specified in the product standards shall be used.

5.1.2.2 Contactors

For qualification testing, wiring suitable for the contact loads specified shall be used.

5.1.3 Sockets

Sockets contacts shall be in accordance with EN 3155-001.

5.2 Functional characteristics

5.2.1 Visual inspection

Visual inspection shall be carried out to ensure that the materials, construction, make-up, marking and finishing comply with the specifications. The visual inspection shall be carried out with the naked eye only.

5.2.2 Dimensions

Tests shall be carried out to ensure that dimensions and weight conform to the requirements of the product standard.

5.2.3 Strength of connections

5.2.3.1 Relays with plug-socket holder

Contact pins

Test procedure

The contact pins shall be tested with a force in compliance with the product standard in the axial direction related to the connector pin, for a period of 15 s to 30 s.

Test criteria

No sign of loosening, breakage of the pins, crack formation or splitting of the insulating material nor any other damage shall be visible which would impair the function of the relay within the limit values prescribed.

Verification test: A (see Table 6).

5.2.3.2 Retention of socket in insert

Test procedure

The test shall be carried out in accordance with EN 2591-409.

For preloads see Table 1.

Table 1

Socket size	Preload N ± 0,5	Test load N ± 0,5
20	13,5	90
16		110
12		135

Test criteria

The change in position of the socket during and/or after the application of the force shall not be greater than 0,3 mm. There shall be no visible sign of damage.

5.2.3.3 Strength of attachment bolts

Test procedure

The relay and plug-socket holder shall be attached to the mounting plate at the torque specified in the product standard.

Test criteria

The plug-socket holder shall withstand one and a half time the torque value specified in the product standard.

There shall be no damage to the plug-socket holder or the relay.

5.2.3.4 Contact insertion and extraction forces

Test procedure

The test shall be carried out in accordance with EN 2591-412.

For insertion and extraction tools see product standard.

See Table 2.

Table 2

Socket size AWG [a]	Wire size AWG [a]	Insertion force N max.	Extraction force N max.
20	16	66	45
16			
12	12		

[a] AWG: Closest American Wire Gauge.

Test criteria

The values shown in Table 2 shall not be exceeded.

5.2.3.5 Contact flexibility and resistance to elongation

Test procedure

The test shall be carried out in accordance with EN 2591-415.

See Table 3.

Table 3

Socket size AWG [a]	Insertion force N max.	Extraction force N max.	Test pin diameter mm ± 0,01	Bending moment N·cm
20	5,1	0,20	1,02	5,7
16	8,5	0,60	1,59	5,7
12	8,5	0,85	2,39	22,7

[a] AWG: Closest American Wire Gauge.

Test criteria

Verification tests shall be carried out in accordance with EN 2591-418.

5.2.3.6 Crimping of socket

Test procedure

The connecting wires shall be crimped on the sockets using a tool as specified in the product standard.

The test shall be carried out in accordance with EN 2591-417.

Test criteria

The test for tensile strength shall be carried out in accordance with EN 2242.

5.2.3.7 Contactor

Test procedure

The test shall be carried out to EN 4232.

Tightening torque: see product standard.

Test criteria

The contact bolts shall not loosen and the lead-through shall not be damaged.

5.3 Mechanical tests

For bistable switching devices the coil voltage shall be switched off after selection.

For test conditions, see product standard.

Half the tests shall be carried out in each of the switching positions.

5.3.1 Vibration, sinusoidal

Mounting method

Mounting of the switching device on the vibrator table shall be rigid, so that the vibrations produced can be transmitted directly to the test sample without absorption or resonance.

The electrical connections shall be wired in accordance with 5.1. The wires shall be secured to the vibrator as close as possible to the point of electrical connection.

Test procedure

The switching device shall be subjected to a vibration test to ISO 7137.

For test conditions, see product standard.

Test criteria

The torque for the connections and attachments shall not be less than 80 % of the rated value.

No opening of closed contacts for longer than 10 μs.

No closing of open contacts for longer than 1 μs.

Verification tests: B, C, D, F, G, J and K (see Table 6).

5.3.2 Vibration, non-sinusoidal

Mounting method

Mounting of the switching device on the vibrator table shall be rigid so that the vibrations produced are transmitted directly to the test sample without absorption or resonance.

The electrical connections shall be wired in accordance with 5.1. The wires shall be secured to the vibrator as close as possible to the point of electrical connection.

Test procedure

The switching device shall be subjected to a vibration test to ISO 7137.

For test conditions, see product standard.

Test criteria

The torque for the connections and attachments shall not be less than 80 % of the rated value.

No opening of closed contacts for longer than 10 μs.

No closing of open contacts for longer than 1 μs.

Verification tests: B, C, D, F, G, J and K (see Table 6).