SLOVENSKI STANDARD
SIST EN 4838-001:2018

01-november-2018

Aeronavtika - Obločni dušilni odklopniki, enopolni, temperaturno kompenzirani, nazivni tok od 3 A do 25 A - 115 V a.c. 400 Hz konstantna frekvenca - 001. del: Tehnična specifikacija

Aerospace series - Arc Fault Circuit breakers, single-pole, temperature compensated, rated current 3 A to 25 A - 115 V a.c. 400 Hz Constant Frequency - Part 001: Technical specification

Luft- und Raumfahrt - Arc Fault Schutzschalter, einpolig, Temperaturkompensiert, Nennströme von 3 A bis 25 A - 115 V a.c. 400Hz Konstantfrequenz - Teil 001: Technische Lieferbedingungen

Série aérospatiale - Disjoncteurs unipolaires à détection d'arc compensés en température, intensités nominales 3 A à 25 A - 115 V a.c. 400 Hz fréquence fixe - Partie 001: Spécification technique

Ta slovenski standard je istoveten z: **EN 4838-001:2018**

ICS:

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

SIST EN 4838-001:2018 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 4838-001

August 2018

ICS 49.060

English Version

Aerospace series - Arc Fault Circuit breakers, single-pole, temperature compensated, rated current 3 A to 25 A - 115 V a.c. 400 Hz Constant Frequency - Part 001: Technical specification

Série aérospatiale - Disjoncteurs unipolaires à détection d'arc compensés en température, intensités nominales 3 A à 25 A - 115 V a.c. 400 Hz fréquence fixe - Partie 001: Spécification technique

Luft- und Raumfahrt - Arc Fault Schutzschalter, einpolig, Temperaturkompensiert, Nennströme von 3 A bis 25 A - 115 V a.c. 400Hz Konstantfrequenz - Teil 001: Technische Lieferbedingungen

This European Standard was approved by CEN on 27 November 2017.

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

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword 3
1 Scope 4
2 Normative references 4
3 Terms and definitions 5
4 Description 5
5 Design 5
6 Characteristics 7
7 Tests 8
8 Qualification tests 16
9 Quality assurance 20
10 Marking 20
11 Delivery conditions 20
12 Packaging 20
13 Storage 20

European foreword

This document (EN 4838-001:2018) 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 February 2019, and conflicting national standards shall be withdrawn at the latest by February 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.

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

1 Scope

This European Standard specifies the single-pole temperature compensated arc fault circuit breakers with or without signal contacts, rated from 3 A to 25 A and used in aircraft on-board circuits. In any operating state a "trip-free" tripping is ensured. These items are designed to protect aircraft wiring system from circuit overload and arc faults. It describes specific environmental, electrical and mechanical characteristics and the stringency of tests to be applied according to test methods of EN 3841-100.

If the design of the arc fault circuit breakers contains software or complex hardware, as a minimum, the software and hardware shall be developed in accordance with EUROCAE ED-12B or C / RTCA DO-178B or C, DAL C and EUROCAE ED-80 / RTCA DO-254, DAL C, respectively.

These arc fault circuit breakers are intended for use in aircraft with electrical supplies in accordance with 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 2083, *Aerospace series — Copper and copper alloys conductors for electrical cables — Product standard*

EN 2266-003, *Aerospace series — Cables, electrical, for general purpose — Operating temperatures between – 55 °C and 200 °C — Part 003: Ink jet printable — Product standard*

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

EN 2825, *Aerospace series — Burning behaviour of non metallic materials under the influence of radiating heat and flames — Determination of smoke density*

EN 2826, *Aerospace series — Burning behaviour of non metallic materials under the influence of radiating heat and flames — Determination of gas components in the smoke*

EN 3841-100 (all parts), *Aerospace series — Circuit breakers — Test methods — Part 100: General*

EN 3844-1, *Aerospace series — Flammability of non metallic materials — Part 1: Small burner test, vertical — Determination of the vertical flame propagation*

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

MIL-I-81969/1-02, *Installing and removal tools, connector electrical contact, Type III, Class 2, composition C* [1)]

MIL-I-81969/14-11, *Installing and removal tools, connector electrical contact, Type III, Class 2, composition B* [1)]

EUROCAE ED-14E / RTCA DO-160E, *Environmental conditions and test procedures for airborne equipment* [2)]

EUROCAE ED-12B or C / RTCA DO-178B or C, *Software Consideration in Airborne Systems and Equipment Certification* [2)]

---

1) Published by: DoD National (US) Mil. Department of Defense http://www.defenselink.mil/

2) Published by: EUROCAE Regional (EU) EURopean Organisation for Civil Aviation Equipment http://www.eurocae.org/

EUROCAE ED-80 / RTCA DO-254, *Design Assurance Guidance for Electronic Hardware* 2)

AS 5692, *Aerospace Standard Arc Fault Circuit Breaker (AFCB) Aircraft, Trip-Free, Single Phase 115 V a.c.-400Hz — Constant Frequency* 3)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 3841-100 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 Description

These arc fault circuit breakers are operated by a "push-pull" type single pushbutton (actuator). In case of thermal overload or arc fault, electrical contacts must open. In both cases tripping time is related according to the type of default. In any operating state a "trip-free" tripping is ensured.

5 Design

5.1 Materials

5.1.1 Metallic materials

All metallic parts shall be resistant to corrosion or finished against corrosion. When dissimilar materials are in close contact, an adequate protection against corrosion shall be used so that the electromotive force of the galvanic couple does not exceed 0,25 V.

When bimetals are used, an eventual corrosion shall not affect the good operation of the circuit breaker.

5.1.2 Insulation materials

The insulating parts shall be made of auto-extinguishing or non-flammable materials; they shall not emit damaging or explosive vapours, even in presence of fire or internal electric arc.

They shall be insensitive to moulds and micro-organisms action.

Application of any material or protective coating, which might crack, break or flake shall be forbidden.

Materials which are not specified or which are not specially described shall be as light as possible for the requested use.

Materials shall be selected according to security criteria (toxicity, smoke density) as defined in contractual documents.

3) Published by: SAE National (US) Society of Automotive Engineers http://www.sae.org/

5.2 Design

5.2.1 Insulating box

The insulating box shall integrate besides the mechanism, the connection and attachment unit.

5.2.2 Free release mechanism

Design of circuit breaker mechanism shall allow free release; i.e. the circuit breaker cuts out in case of overload, and remains cut out even if the actuator is kept by force in engaged position.

A new engagement of circuit breaker is only possible after a first total release of the control actuator.

The operation in these conditions shall not affect further performances of the circuit breaker.

5.2.3 Attachment

All visible parts shall be black coloured and non-reflective.

5.2.4 Electrical connection units

They shall be able to receive the lugs (or contacts).

5.2.5 Control actuator

In engaged position, the visible part of the control actuator shall be of the colour stated in the product standard. In disengaged (or opened) position, the control actuator shall show a white strip.

The outer part of this actuator shall be isolated from all energized parts.

The control actuator shall not stay in a transition position, or give a false indication about the circuit breaker condition. It shall not be removable.

When pushing it, power contacts of the circuit breaker engage and indicating contact opens.

When pulling it, power contacts of the circuit breaker open and indicating contact closes.

The circuit breaker rating is indicated in indelible white colour on the front part of the control actuator.

The product standard gives the digits positioning.

5.2.6 Rating inviolability

The circuit breaker shall be designed in such a way that the calibration unit cannot be reached without breaking a sealing.

5.2.7 Clearances and creepage distances

The clearances, creepage distances and the minimal space to be foreseen between the energized parts and any other part of the circuit breaker made of conductive material, as well as between the energized parts of opposite polarity, shall be sufficient to avoid any default or arcing in all uses and climatic conditions.

5.2.8 Protection against non-release

Electrical overload happening on a circuit breaker locked in its engaged position (sticked contacts or non-operating release mechanism), shall cause the opening of the circuit by circuit breaker destruction without any fire or important smoke release.

5.2.9 Safety and reliability

The arc fault protection must never inhibit the thermal overload protection.

6 Characteristics

6.1 General characteristics

See Table 1.

Table 1 — General characteristics

Designation	Requirements
Assembly	See product standard.
Mass	See product standard.
Operational altitude	See product standard.
Power contact connection	See product standard.
1 input terminal on power supply side (identified by digit 1)	
1 output terminal on distribution side (identified by digit 2)	
Operational ambient temperatures limits for thermal protection	From – 55 °C to 125 °C
Temperature compensation for thermal protection	From – 55 °C to 125 °C See product standard.
Rating marking	On control actuator (indelible white)
Arc fault protection: Operational ambient temperatures limits	From – 40 °C to 85 °C [a]
[a] The MTBF of the electronics (the arc fault protection) can be reduced by an excursion of the temperature inside the ranges [– 55 °C, – 40 °C] and [85 °C, 125 °C]. Nevertheless no nuisance tripping can occur inside these ranges.	

6.2 Ratings

See product standard.

6.3 Nominal voltage of operational circuits

See product standard.

6.4 Dimensional characteristics

See product standard.

6.5 Recommended panel mounting

See product standard.

7 Tests

7.1 Mechanical tests

See Table 2.

Table 2 — Mechanical tests

Tests				Requirements	
Visual check				EN 3841-201	
Operational force		Closing force (push)		EN 3841-502	3,5 N to 45 N
		Opening force (pull)			5 N to 30 N
Mechanical strength	Actuator	Travel		EN 3841-501 For value, see product standard.	
		Transverse load		EN 3841-503	≥ 110 N
		Longitudinal load	Push		≥ 110 N
			Pull		≥ 110 N
	Attachment nut	Tightening torque		EN 3841-504	≥ 5 N.m
		Rotation torque			≥ 3 N.m
	Main contact connection	Screw tightening torque		EN 3841-505	≥ 2 N.m
		Tensile force as per F_1 (see Figure 1 in product standard)			≥ 110 N
		Pressure force as per F_2 (see Figure 1 in product standard).			≥ 55 N
	Signal contact connection (size 20)	See product standard			
		Insertion force Insertion possible without tools		See EN 3841-509	≤ 6N
		Extraction force			≤ 15 N
		Contact retention force (pre-load 13,5 N)		See EN 3841-510	≥ 67 N shift ≤ 0,3 mm
		Radial load		See EN 3841-510	≥ 30 N
		Recommended tools: plastic: MIL-I-81969/14-11 metallic: MIL-I-81969/1-02		See MIL-I-81969/1A and MIL-I-81969/14C	

7.2 Environmental tests

See Table 3.

Table 3 — Environmental conditions *(1 of 2)*

Tests		Requirements	
Combined tests Ambient temperature 70 °C and vibrations (see Notes).	Sinusoidal (see Figure 1). Duration: – circuit breaker in the "closed" position; - 0,9 I_n load - Seven cycles/axis - 1 octave/min; - no load - Two cycles/axis - 1 octave/min. – circuit breaker in the "opened" position; - Two cycles/axis - 1 octave/min.	See EN 3841-506.	5 Hz to 80 Hz - Constant amplitude 2 a = 0,76 mm
			80 Hz to 500 Hz - Constant acceleration = 10 g-PK
			500 Hz to 2 000 Hz - Constant acceleration = 5 g-PK
	Random (see Figure 2). Duration: – circuit breaker in the "closed" position; - 0,9 I_n load - 15 min/axis; - no load - 15 min/axis. – circuit breaker in the "opened" position; - 15 min/axis.		10 Hz to 2 000 Hz - Constant acceleration = 5,82 Grms
	Low frequencies (see Figure 3). Applicability: see product standard. Duration: – circuit breaker in the "closed" position; - 0,9 I_n load - Two cycles/axis; - no load - Two cycles/axis. – circuit breaker in the "opened" position; - Two cycles/axis.		10 Hz to 27 Hz to 10 Hz - Constant acceleration = 10 g-PK
Combined tests Ambient temperature 85 °C, cabin max. altitude 4 600 m and vibrations (see Notes).	Sinusoidal - Applicability: see product standard. Duration: – circuit breaker in the "closed" position; - 0,9 I_n load - Four cycles/axis - 1 octave/min; - no load - Two cycles/axis - 1 octave/min. – circuit breaker in the "opened" position; - Two cycles/axis - 1 octave/min.	See EN 3841-511.	5 Hz to 54 Hz - Constant shift 2 a = 0,5 mm
			54 Hz to 2 000 Hz - Constant acceleration = 3 g-PK