SLOVENSKI STANDARD
SIST EN 2995-001:2009

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Aeronavtika - Odklopniki, enopolni, temperaturno kompenzirani, nazivni tok od 1 A do 25 A - 001. del: Tehniļna specifikacija

Aerospace series - Circuit breakers, single-pole, temperature compensated, rated current 1 A to 25 A - Part 001: Technical specification

Luft- und Raumfahrt - Schutzschalter, einpolig, temperaturkompensiert, Nennströme von 1 A bis 25 A - Teil 001: Technische Lieferbedingungen

Série aérospatiale - Disjoncteurs unipolaires compensés en température, intensités nominales 1 A à 25 A - Partie 001 : Spécification technique

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

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This European Standard (EN 2995-001:2006) 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of an identical text or by endorsement, at the latest by Februray 2007, and conflicting national standards shall be withdrawn at the latest by Februray 2007.

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1 Scope

This standard specifies the single-pole temperature compensated circuit breakers with signal contacts, polarized or not, rated from 1 A to 25 A and used in aircraft on-board circuits. It describes specific environmental, electrical and mechanical characteristics and the stringency of tests to be applied according to test methods of EN 3841-100.

These circuit breakers are intended for use in aircraft with electrical supplies in accordance with EN 2282 (all categories).

2 Normative references

The following referenced documents are indispensable for the application 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 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.* 1)

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.* 1)

EN 3841-100*, *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.* 1)

EN 9133, *Aerospace series – Quality management systems – Qualification Procedure for Aerospace Standards Parts.*

TR 6083, *Aerospace series – Cut-outs for installation of electrical components.* 2)

MIL-I-81969/1A, *Installing and removal tools, connector electrical contact, type III, class 2, composition C.* 3)

MIL-I-81969/14C, *Installing and removal tools, connector electrical contact, type III, class 2, composition B.* 3)

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in EN 3841-100 apply.

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* And all its parts quoted.

1) Published as AECMA Prestandard at the date of publication of this standard.

2) Published as AECMA Technical Report at the date of publication of this standard.

3) Published by: Department of Defense (DOD), the Pentagon, Washington D.C. 20301 USA.

4 Description

These circuit breakers are operated by a "push-pull" type single push button (actuator) and with delayed action "trip-free" tripping. Their function is assured up to the short-circuit current.

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.

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 undervoltage 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 Leakage lines

The leakage lines and the minimal space to be foreseen between the undervoltage parts and any other part of the circuit breaker made of non-insulating material, as well as between the undervoltage parts of opposite polarity, shall be sufficient to avoid any default or arc tracking 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.

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)	
Signal contact connection, circuit closed when circuit breaker is on release	Crimp contacts size 20 See product standard.
Operational ambient temperatures limits	From – 55 °C to 125 °C
Temperature compensation	From – 55 °C to 125 °C See product standard.
Rating marking	On control actuator (indelible white)

6.2 Ratings

See product standard.

6.3 Nominal voltage of main contacts

See product standard.

6.4 Signal contact performances

See Table 2.

Table 2 — Signal contact performances

Signal contact	Type of load	28 V d.c.	5 V d.c.	5 V a.c. [a]	28 V d.c.
	Resistive	≤ 0,5 A	≥ 3 mA	Not used	≥ 3 mA
	Lamp	≤ 0,2 A	Not used	0,23 A	Not used
[a] Applicable on version without diode only.					

NOTE 1 The circuit breaker status signalling function, open or closed shall be guaranteed after all the tests described in this specification.

NOTE 2 In order to avoid any deterioration of the signalization circuit (contact and diode), the reception electrical test could be performed without exceeding the value recommended of 60 mW max. at 28 V d.c. max. (resistive load).

6.5 Dimensional characteristics

See product standard.

6.6 Recommended panel mounting dimensions

Panel cut-out : The panel cut-out is in accordance with the designation TR6083C202.

Spacing : 20 mm horizontal and 40 mm vertical from the centres of the mounting holes.

Panel thickness : 1 mm to 3 mm.

7 Tests

7.1 Mechanical tests

See Table 3.

Table 3 — Mechanical tests

Tests				Requirements	
Visual check				See EN 3841-201.	
Operational force		Closing force (push)		See EN 3841-502.	3,5 N to 45 N
		Opening force (pull)			5 N to 30 N
Mechanical strength	Actuator	Travel		See EN 3841-501. For value, see product standard.	
		Transverse load		See EN 3841-503.	≥ 110 N
		Longitudinal load	Push		≥ 110 N
			Pull		≥ 110 N
	Attachment nut	Tightening torque		See EN 3841-504.	≥ 5 N.m
		Rotation torque			≥ 3 N.m
	Main contact connection	Screw tightening torque		See 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.	≤ 6 N
		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 4.

Table 4 — Environmental conditions

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_n
			500 Hz to 2 000 Hz - Constant acceleration = 5 g_n
	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 = 5,8 g_n
	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_n
			10 Hz to 5 Hz - Constant acceleration = 3,5 g_n
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_n
Mechanical shocks (see notes)		50 g_n - 11 ms - half sine wave. See EN 3841-507.	
Constant accelerations		See product standard.	
Sand and dust		See product standard.	

continued