
Aeronavtika - Odklopniki, tripolni, temperaturno kompenzirani, za naznačene tokove od 20 A do 50 A - 001. del: Tehnična specifikacija

Aerospace series - Circuit breakers, three-pole, temperature compensated, rated currents 20 A to 50 A - Part 001: Technical specification

Luft- und Raumfahrt - Schutzschalter, dreipolig, temperaturkompensiert, Nennströme von 20 A bis 50 A - Teil 001: Technische Lieferbedingungen

Série aérospatiale - Disjoncteurs tripolaires compensés en température, intensités nominales 20 A à 50 A - Partie 001 : Spécification technique

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A - Teil 001: Technische Lieferbedingungen

This European Standard was approved by CEN on 23 July 2023.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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European foreword

This document (EN 2665-001:2023) 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 document has received the approval of the National Associations and the Official Services of the member countries of ASD-STAN, 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of an identical text or by endorsement, at the latest by May 2024, and conflicting national standards shall be withdrawn at the latest by May 2024.

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.

This document supersedes EN 2665-001:2013.

The main changes with respect to the previous edition are as follows:

prEN 2665-001 (P2), 02/2012 — Editorial revision of this document: g_n replaced by g -PK for sinusoidal and low frequencies, g_n replaced by Grms for random.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this document: 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, Türkiye and the United Kingdom.

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EN 2665-001:2023 (E)**1 Scope**

This document specifies the three-pole temperature compensated circuit breakers without signal contacts, rated from 20 A to 50 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.

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 2282,¹ *Aerospace series — Characteristics of aircraft electrical supplies*

EN 2665-004, *Aerospace series — Circuit breakers, three-pole, temperature compensated, rated current 20 A to 50 A — Part 004: UNC thread terminals — Product standard*

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-*, *Aerospace series — Circuit breakers — Test Methods*

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

TR 6083,² *Aerospace series — Cut-outs for installation of electrical components*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

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

¹ Published as ASD-STAN Standard at the date of publication of this document by AeroSpace and Defence industries Association of Europe — Standardization (ASD-STAN), <https://www.asd-stan.org/>.

* All parts quoted in this document.

² Published as ASD-STAN Technical Report at the date of publication of this document. <http://www.asd-stan.org/>.

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 ensured 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 microorganisms action.

Application of any material or protective coating, which might crack, break on 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

[https://](https://standards.iteh.ai/)The insulating box shall integrate besides the mechanism, the connection and attachment unit. <https://standards.iteh.ai/>

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.

EN 2665-001:2023 (E)**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 under voltage 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.

When pulling it, power contacts of the circuit breaker open.

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 under-voltage parts and any other part of the circuit breaker made of non-insulating material, as well as between the under-voltage 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.

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.
Three input terminals on power supply side (identified by digit A1, B1, C1)	See product standard.
Three output terminals on distribution side (identified by digit A2, B2, C2)	
Operational ambient temperatures limits	From -55 °C to 90 °C
Temperature compensation	From -55 °C to 90 °C See product standard.
Rating marking	On control actuator (indelible white)

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 dimensions

Panel cut-out: The panel cut-out is in accordance with the designation TR 6083 C202 (for EN 2665-004).

Spacing: 60 mm horizontal and 45 mm vertical from the centre of the mounting holes.

Panel thickness: 1 mm to 3 mm.

7 Tests

7.1 Mechanical tests

See Table 2.

Table 2 — Mechanical characteristics

Tests				Requirements	
Visual check				EN 3841-201	
Operational force		Closing force (push)		EN 3841-502	8 N to 80 N
		Opening force (pull)			5 N to 45 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	≥ 5,5 N.m
		Rotation torque			≥ 3 N.m
	Main contact connection	Screw tightening torque		EN 3841-505	≥ 2,5 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			

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7.2 Environmental tests

See Table 3.

Table 3 — Environmental conditions (1 of 2)

Tests		Requirements	
Combined tests Ambient temperature 70 °C and vibrations ^a	Sinusoidal (see Figure 1). Duration: – circuit breaker in the “closed” position: – 0,9 I_n load – 7 cycles/axis – 1 octave/min., – no load – 2 cycles/axis – 1 octave/min.; – circuit breaker in the “opened” position: – 2 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 – Overall acceleration = 5,8 Grms
Low frequencies (see Figure 3). Applicability: see product standard. Duration: – circuit breaker in the “closed” position: – 0,9 I_n load – 2 cycles/axis, – no load – 2 cycles/axis; – circuit breaker in the “opened” position: – 2 cycles/axis.		10 Hz to 27 Hz to 10 Hz – Constant acceleration = 10 g- PK	
		10 Hz to 5 Hz – Constant acceleration = 3,5 g- PK	
Combined tests Ambient temperature 85 °C, cabin max. altitude 4 600 m and vibrations ^a	Sinusoidal – Applicability: see product standard. Duration: – circuit breaker in the “closed” position: – 0,9 I_n load – 4 cycles/axis – 1 octave/min, – no load – 2 cycles/axis – 1 octave/min; – circuit breaker in the “opened” position: – 2 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