



# SLOVENSKI STANDARD SIST EN 2996-001:2024

01-januar-2024

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**Aeronavtika - Odklopniki, tripolni, temperaturno kompenzirani, nazivni toki od 1 A do 25 A - 001. del: Tehnična specifikacija**

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

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

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

**Ta slovenski standard je istoveten z: EN 2996-001:2023**

SIST EN 2996-001:2024

**ICS:**

29.120.50	Varovalke in druga nadtokovna zaščita	Fuses and other overcurrent protection devices
49.060	Letalska in vesoljska električna oprema in sistemi	Aerospace electric equipment and systems

**SIST EN 2996-001:2024**

**en,fr,de**



EUROPEAN STANDARD

EN 2996-001

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2023

ICS 49.060

Supersedes EN 2996-001:2006

English Version

## Aerospace series - Circuit breakers, three-pole, temperature compensated, rated currents 1 A to 25 A - Part 001: Technical specification

Série aérospatiale - Disjoncteurs tripolaires compensés  
en température, intensités nominales 1 A à 25 A -  
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This European Standard was approved by CEN on 23 July 2023.

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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 2996-001:2023) 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of an identical text or by endorsement, at the latest by May 2024, and conflicting national standards shall be withdrawn at the latest by May 2024.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 2996-001:2006.

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

- prEN 2996-001 (P3), 05/2005 — 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 2996-001:2023 (E)****1 Scope**

This document specifies the three-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 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,<sup>1</sup> *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-\*, *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,<sup>2</sup> *Aerospace series — Cut-outs for installation of electrical components*

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

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

**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/>

<sup>1</sup> 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.

<sup>2</sup> Published as ASD-STAN Technical Report at the date of publication of this document by AeroSpace and Defence industries Association of Europe — Standardization (ASD-STAN), <https://www.asd-stan.org/>.

<sup>3</sup> 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 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 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).

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### 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.	
Three input terminals on power supply side (identified by digit A1, B1, C1)			
Three output terminals on distribution side (identified by digit A2, B2, C2)			
Signal contact connection, circuit closed when circuit breaker is released		Crimp contacts size 20 See product standard.	
Operational ambient temperatures limits		From -55 °C to 125 °C	
Temperature compensation	Rating 1 A to 15 A	From -55 °C to 125 °C	See product standard.
	Rating 20 A and 25 A	From -55 °C to 90 °C	
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 VDC	5 VDC	5 VAC <sup>a</sup>	28 VDC
	Resistive	≤ 0,5 A	≥ 3 mA	Not used	≥ 3 mA
	Lamp	≤ 0,2 A	Not used	0,23 A	Not used

<sup>a</sup> Applicable on version without diode only.

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

NOTE 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 VDC max. (resistive load).

**EN 2996-001:2023 (E)****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 TR 6083 C202.  
 Spacing: 50 mm horizontal and 40 mm vertical from the centre 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.	8 N to 80 N	
	Opening force (pull)			5 N to 30 N	
Mechanical strength	Actuator	Travel	See EN 3841-501. For value, see product standard.		
		Transverse load		≥ 110 N	
		Longitudinal load	Push	See EN 3841-503.	≥ 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			≥ 2 N.m
		Tensile force as per $F_1$ (see Figure 1 in product standard)		See EN 3841-505.	≥ 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.			