



**International  
Standard**

**ISO 1509**

**General purpose push-pull three-  
pole circuit-breakers for aircraft —  
Performance requirements**

*Disjoncteurs tripolaires à bouton-poussoir d'usage courant  
utilisés à bord des aéronefs — Caractéristiques*

**Second edition  
2024-04**

This document is a preview generated by EMS



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

**Contents**

Page

<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vi</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Design requirements</b> .....	<b>1</b>
4.1 Ambient temperature and altitudes.....	1
4.2 Operation and instructions.....	2
4.3 Fixing type.....	2
4.4 Trip-free function.....	2
4.5 Working characteristics.....	2
4.6 Re-close.....	2
<b>5 Dimensions</b> .....	<b>2</b>
<b>6 Construction</b> .....	<b>2</b>
6.1 Push-button.....	2
6.2 Operation forces.....	2
6.3 Surface treatment.....	2
6.4 Rating inviolability.....	2
6.5 Electrical connections.....	3
6.6 Fasteners.....	3
<b>7 Voltage and current ratings</b> .....	<b>3</b>
7.1 Voltage.....	3
7.2 Current ratings.....	3
<b>8 Environment</b> .....	<b>3</b>
<b>9 Time/current characteristics</b> .....	<b>3</b>
<b>10 Making and breaking capacity</b> .....	<b>4</b>
<b>11 Endurance</b> .....	<b>4</b>
<b>12 Tests</b> .....	<b>4</b>
12.1 General.....	4
12.2 Requirements.....	4
12.3 Test conditions.....	5
<b>13 Type tests</b> .....	<b>5</b>
13.1 General.....	5
13.2 Requirements.....	5
13.3 Vibration test.....	5
13.4 Acceleration and mechanical shocks tests.....	5
13.4.1 Acceleration test.....	5
13.4.2 Mechanical shocks test.....	6
13.5 Climatic test.....	6
13.6 High voltage and insulation tests.....	6
13.6.1 High voltage test.....	6
13.6.2 Insulation resistance tests.....	6
13.7 Test of explosion-proofness.....	6
13.8 Measurement of magnetic influence.....	7
13.9 Tests of temperature rise and minimum and maximum limit of ultimate trip current.....	7
13.10 Operating forces test.....	7
13.11 Mechanical strength tests.....	7
13.11.1 Strength of terminations.....	7
13.11.2 Strength of push-button.....	7

# ISO 1509:2024(en)

	13.11.3 Strength of panel mounting bush.....	8
	13.11.4 Tests.....	8
13.12	Test of calibration of overload trip.....	8
	13.12.1 General.....	8
	13.12.2 Additional requirements.....	8
13.13	Overload and re-closure test.....	8
	13.13.1 General.....	8
	13.13.2 Requirement.....	8
	13.13.3 Tests.....	9
13.14	Endurance tests.....	9
	13.14.1 General.....	9
	13.14.2 Test conditions.....	9
	13.14.3 Requirements.....	9
	13.14.4 Tests.....	10
13.15	Making and breaking capacity tests.....	10
	13.15.1 General.....	10
	13.15.2 Test conditions.....	11
	13.15.3 Tests.....	11
13.16	Test of self re-closing at low temperature.....	12
<b>14</b>	<b>Production tests.....</b>	<b>12</b>
	14.1 Calibration tests.....	12
	14.1.1 General.....	12
	14.1.2 Voltage drop tests.....	12
	14.1.3 Time/current characteristics tests.....	12
	14.1.4 Tests.....	12
	14.1.5 Holding current test.....	12
	14.1.6 Tests.....	12
	14.2 High voltage and insulation tests.....	12
<b>15</b>	<b>Quality tests.....</b>	<b>12</b>
	15.1 Selection of samples.....	12
	15.2 Tests of minimum and maximum limit of ultimate trip current.....	13
	15.3 Operating force test.....	13
	15.4 Test of calibration of overload trip.....	13
	15.5 Vibration test.....	13
	15.6 Strip examination and report.....	13
<b>16</b>	<b>Declarations.....</b>	<b>13</b>
<b>17</b>	<b>Marking.....</b>	<b>13</b>
	17.1 General.....	13
	17.2 Rated current marking.....	14

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 1, *Aerospace electrical requirements*.

This second edition cancels and replaces the first edition (ISO 1509:1973), which has been technically revised.

The main changes are as follows:

- ambient temperature and altitudes have been updated;
- operation forces have been updated;
- time/current characteristics have been updated;
- mechanical shocks test have been updated;
- high voltage and insulation tests have been updated;
- tests of temperature rise and minimum and maximum limit of ultimate trip current have been updated;
- operating forces test have been updated;
- mechanical strength tests have been updated;
- overload and re-closure test have been updated.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

This document provides performance requirements of the general purpose push-pull three-pole circuit-breakers normal ratings up to and including 35 A for aircraft.

The purpose of this document are as follows:

- a) To standardize the requirements for push-pull three-pole trip-free circuit-breakers that are physically and environmentally diversified.
- b) To provide the applicable document for push-pull three-pole trip-free circuit-breakers.

In order to satisfy the purpose of this document, requirements such as those for physical, environmental and individual items are specified in accordance with the detail requirements that are issued individually.

# General purpose push-pull three-pole circuit-breakers for aircraft — Performance requirements

## 1 Scope

This document specifies the performance requirements for push-pull, three-pole, trip-free circuit breakers having an inverse time/current characteristic of normal ratings up to and including 35 A for use in nominal 115 V/200 V three-phase 400 Hz a.c. circuits.

## 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.

ISO 2635, *Aircraft — Conductors for general purpose aircraft electrical cables and aerospace applications — Dimensions and characteristics*

ISO 1033, *Aircraft — Dimensions for general purpose push-pull three-pole circuit-breakers*

ISO 1540, *Aerospace — Characteristics of aircraft electrical systems*

ISO 7137, *Aircraft — Environmental conditions and test procedures for airborne equipment*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/>

### 3.1

#### **push-pull three-pole circuit-breaker**

circuit-breaker with a single button to trip and reset the breaker, by pushing to make and pulling to break

### 3.2

#### **trip-free circuit-breaker**

Circuit-breaker so designed that holding the push-button in the closed position does not override the tripping mechanism and does not permit subsequent closure of the contacts, until the push-button has been returned to the open position and the tripping mechanism has reset

## 4 Design requirements

### 4.1 Ambient temperature and altitudes

The circuit-breaker shall be suitable for use at specified ambient temperatures and altitudes. There are two temperature ranges:  $-55\text{ °C}$  to  $+70\text{ °C}$  or  $-55\text{ °C}$  to  $+125\text{ °C}$ ; and the maximum altitude according to the product standard shall not be less than 22 000 m.