

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1509

PERFORMANCE REQUIREMENTS
FOR GENERAL PURPOSE PUSH-PULL
THREE-POLE CIRCUIT-BREAKERS FOR AIRCRAFT

1st EDITION

November 1970

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Printed in Switzerland

Also issued in French and Russian. Copies to be obtained through the national standards organizations.

BRIEF HISTORY

The ISO Recommendation R 1509, *Performance requirements for general purpose push-pull three-pole circuit-breakers for aircraft*, was drawn up by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1509, which was circulated to all the ISO Member Bodies for enquiry in March 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Israel	Switzerland
Belgium	Italy	Thailand
Brazil	Netherlands	Turkey
Canada	New Zealand	U.A.R.
Czechoslovakia	Poland	United Kingdom
France	Portugal	U.S.S.R.
India	Spain	Yugoslavia

No Member Body opposed the approval of the Draft.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

**PERFORMANCE REQUIREMENTS
FOR GENERAL PURPOSE PUSH-PULL
THREE-POLE CIRCUIT-BREAKERS FOR AIRCRAFT**

1. SCOPE

This ISO Recommendation states 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 115/200 V three-phase 400 Hz a.c. circuits.

2. TERMINOLOGY

- 2.1 *Push-pull circuit-breaker.* A circuit-breaker with a single button to trip and reset the breaker by pushing to make and pulling to break.
- 2.2 *Trip-free circuit-breaker.* A circuit-breaker so designed that holding the push-button in the closed position will not override the tripping mechanism and will not permit subsequent closure of the contacts, until the push-button has been returned to the open position and the tripping mechanism has reset.

3. DESIGN REQUIREMENTS

- 3.1 The circuit-breaker should be suitable for use at ambient temperatures from -40 to $+55$ °C and at altitudes up to 18 300 m.
- 3.2 The circuit-breaker should be operated by a single button, pushed to make and pulled to break the circuit, the button being perpendicular to the plane of the mounting panel. The portion of the button visible when the circuit-breaker is in the closed position should be black. A white band on the button should be exposed when the circuit-breaker is in the open position.
- 3.3 The circuit-breaker should be suitable for through-panel mounting, preferably by single-hole fixing, and should operate satisfactorily when mounted in any attitude.
- 3.4 The circuit-breaker should be trip-free, and should incorporate an automatic overload tripping device in each pole.
- 3.5 The three sets of contacts should open and close together when manually operated at normal load and should open together when automatically tripped on overload current in one or more lines, when the push-button should move to the open or "off" position. The difference in time between the making or breaking of the three sets of contacts should be not more than 5 milliseconds.
- 3.6 The circuit-breaker should be so designed that, after tripping on overload, it cannot reclose automatically.

4. DIMENSIONS

The envelope and fixing dimensions for the circuit-breakers should comply with ISO Recommendation R 1033, *Dimensions for general purpose push-pull three-pole circuit-breakers for aircraft*.

5. CONSTRUCTION

- 5.1 The push-button should be insulated from all current-carrying parts, and should not remain in an intermediate position, or give a false indication.
- 5.2 The circuit-breaker should be so constructed that the forces required to operate it manually do not exceed the following values :

Closing force (newtons)	Tripping force (newtons)
55	40

It is envisaged that in any particular design of circuit-breaker the actual value will be controlled to close limits.

- 5.3 The portion of the circuit-breaker visible when mounted should have a non-glaring finish.
- 5.4 The circuit-breaker should be so constructed that tampering with the calibration is not possible without dismantling the device or breaking the seal.
- 5.5 Each terminal screw or stud should be size No. 6 UNC, or M4 × 0.7, and each should be capable of accepting two tag-type terminations.
- 5.6 The circuit-breaker should be mounted by means of a threaded bush suitable for use with the panel mounting hole specified in ISO Recommendation R 1033, *Dimensions for general purpose push-pull three-pole circuit-breakers for aircraft*. Two hexagon mounting nuts, one locating washer and one internal shakeproof washer should be provided with each circuit-breaker.

6. VOLTAGE AND CURRENT RATINGS

6.1 Voltage

The circuit-breaker should be suitable for operation in a nominal 115/200 V three-phase 400 Hz a.c. supply having the characteristics described in ISO Recommendation R 1540*, *Characteristics of aircraft electrical power systems*.

6.2 Current

The preferred normal current ratings in amperes of the circuit-breakers are as follows :

1 – 2 – 3 – 5 – 7.5 – 10 – 15 – 20 – 25 – 30 – 35

7. ENVIRONMENT

The circuit-breakers should comply with the requirements of ISO Recommendation R . . **, *Environmental and operational conditions of aircraft equipment*, including vibration, acceleration, crash-landing, climatic, explosion proofness and magnetic influence. They should not support mould growth and should not deteriorate even after storage for long periods in the tropics.

8. TIME/CURRENT CHARACTERISTICS

The time/current characteristics of each circuit-breaker should be within the limits shown in Table 1 A or 1 B, as appropriate, which represent envelope characteristics to cover all manufacture. It is expected that the limits for circuit breakers of an individual manufacturer would conform to closer tolerances to meet individual declared time characteristics.

* At present Draft ISO Recommendation.

** To be prepared.

TABLE 1 A

Circuit-breaker normal current rating (per line)	Ambient temperature	Tripping current	Tripping time
A	°C	% normal current	s
1 to 15	$+ 20 \pm 2$	200	6 to 60
		400	1 to 7.5
		600	0.5 to 3.5
		1000	0.2 to 1.2
20 to 35	$+ 20 \pm 2$	200	40 to 70
		400	3.5 to 5.5
		600	1.5 to 1.8
		1000	0.35 to 0.4
1 to 15	$- 40 \pm 2$	200	14 to 200
		400	2 to 12
		600	1 to 5
		1000	0.25 to 1.75
20 to 35	$- 40 \pm 2$	200	500 to 800
		400	15 to 25
		600	4 to 5.5
		1000	1.2 to 1.9
1 to 15	$+ 55 \pm 2$	200	3 to 45
		400	0.6 to 4.5
		600	0.25 to 1.8
		1000	0.09 to 0.53
20 to 35	$+ 55 \pm 2$	200	30 to 50
		400	2.5 to 4.5
		600	0.9 to 1.5
		1000	0.25 to 0.35

TABLE 1 B

Circuit-breaker normal current rating (per line)	Ambient temperature	Tripping current	Tripping time
A	°C	% normal current	s
1 to 10	$+ 20 \pm 5$	200	0.3 to 10
		400	0.09 to 1.6
		600	0.04 to 0.6
		1000	0.01 to 0.2
1 to 10	$- 40 \pm 2$	200	2 to 6
		400	0.35 to 0.55
		600	0.15 to 0.22
		1000	0.06 to 0.09
1 to 10	$+ 55 \pm 2$	200	1 to 5
		400	0.2 to 0.4
		600	0.09 to 0.15
		1000	0.04 to 0.07