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**Aircraft — Hermetically sealed monostable electrical relays, 2A and 3A —
Part 1 : Operating characteristics and test conditions**

Aéronefs — Relais électriques hermétiques monostables 2A et 3A — Partie 1 : Caractéristiques de fonctionnement et conditions d'essai

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 5066/1 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Aircraft — Hermetically sealed monostable electrical relays, 2A and 3A —

Part 1 : Operating characteristics and test conditions

0 Introduction

ISO 5066 deals with hermetically sealed monostable electrical relays, 2A and 3A, and it is divided into two closely united parts :

Part 1 : Operating characteristics and test conditions.

Part 2 : Type approval tests.

For a series of hermetically sealed relays to be declared as conforming to ISO 5066, it shall have passed the type approval tests in accordance with table 8 given in the annex to this part and with the test methods laid down in ISO 5066/2.

A detail specification shall be sent with the relay series which is to be subjected to the type approval tests and shall include

- drawings dimensioned for checking in accordance with ISO 2315;
- a summary of the number of variations, in accordance with ISO 2315;
- the mass of each relay;
- the coil resistance;
- the degree of severity of the test specifications;
- a complete table of samples, tests and frequency of these tests, in order to ensure maintenance of quality and inspection levels in all aspects of manufacture and production;
- a report of performance and limitations in use.

1 Scope and field of application

This part of ISO 5066 specifies the operating characteristics for hermetically sealed monostable electrical relays, 2A and 3A, for aircraft.

It does not specify a particular model of relay as regards dimensions, but proposes limits for the number of variants which may be included in each individual range.

This part of ISO 5066 gives a general view of the basic specifications relating to mechanical and electrical construction of hermetically sealed electrical relays, and of the basic service environment conditions.

2 References

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

ISO 2315, *Aircraft — Two- and four-pole sealed electromagnetic relays, 2A and 3A — Clearance and fixing dimensions.*

ISO 5066/2, *Aircraft — Hermetically sealed monostable electrical relays, 2A and 3A — Part 2 : Type approval tests.*

ISO 7137, *Aircraft — Environmental conditions and test procedures for airborne equipment.*¹⁾

3 Definitions

For the purposes of ISO 5066, the following definitions shall apply.

3.1 electrical relay : A device designed to produce sudden, predetermined changes in one or more electrical output circuits, when certain conditions are fulfilled in the electrical input circuits controlling the device.

NOTES

1) The term "relay" shall be restricted to a relay unit having a single relaying function between its input circuits and its output circuits.

1) Endorsement, in part, of the publication EUROCAE ED-14A/RTCA DO-160A (a document published jointly by the European Organisation for Civil Aviation Electronics and the Radio Technical Commission for Aeronautics).

2 The term "relay" includes all the components which are necessary for its specified operation.

3 The adjective "electrical" can be deleted when no ambiguity may occur.

3.2 all-or-nothing relay : An electrical relay which is intended to be energized by a quantity the value of which is either

- higher than that at which it picks up,
- or lower than that at which it drops out.

NOTE — The adjective "all-or-nothing" can be deleted when no ambiguity may occur.

3.3 non-specified-time relay : An electrical relay for which the times are not subject to any accuracy specification.

3.4 electromechanical relay : An electrical relay in which the designed response is developed by the relative movement of mechanical elements under the action of a current in the input circuits.

3.5 monostable relay : An electrical relay which, having responded to an input energizing quantity (or characteristic quantity) and having changed its condition, returns to its previous condition when the quantity is removed.

3.6 non-polarized relay (d.c.) : D.C. relays the response of which does not depend upon the polarity of their input energizing quantity or quantities.

3.7 energizing quantity : An electrical quantity (either current or voltage) which alone, or in combination with other such quantities, applied to a relay under specified conditions enables it to fulfil its purpose.

3.8 input energizing quantity : For an all-or-nothing relay, an energizing quantity to which the relay is designed to respond when the quantity is applied under specified conditions.

3.9 to energize a relay : To apply to a relay one or more of its energizing quantities.

NOTE — The presence of any one energizing quantity may or may not be sufficient to produce the required function of the relay. Consequently, it is necessary to define all the conditions of energization (the method, magnitude, phase displacement, etc.).

3.10 input circuit : The whole of the electrical parts within a relay (including those parts, if any, intentionally coupled by inductive or capacitive means) and which are connected to those terminals to which a given input energizing quantity is applied.

3.11 unenergized condition : For a monostable relay, the specified condition of an unenergized relay. For a bistable relay, the conventional condition, as stated by the manufacturer.

3.12 energized condition : For a monostable relay, the specified condition of a relay when it is energized in a specific way. For a bistable relay, the opposite of the unenergized condition, as stated by the manufacturer.

3.13 to pick up (operate) : For a relay, to change

- either from the unenergized condition to the energized condition (general case),
- or from an initial condition to a final condition (for some measuring relays or specified-time relays).

3.14 to drop out : For a relay, to change

- either from the energized condition to the unenergized condition (general case),
- or from a final condition to an initial condition (for some measuring relays or specified-time relays).

3.15 to cycle : For a relay, to pick up and then drop out, or vice versa.

3.16 measured (value) : An adjective used to qualify a value when this value is recorded during a measurement on a given relay and at a given moment.

3.17 rated (value) : An adjective used to qualify a value when this value is fixed by the standard or the manufacturer for a specified operating condition.

3.18 test (value) : An adjective used to designate a value when this value corresponds to an operation which the relay is to perform in the course of a test.

3.19 output circuit : The whole of the electrically conductive parts within a relay connected to the terminals between which the predetermined change is produced.

3.20 make contact : A contact which is closed when the relay is in its energized condition and which is opened when the relay is in its unenergized condition.

3.21 break contact : A contact which is opened when the relay is in its energized condition and which is closed when the relay is in its unenergized condition.

3.22 limiting continuous current of an output circuit : The highest value of the current (r.m.s. if a.c.) which a previously closed contact (effectively conducting output) circuit is capable of carrying continuously under specified conditions.

3.23 limiting breaking capacity :The highest value of current which an output circuit is capable of breaking under specified conditions (voltage, number of breaks, power factor, time constant, etc.).

3.24 bouncing (for a contact circuit) :An unintentional phenomenon which may occur while a contact circuit is making or breaking and which is characterized by the contact tips successively touching and separating before reaching their final condition.

3.25 two-way contact : A combination of two contact circuits including three contact members, one of them being common to the two contact circuits. When one of these contact circuits is open, the other is closed, and vice versa.

3.26 change-over break-before-make contact : A change-over contact, one contact circuit of which breaks before the other makes.

3.27 pick-up time : For a relay in the unenergized condition (initial condition), the time interval between the instant the input energizing quantity is removed and the instant the break contacts open and the make contacts close.

3.28 drop-out time : For a relay in the energized condition (final condition), the time interval between the instant the input energizing quantity (characteristic quantity) takes on, under specified conditions, a specified value and the instant the output make circuit opens or the unenergized break circuit closes.

3.29 bounce time : For a contact which is closing (opening) its circuit, the time interval between the instant when the contact circuit first closes (opens) and the instant when the circuit is finally closed (opened).

4 Environmental conditions

4.1 Ambient temperature range

The relays are classified according to the maximum and minimum ambient temperatures for which they are intended :

- minimum temperature : - 65 °C
- maximum temperature : + 125 °C

4.2 Altitude

The relays shall be capable of being used up to an altitude of 24 000 m at the temperatures specified in 4.1.

4.3 Hermetic seal

The relays shall be designed and constructed in such a way that the leakage of gas, measured during test No. 11 described in ISO 5066/2, shall not be greater than 1×10^{-8} cm³/s.

4.4 Shocks, vibrations, accelerations and resistance to climatic conditions

The relays shall be designed and constructed in such a way that, during the shock, vibration and acceleration tests (tests Nos. 15, 16 and 17 described in ISO 5066/2), no opening in the circuit greater than 10 μs shall be detected and that, after the climatic tests (tests Nos. 10, 12 and 13 described in ISO 5066/2), the values recorded shall satisfy the requirements specified for the tests referred to above.

4.5 Explosion proofness

Hermetically sealed monostable relays which conform to the specifications of ISO 5066 do not normally present any danger of explosion.

5 Construction requirements

5.1 Coil

The control coil of the relay shall be capable of being used continuously on an aircraft system of 28 V d.c., in accordance with the characteristics of aircraft electrical systems specified in ISO 1540.

5.2 Case

The case shall not be electrically connected to the coil nor to the contacts.

5.3 Hermetic seal

The relay shall be hermetically sealed by fusion of glass or ceramic to metal and metal to metal. The case shall be filled with a suitable inert gas, in such a way that it does not adversely affect the performance of the relay as required by ISO 5066.

6 Electrical specifications

6.1 Voltage

The relay contacts shall be specified for use in aircraft electrical systems having a rated voltage of 28 V d.c., with the characteristics specified in ISO 1540.

6.2 Current

The rated current shall be selected in accordance with the application in question and within the limits specified in tables 1 and 2.

Table 1 — Current for rated voltage of 28 V direct current

Circuit	Current	
	2A relay A	3A relay A
Non-reactive circuit	2	3
Inductive circuit <i>L/R</i> , 5 to 10 ms	0,75	1

Table 2 — Current for low voltage, alternating or direct current

Circuit	Current
Weak current circuit	From 10 μ A/10 mV to 100 μ A/50 mV

6.3 Insulation resistance

The relays shall be designed and constructed in such way that, during test No. 2 described in ISO 5066/2, the recorded values are not less than the values specified in table 3.

Table 3 — Insulation resistance

Operating temperature	Insulation resistance M Ω
At 25 $^{\circ}$ C	1 000
At extreme temperatures	500

6.4 Coil resistance

The values for coil resistance, measured during test No. 3 described in ISO 5066/2, shall be within the values stipulated in the detail specification.

6.5 Contact resistance

The values for the contact resistances of the relays covered by ISO 5066 shall not exceed the values specified in table 4.

Table 4 — Contact resistance

Measurement during the test	Contact resistance Ω
First measurement	0,05
Final measurement	0,1

Throughout the endurance test (test No. 8 described in ISO 5066/2), a voltage drop greater than 10 % of the open circuit supply voltage shall be cause for the rejection of the relay being tested. In all cases, the contact resistance shall not be greater than 0,1 Ω .

6.6 Pick-up and drop-out voltages

The values for the pick-up and drop-out voltages, recorded during test No. 5 described in ISO 5066/2, shall conform to the values specified in table 5.

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Table 5 — Pick-up and drop-out voltages

Relay	At 25 $^{\circ}$ C			At extreme temperatures		
	Pick-up voltage max. V	Drop-out voltage max. V min. V		Pick-up voltage max. V	Drop-out voltage max. V min. V	
2A	13,5	8	1,5	18	14	1
3A	13,5	8	1,5	18	14	1

6.7 Make and break times

The make and break times, recorded during test No. 6 described in ISO 5066/2, shall conform to the values specified in table 6.

Table 6 — Make and break times

Relay	Break time ms	Make time ms
2A	4	4
3A	5	5

6.8 Contact bounce times

The contact bounce times, recorded during test No. 7 described in ISO 5066/2, shall conform to the values specified in table 7.

Table 7 — Contact bounce times

Relay	Contact bounce time ms
2A	2
3A	2

6.9 Endurance

The relays shall be capable of withstanding, in the specified conditions, the endurance test (test No. 8) described in ISO 5066/2.

6.10 Overload

The relays shall be capable of withstanding, in the specified conditions, the overload test (test No. 9) described in ISO 5066/2.

7 Connections and fixing

Means of connecting and fixing the relays covered by ISO 5066 shall conform to ISO 2315.

8 Sampling for type approval tests

For the purpose of type approval of the range of hermetically sealed monostable relays, a certain number of samples representing all the variants of the range (e.g. means of connection, type of fixing) shall be selected (see table 8 in the annex). The selection shall be submitted to the national approval body for approval.

9 Test conditions

Unless otherwise specified, all the tests shall be carried out under the conditions specified in ISO 7137, i.e. :

- temperature : between + 15 °C and + 25 °C

- atmospheric pressure : from 84 to 107 kPa
- relative humidity : not exceeding 85 %

10 General test method

10.1 Measurements

When measurements are necessary, the precise figures obtained shall be recorded in the quality test report.

10.2 Mounting

The relays shall be held on the test assemblies by their own particular means of fixing. These assemblies shall be designed and constructed so that they do not inhibit the execution of the tests and the reading of the required measurements.

10.3 Operating cycle

An operating cycle corresponds to the two movements "opening-closing".

11 Order of tests

The tests shall be carried out in the order shown in table 8 in the annex.

12 Production and quality tests

Production and quality tests shall be carried out in accordance with the provisions of the national specifications applicable to the range of relays covered by ISO 5066.

13 Marking

The marking shall be clearly legible and shall remain so after all the tests. The following information shall be marked :

- a) the identification mark of the manufacturer;
- b) the reference of the manufacturer of the product;
- c) the date of manufacture (year and week) or the production number;
- d) the connection diagram;
- e) the rated operational voltage;
- f) the coil resistance;
- g) the rated manoeuvring capacity.

The first four items [a) to d)] are compulsory. The other three items [e) to g)], in the order given, may appear either on the relay, depending on the space available, or on a list accompanying a small relay.