INTERNATIONAL STANDARD 1547

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Aircraft — Precision fuse-links — General requirements

Aéronefs — Porte-fusible de précision — Spécifications techniques

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

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.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 20 has reviewed ISO Recommendation R 1547 and found it technically suitable for transformation. International Standard ISO 1547 therefore replaces ISO Recommendation R 1547-1971 to which it is technically identical.

ISO Recommendation R 1547 was approved by the Member Bodies of the following countries :

Australia	Israel	Spain
Belgium	Italy	Switzerland
Canada	New Zealand	Thailand
Czechoslovakia	Peru	Turkey
Egypt, Arab Rep. of	Poland	United Kingdom
Greece	South Africa, Rep. of	

The Member Bodies of the following countries expressed disapproval of the Recommendation on technical grounds :

Germany
Netherlands
U.S.S.R.

The Member Bodies of the following countries disapproved the transformation of ISO/R 1547 into an International Standard :

Germany
U.S.S.R.

Printed in Switzerland

Aircraft — Precision fuse-links — General requirements

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the general requirements for precision fuse-links suitable for use in aircraft electrical systems having voltage and frequency characteristics conforming to ISO/R 222, at any ambient temperature from − 65 to + 85 °C, and all altitudes from 0 to 24 000 m. (See also ISO 1540.)

Where mention is made of "the relevant International Standard", this refers to ISO 1548 or ISO 1549.

2 REFERENCES

ISO/R 222, *Voltages for aircraft electrical systems.*

ISO/R 469, *Dimensions and conductor resistance of general purpose electrical cables with copper conductors, for aircraft.*

ISO/R 474, *Performance requirements for general purpose electrical cables with copper conductors for aircraft.*

ISO 1540, *Aerospace — Aircraft electrical systems — Characteristics.*[1)]

ISO 1548, *Aircraft — Precision fuse-links — Type A.*

ISO 1549, *Aircraft — Precision fuse-links — Type B.*

ISO 2650, *Environmental tests for aircraft equipment — Part 1 : Scope and applicability*

IEC Publication 269, *Low-voltage fuses — Part I : General requirements.*

3 TERMINOLOGY

The terminology used in this International Standard is in conformity with IEC Publication 269, as far as practicable.

4 DIMENSIONS

The dimensions of the fuse-links shall comply with the relevant International Standard.

5 TEMPERATURE AND ALTITUDE RATING

5.1 The fuse-links shall be suitable for use in all ambient temperatures from − 65 to + 35 °C and at all altitudes up to 24 400 m.

5.2 For ambient temperatures between 35 and 85 °C, the fuse-link shall be de-rated by 0,4 % of normal rated current for every one degree Celsius increase in ambient temperature above 35 °C.

6 CURRENT, VOLTAGE AND BREAKING-CAPACITY RATINGS

The current ratings, the voltage ratings, and the breaking-capacity ratings of the fuse-links shall be in accordance with the relevant International Standard.

7 ENVIRONMENT

The fuse-links shall comply with the requirements of the appropriate tests listed in ISO 2650, including vibration (other than direct engine-mounting), acceleration, crash conditions, climatic and explosion-proofness. They shall not support mould growth and shall not deteriorate even after storage for long periods in the tropics.

8 TEMPERATURE RISE

When the fuse-link is suitably mounted and attached to a cable complying with ISO/R 469, of the rating specified in the relevant International Standard, using an appropriate termination and carrying rated current continuously, the temperature of the attached cable due to the combined effects of ambient and temperature rise shall not exceed the safe value for the insulation as specified in ISO/R 474.

9 TIME/CURRENT CHARACTERISTICS

The pre-arcing time/current characteristics of the fuse-links shall comply with the requirements of the relevant International Standard.

1) At present at the stage of draft.

10 ENDURANCE

The fuse-links shall be capable of carrying at least 80 % of their rated current continuously at an ambient temperature of 85 ± 5 °C for a minimum period of 1 000 h without deterioration.

11 IDENTIFICATION AND MARKING

11.1 Every fuse-link shall be clearly and indelibly marked with its rated current.

11.2 The manufacturer's name or identification and the number of the national standard shall be marked either on the fuse-link or on the package.

12 TESTS

12.1 Except where specific details are listed below, tests shall be in accordance with the practice and requirements of relevant national specifications for aircraft fuses. Evidence shall be available to the purchaser that fuse-links identical to those supplied as covered by this International Standard have satisfactorily passed type tests conducted in accordance with clause 13.

12.2 In order that a consistent standard of quality be maintained, the manufacturer shall conduct production routine tests and production quality tests, the minimum requirements for which are indicated in clauses 14 and 15.

12.3 Except where inappropriate, the tests shall be conducted on fuse-links shielded from external draughts and fitted with minimum lengths of 0,6 m of cable of rating specified in the relevant International Standard, with appropriate terminations.

13 TYPE TESTS

13.1 Preliminary tests

All fuse-links subjected to type tests shall first have passed the production routine tests prescribed in clause 14. The fuse-links shall also be subjected to a voltage drop test by the method described in the annex. The mean value and the tolerance on the mean value shall not exceed values quoted in the relevant International Standard.

13.2 Group tests

13.2.1 After fulfilling the requirements of the tests referred to in 13.1, the fuse-links shall be divided into groups for type testing as shown in the table. The voltage drop across the fuse-link contacts shall be measured at the completion of each of the tests prescribed in 13.3.2, 13.3.3, 13.3.4, 13.4 and 13.6, and the value shall not exceed 110 % of the initial value.

13.2.2 Should any fuse-link fail to pass the type tests, the fuse-links shall be deemed not to comply with the requirements of this International Standard.

13.2.3 Items used in tests in any one group shall not be used subsequently for tests in any other group, and shall not be returned to bulk supply.

TABLE — **Type testing groups**

Group	Number of fuse-links required	Type of test	See sub-clause
1	Six of maximum current rating and six of minimum current rating in each body size	Contact robustness Vibration Acceleration Climatic cycling	13.3.1 13.3.2 13.3.3 13.3.4
2	One of any current rating in each body size	Crash conditions	13.4
3	One of any current rating in each body size	Mould growth	13.5
4	One of any current rating in each body size	Tropical exposure	13.6
5	Six of maximum current rating in each body size	Temperature rise	13.7
6	Six of maximum current rating in each body size	Endurance	13.8
7	As required of maximum current rating in each body size	Breaking capacity	13.9
8	As required of every current rating of each body size	Minimum fusing current	13.10
9	As required of every current rating of each body size	Time/current characteristics	13.11

13.3 Group 1

13.3.1 *Contact robustness*

The fuse-links shall be subjected to a steady axial pull of 67,5 N applied for 10 s between the two end caps or tags. There shall be no sign of fracture, displacement of the fuse element, or other deterioration.

13.3.2 *Vibration*

The fuse-links shall be subjected to the appropriate vibration test listed in ISO 2650, carrying rated current throughout the test.

13.3.3 *Acceleration*

The fuse-links shall be subjected to the appropriate acceleration tests listed in ISO 2650, carrying rated current throughout the tests.

13.3.4 *Climatic cycling*

The fuse-links shall be subjected to the appropriate cycles of climatic testing listed in ISO 2650, current not being carried.

13.4 Group 2

Crash conditions

The fuse-links shall be subjected to the appropriate crash condition test listed in ISO 2650.

13.5 Group 3

Mould growth

The fuse-links shall be subjected to the appropriate mould growth tests listed in ISO 2650.

13.6 Group 4

Tropical exposure

The fuse-links shall be subjected to the appropriate tropical exposure tests listed in ISO 2650.

13.7 Group 5

Temperature rise

With the fuse-links, suitably mounted and carrying rated current, the temperature rise in the attached cable (measured, when the temperature reading becomes stable, at the surface of the conductor beneath the insulation at a point 25 mm from the end of the insulation) shall not exceed 40 °C for ferrule-type fuse-links or 55 °C for tag-type fuse-links.

13.8 Group 6

Endurance

The fuse-links, suitably mounted, shall carry 80 % rated current continuously in an ambient temperature of 85 ± 5 °C for a period of 1 000 h. The voltage drop shall be measured between fixed contacts at the commencement of the test and at regular intervals throughout. It shall not at any time exceed 110 % of the initial value.

13.9 Group 7

Breaking capacity

The breaking capacity of the fuse-links shall be tested in accordance with the method described in IEC Publication 269, or by equivalent methods in accordance with the relevant national standard.

13.10 Group 8

Minimum fusing current

The minimum fusing current of the fuse-links shall be determined in accordance with the method described in IEC Publication 269 for the duration of time stated in the relevant International Standard, or by equivalent methods in accordance with the relevant national standard. The values obtained shall be not less than the minimum level indicated in the relevant time/current characteristic curve.

13.11 Group 9

Time/current characteristics

The time/current characteristics of the fuse-links shall be determined in accordance with the method described in IEC Publication 269, or by equivalent methods in accordance with the relevant national standard. Pre-arcing times shall be plotted against prospective current with both axes to logarithmic scale and the characteristic curve obtained shall lie within the appropriate envelope shown in the relevant International Standard.

14 PRODUCTION ROUTINE TESTS

Every fuse-link produced shall pass the following tests :

— a visual inspection for satisfactory workmanship, finish and marking in accordance with clause 11;

— a check that the dimensions are in accordance clause 4;

— measurement of its resistance, the value to be within the limits declared by the manufacturer on the declaration of design and performance.

15 PRODUCTION QUALITY TEST

A test of contact robustness in accordance with 13.3.1 shall be made during manufacture, on ten samples from each batch or on 1 % of production, whichever is the greater, on fuse-links which have passed tests in accordance with clause 14.

Should any sample fuse-link not pass this test, a further equal sample shall be taken at random and subjected to the test. Should any fuse-link of this sample not pass the test, the batch shall be deemed not to comply with this International Standard.

ANNEX

METHOD OF MEASUREMENT OF VOLTAGE DROP

A.1 BASIC TEST REQUIREMENTS

The voltage drop across the fuse-links after carrying the normal rated current d.c. for a period of 5 ± 0,25 s shall be within the limits shown in the relevant International Standard.

A.2 TEST EQUIPMENT

A.2.1 Instruments and shunts

The instruments used to measure the current and voltage drop shall be permanent-magnet moving-coil instruments with a scale length of not less than 127 mm. They shall, with any shunts and connecting leads, fulfil all the requirements for precision-grade instruments.

A.2.2 Current source

The current source shall be a constant voltage d.c supply of a capacity adequate to withstand the current drain imposed without any measurable change in potential during the test. The r.m.s. value of any ripple shall not exceed 1 %.

NOTE – A secondary battery supply is recommended. When this does not form the main source of supply, it is recommended that a secondary battery be connected across the main source of supply.

A.2.3 Load resistances, cables and connections

The load resistances, cables and connections shall be capable of carrying the test current without any appreciable change in the resistance during the test.

A.3 METHOD OF MOUNTING

The fuse-links shall be mounted horizontally, without fuse-carrier. Tag-type fuse-links shall be bolted to suitable fixed contacts and ferrule-type fuse-links shall be mounted in suitable open clips of substantial and robust construction.

A.4 POINTS OF MEASUREMENT OF VOLTAGE DROP

The points of measurement of voltage drop shall be as indicated in the relevant International Standard.

A.5 METHOD OF TEST

Since individual fuse-links of the same type and current rating will have slightly different resistances, which will affect the current in the circuit, and since it is impracticable to adjust the current satisfactorily during the short period of the test, the following procedure shall be adopted :

a) Adjust the current in the circuit using a dummy fuse-link of similar type and rating to those being tested. This procedure shall also be adopted for any subsequent current adjustments.

b) Take instrument readings of current and millivolts after 5 ± 0,25 s, with test fuse-links in circuit.

c) Correct the readings of current and millivolts obtained in b) for the errors in both instruments and shunts at the point of scale at which each instrument is reading.

Should the current not be within ± 3 % of the nominal current rating of the fuse-links being tested, it shall be adjusted and the fuse-links re-tested after an adequate time for cooling.

d) Multiply the corrected value of millivolts obtained in c) by the ratio of the nominal current rating of the fuse-link to the corrected value of current obtained in c).

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