UDC 629.7.064.5 : 621.315.21 : 669.71

Ref. No. : ISO/R 1076-1969 (E)

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 1076

GENERAL PURPOSE ELECTRICAL CABLES

WITH ALUMINIUM OR ALUMINIUM ALLOY CONDUCTORS

FOR AIRCRAFT

STANDARDSISO.COM : Click to view the full PDF of ISO/R 1076:1969

1st EDITION

May 1969

COPYRIGHT RESERVED

The copyright of ISO Recommendations and ISO Standards belongs to ISO Member Bodies. Reproduction of these documents, in any country, may be authorized therefore only by the national standards organization of that country, being a member of ISO.

For each individual country the only valid standard is the national standard of that country.

Printed in Switzerland

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

BRIEF HISTORY

The ISO Recommendation R 1076, *General purpose electrical cables with aluminium or aluminium alloy conductors 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, in 1965, to the adoption of a Draft ISO Recommendation.

In November 1966, this Draft ISO Recommendation (No. 1121) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Belgium	Israel	Switzerland
Canada	Italy	Thailand
Chile	Japan	U.A.R.
Czechoslovakia	Netherlands	United Kingdom
France	Portugal	U.S.A.
Germany	Spain	

No Member Body opposed the approval of the Draft.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council which decided, in May 1969, to accept it as an ISO RECOMMENDATION.

STANDARDSISO.COM : Click to view the full PDF of ISO/R 1076:1969

ISO Recommendation R 1076 May 1969

GENERAL PURPOSE ELECTRICAL CABLES WITH ALUMINIUM OR ALUMINIUM ALLOY CONDUCTORS FOR AIRCRAFT

STANDARDSISO.COM : Click to view the full PDF of ISO/R 1076:1969

1. SCOPE

This ISO Recommendation states the requirements for cables with aluminium or aluminium alloy conductors for general purpose wiring of aircraft circuits in which the voltage between conductors or between conductors and the aircraft structure does not exceed 600 volts (r.m.s.) and in which the frequency does not exceed 1600 Hz. The cables are suitable for use where, in continuous service, no combination of ambiant temperature and conductor current produces a stabilized conductor temperature in excess of 105 °C. The cables are suitable for fixed wiring in aircraft at temperatures down to – 75 °C, but are not suitable for severe flexing at temperatures below – 30 °C. The cables do not support combustion, but they should not be regarded as complying with the requirements of ISO Recommendation R ...,* *Environmental and operational conditions of aircraft electrical equipment – Part 5 : Fire resistance,* in regard to fire resistance.

2. TERMINOLOGY

2.1 *Cable.* Complete assembly of conductor, insulation and protective covering.

2.2 *Conductor.* Conducting portion of a cable.

2.3 *Wire.* Cylindrical metallic wire of uniform cross-sectional area, used to form the conductor.

2.4 *Stranded conductor.* Conductor composed of a number of wires twisted together. When the conductor consists of more than one layer, alternate layers are twisted in opposite directions.

2.5 *Bunched conductor.* Conductor composed of a number of wires in which all wires are twisted together in the same direction.

2.6 *Rope lay conductor.* Conductor in which a number of groups of wires are assembled in concentric layers. Each group may consist of wires assembled in stranded or bunched formation.

2.7 *Insulation.* Part of a cable which serves to insulate the conductor.

2.8 *Core.* Conductor and insulation of a cable, excluding all additional coverings.

2.9 *Protective covering.* Outside covering of a cable protecting the insulation against deterioration caused by abrasion or injurious fluids.

2.10 *Sample.* Amount of cable of one and the same dimension and type, taken from a batch.

2.11 *Test piece.* Continuous length of cable taken from a sample.

* At present under review.

3. MATERIALS

3.1 Conductor wires

3.1.1 The aluminium or aluminium alloy wires should have a resistivity not greater than the value fixed by the International Electrotechnical Commission (IEC) for commercial hard-drawn electrical conductor wire.*

3.1.2 The tensile strength of wires taken from conductors should have values between 1270 daN/cm^2 and 1690 daN/cm^2 (18 000 lbf/in^2 and 24 000 lbf/in^2). Wires having tensile strengths up to 2250 daN/cm^2 (32 000 lbf/in^2) are acceptable subject to the reservation that wires with a strength greater than 1690 daN/cm^2 (24 000 lbf/in^2) may not be suitable for certain crimp forms owing to the probability of breakage of the strands during the crimping operation. The tensile strength of the wires should be based on a gauge length of 10 in (254 mm) held in clamps separated at a rate not exceeding 12 in (300 mm) per minute, the tensile strength being calculated on the original cross-sectional area of the wire.

3.1.3 Wires taken from the cable should not break when subjected to the following test :

Wrap the wire round a wire of its own diameter to form a close helix of eight turns.
Unwrap six turns and then closely re-wrap them in the same direction as the first wrapping.

3.2 Primary insulation and protective covering

The materials used for the primary insulation and protective covering of the cables should be such that the finished cable will comply with all the requirements of this ISO Recommendation. The materials should be free from ingredients likely to cause staining or discolouration of the cable.

4. CONSTRUCTION

4.1 Conductor

4.1.1 The conductor should be bunched, stranded or rope stranded. It should consist of aluminium or aluminium alloy wires complying with clause 3.1.

4.1.2 The complete conductor should not be joined but the ends of individual wires may be tucked into the conductor. There should be not more than one such join in each 50 metres of conductor.

4.2 Complete cable

4.2.1 The insulation should be of uniform circular cross-section throughout the length of the cable and the conductor should be evenly centred in the insulation.

4.2.2 The insulation should not be loose, but it should be possible to strip the complete insulation, leaving the conductor in a condition sufficiently clean to permit satisfactory connections being made to terminations without further cleaning.

4.2.3 The protective coverings over the primary insulation should be so treated and applied that there is no wrinkling back of the exterior protective sheath.

4.2.4 The cables should bear means of identification in accordance with section 11.

5. DIMENSIONS AND CONDUCTOR RESISTANCE

The dimensions and conductor resistance of the finished cables should comply with the values given in Table 1.

* IEC Publication 111, *Recommendation for the resistivity of commercial hard-drawn aluminium electrical conductor wire.*

STANDARDSISO.COM : Click to view the full PDF of ISO/R 1076:1969

TABLE 1 – **Dimensions and conductor resistances of general purpose electrical cables with aluminium or aluminium alloy conductors for aircraft**

Nominal conductor area		Size No.	Minimum number of wires	Maximum resistance od finished cable at 20 °C		Maximum diameter of stranded conductor		Maximum overall diameter of finished cable	
				per km	per 1000 yd				
in^2	mm^2			ohms	ohms	in	mm	in	mm
0.013	8.5	8	41	3.58	3.28	0.160	4.1	0.260	6.6
0.0222	14.3	6	70	2.10	1.92	0.211	5.4	0.325	8.3
0.0331	21.5	4	105	1.40	1.28	0.262	6.7	0.385	9.8
0.0532	34.4	2	168	0.88	0.804	0.330	8.4	0.465	11.8
0.0666	43.0	1	210	0.70	0.642	0.368	9.4	0.515	13.1
0.0845	54.5	0	266	0.55	0.507	0.418	10.6	0.570	14.5
0.108	70.0	00	342	0.44	0.399	0.478	12.2	0.630	16.1
0.132	86.0	000	418	0.36	0.327	0.535	13.6	0.705	17.9
0.169	109.0	0000	532	0.28	0.255	0.587	14.9	0.775	19.7

STANDARDSISO.COM : Click to view the full PDF of ISO/R 1076:1969

6. RESISTANCE TO ADVERSE ENVIRONMENTAL CONDITIONS

The finished cables should be suitable for fixed wiring at temperatures down to – 75 °C. They should be non-hygroscopic and resistant to fluids likely to the encountered on aircraft; they should not support mould growth. All colours should be fast to light and moisture even after storage for long periods in the tropics.

7. TESTS

7.1 The tests listed below should be in accordance with the relevant national standard for general purpose electrical cables for aircraft suitable for operation at stabilized conductor temperatures up to 105 °C. Preferred methods of test are stated in ISO Recommendation R ...,* *Methods of test for general purpose electrical cables with aluminium or aluminium alloy conductors for aircraft.* Evidence should be available to the purchaser that cable covered by this ISO Recommendation has satisfactorily passed type tests conducted in accordance with sections 8, 9 and 10.

7.2 It is not necessarily intended that a type test should be made on every size of cable. The national standard may, subject to the agreement of the national airworthiness authority, permit the division of the range of sizes into groups, tests on one sample being accepted as representative of all the cables in the group.

7.3 In order that a consistent standard of quality be maintained, the manufacturer should conduct production routine tests (see section 9) and production quality tests (see section 10).

8. TYPE TESTS ONLY

Samples of cable should have passed the tests listed in sections 9 and 10 before submission to the following type tests :

(*a*) resistance to typical aircraft fluids (fuel, hydraulic fluid, lubricating oil, including synthetic ester-based oils, and de-icing fluids);

(*b*) ageing in air at high temperature, followed by a bend test at room temperature, and an insulation test whilst immersed in water;

(*c*) flexibility test at room temperature;

(*d*) bend test at low temperature;

(*e*) surface creepage test while immersed in salt water;

(*f*) heat test (to check that adjacent cables do not adhere at elevated temperatures);

(*g*) test of physical properties of insulation material (e.g. 60 days at 113 °C);

(*h*) abrasion test.

* At present Draft ISO Recommendation No. 1468.

STANDARDSISO.COM : Click to view the full PDF of ISO/R 1076:1969