

Specification for

**Electric cables for
general airframe or
equipment
interconnect
use (260 °C), nickel
plated copper and
copper alloy
conductors, with
wrapped insulation**

Committees responsible for this British Standard

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- British Airways
- British Cable Makers' Confederation
- British Rubber Manufacturers' Association
- Civil Aviation Authority (Airworthiness Division)
- Federation of the Electronics Industry
- Ministry of Defence
- Society of British Aerospace Companies Ltd.

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Foreword

This British Standard has been prepared by Technical Committee ACE/6 and specifies requirements for a range of lightweight thin-wall insulation cables that are individually suitable for general airframe or equipment interconnect use. It supersedes BS G 238:1987 which is withdrawn.

This revision introduces dimensions and mass for all types and classes of cable.

The dielectric insulation material is spirally lapped with an overall coating to provide the necessary colour coding and to provide a base for printed identification legends. The standard requires the application of the dielectric material so as to provide the minimum penalties of weight and space whilst offering reliable performance over a full airframe life of not less than 50 000 h.

Cables manufactured to this standard are not required to meet the fire resistance requirements of BS 3G 100-2.3.13 but they are required to satisfy the flammability requirements of BS G 230.

Attention is drawn to BS G 230 which specifies the general requirements for aircraft electric cables (second series).

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies the construction and performance requirements for a range of lightweight cables with wrapped insulation and nickel plated conductors suitable for general airframe use and for equipment interconnect use as stated below. The continuous current ratings for the cables are given in Annex A.

The following types of cable are specified:

type 01 interconnect	} single-core or twisted
type 02 airframe	} multi-cores only;
type 03 interconnect	} two or more cores,
type 04 airframe	} with an outer jacket;
type 05 interconnect	} single- or multi-core,
type 06 airframe	} with a screen and outer jacket.

It is applicable to cables for use in the following situations.

- a) Cables for continuous use where the maximum stabilized conductor temperature does not exceed 260 °C and for applications involving flexing at temperatures down to – 65 °C;
- b) Cables for use where the potentials stated below do not exceed 600 V r.m.s and the frequency does not exceed 2 000 Hz:
 - 1) potential between conductors;
 - 2) potential between a conductor and screen;
 - 3) potential between a conductor and the aircraft structure;
- c) Interconnect cables for use in areas with some physical protection, such as behind panels or bulkheads. They also have an application for the internal wiring of equipment.
- d) Airframe cables of sufficiently robust construction for use for open aircraft wiring.

NOTE The latest edition of an Aerospace Series standard is indicated by a prefix number.

2 References

2.1 Normative references

This British Standard incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the cited publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this British Standard only when incorporated in it by updating or revision.

2.2 Informative references

This British Standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

For the purpose of this British Standard the definitions given in BS G 230 apply.

4 Classification

Cables shall be classified according to the number of cores as follows:

class 1:	single core;
class 2:	two core;
class 3:	three core;
class 4:	four core.
etc.	

5 Construction

5.1 General

The materials and method of construction used for the formation of the cables shall be defined and controlled by the manufacturer to the satisfaction of the Approving Authority¹⁾. No change shall be made to such materials or processes unless it can be shown to the satisfaction of the Approving Authority that the performance and handling properties of the cable have not been degraded.

5.2 Materials

Cables shall be manufactured from unused materials that have been exposed only to processes essential to their manufacture and application.

¹⁾ The Approving Authority is one of the following:

- a) for UK Civil Aviation products, the Civil Aviation Authority, Safety Regulation Group, Aviation House, Gatwick Airport South, West Sussex RH6 0YR (or their accredited representatives);
- b) for UK military products, information is available from the Procurement Executive, Ministry of Defence, Directorate General of Defence Quality Assurance, Directorate of Standardization.

5.3 Conductors

5.3.1 Conductors shall conform to BS G 231 before fabricating into completed cables.

5.3.2 Copper strands and copper alloy strands shall be nickel plated.

5.4 Insulation

The insulation for interconnect cables shall consist of one or more overlapped tapes of insulating material, and for airframe cables, two or more overlapped tapes. If an overall coating is also provided, for the purposes of this standard, it shall be regarded as part of the cable.

5.5 Screen

The screen shall be constructed of a braid having a coverage of 85 % minimum, and a lay factor of less than 3 when calculated in accordance with Annex A of BS 2G 230:1991. There shall be no joints in the complete screen. Where breaks in individual strands occur, the ends shall be brazed or tucked into the weave ensuring that the cut end is on the outside of the screen. There shall be not more than one such break in any 300 mm length of cable or in any 10 m length of individual strand. Strands from which the braid is constructed shall be nickel plated copper wire and conform to BS G 231 before braiding.

5.6 Jacket

The jacket shall consist of insulating material.

5.7 Mass and dimensions

5.7.1 Single-core cables

The mass and dimensions of single-core cables shall conform to Table 1 and Table 2 as appropriate.

5.7.2 Multi-core cables

5.7.2.1 The mass and dimensions of multi-core cables shall conform to Table 3 to Table 8 as appropriate.

5.7.2.2 Multi-core cables shall consist of two or more single cores conforming to **5.7.1**, twisted together with a lay of approximately 12 times the outside major diameter of the laid-up cores.

5.7.2.3 Types 01 and 02 shall consist of twisted assemblies of single-core cable, types 03 and 04 of twisted assemblies with an outer jacket, and types 05 and 06 of twisted assemblies with a screen and outer jacket.

5.8 Colour

The colour of the insulation for class 1 cables, the core insulation for multi-core cables and the jackets shall conform to BS G 230.

6 Designation and marking

6.1 General

The designation and marking of the cables shall conform to BS G 230.

6.2 User applied marking

6.2.1 Appropriate methods of marking type 01 (interconnect) cables shall be declared by the manufacturer who may specifically prohibit the use of hot stamp or laser marking.

6.2.2 The surface of the insulation or coating of type 02 (airframe) cable shall be suitable for the acceptance of user applied identification marks by at least one of the following methods:

- a) hot stamp marking;
- b) laser marking;
- c) ink jet.

The cable manufacturer shall declare which method is suitable and the tests given in clause 8 shall be performed using cables that have been so marked.

6.2.3 Appropriate methods of marking the outer jacket of cable types 03, 04, 05 and 06 shall be declared by the manufacturer who may specifically prohibit the use of hot stamp or laser marking.

7 Packaging and labelling

The cables shall be packed and labelled in accordance with BS G 230.

8 Tests

Cables shall be tested in accordance with BS G 230 as specified in Table 10 or Table 11 as applicable.

NOTE 1 Specific requirements of this standard are given against the appropriate test.

The application of each test for qualification approval, production quality testing, inspection lot testing and production routine testing shall be as given in Table 12. Specific test parameters shall be as given in Table 13. All qualification approval test specimens shall be marked in accordance with **6.2** before the commencement of testing.

NOTE 2 For qualification approval testing, specimens selected from a particular size within the following groups may be considered as proving the requirements for all sizes within that group of a given type (see clause 1).

NOTE 3 For qualification approval testing, qualification of type 05 cable may be considered as proving the requirements of type 03, classes 2 to 4, and qualification of type 06 as proving type 04, classes 2 to 4.

- Group 1. Size 24, type 02, classes 1 to 4.
- Group 2. Sizes 22 to 16, type 02, classes 1 to 4.
- Group 3. Sizes 14 to 12, type 02, class 1.
- Group 4. Size 24, type 01, classes 1 to 4.
- Group 5. Sizes 22 to 16, type 01, classes 1 to 4.
- Group 6. Sizes 24 to 12, type 06, classes 1 to 4.
- Group 7. Sizes 24 to 16, type 05, classes 1 to 4.

9 Reference samples

Long-term storage samples shall be identified and respooled or coiled for storage in a clean environment, under standard conditions [Temperature $(21 \pm 3) ^\circ\text{C}$, relative humidity $[55 \pm 5) \%$]. Such samples, which shall be representative of the size range, shall not constitute part of the type testing, but shall be retained for reference purposes for the construction as initially approved.

Table 1 — Type 01, class 1: single-core interconnect cables (260 °C)

Size	Radial thickness of insulation (min.) mm	Overall diameter		Maximum conductor resistance at 20 °C Ω/km	Mass per unit length (max.) kg/m
		Min. mm	Max. mm		
24	0.13	0.79	0.97	113 ^a	2.57
22	0.13	0.94	1.12	61.3	3.97
20	0.13	1.19	1.37	33.6	6.41
18	0.13	1.44	1.62	21.2	9.66

NOTE The nominal mass of the cable is typically 95 % of the maximum mass. The manufacturer should declare the nominal mass in the declaration of design and performance (DDP).

^a Nickel plated copper alloy.

Table 2 — Type 02, class 1: single-core unscreened airframe cables (260 °C)

Size	Radial thickness of insulation (min.) mm	Overall diameter		Maximum conductor resistance at 20 °C Ω/km	Mass per unit length (max.) kg/m
		Min. mm	Max. mm		
24	0.19	0.90	1.10	113 ^a	2.86
22	0.19	1.05	1.25	61.3	4.32
20	0.19	1.30	1.50	33.6	6.83
18	0.19	1.55	1.75	21.2	10.16
16	0.19	1.80	2.00	14.6	14.08
14	0.19	2.05	2.25	10.7	19.21
12	0.19	2.51	2.71	6.44	29.33
10	0.3	3.20	3.70	4.08	56.00
8	0.3	4.80	5.30	2.28	98.00
6	0.3	5.80	6.30	1.49	145.00
4	0.3	7.10	7.70	0.924	225.00
2	0.3	8.80	9.40	0.585	350.00
1	0.3	9.70	10.40	0.485	420.00
0	0.3	10.90	11.70	0.369	550.00
00	0.3	12.30	13.20	0.283	710.00
000	0.3	14.00	14.80	0.229	870.00
0000	0.3	15.60	16.40	0.179	1 270.00

NOTE The nominal mass of the cable is typically 95 % of the maximum mass. The manufacturer should declare the nominal mass in the DDP.

^a Nickel plated copper alloy.