

Specification for

**Electric cables for  
general airframe or  
equipment  
interconnect  
use (135 °C), extruded  
insulation**

# Committees responsible for this British Standard

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- Association of Manufacturers Allied to the Electrical and Electronic Industry (BEAMA Ltd.)
- British Airways
- British Cable Makers' Confederation
- British Rubber Manufacturers' Association
- Civil Aviation Authority
- Electronic Components Industry Federation
- Ministry of Defence
- Society of British Aerospace Companies

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## Foreword

This British Standard, having been prepared under the direction of the Aerospace Standards Policy Committee, specifies requirements for a range of lightweight and extra-lightweight thin wall insulated cables that are individually suitable for general airframe or equipment interconnect use. It is a revision of BS 2G 233:1987 which is withdrawn.

The dielectric insulation material is applied by extrusion or extrusions over the conductor. 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 100-3.13, but they are required to satisfy the flammability requirements of BS G 230.

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 to iv, pages 1 to 20, 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 construction and performance requirements for a range of lightweight and extra-lightweight cables (designated/EL) with extruded insulation suitable for general airframe use in all sizes. The cables are also suitable for equipment interconnect use in the size ranges 26 to 18 (standard lightweight cable) and 24 to 14 (extra-lightweight cable).

The following types of cables are specified:

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

The cables are suitable for continuous use, where the maximum stabilized conductor temperature does not exceed 135 °C, and for applications involving flexing at temperatures down to – 65 °C.

The cables are suitable for use where the potential between conductors or between a conductor and screen, or the aircraft structure does not exceed 600 V r.m.s and the frequency does not exceed 2 000 Hz.

Interconnect cables are suitable for use in areas with some physical protection, such as behind panels or bulkheads, and may also be used as the basis for cables having additional protection such as a jacket or screen and jacket. They also have an application for the internal wiring of equipment.

Airframe cables are of sufficiently robust construction to be used for open aircraft wiring.

The continuous and short-term current ratings for the cables are specified in this standard.

NOTE 1 The titles of the publications referred to in this standard are listed on the inside back cover.

NOTE 2 The latest revision of an Aerospace Series standard is indicated by a prefix number.

## 2 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.

## 3 Construction

### 3.1 General

The materials and methods of construction used for the formation of the cables shall be defined and controlled to the satisfaction of the Approving Authority<sup>1)</sup>. 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.

### 3.2 Conductors

**3.2.1** Conductors shall comply with BS 2G 231 before being fabricated into completed cable.

**3.2.2** Copper strands shall be tin plated and high strength copper alloy strands shall be silver plated.

NOTE Conductors for extra-lightweight cables have reduced dimension tolerances to achieve the necessary weight reduction.

### 3.3 Insulation

**3.3.1** The insulation for interconnect cables shall consist of one or more homogeneous extruded layers of dielectric material and, for airframe cables, two or more extruded layers. An overall coating may also be provided which, for the purposes of this standard, shall be regarded as part of the cable.

<sup>1)</sup> The Approving Authority is either:

- a) for UK civil aviation products, the Civil Aviation Authority (or their accredited representatives); or
- b) for UK military products, information is available from the Procurement Executive, Ministry of Defence, Directorate General of Defence Quality Assurance, Directorate of Standardization, Kentigern House, 65 Brown Street, Glasgow G28 EX.

**3.3.2** The material shall be new, and shall have been subjected only to those processes essential for its manufacture and application.

**3.3.3** Where two layers are used they shall be of contrasting colours.

### 3.4 Screen

**3.4.1** The screen shall consist of a braid having a minimum coverage of 85 % and a lay factor of less than 3 when calculated in accordance with Appendix A of BS G 230. There shall be no joints in the complete screen.

**3.4.2** 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 not be more than one such break in any 300 mm length of cable, or in any 10 m length of individual strand.

**3.4.3** Strands from which the braid is constructed shall be tin plated and shall comply with BS 2G 231 before braiding.

### 3.5 Jacket

The jacket shall consist of insulating material.

### 3.6 Mass and dimensions

The mass and dimensions of cables shall be as given in Table 1 to Table 15 as appropriate.

NOTE The mass per unit length figures shown in Table 2, Table 4, Table 6, Table 8, Table 12 and Table 14 are achievable by using closer tolerance conductors. These closer tolerances are shown in Table 15.

### 3.7 Multi-core cables

**3.7.1** Multi-core cables shall consist of two or more single-cores complying with **3.6**, twisted together with a lay of approximately 12 times the diameter over the laid-up core for sizes 26 to 4, and approximately 16 times the diameter over the laid-up core for sizes 2 to 0000.

**3.7.2** Types 01, 01/EL, 02, and 02/EL shall consist of twisted assemblies of single-core cable.

**3.7.3** Types 03 and 04 shall consist of twisted assemblies with an outer jacket.

Types 05, 05/EL, 06 and 06/EL shall consist of twisted assemblies with a screen and outer jacket.

**Table 1 — Type 01, class 1: single-core unscreened interconnect cables (135 °C)**

| Size | Radial thickness of insulation (min.) | Overall diameter |      | Maximum conductor resistance at 20 °C | Mass per unit length (max.) |
|------|---------------------------------------|------------------|------|---------------------------------------|-----------------------------|
|      |                                       | Min.             | Max. |                                       |                             |
|      | mm                                    | mm               | mm   | Ω/km                                  | kg/km                       |
| 26   | 0.13                                  | 0.76             | 0.86 | 153 <sup>a</sup>                      | 2.12                        |
| 24   | 0.13                                  | 0.89             | 0.99 | 106 <sup>a</sup>                      | 2.87                        |
| 22   | 0.13                                  | 1.04             | 1.14 | 61.3                                  | 4.22                        |
| 20   | 0.13                                  | 1.22             | 1.37 | 33.6                                  | 6.86                        |
| 18   | 0.13                                  | 1.47             | 1.63 | 21.2                                  | 10.30                       |

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 performance (DDP).

<sup>a</sup> Silver-plated copper alloy.

**Table 2 — Type 01/EL, class 1: single-core unscreened interconnect cables (135 °C)**

| Size | Radial thickness of insulation (min.) | Overall diameter |      | Maximum conductor resistance at 20 °C | Mass per unit length (max.) |
|------|---------------------------------------|------------------|------|---------------------------------------|-----------------------------|
|      |                                       | Min.             | Max. |                                       |                             |
|      | mm                                    | mm               | mm   | Ω/km                                  | kg/km                       |
| 24   | 0.13                                  | 0.89             | 0.99 | 106 <sup>a</sup>                      | 2.44                        |
| 22   | 0.13                                  | 1.04             | 1.14 | 61.3                                  | 3.52                        |
| 20   | 0.13                                  | 1.22             | 1.37 | 33.6                                  | 6.40                        |
| 18   | 0.13                                  | 1.47             | 1.63 | 21.2                                  | 9.69                        |
| 16   | 0.13                                  | 1.68             | 1.83 | 14.6                                  | 13.67                       |
| 14   | 0.13                                  | 2.08             | 2.29 | 10.7                                  | 17.61                       |

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 performance (DDP).

<sup>a</sup> Silver-plated copper alloy.

**Table 3 — Type 02, class 1: single-core unscreened airframe cables (135 °C)**

| Size | Radial thickness of insulation (min.) | Overall diameter |       | Maximum conductor resistance at 20 °C | Mass per unit length (max.) |
|------|---------------------------------------|------------------|-------|---------------------------------------|-----------------------------|
|      |                                       | Min.             | Max.  |                                       |                             |
|      | mm                                    | mm               | mm    | Ω/km                                  | kg/km                       |
| 26   | 0.2                                   | 0.96             | 1.07  | 153 <sup>a</sup>                      | 2.66                        |
| 24   | 0.2                                   | 1.09             | 1.19  | 106 <sup>a</sup>                      | 3.45                        |
| 22   | 0.2                                   | 1.22             | 1.37  | 61.3                                  | 4.99                        |
| 20   | 0.2                                   | 1.42             | 1.58  | 33.6                                  | 7.69                        |
| 18   | 0.2                                   | 1.70             | 1.85  | 21.2                                  | 11.32                       |
| 16   | 0.2                                   | 1.92             | 2.13  | 14.6                                  | 15.72                       |
| 14   | 0.25                                  | 2.23             | 2.44  | 10.7                                  | 21.06                       |
| 12   | 0.25                                  | 2.74             | 2.95  | 6.44                                  | 32.30                       |
| 10   | 0.25                                  | 3.30             | 3.61  | 4.08                                  | 52.30                       |
| 8    | 0.25                                  | 4.76             | 5.15  | 2.28                                  | 94.50                       |
| 6    | 0.25                                  | 5.81             | 6.32  | 1.49                                  | 143                         |
| 4    | 0.25                                  | 7.85             | 8.11  | 0.924                                 | 238                         |
| 2    | 0.25                                  | 9.93             | 10.54 | 0.585                                 | 378                         |
| 1    | 0.25                                  | 11.36            | 11.97 | 0.485                                 | 470                         |
| 0    | 0.25                                  | 12.54            | 13.35 | 0.369                                 | 601                         |
| 00   | 0.25                                  | 14.39            | 15.20 | 0.283                                 | 782                         |
| 000  | 0.25                                  | 15.82            | 16.73 | 0.229                                 | 951                         |
| 0000 | 0.25                                  | 18.23            | 18.71 | 0.179                                 | 1 230                       |

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

<sup>a</sup> Silver-plated copper alloy.