

Specification for

Stud-type terminal blocks for terminations on aircraft electric cables

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Foreword

This British Standard, prepared under the direction of the Aerospace Standards Committee, is a revision of BS 2G 197:1978 which is withdrawn. BS 2G 197:1978 specified a range of terminal blocks that were interchangeable with the most commonly used types specified in BS G 197:1967. The standard also redefined the flammability requirements for the terminal blocks which necessitated some changes in their physical properties.

For reasons of interchangeability, imperial dimensions have been retained for Figure 1 to Figure 4. Metric dimensions are given in parentheses. This revision introduces some changes to the dimensional requirements of the standard that have been found by experience to be necessary. Some changes have been made to the allocation of samples and sequence of testing for type approval. The list of test fluids has also been updated.

The importance of toxicity has been recognized, but no suitable test has been found to date which has proved acceptable for this standard. Pending the development of such a test, the materials from which the terminal blocks are manufactured should present the minimum hazard from toxic fumes and smoke.

The specified temperature ratings for terminal blocks have been selected to permit compatibility with maximum conductor temperatures of aircraft causes commonly in use.

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 17 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.

Amendments issued since publication

Amd. No.	Date of issue	Comments

This British Standard, having been prepared under the direction of the Aerospace Standards Committee, was published under the authority of the Board of BSI and comes into effect on 30 July 1982

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Section 1. General

1 Scope

This British Standard specifies requirements for the design and performance of terminal blocks with studs 4 UNJC, 6 UNJC and 10 UNJF rolled threads for use with ring tongue terminal ends on aircraft cables.

2 References

Reference is made in this standard to the following publications.

BS 3G 100, *General requirements for equipment for use in aircraft*.

BS G 204, *Copper terminal ends for crimping to electric cables with copper conductors*.

BS M 26, *Chemical preparations for chemical closets (re-circulation type) for aircraft*.

BS 5S 80, *Specification for high chromium-nickel corrosion-resisting steel billets, bars, forgings and parts*.

BS 580, *Trichloroethylene*.

BS 805, *Specification for toluenes*¹⁾.

BS 1595, *isoPropyl alcohol*.

BS 2782, *Methods of testing plastics — Part 3: Mechanical properties — Methods 320A to 320F: Determination of tensile strength, elongation and elastic modulus — Method 351A: Determination of Charpy impact resistance of rigid plastics and ebonite (Charpy impact flexural test)*.

BS 4084, *Specification for UNJ threads, with controlled root radius, for aerospace: inch series*.

BS 4487, *Inhibited 1, 1, 1-trichloroethane (methylchloroform)*.

BS 6001, *Sampling procedures and tables for inspection by attributes*.

The latest editions of these standards shall be used.

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

3 Definitions

For the purposes of this British Standard the following definitions apply.

3.1

termination

a permanent formation of an electric cable conductor with a terminal end

3.2

terminal end

a ring tongue cable tag or lug

NOTE These are of the general type specified in BS G 204.

3.3

terminal block

a formation of terminals that are housed in an insulating material

3.4

terminal

a stud and nut assembly that secures terminal ends

3.5

total operating temperature

the ambient temperature plus the temperature rise due to conducted heat from connected cables

Section 2. Design

4 Design and outline dimensions

4.1 The outline dimensions of a range of terminal blocks are shown in Figure 1, Figure 2 and Figure 3. Dimensions for the terminal area are shown in Figure 4.

NOTE For reasons of interchangeability, imperial dimensions have been retained for these figures. Metric dimensions are given in parentheses.

4.2 Terminals and fittings shall be separated by barriers to provide electrical and mechanical isolation such that the barriers shall exceed the height of the studs by at least 1 mm and shall be so designed that any uninsulated sections of the cable terminal ends on adjacent studs cannot be made to contact each other.

4.3 The design of the terminal shall be such that the palm diameter of suitable terminal ends complying with BS G 204 shall not exceed the diameter of the shoulder. The shoulder shall also stand proud of the surrounding insulation to ensure that no part of the terminal end will be held in compression with the insulation as part of the electrical joint. The design of the terminal block shall be such that suitable terminal ends complying with BS G 204 shall be capable of being clamped to the shoulder with the crimp barrel facing up or down and, in the case of a single row block, from either side of the block.

4.4 The terminal block may be provided with a cover as an accessory. The cover shall be made of an insulating material and shall comply with the performance requirements of this standard.

¹⁾ Contained in one volume, BS 135, BS 458, BS 805 "Specification for benzene, xylenes and toluenes".

5 Type and number of terminals

The preferred numbers of terminals in a row are 1, 2, 3, 5 and 10 of the same size stud and there shall not be more than two rows.

6 Screw threads and stiffnuts

6.1 Studs shall be of corrosion resistant steel complying with BS 5S 80 or equivalent; the rolled class 3A unified threads shall comply with BS 4084.

6.2 All nuts shall be stiffnuts incorporating an integral washer and shall be within the range of rundown torque limits given in Table 1 when used with studs complying with **6.1**.

7 Properties of dielectrics

The form and material of terminal blocks shall provide for a robust construction with special regard being paid to the strength and resilience of terminal barriers. Material(s) shall, when tested in standard form, have an elongation at break complying with **36.2** or an impact resistance complying with **36.3**. Preference shall be given to good elongation at break performance unless the upper design temperature selected in accordance with **10.1** dictates the use of a more rigid material.

8 Terminal retention

The insert strength of terminals shall be such that the requirements for axial loads and torque loads specified in clause **31** and clause **32** are satisfied.

9 Voltage and frequency

The blocks shall be suitable for use on aircraft a.c. and d.c. electrical systems having the characteristics specified in BS 3G 100-3.

10 Temperature and altitude

10.1 The blocks shall be suitable for continuous use at a total operating temperature from -65°C to an upper level which shall be selected from the following temperatures.

+ 105°C , + 135°C , + 150°C , + 200°C , + 260°C

10.2 The manufacturer shall declare the failure temperature of the terminal block, when overheated, when tested in accordance with clause **33**.

Failure temperature is defined as the lower of the temperatures at which:

- a) the terminal block fails to comply with **31.3** when an axial load of 50 % of the appropriate load listed in Table 4 is applied; or
- b) the insulation resistance when measured in accordance with clause **24** falls to $0.2\text{ M}\Omega$.

10.3 The blocks shall be suitable for use at altitudes from sea level to 21 340 m.

11 Vibration and acceleration

A terminal block with terminations and cables fitted as specified in **22.4** shall be capable of meeting the vibration conditions specified in clause **25** and of withstanding an acceleration of 25 g_n as specified in clause **26**. If a cover is provided as an accessory, it shall be fitted for these tests.

12 Humidity, temperature and pressure

The blocks shall comply with clause **27**.

13 Tropical exposure

The blocks shall comply with clause **28**.

14 Mould growth

The blocks shall comply with clause **29**.

15 High temperature ageing

The blocks shall comply with clause **30**.

16 Flammability

The blocks shall comply with **34.5** and **34.6**.

17 Resistance to fluids

The blocks shall comply with **35.2** and **35.3**.

18 Marking

18.1 Blocks shall be identified in accordance with BS 3G 100-1.

18.2 Each terminal position shall be numbered either as shown in Figure 1 or in a manner that is both legible and unambiguous.

18.3 Each row of double row terminal blocks shall be identified by the letters L and R as shown in Figure 1 or in a manner that is both legible and unambiguous.

19 Declarations

The manufacturer shall prepare a Declaration of Design and Performance (DDP) as specified in BS 3G 100-1 for each type and size range of terminal block. The DDP shall give appropriate and specific cross-reference to the detailed requirements of this standard and shall, in addition, include particulars of the following.

- a) Dielectric colour or colours.
- b) Ancillary fitments. (With commoning busbars fitted, the specification requirements can be met, e.g. the required test number of terminations can be fitted as shown in Appendix A.)
- c) The electrical rating of commoning busbars.

Section 3. Type tests

20 Standard test conditions

Unless otherwise specified, the tests shall be carried out under normal atmospheric conditions as follows.

- a) Temperature 20 ± 5 °C.
- b) Relative humidity (r.h.) 45 % to 75 %.
- c) Atmospheric pressure 860 mbar to 1 060 mbar²⁾.

21 Recording of results

Where measurements are required, the precise figures obtained shall be recorded in the type test report.

22 Test specimens

22.1 Selection of specimens. Type approval specimens shall be selected from a batch that has satisfied the routine inspection requirements of section 4. 10 way blocks shall be taken as representative of the size range except that additionally a specimen of the smallest number of ways shall be used for the flammability test described in clause 34.

A difference in terminal form or dielectric material (including colour) shall constitute a change of type and may require separate type tests, at the discretion of the approving authority.

22.2 Sequence of tests. Table 2 shows the number of samples and the sequence in which each sample is to be tested.

22.3 Insulation resistance, high voltage and resistance to fluid tests. Insulation resistance, high voltage and resistance to fluid tests shall be conducted on unwired blocks mounted directly on to a metal plate extending beyond the contour of the block.

22.4 Wiring of specimens. Where tests indicate that electrical connections are to be made, the terminal block shall be mounted directly on to a metal plate extending beyond the contour of the block. The cable loom shall be as described in Appendix A.

22.5 Control samples. A minimum of two specimens from each type test batch shall be identified and stored for record purposes.

23 Voltage proof

Specimens shall be mounted as specified in 22.3. A potential of 2 000 V r.m.s. 50/60 Hz a.c. shall be applied for a period of not less than 5 s between each adjacent pair of terminals and between each terminal and the earth plate. There shall be no audible or visible signs of breakdown of insulation or flashover and the specimen shall subsequently comply with clause 24.

24 Insulation resistance

24.1 Sea level. With specimens mounted as specified in 22.3, apply 500 ± 50 V d.c. between the same test points as specified in clause 23. After 15 s electrification or when a stable reading is reached the insulation resistance shall be measured. The minimum acceptable insulation resistance shall be 200 MΩ between any terminal and earth and 100 MΩ between any pair of adjacent terminals.

24.2 Altitude. The procedure in 24.1 shall be repeated with the specimen mounted in a chamber evacuated to a pressure equivalent to 21 340 m. The acceptable insulation resistance shall be as specified in 24.1.

25 Vibration

25.1 The specimen, when mounted and connected as specified in Appendix A, shall be subjected to vibration tests as described in BS 3G 100-2.3.1. These tests shall be specified for type A equipment, category 5, subject to the conditions given in 25.2 to 25.4.

25.2 The specimen shall be vibrated in three axes as specified in 4.2.1 of BS 3G 100-2.3.1 but for a total period of 60 h, this comprising 20 h testing in each of the three mutually perpendicular axes stated.

²⁾ 1 mbar = 100 N/m² = 0.1 kPa.