

Specification for

50A 650V flameproof, restrained and bolted plugs and sockets for use in coal mines

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Mining and Quarrying Requisites Standards Policy Committee (MQE/-) to Technical Committee MQE/14, upon which the following bodies were represented:

- Association of British Mining Equipment Companies
- British Cable Makers' Confederation
- British Coal Corporation
- Council for Electrical Equipment for Flammable Atmospheres (BEAMA Ltd.)
- Health and Safety Executive
- Institution of Mining Electrical and Mining Mechanical Engineers
- Institution of Mining Engineers
- Rotating Electrical Machines Association (BEAMA Ltd.)
- Transmission and Distribution Association (BEAMA Ltd.)

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Foreword

This revision of BS 5125 has been prepared under the direction of the Mining and Quarrying Requisites Standards Policy Committee. It supersedes BS 5125:1974 which is withdrawn. This revision updates the specification to reflect today's usage of 50 A restrained and bolted plugs and sockets designed primarily for equipment used in mining. Due cognizance has been taken of the relevant requirements of BS 4683-2 and BS 5501-5.

This standard is designed to ensure interchangeability of plugs and sockets of different makes, and to standardize the fixing dimensions of sockets; it specifies some electrical and mechanical requirements but does not purport to provide a fully detailed design.

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. Attention is drawn to the Health and Safety at Work etc. Act 1974, the Mines and Quarries Act 1954, the Regulations made under these Acts, and also any other appropriate statutory requirements or bye-laws. These place responsibility for complying with certain specific safety requirements on the manufacturer and the user. The address of the recognized certification authority in the UK for Group I (coal mining) apparatus for flameproof purposes is as follows.

Health and Safety Executive
HSE (M) Certification Support Unit
Harpur Hill
Buxton
Derbyshire SK17 9JN

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 dimensional and test requirements for 50 A flameproof restrained and bolted plugs and sockets suitable for voltages not exceeding 650 V, primarily intended for use with mining apparatus which is connected to its power supply by means of a flexible cable. These plugs and sockets incorporate three power contacts, one pilot contact for electrical interlocking, and a scraping earthing contact. Provision is also made for cable couplers, to enable lengths of flexible cable to be coupled together.

NOTE 1 The figures in this standard show only those essential features and dimensions for function and interchangeability.

NOTE 2 Appendix A lists the information to be supplied by the purchaser.

NOTE 3 The titles of publications referred to in this standard are listed on the inside back cover.

2 Definitions

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

2.1

plug and socket

a device consisting of two portions having metallic contacts and arranged to engage with each other, so forming a ready means of connecting or disconnecting current-using apparatus to or from the source of electrical supply

2.2

flameproof plug and socket

a plug and socket which, when its parts are properly assembled together with the cable attached, complies with the relevant flameproof requirements

2.3

restrained plug and socket

a plug and socket in which the two portions are engaged, retained and disengaged by means of a screwed union-ring

2.4

bolted cable plug and socket

a plug and socket designed to be held together by two or more bolts or screws, or studs and nuts, in such a way that the plug and socket cannot be disengaged without the use of a tool

2.5

plug

that portion of a plug and socket having contacts consisting of tubes and which is attached to a flexible cable

2.6

socket

that portion of a plug and socket having contacts consisting of pins and which is designed for the insertion and engagement of a plug

2.7

fixed socket

a socket incorporating a flange for attachment to associated apparatus

2.8

coupler socket

a socket which embodies a cable gland for attachment to a flexible cable

2.9

cable coupler

an assembly of a plug and a coupler socket

2.10

scraping earthing contact

a device to ensure electrical continuity of the earthing connection between a plug and socket

2.11

cable gland

a device designed to secure the end of a cable by means appropriate to the type of cable, and which may include provision for making electrical connection to any screen or metallic covering

2.12

closer cap

a cap primarily intended for blanking off motor sockets (see note to clause 10)

3 Metallic components

The material for external components and enclosures shall be one of the following:

- a) a corrosion resistant ferrous alloy;
- b) a non-ferrous metal, other than aluminium, magnesium or titanium;
- c) an alloy containing the metals aluminium, magnesium, titanium, either singly or in combinations, providing that the total content of these three constituents does not exceed 15 % (*m/m*) of the alloy and the combined content of magnesium and titanium does not exceed 6 % (*m/m*) of the alloy.

No component part shall be painted or coated with preparations containing, in metallic form, aluminium, magnesium or titanium.

NOTE These limits have been imposed to avoid the hazards of incendive sparking due to friction between rusted steel or iron and the metals in question.

4 Insulation

4.1 Insulation materials

Properties of materials for electrical insulating components shall comply with Table 1.

4.2 Insulators

Insulators shall be free from voids, cracks and deleterious inclusions and shall comply with 13.8.

5 Contacts

Each plug and socket shall be provided with three power contacts and one auxiliary contact, i.e. contact tubes or contact pins, as appropriate, arranged as shown in Figure 1 to Figure 4.

NOTE Provision for one of the power contacts and/or the pilot contact may be omitted from a bolted socket, subject to compliance with all other requirements of this standard.

6 Terminals

6.1 General

Terminals shall be bored to suit the size of cable to be used and shall be capable of being bored to a maximum diameter of 8 mm. For applications where the cable size is not given, terminals shall be bored to a diameter of 6 mm. Terminals shall be integral with contact tubes and contact pins.

NOTE This does not preclude the use of dissimilar metals for contact and terminals.

Where screws are used as the clamping device on a terminal, not less than two such screws shall be provided and they shall be flat point hexagon socket screws complying with BS 4168.

Each terminal shall provide for the entry of the conductor to a minimum depth of 15 mm.

6.2 Earthing

Earthing terminals shall be provided in the plugs and shall be capable of securely accommodating conductors of 6 mm² to 25 mm² cross-sectional area. Additional terminals shall be provided to accommodate securely any metallic screens.

7 Plug

7.1 Case

The general dimensions of the case of the plug shall be as given in Figure 1 or Figure 3 and Figure 5 or Figure 6 as appropriate. The engaging portion of the case of the plug which protects the contact tubes shall be of metal having a tensile strength of not less than 450 N/mm² when determined in accordance with BS 18.

The remaining portion of the case shall be of metal having a tensile strength of not less than 225 N/mm².

The external surface of the engaging portion of the plug casing shall form part of a scraping earthing contact and shall be electrically continuous with the remainder of the plug casing (see 8.3).

7.2 Contact tubes (power and pilot)

The dimensions of the tubes shall be as shown in Figure 1 or Figure 3 as appropriate, and when assembled they shall be self-adjusting to the extent necessary to accommodate at least the permitted tolerances on position shown in Figure 1 or Figure 3.

Contact tubes shall be of any suitable metal having:

- a hardness of not less than 70 HB when determined in accordance with BS 240;
- a volume resistivity of not more than 11 $\mu\Omega$ cm at a temperature of 20 °C.

Table 1 — Properties of electrical insulating materials

Property	Value	Test method
Electric strength (90 °C)	8 kV/mm (min.)	BS 2782-2, method 220 or 221 ^a
Volume resistivity	$1 \times 10^{13} \Omega \text{ cm}$ (min.)	BS 2782-2, method 230A ^b
Tensile strength	34.5 N/mm ² (min.)	BS 2782-3, method 320D
Flexural strength	60 N/mm ² (min.)	BS 2782-3, method 335A
Impact strength	10 kJ/m ² (min.)	BS 2782-3, method 359
Water absorption ^c	50 mg (max.)	BS 2782-4, method 430A
Comparative tracking index ^c	CTI 400 (min.)	BS 5901
Oxygen index	28 % (min.)	BS 2782-1, method 141
NOTE 1 N/mm ² = 1 MPa. ^a Also numbered BS 903-C4. ^b Also numbered BS 903-C2. ^c Preparatory to any testing for these properties remove not less than 0.5 mm by machining from all the surfaces of the test specimen and then finish smoothly.		

Contact tubes shall make good electrical contact with the pins when the plug is inserted in the socket and shall comply with 13.2, 13.3 and 13.4.

7.3 Cable glands

A cable gland shall be provided, suitable for the size and type of cable to be accommodated, up to a maximum overall diameter of 55 mm. Cable glands shall be of the compression type and shall be provided with the following:

- a) the means to comply with the relevant requirements of BS 5501-5 for flameproof cable entries;
- b) the means to secure the cable;
- c) the means to seal the assembly against ingress of moisture.

Where a pliable wire armoured cable is to be accommodated in the gland, a device shall be provided to clamp the armour wires in such a way that a good electrical connection is made to the casing.

NOTE 1 Where non-metallic screens in direct contact with the earthing conductor are incorporated in a cable, it is not necessary to connect these screens to the additional terminals provided in accordance with 6.2.

NOTE 2 The following types of cable are normally employed:

- a) flexible cable with individually screened power cores;
- b) flexible cable with collectively screened cores;
- c) pliable wire armoured flexible cable with or without individually screened power cores.

NOTE 3 The purchaser should state in the enquiry or order the type of cable to be accommodated in the cable gland (see Appendix A).

8 Socket

8.1 Case

The case of the socket shall be of metal having a tensile strength of not less than 225 N/mm² when determined in accordance with BS 18 and shall have the general dimensions shown in Figure 2 or Figure 4 and Figure 5 or Figure 6 as appropriate.

8.2 Contact pins (power and pilot)

Contact pins shall be solid and of any suitable metal having:

- a) a hardness of not less than 70 HB determined in accordance with BS 240;
- b) a volume resistivity of not more than 11 $\mu\Omega$ cm at a temperature of 20 °C.

Contact pins shall comply with the dimensions in Figure 2 and Figure 4.

8.3 Scraping earthing contact

The earth continuity circuit between a plug and socket shall be made by contact between the external surface of the engaging portion of the plug casing and the internal surface of scraping contacts mechanically attached and electrically connected to the socket casing.

The contact shall comply with 13.9.

The design shall be such that the earthing contact shall be made before the power contact pins and tubes come into contact and shall not be broken until the contact pins and tubes have separated.

9 Retaining device

9.1 Restrained type

Of the two portions, i.e. the plug, and the socket or coupler socket, arranged to engage with each other, the plug shall be provided with an internally threaded union-ring capable of rotating on it but not readily detachable from it, and the socket or the coupler-socket shall be provided with an external thread suitable to take the thread of the screwed union-ring. The construction shall be such that the contact pins and contact tubes of the two portions do not come into contact until the union-ring has at least three threads in engagement.

NOTE The union-ring thus forms an operating and retaining device for engaging and disengaging the two portions. Particulars of the union-ring on the plug and the external threads on the socket are shown in Figure 3 and Figure 4 respectively.

The ring shall be drilled with two 9 mm diameter holes positioned diametrically opposite to each other to enable a padlock to be fitted.

9.2 Bolted type

Both portions arranged to engage with each other shall be provided with an external flange, the plug portion shall have clearance holes and the socket portion tapped holes, suitable for taking securing screws. The external flange of the plug portion shall be provided with the means for shrouding the socket heads of the securing screws. The dimensions of the coupling screws, also the dimensions and positions of the holes and of the means of shrouding, shall be as shown in Figure 1 and Figure 2.

10 Closer cap for bolted socket

The closer cap shall be of metal having a tensile strength of not less than 225 N/mm² when determined in accordance with BS 18 and shall display the following warning note (see also Figure 7).

“WARNING: PINS MAY BE LIVE DUE TO MOTOR ROTATION”