

Specification for

**Protected-type
non-reversible plugs,
socket-outlets
cable-couplers and
appliance-couplers
with earthing
contacts for single
phase a.c. circuits up
to 250 volts**

UDC 621.316.541

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This British Standard, having been approved by the Electrical Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 26 July 1961

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the Committee entrusted with the preparation of this standard:

- Electrical Association for Women
- Fire Offices Committee
- Lloyd's Register of Shipping
- Women's Advisory Committee of the BSI

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First published February 1930
First revision July 1961

The following BSI references relate to the work on this standard:
Committee reference ELE/4, ELE/4/11
Draft for comment CZ(ELE) 3800

ISBN 0 580 00672 7

Amendments issued since publication

Amd. No.	Date of issue	Comments
5664	October 1965	
5743	February 1966	
6384	April 1968	
255	May 1969	Indicated by a sideline in the margin

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Foreword

This standard makes reference to the following British Standards:

BS 1361, *Cartridge-fuses for domestic consumers' units*.

BS 1598, *Ceramic materials for telecommunication and allied purposes*.

BS 2004, *PVC-insulated cables and flexible cords for electric power and lighting*.

BS 3042, *Standard test finger (for checking protection against electric shock)*.

For some time there has been a general recognition, on the part of manufacturers and users alike, that revision of BS 196 was necessary to meet the ever extending demands of industry.

This revised edition has been prepared in order to include all known requirements and such revisions of text as were deemed necessary. Also the alternative non-reversibility feature included in Appendix I of the previous issue has been incorporated as an essential feature to meet modern regulations.

Other British Standards for plugs and socket-outlets for electric power supply are:

BS 74, *Charging plugs-and-sockets for electric battery vehicles*.

BS 279, *100-ampere flameproof plugs and sockets (restrained type)*.

BS 546, *Two-pole and earthing-pin plugs, socket-outlets and socket-outlet adaptors*.

BS 1363, *Two-pole and earthing-pin fused-plugs and shuttered socket-outlets for a.c. circuits up to 250 volts*.

BS 1395, *30-ampere flameproof plugs-and-sockets and cable-couplers*.

BS 1778, *15-ampere three-pin plugs, socket-outlets and connectors (theatre type)*.

BS 3214, *Plugs and locking sockets for electric battery vehicles and trucks*.

NOTE Where metric equivalents are stated, the values in British units are to be regarded as the standard. The metric conversions are approximate. More accurate conversions should be based on BS 350, "Conversion factors and tables".

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 54 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.

Section 1. General

1 Scope

This specification relates to non-reversible plugs and sockets with scraping earthing contacts for use in single-phase a.c. circuits of voltages not greater than 250 V. It does not specify a fully detailed design, but it prescribes the dimensions necessary to ensure interchangeability and non-interchangeability, when required, of complete plugs in complete sockets of different makes. The two types detailed are as follows:

- a) Two-pole.
- b) Two-pole and pilot contact.

Either of the two types can be fitted with screwed clamping rings (for weatherproof enclosure).

Either of the two types may or may not be provided with keys and keyways to ensure non-interchangeability where this is necessary.

Either of the two types may or may not be fused (single or double pole). For fused plugs either fuse pins or fuses mounted in the body of the plug may be used. Details are given of the essential dimensions of fuse pins where these are used.

NOTE 1 The construction of plugs with fuse pins and the use of such plugs with socket-outlets are the subject of British patents.

NOTE 2 The scraping earthing contacts are omitted in the circumstances stated in Appendix A for 6 and 12 volt supplies.

NOTE 3 The plugs and socket-outlets may be used on d.c. circuits in circumstances where they are not required to interrupt the current.

2 Definitions

For the purposes of this British Standard the following definitions apply. Figure 1 illustrates the use of the devices defined in a) to g).

- a) *Socket-outlet*, a device with protected current-carrying contact tubes, intended to be mounted in a fixed position and permanently connected to the electricity supply installation, to enable the connection to it of a flexible cord or cable by means of a *plug*.
- b) *Plug*, a device intended for connection to a flexible cord or cable which can be engaged manually with a *socket-outlet* or *connector* and which has current-carrying contact pins which may be exposed when not engaged.
- c) *Connector*, a device intended for connection to a flexible cord or cable, which has protected current-carrying contact tubes similar to those of a *socket-outlet*.

d) *Appliance inlet*, a device fixed to an appliance which has current-carrying contact pins similar to those of a *plug*, with which a suitable *connector* can be engaged manually to provide a supply of electricity to the appliance.

e) A “*plug and socket-outlet*” consists of items a) and b) and enables a flexible cord or cable to be manually connected to the electricity supply.

f) A *cable-coupler* consists of a *plug* and a *connector* and enables two flexible cords or cables to be manually connected.

g) An *appliance-coupler* consists of a *connector* and an *appliance inlet* and enables an appliance to be manually connected to a flexible cord or cable.

h) An *interlock* is a device either electrical or mechanical which prevents the contacts of a plug becoming live prematurely while it is being engaged with a *socket-outlet* or *connector* and which prevents a *plug* from being withdrawn while its contacts are live.

j) “*Protected*” plugs, socket-outlets etc., are devices in which accidental contact cannot be made with the socket contact tubes when the plug is out of engagement or with the current carrying contact pins of the plug while the plug is being inserted into the socket or is in complete engagement. The operator’s hand is also shielded during insertion or withdrawal of the plug.

k) *Cartridge fuse-link* (or fuse-link), a cartridge containing a fuse element.

l) *Fuse pin*, a cartridge fuse-link made in the form of a plug contact pin.

m) *Fusing-factor* (of a fuse-link or fuse pin). The ratio of the minimum fusing current to the normal current rating, namely:

$$\frac{\text{Minimum fusing current}}{\text{Normal current rating}}$$

n) *Prospective current* (of a circuit), the r.m.s. value of the alternating current that would flow on the making of the circuit when the circuit is equipped for the insertion of a fuse pin or link, but the fuse pin or link is replaced by a link of negligible impedance.

o) *Breaking capacity* (of a fuse-link or fuse pin), a prospective current stated by the manufacturer as the greatest prospective current that may be associated with the fuse-link or fuse pin when mounted in the plug as in service.

p) *Type test*, a test of an article intended to show that all other articles made to the same design would (or would not) pass an identical test.

q) *Routine test*, a test of every article in a batch.

r) *Sampling test*, a test of each of a relatively small number of articles selected from a batch intended to show that other articles of the same batch would (or would not) pass an identical test.

Section 2. Requirements

3 Application

The provisions of this specification shall apply to plug and socket-outlets, appliance-couplers and cable-couplers as correctly installed and connected for normal use.

4 Interchangeability

Plug and socket-outlets, appliance-couplers and cable-couplers shall be tested for dimensional interchangeability in accordance with Clause 25.

5 Non-interchangeability

In order to prevent undesirable interchangeability between accessories covered by this specification, use shall be made of differences in the size of the casings and in the size and position of the pins and of keys and keyways both in plugs and sockets to ensure that:

- a) Socket-outlets or connectors will not accept plugs or appliance-inlets of greater current rating or with a different arrangement of contacts.
- b) Socket-outlets or connectors will not accept plugs or appliance-inlets intended for use with a different voltage or a different frequency of supply.
- c) Socket-outlets requiring fused-plugs shall not accept unfused plugs; moreover, they shall only accept either single-pole or double-pole fused plugs according to the requirements of the installation.

Compliance with 5 b) and 5 c) is effected by the use of keys and keyways. Essential dimensions for plug keys and socket keyways are shown in Figure 6 and Figure 7, and essential dimensions for socket keys and plug keyways are shown in Figure 8 and Figure 9. Standard key and keyway positions at 15° intervals are indicated in Figure 10.

Plug and socket keys shall have adequate strength and be able to withstand a shearing load of not less than the values quoted in Figure 6, Figure 7, Figure 8 and Figure 9.

Each key and keyway position or combination of positions is intended to be used for the particular duty stated in Appendix A.

6 Rated voltage

The maximum rated voltage shall be 250 volts a.c. single phase.

7 Rated current

The rated current of the plugs, socket-outlets, cable-couplers and appliance-couplers shall be 5, 15 or 30 amperes.

8 Materials

Parts made of ferrous metals shall be treated to make them rust-resisting.
Casings shall be of metal or insulating material, tough, non-hygroscopic, resistant to heat and to corrosion and which will not soften at the maximum working temperature, nor be liable to become brittle.
Insulation shall be of ceramic or plastics material, tough, non-hygroscopic resistant to heat and which will not soften at the maximum working temperature.
Current-carrying parts and terminals shall be of brass, phosphor bronze and/or other suitable material.

NOTE Attention is drawn to the following British Standards:
BS 771, *Phenolic moulding materials*.
BS 1322, *Aminoplastic moulding materials*.
BS 1598, *Ceramic materials for telecommunication and allied purposes*.
BS 2906, *Aminoplastic mouldings*.
BS 2907, *Phenolic mouldings*.

9 Methods of entry of flexible cord or cable

Plugs and connectors shall be provided with cable-glands which shall be capable of accepting and securely gripping the flexible cords and flexible cables, and the metallic screening if included, in order to prevent any stress on the connections to the terminals.
Unless otherwise specified, the gland shall be suitable for unscreened, unarmoured cable of outside diameter between the limits given in the following table:

Table 1

Current rating of plug or connector	Diameter of cable	
	in	mm
5	1/4 – 3/8	6.35 – 9.52
15	1/4 – 7/16	6.35 – 11.11
30	5/16 – 3/4	7.94 – 19.05

Provision shall be made at the point of entry to ensure that no acute bending of the cable is possible. A hand-grip or other substantial means shall be provided for withdrawing the plug or connector. Cable glands shall give the same degree of protection as the accessories themselves, e.g. weatherproof plugs and connectors shall have weatherproof glands for the range of cable sizes intended to be used. Tests for cable entries are given in Clause 34.

10 Earthing of metal parts

The earth continuity circuit between a plug or an appliance inlet and its corresponding socket-outlet or connector shall be made by contact between the interior face of the plug casing or appliance inlet casing and scraping contacts on the corresponding socket-outlet or connector. This circuit shall be made before the current-carrying plug pins make contact with the corresponding socket contact tubes and be broken after the current-carrying plug pins break contact.

All metal parts of a plug or appliance inlet, other than live parts, shall be in effective electrical contact with the scraping-earthing contacts when the plug or appliance-inlet is in engagement with a corresponding socket-outlet or connector.

All metal parts of a socket-outlet or connector other than live parts shall be in effective electrical contact with the scraping-earthing contacts.

An earthing terminal shall be provided on all accessories.

11 Pilot contacts

The pilot circuit, where such is employed, between a plug or an appliance inlet and its corresponding socket-outlet or connector shall be made by contact between a pin contact of the plug or appliance-inlet, of the section shown in Figure 4 and a tube contact in the socket-outlet or connector protected by insulating material as shown in Figure 5. The pilot pin and tube contacts shall be such as to make contact after and break contact before the main current-carrying contacts. The pilot contacts shall be rated to carry five amperes at 110 volts maximum to earth.

12 Creepage distances and clearances

The minimum clearance in air shall be $\frac{3}{16}$ in (4.76 mm) and the minimum creepage distances shall be $\frac{3}{8}$ in (9.52 mm) between any pair of current-carrying parts and $\frac{1}{4}$ in (6.35 mm) between current-carrying and other metal parts.

13 Enclosure of terminals and separation of conductors

Terminals of plugs, socket-outlets, appliance-couplers and cable-couplers shall be effectively enclosed. Insulating barriers securely fixed to, or forming an integral part of the interiors, shall be provided to separate internal metal at different potential including any bared flexible conductors, even if such conductors should become detached from their terminals.

Section 3. Construction of plugs and appliance inlets

14 Casing

Each plug and appliance inlet shall be provided with a cylindrical casing, the internal surface of which shall be arranged to form the scraping-earthing contact of the plug or appliance inlet. The essential dimensions of the casings are shown in Figure 2 and Figure 4.

15 Contact pins (other than fuse pins)

The contact pins of plugs and appliance inlets shall not be slotted and shall be independently fixed in the base of insulating material.

Each contact pin and the fixed part of its terminal shall be formed in one piece.

The essential dimensions of the contact pins are shown in Figure 2 and Figure 4.

16 Terminals (including earthing terminals)

Each terminal shall be so designed that all the cable strands can be effectively clamped so that a permanently efficient electrical connection is obtained without any damage to the conductors and without any risk of the strands working loose.

When sleeve or pillar type terminals are used they shall comply with the following requirements:

- dimensions in accordance with Figure 2 and Figure 4,
- the cable clamping screws shall be long enough to reach the opposite surface of the cable hole, and shall have rounded ends,
- the diameter of the clamping screws shall not be less than 75 per cent of the diameter of the cable hole,
- the surface of the cable hole against which the cable is clamped shall be smooth and unbroken, and

e) the end of the cable shall pass through the cable hole beyond the threaded hole for a distance at least equal to half the diameter of the clamping screws or $\frac{1}{16}$ in (1.6 mm) whichever is the greater.

Where terminals are not of the pillar or sleeve type, means shall be provided, suitable for repeated use, to prevent spreading of the conductor strands.

An earthing terminal shall be provided and be so arranged that the earth wire of the cable, if any, is visible at least when the plug is removed from the corresponding socket-outlet or connector, and when the connector is removed from the corresponding appliance inlet.

17 Fused plugs

Provision shall be made for plugs, when required, to be either single or double pole fused by means of fuses mounted in the body of the plug or by means of fuse pins.

Fused plugs shall be provided with keyways with the essential dimensions as specified in Figure 8 and Figure 9. Recommendations for the positions of a plug key to be used if required for discrimination between single-pole fused and double-pole fused plugs are given in Appendix A.

It shall not be possible to replace a cartridge fuse-link or a fuse pin in a plug unless the plug is completely withdrawn from the socket-outlet.

- a) *Plugs with fuse-links mounted in the body of the plug.* Fuse-links shall comply with the requirements of BS 1361, “Cartridge fuses for domestic consumers units”, in regard to dimensions and electrical performance for appropriate current ratings.
- b) *Plugs with fuse pins.* Fuse pins shall comply with the dimensions shown in Figure 12. Means shall be provided to prevent a fuse pin working loose under normal service conditions. Unfused pins shall not be removable.

Fuse pins shall be so constructed that they will withstand without damage, the mechanical stresses due to their repeated insertion into and removal from their respective socket contacts and shall comply with the tests specified in Clause 33. The insulating tube forming the barrel of the fuse pin shall be manufactured from material having:

- i) a tensile strength of not less than 20 000 lb per square inch (1 400 kg/cm²),
- ii) a cross breaking strength of not less than 40 000 lb per square inch (2 800 kg/cm²), when tested in accordance with BS 1598.

The electrical performance of fuse pins shall be as follows when mounted in the plug and with the plug mounted in the socket:

- i) fusing factor not more than 1.6 (see Clause 35),
- ii) capable of opening circuits having values of prospective currents between minimum fusing currents and 16 500 amperes at a lagging power factor not greater than 0.3 (category of duty AC3).

Each type of fuse having the same physical dimension shall be available with the standard current ratings given in the following table and shall have the same performance:

Table 2

Current rating of plug	Fuse rating
amperes	amperes
5	2, 5,
15	2, 5, 10, 15
30	10, 15, 20, 30

18 Screwed clamping rings for weatherproof accessories

Screwed clamping rings for use where weatherproof protection is required shall be provided. The essential dimensions of the rings are given in Figure 13.

In order to provide for plugs required for use with weatherproof socket-outlets and connectors complying with the previous edition of this standard (BS 196:1930) a design for the screwed clamping ring required is included in the present edition, and details are shown in Figure 14.

There shall be nothing to prevent plugs without rings being used with sockets having threaded portions and *vice versa*.

Section 4. Construction of socket-outlets and connectors

19 Casing

Each socket shall be provided with a casing the front portion of which shall form or have mechanically attached to it, a rubbing or scraping-earthing-contact so designed as to engage with the internal surface of the earthing-contact of the plug. The earthing-contact thereby made shall be no less effective than that between a current-carrying pin and its contact.

The essential dimensions of the casing are shown in Figure 3 and Figure 5.

20 Socket outlets and connector contacts

Socket-outlet and connector contact tubes shall be so shaped as to provide an easy entry for corresponding contact pins. Contact tubes shall be self-adjusting as to pitch and contact-making and each contact shall make and maintain under normal service conditions satisfactory electrical and mechanical contact with its corresponding pin. The means for producing the contact pressure shall be associated with each contact tube independently. The essential dimension of the contacts are shown in Figure 3 and Figure 5.

Each socket-contact shall be provided with a substantial terminal that cannot work loose under normal service conditions.

21 Terminals (including earthing terminals)

Each terminal shall provide for effectively clamping and securing its conductor so that an efficient electrical connection is permanently maintained.

When sleeve or pillar type terminals are used, they shall have the minimum dimensions shown in Figure 3 and Figure 5 and shall comply with other requirements specified in the second and third paragraphs of Clause 16.

An earthing terminal shall be provided and be so arranged that the earth wire of the cable, if any, is visible at least when the plug or appliance inlet is removed from the corresponding socket-outlet or connector. A second earthing terminal is to be provided inside the casing of the socket-outlets, which need not be visible.

22 Socket-outlets for use on ring and looped circuits

Socket-outlets for use on ring and looped circuits shall not accept unfused plugs.

The casing of socket-outlets for use on single-pole fused or double-pole fused circuits shall be provided with two keys and if required a keyway having the essential dimensions given in Figure 6 and Figure 8 or Figure 7 and Figure 9, and the recommended positions in Appendix A and Figure 10 and Figure 11.

Terminals of such sockets shall be large enough to permit "looping-in" of two cables of the corresponding rating, as given in Table 12 of the IEE Regulations for the Electrical Equipment of Buildings (13th Edition, 1958). The dimensions for sleeve or pillar type terminals shown in Figure 3 and Figure 5 are adequate for this requirement.

23 Screwed rings for weatherproof accessories

The connector or socket-outlet casing shall be threaded for use with the corresponding screwed rings fitted to plugs and appliance inlets. The essential dimensions of the thread are given in Figure 13.

If socket-outlets or connectors of the type complying with the previous edition of this standard (BS 196:1930) are required, the casing shall be threaded as shown in Figure 14.

As an alternative, a separate screwed ring can be fitted to the socket-outlet and the connector providing all other conditions of this specification are met.

Section 5. Tests

24 Tests

The tests specified in Clauses 25 to 29 shall be sampling tests, and the tests specified in Clauses 30 to 41 shall be type tests. The test of Clause 33 b) may, if required, be included in the sampling tests.

The purchaser shall accept certificates of type tests as evidence of compliance with the requirements of this British Standard, and the manufacturers shall hold available such certificates together with detail drawings and a record of any alterations that have been made subsequent to the type test. Type tests may be made by the manufacturer or by a recognized authority. The plugs and sockets used for the test shall be identical in all essential details with those to be used in service.

25 Interchangeability

Plugs and sockets shall be tested for interchangeability by means of the gauges as detailed in the Appendix B, and compliance with the gauges shall be deemed to prove accuracy in respect of the relevant dimensions.

26 Effectiveness of contact

Each socket contact assembled in a complete socket-outlet or connector and the scraping-earthing contact, shall be subject to a withdrawal pull test using a minimum diameter contact pin and a plug casing with the internal scraping-earthing surface at maximum diameter. The withdrawal pull values shall be as given in Table 2A.

Table 2A

Current rating	Minimum withdrawal pull	
	ounces-force	newtons
5	8	2.2
15	12	3.3
30	24	6.7

A test shall also be made to check the sequence of contact making using the circuits shown in Figure 24. When the gauge is slowly inserted into the socket and is then withdrawn the sequence of operation of the lamp or bell indicators shall show a) that the scraping-earth contact is made before and broken after the current-carrying contacts, and b) that the pilot contact, when fitted, is made after and broken before the current-carrying contacts.

27 Test of enclosure for weatherproof models

Plugs and sockets shall be tested for weatherproofness by testing sockets and plugs in full engagement with each other, mounted horizontally with the visible earthing-terminals (if any) uppermost. Each plug shall be wired with flexible cord or flexible cable of the smallest appropriate size (see Table 4), and when it is in full engagement with a socket, they shall be subjected to artificial rain in the form of a finely-divided and reasonably uniform spray, applied at an angle of about 45° to the vertical for 2 minutes (1 minute in each of two directions at right-angles) at the rate of approximately 0.2 inch (5 mm) per minute as measured by a rain-gauge or other equivalent means. No water shall penetrate to the interior of the socket or of the plug.

28 Humidity and insulation-resistance test

Plugs and sockets, appliance inlets and connectors shall be proof against humid conditions which may occur in normal use.

This test is carried out in a humidity cabinet containing air with a relative humidity maintained between 93 and 95 per cent. The temperature of the air at all positions where samples can be placed is kept within 1 deg C (1.8 deg F) of any convenient value between 20 and 30 °C (68 and 86 °F).

The samples are kept in the cabinet for 2 days (48 hours).

After this treatment, the samples shall show no damage within the meaning of the specification and shall pass an insulation-resistance test before being subjected to a high-voltage flash-test as required in Clause 29. The insulation resistance shall be not less than 5 megohms, and the test shall be made at approximately 500 volts d.c. applied for sufficient time for the reading of the measuring-instrument to become steady, the test supply being obtained from an independent source or generated in the measuring-instrument. The insulation resistance shall be measured:

- a) between line and neutral terminals,
- b) between line and neutral terminals connected together and any other metal parts insulated therefrom, and,
- c) between the pilot contact (when fitted) and any other metal parts insulated therefrom.

29 High-voltage test

Plugs and sockets shall be capable of passing a high-voltage test, for which the test-voltage shall be alternating approximately 2 000 volts r.m.s. of sine-wave form and of a frequency of approximately 50 cycles per second and shall be applied for not less than 1 minute

- a) between line and neutral terminals,
- b) between line and neutral terminals connected together and any other metal parts insulated therefrom, and,
- c) between the pilot contact (when fitted) and any other metal parts insulated therefrom.

30 Temperature-rise test

Unfused and fused plugs shall be tested in socket-outlets or connectors for temperature-rise at their rated current. The temperature-rise of any terminal shall not exceed 35 deg (63 deg F) after one hour. The fused plugs shall be double pole fused during this test with fuse pins to this specification or links to BS 1361, of rating equal to the plug. The scraping-earthing connection shall not be loaded during this test but the pilot pin (if any) shall carry a load of 5-amperes. There shall be at least a yard (0.9 metres) of cable connected to each terminal of rating not less than that of the nominal rating of the contacts: cable connections for sockets shall be as specified in Table 12 and cable connections for plugs shall be as specified in Tables 26 and 27 of the IEE Regulations (13th Edition, 1958).

The temperature-rise shall be measured by thermocouples attached by low melting point alloy or by some equally effective means of attachment.

Plugs and sockets shall be mounted and connected as in normal use for this test. The ambient air shall not exceed 35 °C (95 °F) average temperature or 40 °C (104 °F) peak temperature.

31 Test for resistance to heat

Plugs and sockets shall be tested for resistance to heat by keeping them for a period of one hour in a test chamber where a temperature of 100 °C $\pm$ 5 °C (212° $\pm$ 9 °F) is maintained.

The sample shall be examined after the test and shall not have suffered any deterioration likely to impair its further use. Sealing compound (if any) must not have run to such an extent that live parts are exposed, but small displacement is permissible.

32 Test for current-breaking capacity of contacts

Plugs and sockets shall be capable of breaking fifty times a current twenty-five per cent in excess of their rated current, when tested in an a.c. circuit at 275 volts with a power factor of between 0.6 and 0.65 lagging.

The test shall be made at a rate of 7.5 strokes per minute, each stroke consisting of one insertion and one withdrawal, with the socket outlet mounted and connected as in service, including an earthing connection and pilot connection, if any.

During the test no permanent arcing shall occur.

After the test, the samples shall not show any wear, impairing their further operation and the entry holes for the pins shall not show any serious damage.

33 Test for mechanical strength of fuse-pins

(It is optional for fused-plugs to be made with fuse-pins or with fuse links in the body of the plug — see Clause 17).

a) A fuse pin of each rating shall be tested when mounted in a plug by repeated insertion into and withdrawal from the corresponding socket, with no current flowing, for a total of 5 000 cycles, each consisting of one insertion and withdrawal. The test shall be carried out at a steady rate not exceeding 20 cycles per minute, the speed being approximately 6 inches (150 mm) per second both during insertion and during withdrawal.

After this test the plug and socket shall show no wear likely to affect its performance.

b) To ensure that the end-caps are securely fixed, every fuse pin shall withstand without damage a test consisting of an impulsive axial pull, applied once only, of the value given in the following table, $\pm$ 2 per cent.

Table 3

Current rating	Test pull	
	lbf	newtons
5	60	267
15	120	534
30	120	534

The method of applying the test is shown in Figure 16. The axial pull is applied by means of a supplementary weight equal to ten per cent of the test pull as tabulated above, arranged to fall through a height of six inches (150 mm) on to a principal weight, including the weight of the fuse pin, equal to ninety per cent of the value of the pull. The clamps holding the fuse pin shall be so arranged that with the pin held vertically, the pull is applied along the axis of the pin. The two clamps shall be sufficiently rigid to ensure reasonably equal pressure over at least half the circumference of each end-cap.

34 Cable grip test

A length of about one yard (0.9 metres) of flexible cord of a standard type and of each of the approximate sizes shown in Table 4 shall be inserted into the plug or connector as in service, except that the conductors shall not be connected to the terminals and the plug or connector shall be so mounted that the flexible cable hangs vertically downwards and is axial to the cable grip.

A weight of 28 lb (12.7 kg) shall be suspended from a loop at the free end of the flexible cable for at least five minutes, and at the end of this time, the flexible cable shall not have moved noticeably in the cable-grip.

35 Tests for minimum fusing-current

Fuse pins shall be tested for minimum fusing-current under the conditions of normal service with the plug inserted in its appropriate socket (see Clause 17).

For each fuse pin, two currents shall be determined, one of which is 90 per cent of the other, at the larger of which the fuse-element shall melt within the appropriate time indicated in Table 5 and at the smaller of which the fuse element shall not melt within that time. The minimum fusing-current shall be deemed to be the arithmetical mean of the two currents so determined.

Table 4

Current rating of plug or connector	^a Approximate diameter of cable to be gripped			
	2 pole		2 pole and pilot	
amperes	in	mm	in	mm
5	0.28	7.11	0.35	8.89
	0.35	8.89	0.45	11.43
15	0.32	8.13	0.45	11.43
	0.40	10.16	0.55	13.97
30	0.45	11.43	0.55	13.97
	0.55	13.97	0.65	16.51

^a The cable sizes are within the range given in Clause 9 and cover typical types in BS 2004, "PVC-insulated cables and flexible cords for electric power and lighting".

For the purpose of this test, two completely identical fuse-pins or sets of fuse-pins shall be provided, one for use in ascertaining the larger current and one for use in ascertaining the smaller current. At the beginning of each test, the fuse pins and the conductors connected to them shall be approximately at the ambient temperature.

The appropriate duration of a test of minimum fusing-current shall depend on the current rating of the fuse pins, and shall be as stated in Table 5.

Table 5

Current rating of fully wired fuse pins	Appropriate duration of test for minimum fusing current
amperes	hours
5	0.75
15	1.00
30	1.25

36 Tests to determine current-breaking capacity of fuse pin

Fuse pins shall operate satisfactorily in a circuit adjusted for a prospective current having any value from the breaking capacity rating down to the minimum fusing-current.

Twelve fuse pins shall be tested, singly in a single phase a.c. circuit at not less than 250 volts 50 cycles, six at a prospective current of 16 500 amperes at a power-factor not greater than 0.3 lagging and six at prospective currents (not less than the minimum fusing-current) up to five times the minimum fusing-current at the same lagging power-factor.

If in each physical size i.e., 5A, 15A and 30A, the fuse pin with current rating of that size is satisfactory then the fuse pins with lower current rating in the size shall also be deemed satisfactory, providing that they are of the same material and general construction. Fuse pins are to be tested in plugs inserted in sockets as in service.

The fuse pins shall be deemed to be satisfactory if:

- there is no ignition or physical damage of the fuse pins or neighbouring parts.
- the insulation resistance between the terminals is not less than 100 000 ohms, measured at 500 volts immediately after the test.

37 Test for mechanical strength of plugs and connectors

A cable 7 feet (2.13 m) long of the diameter specified in Clause 34 for the rating of the plug or connector is connected to the sample for test. The free end of the cable is fixed to a wall at a height of approximately 2½ ft (0.76 m) (see Figure 15). The sample is held so that the cable is horizontal and it is then allowed to fall onto a concrete floor. This test is repeated eight times, each time rotating the cable through 45° at its fixing.

After the test, the sample shall show no serious damage within the meaning of the specification; in particular, no part shall have loosened.

Small chips and dents can be ignored if they do not adversely affect the protection against electric shock.

38 Withdrawal pull test for socket-outlets and plugs, and connectors and appliance inlets

The value of the withdrawal pull is checked by means of test plugs and shall be within the limits stated in Table 6.

Table 6

Current rating	Withdrawal force minimum		Withdrawal force maximum	
	lbf	N	lbf	N
amperes				
5	2	8.9	10	44.5
15	4	17.8	15	66.8
30	4	17.8	25	111.2

The sample is mounted on a horizontal surface with the contact openings downwards. The test plug is inserted in the sample as shown in Figure 17.

For the verification of the upper limit of the withdrawal force, a principal weight and supplementary weight are used. The supplementary weight is equal to one-tenth of the principal weight, and the sum of the principal weight, the supplementary weight and the test plug is equal to the maximum withdrawal force shown in the table. The principal weight is hung on without jolting the test plug. To overcome the effects of static friction, the supplementary weight is allowed to fall from a height of 2.0 m (51 mm) onto the principal weight. The plug shall come out.

For the verification of the lower limit of the withdrawal force, a single weight is used. This weight is equal to the difference between the minimum withdrawal force shown in the table, and the weight of the test plug.

The plug shall *not* come out.

39 Test for protection against electric shock

Accessories shall be so designed that live parts of socket-outlets and connectors installed as in service, and live parts of plugs and appliance inlets when in partial or complete engagement with the complementary accessories are inaccessible.

The standard test finger to BS 3042 is applied in every possible position, an electrical indicator being used to show contact with live parts.

It is recommended that a lamp be used for the indication of contact and that the voltage be not less than 40 V.

Conformity to the dimensions specified ensures compliance with the requirements regarding non-accessibility when engaging a plug or appliance inlet with the complementary accessories.

40 Impact tests for socket-outlets and appliance inlets

Tests are under consideration.

41 Tracking test

A test is under consideration.

Section 6. Marking

42 Marking of plugs and sockets

All plugs, socket-outlets, connectors and appliance inlets shall be clearly and indelibly marked with:

- The number and date of this British Standard, i.e., BS 196:1961¹⁾.
- The manufacturer's name or trade mark.
- The voltage and current ratings in V and A.
- Code letters according to the type and key position, see Appendix A.

Loose removable labels are not allowed.

Items c) and d) shall be visible after installation.

Item c) shall not appear on a removable portion such as a hinged cover.

NOTE For information to be given with enquiry or order, see Appendix C.

43 Marking of terminals

The letters L and N shall be used to mark the line and neutral terminals respectively of plugs and sockets. Earth terminals shall be marked with the symbol $\perp$ and if practicable, should be accompanied by the letter E.

The pilot terminals shall be marked P.

All markings shall be placed on or as close as practicable to the corresponding terminals and only on parts which cannot be removed without the use of tools, and shall be such as to remain legible during the normal life of the accessory.

¹⁾ The mark BS 196 on the product is an indication that it purports to comply with the requirements of this British Standard. The British Standards Institution is the owner of the registered certification trade mark shown below. The presence of this certification mark on a product is an additional and independent assurance that the product does in fact comply with the requirements of the relevant British Standard. This certification mark may be used by the manufacturer only under licence from the BSI and particulars of the conditions under which licences are granted may be obtained from the Director, the British Standards Institution, 2 Park Street, London, W.1.



Appendix A Plug and socket key and keyway positions for non-interchangeability

(See Section 2, Clause 5)

It is recommended that as far as possible all users of plug and socket outlets, cable and appliance-couplers to BS 196, with or without pilot contacts, should employ keys and keyways in the same angular positions in plugs and sockets of all types and ratings including those with and without pilot contacts to carry out the same discrimination. Cases frequently arise in which the same portable electric appliances are used, for instance by contracting firms, in different users' works. Safety in the use of such appliances would be considerably easier to achieve if all users were to use keys and keyways in the same positions to ensure the same conditions of supply or application.

Pairs of keys in plugs with corresponding keyways in the sockets have already been widely used for voltage discrimination.

It is recommended that this practice shall be extended to cover frequency as well as voltage discrimination, in other words "supply discrimination", by employing, if necessary, more than two keys in one plug, and that keys in plugs shall be confined to this service.

Pairs of keys in sockets with corresponding keyways in the plugs have already been used to prevent sockets requiring fused plugs from accepting unfused plugs. Some users may also require to prevent certain sockets from accepting plugs connected to appliances which for some reason must not be supplied from those sockets, for instance it may be required to keep certain sockets for feeding instruments only. Such requirements may be classed as "application discrimination" and it is recommended that the use of keys in sockets shall be confined to this service.

There remains one discrimination service which might be considered under either heading, namely discrimination between single and double pole fused plugs. Although many users will employ both types of plugs in one Works it is unlikely that they will both be employed on systems having the same voltage and frequency and discrimination will therefore be obtained with the existing plug keys. To meet the somewhat rare cases in which this discrimination is required between systems having the same voltage and frequency, but different systems of earthing, it is essential for a plug key to be employed, not a socket key and it must therefore be classed as "supply discrimination". It is found that a single plug key is sufficient and therefore one single key position is allocated to single pole and another to double pole fused plugs. The use of these two keys for this service is only required if the different systems have the same voltage and frequency.

Discrimination is commonly required between the following voltages:

6, 12, 25, 50, 110, 250

and between d.c. and a.c. at 50 cycles/second and one other frequency.

It is therefore expected that the needs of most users will be met if "supply discrimination" can be obtained between six different voltages, two different frequencies and d.c., any voltage being associated with either frequency or d.c.

All those voltages and frequencies are catered for by following the recommendations below, leaving two spare key positions. The 6 and 12 volt keys would not allow a scraping earth in the normal position, but it is thought that the earth connection will rarely be required for 6 or 12 volts.

The minimum practicable angular spacing for plug and for socket keys is 15°, and keys and keyways cannot occupy the same position at the same time in the same part. Also when a scraping earth is used, neither a key or a keyway can overlap the scraping earthing contact. The detailed Schedule opposite is derived from the above considerations.

It will be noted from the Schedule that the type with no keys or keyways as in the first edition of BS 196 is allocated to a 250 volt 50 c/s supply. For other cases of 50 c/s there will be two keyways in the socket outlet at 180° spacing and these are arranged at different orientations to give voltage discrimination. In cases of other frequencies or d.c., the two keyways at 180° spacing are used for the frequency discrimination and a third keyway is used for voltage discrimination.

The code letters for describing each key combination are built up logically as shown in the diagram. Plugs and sockets should only be used for the purposes indicated by their code marking and by the Schedule.

To secure non-interchangeability for systems not included in the Schedule, other combinations of keys and keyways may be used.

In all cases the code letters should be indelibly marked on the accessory [see Clause 42 d)].

Schedule of key and keyway combinations
(See Figure 10)

Socket-outlet or connector

Voltage	Frequency	Keyway 1	Keyway 2	Keyway 3	Earth	Code
6	50	None	105°	285°	None	VH
12	50	None	75°	255°	None	FT
25	50	None	0°	180°	Yes	AN
50	50	None	135°	315°	Yes	XK
110	50	None	45°	225°	Yes	DR
^a 250	50	None	30°	210°	Yes	CQ
^b 250	50	None	None	None	Yes	None
6	Other than 50 (e.g. 60)	285°	120°	300°	None	VJW
12	Other than 50 (e.g. 60)	75°	120°	300°	None	FJW
25	Other than 50 (e.g. 60)	0°	120°	300°	Yes	AJW
50	Other than 50 (e.g. 60)	315°	120°	300°	Yes	XJW
110	Other than 50 (e.g. 60)	45°	120°	300°	Yes	DJW
250	Other than 50 (e.g. 60)	30°	120°	300°	Yes	CJW
6	d.c.	285°	60°	240°	None	VES
12	d.c.	75°	60°	240°	None	FES
25	d.c.	0°	60°	240°	Yes	AES
50	d.c.	315°	60°	240°	Yes	XES
110	d.c.	45°	60°	240°	Yes	DES
250	d.c.	30°	60°	240°	Yes	CES
Spare (keyways)			90°	270°	None	GU

^a Included for situations where complete non-interchangeability is essential.
^b Original design to BS 196 (1930).

The following keyway positions are required only where two systems having the same voltage and frequency but different systems of earthing are employed in the same works.

Application	Keyway	Earth	Code
For use with single-pole fused plugs (Non-interchangeable with double-pole-fused plugs)	15°	Yes	B
For use with double-pole-fused plugs (Non-interchangeable with single-pole-fused plugs)	195°	Yes	P

The corresponding key positions of the plug or appliance inlet when looked at from the front are the opposite to those shown above and in Figure 9.

For diagrammatic examples of key and keyway combinations, see Figure 10.

Appendix B Gauges

The gauges specified in this Appendix are designed to test plugs, socket-outlets, connectors and appliance inlets of the dimensions stated in Figure 2 to Figure 9 and in the corresponding tables. Figure 18 to Figure 35 show the essential features and dimensions of the gauges. The details of their construction are left to the Gauge Manufacturers. All working surfaces of gauges shall be hardened. Each gauge shall be marked with:

- 1) The number and date of this British Standard (BS 196:1961).
- 2) The manufacturer's name or trade mark.
- 3) An identification number (i.e., the figure number as given in the specification).
- 4) The year of manufacture.

The number of gauges required may be limited by making the same gauge suitable for checking a number of different key and keyway positions.

Figure 18 and Figure 19. *GO gauges for plugs with and without pilot contacts.*

These gauges are made to the lower limit of the dimension A, of Figure 2 and Figure 4 and as well as checking the internal diameter of the plugs, they also check the positions of the contact pins, pilot pins, and non-reverse pins and in addition they act as GO gauges for the contact pins.

Figure 20 and Figure 21. *NOT GO gauges for plugs.*

These gauges are made to the upper limit of the dimension A of Figure 2 and Figure 4 and simply check the internal diameter of the plugs.

Figure 22. *GO gauge for socket-outlets without pilot contacts.*

This gauge is to check the centres of the phase-contact tubes, non-reversal slot and dimensions B and M of Figure 3.

Figure 23. *GO gauge for socket-outlets with pilot contacts.*

This gauge is to check the centres of the three contact tubes and dimensions M and R of Figure 5.

Figure 25. *NOT GO gauge for pins.*

This gauge is made to the lower limit.

Figure 26. *GO gauge for plug keyways.*

The dimensions of Figure 18 also apply to this gauge. The keys are made to the lower limits.

Figure 27. *GO gauge for socket keys.*

The dimensions of Figure 22 also apply to this gauge. The keyways are made to the upper limits.

Figure 28. *GO gauge for plug keyways (plugs with pilot contacts).*

The dimensions of Figure 19 also apply to this gauge. The keys are made to the lower limits.

Figure 29. *GO gauge for socket keys (socket-outlets with pilot contacts).*

The dimensions of Figure 23 also apply to this gauge. The keyways are made to the upper limits.

Figure 30. *GO gauge for plug keys.*

The dimensions of Figure 18 also apply to this gauge. The keyways are made to the upper limits.

Figure 31. *GO gauge for socket keyways.*

The dimensions of Figure 22 also apply to this gauge. The keys are made to the lower limits.

Figure 32. *GO gauge for plug keys (plugs with pilot contacts).*

The dimensions of Figure 19 also apply to this gauge. The keyways are made to the upper limits.

Figure 33. *GO gauge for socket keyways (socket-outlets with pilot contacts).*

The dimensions of Figure 23 also apply to this gauge. The keys are made to the lower limits.

Figure 34 and Figure 35. *GO gauges for earth contacts.*

The dimensions of Figure 22 and Figure 23 also apply to these gauges. The gauges are made to the lower limits.

Appendix C Information to be given with enquiry or order

- 1) Whether plug, socket-outlet, connector or appliance inlet is required.
- 2) Supply voltage and frequency.
- 3) Current rating.
- 4) If pilot contacts are required.
- 5) If single or double pole fusing is required or no fusing; whether fuse plus or fuse-links are required and the current rating.
- 6) Whether discrimination is required between single and double pole fused plugs by keys and keyways.
- 7) Key code required.
- 8) If weatherproof type is required.
- 9) Whether body of metal or insulating material is required.

- 10) Full particulars of cable, if different from that for which the standard gland is provided (see Clause 9).
- 11) Back or side entry for flexible cable.
- 12) Radial circuit, or ring or looped circuit.
- 13) Surface or flush-mounted socket-outlet or appliance inlet.
- 14) Whether circuit will be controlled by a switch.