

**Specification for 2-pin
reversible plugs and
shaver socket-outlets**

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ICS 29.120.30

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This British Standard, having been approved by the Electrical Industry Standards Committee, was published under the authority of the Standards Board and comes into effect on 19 March 1970

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The following BSI references relate to the work on this standard:

Committee reference ELE/4/2
 Draft for comment 66/8189 DC

ISBN 0 580 05807 7

Amendments issued since publication

Amd. No.	Date	Comments
4392	October 1983	
5897	April 1988	
9156	November 1996	
15175	11 August 2004	Indicated by a sideline in the margin

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Foreword

This British Standard has been prepared by Technical Committee PEL/23 (formerly ELE/4/2).

This reprint of BS 4573:1970 incorporates Amendment No. 1:1983, Amendment No. 2:1988, Amendment No. 3:1996 and Amendment No. 4:2004.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 19 and a back cover.

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Section 1. General

1.1 Scope

This British Standard specifies requirements for reversible 2-pin plugs and shaver socket-outlets.

The plugs may be rewirable or integrally moulded and may have the cable entry in any convenient face.

The shaver socket-outlets have a restricted rating of 200 mA for use on voltages of 200 V to 250 V a.c. only and are shuttered, and are for use in rooms other than bathrooms.

These socket-outlets are not necessarily suitable for the supply to electric shavers containing battery charging units.

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

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Section 2. Requirements for plugs

2.1 Interchangeability

Gauges in accordance with Figure 1 shall be used to test the accuracy of plugs, and compliance with the gauges shall be deemed to prove accuracy in respect of the relevant dimensions.

2.2 Precautions against accidental contact

Plug pins shall be provided with fixed insulating sleeves extending outwards along the pin for a distance of not less than 0.315 in (8 mm) and not more than 0.354 in (9 mm) from the engagement face of the plug and shall be sufficiently strong and rigid not to become displaced in normal service.

The outside diameter of such fixed sleeves shall not exceed 0.201 in (5.1 mm) and the minimum thickness shall be 0.020 in (0.5 mm).

The design of the plug shall be such as to prevent a plug pin from making contact with either socket-contact whilst the other pin is completely exposed.

2.3 Contour of plug

The contour of the plug base shall lie within the contour of the gauge shown in Figure 1 and within this contour there shall be no axial projections on the face of the plug base such as would prevent complete engagement of the plug.

2.4 Dimensions and spacing of plug pins

The diameter of the plug pins shall be 0.200 ± 0.001 in (5 mm).

The length of projection of the plug pins shall be $0.625^{+0.040}_{-0.000}$ in (15.8 mm).

The length of the radiused portion at the end of the plug pins shall be $0.062^{+0.010}_{-0.000}$ in (1.5 mm).

The nominal distance between the centres of plug pins shall be 0.656 in (16.6 mm).

These dimensions shall be checked by means of the gauge shown in Figure 1.

2.5 Clearance and creepage

The minimum clearance distance and the minimum creepage distance shall be 0.1 in (2.5 mm) between:

- 1) Live parts of opposite polarity.
- 2) Current carrying parts and other exposed metal parts.

2.6 Materials

Parts made of ferrous metal shall be rendered rustproof.

The following materials shall be used in the component parts of plugs:

Part	Material
Plug cover and base for rewirable plug	Tough, non-ignitable insulating material having plastic yield not exceeding 6 mm when tested at 100 °C in accordance with the plastic yield test, Method 102A of BS 2782-1 ^a .
Plug body for integrally moulded flexible cord	Flexible PVC material as specified in BS 2571 ^b , rubber or other resilient materials. The materials shall be free from blisters, cracks, embedded foreign matter and other physical properties and defects likely to affect insulating and mechanical protecting properties and shall have a hardness ^c not less than 65 British Standard degrees when tested at an ambient temperature of 20 ± 5 °C.
Current carrying parts (other than terminal screws)	Brass, phosphor bronze, or other material of adequate conductivity.

^a BS 2782 *Methods of testing plastics Part 1: Effect of temperature*.

^b BS 2571 *Flexible PVC compounds*.

^c The hardness may be checked by a meter specified in BS 719 *Methods of use and calibration of pocket type rubber hardness meters*. Attention is also drawn to the requirements of BS 903 *Methods of testing vulcanized rubber*.

2.7 Plug cover and plug base

The plug cover and the plug base of a rewirable plug shall be secured firmly to one another. It shall be impossible to remove the cover unless the plug is completely withdrawn from the socket-outlet.

2.8 Plug pins and terminals

Each plug pin of a rewirable plug shall be formed in one piece with, or reliably attached to, the fixed part of its terminal.

In the case of non-rewirable plugs, such as those moulded integrally with the flexible cord, the connections between the conductors and the plug pins may be by any convenient means which will withstand the test specified in 3.5. In the completed plug, the pins shall be securely anchored and shall comply with the tests specified in 3.7 and 3.8.

2.9 Method of entry of flexible cord in the plug

With rewirable plugs, the flexible cord shall enter the plug through one hole, groove or gland and there shall be provision for gripping the flexible cord and preventing acute bending at the point of entry.

With non-rewirable plugs, a flexible lead-in portion shall be provided, where the cord enters the plug.

Rewirable and non-rewirable plugs shall withstand the cord grip test specified in 3.5 or 3.6 as appropriate.

2.10 Plug finger grip

A finger grip or other suitable means shall be provided for inserting and withdrawing the plug without subjecting the flexible cord to any stress.

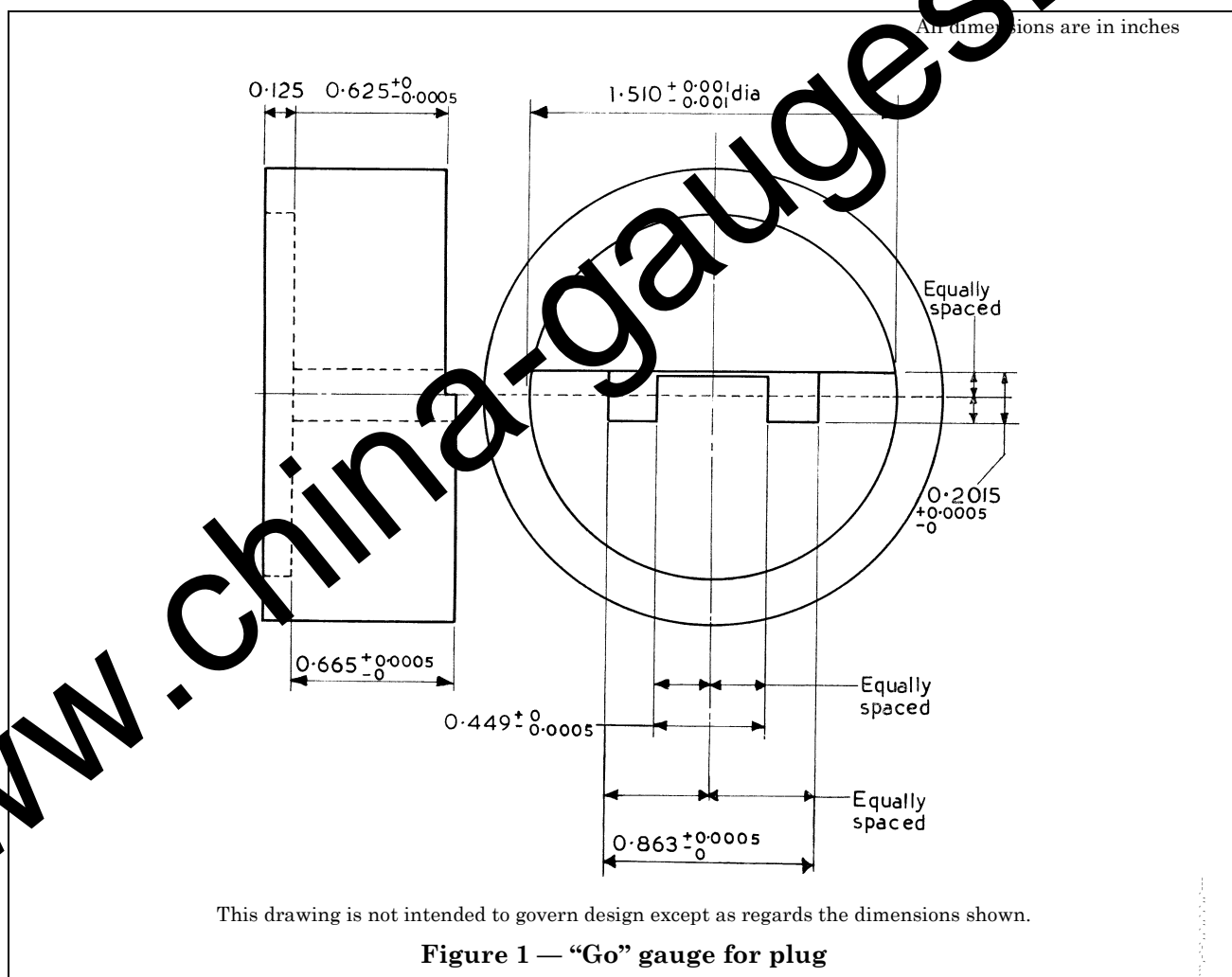
2.11 Separation of terminals and conductors

Insulating barriers forming an integral part of the plug shall be provided to separate metal at different potentials, including bared flexible conductors. The barriers shall be such that when the plug has been correctly wired and assembled, there is negligible risk that a wire or strand shall touch other parts with which contact may be dangerous.

2.12 Marking

All plugs shall be clearly and indelibly marked with the following:

- 1) The manufacturer's name or other identifying marks.
- 2) The number of this British Standard (i.e. BS 4573).



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Section 3. Tests

3.1 General test requirements

3.1.1 Tests shall be made to prove compliance. It is not intended that all the tests shall be made on every plug.

3.1.2 All tests shall be type tests. In addition, the tests of **3.3** and **3.4** shall be routine or screening tests.

3.1.3 Except where otherwise stated in this standard, plugs for test shall be constructed as for normal service, and tests shall be made at an ambient temperature of 20 ± 5 °C (68 ± 9 °F).

3.1.4 All plugs shall be in a clean, new condition at the commencement of the test.

3.2 Type tests

3.2.1 The plugs used for the tests shall be identical in all essential detail with those to be used in service.

3.2.2 The tests specified in **3.3** and **3.4** shall be carried out in that order, on one set of three samples.

3.2.3 Plugs do not comply if there are more failures than that of one sample in one of the tests. If one sample fails in a test, that test and the preceding ones which may have influenced the result of that test, shall be repeated on a second set of three plugs all of which shall then comply with the repeated tests. If any plug fails in the retest then all the plugs are deemed to have failed to comply with this specification.

3.2.4 The manufacturer shall hold available certificates of such type tests as evidence of compliance with the requirements of this standard, together with detailed drawings and a record of any alterations that have been made subsequent to the type tests. Any alteration which is likely to affect the performance of the plug shall invalidate the certificate. Type tests shall be made by the manufacturer, but he shall arrange for a recognized authority to make any type test for which he himself is not equipped.

3.3 Insulation resistance

Each plug tested shall pass an insulation resistance test before being subjected to a high voltage flash test as required by **3.4**. The insulation resistance shall be not less than $10\text{ M}\Omega$, and the test shall be made at not less than 500 V d.c. applied for a sufficient time for the reading of the measuring instrument to become steady. The supply being obtained from an independent source or generated in the measuring instrument. The insulation resistance shall be measured (1) between line and neutral terminals, and (2) between line and neutral terminals connected together and any other metal or conductive parts insulated therefrom.

3.4 High voltage flash test

Each plug shall withstand a high voltage flash test, for which the test voltage shall be alternating, not less than 1500 V, approximately of sine-wave form and shall be applied (1) between line and neutral terminals, and (2) between line and neutral terminals and any other metal or conductive parts insulated therefrom.

3.5 Conductor clamping in non-rewirable plugs

Without the insulating material around them, each pin in turn shall be held firmly with the cord hanging vertically downwards and a weight of 5 lb (2.2 kg) shall be suspended from the cord for a period of one minute. At the end of this period the cord shall not have moved noticeably where it enters the plug.

Each pin in turn shall be held firmly with the cord hanging vertically downwards and a weight of 5 lb (2.2 kg) shall be suspended from the cord for a period of one minute. At the end of this test the cord shall remain securely attached to the pins.

3.6 Cord grip of rewirable plugs

With rewirable plugs, a length of PVC insulated 14/0076 (0.5 mm²) twin flexible cord complying with Clause 19 of BS 2004¹⁾ shall be inserted into a plug as in service, except that the conductors shall not be secured in the terminals.

The plug shall be mounted so that the cord hangs vertically downwards with no external bend and a weight of 8 lb (3.6 kg) shall be suspended from a knot in the flexible cord for ten seconds. After this test has been repeated 10 times, the flexible cord shall not have moved noticeably relative to the plug body.

3.7 Resistance of pins to twisting in non-rewirable plugs

Each plug pin in a complete plug shall resist a torque of 6.5 lbf in (0.7 N·m) applied for one minute without twisting more than the natural resilience of the moulding will allow.

3.8 Resistance of pins to pull-out in non-rewirable plugs

Each plug pin in a complete plug shall resist a static load of 9 lb (4.5 kg) applied axially for one minute without loosening.

3.9 Gauge (see Figure 1)

This gauge is to prove correct spacing of plug pins. It accepts plugs with plug pins of maximum size at centres 0.005 in (0.127 mm) greater or less than the nominal and smaller plug pins with correspondingly increased tolerances on centres. In addition, it proves the absence of axial projections on the face of the plug base when a plug is fully inserted into the gauge; it also indicates accuracy of projection of plug pins from the face of a plug if the end of each plug pin lies within the step on the back of the gauge when the plug is fully inserted.

¹⁾ BS 2004 *PVC-insulated cables and flexible cords for electric power and lighting*.

Section 4. Requirements for shaver socket-outlets

4.1 Interchangeability

Gauges in accordance with Figure 2 to Figure 5 shall be used to test the accuracy of shaver socket-outlets and compliance with the gauges shall be deemed to prove accuracy in respect of the relevant dimensions.

Where a shaver socket-outlet is arranged for flush mounting it shall be suitable for mounting in a box by means of two 4BA screws at 2.375 ± 0.005 in (60.3 mm) centres apart in opposite sides of the box.

4.2 Precautions against accidental contact

The construction of the shaver socket-outlet shall be such that when a plug is withdrawn from it, the current-carrying socket-contacts are automatically screened by shutters. The operation of the shutter shall necessitate the insertion of both pins of the plug.

The design of the shaver socket-outlet with its shutter shall be such as to prevent a plug pin from making contact with either socket-contact whilst the other pin is completely exposed.

4.3 Contact between plug and shaver socket-outlet

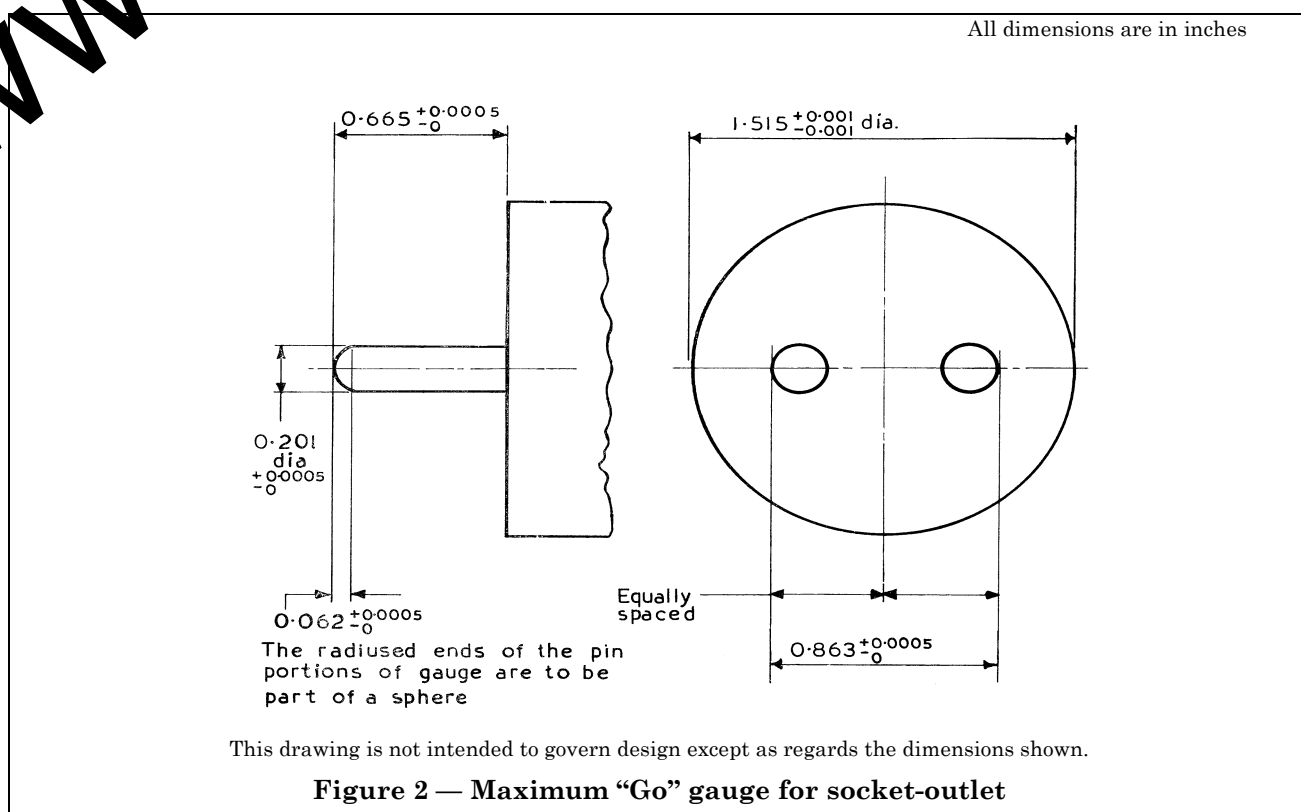
The requirements for electrical engagement between plugs and shaver socket-outlets shall be proved by means of the test gauges depicted in Figure 2 and Figure 5. On insertion of a plug into the shaver socket-outlet, the travel of the end of either pin from the front face of the shaver socket-outlet to the first point of contact with the appropriate socket-contact, in any position the socket-contacts may occupy, shall be not less than 0.358 in (9.09 mm). Compliance shall be checked by the test specified in 6.2.

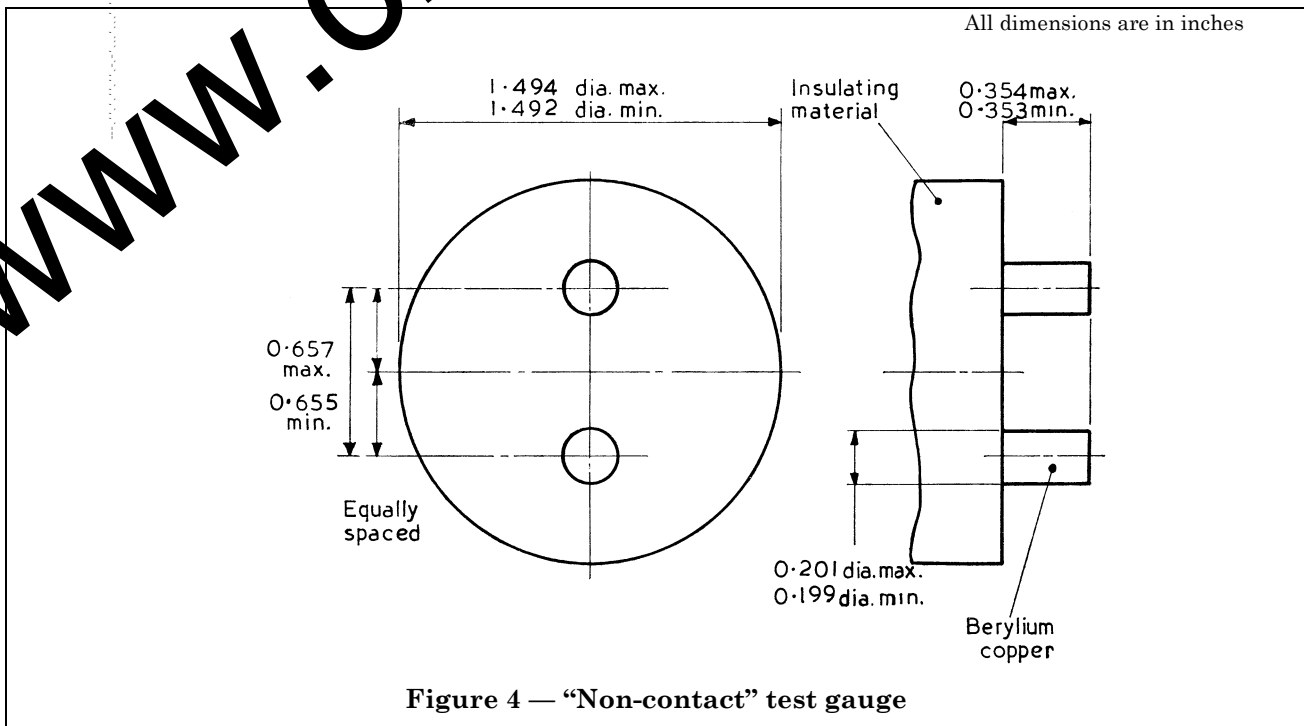
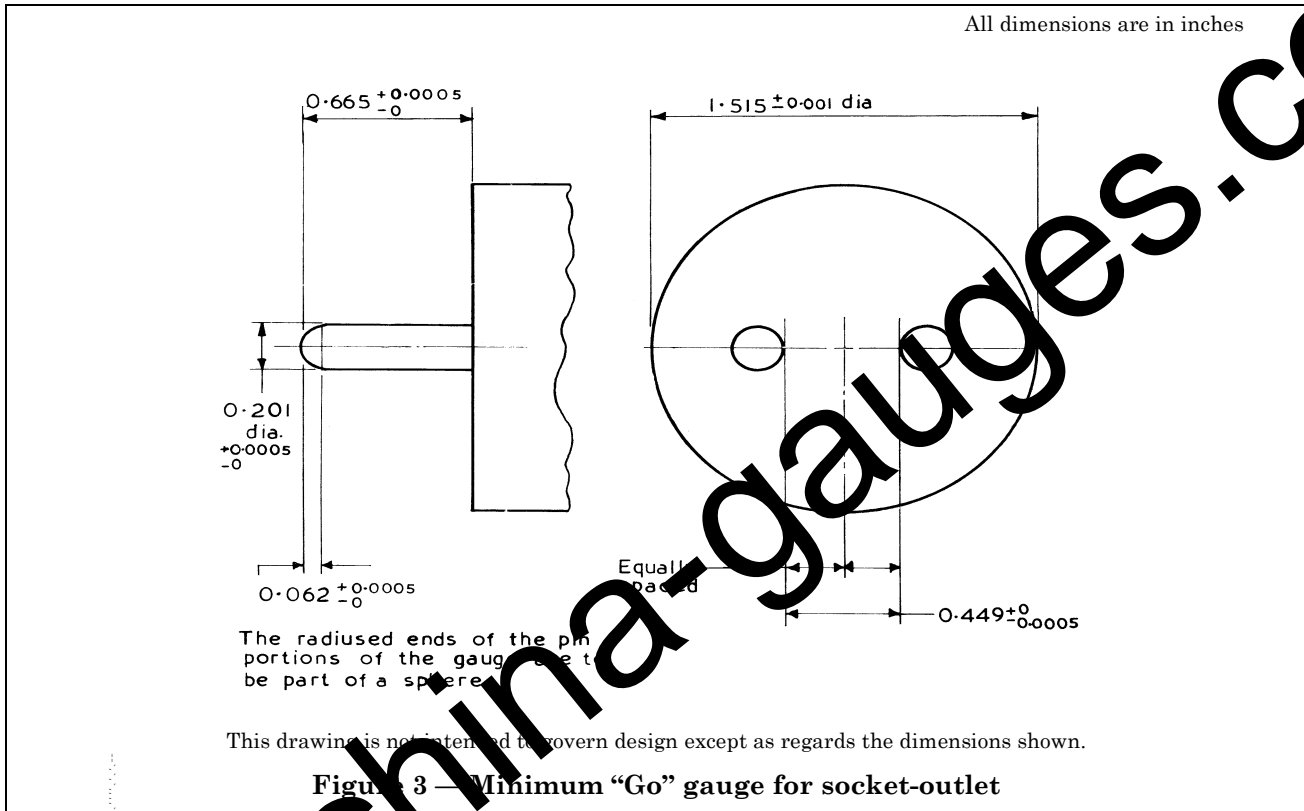
Within the contour of the gauge shown in Figure 2 there shall be no axial projections on the face of the shaver socket-outlet plate or cover, such as would prevent complete engagement between plugs and shaver socket-outlets.

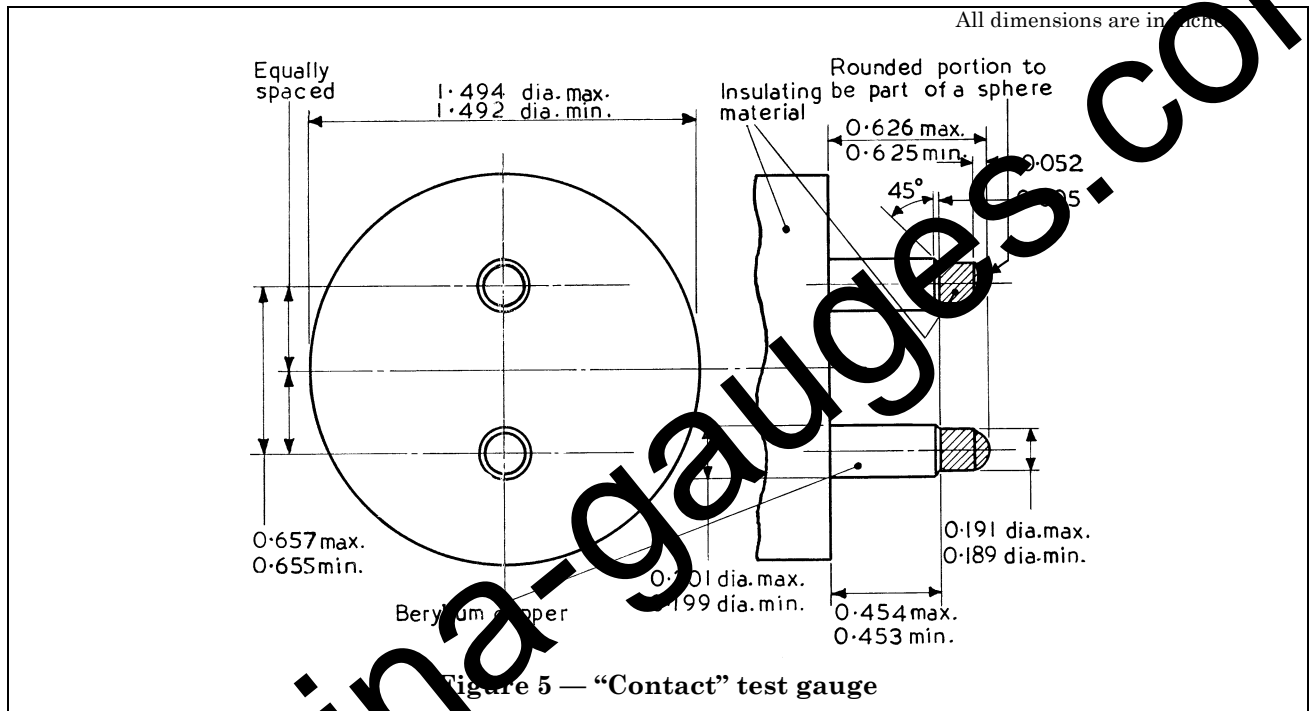
Shaver socket-outlets shall accept the gauges shown in Figure 2 and Figure 3.

4.4 Dimensions and spacings of socket-contacts

The nominal distance between the centres of socket-contacts shall be 0.656 in (16.6 mm).







4.5 Clearance and creepage

The minimum clearance distance and the minimum creepage distance shall be 0.1 in (2.5 mm) between:

- 1) Live parts of opposite polarity.
- 2) Current-carrying parts and other exposed metal parts.
- 3) For surface-mounting socket-outlets, live parts and a flat plane representing the mounting surface of the socket-outlet.
- 4) For flush-mounting socket-outlets, live parts and the back surface of the base.

4.6 Materials

4.6.1 Parts made of ferrous metal shall be rendered rustproof, special attention being given to springs and moving parts.

The following materials shall be used in the component parts of shaver socket-outlets:

Part	Material
Shaver socket-outlet plate	Either tough, non-ignitable insulating material having plastic yield not exceeding 6 mm when tested at 100 °C in accordance with the plastic yield test, Method 102A of BS 2782-1 ^a or by material which satisfies the 850 °C glow wire test performed in accordance with BS 6458-2.1 and which also satisfies the requirements of 4.6.2.
Shaver socket-outlet base	Material which satisfies the 850 °C glow wire test performed in accordance with BS 6458-2.1 and which also satisfies the requirements of 4.6.2.
Shutter	Material which satisfies the 850 °C glow wire test performed in accordance with BS 6458-2.1 and which also satisfies the requirements of 4.6.2.
Current-carrying parts (other than terminal screws)	Brass, phosphor bronze, or other material of adequate conductivity.

^a BS 2782 *Methods of testing plastics Part 1: Effect of temperature.*

4.6.2 Insulating parts specified in 4.6.1 shall be tested as follows:

The part under test shall be placed on a steel plate at least 3 mm thick and in direct contact with it.

The surface of the part to be tested is placed in the horizontal position and a steel ball of 5 mm diameter is pressed against the surface with a force of 20 N.

The test load and the supporting means shall be placed within the heating cabinet for a sufficient time to ensure that they have attained the stabilized testing temperature before the test commences.

The test is made in a heating cabinet at a temperature of $125\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.

After 1 h the ball shall be removed from the specimen, which is then immersed in cold water for cooling down, within 10 s to approximately room temperature.

The diameter of the impression caused by the ball is measured and shall not exceed 0.5 mm.

4.7 Construction of shaver socket-outlets

4.7.1 Socket-contacts

The socket-contacts shall be so shaped at the point of entrance as to provide easy access for the plug pins. They shall be self-adjusting as to contact making. Each socket-contact shall be such as to make and maintain under normal service conditions (see 5.1), effective electrical and mechanical contact with a plug pin of the minimum diameter permitted in 2.4. The means for producing the contact-pressure shall be associated with each socket-contact independently.

The position of the current-carrying socket-contacts relative to the front face of the shaver socket-outlet shall be such that the gauge in Figure 5 shall make electrical contact. In the case of the "no-contact" gauge shown in Figure 4, the current-carrying socket-contacts, in any position they may occupy, relative to the front face of the shaver socket-outlet shall be such that the gauge when fully inserted shall not make electrical contact. The test voltages shall be not less than 40 V and a suitable test apparatus and circuit is shown in Figure 6.

4.7.2 Socket-contacts and terminals

Terminals shall be provided, which shall be connected to the socket-contacts and the current-limiting device in such a manner that they cannot work loose under normal service conditions.

Contact pressure at connections between current-carrying parts shall not be transmitted through materials which may be dimensionally unstable under any service conditions including heat.

Each terminal shall be capable of clamping firmly one or two $3/0.029$ (1.0 mm^2) conductors. The following dimensions shall apply to pillar terminals:

Minimum diameter of hole for conductor:	0.125 in (3.1 mm)	} whichever is the greater
Minimum wall thickness where clamping screw passes through:	0.062 in (1.5 mm) or 2 threads engagement	
Minimum diameter of clamp screw:	0.110 in (6BA) (2.7 mm)	

4.7.3 Current-limiting device

Shaver socket-outlets shall incorporate a current-limiting device, which shall not be a fuse, associated with the live socket-contact. Provision may be necessary for the protection of such a device from inadvertent electrical damage, unless the device has the inherent ability to withstand a prospective short-circuit current of 1000 A. When the protection for such a device is a fuse, it shall comply with BS 646²⁾ and shall have a current rating of 1 A maximum.

Where the current-limiting device is of the manual resetting type, it shall be provided with insulated means for resetting operated from outside the socket-outlet so that it is not necessary to remove the shaver socket-outlet from its box or enclosure to reset.

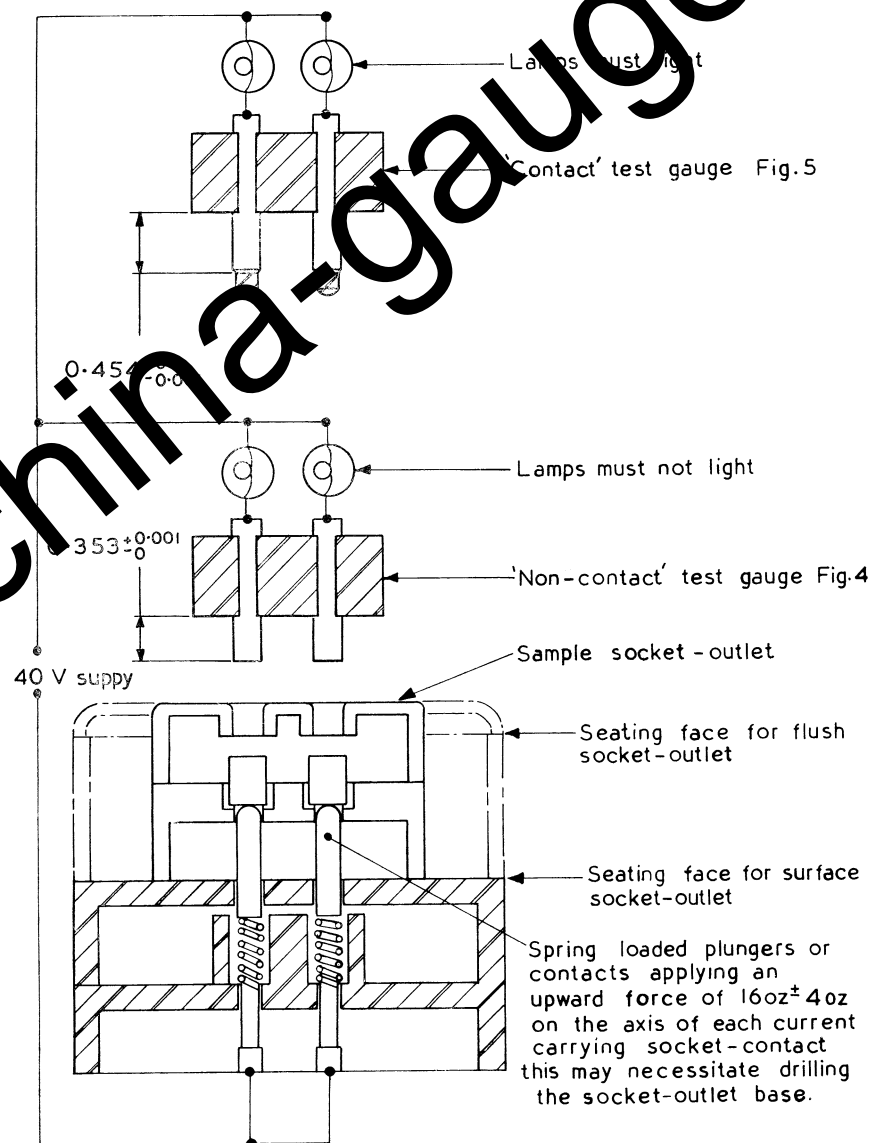
Where the current-limiting device is of the self-resetting type, this shall not be accessible from the outside of the accessory after installation.

²⁾ BS 646 Cartridge fuse-links (rated up to 5 amperes) for a.c. and d.c. service.

The fuse link, if provided, shall be accessible from the front of the shaver socket-outlet only and shall be secured in such a manner that a tool is required for its removal or replacement.

It shall not be possible to touch live metal during the insertion or withdrawal of the fuse link or holder.

The current-limiting device shall permit 200 mA to be carried continuously. The current-limiting device shall operate within 1 h at a current of 300 mA, and within 1 min at a current of 500 mA. Alternatively the current-limiting device shall operate within 100 ms with a current of 800 mA.



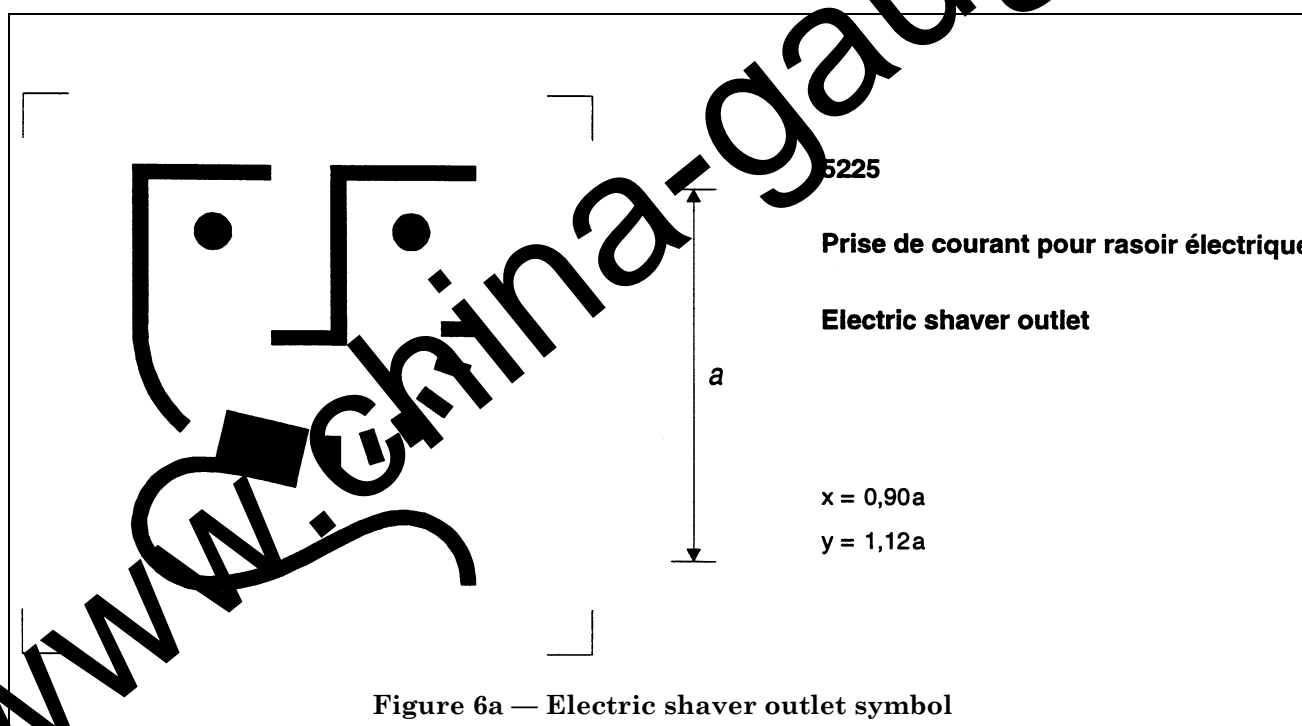
This drawing is not intended to govern design except as regards the dimensions shown.

Figure 6 — Test apparatus and circuit for use with “contact” and “no-contact” test gauges for 2-pin reversible plug and socket-outlet

4.8 Marking

All shaver socket-outlets shall be clearly and indelibly marked with the following:

- 1) The manufacturer's name, trademark or other identifying marks.
- 2) The number of this British Standard (i.e. BS 4573).
- 3) "200/250 V a.c."
- 4) Where the current-limiting device is protected by a fuse, the fuse carrier shall be marked "Fit BS 646 1 A".
- 5) On the front face, the electric shaver outlet symbol illustrated in Figure 6a [BS EN 63417-2:1999, symbol 5225].
- 6) *Deleted*



Section 5. Tests

5.1 General test requirements

5.1.1 Tests shall be made to prove compliance. It is not intended that all the tests shall be made on every shaver socket-outlet. Any plug used for tests on a socket shall be a plug complying with this specification.

5.1.2 All tests shall be type tests. In addition, the tests of **5.3** and **5.4** shall be routine or sample tests.

5.1.3 Except where otherwise stated in this specification, plugs and shaver socket-outlets for test shall be connected and mounted as for normal service, and tests shall be made at an ambient temperature of 20 ± 5 °C (68 ± 9 °F).

5.1.4 For the purposes of any test on a shaver socket-outlet the frequency of the alternating current shall be 50 Hz.

5.1.5 All plugs and shaver socket-outlets shall be in a clean new condition at the commencement of the test.

5.1.6 For the purpose of the endurance test, the insertion and withdrawal of the plugs may be by hand or by machine.

5.2 Type tests

5.2.1 The socket-outlets used for the tests shall be identical in all essential details with those to be used in service.

5.2.2 The tests specified in **5.2.3**, **5.4** and **5.7** shall be carried out in that order, on one set of three samples.

5.2.3 Socket-outlets do not comply with this specification if there are more failures than that of one sample in one of the tests. If one sample fails in a test, that test and the preceding ones, which may have influenced the result of that test, shall be repeated on a second set of three socket-outlets all of which shall then comply with the repeated tests. If any socket-outlet fails in the retest then all the socket-outlets are deemed to have failed to comply with this specification.

5.2.4 The manufacturer shall hold available certificates of such type tests as evidence of compliance with the requirements of this standard, together with detailed drawings and a record of any alterations that have been made subsequent to the type tests. Any alteration which is likely to affect the performance of the socket-outlet shall invalidate the certificate. Type tests shall be made by the manufacturer, but he shall arrange for a recognized authority to make any type test for which he himself is not equipped.

5.3 Insulation resistance

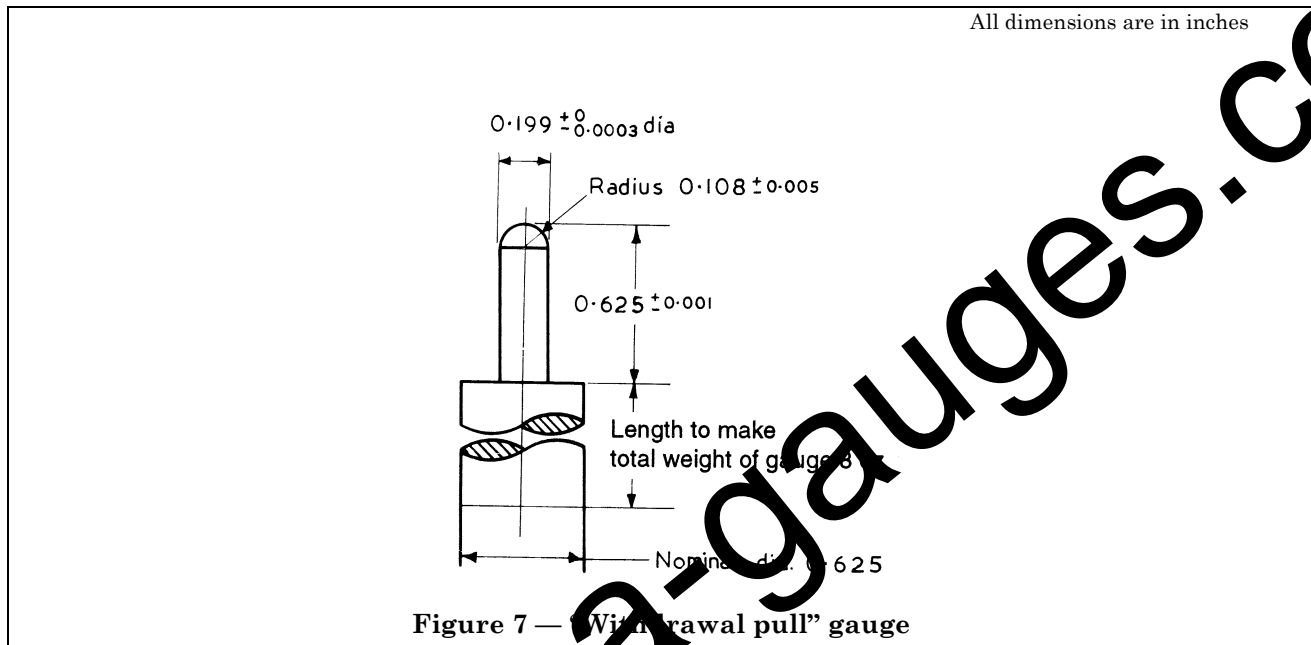
Each shaver socket-outlet tested shall pass an insulation resistance test before being subjected to a high voltage flash test as required by **5.4**. The insulation resistance shall be not less than 10 M Ω , and the test shall be made at not less than 500 V d.c. applied for a sufficient time for the reading of the measuring instrument to become steady, the supply being obtained from an independent source or generated in the measuring instrument. The insulation resistance shall be measured (1) between line and neutral terminals, and (2) between line and neutral terminals connected together and any other metal or conductive parts insulated therefrom.

5.4 High voltage flash test

Each shaver socket-outlet tested shall withstand a high voltage flash test, for which the test voltage shall be alternating, not less than 1500 V, approximately of sine-wave form and shall be applied (1) between line and neutral terminals, and (2) between line and neutral terminals connected together and any other metal or conductive parts insulated therefrom.

5.5 Effectiveness of contact

The minimum withdrawal pull of a gauge (see Figure 7) shall be 0.5 lbf (2.22 N) independent of any force applied by the shutters. As an alternative, the maximum voltage drop between the individual socket-contacts in a complete shaver socket-outlet and a solid brass plug pin measured between the terminal of the socket-contact and the terminal of the plug pin, shall be 10 mV at 200 mA.



5.6 Withdrawal pull of complete plugs

The maximum withdrawal pull of a plug complying with this specification from a shaver socket-outlet shall be 5 lbf (22.2 N).

5.7 Endurance tests

5.7.1 The shaver socket-outlet, when a plug is inserted and withdrawn 15000 times, shall be capable of making and breaking a current of 200 mA in a non-inductive a.c. circuit at 250 V.

5.7.2 The plugs used for this test shall comply with the relevant clauses of this British Standard. The plugs shall be inserted into and withdrawn from the shaver socket-outlet at a rate of six insertions and withdrawals per minute, the speed of travel of the plug being approximately 6 in per second. The plug shall be renewed after each 5000 insertions and withdrawals.

The pins of each of the three plugs used in this test may be lightly greased during the progress of the test, but no additional lubrication of the screening device is permitted.

For the purpose of this test, each line and neutral shaver socket terminal shall be connected to a 3/.029 (1.0 mm²) cable. A load of 200 mA shall be connected to the plug by means of a 14/.0076 (0.5 mm²) flexible cord. The periods during which the plug is inserted and withdrawn shall be approximately equal.

After the above test, the shaver socket-outlet shall not show any wear impairing its operation, and the inlet openings for the pins in the cover shall not show any appreciable damage. The shutters shall still be operating satisfactorily and the socket-contacts safely shielded. The shaver socket-outlet shall still comply with the requirements of 5.3, 5.4, 5.5 and 5.6. The tests prescribed in 5.5 are carried out with the last of the three plugs used for the endurance test.

Where current-limiting devices of the self-resetting type are incorporated, these shall be capable of making and breaking for 10000 cycles of operation in a non-inductive a.c. circuit at 250 V, a current between 350 mA and 800 mA (one cycle is one make and one break operation).

Where current-limiting devices of the manual reset type are incorporated, these shall be capable of making and breaking for 500 cycles of operation in a non-inductive a.c. circuit at 250 V, a current between 350 mA and 800 mA (one cycle is one make and one break operation).

Section 6. Gauges for shaver socket-outlets

6.1 “Go” gauges (see Figure 2 and Figure 3)

These gauges are used to prove correct spacing for socket-contacts and absence of axial projections on the face of the shaver socket-outlet within a specified area.

Any plug accepted by the gauge illustrated in Figure 1 will engage correctly with a shaver socket-outlet if both gauges illustrated in Figure 2 and Figure 3 can be fully inserted into the shaver socket-outlet.

6.2 “Contact” and “no-contact” gauges (see Figure 4 and Figure 5)

These gauges are to prove the correct positioning of the socket-contacts in relation to the front face of the shaver socket-outlet. They are used in a circuit as shown in Figure 6.

6.3 “Withdrawal pull” gauge (see Figure 7)

This gauge is to prove the effective contact pressure of each shaver socket-outlet on a plug pin of minimum diameter.

www.china-gauges.com

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List of references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 646, *Cartridge fuse-links (rated up to 5 amperes) for a.c. and d.c. service.*

BS 903, *Methods of testing vulcanized rubber.*

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

BS 2571, *Flexible PVC compounds.*

BS 2719, *Methods of use and calibration of pocket type rubber hardness meters.*

BS 2782-1, *Methods of testing plastics — Part 1: Effect of temperature.*

BS EN 60417-2, *Graphical symbols, for use on equipment — Part 2: Symbol originals.*

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