

13 A plugs, socket-outlets, adaptors and connection units —

Part 2: Specification for 13 A switched and unswitched socket-outlets

ICS 29.120.30

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Power Electrical Engineering Standards Policy Committee (PEL/-) to Technical Committee PEL/23, upon which the following bodies were represented:

ASTA Certification Services
 Association of Consulting Engineers
 Association of Control Manufacturers [TACMA (BEAMA Ltd.)]
 Association of Manufacturers of Domestic Electrical Appliances
 British Electrical Systems Association (BEAMA Ltd.)
 British Electrotechnical Approvals Board
 British Plastics Federation
 Consumer Policy Committee of BSI
 Department of Health
 Department of Trade and Industry (Consumer Safety Unit, CA Division)
 BEAMA Installation
 Electricity Association
 Electronic Components Industry Federation
 Institution of Electrical Engineers
 Lighting Association
 Lighting Industry Federation Ltd.
 National Inspection Council for Electrical Installation Contracting

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Cable Makers Confederation
 British Radio and Electronic Equipment Manufacturers Association
 Consumers' Association
 ERA Technology Ltd.
 Institute of Trading Standards Administration
 Institution of Incorporated Executive Engineers
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Foreword

This part of BS 1363 is published by BSI Standards Limited, under licence from The British Standards Institution. This part of BS 1363 has been prepared by Technical Committee PEL/23. This part of BS 1363, together with BS 1363-1:1995, supersedes BS 1363:1984.

BS 1363-2:1995+A4:2012 supersedes BS 1363-2:1995 (incorporating Amendments Nos. 1:1997, 2:2003 and 3:2007), which, however, remains current and will be withdrawn on 31 May 2015.

The start and finish of text introduced or altered by Amendment No. 3 and Amendment No. 4, respectively is indicated in the text by tags $\boxed{A_3}$ $\langle A_3 \rangle$ and $\boxed{A_4}$ $\langle A_4 \rangle$ respectively. Text introduced or altered by Amendment No. 1 and Amendment No. 2 is not tagged. Minor editorial corrections are not tagged.

BS 1363 comprises four parts covering the following.

- *Part 1: Rewirable and non-rewirable 13 A fused plugs;*
- *Part 2: Switched and unswitched socket-outlets;*
- *Part 3: Adaptors;*
- *Part 4: 13 A fused connection units: switched and unswitched.*

NOTE In order to prevent confusion with BS 1363:1984, the figure and clause numbers have been retained.

BS 6007 and BS 6500, which are called up in this part of BS 1363, have been superseded by BS EN 50525. In the transition period up until 31 December 2012 cables to BS 6007 and flexible cords to BS 6500, or cables to BS EN 50525, may be used. After that date all cables have to be to the relevant part of BS EN 50525.

The structure of BS EN 50525 and its derivation from British Standards and HD 21 and HD 22 is set out in BS EN 50525-1:2011, National Annex NA. This is reproduced in Annex H for the convenience of users of this part of BS 1363.

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

Compliance with a British Standard cannot confer immunity from legal obligations.

Attention is drawn to Statutory Instrument 1768, 1994.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 60, an inside back cover and a back cover.

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1 Scope

This part of BS 1363 specifies requirements for 13 A switched and unswitched shuttered socket-outlets for household, commercial and light industrial purposes, with particular reference to safety in normal use. The socket-outlets are suitable for the connection of portable appliances, sound-vision equipment, luminaires, etc. in a.c. circuits only, operating at voltages not exceeding 250 V r.m.s. at 50 Hz using plugs in accordance with BS 1363-1:1995.

Requirements are specified for 13 A shuttered socket-outlets in single or multiple arrangements, with or without associated controlling switches, for flush mounting in suitable boxes, e.g. complying with BS 4662, or for surface or panel mounting or for portable use. $\overline{A_4}$ Fixed socket-outlets are intended for use with cables complying with BS 6004:2000 or BS 6007:2000, or equivalent cables to the relevant part of BS EN 50525 (see Annex H), having copper conductors. Portable socket-outlets are intended for use with flexible cords complying with BS 6500:2000, or equivalent cables to the relevant part of BS EN 50525. $\overline{A_4}$ Socket-outlets containing devices other than fuse links, switches and indicator lamps are outside the scope of this part of BS 1363.

NOTE 1 The titles of the publications referred to in this part of BS 1363 are listed on the inside back cover.

NOTE 2 In order to maintain safety and interchangeability with plugs and socket-outlets it is necessary that these products comply with the requirements of Clause 9, Clause 12 and Clause 13 of this part of BS 1363, however their body outline need not be limited at a distance of 6.35 mm from the plug engagement $\overline{A_3}$ surface $\overline{A_3}$.

NOTE 3 Requirements for electromagnetic compatibility are not given for the following reasons.

A switched or unswitched socket-outlet does not emit intolerable electromagnetic interference since significant electromagnetic disturbances are only generated during insertion and withdrawal which are not continuous.

A switched or unswitched socket-outlet is mechanical by nature of construction. The product is therefore immune from electromagnetic interference.

2 Conditions of use

Socket-outlets shall be suitable for use under the following conditions:

- a) an ambient temperature in the range $-5\text{ }^{\circ}\text{C}$ to $+40\text{ }^{\circ}\text{C}$, the average value over 24 h not exceeding $25\text{ }^{\circ}\text{C}$;

NOTE Under normal conditions of use, the available cooling air is subject to natural atmospheric variations of temperature and hence the peak temperature occurs only occasionally during the hot season, and on those days when it does occur it does not persist for lengthy periods.

- b) a situation not subject to exposure to direct radiation from the sun or other source of heat likely to raise temperatures above the limits specified in a);
- c) an altitude not exceeding 2 000 m above sea level;
- d) an atmosphere not subject to abnormal pollution by smoke, chemical fumes, rain, spray, prolonged periods of high humidity or other abnormal conditions. This is equivalent to pollution degree 2, $\overline{A_3}$ see Annex E, and overvoltage category III, see Annex D. $\overline{A_3}$

3 Terms and definitions

For the purposes of this part of BS 1363 the following definitions apply.

NOTE Where the terms voltage and current are used, they imply r.m.s. values, unless otherwise stated.

3.1

socket-outlet

an accessory having a set of three socket-contacts designed to engage with the pins of a corresponding plug and having means for the electrical connection of appropriate cables or flexible cords

3.2

fixed socket-outlet

a socket-outlet which with its associated enclosure is intended for use mounted in or on a fixed surface

3.3

surface-mounted socket-outlet

a socket-outlet which is intended to be mounted on a wall or other flat surface without the need for recessing

3.4

flush-mounted socket-outlet

a socket-outlet which is intended to be mounted in a box which is recessed into a wall or other flat surface. The socket-outlet plate and the socket-outlet base are regarded as forming a complete unit, and the socket-outlet plate is mounted with its back either flush with a wall or other flat-surface structure, or flush with the front of a socket-outlet box or enclosure

3.5

panel-mounted socket-outlet

a socket-outlet intended for incorporation into equipment panels or electrical trunking and which depends upon such incorporation for its enclosure

3.6

portable socket-outlet

a socket-outlet intended to be connected to, or integral with, a flexible cord, and which can easily be moved from one place to another while connected to the supply

3.7

rewirable portable socket-outlet

a portable socket-outlet so constructed that a flexible cord can be fitted or replaced using general purpose tools

3.8

non-rewirable portable socket-outlet

(A4) a portable socket-outlet so constructed that it forms a complete unit with the flexible cord which cannot be replaced after assembly by the manufacturer of the portable socket-outlet **(A4)**

NOTE See also 13.18.

3.9

moulded-on portable socket-outlet

a non-rewirable portable socket-outlet, the manufacture of which is completed by insulating material moulded around pre-assembled component parts and the terminations of the flexible cord

3.10

fused socket-outlet

a socket-outlet having provision for a replaceable cartridge fuse link

3.11

switched socket-outlet

a socket-outlet with an associated switch to disconnect the supply to the line socket contact or to both line and neutral socket contacts

3.12

multiple socket-outlet

a combination of two or more socket-outlets

3.13

socket-outlet base

that part of the socket-outlet which carries the contacts

NOTE It may be integral with the socket-outlet plate.

3.14

socket-outlet plate

the external plate which covers the base and contact assembly of a socket-outlet and through which the pins of the plug are inserted

3.15

socket-outlet box

a box suitable for mounting one or more socket-outlets

3.16**shutter**

a movable device arranged to shield the current-carrying socket-outlet contacts automatically when a corresponding plug is removed

3.17**actuating member**

that part which is moved, e.g. pulled, pushed or turned by the user, to operate the switch mechanism

3.18**indicator lamp (pilot lamp)**

a lamp \square_{A3} or similar device \square_{A3} which illuminates to indicate that the socket-outlet contacts are energized

3.19**terminal**

a means by which the user can make an electrical connection between the appropriate cable or flexible cord and the conducting parts of the socket-outlet without the use of special tools

3.20**screw-type terminal**

a terminal in which the connection is made directly by means of screws or nuts of any kind or indirectly through an intermediate metal part such as a washer, clamping plate or anti spread device on which the screw or nut bears directly

NOTE The following are examples of screw-type terminals.

- a) A pillar terminal is a terminal in which the conductor is inserted into a hole or cavity, where it is clamped under the shank of the screw or screws.
- b) A screw terminal is a terminal in which the conductor is clamped under the head of the screw.
- c) A stud terminal is a terminal in which the conductor is clamped under a nut.

3.21**termination**

a means by which an electrical connection can be made between the appropriate flexible cord and the conducting part of the socket-outlet using special purpose tools, e.g. soldering, welding, crimping

3.22**fuse carrier**

a movable or removable part designed to carry, retain, cover and/or remove the fuse link

3.23**type test**

a test or series of tests made on a type test sample, for the purpose of checking compliance of the design of a given product with the requirements of the relevant standard

3.24**type test sample**

a sample consisting of one or more similar units or specimens submitted by the manufacturer or responsible vendor for the purpose of a type test

3.25**accessible external surface of a socket-outlet**

all surfaces which can be touched by test probe B of BS EN 61032:1998 when the socket-outlet is installed as in use

3.26**live parts**

current-carrying parts and those metal parts in contact with them during normal use

NOTE Metal parts of the earthing circuit are not considered to be current-carrying parts.

3.27**fine wire thermocouple**

a thermocouple having wires not exceeding 0.3 mm in diameter

3.28**calibrated link**

a calibrated heat source for use in place of a fuse link during temperature-rise tests

3.29**resilient material**

a material having the inherent capability of regaining or substantially regaining its original form when deforming loads are removed

3.30**creepage distance**

the shortest distance along the surface of the insulating material between two conductive parts

3.31**clearance**

shortest distance in air between two conductive parts

3.32**basic insulation**

insulation applied to live parts to provide basic protection against electric shock

NOTE Basic insulation does not necessarily include insulation used exclusively for functional purposes.

3.33**supplementary insulation**

independent insulation applied in addition to basic insulation, in order to provide protection against electric shock in the event of failure of basic insulation

3.34**reinforced insulation**

a single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation under the conditions specified in the relevant standard

3.35**functional insulation**

insulation between conductive parts which is necessary only for the proper functioning of the equipment

A₃ 3.36**engagement surface of a socket-outlet**

that surface which cannot be touched by test probe B of BS EN 61032:1998 when Figure 11 gauge is in full engagement with the socket-outlet A₃

A₄ 3.37**insignificant mass**

insufficient combustible mass to constitute a fire hazard

NOTE Parts of insignificant mass are usually less than 2 g. A₄

A₄ 3.38**small parts**

parts where each surface lies completely within a circle of 15 mm diameter or where some of the surface lies outside the 15 mm diameter circle but in such a way that it is not possible to place a circle of 8 mm diameter on any of this remaining surface

[BS EN 60695-2-11:2001, 3.1, modified]

NOTE More information concerning small parts can be found in BS EN 60695-2-11:2001, 3.1. A₄

4 General

Socket-outlets shall be so designed and constructed that in normal use their performance is reliable and minimizes the risk of danger to the user or to the surroundings. Such socket-outlets shall be capable of meeting all the relevant requirements and tests specified in this part of BS 1363.

Unless otherwise stated, reference to a plug within this part of BS 1363 shall mean a plug in accordance with BS 1363-1:1995.

A₄ Throughout this standard, where cords to BS 6500 are referred to these may be replaced by equivalent cords (now referred to as cables) to BS EN 50525 which has superseded BS 6500; when BS 6500 is withdrawn, equivalent cables (cords) to BS EN 50525 shall be used. A₄

5 General conditions for type testing

5.1 All tests shall be type tests.

Unless otherwise specified in this part of BS 1363 the socket-outlets shall be tested as delivered by the manufacturer or responsible vendor and under normal conditions of use, at an ambient temperature of $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, after being conditioned at normal laboratory temperature and humidity levels for at least 4 days.

Unless otherwise stated by the manufacturer, flush-mounted socket-outlets shall be tested when mounted on a corresponding insulated box complying with BS 4662:1970, the fixing screws being tightened with a torque of $0.6\text{ N}\cdot\text{m} \pm 10\%$.

Other types shall be mounted according to the manufacturer's instructions.

The socket-outlets used for the tests shall be representative of normal production items in respect of all details which may affect the test results.

Non-rewirable socket-outlets shall be supplied with an appropriate flexible cord which shall be at least 1 m long.

Socket-outlets shall be deemed to comply if no specimen fails in the complete series of tests given in Table 1.

If one specimen fails in the complete series of tests given in Table 1, then socket-outlets of that type shall be deemed to have failed to comply with this part of BS 1363, unless the socket-outlets shall be shown to be not representative of normal production or design, in which case a further type test sample shall be submitted to the test or tests in that particular group. If there is no failure in this re-test then socket-outlets of that type shall be deemed to comply with this part of BS 1363.

If more than one specimen fails in the complete series of tests given in Table 1 then socket-outlets of that type shall be deemed not to comply with this part of BS 1363.

For type testing, all tests have been included in the test schedule and shall be performed in the specified order.

NOTE 1 References to carrying out specific tests in various clauses are not intended to indicate a sequence of testing different to that in the schedule and should not be conducted as separate additional tests.

NOTE 2 Where reference to BS 6500:2000 is made equivalent flexible cords to the latest version of that standard may be used.

5.2 All inspections and tests, of any one classification (see Clause 6), shall be carried out as specified in the clauses listed in Table 1 on the number of specimens in the sample column and in the order given.

5.3 Gauges in accordance with Figure 11, Figure 12, Figure 14, and Figure 16 shall be considered to comply with the dimensional requirements if the results of the measured values are within the specified dimensions and the uncertainty of measurement at not less than 95 % confidence level does not exceed $\pm 0.005\text{ mm}$.

Table 1 — Schedule of tests

Sequence	Samples	Test	Clause no.
1	3	Inspection, measurement, gauging and manipulation	5, 6, 7, 9.1, 11.1, 9.2, 9.4, 10.1, 13.1, 13.2, 13.3, 13.9, 13.10, 13.12, 13.14, 13.15, 13.16, 13.17, 13.18, 13.20, 19.2, 19.3, 19.4, 19.6, 21, 8 ^{A4} (except Annex C) ^{A4}
2	3	General	^{A3} 5, 9.3, 21.3 (10.2, 10.3 only), 19.1, 14.2, 13.13 (9.1.1 only), 13.4.1a), 13.4.1b), 13.5, 13.6 ^{A3}
3	3		5, 13.13 (20.1.2 only), 17, 13.11, (13.11.1 only), 16, 19.5, 21.3
4	3		5, 14.1, 15, 18.1.2 (9.1, 16, 13.19, 15, 13.4.1a) 10.2, 13.6, 13.7, 13.8)
5	3		5, 14.2, 18.1.3, 20
6	3		Materials
7	3	5, 23.2 ^{A4} , 8.2 (Annex C only) ^{A4}	
8	3	5, 24, 21.3	
9 ^a	3	Positive break	5, 13.11.2
NOTE The order of tests given in sequence no. 1 above is preferred but not mandatory except where required within the text of the appropriate clause.			
^a An additional new set of three samples prepared with the contacts closed is supplied by the manufacturer for this test.			

6 Classification

Socket-outlets shall be classified as follows:

- single or multiple;
- switched or unswitched;
- fused or unfused;
- fixed or portable;
- (if fixed) flush or surface or panel-mounting;
- (if portable) rewirable or non-rewirable;
- with or without indicator lamp.

7 Marking and labelling

7.1 Socket-outlets shall be legibly and durably marked with the following information, which shall not be placed on screws, removable washers or other easily removable parts, or upon parts intended for separate sale:

- a) either the name, trade mark or identification mark of the manufacturer or responsible vendor, which may be duplicated on a removable fuse carrier;
- b) the number of this British Standard, i.e. BS 1363¹⁾;
- c) for portable socket-outlets the number of this British Standard shall be followed by “/A”;
- d) on rewirable socket-outlets the terminals intended for the connection of the various conductors shall be identified by the symbols given in **A3** 7.5 **A3**;
- e) for fused socket-outlets, the words “FUSE” or “FUSED” or the symbol (given in **A3** 7.5 **A3**) on the engagement surface of a socket-outlet;
- f) fixed fused multiple socket-outlets shall be marked on the engagement surface with the maximum rated current of 13 A (e.g. MAX. 13A);
- g) all socket-outlets shall be marked with the following:
 - 1) rated current;
 - 2) rated volts;
 - 3) nature of supply.

Portable socket-outlets shall be marked on the accessible external surface. In the case of a non-rewirable portable socket-outlet, the rated current shall be the maximum current appropriate to the attached flexible cord as given in Table 2.

¹⁾ Marking BS 1363 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. **A3** Text deleted **A3**

Table 2 — Rated current and maximum fuse rating in normal use, and load for flexing and cord grip tests related to size of flexible cord

Flex cord nom cross-sectional area mm ²	Rated current A	Test current ±0.4 A A	Fuse rating A	Load for flexing test +2 %, -0 % kg	Cord grip tests	
					Load +2 %, -0 % kg	Torque ^a N·m
0.5	3	3.5	3	1	3	0.15
0.75	6	7	7 (13) ^b	1	3	0.20
1	10	11	10 (13) ^b	2	3	0.25
1.25	13	14	13	2	6	0.30
1.5	13	14	13	2	6	0.35

^a The recording of a measured value of torque in accordance with this table is considered to comply with this part of BS 1363 on condition that the uncertainty of measurement at not less than 95 % confidence level does not exceed ±10 %.

^b The figure in brackets indicates the maximum fuse rating when a non-rewirable plug/cord assembly is used with certain equipment which because of its operating characteristic needs a higher rating of fuse link.

7.1.1 Compliance shall be checked by inspection and by rubbing the markings for approximately 15 s with a cloth soaked in water, and again for approximately 15 s with a cloth soaked in an aliphatic solvent hexane with a content of aromatics of maximum 0.1 % by volume, a Kauri-butanol value of 29, initial boiling point of approximately 69 °C, and relative density of approximately 0.68.

The marking shall remain legible. Markings produced by an engraving or moulding process shall be deemed to comply without test.

7.2 Portable fused socket-outlets shall be supplied with a removable tag, label or instructions indicating the rating of the fuse link fitted, e.g. “Fitted with X ampere fuse” (where “X” denotes the rating of the fuse link).

7.2.1 Compliance shall be checked by inspection.

7.3 Portable socket-outlets fitted with a flexible cord shall be supplied with a label or instruction indicating the colour coding of the cores of the flexible cord as follows.

Wires in the mains lead shall be coloured in accordance with the following code:

Green/yellow	Earth
Blue	Neutral
Brown	Live

7.3.1 Compliance shall be checked by inspection.

7.4 Rewireable portable socket-outlets shall be provided with adequate instructions for the safe connection of the appropriate 3-core flexible cord, including clear instructions for the removal of insulation from the conductors.

7.4.1 Compliance shall be checked by inspection.

7.5 If symbols are used they shall be as follows:

amperes	A	
volts	V	
* alternating current	~	
line	L	
neutral	N	
* earth	⊕	(preferred) or ⊕
* fuse	⊞	

NOTE 1 BS 6217 gives details of symbols marked.*

NOTE 2 For the marking of the rated current and rated voltage of the socket-outlet, figures may be used alone, the figures for the current rating being placed before or above that of the rated voltage and separated by a line.

If a symbol for nature of supply is used, it shall be placed next to the marking for rated current and rated voltage. Examples are as follows:

13 A 250 V ~ or 13/250 ~ or $\frac{13}{250}$ ~

or 13 A 250 V a.c. or 13/250 a.c. or

$\frac{13}{250}$

8 Clearances, creepage distances and solid insulation

Socket-outlets shall be constructed so that the clearances, creepage distances and solid insulation are adequate to withstand the electrical stresses taking into account the environmental influences that may occur. Clearances, creepage distances and solid insulation shall comply with the relevant

requirements of 8.1, 8.2 and 8.3.

The distance between lead wires in the pinch of a neon lamp with external resistor shall be a minimum of 1 mm.

Text deleted

Socket-outlets complying with the requirements for basic insulation shall be deemed to meet the requirements of this clause. If the manufacturer declares an insulation level exceeding basic insulation then the socket-outlet shall be tested accordingly.

NOTE 1 The requirements and tests are based on BS EN 60664-1.

NOTE 2 Product insulation consists of Basic Insulation and Protective Earthing as required by BS EN 61140 for Class I equipment. Mechanical strength equivalent to that which would be provided by Reinforced Insulation as listed in BS EN 61140 is achieved in BS 1363 products through the specific mechanical and material tests of BS 1363.

8.1 Clearances

Socket-outlets energized directly from the low-voltage supply fall into Overvoltage Category III.

The clearances shall be dimensioned to withstand the rated impulse voltage declared by the manufacturer considering the rated voltage and the Overvoltage Category as given in Annex D and the pollution degree declared by the manufacturer in accordance with Annex E.

For the measurements:

- all parts which may be removed without the use of a tool are removed and moveable parts which can be assembled in different orientations are placed in the most unfavourable position.

NOTE Moveable parts are, for example hexagonal nuts, the position of which cannot be controlled throughout an assembly.

Text deleted

8.1.1 Clearances for basic insulation

The clearances for basic insulation shall not be less than the values given in Table 8 except as described below.

Smaller unspecified clearances (except those values marked in Table 8 with Note b) may be used if the socket-outlet meets the impulse withstand voltage test of Annex F at the impulse voltage specified in Annex D but only if the parts are rigid or located by mouldings or if the construction is such that it is unlikely that distances will be reduced by distortion or by movement of the parts during mounting, connection and normal use.

Compliance shall be checked by inspection, and if necessary by measurement, or by the test of Annex F.

If clearance distances are to be measured, this shall be carried out in accordance with Annex B.

8.1.2 Clearances for functional insulation

The clearances for functional insulation shall not be less than the values specified for basic insulation in 8.1.1.

Ⓐ Compliance shall be checked by inspection, and if necessary by measurement, or by the test of Annex F. If clearance distances are to be measured, this shall be carried out in accordance with Annex B. Ⓐ

8.1.3 Clearances for supplementary insulation

The clearances for supplementary insulation shall not be less than the values specified for basic insulation in 8.1.1.

Ⓐ Compliance shall be checked by inspection, and if necessary by measurement, or by the test of Annex F. If clearance distances are to be measured, this shall be carried out in accordance with Annex B. Ⓐ

Table 8 — Minimum clearances for basic insulation

Rated impulse withstand voltage kV ^a	Minimum clearances in air up to 2 000 m above sea level mm
0.33	0.2 ^b
0.50	0.2 ^b
0.80	0.2 ^b
1.5	0.5
2.5	1.5
4.0	3
6.0	5.5

^a See Annex Ⓐ D Ⓐ. This voltage is:

- for functional insulation: the maximum impulse voltage expected to occur across the clearance;
- for basic insulation directly exposed to or significantly influenced by transient overvoltage from the low-voltage mains: the rated impulse withstand voltage of the socket-outlet;
- for other basic insulation: the highest impulse voltage that can occur in the circuit.

^b Minimum clearance values are based on BS EN 60664-1.

8.1.4 Clearances for reinforced insulation

The clearance for reinforced insulation shall be not less than the values specified for basic insulation in 8.1.1 but using the next higher step for rated impulse withstand voltage given in Table 8.

Compliance shall be checked by inspection and by measurement Ⓐ, or by the test of Annex F Ⓐ.

Ⓐ 8.1.5 Contact gap

The minimum contact gap shall be 1.2 mm in the open position.

Compliance shall be checked by measurement. Ⓐ

8.2 Creepage distances

The creepage distances shall be dimensioned for the voltage, which is expected to occur in normal use taking into account the pollution degree, and the material group as declared by the manufacturer.

For the measurements:

- all parts which may be removed without the use of a tool are removed and moveable parts which can be assembled in different orientations are placed in the most unfavourable position.

NOTE 1 Moveable parts are, for example hexagonal nuts, the position of which cannot be controlled throughout an assembly.

NOTE 2 A creepage distance cannot be less than the associated clearance.

Creepage distances are measured in accordance with Annex **A3** B **A3**.

The relationship between material group and between comparative tracking index (CTI) values and proof tracking index (PTI) values is as follows:

Material group I	$600 \leq \text{CTI/PTI}$
Material group II	$400 \leq \text{CTI/PTI} < 600$
Material group IIIa	$175 \leq \text{CTI/PTI} < 400$
Material group IIIb	$100 \leq \text{CTI/PTI} < 175$

The CTI or PTI values are determined in accordance with Annex **A3** C **A3**.

NOTE 3 For glass, ceramics and other inorganic materials which do not track, creepage distances need not be greater than their associated clearance.

8.2.1 Creepage distances for basic insulation

The creepage distances for basic insulation shall not be less than the values given in Table 9.

Compliance shall be checked by measurement.

Table 9 — Minimum creepage distances for basic insulation

Rated voltage ^a V (r.m.s.)	Pollution Degree 2			Pollution Degree 3		
	Material group ^b			Material group ^b		
up to and including	I	II	IIIa/IIIb	I	II	IIIa
250	1.3	1.8	2.5	3.2	3.6	4.0

^a This voltage is the voltage rationalized through Table 3a and Table 3b of BS EN 60664-1 based on the rated voltage.
^b Details of pollution degrees are given in Annex **A3** E **A3**.

8.2.2 Creepage distances for functional insulation

The creepage distances for functional insulation shall not be less than the values specified for basic insulation in 8.2.1.

Compliance shall be checked by measurement.

8.2.3 Creepage distances for supplementary insulation

The creepage distances for supplementary insulation shall not be less than the values specified for basic insulation in 8.2.1.

Compliance shall be checked by measurement.

8.2.4 Creepage distances for reinforced insulation

The creepage distances for reinforced insulation shall not be less than those derived from twice the distance specified for basic insulation in Table 9.

Compliance shall be checked by measurement.

8.3 Solid insulation

Solid insulation for basic, **A4** functional, **A4** supplementary and reinforced insulation shall be capable of withstanding electrical stresses which may occur in normal use.

No minimum thickness is specified for solid insulation.

A4 8.3.1 Compliance shall be checked by tests in accordance with 15.1.3 using the values given in Table 10. **A4**

Ⓐ₄ Text deleted Ⓐ₄

Ⓐ₃ Table 10 — Withstand voltages for insulation types

Insulation	Test voltage V (r.m.s.)
Functional Insulation	1 500
Basic Insulation	1 500
Supplementary Insulation	1 500
Reinforced Insulation	3 000

Ⓐ₃

9 Accessibility of live parts

9.1 Socket-outlets shall be so designed that when they are mounted and wired as in normal use, live parts are not accessible.

9.1.1 Compliance shall be checked by the application of the test pin shown in Figure 1 perpendicular to the accessible external surface of the socket-outlet with a force of 5_{-1}^0 N. It shall not be possible to touch live parts.

9.2 Socket-outlets shall be designed and constructed so as to protect the user against accidental contact with live parts during insertion or withdrawal of plugs.

9.2.1 Compliance shall be proved by satisfying the dimensional and gauging requirements of this part of BS 1363.

9.3 Resilient accessible external surfaces of socket-outlets shall be so designed and constructed that when assembled and wired as in normal use, there is no risk that, as a result of undue pressure, live parts could penetrate the accessible external surfaces or become so disposed as to reduce creepage and clearances below those given in Clause 8.

9.3.1 Compliance shall be checked by the following test (an example of a suitable test apparatus is shown in Figure 2).

The design of the apparatus shall be such that a steady force of 240_{-10}^0 N can be applied to those places where the possibility of a failure exists, the force being applied through a metal test pressure block as shown in Figure 2.

Each sample is subjected to the force at each chosen place in turn. During each application of force, a test voltage of $2\ 000\text{ V} \pm 60\text{ V}$ 50 Hz of substantially sinusoidal waveform is applied for 60_{0}^{+5} s between all live parts bonded together and the earthed test pressure block.

During the test no flashover or breakdown shall occur.

After the test it shall not be possible to touch live parts with test probe 11 of BS EN 61032:1998 applied with a force of 30_{-2}^0 N.

9.4 It shall not be possible to introduce a conducting device through the earthing socket aperture(s) of a socket-outlet in such a manner that there is a risk of making contact with any live conductor, with or without insulation.

9.4.1 Compliance shall be checked by introducing a rigid metal pin, $1_{-0.05}^0$ mm diameter \times 60 mm \pm 1 mm long, through the earthing socket aperture or apertures of a socket-outlet mounted and wired within an appropriate enclosure, applying a force of 5_{-1}^0 N, with the conductors in the most unfavourable positions.

10 Provision for earthing

10.1 Socket-outlets shall be so constructed that, when inserting the plug, the earth connection is made before the current-carrying pins of the plug become live. When withdrawing the plug, the current-carrying parts shall separate before the earth contact is broken.

10.1.1 Compliance shall be checked by inspection and electrical test.

10.2 All accessible metal parts of socket-outlets shall be in effective electrical contact with the earthing socket contact, except that metal parts on, or screws in or through, non-conducting material, and separated by such material from current-carrying parts in such a way that in normal use they cannot become live, need not be in effective electrical contact with the earthing socket contact.

NOTE Metal parts having an accessible surface coating of lacquer or enamel are accessible metal parts within the meaning of this requirement.

10.2.1 Compliance shall be checked by inspection and the following:

- a) for metal parts insulated from live parts, by the test described in **15.1.3**;
- b) for metal parts connected to an earthing terminal by the following test. A current of $25 \text{ A} \pm 0.75 \text{ A}$, derived from an a.c. source having a no-load voltage not exceeding 12 V, is passed for 60^{+5}_0 s between the earthing terminal and any accessible metal part intended to be earthed and between the earthing terminal and an earthing plug pin inserted in the earthing socket contact;
- c) the resistance between the earthing terminal and any other nominated part shall not exceed 0.05Ω .

10.3 If means are provided for electrically bonding the mounting box to the earthing circuit of the socket-outlet by means of the fixing screws the connection between the screw and earthing terminal shall be of low resistance.

10.3.1 Compliance shall be checked by the test described in **10.2.1b)** applied between the socket-outlet earthing terminals and any fixing screw in electrical contact with the earthing circuit. For the purpose of this test the socket-outlet shall be attached to its appropriate mounting box, the fixing screws being tightened to a value of two-thirds those given in Table 3a.

Table 3a — Torque values for screws and nuts

Declared diameter of screw thread mm	Torque		
	For metal screws (see Note 1) N·m	For other metal screws and nuts N·m	For screws of insulating material N·m
Up to and including 2.8	0.2	0.4	0.4
Over 2.8, up to and including 3	0.25	0.5	0.5
Over 3, up to and including 3.2	0.3	0.6	0.6
Over 3.2, up to and including 3.6	0.4	0.8	0.6
Over 3.6, up to and including 4.1	0.7	1.2	0.6
Over 4.1, up to and including 4.7	0.8	1.8	0.9
Over 4.7, up to and including 5.3	0.8	2.0	1.0
Over 5.3, up to and including 6	—	2.5	1.25

NOTE 1 This column applies to metal screws without heads if the screw when tightened does not protrude from the hole, and to other metal screws which cannot be tightened by means of a screwdriver with a blade wider than the diameter of the screw.

NOTE 2 The recording of a measured value given in this table is considered to comply with this part of BS 1363 on condition that the uncertainty of measurement at not less than 95 % confidence level does not exceed $\pm 10 \%$.

11 Terminals and terminations

11.1 Terminals and terminations shall provide for effective clamping and securing of conductors connected to them, so that efficient electrical connection is made.

11.1.1 Compliance shall be checked in accordance with **11.2** to **11.9**.

11.2 Rewirable socket-outlets shall be provided with terminals as defined in **3.20**.

11.2.1 Compliance shall be checked by inspection.

11.3 Non-rewirable portable socket-outlets shall be provided with soldered, welded, crimped or similar terminations; for all these methods of termination, not more than one strand of a 0.5 mm² or two strands of other sized conductors shall be fractured during connection.

Screwed and “snap-on” terminals shall not be used. Crimped connections shall not be made on to pre-soldered flexible cords unless the soldered area is entirely outside the crimp.

11.3.1 Compliance shall be checked by inspection and measurement.

11.4 Terminals in rewirable portable socket-outlets shall permit the connection, without special preparation, of flexible cords having nominal conductor cross-sectional areas of 0.5 mm² to 1.5 mm² ^{A3} as given in Table 27 of BS 6500:2000. ^{A3}

11.4.1 Compliance shall be checked by inspection and fitting the appropriate conductors.

11.5 Line and neutral terminals in fixed socket-outlets shall permit the connection, without special preparation, of one, two or three 2.5 mm² solid or stranded or of one or two 4 mm² stranded conductors ^{A3} as given in Table 8 of BS 6004:2000. ^{A3}

11.5.1 Compliance shall be checked by inspection and by fitting the appropriate conductors.

11.6 Earthing terminals in fixed socket-outlets shall permit the connection, without special preparation, of one, two or three 1.5 mm² or 2.5 mm² solid or stranded or of one or two 4 mm² stranded conductors.

11.6.1 Compliance shall be checked by inspection and fitting the appropriate conductors.

11.7 Where pillar terminals are used they shall have clamping screws of sufficient length to extend to the far side of the conductor hole. The end of the screw shall be slightly rounded so as to minimize damage to the conductors. The sizes of the conductor hole and the clamping screw shall be such that the clearance between the sides of the major diameter of the clamping screw and the conductor hole does not exceed 0.4 mm when intended for the connection of flexible cords and 0.6 mm when intended solely for the connection of fixed wiring.

11.7.1 Compliance shall be checked by inspection and measurement.

11.8 Terminal screws shall have a declared outside diameter of not less than 3 mm or be not smaller than 6 B.A.

Thread cutting and/or thread forming screws shall not be used.

11.8.1 Compliance shall be checked by inspection and measurement.

11.9 In rewirable portable socket-outlets terminals shall be so located or shielded that should a stray strand of a flexible conductor escape when the conductors are fitted, there is negligible risk of accidental connection between live parts and accessible external surfaces, or of a stray strand bypassing the fuse link if any.

11.9.1 Compliance shall be checked by inspection, and by the following test.

A length of insulation in accordance with the manufacturer's instructions is removed from the end of a flexible conductor having a nominal cross-sectional area of 1.5 mm². One free strand of the flexible conductor is left free and the other strands are fully inserted into and clamped in the terminal. The stray strand is bent, without tearing the insulation back, in every possible direction, but without making sharp bends round barriers unless a bend is reproduced by the replacement of the cover.

The free strand of a flexible conductor connected to a live terminal shall not:

- a) touch any metal part, so as to bypass any fuse link;
- b) touch any metal part which is accessible or is connected to an accessible metal part;
- c) reduce creepage distances and clearances to accessible surfaces to less than 1.3 mm.

The free strand of a flexible conductor connected to an earthing terminal shall not touch any live parts.

12 (Not used)

13 Construction of socket-outlets

13.1 The disposition of the socket contacts shall be as shown in Figure 3.

^{A4} The engagement surface shall be substantially flat. Any steps or profile contours on the engagement surface shall not result in the surface deviating from the plane of engagement by more than 2 mm. Holes

not exceeding 8 mm diameter for the purpose of assembly fixing shall be deemed acceptable. There shall be no projection on the engagement surface of a socket-outlet such as would prevent the full insertion of a plug. If raised marking is used it shall not project more than 0.5 mm from the engagement surface of a socket-outlet and shall allow compliance with 13.2. The spacing of the socket contacts shall correspond with that of plug pins as specified in BS 1363-1:1995. \AA

13.1.1 Compliance shall be checked by inspection, \AA measurement \AA and the use of the gauges shown in Figure 11.

\AA Text deleted \AA

13.2 The line and neutral socket contacts in socket-outlets shall be positioned so as to make satisfactory contact with the corresponding pins of a plug in all positions that the contacts may occupy when the plug is correctly and fully inserted.

13.2.1 Compliance shall be checked by inspection and the use of the gauge shown in Figure 12 and the circuit shown in Figure 13. Both indicator lamps shall light.

13.3 On insertion of a plug into a socket-outlet, the travel of the end of either current-carrying pin from the front face of the 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 9.6 mm.

13.3.1 Compliance shall be checked by inspection and the use of the gauge shown in Figure 14 and the circuit shown in Figure 13. Neither indicator shall light.

13.4 Socket contacts shall be self-adjusting as to contact making and each socket contact shall be such as to make and maintain, in normal use, effective electrical and mechanical, contact with a corresponding plug pin. The means for producing the contact pressure shall be associated with each socket contact independently and shall not be dependent on insulating material. Each socket contact shall be reliably connected to the fixed parts of its terminal or termination.

13.4.1 Compliance shall be checked by the following tests and Clause 16.

a) The voltage drop between any individual line or neutral socket contact and the corresponding plug pin is measured between the terminal connecting strap at a point immediately adjacent to the socket contact and the corresponding plug pin. The voltage drop shall not exceed 25 mV at $13 \text{ A} \pm 0.4 \text{ A}$.

b) The withdrawal pull of a gauge as shown in Figure 16b) from any individual line or neutral socket contact is checked ensuring that neither the shutter mechanism, nor the material of the cover or base moulding, have any effect on the results of the test. The socket contact shall retain the gauge for not less than 30 s when the socket-outlet is held horizontally with the gauge hanging vertically downwards.

13.5 Line and neutral socket contacts shall withstand the stresses imposed upon them by the use of socket-outlet adaptors and the like.

13.5.1 Compliance shall be checked by the following test.

The socket-outlet is mounted with \AA the engagement surface of the socket-outlet \AA in the vertical plane and with the major axis of the line and neutral pins horizontal \AA ensuring that the shutter mechanism does not have any effect on the results of the test \AA . The end E of the gauge shown in Figure 15 is inserted into the line socket aperture as far as the pin D and a mass of $750 \text{ g} \pm 5 \text{ g}$ is suspended from pin C for 30^{+5}_0 s .

The socket-outlet is rotated through 180° approximately about an axis perpendicular to \AA the engagement surface of the socket-outlet \AA and the load applied to pin C for a further 30^{+5}_0 s . The test is repeated with the gauge inserted in the neutral socket aperture. After the test the socket contact shall retain the weight gauge shown in Figure 16b) for not less than 30 s when \AA the engagement surface of the socket-outlet \AA is held horizontally, with the gauge hanging vertically downwards.

13.6 Earth socket contacts shall withstand the stresses imposed upon them by the attempted incorrect insertion of plugs.

13.6.1 Compliance shall be checked by the following test.

The socket-outlet is mounted with \AA the engagement surface of the socket-outlet \AA in the vertical plane and with the major axis of the earth pin aperture horizontal \AA ensuring that the shutter mechanism does not have any effect on the results of the test \AA . The end A of the gauge shown in Figure 15 is inserted

into the earth socket aperture as far as the pin B, and a mass of $750 \text{ g} \pm 5 \text{ g}$ is suspended from pin D for $30 \text{ s} \text{ }^{+5}_0$. The socket-outlet is rotated through 180° approximately about an axis perpendicular to A_4 the engagement surface of the socket-outlet A_4 and the load applied to pin D for a further $30 \text{ s} \text{ }^{+5}_0$.

After the test the earth socket contact shall retain the weight gauge shown in Figure 16a) for not less than 30 s when A_4 the engagement surface of the socket-outlet A_4 is held horizontally with the gauge hanging vertically downwards.

13.7 The construction of the socket-outlet shall be such that when a plug is withdrawn from it, the current-carrying socket contacts are automatically screened by shutters. One socket aperture shutter shall not be capable of closing independently of the other aperture shutter. The shutters shall be operated either by the insertion of the earthing pin or by the simultaneous insertion of any two or more pins of the plug, provided that the gauge [see Figure 16b)] inserted into any current-carrying socket aperture shall not open the shutter. A_4 Compliance shall be checked by the tests of **13.7.1**. A_4

A_4 It shall not be possible to operate a shutter by inserting a 2-pin plug into a 3-pin socket-outlet. Compliance shall be checked by the tests of **13.7.2**. A_4

13.7.1 Compliance shall be checked by inspection, by the test described in **18.1.2**, and by the application of the gauge shown in Figure 16b). The gauge and the test pin, shown in Figure 1, are applied to the shutter using a force of $5 \text{ N} \text{ }^{+0}_1$ applied perpendicular to the engagement A_3 surface A_3 of the socket-outlet.

It shall not be possible to touch current-carrying parts.

A_4 **13.7.2** Earth pin operated shutters and 3-pin operated shutters shall be deemed to comply with this requirement without testing. For other shutter designs, compliance shall be checked by the following test.

A 2-pin plug complying with BS EN 50075 shall be applied to the socket line and neutral apertures with a force of $30 \text{ N} \text{ }^{+0}_2$. The plug pins, when applied in any direction, shall not make contact with live parts. A_4

13.8 The construction of socket-outlets shall be such as to allow for easy withdrawal of the plug.

13.8.1 Compliance shall be checked by the following test.

A plug is inserted into and withdrawn from the socket-outlet 10 times with the socket-outlet mounted as in normal use.

The plug is then inserted into the socket-outlet and a force is gradually exerted in a direction parallel to the axis of the pins.

It shall not be possible to reach a pull of 36 N without the plug coming out of the socket-outlet.

NOTE Care should be taken to remove any grease from the plug pins and socket contacts prior to the tests.

13.9 Apertures for the reception of the line and the neutral plug pins shall not exceed $7.2 \text{ mm} \times 4.8 \text{ mm}$ and for the earthing plug pin $8.8 \text{ mm} \times 4.8 \text{ mm}$.

NOTE Apertures may be shaped at their front edges to facilitate insertion of appropriate plug pins.

The holes for the line and the neutral plug pins in metal plates shall have sufficient insulating material around them to ensure compliance with Clause 8.

Earth socket contacts may be flush with the front face of covers or cover plates but shall not depend for their effectiveness on insulating material of the cover. In such a case the aperture shall be measured between the contact faces at the maximum separation.

13.9.1 Compliance shall be checked by inspection and measurement.

13.10 No part of the aperture intended for the reception of the line or neutral pin shall be less than 9.5 mm from the periphery of the A_4 engagement surface A_4 of a socket-outlet except that when a shutter is operated by the simultaneous insertion of the current-carrying pins this dimension shall be increased to not less than 18 mm from the lower edge of the socket-outlet.

NOTE The 9.5 mm and 18 mm dimensions may include a peripheral edge radius of not more than 1 mm.

13.10.1 Compliance shall be checked by inspection and measurement.

13.11 Switches shall be so constructed that undue arcing cannot occur when the switch is operated slowly.

The switch in any switched socket-outlet shall disconnect at least the supply to the line socket contact.

Double pole switches shall make or break each pole with one movement of the actuator.

13.11.1 Compliance shall be checked by inspection and by the following test.

Following the test described in Clause 17, the circuit is broken a further 10 times, each time moving the actuating member by hand over a period of approximately 2 s in a manner such as to attempt to stop the moving contact in an intermediate position causing arcing. The actuating member shall be released after approximately 2 s and any arcing shall cease.

13.11.2 The actuating member of a switch shall not remain at rest in the off position whilst the switch contacts remain closed. The actuating mechanism shall be so constructed that when operated the switch can remain only in a position giving adequate contact or adequate separation of contacts. For socket outlets that cannot be dismantled after assembly an additional new set of three samples prepared with the contacts closed is supplied by the manufacturer for this test.

13.11.3 Compliance shall be checked by inspection and by the test of 13.11.4.

13.11.4 The necessary force F to switch off shall first be measured and the force should be applied to the extremity of the actuating member.

A3 With the actuating member of the switch in the closed position, the fixed and moving contacts of each pole shall be mechanically fixed together to provide the most onerous condition. When fixing the contacts, care should be taken to ensure that the test result is not unduly affected. **A3**

The actuating member shall be subjected to a test force as defined in Table 3b. This force shall be applied in one smooth and continuous motion to the extreme point of the actuating member in the most favourable direction to open the contacts for a period of 10 s.

If locking means are designed to lock the actuating members in opened position, it shall not be possible to lock the actuating members in this position while the force is applied.

After the test and when the test force is no longer applied, the actuating member shall not remain at rest in the "OFF" position.

Table 3b — Actuator test force

Type of actuator	Test force	Minimum test force N	Maximum test force N
Switch actuator	3F	50	150
F is the normal operating force in new condition. The test force shall be 3F with the stated minimum and maximum values applied.			
NOTE 1 The use of grease and the likes are not considered to be a mechanical means.			
NOTE 2 The specimen may be dismantled where necessary in preparation for this test but adequate care must be taken that the test specimen or components are not damaged during this preparation.			

13.12 Multiple socket-outlets shall be capable of simultaneous use of all socket-outlets.

13.12.1 Compliance shall be checked by inspection and by fitting gauges as shown in Figure 11 in adjacent socket-outlets of the multiple socket-outlet.

13.13 If a fuse link is fitted to a socket-outlet it shall comply with BS 1362:1973 and shall be mounted in suitable contacts between the line terminal or terminations and the corresponding socket contact or contacts or the switch.

The design shall be such that the fuse link cannot be displaced accidentally during use or be left in incorrect contact when the fuse cover or fuse carrier is replaced and secured in position. It shall be possible to remove and replace the fuse link whilst passing current without dismantling the socket-outlet and no live parts shall become accessible during its removal or replacement.

The contact for a fuse link connected to the line terminal, or to a switch, shall be formed in one piece with a fixed part of that terminal or the switch, or connected to them in such a way that efficient electrical connection is made that cannot work loose in normal use. The other contact for the fuse link shall be similarly connected to the corresponding socket contact or contacts.

13.13.1 Compliance shall be checked by inspection and by the application of the standard test probe B of BS EN 61032:1998 and the test pin shown in Figure 1 applied in accordance with 9.1.1. Fuse link clips in socket outlets shall be checked for mechanical strength by the insertion and withdrawal test described in 20.1.2.

Current making and breaking of fuse links shall be checked by the test described in 17.1.4 after which the temperature-rise test described in Clause 16 shall be carried out.

13.14 Conductive component parts of socket-outlets shall be so located and separated that, in normal use, they cannot be displaced so as to affect adversely the safety or proper operation of the socket-outlet.

13.14.1 Compliance shall be checked by inspection and manipulation.

13.15 For flush socket-outlets, the size of the base or bases shall be such that the clearance for the purpose of wiring between the base or bases and the inside walls of the box or enclosure is not less than 6 mm and such that the clearance between the overall depth of the base or bases and the bottom of a 35.0 mm deep box or enclosure is not less than 14 mm, when the box or enclosure and the socket-outlet are in the relative positions they will occupy in use, except that encroachments on these clearances shall only be acceptable if there is no interference with at least one conduit or cable entry on each face of the box or enclosure.

There shall be no live metal protruding from or flush with the socket-outlet base. Any exposed live metal part shall be recessed to give the necessary clearance distance from any earthed metal which may come into contact with the base.

NOTE If the terminals are arranged for front wiring after fixing the base then the 14 mm clearance need not apply.

For socket-outlets for use in other enclosures, the clearance between the socket-outlet and the appropriate box or enclosure shall provide adequate wiring space according to the method of entry of all the necessary cables.

Where it is intended that the fixed wiring conductors pass through holes in the base of the socket-outlet to the terminals, each hole shall be large enough to accept satisfactorily three 2.5 mm² cable cores with their insulation, the sheath, if any, having been removed.

13.15.1 Compliance shall be checked by inspection and measurement.

13.16 Fixed surface-mounted socket-outlets shall be provided with means to ensure proper seating on a flat surface and with fixing holes which will accept No. 6 wood screws complying with BS 1210:1963.

Flush or semi-flush mounted socket-outlet plates shall have provision for two M3.5 fixing screws at centres of 60.3 mm ± 0.2 mm on the horizontal or vertical centrelines for boxes intended to accommodate 1-gang socket-outlets, 120.6 mm ± 0.3 mm on the horizontal or vertical centrelines for boxes intended to accommodate 2-gang socket-outlets of 180.9 mm ± 0.4 mm on the horizontal or vertical centrelines for boxes intended to accommodate 3-gang socket-outlets in accordance with BS 4662.

The size and disposition of fixing holes shall be such as to allow satisfactory attachment to boxes having centres manufactured to a ±0.8 mm tolerance.

13.16.1 Compliance shall be checked by inspection and measurement.

13.17 Flush socket-outlet plates either of insulating material or metal, or a combination of both, shall be 82.5 mm × 82.5 mm minimum for single socket-outlets and 82.5 mm × 142.5 mm minimum for multiple socket-outlets.

13.17.1 Compliance shall be checked by inspection and measurement.

13.18 The base and cover of non-rewirable portable socket-outlets shall be permanently attached to each other, such that the flexible cord cannot be separated without making the portable socket-outlet permanently useless, and the portable socket-outlet cannot be opened by hand or by using a general purpose tool, for example a screwdriver used as such. A portable socket-outlet is considered to be permanently useless when for reassembling the portable socket-outlet parts or materials other than the original have to be used.

The base and cover of rewirable portable socket-outlets shall be firmly secured to each other, such that they cannot be detached from each other without the aid of a tool.

13.18.1 Compliance shall be checked by inspection.

13.19 Portable socket-outlets shall be so designed and constructed that they cannot be deformed to allow access to live parts or to allow separated metal parts to be brought into contact with each other.

13.19.1 Compliance shall be checked by inspection and by use of test probe 11 of BS EN 61032:1998 applied with a force of $30 \begin{smallmatrix} 0 \\ -2 \end{smallmatrix}$ N immediately after the appropriate temperature-rise test described in Clause 16.

13.20 For non-rewirable portable socket-outlets means shall be provided to prevent loose strands of a conductor connected to current-carrying parts from reducing the minimum insulation thickness requirements between such parts and all accessible external surfaces of the socket-outlet.

13.20.1 Compliance shall be checked by inspection and the test described in **15.2**.

14 Resistance to ageing and to humidity

14.1 Resistance to ageing

Socket-outlets shall be resistant to ageing.

14.1.1 Compliance is checked by the following test.

Socket-outlets are subjected to a test in a heating cabinet with an atmosphere having the composition and pressure of the ambient air and ventilated by natural circulation.

The temperature in the cabinet is maintained at $70\text{ °C} \pm 5\text{ °C}$.

The specimens are kept in the cabinet for 168 h (0, +2) h.

NOTE 1 The use of an electrically heated cabinet is recommended.

NOTE 2 Natural circulation may be provided by holes in the walls of the cabinet.

After the treatment, the samples are removed from the cabinet and kept at room temperature and relative humidity for 1 h; and following which they are examined and shall show no damage which:

- would lead to non-compliance with this standard;
- would impair safety;
- would prevent further use.

14.2 Resistance to humidity

Socket-outlets shall be proof against humid conditions which may occur in normal use.

14.2.1 Compliance shall be checked by the following humidity treatment followed within 20 min by the measurement of the insulation resistance and by the electric strength test specified in Clause **15**.

Rewireable portable socket-outlets are fitted with $1\ 000\text{ mm} \pm 50\text{ mm}$ of 3-core 1.25 mm^2 PVC cord as specified in Table 27 of BS 6500:2000. Non-rewirable portable socket-outlets are tested with $1\ 000\text{ mm} \pm 50\text{ mm}$ of the flexible cord with which they are supplied. Fixed socket-outlets are tested as delivered.

Vitrified ceramic material, which after 24 h immersion in water has not increased in mass by more than 0.5 % after all the moisture has been removed from its surface, shall not be subjected to further tests, providing the resistance to water of the material does not depend on glaze or varnish.

To suit the ambient conditions at the time of test, a convenient temperature, T (in $^{\circ}\text{C}$), between $20\text{ }^{\circ}\text{C}$ and $30\text{ }^{\circ}\text{C}$, is chosen as a reference temperature. The sample is brought to a temperature of between T and $T + 4\text{ }^{\circ}\text{C}$ and is then placed in a humidity cabinet containing air with a relative humidity maintained between 85 % and 95 %. The temperature of the air where the samples are placed shall be maintained within $\pm 2\text{ }^{\circ}\text{C}$ of the chosen value T .

The sample is kept in the cabinet for $48\text{ }_0^{+1}\text{ h}$.

NOTE 1 In most cases samples may be brought to the chosen reference temperature by keeping them at this temperature for at least 4 h before the humidity treatment.

NOTE 2 A relative humidity of between 85 % and 95 % can be obtained by placing in the humidity cabinet a saturated solution of potassium nitrate (KNO_3) or sodium sulfate (Na_2SO_4) in water having a sufficiently large contact surface with the air.

In order to achieve the specified conditions within the cabinet it is necessary to ensure constant circulation of the air within the cabinet and, in general, to use a cabinet which is thermally insulated.

The tests described in Clause **15** shall be made in the humidity cabinet or immediately after removal of the specimen from the cabinet in a room where the specified temperature is maintained. Inspection shall not reveal any damage to the sample which would impair its use or safety within the requirements of this part of BS 1363.

15 Insulation resistance and electric strength

15.1 The insulation resistance and electric strength of socket-outlets shall be adequate.

15.1.1 Compliance shall be checked by the tests described in **15.1.2** and **15.1.3**.

15.1.2 The insulation resistance is measured using a d.c. voltage of 500^{+250}_0 V the measurement being made for 60^{+5}_0 s after application of the voltage.

The insulation resistance is measured consecutively between:

- a) line and neutral terminals/terminations;
- b) line and neutral terminals/terminations connected together and:
 - 1) a metal foil in contact with the entire accessible external surface;
 - 2) the earthing terminal/terminations;
 - 3) any metal part of a cord anchorage;
- c) each switched pole terminal of a switched socket and corresponding socket-outlet contact, with the switch contacts open.

The insulation resistance shall be not less than the following:

- i) $5\text{ M}\Omega$ between parts of opposite polarity;
- ii) $5\text{ M}\Omega$ between parts of opposite polarity connected together, A_4 and other parts, including earthed metal, intended to be insulated from them; A_4
- iii) $2\text{ M}\Omega$ across switch contacts with the switch open (where applicable).

One pole of neon indicators and the like shall be disconnected before making this test.

Where terminals/terminations are not directly accessible, e.g. in non-rewirable portable socket-outlets, these tests shall be made using accessible parts, e.g. socket-outlets contacts, known to be connected to the terminations.

15.1.3 A 50 Hz voltage of substantially sinusoidal waveform is applied as described in **15.1.2**. Initially, not more than 1 000 V is applied, the voltage then being raised to $2\ 000\text{ V} \pm 60\text{ V}$. The high voltage source used shall be such that when the output is adjusted to $2\ 000\text{ V} \pm 60\text{ V}$ for 60^{+5}_0 s and is then short circuited, the output current is not less than 200 mA. Any overcurrent protection shall not operate at a current less than 100 mA.

During the test no flashover or breakdown shall occur.

Glow discharges without drop in voltage shall be ignored.

One pole of neon indicators and the like shall be disconnected before making this test.

15.2 A_4 Non-rewirable portable socket-outlets A_4 shall withstand a high voltage test, for which the test voltage shall be alternating, (50 Hz to 60 Hz) applied between all current-carrying parts connected together and a conducting electrode in contact with the entire outer accessible surface. This test shall be carried out at $6\ 000\text{ V} \pm 100\text{ V}$ for a period between 3 s and 5 s.

During the test no breakdown or flashover shall occur.

Glow discharges without drop in voltage shall be ignored.

16 Temperature rise

16.1 Socket-outlets and their surroundings shall not attain excessive temperatures in normal use.

16.1.1 Compliance shall be checked by the tests described in **16.1.2**, and **16.1.3** for fixed socket-outlets and portable socket-outlets respectively.

The tests shall be carried out at rated voltage +10 %, -20 %.

For these tests, where conductors are connected to terminals, the terminal screws shall be tightened with a torque equal to two-thirds of the values given in Table 3a.

During the tests temperature rises are measured at the terminals or terminations and where overheating might result in a hazard and the values measured shall not exceed the values given in Table 4. Temperature rises are determined by means of fine wire thermocouples so chosen and positioned that they have minimum effect on the temperature of the part under test. The thermocouples are attached by means of a mixture of equal parts of resin adhesive and zinc oxide, by soldering, or by other equally effective means.

NOTE If soldering is used, it is essential that care is taken to ensure that the heat from the soldering process does not affect the performance of the socket-outlet and that no electrical connections are bridged by solder.

If, in order to fix thermocouples, a non-rewirable portable socket-outlet is dissected to give access to the appropriate positions, the removed parts shall be replaced and if necessary shall be cemented in place such that no additional air spaces are created.

Table 4 — Permitted temperature rises

Measurement point	Temperature rise K
Terminals or terminations	52
Accessible external surface	52

NOTE The recording of a measured value up to and including the specified maximum permissible limit for temperature rise is considered to comply with the requirements of the standard on condition that the uncertainty of measurement at not less than 95 % confidence level does not exceed ± 2 °C.

16.1.2 Surface-mounted fixed socket-outlets are mounted as in use with their accompanying mounting block or backplate fixed to a vertical plywood board having a nominal thickness of 24 mm and having a surface extending at least 150 mm in each direction beyond the extremity of the socket-outlet.

Flush-mounted socket-outlets having one or two sets of socket contacts and designed for use with flush-mounted socket-outlet boxes as shown in either Figure 1b) or Figure 2b) of BS 4662:1970 are mounted on a test fixture designed to simulate normal conditions of use, comprising such a metal box having a nominal internal depth of 35 mm, which is fixed into a block of wood, so that the front edges of the metal box are between 2.5 mm to 5 mm below the front surface of the block. The size of the block shall be such that there is a minimum of 25 mm of wood surrounding the box on all four sides and the back. The socket-outlet is then mounted by means of its fixing screws so that the rear of the plate is flush with the surface of the block.

Other types of fixed socket-outlets are mounted according to the manufacturer's instructions or, in the absence of such instructions, in the position of normal use considered to give the most onerous conditions.

The line, neutral and earth terminals of a single socket-outlet are connected to an incoming and outgoing 2.5 mm² 2-core and earth PVC insulated and sheathed cable as given in Table 8 of BS 6004:2000.

A twin unfused socket-outlet is connected as described above.

A multiple unfused socket-outlet having more than two sets of socket contacts is connected to an incoming 4 mm² 2-core and earth PVC insulated and sheathed cable as given in Table 8 of BS 6004:2000. There shall be no outgoing cable.

A fused socket-outlet having more than one set of socket contacts is connected to an incoming and outgoing 2.5 mm² 2-core and earth PVC insulated and sheathed cable as given in Table 8 of BS 6004:2000.

The incoming cable shall enter on the horizontal axis on one side of the enclosure and, where specified, the outgoing cable shall leave on the horizontal axis on the opposite side of the enclosure. Where possible, the cables shall enter and leave the enclosure through the standard knockouts provided and these, if required, shall be fitted with suitable grommets. The points of entry and exit shall be sealed to prevent circulation of air.

For surface-mounted socket-outlets the length of each of the cables within the enclosure shall be 75 mm \pm 5 mm and for flush socket-outlets the length of each cable within the box shall be 150 mm \pm 5 mm. In each case the outer sheath shall be removed from the cores to within 20 mm of the point of entry of the cable to the box or enclosure.

The fuse link, if any, incorporated in a multiple fused socket-outlet is replaced by a calibrated link, constructed and calibrated in accordance with Annex A.

Socket-outlets under test shall be subjected to electrical loading as given in Table 5. Where a plug is specified it shall be a special test plug, constructed and calibrated whilst carrying a load in accordance with Annex A_3 G A_3 . During the test the resistor of the test plug shall be connected to a d.c. source of supply equivalent to the “calibration voltage”.

Table 5 — Loading of socket-outlets for temperature-rise test

Number of outlets	Plugs with connected loads ± 0.4 A	Balance of load ± 0.4 A A	Total load on supply cable (nominal) A
1	1 \times 14 A	6	20
2	1 \times 14 A + 1 \times 6 A	—	20
>1 (fused)	1 \times 14 A	6	20
>2 (unfused)	2 \times 14 A	—	28

NOTE The tolerance values for current take account of an uncertainty of measurement of not greater than ± 1.5 % at a confidence level of not less than 95 %.

In the case of socket-outlets having more than one outlet, the disposition of the plugs shall be so arranged as to give the most onerous test conditions with regard to the position of terminals and fuses.

In the case of fused socket-outlets in which the number of outlets is greater than two, the test is then repeated, the total test current being divided equally between each of the test plugs, one inserted into each set of socket contacts in the socket-outlet.

The socket-outlet is subjected to the loading given in Table 5 for a minimum continuous period of 4 h or longer until stability is reached with a maximum duration of 8 h, stability being taken as less than 1 K rise within 1 h.

16.1.3 Rewireable portable socket-outlets are tested with 1 000 mm \pm 50 mm of 1.25 mm² 3-core PVC flexible cord as given in Table 27 of BS 6500:2000, non-rewireable portable socket-outlets are tested with 1 000 mm \pm 50 mm of the flexible cord supplied with them.

The fuse link, if any, incorporated in the portable socket-outlet is replaced by a calibrated link, constructed and calibrated in accordance with Annex A.

The portable socket-outlet is placed in its intended position of normal use on a horizontal plywood board having a nominal thickness of 24 mm and having a surface extending at least 150 mm in each direction beyond the extremities of the socket-outlet.

A test current appropriate to the flexible cord fitted as given in Table 2 is passed through the portable socket-outlet by means of a special test plug constructed and calibrated in accordance with Annex A_3 G A_3 . In the case of a multiple portable socket-outlet the plug shall be placed in the set of socket contacts considered to give the most onerous conditions.

The socket-outlet is operated as described for a minimum continuous period of 4 h or longer until stability is reached with a maximum duration of 8 h, stability being taken as less than 1 K rise within 1 h.

In the case of a multiple portable socket-outlet, the test is then repeated, the total test current being divided equally between each of the test plugs, one inserted into each set of socket contacts in the portable socket-outlet. A_4 For portable socket-outlets with more than 4 outlets, the test shall be performed with 4 test plugs inserted into 4 sets of socket contacts, selected to give the most onerous conditions. The remaining outlets shall have nothing inserted into them. A_4

A_4 **16.1.4** Fixed and panel mounted socket-outlets with more than one terminal for line and/or neutral connections (i.e. internal connections could form part of an external ring circuit) shall be subjected to an additional temperature rise test, as described in **16.1.2** except: incoming and outgoing conductors (2.5mm² 2-core and earth PVC insulated and sheathed cable as given in BS 6004:2000, Table 8) are fitted to separate terminals. A test current of 20 A is applied without any plugs being engaged with the socket-outlet.

Following this test, the resistance between each line terminal and between each neutral terminal shall be measured using a current of 25 $^{+0.75}_0$ A derived from an a.c. source having a no-load voltage not exceeding 12 V, passed for 60 $^{+5}_0$ s. The resistance shall not exceed 0.05 Ω . A_4

17 Breaking capacity of socket-outlets

17.1 The breaking capacity of socket contacts, switches, and fuse contacts incorporated in socket-outlets, shall be adequate.

17.1.1 Compliance shall be checked by the tests described in **17.1.2**, **17.1.3** and **17.1.4** as applicable, which shall be completed with the socket-outlets connected and mounted as in normal use.

17.1.2 The socket contacts shall make and break a current of 1.25 times rated current ± 0.4 A [i.e. $(1.25 \times 13) \pm 0.4$ A] in a substantially non-inductive a.c. circuit at $250 \text{ V} \pm 5 \text{ V}$, 10 times in succession at intervals of approximately 30 s, a plug being withdrawn from the socket-outlet at a speed of approximately 150 mm/s immediately after insertion. For the purpose of the test the fuse link may be replaced by a link of negligible impedance.

After the test, the socket-outlet shall be capable of satisfying the subsequent tests detailed in Table 1 for the appropriate test sample.

17.1.3 The switch shall make and break a current of 1.25 times rated current ± 0.4 A [i.e. $(1.25 \times 13) \pm 0.4$ A] in a substantially non-inductive a.c. circuit at $275 \text{ V} \pm 5 \text{ V}$, 10 times in succession at intervals of approximately 30 s.

After the test, the socket-outlet shall be capable of satisfying the subsequent tests detailed in Table 1 for the appropriate test sample.

17.1.4 The fuse contacts shall make and break a current by insertion and removal of a fuse in a substantially non-inductive a.c. circuit at $275 \text{ V} \pm 5 \text{ V}$, 10 times in succession at intervals of approximately 30 s, the values of the current being 1.25 times rated current ± 0.4 A [i.e. $(1.25 \times 13) \pm 0.4$ A] for fuses in single socket-outlets and 1.6 times rated current ± 0.4 A for fuses in multiple socket-outlets. Standard 13 A fuse links in accordance with BS 1362:1973 are used for this test, and may be replaced if necessary during the test. For the test, all metal parts not in contact with line contacts shall be connected to the earth pole of the test circuit.

After the test, the socket-outlet shall be capable of satisfying the subsequent tests detailed in Table 1 for the appropriate test sample.

18 Normal operation of socket-outlets

18.1 Socket-outlets shall withstand without excessive wear or other harmful effects, the electrical and mechanical stresses occurring in use.

18.1.1 Compliance shall be checked by the tests described in **18.1.2** and **18.1.3**.

18.1.2 The combination of plugs having solid pins and the socket-outlet under test **A3** with the engagement surface substantially vertical **A3** shall make and break their rated current ± 0.4 A at $250 \text{ V} \pm 10 \text{ V}$ a.c. 15 000 times (30 000 movements) in a substantially non-inductive circuit. Each plug is inserted into and withdrawn from the socket-outlet under test at a rate of approximately six insertions and six withdrawals per minute, the speed of travel of the plug being approximately 150 mm/s. The periods during which the plug is inserted and withdrawn are approximately equal. The plug pins are renewed after each 5 000 insertions and withdrawals. For the purpose of this test no lubrication is applied to the plug or socket under test.

After the test the shutter shall be operating satisfactorily, the socket contacts safely shielded and the socket-outlet shall be in accordance with Clause **9.1**, Clause **16 A3** and Clause **13.19 A3**, Clause **15**, Clause **13.4.1a**), Clause **10.2**, Clause **13.6**, Clause **13.7** and Clause **13.8**. The permitted value of voltage drop described in **13.4.1a**) is increased to not greater than **13.4.1a**) 40 mV.

18.1.3 In switched socket-outlets the voltage drop across each switched pole, measured at points immediately adjacent to the switch, shall not exceed 60 mV at rated current.

The switch shall then make and break a current of $13 \text{ A} \pm 0.4 \text{ A}$ at $250 \text{ V} \pm 10 \text{ V}$ 15 000 times (30 000 movements) in a substantially non-inductive a.c. circuit at a rate of approximately six complete cycles per minute at regular intervals. The periods during which the switch is "on" and "off" shall be approximately equal. The means used for operating the switch shall be such as to move the actuating member at a speed of approximately 300 mm/s both in making and breaking the circuit and shall be so positioned that the normal action of the mechanism is not interfered with in any way.

At the end of the test, the switch shall be capable of making and breaking the rated current of $13 \text{ A} \pm 0.4 \text{ A}$ at $250 \text{ V} \pm 10 \text{ V}$ and the voltage drop across each switched pole, measured as above, shall not exceed 75 mV.

The switch shall also be in accordance with Clause **15**, the test voltages of **15.1.3** being reduced by 25 %.

19 Connection of flexible cords and cord anchorage

19.1 Provision shall be made for the entry and effective clamping without bending of 3-core flexible cords for rewirable portable socket-outlets, as given in ~~Table 11, Table 12, Table 13, Table 26 and Table 27~~ of BS 6500:2000, having nominal conductor cross-sectional areas not exceeding 1.5 mm².

For non-rewirable portable socket-outlets provision shall be made for the entry and adequate retention of the 3-core flexible cord with which the socket-outlet is supplied.

The cord anchorage shall be such that the conductors are relieved from strain, including twisting, where they are connected to the terminals or terminations.

The cord anchorage shall contain the sheath. Cord anchorages shall either be of insulating material or if of metal shall be provided with an insulating lining fixed to the metal parts.

Methods such as tying the flexible cord into a knot or tying the ends with string or the like shall not be used.

19.1.1 Compliance shall be checked by inspection and by the following tests.

a) Rewirable portable socket-outlets are fitted with a 3-core flexible cord having a nominal cross-sectional area of 0.5 mm² as given in Table ~~26~~ of BS 6500:2000. The conductors are introduced into the terminals and the terminal screws tightened just sufficiently to prevent the conductors easily changing their positions. The cord anchorage is used in the normal way, the clamping screws, if any, being tightened to a torque of two-thirds of that given in Table 3a. The assembly is then left untouched for a minimum of 24 h.

After this preparation, it shall not be possible to push the flexible cord into the portable socket-outlet to such an extent as to impair safety or so that the cord anchorage is loosened.

The flexible cord is then subjected 25 times to the pull given in Table 2. The pulls are applied without jerks in the most unfavourable position momentarily. Immediately afterwards, the flexible cord is subjected for 60⁺⁵₀ s to the appropriate torque shown in Table 2, as near as practicable to the cord entry.

These tests are then repeated but with the portable socket-outlet fitted with a 3-core flexible cord having a nominal conductor cross-sectional area of 1.5 mm² as given in Table 27 of BS 6500:2000.

b) For non-rewirable portable socket-outlets the test is carried out with the cord with which it is supplied, using the appropriate load and torque as given in Table 2. The conductors of the flexible cord are severed at the point of termination prior to the test.

During this test the insulation of the flexible cord shall not be damaged.

A voltage of 3 750 V ± 75 V is applied for 60⁺⁵₀ s between the conductors. Breakdown or flashover is considered to indicate damage to the flexible cord.

c) After the tests given in a) and b) the flexible cord shall not have been displaced by more than 2 mm.

For the measurement of longitudinal displacement a mark is made on the cord whilst it is subjected to the pull at a distance of approximately 20 mm from the anchorage before starting the tests. After the test the displacement of the mark on the flexible cord in relation to the cord anchorage is measured whilst the cord is again subject to the pull.

19.2 Cord anchorages in rewirable portable socket-outlets shall anchor the cord securely to the socket-outlet. The design shall ensure the following:

- the cord anchorage cannot be released from the outside without the use of a tool;
- it shall not be possible to touch cord anchorage screws, if any, with test probe B of BS EN 61032:1998 when the socket outlet is energized;
- the cord is not clamped by a metal part bearing directly on the flexible cord;
- at least one part of the anchorage is securely fixed to the socket-outlet;
- clamping the cord does not require the use of a special purpose tool;
- the cover may be correctly fitted without damage when the portable socket-outlet is wired with the largest specified flexible cord and all screws are tightened to the torque specified in Table 3a.

19.2.1 Compliance shall be checked by inspection and test.

19.3 Screws which are used when clamping the flexible cord shall not serve to fix any other components unless the portable socket-outlet is rendered manifestly incomplete if the component is omitted or is replaced in an incorrect position, or the component intended to be fixed cannot be removed without further use of a tool.

19.3.1 Compliance shall be checked by inspection.

19.4 Non-rewirable portable socket-outlets shall be fitted with 3-core flexible cords complying with BS 6500:2000. Connections shall be as given in Table 6.

19.4.1 Compliance shall be checked by inspection and continuity test.

Table 6 — Connection of flexible cords

Termination	Conductor insulation colour:3-core
Earthing	Green/yellow
Live	Brown
Neutral	Blue

19.5 Non-rewirable portable socket-outlets shall be so designed that the flexible cord is not subjected to excessive bending where it enters the portable socket-outlet.

19.5.1 Compliance shall be checked by the following test using an apparatus similar to that shown in Figure 18. The portable socket-outlet is fixed to the oscillating member of the apparatus so that when this is vertical the axis of the flexible cord at the point of entry is vertical and passes through the axis of oscillation.

The flexible cord is loaded with a weight as given in Table 2.

The distance between the point of entry to the portable socket-outlet and the axis of oscillation is adjusted so that the weight makes the minimum lateral movement as the oscillating member moves. A current appropriate to the flexible cord fitted, as given in Table 2, is passed through the line and neutral conductors, the voltage between them being $250 \text{ V} \pm 10 \text{ V}$ a.c. The earthing conductor shall be connected at one end to the neutral conductor.

The oscillating member is moved backwards and forwards through an angle of $45^\circ \pm 3^\circ$ on either side of the vertical, the number of flexings being 10 000 at a rate of 60_{-10}^0 per minute. After 5 000 flexings, socket-outlets are turned through $90^\circ \pm 5^\circ$ about the cord entry centreline.

NOTE A flexing is one movement through 90° , either backwards or forwards.

During the test there shall be no interruption of the current passing through the conductors and no short circuit between them.

After the test the sample shall show no damage except that breakage of no more than 10 % of the total number of conductor strands in any core is ignored provided they have not pierced the insulation.

19.6 The cord entry to rewirable portable socket-outlets shall be so shaped as to prevent damage to the cord.

19.6.1 Compliance shall be checked by inspection.

20 Mechanical strength

20.1 Socket-outlets shall have adequate mechanical strength and be so constructed as to withstand such handling as may be expected in normal use.

20.1.1 Compliance shall be checked by the tests described in **20.1.2**, **20.1.3**, **20.1.4** and **20.1.5** as appropriate.

Any decorative cover, cover plates or parts thereof, not providing protection against electric shock, shall be removed prior to testing.

20.1.2 A solid link of stainless steel as shown in Figure 19 is inserted and withdrawn from the fuse clips of a fused socket-outlet 20 times in succession in a normal manner, not in misuse conditions, at a rate not exceeding 10 per minute. A standard fuse link complying with BS 1362:1973 is then fitted and the appropriate mechanical strength test completed.

20.1.3 Fixed socket-outlets are tested with the impact test apparatus shown in Figure 21a). The pendulum consists of a steel tube with an external diameter of 9 mm nominal and a wall thickness of 0.5 mm nominal suspended in such a way that it swings only in a vertical plane. A hammer is rigidly fixed to the lower end.

The striking element has a hemispherical face made of polyamide having a Rockwell hardness of A_4 $85 \leq \text{HRR} \leq 100$ A_4 , or hornbeam, and a radius of $10 \text{ mm} \pm 0.5 \text{ mm}$ [see Figure 21b)]. The design of the apparatus is such that a force of between 1.9 N and 2 N has to be applied to the face of the hammer to maintain the pendulum in a horizontal position.

The socket-outlet is mounted on a sheet of plywood approximately 8 mm thick and 175 mm square, secured at its top and bottom edges to a mounting support.

The mounting support [see Figure 21c)], having a mass of $10 \text{ kg} \pm 1 \text{ kg}$, is mounted on a rigid bracket by means of pivots. The bracket is mounted on a frame which is fixed to a solid wall.

The design of the mounting assembly shall be such that:

- a) the specimen can be so placed that the point of impact lies in the vertical plane through the axis of the pendulum pivot;
- b) the specimen can be moved horizontally and turned about an axis perpendicular to the surface of the plywood;
- c) the plywood can be turned about a vertical axis.

The socket-outlet is mounted on the plywood as in normal use.

Flush socket-outlets and their boxes (if any) are placed in a block of hardwood which is itself fixed to the sheet of plywood.

The wood used shall have the direction of the wood fibres perpendicular to the direction of impact.

To simulate the condition of normal use the rear of the plate is flush with the surface of the block. The front edge of the box is between 2.5 mm and 5 mm behind the face of the block.

The socket-outlet is placed so that the point of impact lies in the vertical plane through the axis of the pivot of the pendulum. For all tests the hammer falls from a height of 150_{-5}^0 mm measured vertically between the point of impact on the specimen and the face of the hammer at the point of release. Ten blows are applied to points evenly distributed over the socket-outlet. Any lens incorporated in a socket-outlet receives one blow of the hammer at a point approximately at its centre. One of the 10 blows of the hammer is applied to the actuating member, if any.

After the test the socket-outlet shall still be in accordance with Clause 8, Clause 9 and Clause 15. After the test on a lens, the lens may be cracked and/or dislodged but it shall not be possible to touch live parts using the test pin shown in Figure 1 applied with a maximum force of 5 N, applied in accordance with 9.1.1.

Damage to the finish, small dents which do not reduce creepage distances and clearances below the values specified in Clause 8 and small chips that do not adversely affect the protection against electric shock or moisture shall be ignored.

Cracks not visible with normal or corrected vision without additional magnification, and surface cracks in fibre-reinforced mouldings and the like shall be ignored.

20.1.4 Rewireable single and twin portable socket-outlets are fitted with 3-core PVC 1.25 mm² flexible cord as given in Table 27 of BS 6500:2000, the terminals and cover screws being tightened with the torque in Table 3a. Non-rewireable single and twin portable socket-outlets are tested as delivered.

The flexible cords attached to socket-outlets are cut to a length of $150 \text{ mm} \pm 5 \text{ mm}$ measured from the nearest edge of the socket-outlet, precoiled flexible cords being extended before measurement.

They are tested in the tumbling barrel shown in Figure 20. The barrel is turned at a rate of approximately 5 r/min, (approximately 10 falls per minute).

Only one socket-outlet is tested at a time. The number of drops is 5 000.

After the test the portable socket-outlet shall show no external damage which might affect the safety and no components shall have become detached.

Compliance shall be checked by inspection and the test described in 13.4b) and Clause 15 and Clause 16.

Small chips and dents which do not adversely affect the protection against electric shock shall be ignored.

For the repeat test in accordance with Clause 16, the attached flexible cord is retained without disturbing the terminal connections, but the conductor insulation and sheath are removed only as far as is necessary for the attachment of a $1\,000 \text{ mm} \pm 50 \text{ mm}$ length of flexible cord of the same type as that already attached to the socket-outlet, the connection being made by means of a connector having a current rating appropriate to that of the flexible cord.

20.1.5 Rewireable portable socket-outlets with more than two outlets are fitted with 3-core 1.25 mm² flexible cord as given in Table 27 of BS 6500:2000.

Non-rewirable socket-outlets are tested as delivered.

The free end of the flexible cord which is approximately 2 250 mm long is fixed to a wall at a height of 400₋₁₀⁰ mm above the floor, as shown in Figure 22. The specimen is held so that the cable is approximately horizontal and then it is allowed to fall on to a concrete floor eight times, the flexible cord being rotated through approximately 45° at its fixing each time.

After the test, the socket-outlet shall show no external damage which might affect the safety, no components shall have become detached and the portable socket-outlet shall satisfy the tests described in 13.4b) and Clause 15 and Clause 16. For the repeat test in accordance with Clause 16 the attached flexible cord is reduced to 1 000 mm ± 50 mm without disturbing the terminal connections.

Small chips and dents which do not adversely affect the protection against electric shock are ignored.

21 Screws, current-carrying parts and connections

21.1 Screwed connections, electrical and otherwise, shall withstand the mechanical stresses occurring in normal use. Screws directly transmitting electrical contact pressure shall screw into metal. Screws shall not be of metal which is soft and liable to creep.

Screws shall not be of insulating material if their replacement by a metal screw would affect the safety or performance requirements of the socket-outlet.

Contact pressure in electrical connections within the socket-outlet and between the socket-outlet and the cable or flexible cord connected to it shall not be transmitted through insulating material other than ceramic, pure mica or other material with characteristics no less suitable, unless there is sufficient resiliency in the metallic parts to compensate for any possible shrinkage or yielding of the insulating material.

NOTE The suitability of the material is considered in respect of the stability of the dimensions under all conditions of normal use especially in view of shrinking, ageing or cold flow of the insulating part.

21.1.1 Compliance shall be checked by inspection and, for screws and nuts which are intended to be tightened during installation, or use, or during replacement of a fuse link by the following test.

The screw is tightened and loosened as follows:

- a) 10 times for screws in engagement with a thread of insulating material, the screw being completely removed and replaced each time;
- b) five times for nuts and other screws.

When testing terminal screws and nuts a 1.5 mm² flexible conductor is placed in the terminal in the case of portable socket-outlets, and a 2.5 mm² solid conductor is placed in the terminal in the case of fixed socket-outlets. The conductor is moved each time the screw is loosened. The test is made by means of a suitable test screwdriver, applying a torque as given in Table 3a.

During the test no damage impairing the further use of the screwed connection shall occur.

NOTE It is essential that the shape of the blade of the test screwdriver suits the head of the screw being tested and that the screw is not tightened in jerks.

21.2 Thread-cutting and/or thread-forming screws shall not be used for the making of current-carrying or earth continuity connections.

NOTE Thread-forming screws may be used to provide earthing continuity, provided that it is not necessary to disturb the connection in normal use and at least two screws are used for each connection.

Screws which make a mechanical connection between different parts of the socket-outlet shall be locked against loosening, if the connection carries current.

Rivets used for current-carrying or earth continuity connections shall be locked against loosening, if these connections are subject to torsion in normal use which is likely to loosen the connection.

21.2.1 Compliance shall be checked by inspection and by manual test.

NOTE 1 Spring washers and the like may provide satisfactory locking.

NOTE 2 For rivets a non-circular shank or an appropriate notch may be sufficient.

21.3 Current-carrying parts and A_4 earthing contacts A_4 shall be of brass, copper, phosphor-bronze or other metal at least equivalent with regard to its conductivity, resistance to abrasion and resistance to corrosion.

NOTE This requirement does not apply to screws, nuts, washers, clamping plates and similar parts of terminals, nor to parts of socket-outlets used for earth continuity purposes other than the earthing contacts.

21.3.1 Compliance shall be checked by inspection and by the relevant tests described in **10.2**, A_4 **10.3** A_4 Clause **16** and Clause **24**.

22 Resistance to heat

22.1 Socket-outlets shall be resistant to heat.

22.1.1 Compliance shall be checked by the test described in **22.1.2** or **22.1.3**.

Parts made from rubber or ceramics in fixed socket-outlets shall not be subjected to these tests.

22.1.2 For complete socket-outlets and for separate ancillary components specimens are kept for 60^{+5}_0 min in a heating cabinet maintained at the following temperature:

- a) $70\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$ for portable socket-outlets, mounting boxes, separate covers and separate cover plates;
- b) $100\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$ for all other socket-outlets.

During the test they shall not undergo any change impairing their further use and the sealing compound shall not flow to such an extent that live parts are exposed.

NOTE A slight displacement of the sealing compound should be disregarded.

After the test the socket-outlet shall still comply with **9.2.1** and **15.1.3**, and it shall not be possible to touch live parts with test probe 11 of BS EN 61032:1998 applied with a force of 30^{+0}_{-2} N.

22.1.3 Portable socket-outlets with external parts of resilient material, e.g. thermoplastics, rubber, are subjected to a pressure test by means of an apparatus similar to that shown in Figure 23, the test being made in a heating cabinet at a temperature of $70\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$.

The socket-outlet is clamped between the jaws in such a way that these press against it in the area where it is gripped in normal use, the centreline of the jaws coinciding as nearly as possible with the centre of this area.

The force applied through and including the effect of the jaws is 20^{+0}_{-1} N.

After 60^{+5}_0 min the jaws are removed and the socket-outlets shall satisfy the tests described in **15.1.2b)1)** and **15.1.3** and shall accept the gauges of Figure 11.

22.2 Parts of insulating material shall be sufficiently resistant to heat having particular regard to their location and function in the complete socket-outlet.

22.2.1 Compliance shall be checked as follows:

- a) parts of ceramic material are deemed to comply without testing;
- b) external parts of socket-outlets tested according to **22.1.3**, are deemed to comply without further testing;
- c) all other parts of insulating material shall be subjected to the ball pressure test A_4 in accordance with BS EN 60695-10-2:2003. A_4

A_4 The test temperatures shall be as given below. A_4

For parts of insulating material necessary to retain current-carrying parts in position and the material forming the front surface of socket-outlets, within a zone of 2 mm around line and neutral pin entry holes, the test temperature shall be:

- 1) for fixed socket-outlets: $125\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$;
- 2) for portable socket-outlets: $75\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$.

For parts of insulating material not necessary to retain current-carrying parts in position, even though they may be in contact with them, the test temperature shall be $75\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$ for fixed and portable socket-outlets.

A4 Text deleted **A4**

23 Resistance to abnormal **A3** heat and fire **A3**

23.1 General

Socket-outlets shall be proof against abnormal **A3** heat and fire **A3**.

23.1.1 Compliance shall be checked by the test described in **23.2**.

The tests shall not be made on parts of ceramic material or metal.

23.2 Glow-wire test

The test is performed in accordance with **A4** BS EN 60695-2-11:2001 **A4** and at the test temperature given in Table 7.

Table 7 — Application of glow-wire test

Part	Temperature of glow wire	
	Portable socket-outlets °C	Fixed socket-outlets °C
Parts necessary to retain live parts in position	750 ± 10	850 ± 15
Parts not necessary to retain live parts in position (although they may be in contact with live parts)	650 ± 10	650 ± 10

NOTE If the test specified is required to be made at more than one place on the same specimen, it is essential that care is taken to ensure that any deterioration caused by previous tests does not affect the result of the test to be made.

A4 Small parts (see **3.38**), parts of insignificant mass (see **3.37**), parts unlikely to be subjected to abnormal heat and parts whose failure to pass these tests would not materially affect the safety of the socket-outlet are not subjected to this glow-wire test. **A4**

The glow-wire test is applied to ensure that an electrically heated test wire under defined test conditions does not cause ignition of insulating parts or to ensure that a part of insulating material which might be ignited by the heated test wire under defined conditions, has a limited time to burn without spreading fire by flame or burning parts or droplets falling down from the tested part onto a pinewood board covered with tissue paper.

The test specimen shall be either a complete socket-outlet or, if the test cannot be made on a complete socket-outlet, a suitable part may be cut from one for the purpose of the test.

The test shall be made on one specimen.

In case of doubt, the test shall be repeated on two further specimens.

The test is made, applying the glow wire once.

The specimen shall be positioned during the test in the most unfavourable position of its intended use (with the surface tested in a vertical position).

The tip of the glow wire shall be applied to the specified surface of the specimen taking into account the conditions of the intended use under which a heated or glowing element may come into contact with the specimen.

The specimen shall be regarded as having passed the glow-wire test if any of the following apply:

- a) there is no visible flame and no sustained glowing;
- b) flames and glowing at the specimen extinguish within 30 s after the removal of the glow wire;
- c) there is no ignition of the tissue paper nor scorching of the board.

24 Resistance to excessive residual stresses and to rusting

24.1 Press-formed or similar current-carrying parts of copper alloy containing less than 80 % of copper shall be resistant to failure in use due to stress corrosion.

24.1.1 Compliance shall be checked by the following test.

The sample is degreased in a suitable alkaline degreasing solution or organic solvent, then immersed in an aqueous solution of mercurous nitrate containing 10 g of $\text{Hg}_2(\text{NO}_3)_2$ and 10 ml of HNO_3 (relative density 1.42) per litre of solution for $30 \text{ min} \pm 1 \text{ min}$ at a temperature of $20 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$.

NOTE Attention is drawn to the fact that due precautions should be taken when using these liquids as they are toxic.

After the treatment the sample is washed in running water, any excess mercury wiped off, and the sample is immediately visually examined.

There shall be no cracks visible with normal or corrected vision without additional magnification.

24.2 Ferrous parts, the rusting of which might cause the socket-outlet to become unsafe, shall be adequately protected against rusting.

24.2.1 Compliance shall be checked by the following test.

The sample is degreased in a suitable alkaline degreasing solution or organic solvent, the parts are then immersed for $10 \text{ min} \pm 0.5 \text{ min}$ in a 10 % solution of ammonium chloride in water at a temperature of $20 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$.

Without drying but after shaking off any drops, the parts are placed for $10 \text{ min} \pm 0.5 \text{ min}$ in a box containing air saturated with moisture at a temperature of $20 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$. After the parts have been dried for at least 10 min in a heating cabinet at a temperature of $100 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$ their surfaces shall show no signs of rust.

NOTE 1 Traces of rust on sharp edges and any yellowish film removable by rubbing should be ignored.

NOTE 2 For small helical springs and the like, and for parts exposed to abrasion, a layer of grease may provide sufficient protection against rusting. Such parts are only subjected to the test if there is doubt about the effectiveness of the grease film and the test should then be made without previous removal of the grease.

25 (*Not used*)

Annex A (normative)**The construction and calibration of a calibrated link****A.1 Construction**

The calibrated link (see Figure 28) shall employ the following components used to produce fuses complying with BS 1362:1973:

- a) ceramic body (as standard);
- b) filling (as standard);
- c) end caps [modified standard cap as shown in Figure 28a)].

The resistive element shall be of copper nickel wire having a resistivity value between $44 \mu\Omega \cdot \text{cm}$ and $49 \mu\Omega \cdot \text{cm}$. The overall length shall be $25.4^{+0.8}_{-0.4}$ mm and the diameter such as to allow a small reduction in the cross-sectional area to adjust the watts loss to the required value. The ends are turned down so that the distance between the shoulders so formed shall be $25.4^{+0.8}_{-0.4}$ mm less twice the end cap end wall thickness t [see Figure 28b)].

The resistive element shoulders shall be firmly butted to the inside faces of the end caps and soldered using a tin silver solder, grade 96S as specified in BS 219:1977. The assembly thus formed [see Figure 28c)] shall be checked for watts loss in accordance with A.2. Metal shall then be carefully filed from the resistive element over as long a length as is possible and the assembly rechecked until the desired watts loss is achieved.

One end cap shall then be unsoldered, a standard ceramic body fitted, the cavity filled and the end cap resoldered in position making sure the shoulder of the element is butted to the inside face of the end cap (the ceramic body shall not interfere with this condition). [See Figure 28d)]

The watts loss shall be rechecked in accordance with A.2 and adjusted if necessary.

The resulting calibrated link shall be marked "NOT A FUSE" on the ceramic body and shall dimensionally be in accordance with BS 1362:1973.

A.2 Calibration

The calibration jig shown in Figure 29 is mounted horizontally approximately 25 mm above a wooden board by means of two ceramic pillars. A fine wire thermocouple is attached to the centre of each fuse contact clip, on the outside of the top edge, in such a way that it does not interfere with the contact area. The thermocouples are taken out of the box in slots cut in one end of the jig base, the width of the slots just being sufficient to accept the diameter of the thermocouples. The connection to the jig base shall be by means of PVC insulated single-core copper cables, $0.3 \text{ m} \pm 0.05 \text{ m}$ in length and 2.5 mm^2 cross-section.

The surroundings shall be free from draughts and the ambient air temperature, measured by a suitable thermometer or thermocouple at a horizontal distance of 1 m to 2 m from the calibrated link, shall be in the range of $15 \text{ }^\circ\text{C}$ to $25 \text{ }^\circ\text{C}$. The calibrated link shall be inserted into the clips provided in the calibration jig and the cover replaced. A current of $13 \text{ A} \pm 0.1 \text{ A}$ is then passed continuously through the calibrated link for $60 \text{ min} \pm 5 \text{ min}$. At the end of this time the temperatures measured by the thermocouples are noted, the cover of the jig is then removed and the millivolt drop between the end surfaces of the end caps of the calibrated link is measured whilst it is still carrying the test current.

A.C. shall be used for the calibration.

The calibration is considered to be correct when the following apply:

- a) the product of the measured millivolt drop multiplied by the test current gives a result of $1_{-0.05}^{0.00}$ W;
- b) the temperature difference between the fuse contact clips does not exceed $2 \text{ }^\circ\text{C}$.

A3

Annex B (normative)

Measurement of clearances and creepage distances

The width X specified in Examples 1 to 11 apply to all examples as a function of the pollution degree as given in Table B.1.

Table B.1 — Minimum values of width X

Pollution degree	Minimum values of width X mm
1	0.25
2	1.0
3	1.5

If the associated clearance is less than 3 mm, the minimum groove width may be reduced to one third of this clearance.

The methods of measuring creepage distances and clearances are indicated in the following Examples 1 to 11. These cases do not differentiate between gaps and grooves or between types of insulation.

The following assumptions are made:

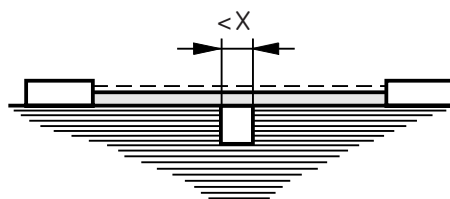
- any recess is assumed to be bridged with an insulating link having a length equal to the specified width X and being placed in the most unfavourable position (see Example 3);
- where the distance across a groove is equal to or larger than the specified width X, the creepage distance is measured along the contours of the groove (see Example 2);
- creepage distances and clearances measured between parts which can assume different positions in relation to each other, are measured when these parts are in their most unfavourable position.

Explanation for Examples 1 to 11

----- clearance

===== creepage distance

All dimensions are in millimetres



Example 1

Example 1

Condition:

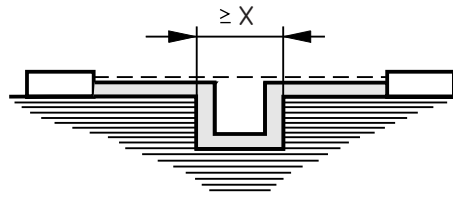
Path under consideration includes a parallel- or converging-sided groove of any depth with a width less than “X” mm.

Rule:

A4 Creepage distance A4 and clearance are measured directly across the groove as shown.

A3

A3



Example 2

Example 2

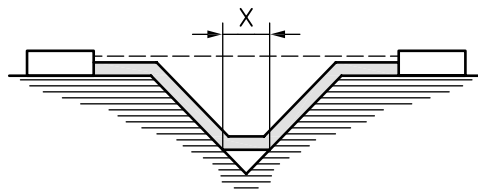
Condition:

Path under consideration includes a parallel-sided groove of any depth and with a A4 width equal to or greater than A4 “X” mm.

Rule:

Clearance is the “line of sight” distance. Creepage path follows the contour of the groove.

A4



Example 3

Example 3

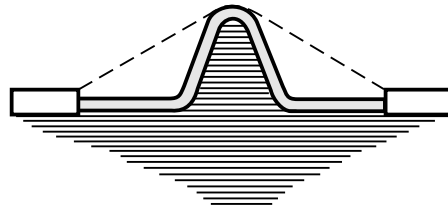
Condition:

Path under consideration includes a V-shaped groove with a width greater than “X” mm.

Rule:

Clearance is the “line of sight” distance. Creepage path follows the contour of the groove but “short circuits” the bottom of the groove by an “X” mm link.

A4



Example 4

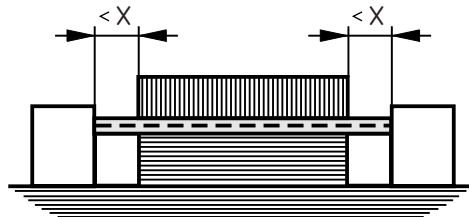
Example 4

Condition:

Path under consideration includes a rib.

Rule:

Clearance is the shortest direct air path over the top of the rib. Creepage path follows the contour of the rib.



Example 5

Example 5

Condition:

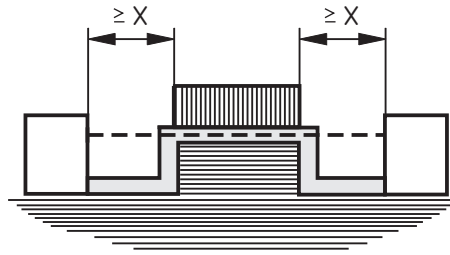
Path under consideration includes an uncemented joint with grooves less than “X” mm wide on each side.

Rule:

Creepage and clearance path is the “line of sight” distance shown.

A3

A3



Example 6

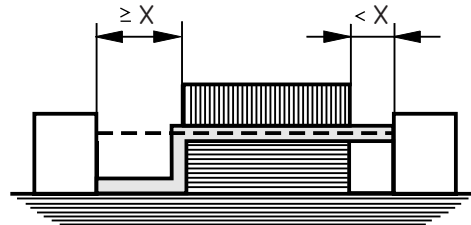
Example 6

Condition:

Path under consideration includes an uncemented joint with grooves equal to or more than “X” mm wide on each side.

Rule:

A4 Clearance path is the “line of sight” distance. A4 Creepage follows the contour of the grooves.



Example 7

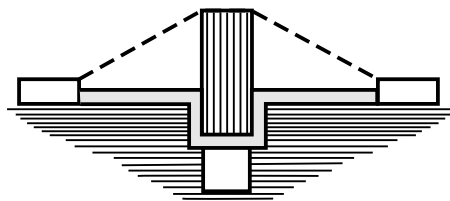
Example 7

Condition:

Path under consideration includes an uncemented joint with groove on one side less than “X” mm wide and the groove on the other side equal to or more than “X” mm wide.

Rule:

Clearance and creepage paths are as shown.



Example 8

Example 8

Condition:

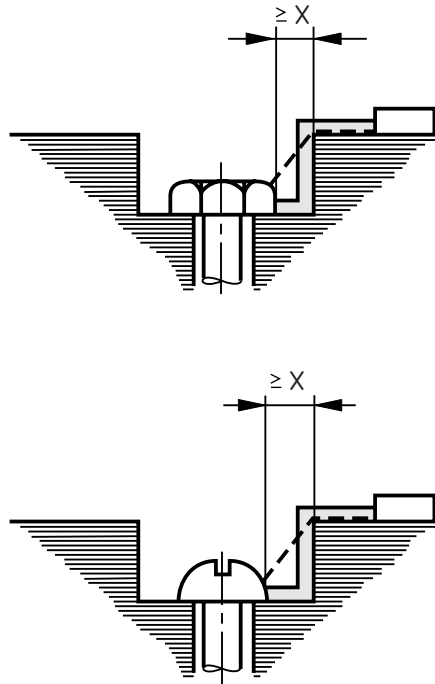
A4 Path under consideration includes a barrier with an uncemented joint. The creepage distance through the uncemented joint is less than the creepage distance over the barrier. A4

Rule:

A4 Clearance is the shortest direct air path over the top of the barrier. The creepage path follows the contour of the joint. A4

A3

A3



Example 9

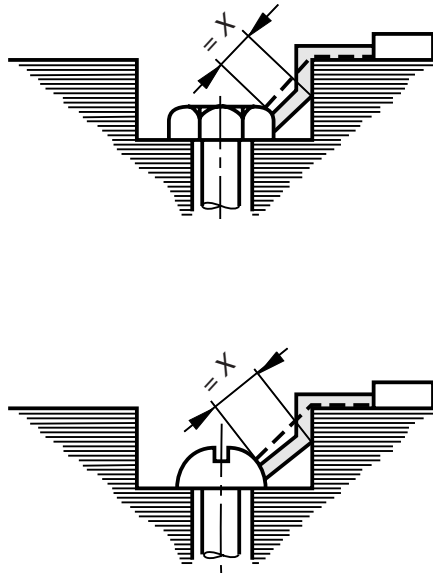
Example 9

Condition:

Gap between head of screw and wall of recess wide enough to be taken into account A4 (greater than or equal to "X" mm) A4.

Rule:

Clearance and creepage distance paths are as shown.



Example 10

Example 10

A4 Condition:

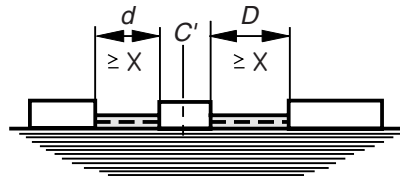
Gap between head of screw and wall of recess too narrow to be taken into account (less than "X" mm). A4

A4 Rule:

Measurement of clearance and creepage distance is from the screw head to the point on the wall which is at a distance equal to "X" mm (as shown). A4

A3

A3



Example 11

Example 11

A4 Condition: Path under consideration includes a floating part, C' , with different sized grooves either side, each greater than or equal to “X” mm. A4

A4 Rule: Clearance and creepage distance are both distance $d + D$. A4

Annex C (normative)

Determination of the Comparative Tracking Index (CTI) and Proof Tracking Index (PTI)

The CTI or PTI is determined in accordance with BS EN 60112.

For the purpose of this standard the following applies.

- a) In Clause 5 of BS EN 60112:2003, Test specimen:
 - Note 3 and the last paragraph also apply to PTI;
 - If the surface 15 mm × 15 mm cannot be obtained because of the small dimensions of the PT system then special samples made with the same manufacturing process may be used.
- b) The test solution “A” described in 7.3 of BS EN 60112:2003 shall be used.
- c) In Clause 8 of BS EN 60112:2003, Procedure, either CTI or PTI is determined.
 - CTI is determined in accordance with Clause 11 of BS EN 60112:2003.
 - The PTI test of Clause 10 of BS EN 60112:2003 is performed on five samples at the voltage referred to in 10.1 of BS EN 60112:2003 based on the appropriate creepage distance, material group, pollution degree conditions and on the rated voltage of this standard declared by the manufacturer.

A3

**Annex D (normative)****Relation between rated impulse withstand voltage, rated voltage and Overvoltage Category****Table D.1 — Rated impulse withstand voltage for socket-outlets energized directly from the low voltage mains**

Nominal voltage of the supply system based on IEC 60038 ^a	Voltage line to neutral derived from nominal voltages a.c. or d.c. up to and including	Rated impulse withstand voltage		
		Overvoltage Category		
V	V	I	II	III
230/400	300	1 500	2 500	4 000

NOTE 1 For more information concerning supply systems see BS EN 60664-1.

NOTE 2 For more information concerning Overvoltage Category see BS EN 60664-1.

NOTE 3 Socket-outlets fall into Overvoltage Category III. Parts of socket-outlets where appropriate overvoltage reduction is provided fall into Overvoltage Category I. Energy consuming equipment falls into Overvoltage Category II.

^a The / mark indicates a four-wire three-phase distribution system. The lower value is the voltage line-to-neutral, while the higher value is the voltage line-to-line.

Annex E (normative)**Pollution degree**

The micro-environment determines the effect of pollution on the insulation. The macro-environment, however, has to be taken into account when considering the micro-environment.

Means may be provided to reduce pollution at the insulation under consideration by effective use of enclosures, encapsulation or hermetic sealing. Such means to reduce pollution may not be effective when the PT-system is subject to condensation or if, in normal operation, it generates pollutants itself.

Small clearances can be bridged completely by solid particles, dust and water and therefore minimum clearances are specified where pollution may be present in the micro-environment.

NOTE Pollution will become conductive in the presence of humidity. Pollution caused by contaminated water, soot, metal or carbon dust is inherently conductive.

Degrees of pollution in the micro-environment

For the purpose of evaluating creepage distances and clearances, the following three degrees of pollution in the micro-environment are established.

— Pollution degree 1

No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.

— Pollution degree 2

Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected.

— Pollution degree 3

Conductive pollution occurs or dry non-conductive pollution occurs which becomes conductive due to condensation which is to be expected.



A3

Annex F (normative)

Impulse voltage test

The purpose of this test is to verify that clearances will withstand specified transient overvoltage. The impulse withstand voltage test is carried out with a voltage having a 1.2/50 μ S waveform as specified in A4 BS EN 61180-1:1995, Section 6 A4 and is intended to simulate overvoltage of atmospheric origin. It also covers overvoltages due to switching of low-voltage equipment.

The test shall be conducted for a minimum of three impulses of each polarity with an interval of at least 1 s between pulses. A4 There shall be no discharges during the test. Glow discharges without a drop in voltage shall be ignored. A4

A4 For solid insulation and for clearances not checked by measurement, the impulse withstand voltage shall be applied between:

- a) line and neutral terminals/terminations;
- b) line and neutral terminals/terminations connected together and:
 - 1) a sheet of metal foil in contact with the entire accessible external surface;
 - 2) the earthing terminal/termination;
 - 3) any metal part of a cord anchorage;
- c) each switched pole terminal of a switched socket-outlet with the switch contacts open. A4

NOTE 1 The output impedance of the impulse generator should be not higher than 500 Ω .

A4 NOTE 2 The expression "discharge" is used to cover the phenomena associated with the failure of insulation under electric stress, which include current flow and a drop in voltage. A4

The impulse shall have the following characteristics:

- the waveform 1.2/50 μ S for the no load voltage with amplitudes equal to the values given in Table F.1;
- A4 Text deleted A4

NOTE 3 If the sample is provided with surge suppression the impulsive voltage wave may be chopped but the sample should be in a condition to operate normally again after the test. If the sample is not provided with surge suppression and it withstands the impulse voltage, the waveform will not be noticeably distorted.

Table F.1 — Test voltages for verifying clearances at sea level

Rated impulse withstand voltage \hat{U} kV	Impulse test voltage at sea level \hat{U} kV
0.33	0.35
0.5	0.55
0.8	0.91
1.5	1.75
2.5	2.95
4.0	4.8
6.0	7.3

NOTE 1 When testing clearances, associated solid insulation will be subjected to the test voltage. As the impulse test voltage of Table G.1 is increased with respect to the rated impulse withstand voltage, solid insulation will have to be designed accordingly. This results in an increased impulse withstand capability of the solid insulation.

NOTE 2 The test may be made with the pressure adjusted to the value corresponding to the altitude of 2 000 m (80 kPa) and 20 °C with the test voltage corresponding to the rated impulse withstand voltage. In this case, solid insulation will not be subjected to the same withstand requirements as when testing at sea level.

NOTE 3 Explanations concerning the influencing factors (air pressure, altitude, temperature humidity) with respect to electric strength of clearances are given in BS EN 60664-1.

A3

A3

Annex G (normative)

Test plug for temperature-rise test

G.1 General

The test plug consists of a body made from insulating material and pins of brass. The pin dimensions and centres are as shown in Figure 4 of BS 1363-1:1995+A4.

Inside the test plug a ceramic-covered wire-wound resistor is clamped to the line pin making no electrical contact between the pin and the resistor element, though good thermal contact is essential. Thermal contact compound shall be used on the interface between the ceramic resistor body and the metal clamp. The M3.5 clamp screw shall be tightened to a torque of $0.2 \text{ N}\cdot\text{m} \pm 0.02 \text{ N}\cdot\text{m}$. The resistor leads pass through the sides or cover of the test plug. Approximately 1 000 mm of 3-core flexible cord as given in Table 27 of BS 6500:2000 with nominal cross-section 1.25 mm^2 is connected to the plug by soldering the line and neutral cores to their respective plug-pins. The earth core of the cord is not fitted to the earth pin. Details are shown in Figure 30.

G.2 Calibration

The test plug is mounted in the dummy front plate (see Figure 17 in BS 1363-1:1995) and the test carried out in accordance with A4 16.1.2 A4 with $14 \text{ A} \pm 0.2 \text{ A}$ flowing through the flexible cord attached to the plug. At the same time a separate low voltage d.c. supply is connected to the resistor and the voltage adjusted until the temperature rise on the plug-pin spacer stabilizes at $35 \text{ K} \pm 1 \text{ K}$. The value of the voltage applied to the resistor is noted. The calibration voltage is applied to the resistor when checking the temperature rise of a socket-outlet. A3

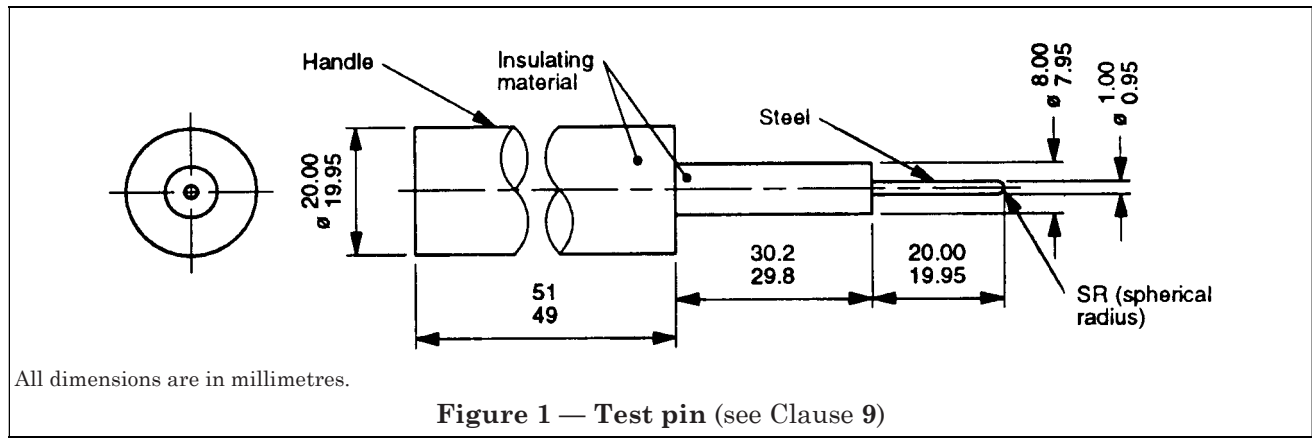


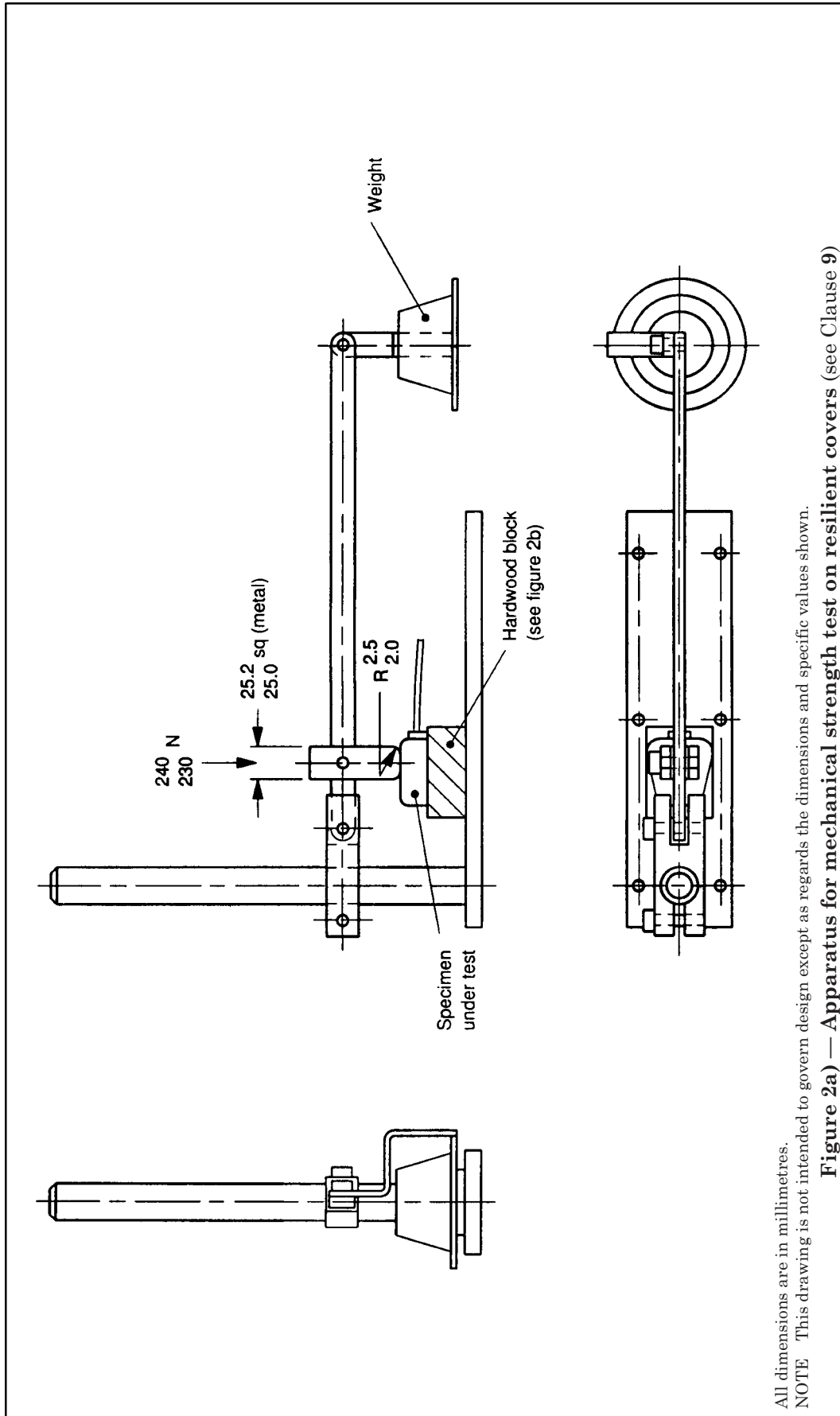
Annex H (informative)
Specific structure of BS EN 50525 and its derivation from British Standards and from HD 21 and HD 22
 (BS EN 50525-1:2011, National Annex NA)

Part number of BS EN 50525	Short title	Derivation		
		BS	Table No(s)	HD
1	General requirements	(Note 1)	(Note 1)	HD 21.1; HD 22.1
2-11	PVC flexible cables	BS 6500 BS 7919	26, 27, 28, 29 40, 41	HD 21.5; HD 21.12
2-12	Extensible leads	BS 6500	Clause 8	HD 21.10
2-21	Rubber flexible cables	BS 6500 BS 7919	12, 13, 15, 16 10-17, 20, 21, 23, 24	HD 22.4; HD 22.10; HD 22.11; HD 22.12; HD 22.16
2-22	Braided flexible cables	–	–	HD 22.14 (Clause 6)
2-31	PVC conduit wire	BS 6004	4a), 4b), 5, 11a), 11b), 12	HD 21.3; HD 21.7
2-41	Rubber single core – SiR	BS 6007	8, 9, 10	HD 22.3
2-42	Rubber single core – EVA	BS 6007	3, 4, 5, 6, 7	HD 22.7
2-51	PVC sheathed wiring	BS 6004 BS 7919	13 42, 43	HD 21.13
2-71	Tinsel flexible cables	BS 6500	24	HD 21.5 (Clause 2)
2-72	PVC separable flat	–	–	HD 21.11
2-81	Welding cable	BS 638-4	1, 2	HD 22.6
2-82	Lighting chains	–	–	HD 22.8
2-83	SiR flexible	BS 7919	22	HD 22.15
3-11	Halogen-free flexible (T/P)	–	–	HD 21.14
3-21	Halogen-free flexible (X/L)	BS 7919	18, 19	HD 22.13
3-31	Halogen-free single core (T/P)	–	–	HD 21.15
3-41	Halogen-free single core (X/L)	BS 7211	3a), 3b), 4a), 4b)	HD 22.9

NOTE 1 General requirements were given in each relevant BS as appropriate.



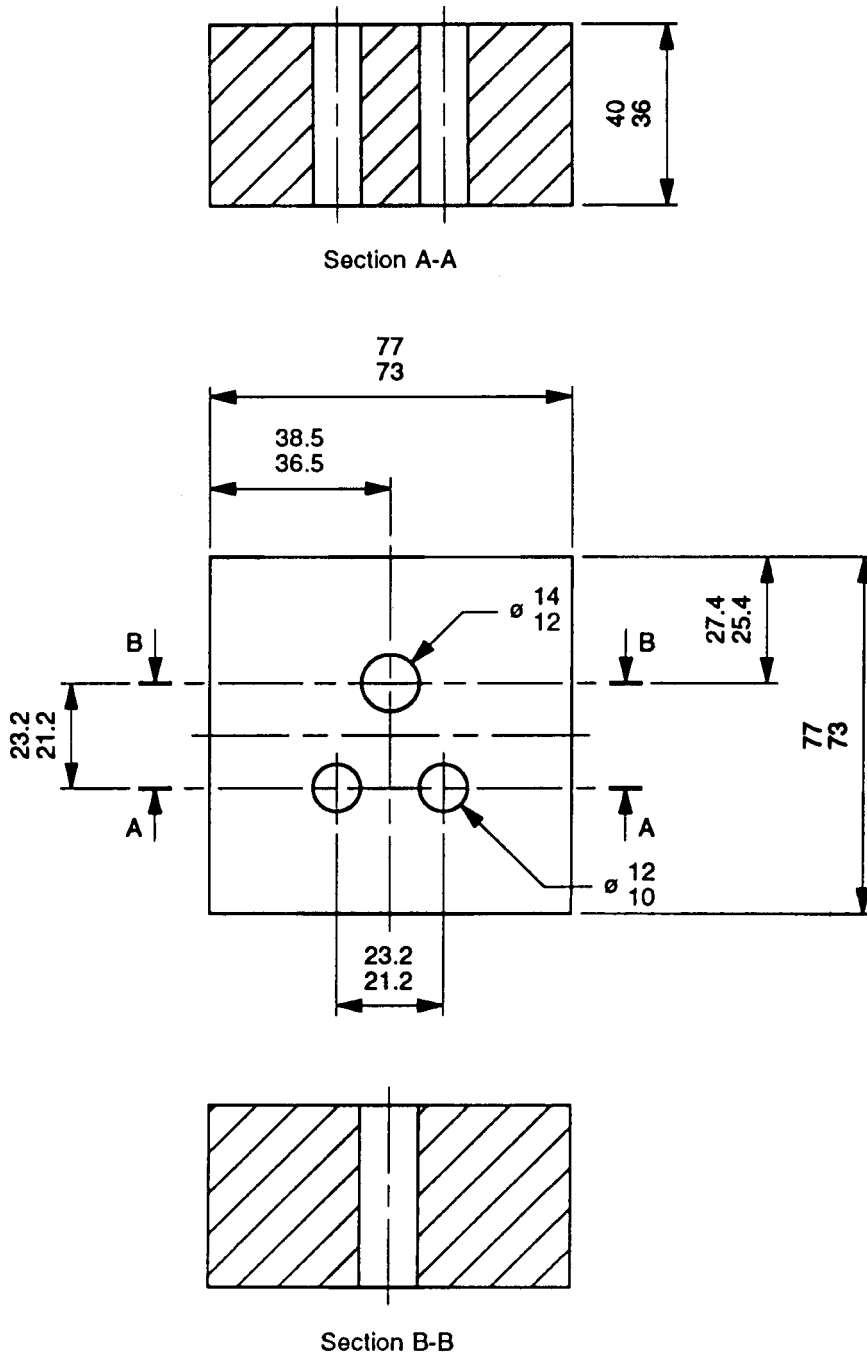




All dimensions are in millimetres.

NOTE This drawing is not intended to govern design except as regards the dimensions and specific values shown.

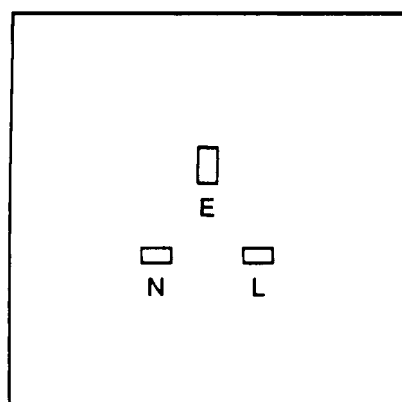
Figure 2a) — Apparatus for mechanical strength test on resilient covers (see Clause 9)



All dimensions are in millimetres.

NOTE Holes are not used for testing sockets.

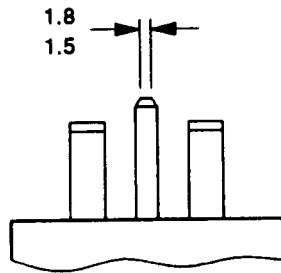
Figure 2b) — Hardwood block for Figure 2a) (see Clause 9)



Lower edge

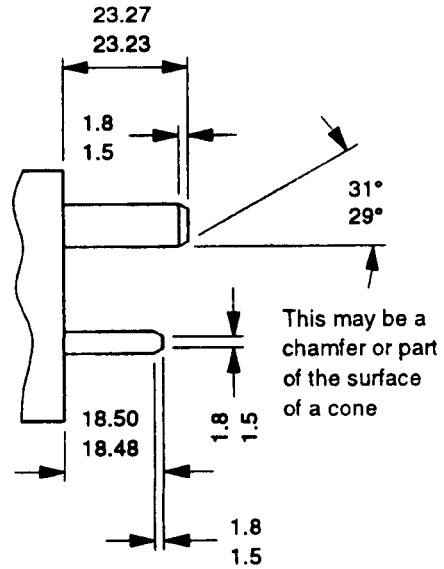
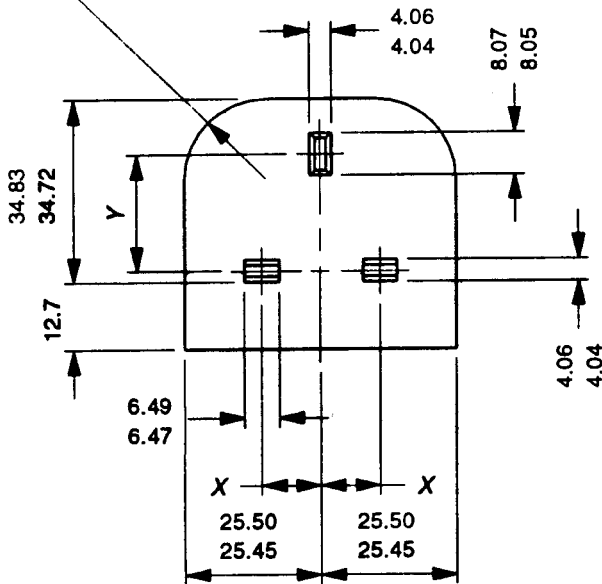
NOTE The diagram shows the disposition of the socket-contacts as viewed from the front of a socket-outlet.

Figure 3 — Disposition of socket contacts (see Clause 13)



		Dimension X	Dimension Y
Pins at max. centres	Min.	11.19	22.37
	Max.	11.21	22.39
Pins at min. centres	Min.	11.01	22.07
	Max.	11.03	22.09

R 15.2 T.P. (true profile) with a tolerance zone 0.1 from the T.P. The form of this contour is to blend smoothly with the sides



This may be a chamfer or part of the surface of a cone

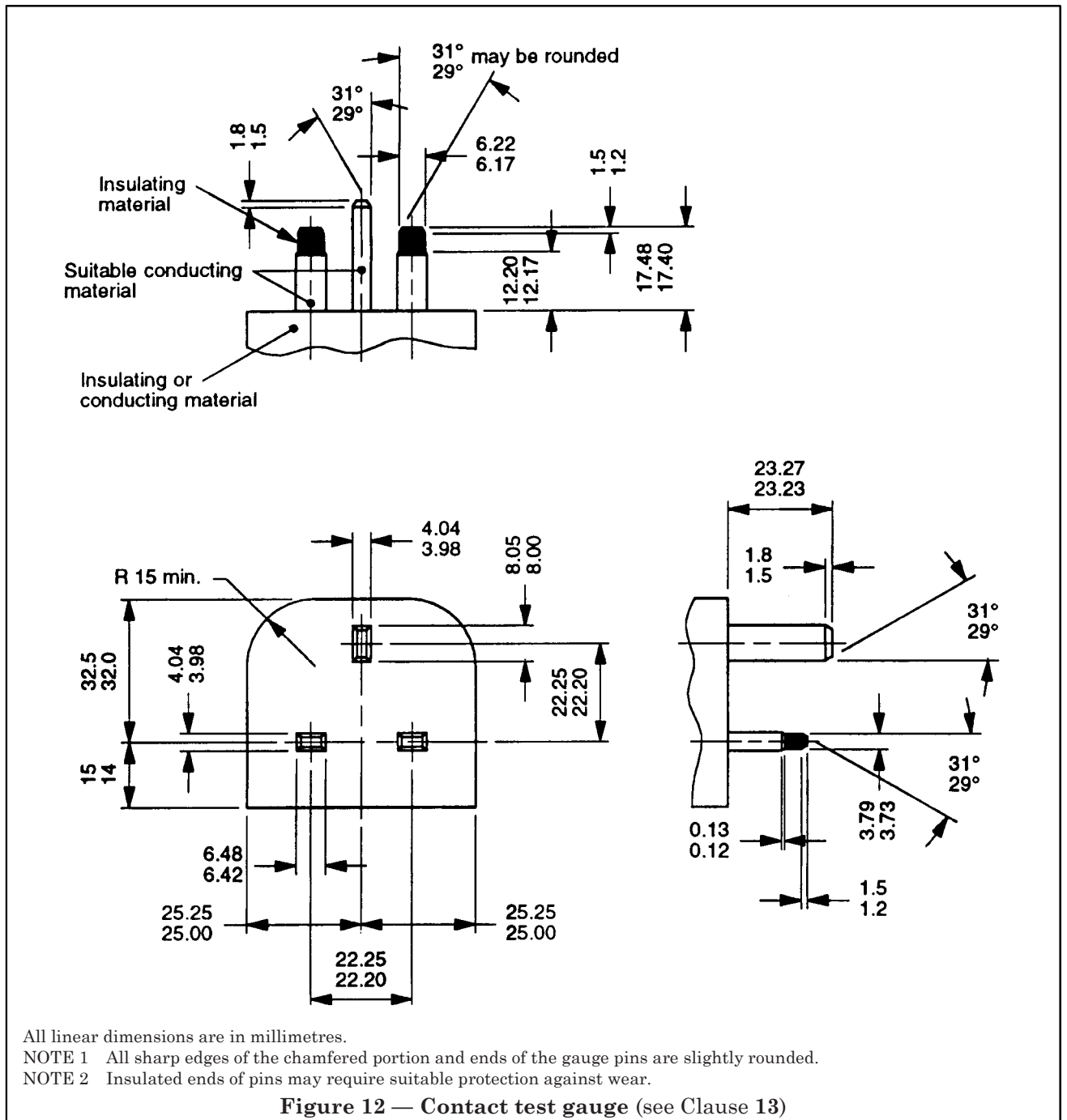
General view

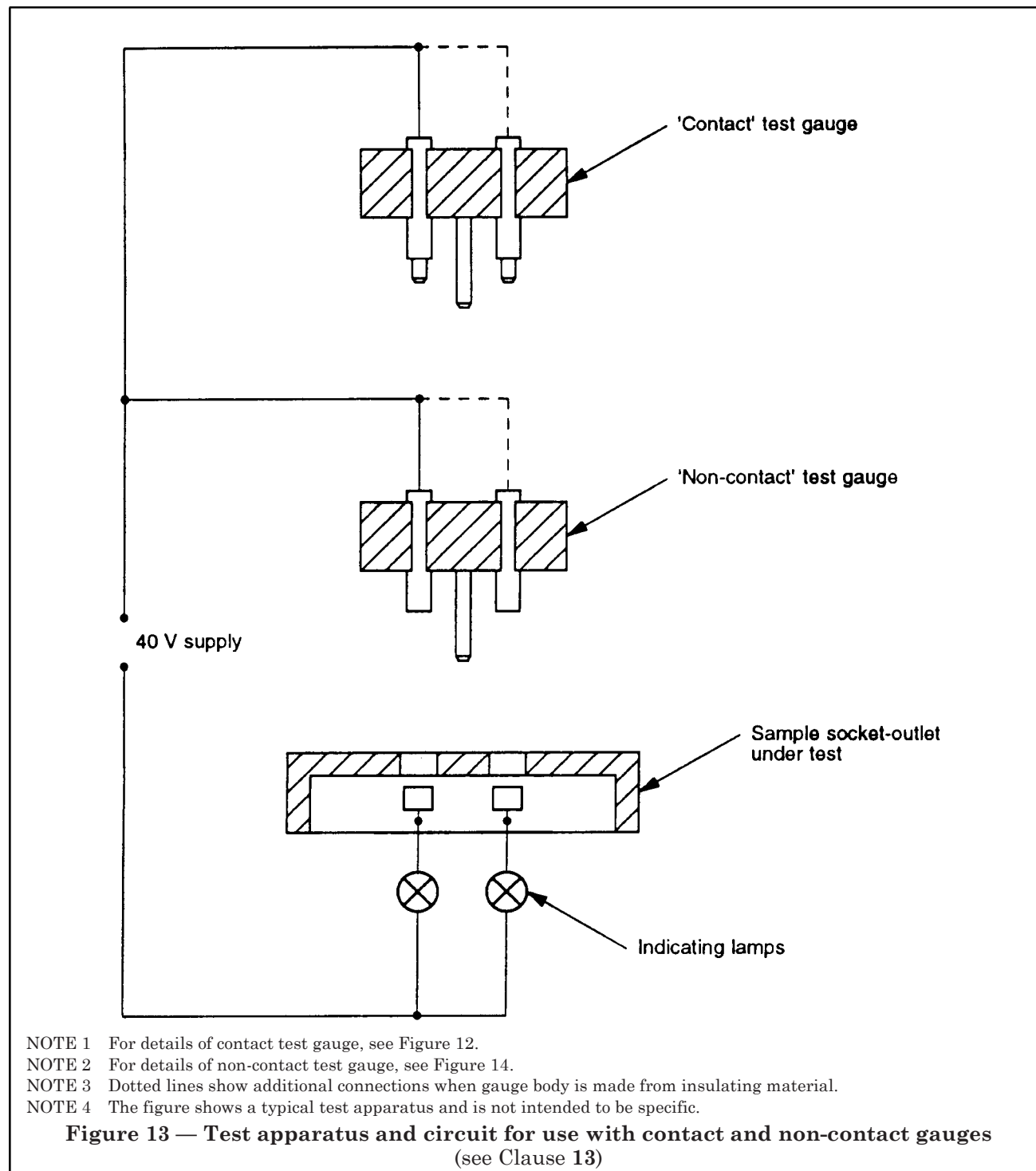
All linear dimensions are in millimetres.

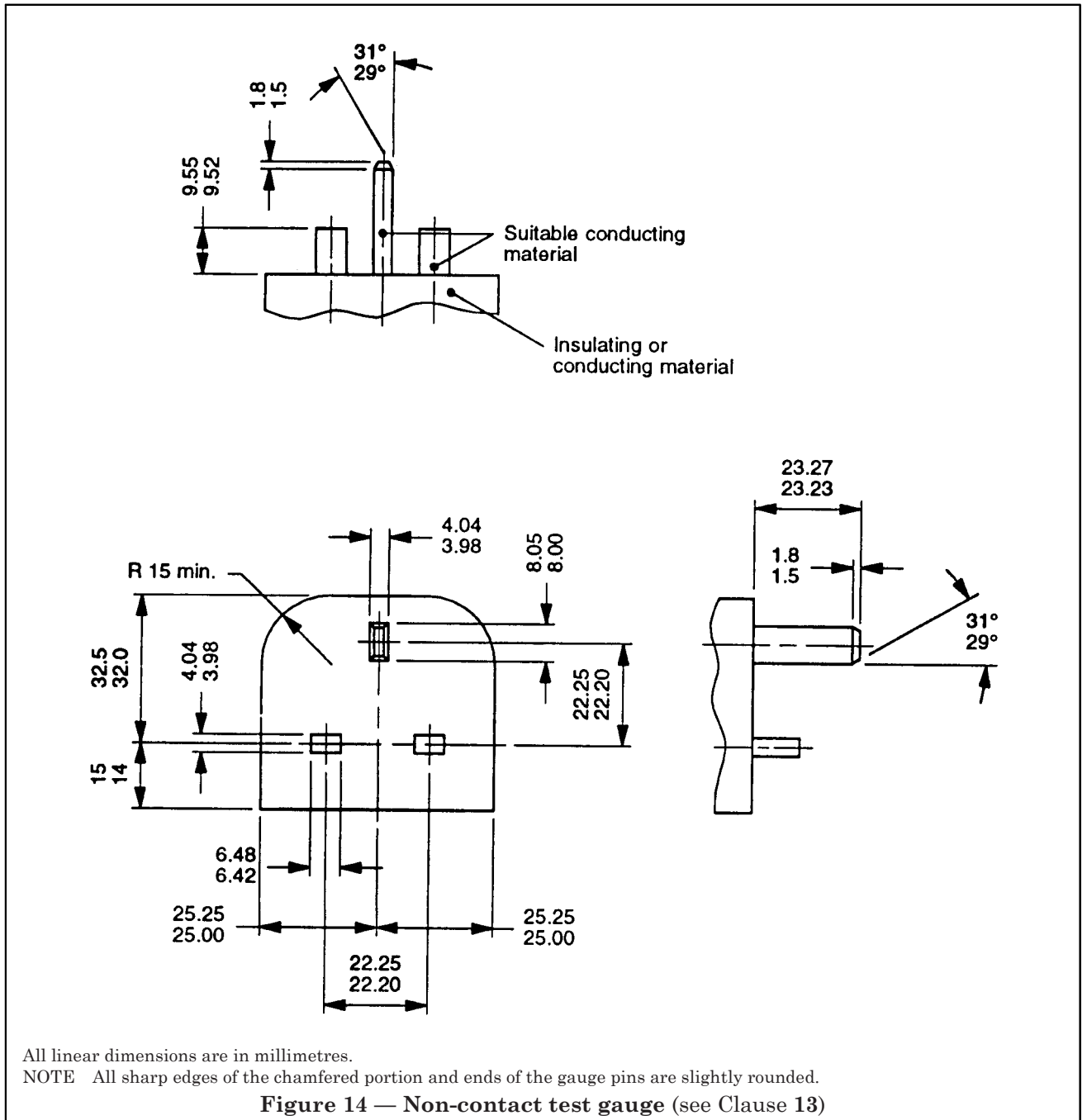
NOTE 1 All sharp edges of the shaped portion of all the pins of the socket-outlet gauge are slightly rounded.

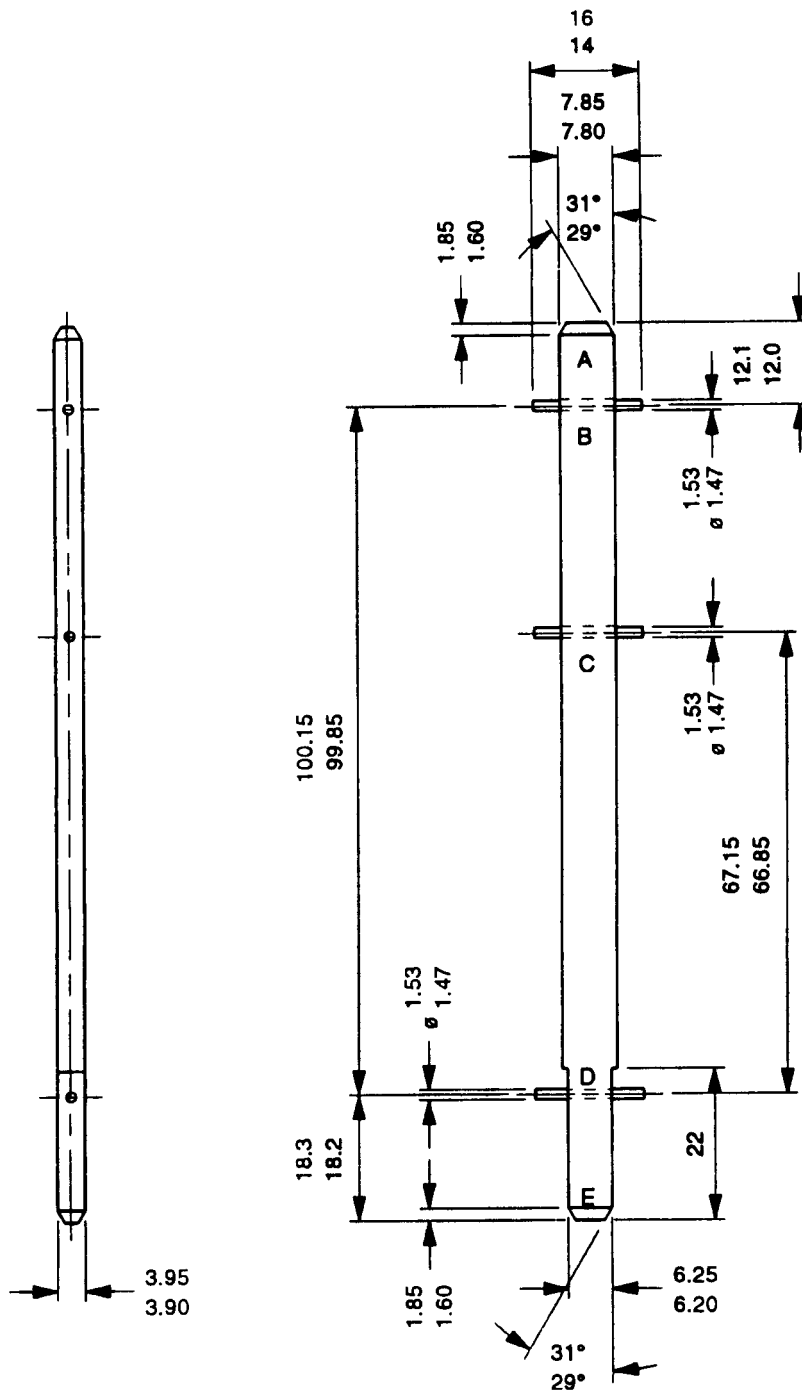
NOTE 2 The surfaces of the gauge in which the pins are mounted are flat to within 0.025 mm.

Figure 11 — Go gauge for socket-outlet (see Clause 13)



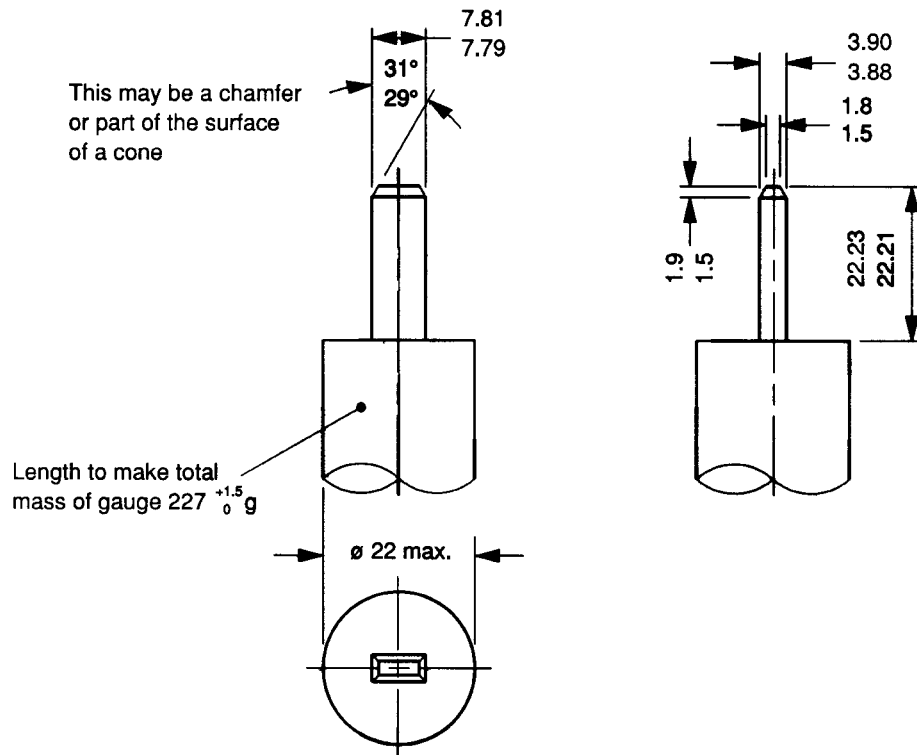




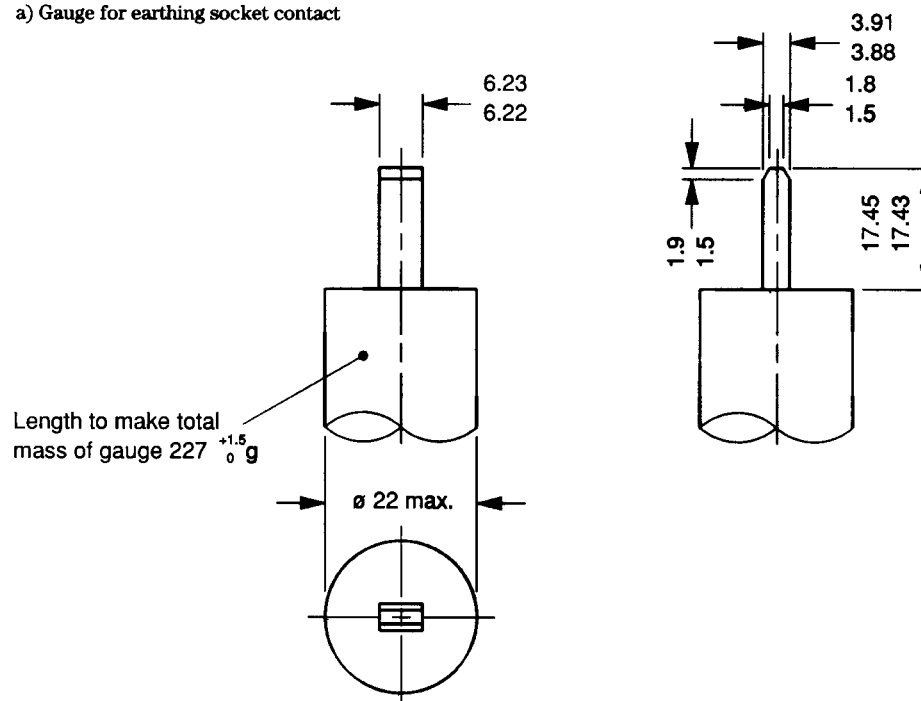


All linear dimensions are in millimetres.
 NOTE The material is of steel.

Figure 15 — Turning moment gauge (see Clause 13)



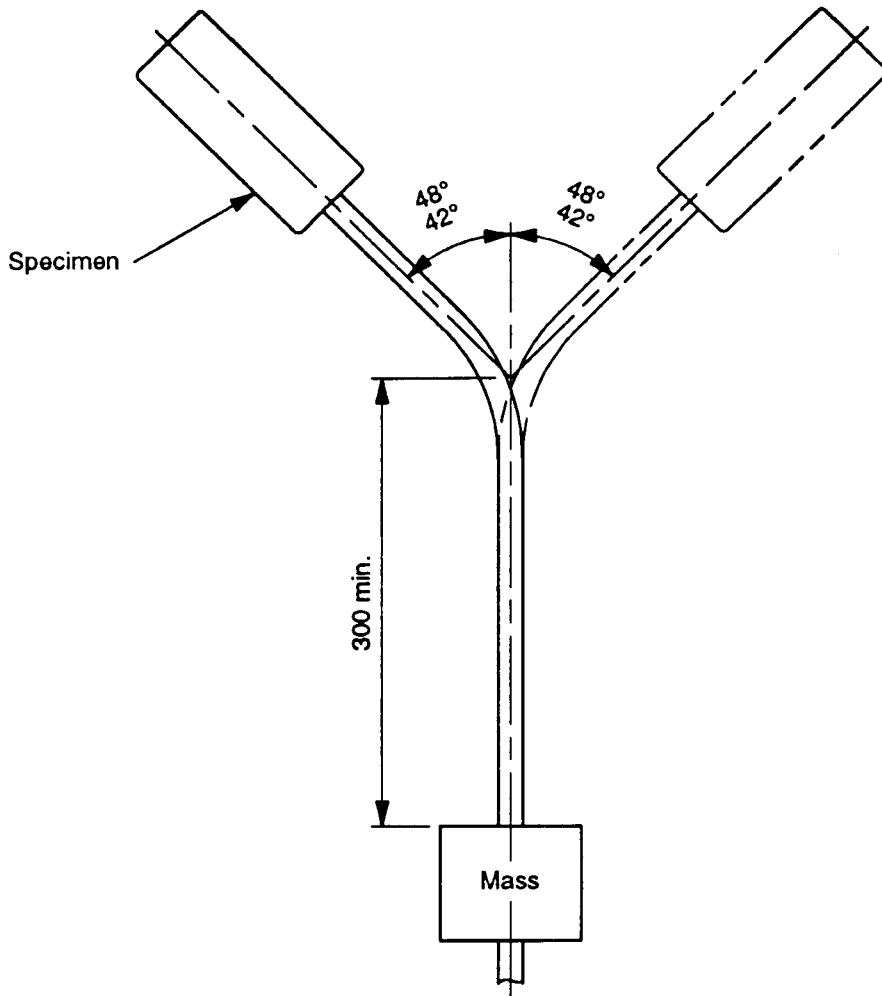
a) Gauge for earthing socket contact



b) Gauge for line and neutral current-carrying socket contacts

All linear dimensions are in millimetres.

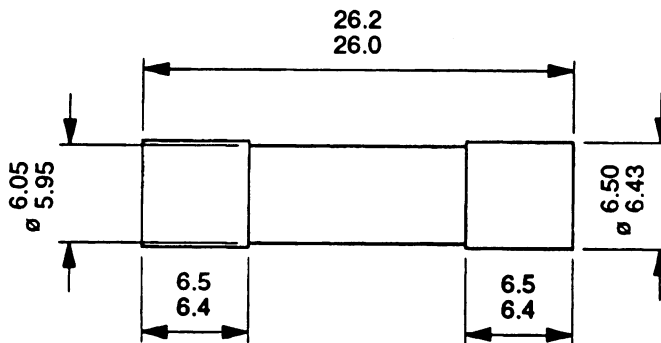
Figure 16 — Withdrawal pull gauges for effectiveness of contact (see Clause 13)



Linear dimension is in millimetres.

NOTE This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.

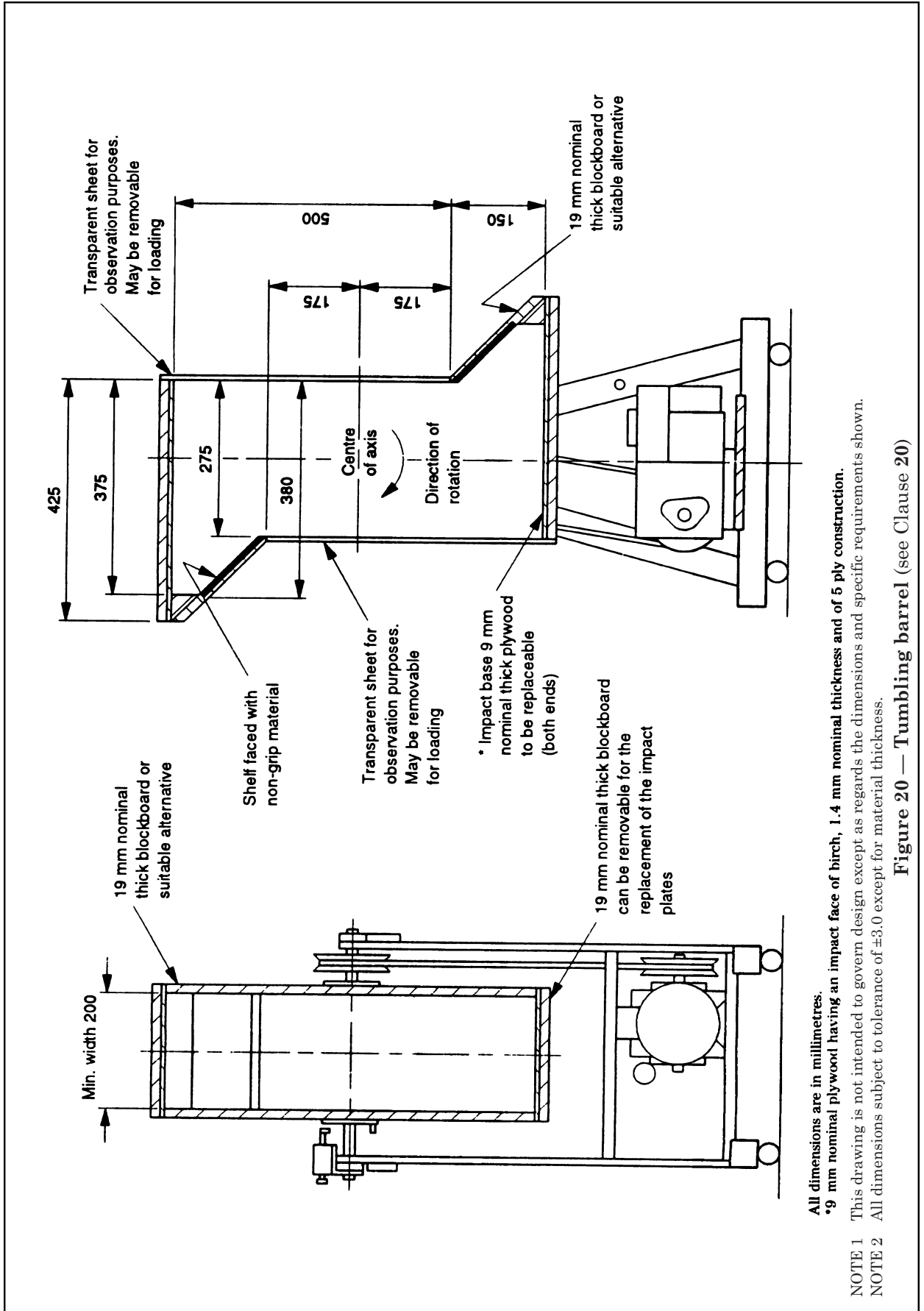
Figure 18 — Apparatus for flexing test (see Clause 19)



All dimensions are in millimetres.

NOTE Finish: polished and sharp corners removed.

Figure 19 — Solid link for test on fuse clips (see Clause 20)



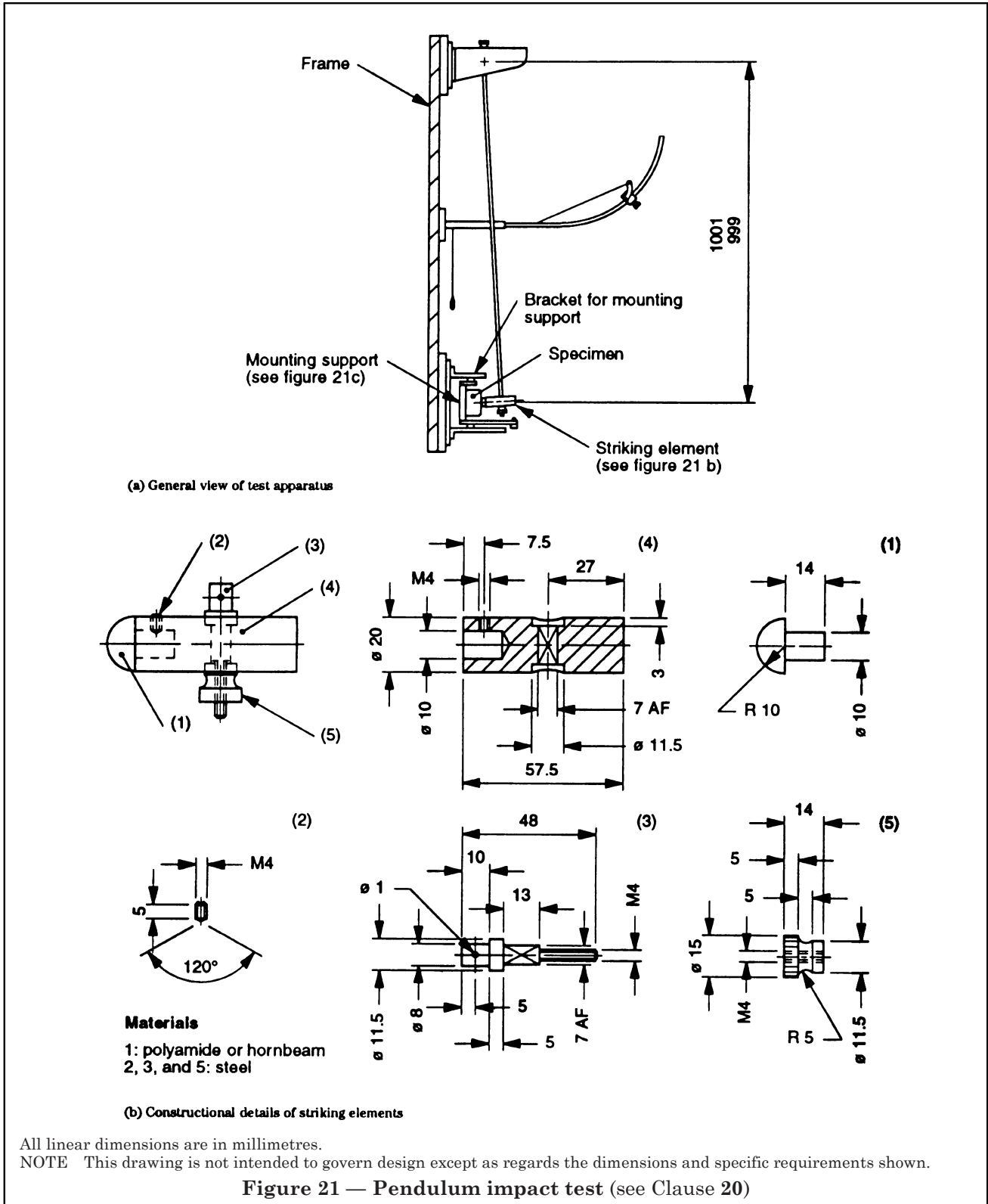
All dimensions are in millimetres.

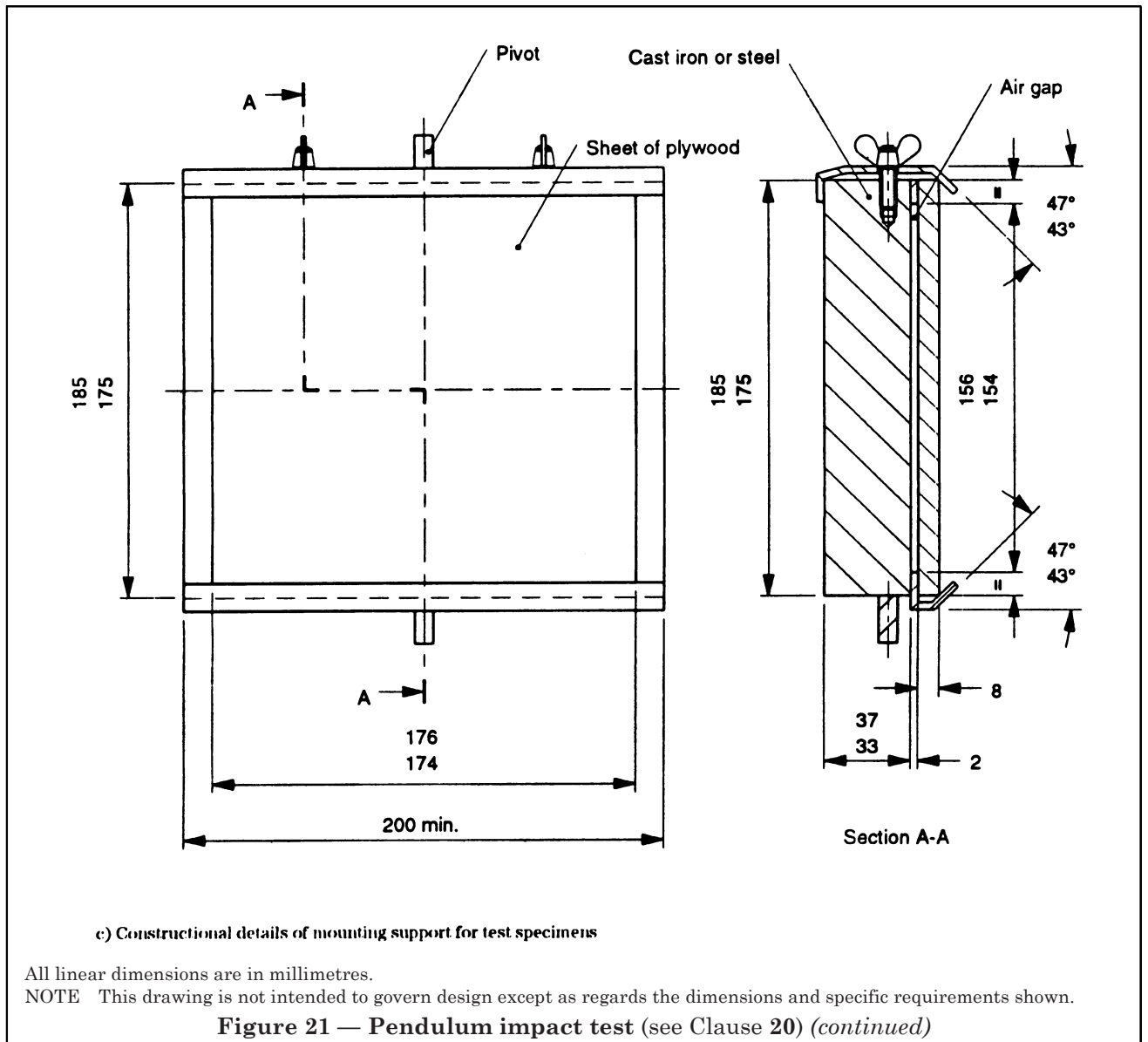
*9 mm nominal plywood having an impact face of birch, 1.4 mm nominal thickness and of 5 ply construction.

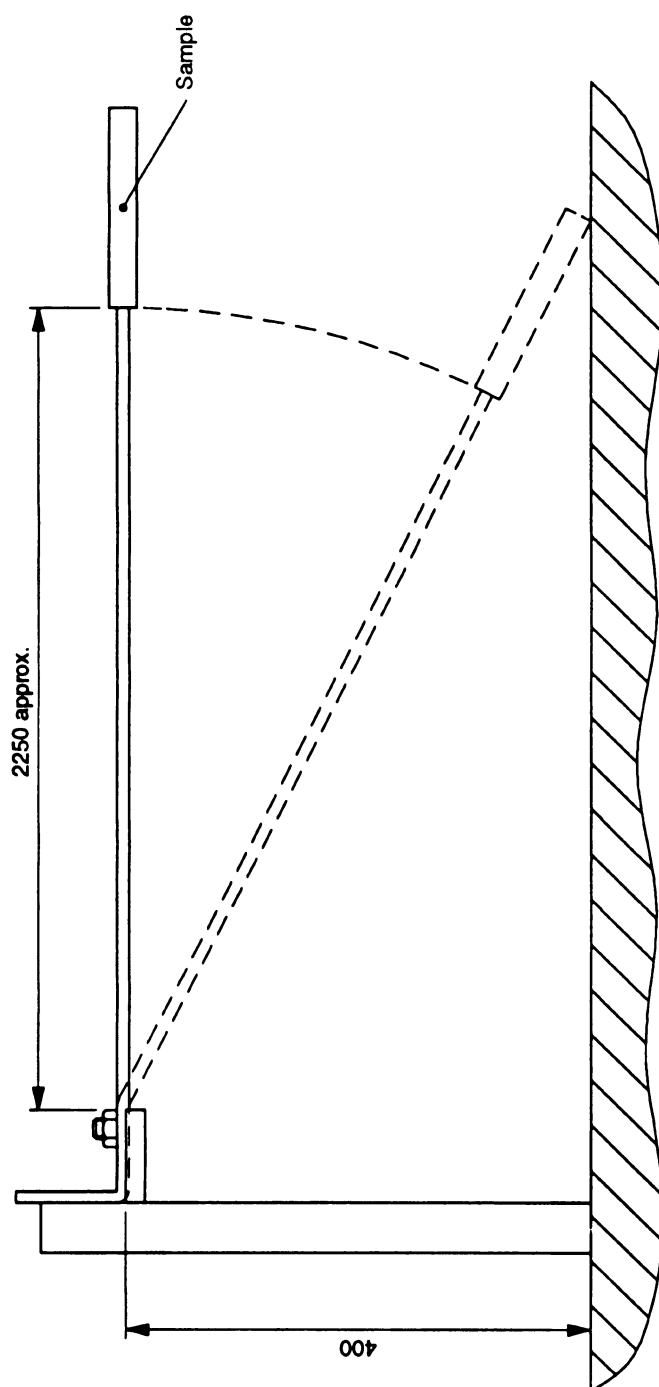
NOTE 1 This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.

NOTE 2 All dimensions subject to tolerance of ± 3.0 except for material thickness.

Figure 20 — Tumbling barrel (see Clause 20)



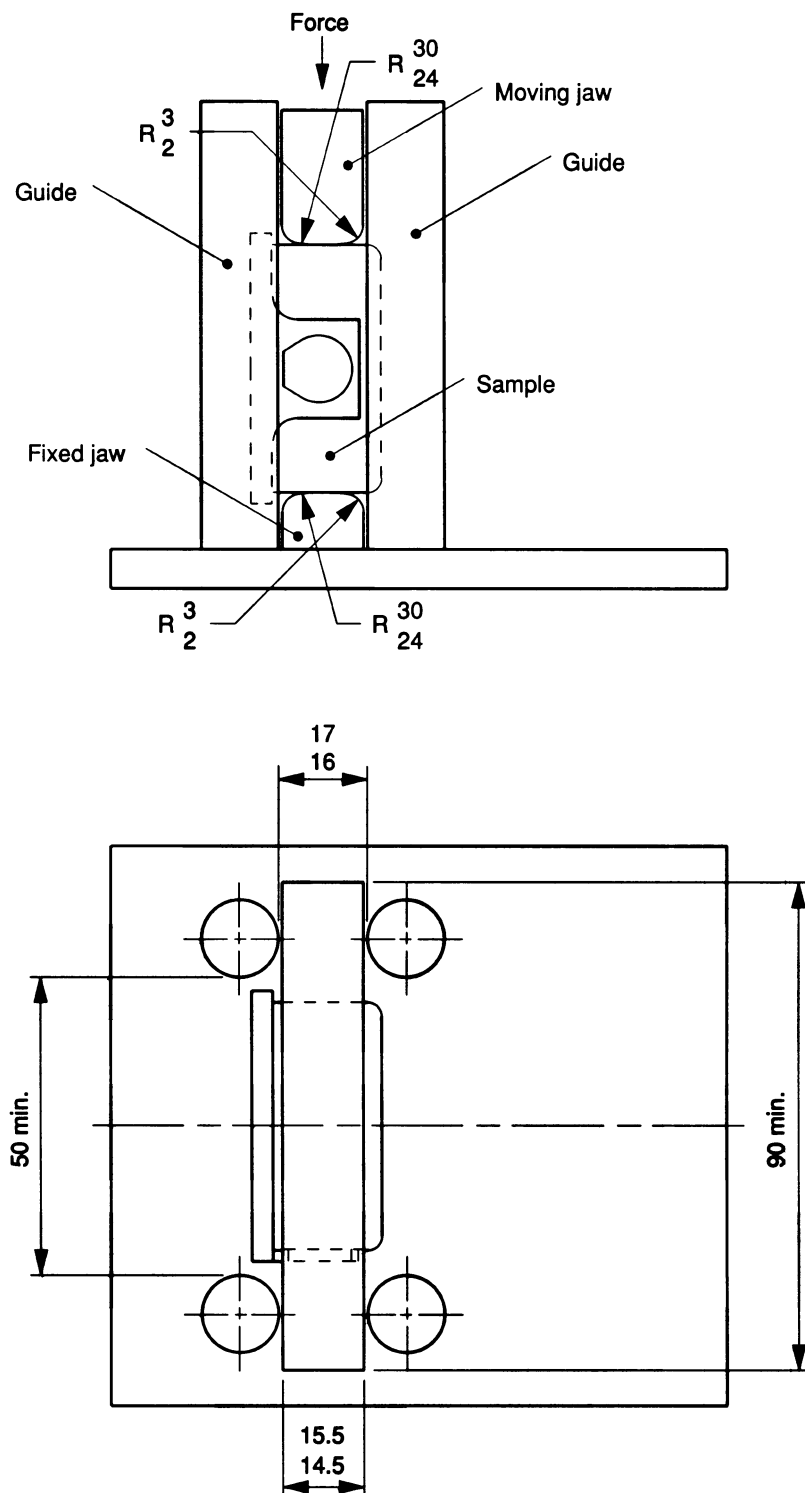




All dimensions are in millimetres.

NOTE This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.

Figure 22 — Arrangements for mechanical strength test for portable socket-outlets
(see Clause 20)



All dimensions are in millimetres.

NOTE This drawing is not intended to govern design except as regards the dimensions and specific requirements shown.

Figure 23 — Apparatus for pressure test (see Clause 22)

Figure 24 *Figure deleted*

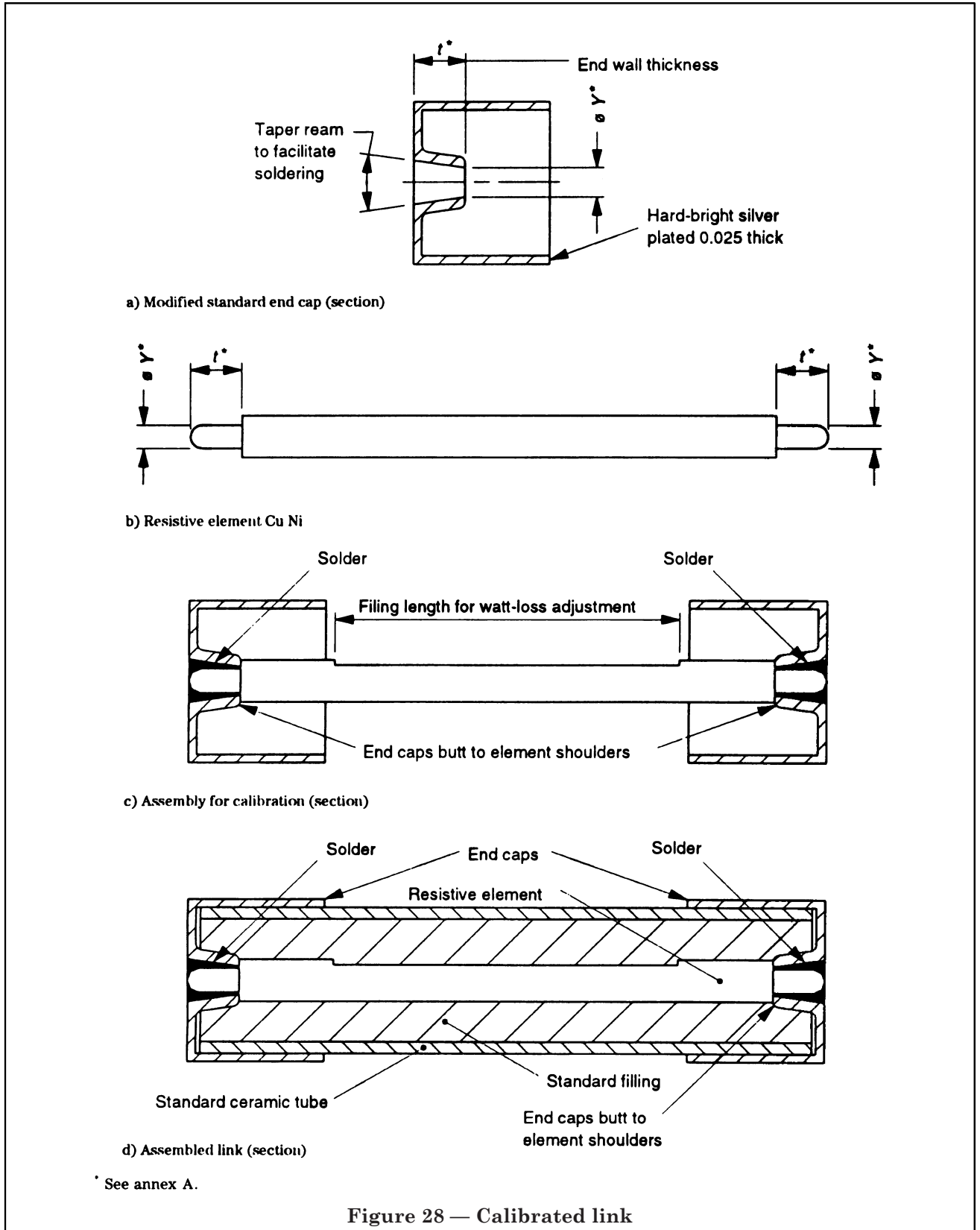
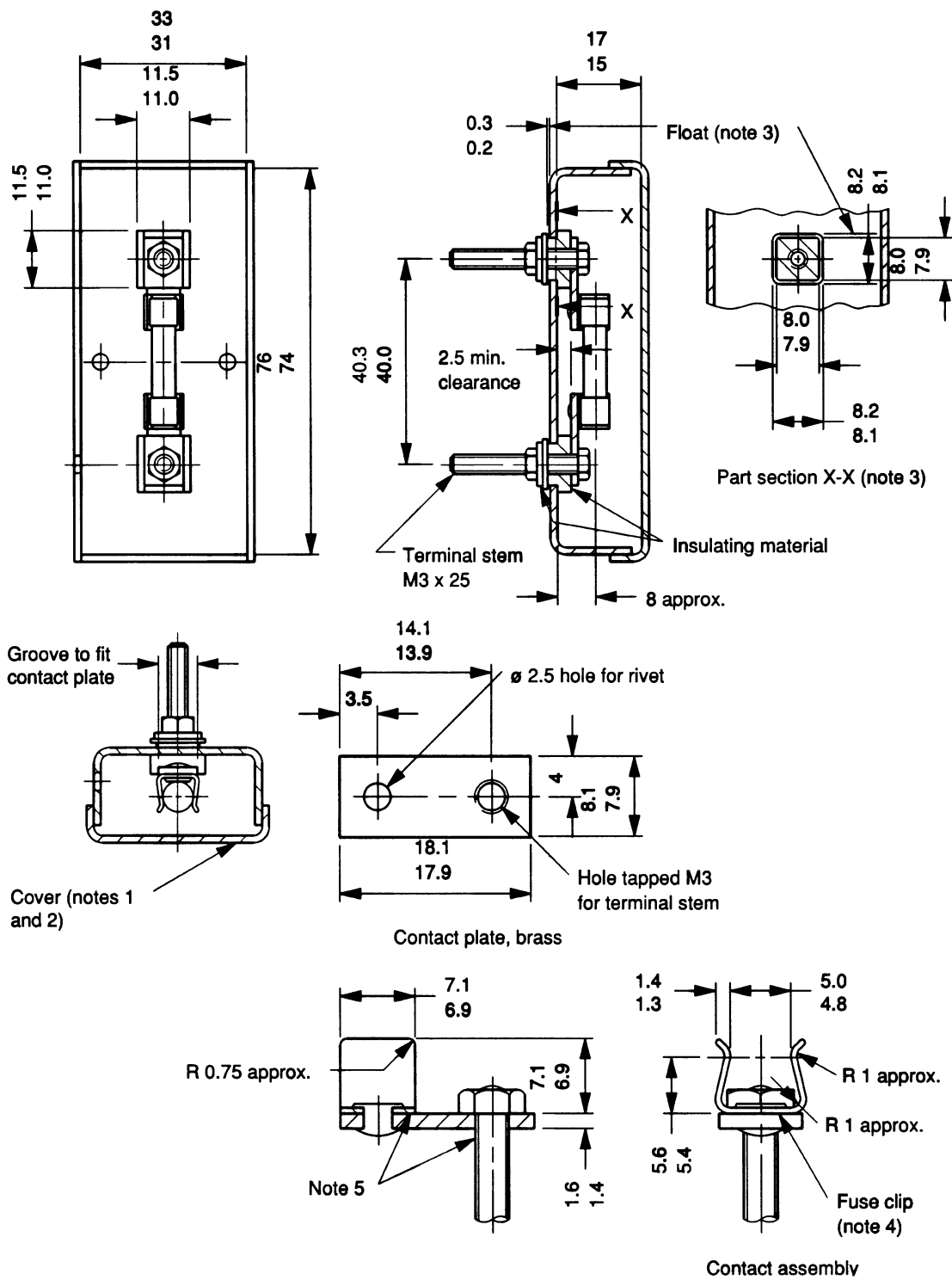


Figure 28 — Calibrated link



All dimensions are in millimetres.

NOTE 1 Box and cover made from 1.25 mm brass sheet, clean natural finish.

NOTE 2 Cover should be a push fit on box and should not be rigidly attached.

NOTE 3 The end float and clearance between the insulation and the box is to allow the contacts to be self-aligning.

NOTE 4 Fuse clip. Made from beryllium copper 0.45 mm thick and heat treated (170 HV minimum). Base of clip to be flat; finish, silver plated.

NOTE 5 Joints between clip, contact plate and terminal stem to be soldered.

Figure 29 — Calibration jig for calibrated link (see A.2)

A3

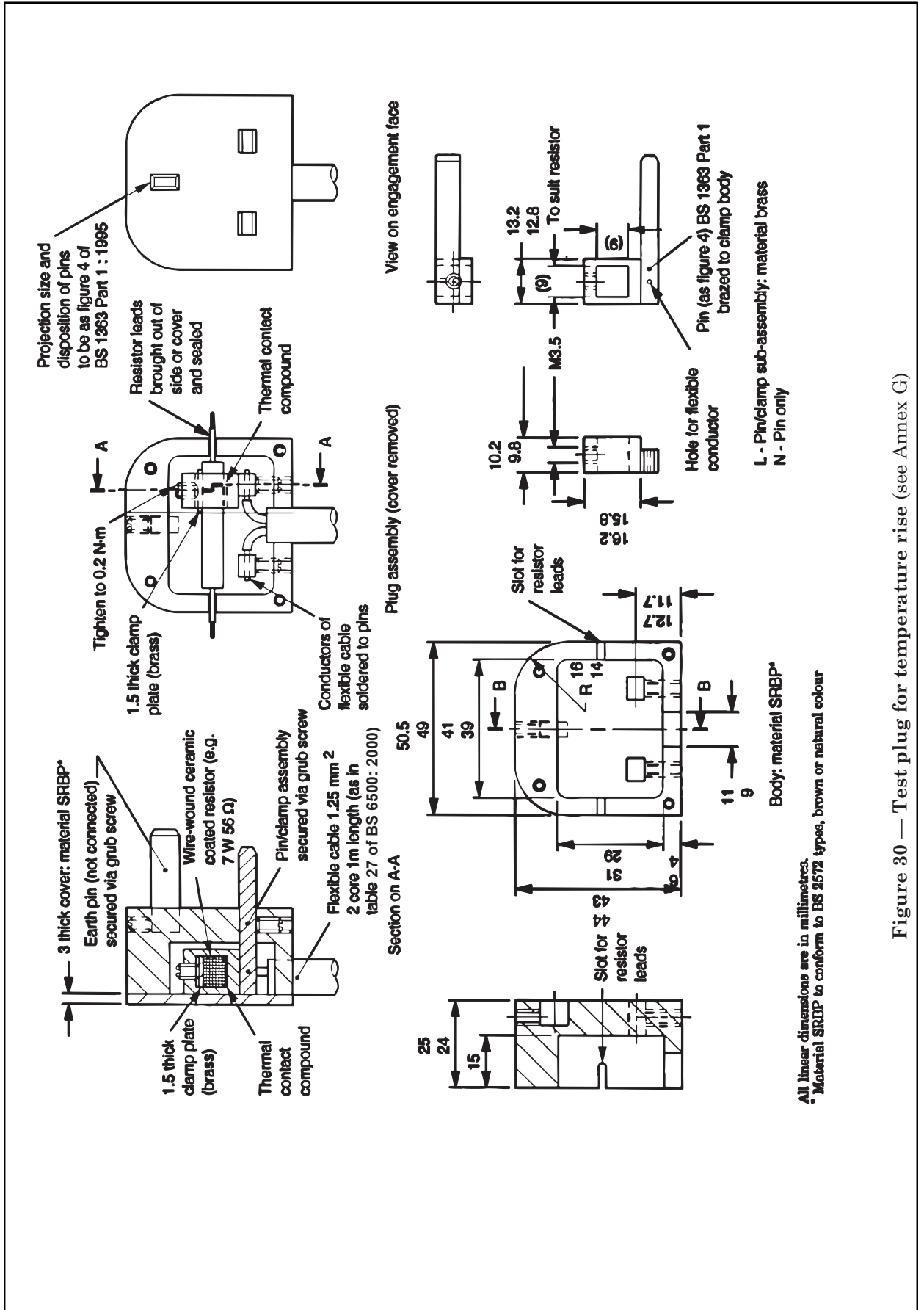


Figure 30 — Test plug for temperature rise (see Annex G)

A3

List of references

BSI publications

BS 219:1977, *Specification for soft solders.*

BS 1210:1963, *Specification for wood screws.*

BS 1362:1973, *Specification for general purpose fuse links for domestic and similar purposes (primarily for use in plugs).*

BS 1363-1:1995, *13 A plugs, socket-outlets, adaptors and connection units — Part 1: Specification for rewirable and non-rewirable 13 A fused plugs.*

BS 1363-3:1995, *13 A plugs, socket-outlets, adaptors and connection units — Part 3: Specification for adaptors.*

BS 1363-4:1995, *13 A plugs, socket-outlets, adaptors and connection units — Part 4: Specification for 13 A fused connection units: switched and unswitched.*

BS 4662:1970, *Specification for boxes for the enclosure of electrical accessories.*

BS 5901:1980, *Method of test for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions.*

BS 6004:2000, *Electric cables — PVC insulated, non-armoured cables for voltages up to and including 450/750 V, for electric power, lighting and internal wiring.*

BS 6007:2000, *Electric cables — Single core unsheathed heat resisting cables for voltages up to and including 450/750 V, for internal wiring.*

BS 6500:2000, *Electric cables — Flexible cords rated up to 300/500 V, for use with appliances and equipment intended for domestic, office and similar environments.*

BS EN 50075, *Specification for non-rewirable two-pole plugs 2.5 A 250 V, with cord, for the connection of class-II equipment for household and similar purposes.*

BS EN 50525, *Electric cables – Low voltage energy cables of rated voltages up to and including 450/750 V (U_0/U).* ^{A4}

BS EN 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials.*

BS EN 60664-1: *Insulation coordination for equipment within low-voltage systems — Part 1: Principles, requirements and tests.* ^{A3}

BS EN 60695-2-11:2001, *Fire hazard testing — Part 2-11 :Glowing/hot-wire based test methods — Glow-wire flammability test method for end-products.*

BS EN 60695-10-2:2003, *Fire hazard testing — Part 10-2: Abnormal heat — Ball pressure test.* ^{A4}

BS EN 61032:1998, *Protection of persons and equipment by enclosures — Probes for verification.*

BS EN 61140, *Protection against electric shock — Common aspects for installation and equipment.* ^{A3}

BS EN 61180-1:1995, *Guide to high-voltage test techniques for low-voltage equipment — Part 1: Definitions, test and procedure requirements.* ^{A4}

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