BRITISH STANDARD

BS 4177:1992
Incorporating Amendments Nos. 1, 2, 3 and 4

Specification for

Cooker control units

ICS 29.120.40; 97.040.20

Confirmed January 2010

BSI British Standards

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:

Association of Consulting Engineers

Association of Control Manufacturers [TACMA (BEAMA Ltd.)]

Association of Manufacturers of Domestic Electrical Appliances

ASTA Certification Services

British Electrical Systems Association (BEAMA Ltd.)

British Electrotechnical Approvals Board

British Plastics Federation

Consumer Policy Committee of BSI

Decorative Lighting Association

Department of Health

Department of Trade and Industry (Consumer Safety Unit, CA Division)

Electrical Installation Equipment Manufacturers' Association (BEAMA Ltd.)

Electricity Supply Industry in United Kingdom

Institution of Electrical Engineers

Lighting Industry Federation Ltd.

National Inspection Council for Electrical Installation Contracting

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Amendments issued since publication

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Amd. No. 1	July 1993	
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Amd. No. 3	19 November 2004	
Amd. No. 4	31 December 2007	See foreword

Contents

Foreword

This revision of BS 4177 has been prepared under the direction of the Power Electrical Engineering Standards Policy Committee and it supersedes BS 4177:1967, which is withdrawn.

The start and finish of text introduced or altered by Amendment No. 4 is indicated in the text by tags ⟨A1⟩ ⟨A1⟩.

This revision updates the specification in line with current practices and test methods. Amendment No. 4 introduces certain changes to introduce modern test and performance requirements to verify the suitability of the main switch to provide isolation.

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.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 49 and a back cover.

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1 Scope

This British Standard specifies requirements and tests for those cooker control units primarily intended for the control of the electric supply to cookers consisting of a main switch with certain auxiliaries and rated at a voltage not exceeding 250 V at 50 Hz. Such units comprise the following:

a) a main switch, for controlling the electric supply to the cooker, having a rated current not exceeding 45 A;

b) a socket-outlet and associated switch having a rated current not exceeding 15 A.

Cooker control units complying with this standard are suitable for use under the following conditions:

1) in air temperatures from – 5 °C to +40 °C with an average value over a period of 24 h not exceeding +25 °C;

2) where the altitude of the site of installation does not exceed 2 000 m;

3) in an atmosphere not subject to pollution by smoke, chemical fumes, rain, spray, prolonged periods of high humidity or other conditions.

NOTE 1 Direct radiation from the sun should be avoided and instructions to this effect are recommended.

In locations where special conditions prevail, e.g. in ships and vehicles, and in hazardous locations, for instance where explosions are liable to occur, special constructions may be required. Appendix A gives a guideline regarding the EMC Directive 89/336/EEC.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

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

2.1
cooker control unit
assembly of parts enclosed in a case or mounting box for the purpose of controlling the electric supply to a cooker, as well as the electric supply to other electrical appliances, connected by a plug to the socket-outlet forming an integral part of the cooker control unit

2.2
surface-type cooker control unit
cooker control unit having a case or mounting box which is intended to be mounted on the surface of a wall

2.3
flush-type cooker control unit
cooker control unit having a mounting box which is intended to be recessed into a wall, the bearing surfaces of the cover being mounted flush with the surface of the wall

NOTE For the purpose of attachment and adjustability of flush-type units, the assembly of parts and the cover are considered as one unit.

2.4
panel mounting cooker control unit
cooker control unit intended for incorporation into equipment panels or electrical trunking and which depends upon such incorporation for its enclosure

2.5
mounting box
box in or on a wall, for flush or surface application, intended to house a cooker control unit

2.6
enclosure
mounting box complete with a protective cover or lid

NOTE The protective cover may be part of the cooker control unit.

2.7
cooker circuit
circuit from the cooker control unit to the cooker, including the main switch in the cooker control unit

2.8
auxiliary circuit
circuit from the cooker control unit, including the switched socket-outlet in the cooker control unit supplying the portable appliance intended to be connected thereto

2.9
switch
device designed to make or break the current in one or more electric circuits

2.10
main switch
switch incorporated in the cooker control unit designed to make and break the current in all current-carrying poles of an electric circuit to provide the safe disconnection of the cooker from the supply

2.11
rotary switch
switch having an actuating member which is turned in a circular motion

2.12
actuating member
part which is moved, e.g. pulled, pushed or turned by the user to operate the switch mechanism

2.13
type test
test of one or more cooker control units to show that all units made to the same specification and having the same essential details would pass an identical test

2.14
ambient temperature
specified temperature of the environment within which specified type tests are undertaken

2.15
fine wire thermocouple
thermocouple having wires not exceeding 0.3 mm in diameter

2.16
luminous indicator
luminous means of indicating that the cooker control unit or auxiliary switched socket-outlet, as appropriate, is energized

2.17
terminal
conductive part of a device, provided for reusable electrical connection to external circuits

2.18
terminal with screw clamping
terminal intended for the connection, by clamping only, of external rigid or flexible conductors

2.19
pillar terminal
terminal with screw clamping in which the conductor is inserted into a hole or cavity, where it is clamped under the end of the screw or screws

NOTE 1 The clamping pressure may be applied directly by the end of the screw or through an intermediate clamping member to which pressure is applied by the end of the screw.

NOTE 2 Examples of pillar terminals are given in Table 1 and shown in Figure 1.

Table 1 — Pillar terminals

Conductor capacity of terminal	Minimum distance *g* between clamping screw and end of conductor when fully inserted	
	One screw	Two screws
mm^2	mm	mm
0.5 to 1.0	1.5	1.5
1.0 to 1.5	1.5	1.5
1.0 to 2.5	1.8	1.5
1.5 to 4.0	1.8	1.5
4.0 to 6.0	2.0	1.5
6.0 to 10.0	2.5	2.0
10.0 to 16.0	3.0	2.0

2.20
screw terminal
terminal with screw clamping in which the conductor is clamped under the head of the screw

NOTE 1 The clamping pressure may be applied directly by the head of the screw or through an intermediate part, such as a washer, a clamping plate or an anti-spread device.

NOTE 2 Examples of screw terminals are shown in Table 1a and Figure 2.

2.21
stud terminal
terminal with screw clamping in which the conductor is clamped under a nut

NOTE 1 The clamping pressure may be applied directly by a suitably shaped nut or through an intermediate part, such as a washer, a clamping plate or an anti-spread device.

NOTE 2 Examples of stud terminals are shown in Table 1a and Figure 2.

2.22
saddle terminal
terminal with screw clamping in which the conductor is clamped under a saddle by means of two or more screws or nuts

NOTE Examples of saddle terminals are shown in Table 1a and Figure 3.

2.23
mantle terminal
terminal with screw clamping in which the conductor is clamped against the base of a slot in a threaded stud by means of a nut

NOTE 1 The conductor is clamped against the base of the slot by a suitably shaped washer under the nut, by a central peg if the nut is a cap nut, or by equally effective means for transmitting the pressure from the nut to the conductor within the slot.

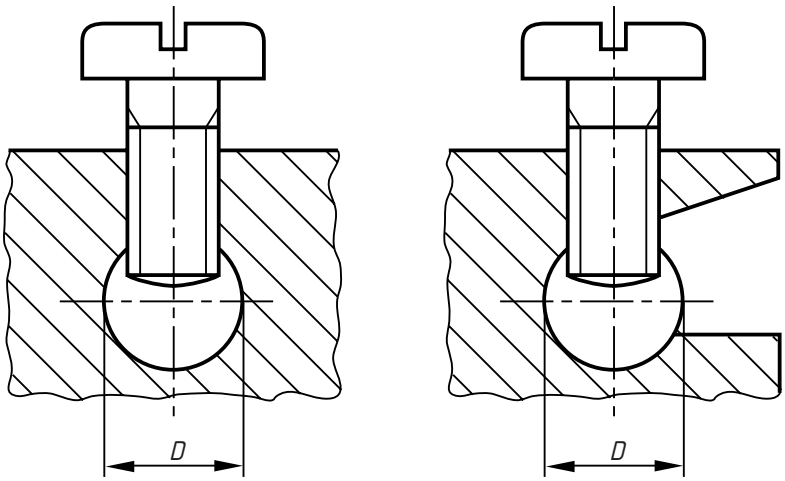
NOTE 2 Examples of mantle terminals are given in Table 2 and shown in Figure 4.

Table 1a — Minimum diameters of conductor spaces

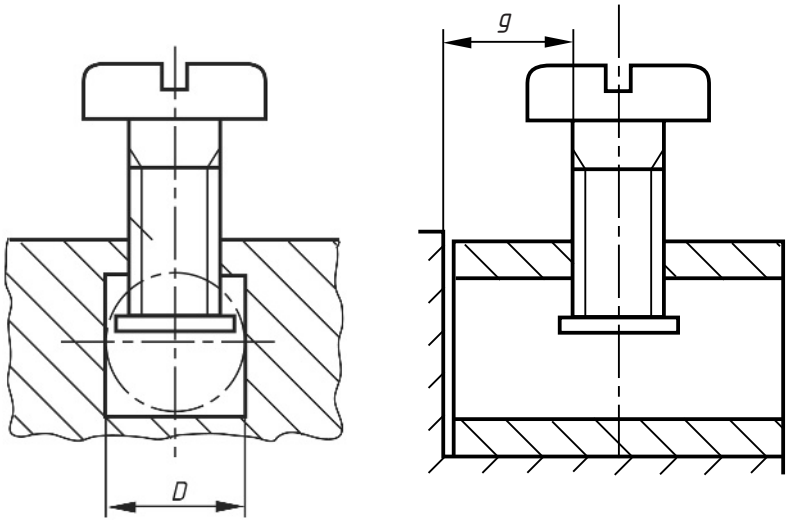
Cross-section of conductor accepted by the terminal capacity	Minimum diameter *D* of conductor space			
	Pillar terminals	Screw terminals and stud terminals	Saddle terminals	Mantle terminals
mm^2	mm	mm	mm	mm
Up to 2.5	3.0	2.0	—	2.0
>2.5 to 4.0	3.6	2.7	3.0	2.7
>4.0 to 6.0	4.0	3.6	4.0	3.6
>6.0 to 10.0	4.5	4.3	4.5	4.3
>10.0 to 16.0	5.5	5.5	5.5	5.5

Table 2 — Mantle terminals

Conductor capacity of terminal mm^2	Minimum distance between fixed part and end of conductor when fully inserted mm
0.5 to 1.0	1.5
1.0 to 1.5	1.5
1.0 to 2.5	1.8
1.5 to 4.0	1.8
4.0 to 6.0	2.0
6.0 to 10.0	2.5
10.0 to 16.0	3.0



(a) Terminals without pressure plate



(b) Terminals with pressure plate

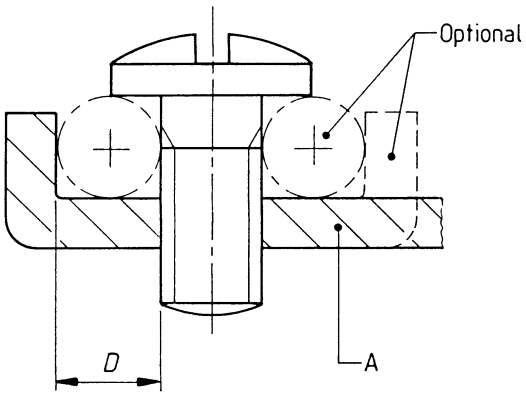
Key

D conductor space
g minimum distance

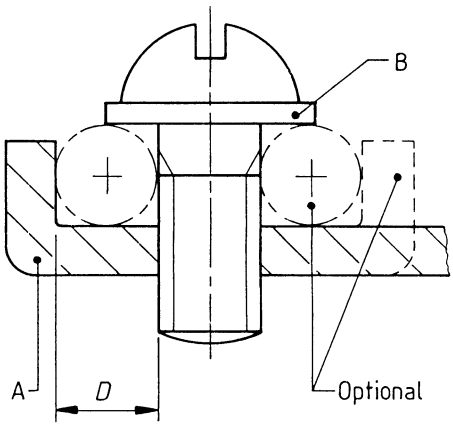
NOTE 1 The part of the terminal containing the threaded hole and the part of the terminal against which the conductor is clamped by the screw may be two separate parts as in the case of terminals provided with a stirrup.

NOTE 2 The shape of the conductor space may differ from those shown.

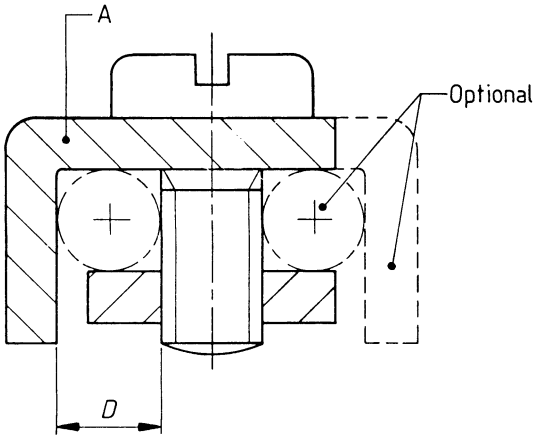
Figure 1 — Pillar terminals



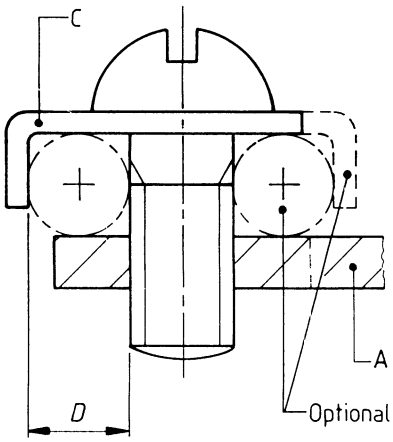
(a) Screw not requiring washer, clamping plate or anti-spread device

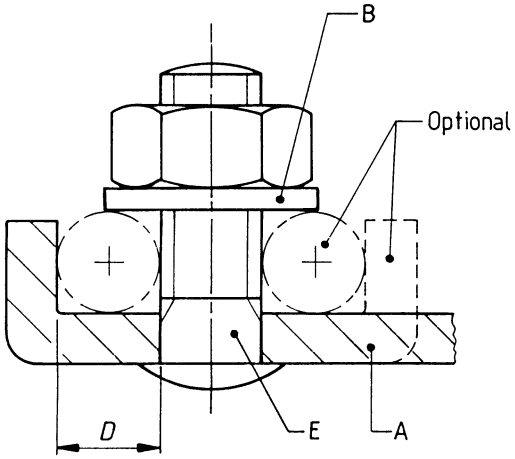


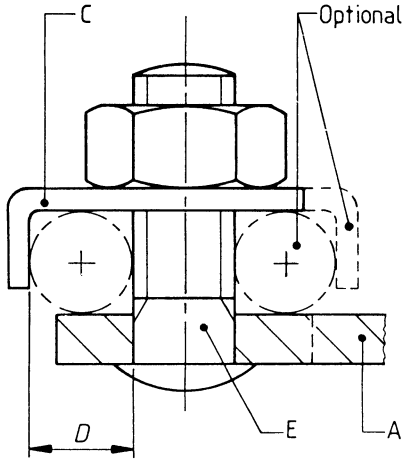
(b) Screw requiring washer, clamping plate or anti-spread device



(c) Screw terminals







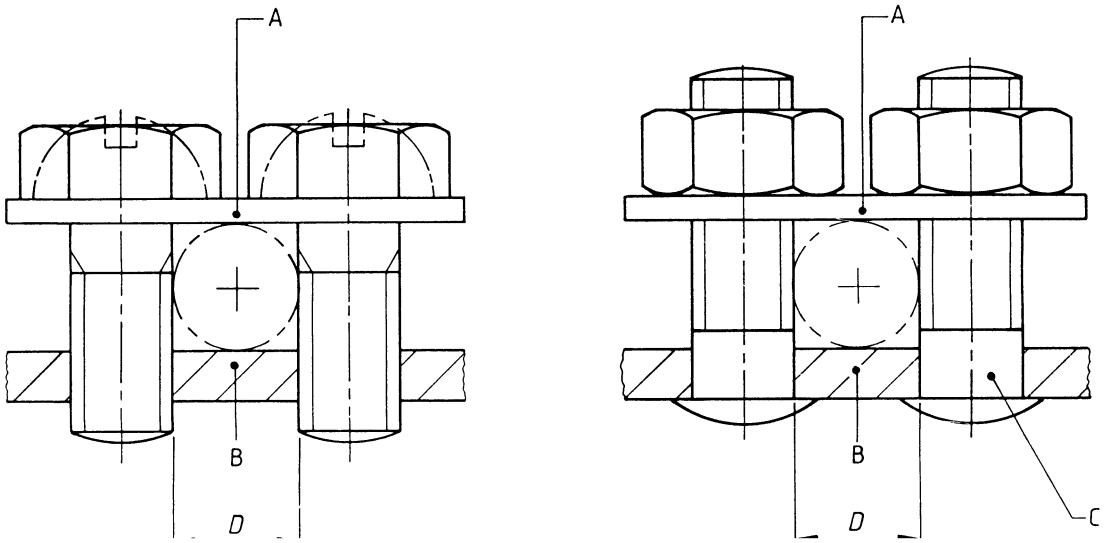
(d) Stud terminals

Key

A Fixed part
B Washer or clamping plate
C Anti-spread device
D Conductor space
E Stud

NOTE The part which retains the conductor in position may be of insulating material provided the pressure necessary to clamp the conductor is not transmitted through the insulating material.

Figure 2 — Screw terminals and stud terminals



Key

A Saddle

B Fixed part

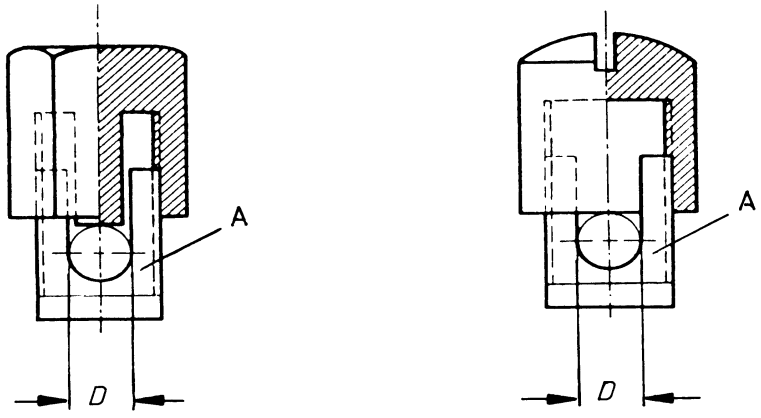
C Stud

D Conductor space

NOTE 1 The shape of the conductor space may differ from that shown.

NOTE 2 The shape of the upper and lower faces of the saddle may be different, to accommodate conductors of either small or large cross-sectional areas by inverting the saddle.

Figure 3 — Saddle terminals



Key

A Fixed part

D Conductor space

NOTE It is essential that the bottom of the conductor space is slightly rounded in order to obtain a reliable connection.

Figure 4 — Mantle terminals

2.24
auxiliary switched socket-outlet
socket-outlet, with an associated switch, incorporated within the cooker control unit

2.25
fused auxiliary switched socket-outlet
auxiliary switched socket-outlet incorporating a replaceable fuse-link between the line socket-contact and the line switch contact in the auxiliary circuit

2.26
fuse-link
part of a fuse including the fuse-element that is intended to be replaced after the fuse has been operated

2.27
fuse-carrier
movable or removable part designed to carry, retain, cover and/or remove a fuse-link

2.28
fuse-cover
fuse-carrier specifically intended to cover a fuse-link

2.29
easily removable parts
parts which are removed during the normal installation of the cooker control unit

2.30
basic insulation
insulation applied to live parts to provide basic protection against electric shock

2.31
supplementary insulation
independent insulation applied in addition to basic insulation, in order to ensure protection against electric shock in the event of a failure of the basic insulation

2.32
double insulation
insulation comprising both basic insulation and supplementary insulation

2.33
reinforced insulation
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 this standard

NOTE The term "insulation system" does not imply that the insulation has to be one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or basic insulation.

2.34
accessible external surfaces
surfaces of a cooker control unit which can be touched by test finger I of BS 3042 when the cooker control unit is installed as in use

2.35
base
part of a cooker control unit retaining current-carrying parts and, in general, the mechanism of a switch or switched socket-outlet, in position

2.36
current carrying parts
live parts and those parts in contact with them during normal use

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

〈A1〉 **2.37**
isolation
function intended to make dead, for reasons of safety, all or a discrete section of the electrical installation by separating the electrical installation or section from every source of electrical energy 〈A1〉

3 General

Cooker control units shall be so designed and constructed that, in normal use, their performance is reliable and without danger to the user or surroundings.

NOTE Where tolerances are not specified in this standard the values should be regarded as nominal.

4 Type testing

NOTE The tests in this standard are type tests.

4.1 A manufacturer or responsible vendor who claims compliance with this standard, for any product, shall submit representative type test samples of that product to the relevant tests of this standard in the sequence specified in **4.4**.

NOTE The tests may be made by the manufacturer, or the responsible vendor, or may be made on his behalf by any competent testing laboratory or certification authority.

The results of such tests shall be recorded and retained for reference and inspection.

4.2 Unless otherwise specified, the samples shall be tested as delivered by the manufacturer or responsible vendor and under normal conditions of use.

Cooker control units shall be tested together with their appropriate boxes and/or enclosures.

4.3 Unless otherwise specified, the tests shall be carried out at an ambient temperature of 20 ± 5 °C.

4.4 For cooker control units 15 specimens shall be tested.

Each set of three specimens shall be tested as follows:

a) three specimens in accordance with all the relevant tests of Clauses **7**, **8**, **9**, **10**, **12**, **13**, **19**, **21** and **22**;

b) three specimens in accordance with Clauses **14**, **15** and **11**;

c) three specimens in accordance with Clauses **16** and **18**;

d) three specimens in accordance with Clause **17**;

e) three specimens in accordance with Clauses **20**, **23** and **24**.

4.5 If no specimens fail in the complete series of tests, specified in **4.4**, units of that type shall have complied with this standard.

If one specimen fails in any group in the complete series of tests specified in **4.4**, then units of that type shall have failed to comply with this standard, unless that unit can be shown to be not representative of normal production or design, in which case a further set of specimens shall be submitted to the test or tests in that group. If there is no failure in this retest then units of that type shall have complied with this standard.

If more than one specimen fails in the complete series of tests given in **4.4** then units of that type shall have failed to comply with this standard.

5 Ratings

5.1 Cooker control units shall have a rated voltage not exceeding 250 V a.c., at 50 Hz.

5.2 Cooker control units shall have rated currents as follows:

a) for the switch controlling the electric supply to the cooker, 32 A or 45 A;

b) for the switched socket-outlet, 13 A or 15 A.

6 Classification

6.1 Cooker control units shall be classified as follows:

a) according to the method of installation:

1) surface mounting;

2) flush mounting;

3) panel mounting;

b) according to the auxiliary switched socket-outlet:

1) 13 A, BS 1363 type;

2) 15 A, BS 546 type;

c) according to the method of enclosure:

1) to suit the box shown in Figure 5;

2) to suit the box shown in Figure 6;

3) to suit the boxes specified in BS 4662;

4) to suit boxes or enclosures not shown in Figure 5, Figure 6 or specified in BS 4662.

d) according to indication:

1) fitted with luminous indicators or other equivalent apparatus;

2) not fitted with luminous indicators or other equivalent apparatus.

7 Marking

7.1 General

7.1.1 *Requirement*

Cooker control units shall be marked with the following:

a) the number and date of this British Standard, i.e. BS 4177[1)];

b) the maker's or responsible vendor's name or trade mark or identification mark;

c) the rated current of the main switch intended to control the electric supply to the cooker;

d) the rated voltage in volts;

e) the nature of supply (e.g. a.c. only);

f) the word "COOKER" adjacent to the actuating member of the main switch intended to control the electric supply to the cooker;

g) an indication of the main switch contact position, e.g. off and on;

h) the word "FUSE" or "FUSED" for fused auxiliary switched socket-outlets or the appropriate symbol detailed in **7.2**[2)];

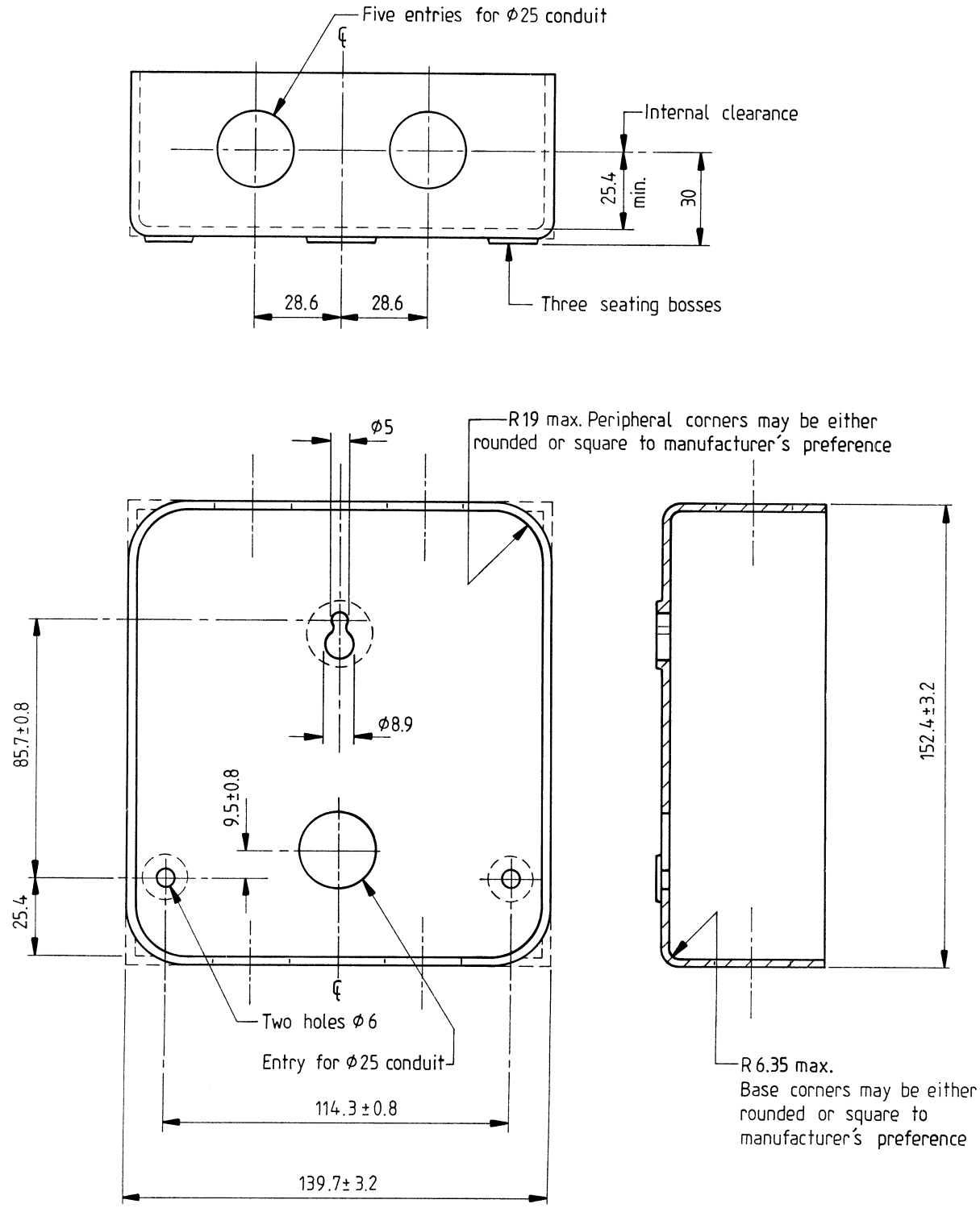
i) terminal identification.

7.1.2 *Test*

Compliance with **7.1.1** shall be checked by inspection.

[1)] Marking BS 4177 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 therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

[2)] BS 6217 gives guidance on symbols for use on electrical equipment.

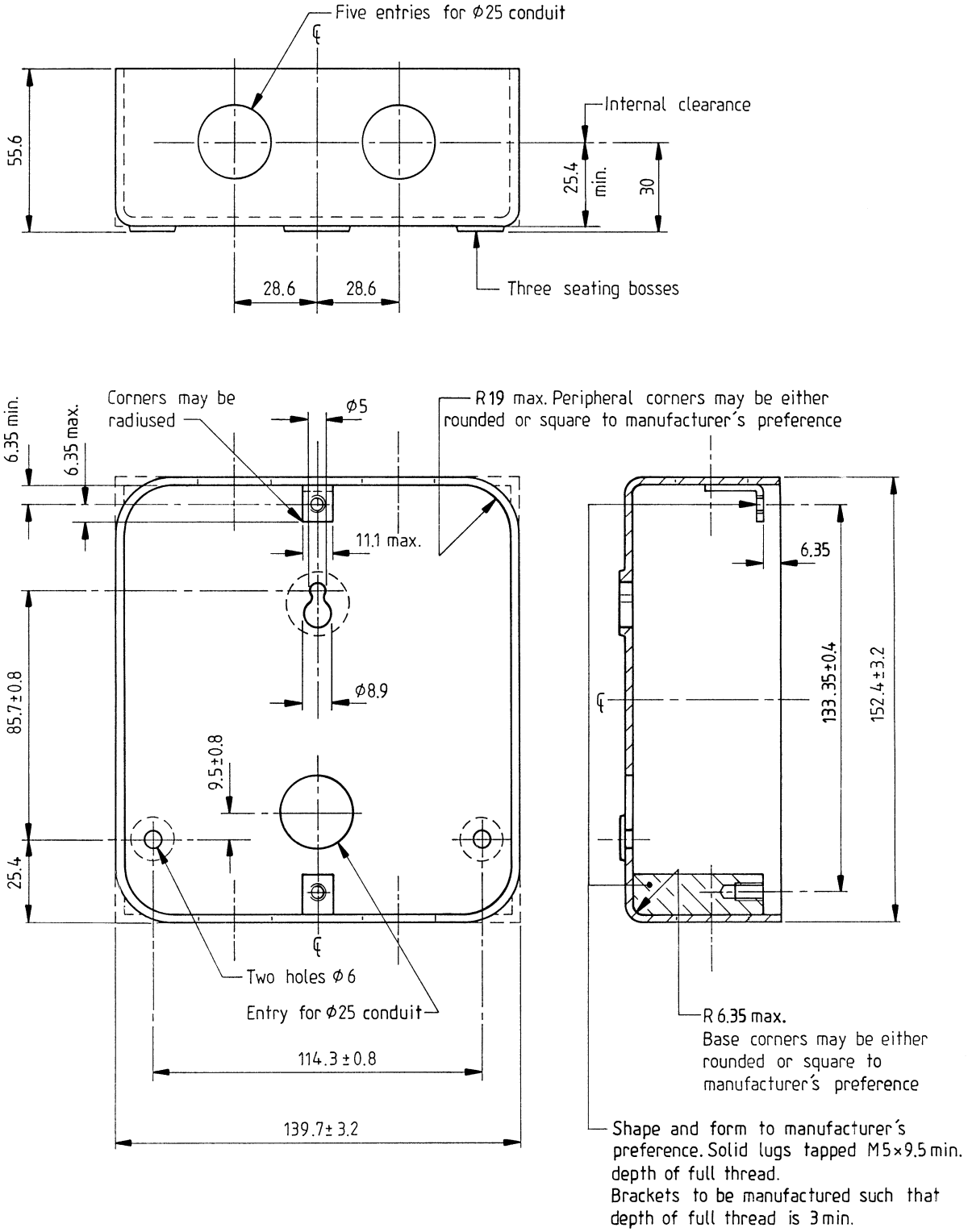


All dimensions are in millimetres.

NOTE 1 Entries for conduits are appropriate only for metal construction.

NOTE 2 Unless otherwise stated tolerances are ±1 mm.

Figure 5 — Box for surface-type cooker control unit



All dimensions are in millimetres.

NOTE 1 Entries for conduit are appropriate only for metal construction.

NOTE 2 Unless otherwise given tolerances are ±1 mm; this does not apply to dimensions with maximum or minimum tolerances.

Figure 6 — Box for flush-type cooker control unit

7.2 Symbols

7.2.1 *Requirement*

When symbols are used, they shall be as follows:

a) Amperes A;

b) Volts V;

c) Alternating current ∽;

d) Neutral N;

e) Line L;

f) Earth ⏚ or ⏚;

NOTE 1 It is recommended that, where practicable, the symbol ⏚ should be used.

g) Fuse ⏛;

h) "off" position 0;

i) "on" position 1.

NOTE 2 For the marking with rated current and rated voltage, figures may be used alone.

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

NOTE 3 The marking for current, voltage and nature of supply may be, for example, as follows:

"45 A 250 V ∼" or "45/250 ∼" or "$\frac{45}{250}$ ∼"

7.2.2 *Test*

Compliance with **7.2.1** shall be checked by inspection.

7.3 Location

7.3.1 *Requirement*

The marking for rated current, rated voltage, nature of supply, maker's or responsible vendor's name, trade mark or identification mark and the number and date of this British Standard (see **7.1**) shall be on the main part of the cooker control unit but need not be visible when the unit is installed and mounted as for normal use.

Parts such as cover plates, which are necessary for safety purposes and intended to be sold separately, shall be marked with the maker's or responsible vendor's name, trade name or identification mark.

7.3.2 *Test*

Compliance with **7.3.1** shall be checked by inspection.

7.4 Fuse incorporation

7.4.1 *Requirement*

The marking for fuse incorporation, if applicable, shall be visible when the cooker control unit is installed and mounted as for normal use.

7.4.2 *Test*

Compliance with **7.4.1** shall be checked by inspection.

7.5 Terminals

7.5.1 *Requirement*

Terminals of cooker control units shall be identified by the symbols given in **7.2**. The symbol shall be as close as practicable to the corresponding terminal. Incoming terminals shall be clearly identified. Lines formed incidentally by the construction of the production tools are not considered as part of the marking.

These markings shall not be placed on screws or any other easily removable parts.

7.5.2 ***Test***

Compliance with **7.5.1** shall be checked by inspection.

7.6 "On" and "off" positions

7.6.1 ***Requirement***

Switches which are marked so that the "on" or "off" positions are indicated, shall have those markings clearly visible from the front of the cooker control unit when fitted with its corresponding cover or cover plates. If these markings are indicated on the cover or cover plates it shall not be possible to fix the cover or cover plates in such a way that the markings are incorrect.

Where indications of "on" and "off" positions are given it shall not be possible for the switch to indicate "off" with the actuating member at a position of rest if the contacts are still closed.

7.6.2 ***Test***

Compliance with **7.6.1** shall be checked by inspection, manual operation and continuity test.

7.7 Poles

7.7.1 ***Requirement***

If the cooker control unit is marked to indicate the number of poles in the main switch, the number of poles in the auxiliary switch shall also be marked if different.

NOTE The marking of the number of poles on the auxiliary switch may be incorporated in the main switch marking.

7.7.2 ***Test***

Compliance with **7.7.1** shall be checked by inspection.

7.8 Instruction sheet

7.8.1 ***Requirement***

If it is necessary to take special precautions when installing the cooker control unit, details of these shall be given in an instruction sheet which accompanies the unit.

NOTE 1 Special precautions may be necessary, e.g. for panel mounting cooker control units.

NOTE 2 In order to ensure that, after installation, the conditions necessary to comply with these requirements are achieved, the instruction sheet should include clear information with regard to the following:

a) dimensions of the space to be provided for the unit;

b) dimensions and position of the means for supporting and fixing the unit within this space;

c) minimum clearances between the various parts of the unit and the surrounding parts where fitted.

7.8.2 ***Test***

Compliance with **7.8.1** shall be checked by inspection.

7.9 Legibility and durability

7.9.1 ***Requirement***

Marking shall be easily legible and durable and shall not be placed on screws, washers or other easily removable parts.

7.9.2 ***Test***

Compliance for legibility shall be checked by inspection using normal or corrected vision without additional magnification.

For marking not made by engraving or moulding, compliance for durability shall be checked by testing in accordance with Appendix B.

NOTE Marking made by engraving or moulding complies with the requirement for durability without testing.

8 Dimensions

8.1 Surface-type cooker control units

8.1.1 *Requirement*

The dimensions of the boxes for surface-type cooker control units intended for use in boxes complying with this standard, including the size and position of the box fixing holes and cable openings, shall be as shown in Figure 5.

The minimum thickness of box walls shall be in accordance with Table 3.

8.1.2 *Test*

Compliance with **8.1.1** shall be checked by inspection and measurement.

Table 3 — Metal boxes or enclosures

Material of box or enclosure	Minimum thickness of wall mm
Sheet steel	0.91
Cast metal	2.28
Die-cast metal	1.52

8.2 Flush-type cooker control units intended for use in boxes complying with this standard

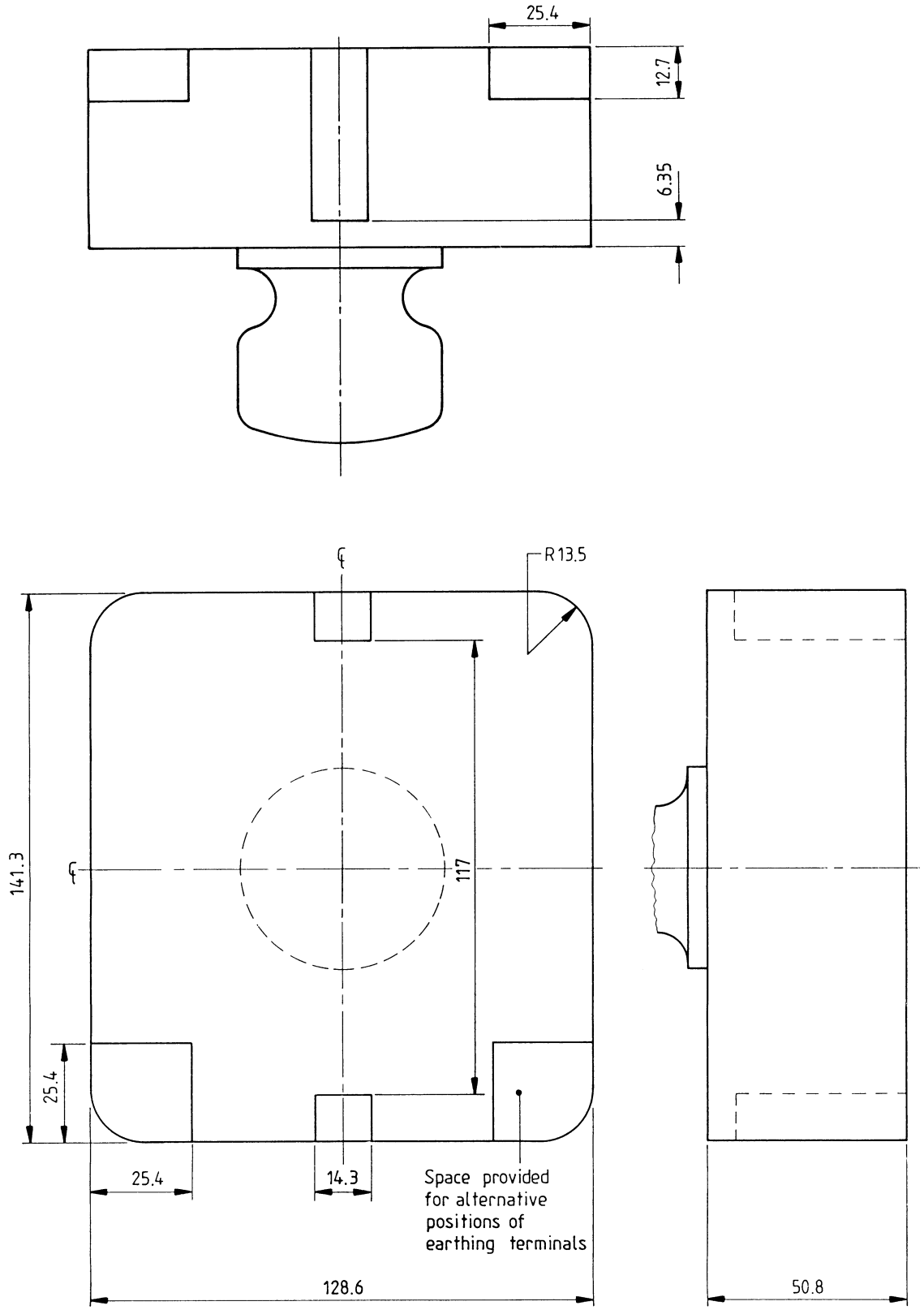
8.2.1 *Requirement*

The dimensions of boxes for flush-type cooker control units intended for use in boxes complying with this standard, including the size and position of the box fixing holes and cable openings, shall be in accordance with Figure 6. The cover or cover plate of the flush-type cooker control unit shall be nominally 165 mm wide and 178 mm high.

NOTE The corners of the cover may be radiused to a maximum of 13 mm.

There shall be no internal projections in a box complying with Figure 6 such as would prevent the complete insertion of the gauge shown in Figure 7. To allow for adjustment of the unit if the box is fixed out of square, provision shall be made for an angular movement of approximately 2.5° on each side of the symmetrical position between the box and the associated unit (consisting of the assembly of parts and cover). The box shall be arranged in such a way that the unit can be fixed to it by means of two M5 screws.

The minimum thickness of box walls shall be as shown in Table 3.



All dimensions are in millimetres.

NOTE Tolerances are ±0.15 mm.

Figure 7 — Effective internal clearance gauge of flush-type cooker control unit
(as shown in Figure 6)

8.2.2 ***Test***

Compliance with **8.2.1** shall be checked by inspection, measurement and application of a gauge as shown in Figure 7.

8.3 Flush-type cooker control units intended for use in boxes complying with BS 4662

8.3.1 ***Requirement***

For flush-type mounted cooker control units intended to be used in boxes complying with BS 4662, the minimum overall sizes of the cover or cover plate, either of metal or insulating material or a combination of both, shall be greater than the associated boxes in order to comply with Clause **9**.

The size and disposition of the fixing screw holes shall have a tolerance of ±0.8 mm on the centres of the M3.5 fixing screws.

8.3.2 ***Test***

Compliance with **8.3.1** shall be checked by inspection, measurement and by testing in accordance with Clause **9**.

8.4 Cooker control units not intended for use in boxes specified in this standard or BS 4662

8.4.1 ***Requirement***

For cooker control units intended to suit boxes or enclosures not shown in Figure 5, Figure 6 or specified in BS 4662 no dimensions are specified, however all other requirements of this British Standard shall be complied with.

8.4.2 ***Test***

Compliance with **8.4.1** shall be checked by inspection.

9 Accessibility of live parts

9.1 General

9.1.1 ***Requirement***

Cooker control units shall be so designed that when they are mounted and correctly wired as in normal use, live parts are not accessible (see **9.1.2**) even after the removal of parts which can be removed without the use of a tool.

9.1.2 ***Test***

Compliance with **9.1.1** shall be checked by inspection and/or by testing in accordance with **C.1**.

Cooker control units having enclosures, covers or cover plates made of thermoplastics material shall also be tested in accordance with **C.2**.

During this test, cooker control units with their associated mounting means shall not deform to such an extent that live parts can be touched with the unjointed test finger.

9.2 Actuating members

9.2.1 ***Requirement***

Knobs, push buttons, rockers and the like shall be of insulating material unless either their accessible metal parts (see **9.3**) are separated from the live parts of the mechanism by double or reinforced insulation or they are connected to earth.

9.2.2 ***Test***

Compliance with **9.2.1** shall be checked by inspection and in accordance with the tests of **10.1.1**b), Clause **15** and Clause **22**.

9.3 Accessible parts

9.3.1 *Requirement*

Parts accessible to a test finger shall be of insulating material, with the exception of the following:

a) small screws which are isolated from live parts and which are used for fixing bases and covers or cover plates;

b) actuating members, complying with **9.2**;

c) covers and cover plates of metal which shall be one of the following:

1) protected by supplementary insulation, made by insulating linings or insulating barriers fixed to the covers or cover plates or to the body of the cooker control unit in such a way that the insulating linings or insulating barriers cannot be removed without being permanently damaged;

2) so designed that they cannot be replaced in an incorrect position and that, if they are omitted, the cooker control unit, is rendered inoperable or manifestly incomplete;

3) so designed that there is no risk of accidental connection between live parts and metal covers or cover plates, for example, through their fixing screws, even if a conductor comes away from its terminal;

4) automatically connected, through a low resistance connection, to earth during the fixing of the cover or cover plate itself.

NOTE Fixing screws or other means are allowed for such automatic connection.

9.3.2 *Test*

Compliance with **9.3.1** shall be checked by inspection and also in accordance with the following:

a) Clauses **15** and **22**, for the linings and barriers;

b) **10.1.1**b) for the effectiveness of connection to earth.

NOTE Insulating coating sprayed on the inside or on the outside of the metal covers or cover plates are not insulating linings or barriers for the purposes of this subclause.

9.4 Protrusion of metal parts of switch operating mechanisms

9.4.1 *Requirement*

For switches operated by means of a removable key or similar device such metal parts of the mechanism shall be insulated from live parts.

Metal parts of switch operating mechanisms, such as the spindle, the pivot of the dolly or the rocker, that are not insulated from live parts shall not protrude from the box or enclosure.

9.4.2 *Test*

Compliance with **9.4.1** shall be checked by inspection, if necessary after the actuating member has been removed or broken.

NOTE If the actuating member has to be broken, compliance is checked after having tested the member in accordance with Clause **23**.

9.5 Accessibility of metal parts of switch operating mechanisms

9.5.1 *Requirement*

Metal parts of switch operating mechanisms, such as the spindle, the pivot of the dolly or rocker, shall not be accessible to a test finger when the cooker control unit is fixed as in normal use.

If the metal parts of the mechanism are not separated from live parts in such a way that the creepage distances and clearances have at least twice the values specified in Clause **22**, or they are not connected to earth, the following shall apply. The metal parts shall be insulated from accessible metal parts, including any metal frames supporting the base of flush or panel mounting units, liable to be mounted in a metal box or enclosure, and from screws for fixing the base to its support.

9.5.2 *Test*

Compliance with **9.5.1** shall be checked by inspection, by measurement and in accordance with the tests of Clause **9** and of Clause **15**.

9.6 Fused auxiliary switched socket-outlets

9.6.1 *Requirement*

For fused auxiliary switched socket-outlets it shall not be possible to touch live parts during the normal removal or replacement of a fuse.

9.6.2 *Test*

Compliance with **9.6.1** shall be checked by application of test finger I of BS 3042.

9.7 Luminous indicator

9.7.1 *Requirement*

If a luminous indicator or equivalent apparatus is fitted the live parts shall be so placed that they are accessible only with the use of tools, when the unit is mounted and installed as for normal use.

9.7.2 *Test*

Compliance with **9.7.1** shall be checked by inspection.

9.8 Auxiliary switched socket-outlets

9.8.1 *Requirement*

Auxiliary switched socket-outlets shall comply with the dimensional and gauging requirements of either BS 1363 or BS 546, as appropriate.

9.8.2 *Test*

Compliance with **9.8.1** shall be checked by testing in accordance with the relevant dimensional and gauging requirements of either BS 1363 or BS 546.

10 Provision for earthing

10.1 Accessible parts

10.1.1 *Requirement*

Accessible metal parts of cooker control units and metal surface boxes or enclosures shall be in electrical contact with the earthing terminal(s) with the exception of metal parts on, or screws in or through, non-conducting material, which are separated by such material from current-carrying parts in such a way that in normal use they cannot become live.

NOTE Metal parts having an accessible surface coating of lacquer or enamel are accessible parts.

Provision shall be made for the addition of means for the earthing of all metal boxes.

In boxes of insulating material, except those intended solely for use with cooker control units, provision shall be made for fixing a terminal for the earth continuity conductor(s). The means provided shall be rigidly fixed to the box.

The earthing socket-contact of the switched socket-outlet shall be in electrical contact with the earthing terminal(s).

10.1.2 *Test*

Compliance with **10.1.1** shall be checked by inspection and in accordance with the following:

a) for metal parts insulated from live parts, the test in **15.1.2**;

b) for metal parts connected to the earthing terminal(s) the test in Appendix D.

When tested in accordance with Appendix D, the resistance between the earthing terminal(s) and any other nominated part shall not exceed 0.05 Ω.

NOTE Care should be taken that the contact resistance between the tip of the measuring probe and the metal part under test does not influence the test results.

10.2 Earthing terminals

10.2.1 *Requirement*

Earthing terminals incorporated in cooker control units shall be terminals with screw clamping and shall comply with Clause **11**.

10.2.2 *Test*

Compliance with **10.2.1** shall be checked by inspection and in accordance with Clause **11**.

11 Terminals

11.1 General

11.1.1 *Requirement*

Cooker control units shall be provided with terminals having screw clamping.

The means for clamping the conductors in the terminals shall not serve to fix any component other than the terminal (see the Note).

NOTE They may hold the terminals in place or prevent them from turning.

11.1.2 *Test*

Compliance with **11.1.1** shall be checked by inspection and in accordance with the tests of **11.2** to **11.12**.

All the tests on terminals shall be carried out after being tested for resistance to ageing, see **14.1**.

11.2 Cross-sectional areas of copper conductors

11.2.1 *Requirement*

Cooker control units shall be provided with terminals which shall allow the connection of copper conductors having nominal cross-sectional areas as specified in Table 4.

Table 4 — Conductors to be accommodated by terminals

Rated current A	**Nominal cross-sectional area of rigid conductors (solid or stranded)** mm^2
Up to and including 32	From 4.0 to 10.0 inclusive
Above 32 up to and including 45	From 6.0 to 16.0 inclusive

11.2.2 *Test*

Compliance with **11.2.1** shall be checked by inspection, and by fitting conductors of the smallest and largest nominal cross-sectional areas specified.

11.3 Connection of the conductor

11.3.1 *Requirement*

Terminals shall allow the conductor to be connected without special preparation.

NOTE The term special preparation covers soldering of wires of the conductor, use of cable lugs, formation of eyelets, etc. but not the reshaping of the conductor before its introduction into the terminal or the twisting of a flexible conductor to consolidate the end.

11.3.2 *Test*

Compliance with **11.3.1** shall be checked by inspection.

11.4 Mechanical strength, screws and nuts

11.4.1 *Requirement*

Terminals shall have adequate mechanical strength.

Screws and nuts for clamping the conductors shall have either a metric International Organization for Standardization (ISO) thread or a thread of similar pitch and mechanical strength.

NOTE Provisionally Système International (SI), British Association screw thread (BA) and unified screw thread (UN) threads are considered to be comparable in pitch and mechanical strength to metric ISO thread.

Screws shall not be of metal which is soft or liable to creep, such as zinc or aluminium.

11.4.2 *Test*

Compliance with **11.4.1** shall be checked by inspection and by testing in accordance with the tests of **11.7.2** and **11.9.2**.

11.5 Corrosion

11.5.1 *Requirement*

Terminals shall be resistant to corrosion.

11.5.2 *Test*

Compliance with **11.5.1** shall be checked by testing in accordance with **21.4**.

11.6 Damage to conductor

11.6.1 *Requirement*

Terminals shall be so designed that they clamp the conductors without undue damage to the conductors.

11.6.2 *Test*

Compliance with **11.6.1** shall be checked by testing in accordance with Appendix E. During the test, the solid conductor or any strand of a stranded conductor shall not come out of or break at the terminal.

11.7 Conductor mobility

11.7.1 *Requirement*

Terminals shall be so designed that they secure the conductor between metal surfaces.

11.7.2 *Test*

Compliance with **11.7.1** shall be checked by testing in accordance with Appendix F. During the test, the conductor shall not move noticeably in the terminal.

11.8 Conductor or wire slippage

11.8.1 *Requirement*

Terminals shall be so designed or placed that neither a rigid solid conductor nor a wire of a stranded conductor shall slip out while the clamping screws or nuts are tightened.

11.8.2 *Test*

Compliance with **11.8.1** shall be checked by testing in accordance with Appendix G. After the test, no wire shall have escaped from the terminal.

11.9 Terminal fixings

11.9.1 *Requirement*

Terminals shall be so fixed or located within the unit that, when the clamping screws or nuts are tightened or loosened, the terminals shall not work loose from their fixings to the unit (see Note 1).

NOTE 1 These requirements do not imply that the terminals should be so designed that their rotation or displacement is prevented, but that any movement should be sufficiently limited so as to prevent failing to comply with this standard.

NOTE 2 The use of sealing compound or resin is considered to be sufficient for preventing a terminal from working loose provided that the following applies:

a) the sealing compound or resin is not subject to stress during normal use;

b) the effectiveness of the sealing compound or resin is not impaired by temperatures attained by the terminal under the most unfavourable conditions within the scope of this standard.

11.9.2 *Test*

Compliance with **11.9.1** is checked by testing in accordance with Appendix H. During the test, terminals shall not work loose and there shall be no damage, such as breakage of screw or damage to the head, slots, threads, washers or stirrups that will impair the further use of the terminals.

NOTE 1 For mantle terminals the specified nominal diameter is that of the slotted stud.

NOTE 2 It is essential that the shape of the blade of the test screwdriver suits the head of the screw to be tested.

NOTE 3 It is essential that screws and nuts are not tightened in jerks.

11.10 Locking of clamping screws

11.10.1 *Requirement*

Clamping screws or nuts of earthing terminals shall be locked against accidental loosening and it shall not be possible to loosen them without the aid of a tool.

11.10.2 *Test*

Compliance with **11.10.1** shall be checked manually.

NOTE In general, the designs of terminals shown in Figure 1, Figure 2, Figure 3 and Figure 4 provide sufficient resiliency to comply with this requirement; for other designs, special provisions, such as the use of an adequately resilient part which is not likely to be removed inadvertently, may be necessary.

11.11 Corrosion

11.11.1 *Requirement*

Earthing terminals shall be such that there is no risk of corrosion resulting from contact between the terminal and the copper of the earthing conductor, or any other metal that is in contact.

The body of earthing terminals shall be either:

a) brass or another alloy or metal no less resistant to corrosion;

b) a part of the metal frame or box, where the screw or nut shall be of brass or a metal no less resistant to corrosion.

If the body of the earthing terminal is a part of a frame or box of aluminium alloy, precautions shall be taken to avoid the risk of corrosion resulting from contact between copper and aluminium or its alloys.

NOTE Screws or nuts of plated steel complying with 24.2 are considered to be of a metal no less resistant to corrosion than brass.

11.11.2 *Test*

Compliance with **11.11.1** shall be checked by inspection and by testing in accordance with **24.2**.

11.12 Pillar terminals

11.12.1 *Requirement*

For pillar terminals, the distance between the clamping screw and the end of the conductor, when fully inserted, shall be at least that specified in Figure 1.

NOTE The minimum distance between the clamping screw and the end of the conductor applies only to pillar terminals in which the conductor cannot pass right through.

For mantle terminals, the distance between the fixed part and the end of the conductor, when fully inserted, shall be at least that shown in Figure 4.

11.12.2 *Test*

Compliance with **11.12.1** shall be checked by measurement after a solid conductor of the largest cross-sectional area equal to the maximum size detailed in Table 4, for the appropriate terminal capacity, has been fully inserted and fully clamped.

12 Construction

12.1 General

12.1.1 *Requirement*

Insulating linings, barriers and the like, shall be mechanically strong and shall be secured.

12.1.2 *Test*

Compliance with **12.1.1** shall be checked by inspection after testing in accordance with Clause **19**.

12.2 Design

12.2.1 *Requirement*

Cooker control units shall be so constructed as to permit the following:

a) the introduction and connection of the conductors in the terminals;

b) the positioning of the conductors;

c) the fixing of the cooker control unit onto a wall or into a box or enclosure as applicable;

d) adequate space between the underside of the base and the surface on which the base is mounted or between the sides of the base and the enclosure (cover or box) so that, after installation of the cooker control unit, the insulation of the conductors does not come in contact with live parts of different polarity or with moving parts of any switch mechanism, such as the spindle of a rotary switch.

NOTE 1 It is essential that surface-type cooker control units are made in such a way that the fixing means do not damage the insulation of the cables during the installation; this does not imply that the metal parts of the terminals should be necessarily protected by insulating barriers or insulating shoulders in order to avoid contact, due to incorrect installation of the terminal metal parts, with the insulation of the conductor.

NOTE 2 For surface-type cooker control units, mounted on a mounting plate, a wiring channel may be needed in order to avoid damage to the cable insulation.

In addition, cooker control units designed such that the cover or cover plate can be removed without displacement of the conductors shall permit the following:

1) the fixing of the base to a wall or in a box or enclosure and correct positioning of the conductors;

2) the positioning and removal of the cover or cover plate, without displacing the conductors.

12.2.2 *Test*

Compliance with **12.2.1** shall be checked by inspection and by the installation of conductors of the largest appropriate cross-sectional area specified in Table 4.

12.3 Covers and cover plates

12.3.1 *Requirement*

Removable covers and cover plates shall be held in place at two or more points.

NOTE 1 It is recommended that the fixings of removable cover plates are captive. The use of tight fitting washers of cardboard is suitable for securing captive screws.

In cooker control units where the cover or cover plate can be removed without displacement of the conductors, and the fixings of the cover or cover plate serve also to fix the base, there shall be means to maintain the base in position after removal of the cover or cover plate.

NOTE 2 Decorative covers and decorative cover plates or parts thereof, which do not provide protection against electric shock are not considered to be covers or cover plates for the purposes of this standard.

12.3.2 *Test*

Compliance with **12.3.1** shall be checked by inspection and installation.

12.4 Free openings

12.4.1 *Requirement*

Cooker control units shall be so constructed that, when they are fixed and wired as in normal use, there are no free openings in their boxes or enclosures permitting access to live parts.

12.4.2 *Test*

Compliance with **12.4.1** shall be checked by inspection, and by the installation of conductors of the smallest appropriate cross-sectional area specified in Table 4 and the application of test finger III of BS 3042 with a force of 30 + 0, –2 N.

NOTE Small gaps between boxes and conduits or cables, or between enclosures and operating means are neglected.

12.5 Knobs

12.5.1 *Requirement*

Knobs of rotary switches shall be coupled to the shaft or part operating the mechanism.

12.5.2 *Test*

Compliance with **12.5.1** shall be checked by testing in accordance with Appendix J. During the test, the knob shall not become uncoupled.

12.6 Accessibility of mounting screws

12.6.1 *Requirement*

Screws or other means for mounting the cooker control unit in a box or enclosure shall be accessible from the front. These means shall not serve any other fixing purpose.

12.6.2 *Test*

Compliance with **12.6.1** shall be checked by inspection.

12.7 Bases

12.7.1 *Requirement*

Cooker control units comprising a main switch, an auxiliary switch and a socket-outlet having more than one base shall be so designed that each base can be positioned.

The fixing of each base shall be independent of the fixing of the combination to the mounting surface.

12.7.2 *Test*

Compliance with **12.7.1** shall be checked by inspection.

12.8 Auxiliary socket-outlets

12.8.1 *Requirement*

Auxiliary socket-outlets shall comply with BS 1363 or BS 546 as appropriate.

12.8.2 *Test*

Compliance with **12.8.1** shall be checked by the relevant tests and measurements of BS 1363 or BS 546 as appropriate.

NOTE Attention is drawn to Statutory Instrument 1987 No. 603. Consumer Protection. The Plugs and Sockets etc. (Safety) Regulations 1987.

12.9 Conductors

12.9.1 *Requirement*

Cooker control units provided with a box or enclosure shall be so constructed that the conductor ends can be prepared after the box or enclosure is mounted in position, but before the cooker control unit is fitted in the box or enclosure.

In addition the base, of cooker control units where the cover or cover plate can be removed without displacement of the conductors, shall be stable when mounted in the box or enclosure.

12.9.2 *Test*

Compliance with **12.9.1** shall be checked by inspection and by the installation of conductors of the largest cross-sectional area specified in Table 4.

12.10 Cables

12.10.1 *Requirement*

Surface mounted boxes or enclosures for use with cooker control units shall be constructed for the entry of a cable having conductors of the cross-sectional area specified in Table 4, according to the current rating of the cooker control unit.

NOTE 1 Cable openings for the metal boxes in Figure 5 and Figure 6 are suitable for 25 mm conduit.

Cable openings for all boxes or enclosures shall be constructed for the entry of the conduit or the protective covering of the cable, as applicable, to provide complete mechanical protection.

Cooker control units shall be so constructed that the conduit or protective covering of the cable, as applicable, can enter not less than 1 mm into the box or enclosure.

NOTE 2 Inlet openings of adequate size may be obtained by the use of knockouts or of suitable insertion pieces.

12.10.2 *Test*

Compliance with **12.10.1** shall be checked by inspection and by measurement.

12.11 Cord anchorage

12.11.1 *Requirement*

Non-metallic surface boxes shall have a cord anchorage to enable the ends of conductors of flexible cords or cables and the terminals to which they are connected to be relieved from strain, e.g. twisting.

The cord anchorage shall contain the sheath and shall be either of insulating material or of metal. If the cord anchorage is of metal it shall be provided with an insulating lining fixed to the metal parts. Cord anchorages shall anchor the cord to the cooker control unit.

The construction shall ensure that the following applies:

a) the cord anchorage cannot be released from the outside;

b) cord anchorage restraint is not effected by a metal part bearing directly on the flexible cord or cable;

c) not less than one part of the anchorage is securely fixed to the cooker control unit or its mounting box or enclosure;

d) the clamping of the cord or cable does not require the use of a special purpose tool.

Cord anchorage clamping screws shall only serve to fix any other components if the cooker control unit is rendered manifestly incomplete if that component is omitted or replaced in an incorrect position, or if the component intended to be fixed cannot be removed without further use of a tool.

12.11.2 ***Test***

Compliance with **12.11.1** shall be checked by inspection and by testing in accordance with Appendix K.

After being prepared in accordance with **K.1**, it shall not be possible to push the cable into the cooker control unit or its box or enclosure to such an extent as to impair safety or so that the anchorage is loosened.

After testing in accordance with **K.2.2** the cable shall not have been displaced by more than 2 mm.

NOTE 1 One pole of any luminous indicating device or the like may be removed for the voltage test in **K.2.3**.

NOTE 2 When tested in accordance with **K.2.3**, breakdown or flashover will indicate damage to the cable.

During the test the insulation of the cable shall not be damaged.

12.12 Fuse-link

12.12.1 ***Requirement***

Cooker control units incorporating a socket-outlet and switch of the BS 546 type shall include provision for a 15 A type 1 cartridge fuse-link complying with BS 1361 which shall be mounted, in contacts, between the line socket contact and line switch contact in the auxiliary circuit.

The construction shall be such that the fuse-link cannot be unintentionally displaced 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 without dismantling the cooker control unit and no live parts shall become accessible, see Clause **9**, during its removal or replacement.

12.12.2 ***Test***

Compliance with **12.12.1** shall be checked by inspection and by the application of test finger I of BS 3042 applied with a force of $5 + 0, -1$ N. Fuse-link contacts in cooker control units shall be checked for mechanical strength by the insertion and withdrawal of a stainless steel solid link of 10.41 mm to 10.42 mm diameter and 26.16 mm to 26.20 mm length, 10 times, i.e. 20 movements, in succession, in a normal manner, at a rate not exceeding 10 times per minute.

After this test the stainless steel solid link shall, for the remaining tests, as specified in **4.4**, be replaced by a solid link of negligible impedance of 10.22 mm to 10.23 mm and 25.40 mm to 25.44 mm.

13 Switch mechanisms

13.1 Moving contacts

13.1.1 ***Requirement***

The main switch of a cooker control unit shall be so constructed that the moving contacts can come to rest only in the “on” and “off” positions.

13.1.2 ***Test***

Compliance with **13.1.1** shall be checked by inspection and by manual test.

13.2 Actuating member

13.2.1 ***Requirement***

The actuating member of the switch controlling the electric supply to the cooker, i.e. the main switch, when released, shall automatically take up the position corresponding to that of the moving contacts.

13.2.2 ***Test***

Compliance with **13.2.1** shall be checked by inspection and by manual test.

13.3 Main switch

13.3.1 ***Requirement***

The main switch of a cooker control unit shall be so constructed that undue electrical arcing cannot occur when the switch is operated slowly.

13.3.2 ***Test***

Compliance with **13.3.1** shall be checked by testing in accordance with Appendix L. During the test, no sustained arcing shall occur.

〈A1〉13.4 Main switch contact position

13.4.1 ***Requirement***

The actuating member of the main switch shall not remain at rest in the "off" position whilst the switch contacts remain closed. The actuating mechanism shall be constructed such that when operated the switch can remain only in a position giving adequate contact or adequate separation of contacts.

13.4.2 ***Test***

Compliance with **13.4.1** shall be checked by inspection and by the following test.

The necessary force *F* to switch off shall first be measured and the force shall be applied to the extremity of the actuating member. With the actuating member of the switch in the closed position, the fixed and moving contacts of one pole shall be mechanically fixed to provide the most onerous condition which simulates a welded contact. Care shall be taken when fixing the contacts as not to unduly affect the test result.

The actuating member shall be subjected to a test force as defined in Table 4a. 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 4a – Actuator test force

Main Switch Actuator	Test force	Minimum test force N	Maximum test force N
	3*F*	50	150

F is the normal operating force in new condition. The test force shall be 3*F* with the stated minimum and maximum values applied.

NOTE 1 The use of grease (and similar) is not considered to be mechanical means.

NOTE 2 The specimen may be dismantled where necessary in preparation for this test but care should be taken that the test specimen or components are not damaged during this preparation.

〈A1

13.5 Switch mechanism

13.5.1 ***Requirement***

The switch mechanism controlling the auxiliary socket-outlet of cooker control units shall comply with BS 546 or BS 1363 as applicable and shall be connected to the supply terminal(s) of the main switch.

13.5.2 ***Test***

Compliance with **13.5.1** shall be checked by inspection and in accordance with the appropriate tests of BS 546 or BS 1363.

13.6 Removable covers or cover plates

13.6.1 ***Requirement***

If the covers or cover plates are removable for installation purposes the action of the main switch mechanism shall be independent of the presence of the cover or cover plate.

13.6.2 ***Test***

Compliance shall be checked by inspection and by connecting the switch, without cover or cover plate fitted, in series with a lamp and by operating the actuating member normally without undue force. During the test the lamp shall not flicker.

Table 5 — Creepage distances, clearances and distances through insulating material

Description	Distance
Creepage distance:	mm
a) *deleted by amendment No. 3*;	
b) between live parts of different polarity;	2.5[a]
c) between live parts and:	
accessible metal parts;	
parts of the earthing circuit;	
screws or devices for fixing bases, covers or cover plates;	
metal parts of the mechanism, if required to be insulated from live parts (see **9.4**);	2.5
d) between metal parts of the mechanism, if required to be insulated from accessible metal parts (see **9.5**) and:	
screws or devices for fixing bases, cover or cover plates;	
metal frames supporting the base of flush-type cooker control units;	
accessible metal parts.	2.5
Clearance:	
1) *deleted by amendment No. 3*;	
2) between live parts of different polarity;	2.5
3) between live parts and metal parts of the switch mechanism, if required to be insulated from live parts (see **9.4**);	2.5
4) between live parts and:	
accessible metal parts not mentioned in 5) and 6);	
parts of the earthing circuit;	
metal frames supporting the base of flush-type cooker control units;	
screws or devices for fixing bases, covers or cover plates;	2.5
5) between live parts and earthed metal boxes without insulating lining, with cooker control unit mounted in the most unfavourable position;	2.5
6) between live parts and the surface on which the base of a surface-type cooker control unit is mounted when the base is fixed directly on the wall;	6
7) between live parts and the bottom of any conductor recess, if any, in a base of a cooker control unit for surface mounting when the base is fixed directly on the wall;	2.5
8) between metal parts of the switch mechanism, if required to be insulated from accessible metal parts (see **9.5**) and:	
screws or devices for fixing bases, covers or cover plates;	
metal frame supporting the base of flush-type cooker control unit;	
accessible metal parts:	2.5
Distances through insulating material:	
i) between live parts covered with not less than 2 mm of sealing compound and the surface on which the base of a surface-type cooker control unit is mounted;	2.5
ii) between live parts covered with not less than 2 mm of sealing compound and the bottom of any conductor recess, if any, in the base of a surface-type cooker control unit;	2.5
iii) between live parts and accessible external surface of the cooker control unit.	2.0[b]

[a] The value of 2.5 mm is reduced to 1 mm for the distance between the lead wires in the pinch of a neon indicator lamp with external resistor.

[b] Alternatively the distance may be 2.5 mm comprising not less than 1 mm through solid insulation plus an additional distance through air.

14 Resistance to ageing and humidity

14.1 Resistance to ageing

14.1.1 *Requirement*

Cooker control units shall be resistant to ageing.

14.1.2 *Test*

Compliance with **14.1.1** shall be checked in accordance with Appendix M.

14.2 Resistance to humidity

14.2.1 *Requirement*

Cooker control units shall be proof against humidity which may occur in normal use.

14.2.2 *Test*

Compliance with **14.2.1** shall be checked by the humidity treatment described in Appendix N.

After this treatment, the specimens shall comply with this standard.

NOTE They should show no damage within the meaning of this standard.

The humidity treatment shall be followed immediately by the measurement of the insulation resistance and by the electric strength test specified in Clause **15**.

15 Insulation resistance and electric strength

15.1 General

15.1.1 *Requirement*

The insulation resistance and the electric strength of cooker control units shall be tested in accordance with **15.1.2**, immediately after the humidity test in **14.2**, in the humidity cabinet or in a room in which the prescribed temperature is maintained.

NOTE One pole of luminous indicators and the like is disconnected before making the tests.

15.1.2 *Test*

Compliance with **15.1.1** shall be tested in accordance with Appendix P.

With the main and auxiliary socket-outlet switches both closed the insulation resistance shall be not less than 5 MΩ in the following positions:

a) between line and neutral terminals;

b) between line and neutral terminals and any other metal parts insulated therefrom, including earthing terminals.

During the test for electric strength (see **P.3**) no flashover or breakdown shall occur.

NOTE Glow discharges without drop in voltage are ignored.

〈A1〉 15.2 The main switch

15.2.1 *Requirement*

The main switch shall be suitable for isolation.

15.2.2 *Test*

Compliance with **15.2.1** shall be tested in accordance with **P.4**. 〈A1〉

16 Temperature rise

16.1 General

16.1.1 *Requirement*

Terminals for the connection of external conductors do not attain excessive temperatures (see **16.1.2**).

16.1.2 *Test*

Compliance with **16.1.1** shall be checked by testing in accordance with Appendix Q.

With the main switch only under test (see **Q.2.1**) there shall be no load taken from the auxiliary switched socket-outlet.

17 Making and breaking capacity

17.1 Switches in auxiliary switched socket-outlets

17.1.1 *Requirement*

Switches incorporated in auxiliary switched socket-outlets shall comply with the making and breaking capacity requirements of either BS 546 or BS 1363 as applicable.

17.1.2 *Test*

Compliance with **17.1.1** shall be checked by the appropriate tests of the applicable standard.

17.2 Current breaking

17.2.1 *Requirement*

Socket-outlets incorporated in cooker control units shall comply with the current breaking requirements of either BS 546 or BS 1363 as applicable.

17.2.2 *Test*

Compliance with **17.2.1** shall be checked by the appropriate tests of the applicable standard.

17.3 Switch controlling electric supply

17.3.1 *Requirement*

The switch controlling the electric supply to the cooker shall comply with **17.3.2**.

17.3.2 *Test*

Compliance with **17.3.1** shall be checked by testing the cooker control unit in accordance with Appendix R.

The switch shall make and break the test load 100 times, i.e. 200 movements, at a rate of approximately 15 movements per minute, the "on" and "off" periods being approximately equal.

After the tests, the cooker control unit shall still be in a serviceable condition as checked by the following additional tests:

a) by inspection and continuity test it shall be verified that the indicated positions of actuators and/or marking corresponds with the positions of the moving contacts;

b) insulation resistance test, as specified in Clause **15**;

c) electric strength test, as specified in Clause **15**, but at a voltage of 50 % of that specified.

18 Normal operation

18.1 Switches in auxiliary switched socket-outlets

18.1.1 *Requirement*

Switches incorporated in auxiliary switched socket-outlets shall comply with the normal operation requirements of BS 546 or BS 1363 as applicable.

18.1.2 *Test*

Compliance with **18.1.1** shall be checked by the appropriate tests of the applicable standard.

18.2 Socket contacts and shutters

18.2.1 *Requirement*

Socket contacts and shutters incorporated in the socket-outlet shall comply with BS 546 or BS 1363 as applicable.

18.2.2 *Test*

Compliance with **18.2.1** shall be checked by the appropriate tests of the applicable standard.

18.3 [A1]The main switch[A1]

18.3.1 *Requirement*

The switch controlling the electric supply to the cooker shall be capable of normal operation at rated current and rated voltage in a substantially non-inductive a.c. 50 Hz circuit.

[A1] The leakage current across each open pole when measured at a voltage of 110% of the rated voltage shall not exceed:

- 0.5 mA per pole in the new, clean and dry conditions, and
- 6 mA per pole after the normal operation test of **18.3.2**. [A1]

Metal parts, including the case or box and the operating handle of the switch, which are normally connected to earth in service, shall be connected to earth through a fine wire copper fuse not greater than 0.12 mm diameter and not less than 80 mm in length. The fine wire fuse shall be in series with a non-inductive resistance of not more than 0.5Ω.

18.3.2 *Test*

[A1] Compliance with **18.3.1** shall be checked initially by measuring the leakage current at a voltage of 110% of the rated voltage and then subsequently by testing in accordance with Appendix S. [A1]

The switch shall make and break a substantially non-inductive load equal to the rated current ±0.5 A of the switch at rated voltage ±10 % having a lagging power factor of cos θ = 0.95 ± 0.5.

At the end of the test the switch shall show no defect which will prevent its continuing in service, for example, defects may be one or more of the following:

a) deterioration of boxes, insulating linings or barriers to such an extent that the switch cannot be further operated or that Clause **9** is no longer complied with;

b) loosening of electrical or mechanical connections;

c) seepage of any sealing compound;

[A1]d) leakage current, when measured, exceeding 6 mA at a voltage 110% of the rated voltage.[A1]

The following additional tests shall then be made:

1) by inspection and continuity test it shall be verified that the indicated position of the actuator and/or marking corresponds with the position of the moving contacts;

2) the insulation resistance test, as in **15.1**;

3) the electric strength test, as in **15.1.2**, but at a voltage 50 % of that specified.

19 Mechanical strength

19.1 General

19.1.1 *Requirement*

Cooker control units and associated surface mounting boxes and/or enclosures shall have adequate mechanical strength to withstand the stresses imposed during installation and use.

19.1.2 *Test*

Compliance with **19.1.1** shall be checked by testing in accordance with Appendix T.

After the test, the specimens shall show no damage within the meaning of this standard (see the Note). In particular, live parts shall not become accessible (see Clause **9**).

NOTE Damage may be to the finish or it may take the form of small dents which do not reduce creepage distances or clearances below the values specified in Clause **22**, or small chips which do not adversely affect the protection against electric shock are neglected.

After the test on a lens, if the lens is cracked and/or dislodged it shall not be possible to touch live parts using test finger I of BS 3042 applied with a force of 5 + 0, –1 N.

20 Resistance to heat

20.1 Cooker control units and boxes or enclosures

20.1.1 *Requirement*

Cooker control units and boxes or enclosures made of insulating material shall be resistant to heat.

20.1.2 *Test*

Compliance with **20.1.1** shall be checked as follows:

a) for mounting boxes, and easily removable parts by testing in accordance with **U.3**;

b) for cooker control units, with the exception of parts covered by the provisions of **20.1.2**a), by the tests of **U.1**, **U.2**, and, with the exception of parts made from natural or synthetic rubber or a mixture of both, **U.3**.

Immediately, after testing in accordance with **U.1**, the specimens shall not have undergone any change impairing their further use. Any sealing compound shall not have flowed to such an extent that live parts are exposed.

After testing in accordance with **U.1**, and after the specimens have been allowed to cool down to approximately room temperature, there shall be no access to live parts which are normally not accessible when the specimens are mounted as in normal use, applying test finger I of BS 3042 with a force of 5 + 0, –1 N. After testing in accordance with **U.1**, markings shall still be legible (see Note).

NOTE Discolouration, blisters or slight displacement of any sealing compound is disregarded provided that safety is not impaired within the meaning of this standard.

After testing in accordance with **U.2** or **U.3**, the diameter of the impression caused by the ball is measured and shall not exceed 2 mm.

21 Screws, connections and current-carrying parts

21.1 Screws

21.1.1 *Requirement*

NOTE 1 It is essential that both electrical and mechanical connections withstand the mechanical stresses occurring in normal use.

Screws used exclusively for cord anchorage purposes shall comply with **12.11**.

Screws or nuts which transmit contact pressure shall be in engagement with a metal thread.

NOTE 2 Requirements for terminals are specified in Clause **11**.

21.1.2 *Test*

Compliance with **12.1.1** shall be checked by inspection and, for screws and nuts which are operated when mounting the cooker control unit during installation, by testing in accordance with Appendix V.

During the test, no damage impairing the further use of the screwed connections shall occur, such as breakage of screws or damage to the head slots rendering them unservicable, or damage to threads, washers or stirrups.

NOTE 1 Screws or nuts which are operated when assembling the unit include screws for fixing covers or cover plates, etc. but not connecting means for screwed conduits and screws for fixing the base of a unit.

NOTE 2 It is essential that the shape of the blade of the test screwdriver suits the head of the screw to be tested. It is essential that screws and nuts are not tightened in jerks. Damage to covers is ignored.

21.2 Electrical connections

21.2.1 *Requirement*

Electrical connections shall be so designed that contact pressure is not transmitted through insulating material other than ceramic or pure mica unless the metallic parts compensate for any shrinkage or yielding of the insulating material.

21.2.2 *Test*

Compliance with **21.2.1** shall be checked by inspection.

21.3 Screws and rivets as electrical and mechanical connections

21.3.1 *Requirement*

Screws and rivets which serve as electrical as well as mechanical connections shall be locked against loosening or turning.

21.3.2 *Test*

Compliance with **21.3.1** shall be checked by inspection.

NOTE 1 Spring washers may provide satisfactory locking.

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

NOTE 3 Sealing compound which softens on heating provides satisfactory locking only for screw connections not subjected to torsion in normal use.

21.4 Current carrying parts

21.4.1 *Requirements*

Current carrying parts shall be of metal.

NOTE 1 The metal should have, under the conditions occurring in the equipment, mechanical strength, electrical conductivity and resistance to corrosion adequate for the current carrying parts intended use.

NOTE 2 Examples of suitable metals are given in **21.5** of BS 3676-1:1989.

Current carrying parts which could be subjected to mechanical wear shall not be made of steel provided with an electroplated coating.

Metals showing a great difference of electrochemical potential with respect to each other shall not be used in contact with each other under moist conditions[3)].

21.4.2 *Test*

Compliance with **21.4.1** shall be checked by inspection and, if necessary, by chemical analysis.

21.5 Current carrying parts

21.5.1 *Requirement*

Thread forming screws shall not be used for the connection of current carrying parts.

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.

21.5.2 *Test*

Compliance with **21.5.1** shall be checked by inspection.

22 Creepage distances, clearances and distances through insulating material

22.1 Requirement

The minimum clearance through air and the minimum creepage distance of the cooker control unit shall be not less than the values shown in either Table 5, BS 1363 or BS 546 as applicable.

22.2 Test

Compliance with **22.1** shall be checked by measurement.

23 Resistance of insulating material to abnormal heat, to fire and to tracking

23.1 Resistance to heat and to fire

23.1.1 *Requirement*

The resistance to heat and fire of parts composed of insulating material except for small parts such as washers and ceramic parts, shall be determined.

NOTE These parts might be exposed to thermal stresses due to electric effects and their deterioration might impair the safety of the cooker control unit.

[3)] This does not apply to screws, nuts, washers, clamping plates and similar parts of terminals.

23.1.2 ***Test***

Compliance with **23.1.1** shall be checked by testing in accordance with the glow wire test in Appendix W.

The cooker control unit shall have passed the glow-wire test if either of the following apply:

a) there is no visible flame and no sustained glowing;

b) flames and glowing at the cooker control unit extinguish within 30 s after the removal of the glow wire.

There shall be no ignition of the wrapping tissue or scorching of the board.

23.2 Resistance to tracking

23.2.1 ***Requirement***

Parts of insulating material retaining live parts in position shall be made of material resistant to tracking.

23.2.2 ***Test***

For material other than ceramic, compliance with **23.2.1** shall be checked in accordance with BS 5901 by performing the test on one cooker control unit.

For ceramic materials the flat surface of the part to be tested (see note) shall be placed in the horizontal position on the apparatus. The material under test shall have a proof tracking index of 175 using the test solution A with the interval between drops of 30 ± 5 s.

NOTE The flat surface area of the part to be tested should be not less than 15 mm × 15 mm and not less than 3 mm thick. If the part requiring test does not meet this dimensional criteria, it is permitted to stack specimens to reach the 3 mm thickness value or else a plaque of the identical material 3 mm thick may be used.

24 Resistance to excessive residual stresses and to rusting of ferrous parts

24.1 Requirement

Ferrous parts, including covers and boxes, shall be protected against rusting.

24.2 Test

Compliance with **24.1** shall be checked by testing ferrous parts other than small springs and such like and inaccessible parts in accordance with Appendix Y.

After the parts have been dried for 10 ± 0.5 min in a heating cabinet at a temperature of 100 ± 5 °C their surface 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 springs and the like, and for inaccessible parts (see Clause **9**) exposed to abrasion, a layer of grease may provide sufficient protection against rusting. Such parts are subjected to the test only if there is doubt about the effectiveness of the grease film and the test is then made without previous removal of the grease.

Appendix A
Guideline regarding the EMC Directive 89/336/EEC as applicable to cooker control units

A.1 General

This guideline is the result of a consideration of the normal switching rate, the normal electrical load and the switch electrical rating of a cooker control unit used for its intended purpose and which complies with this standard.

A.2 Emission

A cooker control unit will not emit intolerable electromagnetic interference since significant electromagnetic disturbances are only generated during switching operations which are not continuous and no tests are necessary.

A.3 Immunity

A cooker control unit is mechanical by nature of construction and contains no electronic components. The product is therefore immune from electromagnetic interferences and no tests are necessary.

Appendix B
Method of test for durability

Rub the marking by hand for approximately 15 s with a piece of cloth soaked in water and again for approximately 15 s with a piece of cloth soaked in an aliphatic solvent hexane with an aromatic content of maximum 0.1 % (*V*/*V*), a kauri-butanol value of 29, initial boiling point approximately 69 °C, and apparent density of approximately 0.68 g/cm^{-3}.

Appendix C
Method of testing the accessibility of live parts

C.1 General

Mount the sample as in normal use. Remove those parts which may be removed without the use of a tool and which are fitted with conductors of the smallest cross-sectional area appropriate to the unit.

Repeat the test using conductors of the largest cross-sectional area appropriate to the unit.

Perform the test with the incoming and outgoing cables or flexible cords fitted, but without a plug fitted to the auxiliary switched socket-outlet. Apply test finger I of BS 3042 in every possible position, with a force of 5 + 0, –1 N. Use an electrical indicator with a voltage not less than 40 V and not more than 50 V to show contact with the relevant part.

C.2 Cooker control units having enclosures, cover or cover plates

Perform the test at an ambient temperature of 35 ± 2 °C and with the cooker control units and the enclosures, covers or cover plates also at this temperature.

Apply the finger to all places where the yielding of the insulating material could impair the safety of the cooker control unit, e.g. thin walled knockouts.

Appendix D
Method of determining the provision for earthing for accessible metal parts connected to the earthing terminal(s)

Pass a current of 25 ± 0.5 A, derived from an a.c. source having a no load voltage not exceeding 12 V for 60 + 5, –1 s between the following:

a) the incoming earthing terminal and any accessible metal part intended to be earthed;

b) each earthing terminal where more than one is provided;

c) the earthing terminal(s) and a plug pin inserted in the earthing socket contact of the switched socket-outlet.

Appendix E
Method of determining damage to conductors by the terminal

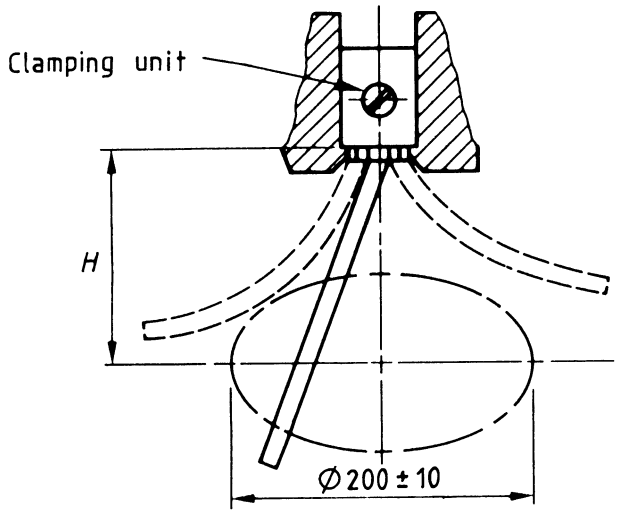
Fit the terminal with a rigid (solid or stranded) conductor, complying with Table 4, first with the smallest and then with the largest cross-sectional area appropriate. Tighten the clamping screws or nuts with the appropriate torque. (See Appendix F.)

Subject each conductor to two circular motions as shown in Figure 8 using the appropriate *H* value (see Table 6).

Move the conductor in one direction at a constant speed of approximately 1 turn per 5 s. During the circular motion, subject the conductor to a pull having a value shown in Table 7. The terminal shall not be subjected to additional torsion and pull forces.

Table 6 — *H* values

Conductor cross-sectional area mm^2	*H* mm
≤ 4	250 ± 10
≤ 16	500 ± 10



All dimensions are in millimetres.

Figure 8 — Arrangement for checking damage to conductors

Table 7 — Pull for terminal clamping test

Cross-sectional area of conductor mm²	Pull +2 %, –0 % N
2.5	50
4	50
6	60
10	80
16	90

Appendix F
Method of test for determining conductor mobility

Fit the terminal with a rigid (solid or stranded) conductor, in accordance with Table 4, first with the smallest and then the largest cross-sectional area appropriate. Tighten the clamping screws or nuts with a torque equal to two-thirds of the torque given in the appropriate column of Table 8.

NOTE If the screw has a hexagonal head with a slot, the torque applied is equal to two-thirds of the torque shown in column 3 of Table 8.

Subject each conductor to the pull given in Table 7, without jerking, for 1 min in the direction of the axis of the conductor space.

Table 8 — Torque values for screws

Declared diameter of thread	Torque ± 5 %				
	1[a]	2[b]	3[c]	4[d]	5[e]
mm	N·m	N·m	N·m	N·m	N·m
Up to and including 2.8	0.2	—	0.4	—	0.4
Over 2.8 up to and including 3.0	0.25	—	0.5	—	0.5
Over 3.0 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	—	0.8
Over 3.6 up to and including 4.1	0.7	1.2	1.2	1.2	1.2
Over 4.1 up to and including 4.7	0.8	1.2	1.8	1.8	1.8
Over 4.7 up to and including 5.3	0.8	1.4	2.0	2.0	2.0
Over 5.3 up to and including 6.0	—	1.8	2.5	3.0	3.0

NOTE Where a screw has a hexagonal head with a slot for tightening with a screwdriver and the values in column 3 and 5 are different, the test is performed twice, first applying to the hexagonal head the torque specified in column 5 and then applying the torque specified in column 3 by means of a screwdriver. If the values in column 3 and 5 are the same, only the test with the screwdriver is made.

[a] These are screws without heads if the screw, when tightened, does not protrude from the hole and other screws which cannot be tightened by means of a screwdriver with a blade wider than the diameter of the screw.
[b] Nuts of mantle terminals which are tightened by means of a screwdriver.
[c] Other screws which are tightened by means of a screwdriver.
[d] Nuts of mantle terminals, in which the nut is tightened by means other than a screwdriver.
[e] Screws or nuts, other than nuts of mantle terminals, which are tightened by means other than a screwdriver.

Appendix G
Method of test for determining conductor or wire slippage

Fit the terminal with a conductor having the largest cross-sectional area appropriate (see Table 4), and having the composition shown in Table 9.

Table 9 — Wires for terminal clamping test

Cross-sectional area	Number of wires and nominal diameter of wires	
mm^2	mm	mm
2.5	1 × 1.78	7 × 0.67
4	1 × 2.25	7 × 0.86
6	1 × 2.76	7 × 1.05
10	1 × 3.57	7 × 1.35
16	—	7 × 1.70

Straighten wires of rigid (solid or stranded) conductors before insertion into the clamping means of the terminal.

NOTE In addition rigid stranded conductors may be twisted to restore them approximately to their original shape.

Insert the conductor into the clamping means of the terminal for the minimum distance specified or, where no distance is specified, until it just projects from the far side of the terminal and in the position most likely to allow the wire to escape.

Tighten the clamping screw with a torque equal to two-thirds of the torque shown in the appropriate column of Table 3.

Test the terminals with both solid conductors and stranded conductors.

Appendix H
Method of test for terminal fixings

Place a solid rigid or stranded copper conductor of the largest cross-sectional area specified in Table 4 in the terminal.

Tighten screws and nuts and loosen five times by means of a suitable test screwdriver or spanner. Apply a torque when tightening equal to the torque shown in Table 8. Use a new conductor end each time the screw or nut is loosened.

Appendix J
Method of testing knobs

Subject the knob to an axial pull of 100 + 0, –5 N for 60 + 5, –0 s. After this, turn the knobs of switches having only one direction of operation, without undue force, 100 times in the reverse direction.

Appendix K
Method of test for cord anchorages

K.1 Preparation

Fit the cooker units with 3-core cable of the smallest size appropriate to the rated current of the main switch specified in Table 4. Introduce the conductors into the terminals. Tighten the terminal just enough to prevent the conductors easily changing their positions. Employ the cord anchorage as it would be employed in use. Tighten the clamping screws, if any, to a torque of two-thirds of that given in Table 8. Leave the assembly, untouched, for 24 h.

Prepare the largest 3-core cable appropriate to the rated current of the main switch specified in Table 4 in the same way when testing in accordance with **K.2.4**.

K.2 Method

K.2.1 Make a mark on the sheath 20 mm from the anchorage whilst subjecting to a pull of 30 + 0.6, –0 N. Measure the displacement of the mark in relation to the anchorage whilst the cord is again subjected to the pull. Apply the pull momentarily, without a jerk, in the most unfavourable position.

K.2.2 Subject the cable 25 times to a pull of 30 + 0.6, –0 N. Immediately after, subject the cable to a torque of 0.15 N·m ± 5 % for 60 + 5, –0 s, as close as practicable to the cable entry. Do the test 25 times with a 25 mm^2 3-core cable.

K.2.3 Apply 3 750 + 0, –80 V a.c. for 60 + 5, –0 s between the conductors.

K.2.4 Repeat **K.2.1** to **K.2.3** using the largest 3-core cable appropriate to the rated current of the main switch as specified in Table 4. Use the pull given in Table 10.

Table 10 — Pull and torque tests for cable/cord anchorage test

Conductor size mm^2	**Pull +0, –5 %** N	**Torque ±5 %** N·m
2.5	55	0.2
4	65	0.25
6	85	0.30
10/16	100	0.35

Appendix L
Method of determining arcing

After testing in accordance with all the requirements of Clause **18**, break the circuit a further 10 times. Move the actuating member steadily, by hand, over a period of 2 s. If possible, stop the moving contacts in an intermediate position.

Release the actuating member.

Appendix M
Method of determining resistance to ageing

M.1 Apparatus

M.1.1 *Heating cabinet,* ventilated by fan assistance, having an atmosphere of the composition and pressure of ambient air.

NOTE Use of an electrically heated cabinet is recommended.

M.2 Method

M.2.1 Mount the cooker control units in boxes or enclosures as in normal use. Place the cooker control units in a cabinet at 70 ± 2 °C. Keep the specimens in the cabinet for 168 h, i.e. 7 days.

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

Remove the samples from the cabinet and keep at room temperature for not less than 4 h. Check to see that the samples show no cracks visible with normal or corrected vision and without additional magnification.

M.2.2 To determine if the material has become sticky or greasy, press each sample with a force of 5 + 0, –0.1 N with the forefinger wrapped in a dry piece of rough cloth.

NOTE The force of 5 N can be obtained as follows:

a) place each specimen in one of the pans of a balance and load the other pan with a mass equal to the mass of the sample plus 500 g;

b) restore the equilibrium by pressing the specimen with the forefinger wrapped in a dry piece of rough cloth.

Appendix N
Humidity treatment

N.1 Preparation

Bring the samples to a temperature between t and $t + 4$ °C, where t is any convenient temperature between 20 °C and 30 °C. Keep the samples at this temperature for not less than 4 h before the humidity treatment.

Perform the humidity treatment in a humidity cabinet containing air with a relative humidity between 85 % and 95 % and an air temperature maintained within $t \pm 1$ °C.

Keep the specimens in the cabinet for 48 h, i.e. 2 days.

NOTE 1 A relative humidity between 85 % and 95 % can be obtained by placing in the humidity cabinet a saturated solution of sodium sulfate (Na_2SO_4) or potassium nitrate (KNO_3) in water having a sufficiently large contact surface with the air.

NOTE 2 In order to achieve the specified conditions within the cabinet, it is necessary to ensure constant circulation of the air within and, in general, to use a cabinet which is thermally insulated.

Appendix P
Insulation resistance and electric strength

P.1 General

Test in either a humidity cabinet or in a room in which the specified temperature is maintained. Disconnect one pole of luminous indicators.

P.2 Insulation resistance

Apply 500 V d.c. Measure the insulation resistance 1 min after application of the voltage, with the main and auxiliary socket-outlet switches both closed.

P.3 Electric strength

Apply a 50 Hz voltage of substantially sinusoidal waveform for 60 + 5, –0 s in the following positions:

a) between line and neutral terminals with the main and auxiliary socket-outlet switches closed;

b) between line and neutral terminals and any accessible metal parts with the main and auxiliary socket-outlet switches closed;

c) between line and neutral terminals and the earth terminal(s) with the main and auxiliary socket-outlet switches closed;

d) across each switched pole of each open switch.

Initially, apply not more than 750 V then raise the voltages to 1 500 ± 60 V.

NOTE The voltage source used should be such that when the output is adjusted to 2 000 ± 60 V for 5 s and then short-circuited, the output current is not less than 100 mA.

⟨A1⟩ P.4 Method

P.4.1 ***Classification***

Cooker control units shall be classified as overvoltage category III as defined in BS EN 60664-1.

P.4.2 ***Appratus***

Use ordinary laboratory equipment and the following.

P.4.2.1 Impulse generator producing positive and negative impulses, adjusted to produce a front time of 1.2 µs and a time to half value of 50 µs, the tolerances being ± 5% for the peak value, ± 30% for the front time and ± 20% for the time to half value.

P.4.2.2 Ohmmeter, capable of measuring 500 Ω.

P.4.2.3 Appropriate voltage dividers.

P.4.2.4 Appropriate voltage sensors.

P.4.3 ***Test***

P.4.3.1 Ensure that cooker control units are new, clean and dry when in the open position.⟨A1⟩

〈A1〉**P.4.3.2** Select the test voltage from Table 11 in accordance with the altitude at which the device is tested.

Adjust the shape of the impulses with the isolating switch under test connected to the impulse generator, using appropriate voltage dividers and voltage sensors.

Control any small oscillations in the impulses so that they have an amplitude near the peak of the impulse less than 5% of the peak value; control oscillations on the first half of the front to amplitudes up to 10% of the peak value.

P.4.3.3 Using the impulse generator, apply a 1.2/50 μs impulse voltage as specified in BS 923-1 between the line terminals connected together and the load terminals connected together with the contacts in the open position.

Apply the impulse voltage 3 times at intervals of 1 s minimum.

P.4.3.4 Consider the test invalid if there are discharges during the test.

NOTE 1 The output impedance of the test apparatus should not be higher than 500 Ω.

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

Table 11 – Test voltage across the open contacts for verifying the suitability for isolation at a rated voltage of 250 V referred to the altitude where the test is carried out

Altitude m	Test voltage kV
0	6.2
200	6.0
500	5.8
1 000	5.6
2 000	5.0

〈A1〉

Appendix Q
Temperature rise test

Q.1 Principle

There are two tests as follows:

a) a test during which the main switch only is carrying its rated current (see **Q.2**);

b) a test during which the rated current of the cooker control unit as a whole is shared appropriately between the main switch and the auxiliary socket-outlet and associated switch (see **Q.3**).

The appropriate test current is passed through the cooker control unit for a continuous period of 1 h, during which the temperature rise of the terminals for the connection of external conductors shall not exceed 47 K (this includes an uncertainty of temperature measurement of a maximum of 2 °C, i.e. the measured value shall not exceed 45 K).

Q.2 Preparation

Q.2.1 *Mains switch only under test*

Connect a supply of 250 + 25, –50 V a.c. 50 Hz to the supply terminals of the cooker control unit. Connect one of the following substantially non-inductive outgoing terminals of the cooker control unit:

a) 38 ± 0.5 A for cooker control units rated at 32 A;

b) 51 ± 0.5 A for cooker control units rated at 45 A.

The incoming and outgoing conductors shall each consist of 2-core and earth PVC insulated and sheathed cable as given in Table 5 of BS 6004:1990 of the maximum size of conductor appropriate to the current rating of the cooker control units in Table 4. The incoming and outgoing conductor each shall be at least 1 m in length.

Q.2.2 *Mains switch and auxiliary switched socket-outlet simultaneously under test*

The supply voltage and incoming and outgoing conductors connected to the incoming and outgoing terminals shall be as described in **Q.2.1**. Connect a load of 14 ± 0.4 A for socket-outlets complying with BS 1363, and 16 ± 0.4 A for those complying with BS 564. Connect the load by one of the following methods:

a) via the special test plug inserted in the socket-outlet as specified in BS 1363;

b) via an appropriate non-fused plug complying with BS 546 fitted with approximately 1 m of flexible cord complying with Table 16 of BS 6500:1990.

Adjust the load in order that the total load is equal to that described in **Q.2.1**.

Q.3 Method

Mount surface mounting cooker control units as in use with their accompanying block, backplate, box or enclosure fixed to a vertical plywood board 25 ± 1 mm thick and having a flat surface extending not less than 150 mm in each direction beyond the extremity of the cooker control unit.

Mount flush mounting cooker control units for use with flush-mounted boxes on an appropriate box as recommended by the manufacturer. Place the boxes in a block of wood simulating the conditions of normal use so that the front edges of the box are 2.5 mm to 5 mm below the front surface of the block. There shall be not less than 25 mm of wood surrounding the box on all four sides and the back.

The incoming cable shall enter the top of the box and the outgoing cable shall leave on the vertical axis on the opposite side of the box. Where possible, the cables shall enter and leave the box 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-mounting cooker control units the length of each of the cables within the enclosure shall be at least 75 mm and for flush mounting units the length of each cable within the box shall be at least 150 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.

Tighten terminal screws with a torque equal to two-thirds of the values given in Table 8.

Determine temperature rises by means of fine wire thermocouples, having wire not exceeding 0.3 mm diameter, chosen and positioned so that they have minimum effect upon the temperature of the part under test. Attach the thermocouples by means of a mixture of equal parts of resin adhesive and zinc oxide, by soldering, or by other equally effective means.

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 unit and that no electrical connections are bridged by solder.

Appendix R
Making and breaking capacity

Connect the cooker control unit as described in Appendix Q, using a supply voltage of 275 ± 5 V. Adjust the load so that the switch makes and breaks a load of 1.2 times to 1.25 times the rated current in an inductive a.c. circuit having a logging power factor of $\cos \theta = 0.3 \pm 0.05$.

NOTE 1 Iron-cored inductors may be used, provided the current has substantially sinewave form.

NOTE 2 Resistors and inductors are not connected in parallel, except that, if an air cored inductor is used, a resistor taking approximately 1 % of the current through the inductor is connected in parallel with it.

Appendix S
Determination of normal operation of switch controlling electric supply

Operate the switch 5 000 times, i.e. 10 000 movements, at a rate of 10 movements per minute to 12 movements per minute, the “on” and “off” periods being approximately equal. The speed and manner of the operation of the switch shall be such as to simulate normal operation by hand.

After one-quarter of the specified movements repeat the temperature rise test (see Clause **16**) with the test current reduced to rated value. Complete the remainder of the specified movements.

Appendix T
Impact test

T.1 General

Subject the samples to blows by means of an impact test apparatus as shown in Figure 9, Figure 10 and Figure 11.

The striking element has a hemispherical face of 10 ± 0.5 mm radius, made of polyamide having a Rockwell hardness of R100 ± 5 (see BS 2782:Method 365C), and a mass of 150 ± 1 g.

It is rigidly fixed to the lower end of a steel tube with an external diameter of approximately 9 mm and a wall thickness of approximately 0.5 mm, which is pivoted at its upper end in such a way that it swings only in a vertical plane.

The axis of the pivot shall be 1 000 ± 1 mm above the axis of the striking element.

The design of the apparatus shall be such that a force between 1.9 N and 2.0 N has to be applied to the face of the striking element to maintain the tube in a horizontal position.

Mount the specimens on a sheet of plywood, approximately 8 mm thick and 250 mm square, secured at its top and bottom edges to a rigid bracket, which is part of the mounting support.

The mounting support shall have a mass of 10 ± 1 kg and shall be mounted on a rigid frame by means of pivots.

The frame shall be fixed on a solid wall.

The design of the mounting 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 pivot;

b) the specimen can be moved horizontally and turned about an axis perpendicular to the surface of the plywood;

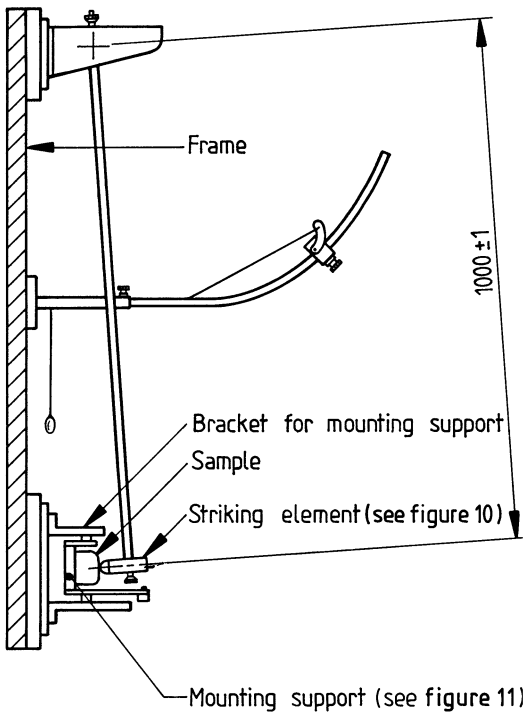
c) the plywood can be turned about a vertical axis.

Mount the cooker control units and associated boxes or enclosures on the plywood as in normal use.

Remove decorative cover plates removable without the use of a tool prior to testing.
Mount flush mounting cooker control units in a relevant mounting box in a recess provided in a block of hornbeam or similar material, which is fixed to a sheet of plywood, and with the rear of the plate flush with the surface of the block. If wood is used for the block, the direction of the wood fibres shall be perpendicular to the direction of the impact. Mount the box simulating the conditions of normal use, so that the front edges of the box are between 2.5 mm and 5 mm below the front surface of the block.

Surface-type cooker control units and their associated box or enclosure are mounted on the support as in normal use.

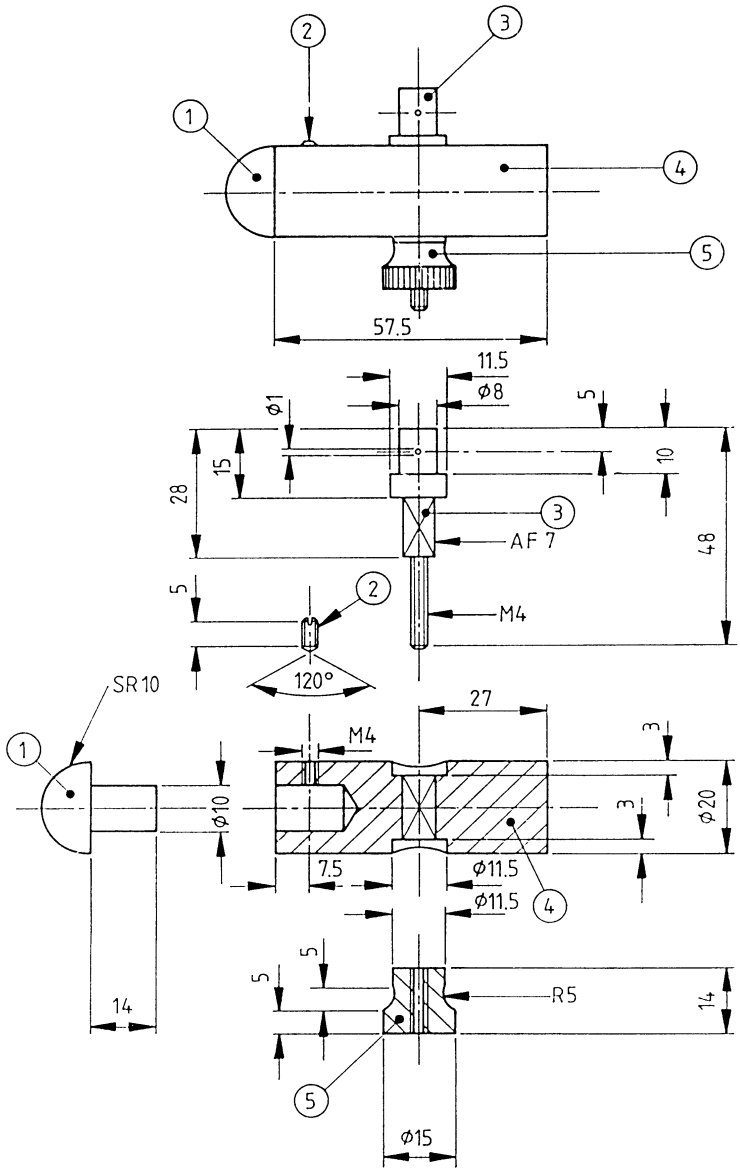
Before applying the blows, tighten fixing screws with a torque equal to two-thirds of that specified in Table 8.



All dimensions are in millimetres.

Figure 9 — General view of impact test apparatus

Mount specimens so that the point of impact lies in the vertical plane through the axis of the pivot.



Materials

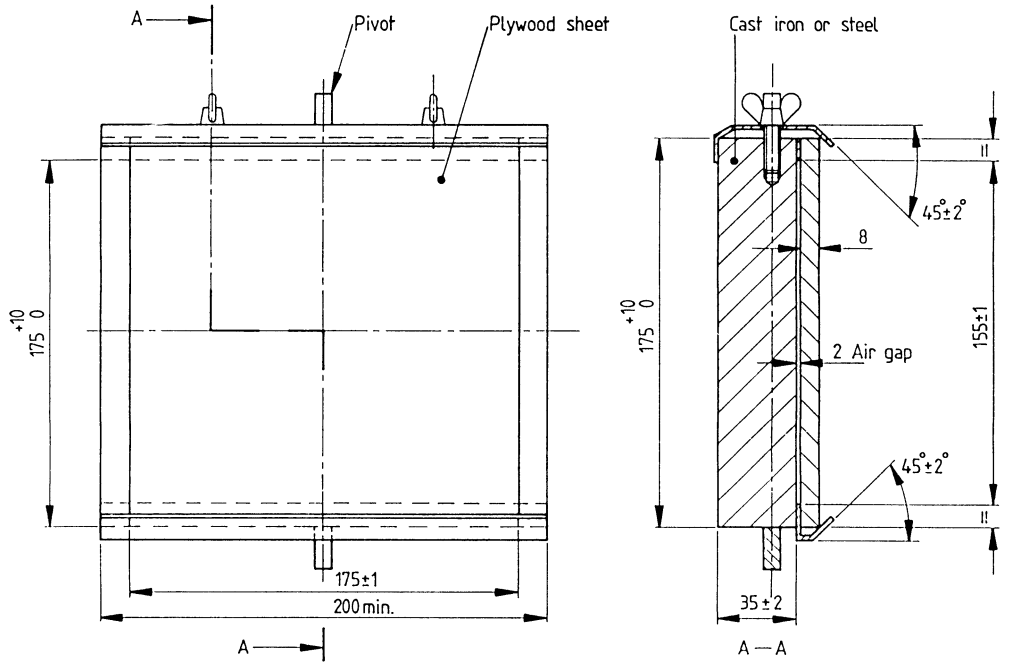
1	polyamide
2, 3, 4, 5	steel

All linear dimensions are in millimetres.

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

NOTE 2 The tolerance on all linear dimensions is ±1 mm.

Figure 10 — Constructional details of striking element



All linear dimensions are in millimetres.

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

Figure 11 — Constructional details of mounting support for test samples

Allow the striking element to fall from a height as follows:

1) 75 $^{+0}_{-5}$ mm for those parts of covers which are recessed to a depth of at least one-sixth of the largest dimensions of the recessed part;

2) 100 $^{-0}_{+5}$ mm for flat surfaces of cover plates of flush-type switches;

3) 200 $^{-0}_{+5}$ mm for parts projecting from the mounting surfaces, e.g. rims exceeding 20 mm from the walls, of cover plates of flush-type switches and for boxes of surface types.

The height of fall shall be the vertical distance between the position of a checking point, when the pendulum is released, and the position of that point at the moment of impact. Mark the checking point on the surface of the striking element where the line through the point of intersection of the axes of the steel tube of the pendulum and the striking element and perpendicular to the plane through both axes, meet the surface.

NOTE Theoretically the centre of gravity of the striking element should be the checking point. As the centre of gravity in practice is difficult to determine, the checking point is chosen as described above.

The number of blows are applied in accordance with **T.2** to **T.5**.

T.2 Flush-type cooker control units

Apply 10 blows, one blow approximately in the centre, one at each extremity of the area which covers the box and two approximately midway between the previous blows, the sample being moved horizontally; apply the remaining five blows in the same way after the sample has been turned through approximately 90° about its axis, perpendicular to the support.

T.3 Surface-type cooker control units and boxes or enclosures of surface-type cooker control units

Apply 10 blows, one blow approximately in the centre, one on each side of the sample turned between 50° and 60° about a vertical axis, and two approximately midway between the previous blows; apply the remaining five blows in the same way after the sample has been turned through approximately 90° about its axis, perpendicular to the support. The two lines of blows on the surface of the samples are chosen so as to be as nearly as possible equidistant from the cable entries.

T.4 Switch actuating members of flush and surface-type cooker control units

Apply one blow to each actuating member.

T.5 Any lens

Apply one blow to any indicating lens at a point approximately at its centre.

Appendix U
Determination of resistance to heat

U.1 Maintain the specimens for 1 h in a heating cabinet at a temperature of 100 ± 2 °C.

U.2 Subject the parts of insulating material necessary to retain current-carrying parts and the parts of the earthing circuit in position to a ball-pressure test by means of the apparatus shown in Figure 12, except that insulating parts necessary to retain the earthing terminals in a box or enclosure shall have been tested in accordance with **T.3**.

NOTE When it is not possible to carry out the test on the specimen under test, the test should be carried out on a sample of the material not less than 2 mm thick.

Place the surface of the part to be tested in the horizontal position and press a 5 mm diameter steel ball bearing against the surface with a force of 20 + 0, –1 N

Support the underside of the part being tested to withstand the test force and to minimize the risk of distortion.

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

Place the part to be tested in the heating cabinet, for a period of not less than 10 min, before the test load is applied.

Perform the test in a heating cabinet at a temperature of 125 ± 2 °C. Remove the ball from the sample after 60 + 1, 0 min.

Cool down the ball within 10 s to approximately room temperature by immersion in cold water.

Measure the diameter of the impression caused by the ball.

U.3 Subject parts of insulating material not necessary to retain current carrying parts and parts of the earthing circuit in position even though they are in contact with them to a ball-pressure test in accordance with **T.2**. Perform the test at a temperature of 70 ± 2 °C.

Appendix V
Method of test for screws

Tighten and loosen the screws or nuts as follows:

a) 10 times for screws in engagement with a thread of insulating material;

b) 5 times in all other cases.

Completely remove and reinsert, each time, the screws or nuts in engagement with a thread of insulating material.

Perform the test by means of a suitable screwdriver or a suitable tool, applying a torque as specified in Table 8.

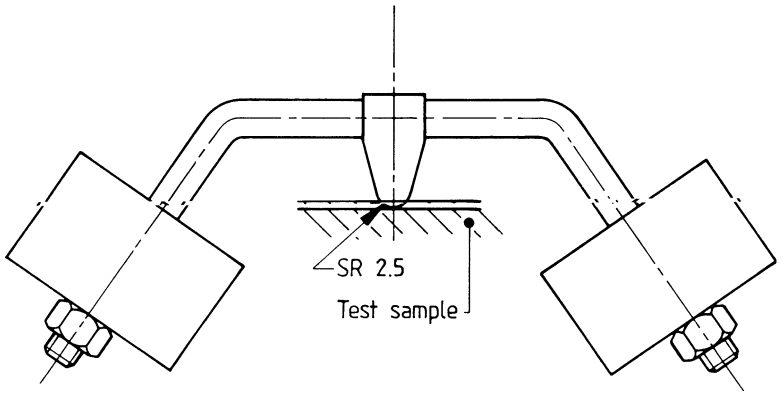
Appendix W
Glow wire test

Perform the test in accordance with Clauses **4** to **10** of BS 6458-2.1:1984 under the following conditions:

a) for parts of insulating material necessary to retain current carrying parts in position by the test made at a temperature of 850 ± 10 °C;

b) for parts of insulating material not necessary to retain current carrying parts in position, although they may be in contact with them, by the test made at a temperature of 650 ± 10 °C.

If the test has to be made at more than one place on the same cooker control unit, take care to ensure that any deterioration caused by previous tests does not affect the result of the tests to be made.



All dimensions are in millimetres.

Figure 12 — Ball-pressure apparatus

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 onto the tissue paper covering the pinewood board.

If possible, the specimen should be a complete cooker control unit. If the test cannot be made on a complete cooker control unit, a suitable part may be cut from it for the purpose of the test. The test is 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 cooker control unit.

Appendix Y
Residual stresses and rusting

Dry the parts in a heating cabinet for 10 ± 0.5 min at a temperature of 100 ± 5 °C and examine them.

blank

Publication(s) referred to

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

A1 BS 923-1, *Guide on high-voltage testing techniques — Part 1: General.* A1

BS 1361, *Specification for cartridge fuses for a.c. circuits in domestic and similar premises.*

BS 1363, *Specification for 13 A fused plugs and switched and unswitched socket-outlets.*

BS 2782, *Methods of testing plastics.*

BS 2782-3, *Mechanical properties.*

BS 2782:Method 365C, *Determination of Rockwell hardness.*

BS 3042, *Specification for standard test fingers and probes for checking protection against electrical, mechanical and thermal hazard.*

BS 3676, *Switches for household and similar fixed electrical installations.*

BS 3676-1, *Specification for general requirements.*

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

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

BS 6004, *Specification for PVC-insulated cables (non-armoured) for electric power and lighting.*

BS 6217, *Guide to graphical symbols for use on electrical equipment.*

BS 6458, *Fire hazard testing for electrotechnical products.*

BS 6458-2, *Methods of test.*

BS 6458-2.1, *Glow-wire test.*

BS 6500, *Specification for insulated flexible cords and cables.*

A1 BS EN 60664-1, *Insulation coordination for equipment within low-voltage systems — Part 1: Principles, requirements and tests.* A1

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