

BRITISH STANDARD 4177 : 1967

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**SPECIFICATION FOR
COOKER
CONTROL UNITS**

RATED AT 30 AMPERES AND 45 AMPERES

250 VOLTS SINGLE-PHASE ONLY

BRITISH STANDARDS INSTITUTION

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B.S. 4177 : 1967

BRITISH STANDARDS INSTITUTION

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THIS BRITISH STANDARD, having been approved by the Electrical Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 30 June, 1967.

BS 438. First published February, 1932.
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Third revision February, 1952.

BS 1833. First published May, 1952.
Revised and combined as BS 4177 June, 1967.

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 9000, fully indexed and with a note of the contents of each, will be found in the BSI Catalogue. The BSI Catalogue may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:
BS 4568. Steel conduits and fittings with metric threads.

BS 88. Electric fuses for circuits of voltage-ratings up to 660 volts.

BS 546. Two-pole and earthing-pin plugs, socket-outlets and socket-outlet adaptors for circuits up to 250 volts.

BS 738. Definitions for non-ignitable and self-extinguishing properties of solid electrical insulating materials (including classification and methods of test).

BS 861. Air-break switches (including isolating switches, totally enclosed and flameproof types) for voltages not exceeding 660 volts.

BS 1361. Cartridge fuses for domestic consumers' units.

BS 1363. 13A plugs, switched and unswitched socket-outlets.

BS 2782. Methods of testing plastics.

BS 3036. Semi-enclosed electric fuses (ratings up to 200 amperes and 250 volts to earth).

BS 3676. Switches for domestic and similar purposes (for fixed or portable mounting).

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following BSI references relate to the work on this standard:
Committee reference ELE/4, ELE/4/20 Draft for comment D64/14307

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CO-OPERATING ORGANIZATIONS

The Electrical Industry Standards Committee under whose supervision this British Standard was prepared consists of representatives from the following Government departments and scientific and industrial organizations:

- Associated Offices' Technical Committee
- *Association of Consulting Engineers
- Association of Mining Electrical and Mechanical Engineers
- *Association of Supervising Electrical Engineers
- *British Electrical and Allied Manufacturers' Association
- British Railways Board
- Crown Agents for Oversea Governments and Administrations
- Electric Cable Makers' Confederation
- Electric Lamp Industry Council
- *Electric Light Fittings Association
- *Electrical Contractors' Association (Incorporated)
- Electrical Contractors' Association of Scotland
- *Electrical Research Association
- *Electricity Council, the Central Electricity Generating Board and the Area Boards in England and Wales
- Electronic Engineering Association
- Engineering Equipment Users' Association
- *Institution of Electrical Engineers
- Ministry of Technology
- Ministry of Defence, Army Department
- Ministry of Defence, Navy Department
- *Ministry of Labour (H.M. Factory Inspectorate)
- Ministry of Power
- *Ministry of Public Building and Works
- Municipal Passenger Transport Association (Incorporated)
- National Inspection Council for Electrical Installation Contracting
- National Physical Laboratory (Ministry of Technology)
- Oil Companies Materials Association
- *Post Office
- Public Transport Association (Incorporated)
- South of Scotland Electricity Board

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

- Electrical Association for Women
- Electrical Power Engineers' Association
- Fire Offices Committee
- Women's Advisory Committee of the BSI

BRITISH STANDARD SPECIFICATION FOR COOKER CONTROL UNITS RATED AT 30 AMPERES AND 45 AMPERES 250 VOLTS SINGLE-PHASE ONLY

FOREWORD

This British Standard is a revision of BS 1833 : 1952, 'Cooker control units rated at 30 amperes 250 volts single-phase a.c. only'. It now provides for an alternative 45 A rating and also includes units hitherto covered by BS 438* with the exception of those designed for d.c.

BS 438 was based on the use of BS 546† sockets for the auxiliary circuit, whereas BS 1833 employed sockets to BS 1363‡. Both those types of socket for the auxiliary circuits are covered in this revision, and BS 1833 and BS 438 are accordingly withdrawn.

The performance and safety requirements for those units hitherto covered by BS 438 have been raised to the level of those covered by the 1952 edition of BS 1833.

The units include a switch to control certain auxiliaries. When such auxiliaries are not required a switch complying with BS 861§ or BS 3676|| may be appropriate if there is suitable provision for earths.

SPECIFICATION

1. GENERAL

1.1 SCOPE

This British Standard specifies units primarily intended for the control of electrical cookers and which consist of a switch associated with certain auxiliaries.

It specifies requirements for single-phase a.c. units suitable for control of electric cookers; such units consist of:

- (1) A switch for controlling current to the cooker which shall be of 30 A, alternatively 45 A rating.
- (2) An auxiliary circuit for other apparatus.

The cooker control units specified in this standard are not intended for use in an ambient temperature exceeding 50°C unless derated.

*BS 438 : 'Cooker control units for use in 2-wire circuits of not more than 250 volts declared voltage'.

†BS 546, 'Two-pole and earthing-pin plugs, socket-outlets and socket-outlet adaptors for circuits up to 250 volts'.

‡BS 1363, 13 A plugs, switched and unswitched socket-outlets

§BS 861, 'Air-break switches (including isolating switches, totally enclosed and flameproof types) for voltages not exceeding 660 volts'.

||BS 3676, 'Switches for domestic and similar purposes (for fixed or portable mounting)'.

1.2 DEFINITIONS

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

- (1) *Cooker control unit.* An assembly of parts enclosed in a case or box for the purpose of controlling the supply to a cooker as well as the supply to auxiliary apparatus connected by a plug to a socket-outlet forming an integral part of the cooker control unit.
- (2) *Surface-type cooker control unit.* A cooker control unit the case of which is intended to be mounted on the surface of a wall.
- (3) *Flush-type cooker control unit.* A cooker control unit the box of 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.
- (4) *Type test.* A test of a particular design of a cooker control unit intended to show whether or not other cooker control units made to the same design will pass an identical test.
- (5) *Routine test.* A test of a sufficient number of cooker control units selected from each batch to establish consistency of manufacture.
- (6) *Cooker circuit.* The circuit from the cooker control unit to the cooker, including the main switch in the control unit.
- (7) *Auxiliary circuit.* The circuit from the cooker control unit, including the switch and socket-outlet in the control unit, and the portable appliance connected thereto.

1.3 COOKER CONTROL UNITS

Cooker control units shall take one of three forms.

1.3.1 Form A cooker control units. Form A cooker control units shall consist of a main switch of 30 A, alternatively 45 A rating, an auxiliary switch of at least 13 A rating and a 13 A socket-outlet conforming to BS 1363* mounted in a flush or surface-mounting box of specified dimensions.

1.3.1.1 Dimensions. The essential dimensions of form A cooker control units including the size and position of fixing holes and cable openings shall be as shown in Figs. 1 and 2.

The cover of a flush-type unit shall be nominally 165 mm wide and 178 mm high, and its corners may be radiused to a maximum of 13 mm

There shall be no internal projections in the box of flush-type units such as would prevent the complete insertion of the gauge shown in Fig. 3.

1.3.1.2 Attachment and adjustability of flush-type units. It is intended that the box of a flush-type unit shall be mounted so that its front edge does not project beyond the wall.

*BS 1363, 13 A plugs, switched and unswitched socket-outlets



To allow for adjustment of the unit if its box is fixed out of square, provision shall be made for an angular movement of $2\frac{1}{2}^\circ$ 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 for the unit to be fixed to it by means of two No. M 5 screws.

1.3.1.3 Cable openings. Cable openings shall be as shown in Figs. 1 and 2 and shall be suitable for 25 mm conduit.



1.3.2 Form B cooker control units. Form B cooker control units shall consist of:

(1) Units as in form A but fitted with luminous indicators or other equivalent apparatus, or

(2) Units as in form A except that the auxiliary circuit, instead of being 13 A rating is 15 A rating controlled by an auxiliary switch of at least equivalent rating, with or without indicators or other apparatus. The 15 A circuit shall be provided with an appropriate fuse within the unit as specified in 1.10(2), contained in boxes of the dimensions specified for form A.

1.3.3 Form C cooker control units. Form C cooker control units shall consist of flush or surface-mounting units generally as form A or form B but mounted in enclosures of dimensions other than those specified for form A or form B.

1.4 GENERAL REQUIREMENTS

All materials shall comply with the relevant British Standards. Parts made of ferrous metal shall be treated to resist rust, special attention being given to springs and moving parts.

1.5 CONTAINING CASES AND BOXES

1.5.1 Cases of surface-type units. Cases of surface-type units shall be of metal or insulating material or a combination of the two and boxes of flush-type units shall be of metal or insulating material. They shall be so constructed as to ensure adequate strength and rigidity.

Cases and covers for surface type units and covers for flush-type units, when made of insulating material shall be tested for mechanical strength in accordance with 2.5.

Cases of surface-type units shall be so designed that when fixed on a flat surface they are in contact with the mounting surface at the points of support only.

1.5.2 Metal cases and boxes. Metal cases and boxes shall be of good quality castings or of sheet metal or combination of both, and shall be either non-corroding or suitably protected against corrosion. The surface finish shall be hard and durable. Minimum thickness of the walls shall be as in Table 1.

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TABLE 1. METAL CASES OR BOXES

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

1.5.3 Insulating cases and boxes.

Insulating cases and boxes shall be of tough material, non-ignitable when tested in accordance with Clause 2.9 and having a plastic yield not exceeding 6 mm when tested at 100 °C in accordance with plastic yield test method 102A of BS 2782 : Part 1 : 1965†.

1.6 CLEARANCES AND SHIELDING

Adequate clearances or, where necessary, arc-shields shall be provided to ensure that there is no arcing between poles or to earth when the cooker control unit is operating under normal service conditions.

The design of the case shall be such as to make it impossible to touch inadvertently any live metal during the normal removal or replacement of a fuse, if fitted. If a luminous indicator is fitted of the type not intended for the consumer to replace, it shall be so placed that it is inaccessible without the use of tools.

1.7 CABLE OPENINGS

In metal cases, cable openings shall be provided for 25 mm conduit or suitable knock-outs for TRS cable shall be provided in cases of moulded construction.

Means shall be provided for blanking-off the unused cable openings in such a manner that the blanks cannot become detached in normal use.

Adequate clearances shall be allowed to enable conduit bushes and lock-nuts complying with BS 4568 : Part 2 : 1970‡ to be fitted internally at all cable opening for 25 mm conduit.

Where knock-outs are provided these should be capable of being removed cleanly and, in the case of insulated boxes without damage to the surrounding material.

In the case of non-metallic surface boxes provision shall be made to enable the ends of conductors of flexible cords or cables and the terminals to which they are connected to be relieved from strain including twisting by means of a

†BS 2782, 'Methods of testing plastics'.

‡BS 4568, 'Steel conduits and fittings with metric threads

cord-grip which shall be arranged to clamp the outer sheath of the cord or cables.

1.8 ACCESSIBILITY OF COMPONENTS

The interiors of cooker control units to forms A and B shall be capable of being removed and refixed without detaching the box or case from the normal position of mounting, but covers of boxes and cases shall be so designed that they cannot be removed without the aid of a tool.

1.9 COOKER CIRCUIT

The cooker circuit, as defined in 1.2 (6), shall be controlled by a double-pole switch rated at either 30 A or 45 A, 250 V, 50 cycles per second, a.c., and mechanical means shall be provided for clear indication of the ON and OFF position of the switch. In addition a luminous indicator connected across the outgoing terminals may be used for units of forms B and C, if desired. The switch shall comply with the following requirements.

1.9.1 Operating handle. The operating handle of the switch, if of metal, shall be earthed, e.g. by effective contact with the enclosure if of metal. An insulating operating handle having internal metal support or reinforcement shall be so constructed that live metal cannot be touched inadvertently even if any part of the insulation becomes broken or detached.

1.9.2 Positive action of switches. The opening of the switch contacts by the operation of the switch handle shall be positive with or without the action of any associated spring.

In the case of quick-make or quick-break switches it shall not normally be possible for the switch to be left in partial engagement.

NOTE. It is recommended that if, with a broken spring, it is possible to close the switch, it should be possible to close the contacts sufficiently to carry rated current.

1.10 AUXILIARY CIRCUIT

The auxiliary circuit, as defined in 1.2 (7), shall comprise the following components with interconnections as indicated by the dotted lines in Fig. 4:

(1) A switch having a current-rating not less than that of the socket-outlet of the unit at 250 V, 50 cycles per second a.c. Mechanical means shall be provided for clear indication of the ON and OFF positions of the switch.

In addition a luminous indicator to indicate that the socket-contacts are alive may be used for units of forms B and C if desired.

(2) A shuttered socket-outlet in accordance with BS 1363* or BS 546† ratings, except that the socket-outlet may be modified in such a way as to

*BS 1363, 13A plugs, switched and unswitched socket-outlets

†BS 546, Two-pole and earthing-pin plugs, socket-outlets and socket-outlet adaptors for circuits up to 250 volts.

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make it suitable for mounting in the cooker control unit, provided that such modification does not affect any of the requirements with respect to safety and performance (including interchangeability of plugs).

A unit with a socket to BS 546* shall include a single-pole fuse connected in the auxiliary circuit to the line-socket contact, the fuse shall comply with the requirements of BS 88† or BS 3036‡, or incorporate a cartridge fuse-link to BS 1361§. Means shall be provided for giving access to the fuse-link so as to facilitate its inspection or replacement in service. It should not be necessary to remove the unit from its case in order to gain access to the fuse.

The switch under (1) and the socket-outlet under (2), may be combined if they comply with BS 2814|| and pass the tests in 2.5 and 2.6 of this specification.

The switch shall also comply with the following requirements:

(a) *Operating handle.* The operating handle of the switch, if of metal, shall be earthed, e.g. by effective contact with the enclosure if of metal. An insulating operating handle having internal metal support or reinforcement shall be so constructed that live metal cannot be touched inadvertently even if any part of the insulation becomes broken or detached.

(b) *Switch action.* In the case of quick-make or quick-break switches it shall not be possible during normal operation for the switch to be left in partial engagement.

NOTE. It is recommended that if, with a broken spring, it is possible to close the switch, it should be possible to close the contacts sufficiently to carry rated current.

1.11 PROVISION FOR EARTHING

1.11.1 An earthing terminal or terminals shall be provided:

(1) To enable the case, if of metal, to be efficiently earthed irrespective of any means provided for attaching the metallic covering (armouring, or other metallic enclosure) of the supply cable. Where the earthing wire is to be clamped to the case, there shall be no enamel or insulating covering at the point at which earthing conductors or screws which effect earth continuity are intended to be connected or to make contact with, a metal case, box or lid.

(2) To enable the earth wire to be looped to the cooker when required, and to provide means of earthing the earth socket-contact of the auxiliary circuit.

1.11.2 Provision shall be made to ensure that the cover of the case, if of metal, makes good electrical contact with the earthed case. Provision shall be made,

*BS 546, 'Two-pole and earthing-pin plugs, socket outlets and socket-outlet adaptors for circuits up to 250 volts'.

†BS 88, 'Electric fuses for circuits of voltage-ratings up to 660 volts'.

‡BS 3036, 'Semi-enclosed electric fuses (ratings up to 200 amperes and 250 volts to earth)'.

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

||BS 1363, 13A plugs, switched and unswitched socket-outlets



whether the case be of the insulated or non-insulated type, for earthing any exposed metal liable to become alive in the event of insulation of any point of the unit becoming defective.

When any live parts are mounted on a hinged or detachable lid or chassis, the lid or chassis shall be provided with a means of adequately bonding it to the box or earthing continuity conductor.

1.12 TERMINALS

1.12.1 Each line and neutral terminal for the incoming and outgoing cables shall be of brass or other suitable metal and shall provide means for equally effectively clamping one conductor of either 2.5 mm^2 or 6.0 mm^2 for the 30 A rating, and either 2.5 mm^2 or 10 mm^2 for the 45 A rating.

Where the conductors are clamped by the end of a screw such end shall be so shaped as to minimize damage to the conductor, and there shall be either:

- (1) One clamping screw not smaller than $M6$ or
- (2) Two cheese-headed clamping screws not smaller than $M3.5$.

In either case, there shall be a length of at least 3.0 mm of thread in the terminal block.

1.12.2 If one earth terminal only is provided it shall comply with all the requirements of 1.11.1, and the screws shall be long enough to extend to the far side of the conductor holes. Alternatively, more than one earth terminal may be provided, each capable of clamping one incoming conductor of the size specified in 1.12.1.

If two or more terminals are provided they shall be adequately bonded together and to the socket earth-contact, and any other parts required to be earthed as detailed in 1.11.

For any other type of terminals the clamping means shall be not less effective, with particular reference to a temperature rise test.

1.13 MARKING

Cooker control units shall be marked with the number of this British Standard, i.e. BS 4177 : 1967 with the form letter A, B or C, the manufacturer's name or identifying mark and the following:

- (1) '30A-250V, a.c. only' or '45A-250V, a.c. only'.
- (2) 'The line terminals shall be indicated by the letter 'L', the neutral terminals by the letter 'N' and the earth terminals by the symbol $\perp$ and if practicable, by the letter 'E'. The letters and symbols shall be as close as practicable to the corresponding terminals. It shall be clearly indicated which are the incoming terminals.

(3) The word COOKER adjacent to the operating handle of the cooker switch, and clearly visible in normal use.

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NOTE.—The mark BS 4177 : 1967 on or in relation to the product is a claim by the manufacturer that it complies with the requirements of the standard.

The British Standards Institution is the owner of a registered certification trade mark. This is shown below, enclosed in the words 'Approved to British Standard'. This mark can be used only by manufacturers licensed under the certification mark scheme operated by the BSI. The presence of this mark on or in relation to a product is an assurance that the goods have been produced to comply with the requirements of the British Standard under a system of supervision, control and testing operated during manufacture and including periodical inspection at the manufacturer's works in accordance with the certification mark scheme of the BSI.

Further particulars of the terms of licence may be obtained from the Director, British Standards Institution, 2 Park Street, London, W.1.



2. TESTS

2.1 GENERAL REQUIREMENTS

2.1.1 All tests of cooker control units specified in the following clauses shall be type tests, with the exception of the tests described in 2.6 and 2.7, which shall be routine tests.

2.1.2 The purchaser shall accept certificates of type tests as evidence of compliance of cooker control units with the relevant clauses of this specification and the manufacturer shall hold available such certificates, together with detail drawings and a record of any alterations that have been made to the cooker control units subsequent to the type test.

2.1.3 Type tests may be made by the manufacturer, provided that he shall arrange for a recognized authority to make any type test for which he himself is not equipped.

2.1.4 The cooker control units used for type test shall be identical in all essential details with those to be used in service, and the tests when appropriate, shall be made with plug in engagement with the socket-outlet. Conductors appropriate to condition of use shall be connected.

2.1.5 The lubrication of switches such as is desirable during prolonged normal use is permitted during any stage of the type test.

2.1.6 Cooker control units used for the sampling tests shall pass the insulation resistance test described in 2.6 before being subject to the high-voltage flash test described in 2.7.

2.1.7 It is not intended that the test in 2.8 should be performed on the same switch as tested under 2.4.2 and 2.5.