
Specification for

Electrical controls for household and similar general purposes

Spécification des contrôles électriques pour usages domestiques
et analogues généraux

Spezifikation für elektrische Steuereinrichtungen für häusliche und
ähnliche allgemeine Verwendung



Amendment No. 1
published and effective from 30 December 1988
to BS 3955 : 1986

Specification for electrical controls for
household and similar general purposes

Revised text

AMD 5940
December 1988

Contents

After the entry for figure 23 insert the following.

- '24. Pulse for voltage spike tests
- 25. Endurance test probe 1
- 26. Endurance test probe 2'

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December 1988

Clause 1.1

Insert the following new paragraph between the existing paragraphs 4 and 5, i.e. after note 1.

'This standard does not apply to either manual switches or to dimmer switches which are intended for mounting as part of the fixed wiring of a building. Such equipment is in the scope of BS 3676 and BS 5518 respectively.'

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Clause 2 Definitions

In **2.8** NOTE 1, **2.9** NOTE 2, **2.10** NOTE 1 and **2.104** NOTE 1.

Insert at the end of each of these notes the following new sentence.

'Also the class and security of a disconnection may be limited by the class and security of disconnection provided by any circuit controlling that disconnection.'

In **2.105** Operating time

Delete 'table 18' in line 5 and substitute 'table 20'.

After **2.106** insert the following new clauses.

2.107 dimmer control. An energy regulator in which the cycle rate, usually phase control at supply frequency, is such that when controlling a tungsten or fluorescent lamp load no unintended flicker occurs.

2.108 membrane actuated control. A control, the actuating member of which is a flexible insulating sheet or film.

NOTE 1. Membrane actuated controls are generally known as membrane switches.

NOTE 2. Such controls are often arranged in an array and may have a common membrane.'

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New clause 6.15

After 6.14 insert the following.

‘6.15 Abrasion and detergent. Classification according to a degree of protection against abrasion and detergent shall be as follows for controls incorporating membrane actuated controls.

- (a) Not protected against abrasion or detergents.
- (b) Protected against abrasion and detergents.’

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Clause 7.1.3.2

In lines 1 and 2 delete ‘class controls’ and substitute ‘class I controls’.

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Table 2. Marking requirements

Insert the following new entries at the end of the table.

—	X	X	27	For membrane actuated controls, the degree of protection against abrasion and detergent
—	—	X	28	For dimmer controls, warning stating that the control is not suitable for use with fluorescent lamps, if this is applicable
—	—	X	29	For dimmer controls, the maximum permissible continuous rated lamp load in watts
—	—	X	30	For dimmer controls, the minimum rated lamp load in watts

NOTE. The minimum nominal value shall not be greater than 15 % of the rated load of the dimmer control except that for dimmer controls having a rated load of 250 W or less, the minimum nominal value shall not exceed 40 W.

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Clause 7.2.7

In line 11 delete ‘2.104’ and substitute ‘2.105’.

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New clause 7.2.29

After 7.2.28 insert the following.

‘7.2.29 For dimmer controls the types of circuits and lamps for which the control is designed shall be stated. A warning must also be included if it is necessary to derate the control when used for certain types of lamps or combinations of lamps.’

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Clause 11.26

In line 3, after ‘positions’, insert ‘they have a contact separation of at least 3 mm in at least 2 poles and’.

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New clauses 11.36, 11.37, 11.38 and 11.39

After 11.35 insert the following.

‘11.36 In-line and free-standing dimmer controls shall not rely on class D disconnection for an OFF position.

11.37 In-line and free-standing dimmer controls shall be so designed and constructed that when the control is at any position of the regulating means and when operated at rated voltage controlling any load permitted by the manufacturer either:

- (a) the controlled lamp(s) shall be visible in normal daylight (see note); or
- (b) an indicator, additional to the regulating means, indicates that the output is, or may become, live.

NOTE. A definition for visibility in normal daylight is under consideration.

11.38 In-line and free-standing dimmer controls shall be so designed and constructed as to be capable of withstanding a through fault current resulting from a line to neutral fault in the load circuit without causing any electrical, thermal or mechanical hazard. Compliance shall be checked by the following test.

A short circuit shall be applied between the line and neutral connections on the output side of the dimmer control, the switch being in the ON position and the regulating means being at the most onerous position. The supply shall be at rated voltage and shall be protected by a fuse to BS 1362 rated at 13 A.

If damage to the dimmer control occurs during this test such damage shall not cause an infringement of clauses **8**, **13** and **20**.

11.39 Three untested samples of membrane actuated controls declared as protected against abrasion and detergent are subjected to the following test.

Using an apparatus similar to figure 10 but with the rubbing surface of hard white buffing felt covered by silicon carbide paper grade 240 and using a weight of 500 g, apply 1000 cycles (2000 strokes) to the accessible surface of the membrane. The silicon carbide paper is renewed for each test.

After the test the samples should be inspected and subjected to the electric strength tests specified in clause **13** and if applicable, table 19 note 15. After the test, the control shall continue to comply with clauses **7**, **8**, **13**, and **20**.

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Table 11. Insulation resistance and electric strength

Insert the following new note 14 after note 13.

‘NOTE 14. Additional samples or part-samples may be used for the pre-endurance tests, if it is not possible to apply the electric stresses specified in note 14 to table 19 without first dismantling the samples. The samples that have been dismantled are not then used for the heating and endurance tests.’

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Clause 13.5

Delete the second paragraph and substitute the following.

‘Two separate tests are carried out using the pulses detailed in (a) and (b) and in figure 24. For each test five pulses of voltage shall be applied at intervals of not less than 5 s in one direction and then repeated in the other direction with the following characteristics.

- (a) Pulse width 20 μ s and rise time 1 to 4 μ s
- (b) Pulse width 100 ns and rise time 5 to 10 ns

NOTE. For pulse definitions see figure 24.’

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Clause 14.4.2

Insert after the existing note, the new note 2 and renumber the existing note as note 1.

‘NOTE 2. Where the whole control has been declared as the ‘sensing element’ (see 7.2.14), the heating test should be conducted under the conditions of both 14.4.1 and 14.4.2. If all contacts are open under 14.4.1 conditions, parts are considered to have reached $T_{\max}$ or the temperature determined under 14.4.2 conditions, whichever is higher.’

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Clause 17.1.4

Insert the following new paragraph at the end of the clause.

‘Membrane actuated controls are actuated by the probes shown in figures 25 and 26; probe 2 shown in figure 26 with the hoop fixed in the most onerous plane, being used for the first 5 % of the declared number of cycles of manual operation and probe 1 shown in figure 25 being used for the remainder of the declared number of cycles of manual operation.’

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New clause 17.1.9

After 17.1.8 insert the following.

‘17.1.9 Pre-conditioning membrane actuated controls.

For membrane actuated controls declared as protected against abrasion and detergent, using the detergent specified in B.1.4 the following procedure shall be conducted 10 times.

The accessible surface of the membrane actuated controls shall be subjected to a layer of detergent approximately 0.5 mm deep for a period of two h.

At the end of this period the scabs shall be removed by wiping with damp cloth.

The samples shall be allowed to dry completely.’

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Table 19. Creepage distances, clearances and distances through insulation

In the first column under item (m), insert ‘(note 7)’ after ‘insulation’.

In the first column under item (n), insert ‘(note 7)’ after ‘insulation’.

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Clause 20.3

In lines 3 and 4 of paragraph 1, delete ‘class A or class B’ and substitute ‘class B or class D’.

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Clause 21.1.2 Ball-pressure test

Delete the text between ' T_b is equal to . . . ' and ' . . . (a), (b) or (c), whichever was applicable.' and substitute the following new text.

' T_b for a part is the highest of the temperatures shown below applicable to that part. Where the whole control, has been declared as the 'sensing element' (see 7.2.14), the part is regarded as part of the sensing element and also part of the switch head.

(a) 20 °C in excess of the maximum temperature recorded during the heating test specified in clause 14.

(b) For parts of the switch head:

100 °C, when T_{max} is between 30 °C and up to but excluding 55 °C;

125 °C, when T_{max} is between 55 °C and up to but excluding 85 °C;

T_{max} plus 40 °C if T_{max} is 85 °C or above.

(c) For parts of the declared extent of the sensing element (see 7.2.14), the maximum declared temperature of sensing element (see 7.2.17).'

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Clause 25.1

In paragraph 2, line 1, delete 'not'.

Delete the full stop at the end of paragraph 2 and insert 'in all respects other than the maintenance of the disconnection which is determined by compliance with other clauses, e.g. clauses 13 and 17.'

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Clause A.1 General

Insert the following new paragraph 2 after paragraph 1.

'Notwithstanding the guidance given in this appendix, a declaration of 300 000 cycles of contact operation is normally considered sufficient to prove the electrical durability of a contact system for all household applications.'

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Table 23. Parameters for temperature limiters

Under the column headed 'Appliance' insert

'Stationary instantaneous water heaters' between 'Infra-red . . . ' and 'Tea maker'.

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Table 28. Parameters for manual switches

Delete 'Power tools (BS 2769)³ ON/OFF' in line 3 under M = 50 000.

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Table 29. Parameters for miscellaneous electro-magnetic and electro-thermal controls

Insert the following after the entry for 'still projector' and before the entry for 'refrigerator':

in the column headed 'A'; '6 000'

in the column headed 'M'; '—'

in the column headed 'Appliance'; 'Ceramic hob'

In the column headed 'Particular purpose of control'; 'Visual indicator'.

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New figures 24, 25 and 26
Insert the new figures 2 (below), 25 and 26, attached.

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Standards publications referred to

Insert the following two references.

- 'BS 3676 Specification for switches for domestic and similar purposes (for fixed or portable mounting)'
- 'BS 5518 Specification for electronic variable control switches (dimmer switches) for tungsten filament lighting'

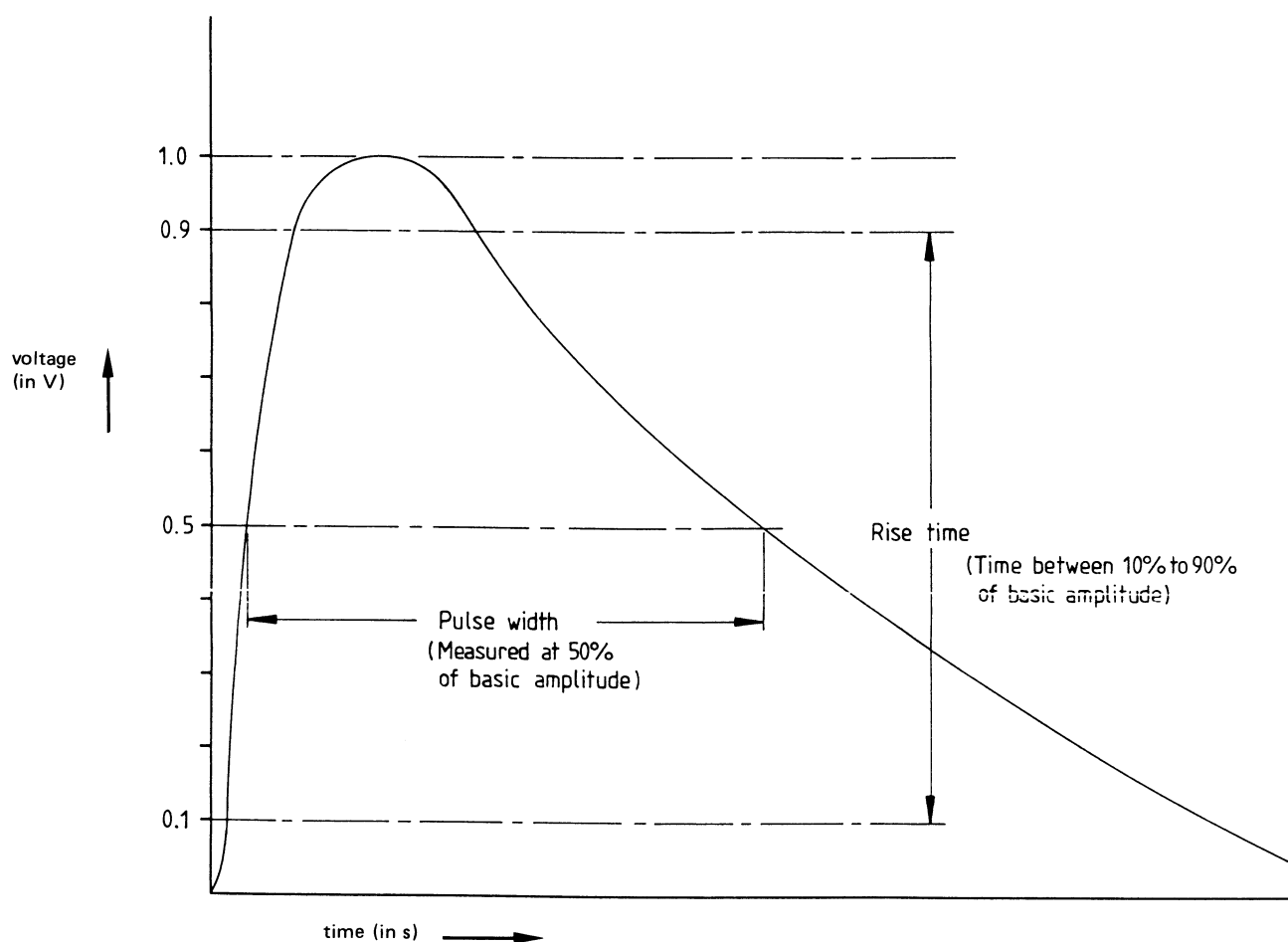


Figure 24. Pulse for voltage spike tests

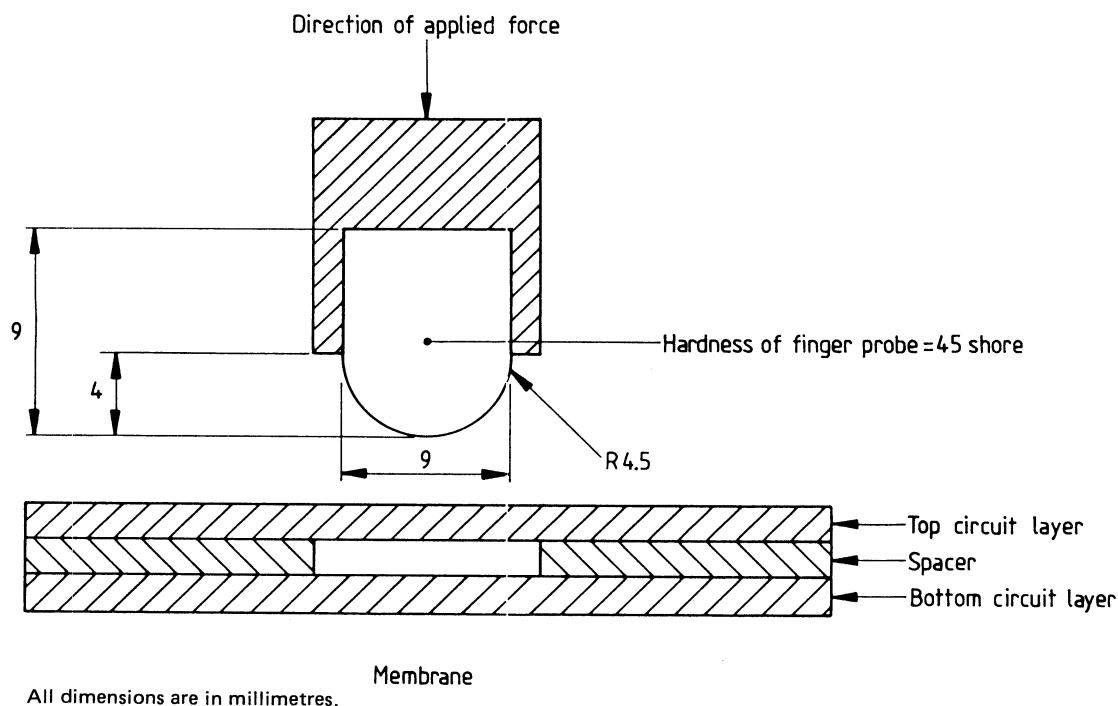
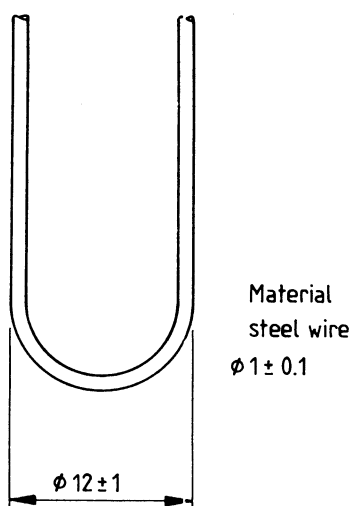


Figure 25. Endurance test probe 1



All dimensions are in millimetres.

Figure 26. Endurance test probe 2

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Foreword

This revision of BS 3955 has been prepared under the direction of the Light Electrical Engineering Standards Committee.

This revision is necessary to consolidate the extensive amendments which have been made to the standard since the previous edition was published in 1979 and to introduce further changes which the use of this standard for certification purposes has shown to be essential.

The 1979 edition was entitled 'Electrical controls for household and similar general purposes', Part 3 'General and specific requirements', and is now withdrawn. Part 3 was used to avoid confusion with BS 3955 : Part 1 : 1965 'General requirements' and specific requirements in Sections 2A, 2B, 2C, 2D, 2E and 2F of Part 2 of BS 3955. Part 1 and all the Sections of Part 2 were withdrawn in October 1981. This 1986 revision specifies the general and specific requirements in a single standard, as was the case in Part 3, but since Parts 1 and 2 have been withdrawn it is no longer necessary to publish this standard as a Part.

This British Standard is related to IEC Publication 730-1 'Automatic electrical controls for household and similar use' Part 1 'General requirements for household and

similar use'. When Part 2 'Particular requirements for controls for household appliances' of IEC Publication 730 is published it is expected that European harmonization will be considered in CENELEC, the European Committee for Electrotechnical Standardization.

The main changes in this revision are as follows:

- requirements for electronic controls and electronic assemblies;
- requirements for the assessment of electronic components failure;
- a new appendix, appendix E, 'Typical electronic component fault conditions';
- a new means of disconnection, class D disconnection by an electronic device and a new appendix, appendix F, 'Guidance on the use of class D circuit disconnection';
- revised requirements for tab dimensions;
- guidance on values of utilization parameters for new types of controls and controls in new applications;
- a large number of detailed changes necessary to bring the standard up to date.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

British Standard Specification for

Electrical controls for household and similar general purposes

1. Scope

1.1 This British Standard specifies requirements and tests for electrical controls either electrically operated or designed to control an electrical function, or both, with a rated voltage not exceeding 500 V and a rated current not exceeding 63 A, for use with appliances and apparatus for household and similar general purposes, hereafter referred to as appliances.

This standard applies to controls which may be integrated with, or incorporated in or on, appliances and also to independently mounted controls and to free-standing controls.

The requirements of this standard are based on the assumption that, in normal use, the voltage between the supply lines and earth does not exceed 250 V.

This standard is also applicable to controls incorporating electronic devices, units or assemblies.

NOTE 1. Where an electronic control is used with a fuel burning appliance, further requirements may be applicable.

This standard does not apply to PTC, NTC and VDR elements that are inherent in a controlled load and which may therefore provide a control function. It does, however, apply to controls incorporating such elements in whatever function.

NOTE 2. Controls intended for operation in hazardous locations, e.g. in explosive gas atmospheres and in situations to which the Offices, Shops and Railways Premises Act 1963, and the Factory Acts apply, may require special constructional features not covered by this standard.

NOTE 3. This standard does not specify requirements for operation with mains-borne perturbations.

1.2 This standard is concerned primarily with safety but it also contains some performance evaluation where such performance is directly associated with safety of the user.

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

2. Definitions

NOTE. The terms voltage and current imply the root mean square (r.m.s.) values unless otherwise specified.

For the purposes of this British Standard the following definitions (listed in alphabetical order) apply.

2.1 accessible part or surface. That which can be touched by the test finger shown in figure 7 when the control is installed as in normal use and when detachable parts have been removed.

2.2 activating quantity. A physical state of a medium, the variation or stability of which is being sensed.

2.3 actuate (actuation). A manual movement of the actuating member of the control by the user.

2.4 actuating means. Any part that connects the actuating member to the mechanism of the control or appliance, and

which can, in the absence of the actuating member, be used to actuate the control or appliance during the tests of this standard.

2.5 actuating member. That part which is moved, pulled, pushed or turned manually to cause the control to operate, to initiate the control function or to regulate the control.

NOTE. It does not include any device such as a set screw used to adjust the control if such a device is adequately locked against further movement or if a tool is required for its adjustment. Sealing compound or a lock nut are both considered to provide adequate locking.

2.6 adjust. To change or vary by the use of a tool the characteristics of the automatic or manual functions of a control.

2.7 automatic function. The mechanical movements and contact operations that occur as a result of a change of value of the activating quantity influencing the sensing element (sensor operation) or as a result of operation by a prime mover (motor operation).

NOTE. Some mechanical movements and contact operations may result from both automatic and manual functions.

2.8 class A circuit disconnection. A non-cycling interruption of a circuit intended for full electrical disconnection and which provides air gaps in two or more poles of at least 3 mm. These gaps may be obtained by an automatic function or a manual function, but they are secure against any subsequent infringement by an automatic function.

NOTE 1. Some controls may incorporate circuit disconnection of more than one class.

NOTE 2. Class A disconnection provides electrical isolation for all live parts behind the disconnection.

NOTE 3. An electronic device does not provide this disconnection.

2.9 class B circuit disconnection. A non-cycling interruption of a circuit for functional disconnection and which provides an air gap satisfying certain electric strength requirements in at least one pole. The gap may be obtained by an automatic function or a manual function, but is secure against any subsequent infringement by an automatic function between defined limits of that function. (See 7.2.20.)

NOTE 1. See 7.2.20.

NOTE 2. Some controls may incorporate circuit disconnection of more than one class.

NOTE 3. Class B circuit disconnection ensures that, for all non-sensing controls, the function controlled by the disconnection is secure and that, for all sensing controls, the function controlled is secure between the limits of the activating quantity declared in 7.2.20.

NOTE 4. An electronic device does not provide this disconnection.

2.10 class C circuit disconnection. An interruption of a circuit by a cycling action or a non-cycling action which does not ensure class A, class B or class D circuit disconnection.

NOTE. Some controls may operate circuit disconnections of more than one class.

2.11 class I control. An independently mounted or free-standing control having at least functional insulation throughout and provided with an earthing terminal or earthing contact, and for controls designed for connection by means of a flexible cable or cord provided with either an appliance inlet with earthing contact or a non-detachable flexible cable or cord with earthing conductor.

NOTE. Class I controls may have parts with double insulation or reinforced insulation or parts operating at extra-low voltage.

2.12 class II control. An independently mounted or free-standing control with double insulation and/or reinforced insulation throughout.

NOTE 1. The existence of an earthing symbol (see 7.1.4), is considered to imply the existence of an earthing terminal.

NOTE 2. Class II controls may have parts operating at extra-low voltage.

2.13 class III control. An independently mounted or free-standing control designed for operation at extra-low voltage and which has no circuits either internal or external which operate at a voltage other than extra-low voltage.

2.14 clutch. A mechanical device by which an actuating member can override either a prime mover or an activating quantity.

2.15 control. A device that controls a function (electrical or otherwise) of an appliance or part of it, either manually or automatically.

2.16 cord actuated control. A control intended to be mounted in or on an appliance and actuated by means of a pull cord or chain.

2.17 cover (or cover plate). A part that is accessible when the control is mounted as in normal use and which is removable only with the use of a tool but which does not require the use of a special purpose tool for this purpose.

2.18 current sensing control. A control the operation of which depends substantially on the value or the change in the value of a current passing through the sensing element.

2.19 detachable cable or cord. A flexible supply cord connected to the control or appliance with an appliance coupler.

2.20 detachable part. A part that is removable without the use of a tool when the control is mounted as in normal use.

2.21 dirt-free situation. A situation in which the inside of the control is not exposed to the deposition of dirt as, for example, in the case of a close fitting cover. It is not necessary that this cover should be hermetically sealed or provided with a gasket.

2.22 dirty situation. A situation in which the deposition of dirt is greater than in a normal situation, for example if the atmosphere of normal closed domestic premises is circulated and the control is placed in the uncleaned (unfiltered) air stream.

2.23 discrete. That which is separate, individual, or discontinuous.

2.24 double insulation. Insulation comprising both functional insulation and supplementary insulation.

2.25 drift. The maximum alteration of the value of the operating characteristic of any one sample which can occur when it is tested under the conditions specified in this standard.

NOTE. The alteration may be related to an absolute value or combined with the manufacturer's deviation if permitted by the appropriate subclause of clause 15.

2.26 duty cycle of an appliance. A cycle of operations or sequence of operations from initiation by the user to the completion of the intended functions.

NOTE. The duty cycle of a vacuum cleaner is from the switching on of the appliance to the switching off. The duty cycle of a washing machine is from the initiation of a programme to its completion.

2.27 encapsulated situation. A situation effectively protected against the ingress of pollution by means of a seal of cross-linked polymer or other similar material.

2.28 energy regulator. A variable self-recycling motorized control which varies and regulates the energy to a load by making and breaking the circuit; the ratio of the ON to the ON plus OFF time determining the average energy supplied.

NOTE. An energy regulator, which is often electrothermally operated, is substantially independent of external activating quantities such as temperature. If such a control is not substantially independent of temperature, it should be classified as a temperature-sensing control with self-heat.

2.29 enclosed control. A control that does not rely for protection of live parts on the method of mounting in the appliance.

2.30 external cable, cord or conductor. Any cable, cord, or conductor that is external to an independently mounted or free-standing control, or external to an appliance in or on which a control is mounted, and the conductors of such cables and cords.

2.31 extra-low voltage. A nominal voltage not exceeding 42 V between conductors and between conductors and earth, the no-load voltage not exceeding 50 V.

NOTE. BS 3456 additionally specifies a maximum r.m.s. voltage to earth of 30 V.

2.32 free-standing control. A separately cased control that is intended to be connected to the supply and/or to an appliance by means of flexible cables or cords, socket outlets or connectors only. If it may, for convenience, be fixed to a wall or an appliance, it will nevertheless comply with all the appropriate requirements after removal. If such a control is, or is intended to be, directly connected to either an appliance or another control which is fully marked according to the requirements of BS 3456 or BS 3955 respectively, by a non-rewirable flexible cable or cord, it is, for the purpose of marking only, regarded as an integrated control.

2.33 functional insulation. The insulation necessary for the proper functioning of the control and for basic protection against electric shock.

2.34 humidity sensing control. A control that responds automatically to the value or change in the value of humidity.

2.35 incorporated control. A control intended for eventual incorporation in or on an appliance, but which can be tested separately for all requirements of this standard.

2.36 independently mounted control. A control designed for permanent connection to fixed wiring but mounted away from the appliance which it controls, for example a room thermostat.

2.37 index. Any actuation that moves an actuating member into a located position for the purpose of varying or changing a controlled parameter.

2.38 in-line cord control. A free-standing control that, in use, is intended to be suspended by its flexible cable(s) or cord(s) irrespective of where these enter the control.

2.39 integrated control. A control the operation of which is dependent on its correct mounting and fixing in an appliance and which can only be tested when associated with the relevant parts of that appliance.

2.40 intermediate position. Any position of an actuating member that is adjacent to a located position and in which the actuating member can be left.

2.41 light-sensing control. A control that responds automatically to the value or a change in the value of the light to which its light-sensing element is sensitive.

2.42 liquid level sensing control. A control that responds automatically to the level or change in level of a liquid.

2.43 live part. A conductive part that is at a potential with respect to any other conductive part in normal use but excluding conductive parts connected or intended to be connected directly to the earthing means.

2.44 manual function. The immediate mechanical movements and contact operations that occur as a result of each discrete manual actuation of an actuating member or means.

NOTE. A manual actuating member or means may be associated with one or more manual functions. An example of the latter is a rotary control in which different sectors of the rotation are associated with different functions. 'Manual' includes cord and foot operation.

2.45 manufacturer servicing. Denotes servicing that is done only by the manufacturer or his accredited servicemen.

NOTE. This may be due to the need for special tools, or special instrumentation, and includes the adjustment of a control.

2.46 manufacturing deviation. The maximum difference in values of an operating characteristic, an operation time or an operating sequence that may be obtained between any two controls supplied by the manufacturer to a unique type reference when tested in the new condition in the same manner.

NOTE. The difference may be related to an absolute value if permitted by the appropriate subclause of clause 15.

2.47 motorized control. An automatic control that is not sensitive to an activating quantity but which is operated by a prime mover.

2.48 multi-range energy regulator. An energy regulator with more than one range of regulation.

2.49 non-rewirable flexible cable or cord. A flexible supply cord that cannot be replaced by the user without damaging part of the appliance, control or the flexible cable or cord.

NOTE. Provision can be made for replacement of such a cable or cord by the manufacturer's service organization or an equivalent.

2.50 non-self-recycling motorized control. A motorized control that stops at the end of each cycle and requires manual actuation before the next cycle can take place.

2.51 non-self-resetting thermal cut-out. A thermal cut-out that requires resetting by hand in order to restore the current.

NOTE. A non-self-resetting thermal cut-out provides class A, class B or class D disconnection.

2.52 normal situation. A situation in which the deposition of dust from the atmosphere prevailing in normal closed domestic premises is likely to occur on the electrical or moving mechanical parts of the control.

2.53 normal use. Denotes the use of the control, in or with its associated equipment, for the purpose for which it was made, and in the manner intended by the manufacturer.

2.54 NTC (negative temperature coefficient) thermistor. A resistive element made of conductive material which shows, over the resistance-temperature characteristic, a decrease in its electrical resistance with increasing temperature associated with a change in the crystalline structure.

2.55 OFF condition. That condition which can be achieved manually or automatically, in which the function being controlled is secure against reactivation within the limits and parameters specified for that function.

NOTE. An OFF condition may be achieved by class A, class B or class D circuit disconnection.

2.56 OFF position. A position providing a visible indication of an OFF condition.

NOTE. The markings on the tappets, or an anticipatory actuating member, of a continuously cycling motorized control or the markings on a central heating programmer where infringement of a disconnection would result only in a hot water radiator circuit or a hot water storage circuit coming on when not intended, are disregarded for the purpose of this definition.

2.57 operate (operation). The movement that occurs as a result of an automatic function or a manual function.

NOTE. Contacts operate as the result of either automatic or manual function.

2.58 operating characteristic. The value of the relevant temperature, pressure, current, etc., at which a sensing control operates on a rise or fall of the activating quantity.

2.59 operating sequence. The designed order or pattern in which, and/or the time at which, the contacts of a control are intended to open or close, as a result of either an automatic or a manual function. It includes the pattern of opened or closed contacts in any rest position, indexed intermediate or regulated, of the control.

2.60 orientation. A relationship with a datum defined by angles or dimensional co-ordinates.

2.61 plug-in control. A control that is connected by means of a simple manual operation, with or without the aid of a tool, and for which the electrical connection is not otherwise tested by the clauses of this specification.

2.62 position sensing control. A control that responds automatically to the position or change in the position of the medium or part to whose position it is sensitive.

2.63 pressure-sensing control. A control that responds automatically to the value or a change in value of the pressure to which its pressure-sensing element is sensitive.

2.64 prime mover. Any device used to provide the mechanical energy required to operate a motorized control.

NOTE. A prime mover may be a mechanical storage device (clock-work spring), an electro-magnetic device (electric motor, or stepping solenoid), an electro-thermal device (heating element of an energy regulator) or any other time-based mechanism.

2.65 PTC (positive temperature coefficient) thermistor. A resistive element made of conductive ceramic material which shows, over at least part of the resistance-temperature characteristic, an important anomalous increase in its electrical resistance with increasing temperature associated with a change in the crystalline structure. The change in temperature is obtained either by the flow of current through the thermosensitive element or by a change in the ambient temperature or by a combination of both these means. These elements also exhibit a decreasing resistance with applied voltage, as a secondary effect.

2.66 pull cord. An actuating member made of flexible insulating or insulated material.

2.67 rated frequency or rated frequency range. The frequency or frequency range assigned to the control by the manufacturer.

NOTE. If a frequency range is given, then it is expressed by its lower and upper limits.

2.68 rated voltage, current or wattage. The voltage, current or wattage assigned to the control by the manufacturer. For three-phase supply the rated voltage is the line voltage.

2.69 rated voltage, current or wattage range. The voltage current or wattage ranges assigned to the control by the manufacturer and expressed by lower and upper limits.

NOTE. See also 4.13.

2.70 receptacle. A female termination capable of being permanently joined to wiring without the use of solder, intended for snap-on attachment to a tab.

2.71 regulate (regulation). Any actuation which moves an actuating member into a non-located position for the purpose of varying or changing a controlled parameter.

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

NOTE. The term 'insulation system' does not imply that the insulation must be one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or functional insulation.

2.73 relay. A control that uses electro-magnetic or electro-thermal means to operate electrical contacts.

NOTE. Motor start relays and other current sensitive devices are excluded.

2.74 rewirable flexible cable or cord. A flexible supply cord which can be replaced by the user without damaging part of the appliance, control or the flexible cable or cord.

NOTE. The breakage of paint seals is not regarded as damage.

2.75 screwless terminal. A device intended for rewirable connections of a conductor to electrical equipment, or for rewirable interconnection of two connectors, the connection being achieved directly or indirectly by means of springs, wedges, eccentrics, cones or the like.

NOTE. The following are not regarded as screwless terminals:

- terminals requiring the fixing of special devices to the connectors before clamping them in the terminal, for example, snap-on connectors;
- terminals requiring wrapping of the conductors, for example those with wrapped joints;
- terminals providing direct contact to the conductors by means of edges or points penetrating the insulation.

2.76 self-recycling motorized control. A motorized control that continues with a subsequent cycle when the preceding one has been completed.

2.77 self-resetting thermal cut-out. A thermal cut-out that automatically restores the current after the relevant part of the appliance has cooled down sufficiently.

2.78 self-heat. Heat generated within the control either by intention or otherwise which assists or tends to assist or influence the thermal operation of the contacts.

2.79 sensing element. That part of a control which is intended to be exposed to the influence of an activating quantity. If it is impossible to distinguish between the sensing element and the switch head, the sensing element is taken to include the whole control.

2.80 servicing. Denotes any process necessary to maintain the control, in or with its equipment, in good order, that would be done by a competent person, such as in a workshop, by an electrician or by a service organization.

2.81 single range energy regulator. An energy regulator with only one range of regulation.

2.82 special purpose tool. A tool which is unlikely to be readily available in a normal household, for example a box spanner. Tools such as coins, or screwdrivers and spanners designed to operate square or hexagonal nuts are not special purpose tools.

2.83 supplementary insulation (protective insulation.)

An independent insulation provided in addition to the functional insulation in order to ensure protection against electric shock in the event of a failure of the functional insulation.

2.84 switch head. The complete control excluding only the sensing element.

2.85 tab terminal. A male termination intended for connection to circuit wiring by a receptacle.

2.86 temperature limiter. A temperature sensing control that in operation limits the temperature attained by an appliance, part of an appliance or a medium, and which in normal use operates only once under electrically loaded conditions during each discrete part of a duty cycle of an appliance. The reverse operation either may not occur during this duty cycle or may be electrically unloaded by an auxiliary control. Regulation by the user is permissible for both type 1 and type 2 temperature limiters. It may or may not require manual resetting.

2.87 thermal cut-out. A device that, during abnormal operation, limits the temperature of an appliance, or of parts of it, by automatically opening the circuit or by reducing the current, and which is so constructed that its setting cannot be altered by the user.

2.88 thermal link. A thermal cut-out which operates only once and then requires partial or complete replacement.

2.89 thermostat. A temperature-sensing control that operates by cycling during normal use and which is designed to keep the temperature of an appliance, parts of an appliance, or a medium between certain values.

2.90 tool. A screwdriver, a coin or any other object that may be used to operate a screw or similar fixing means.

2.91 type 1 control. A control that has operating characteristics which do not have to be tested for reliability.

NOTE. The safety of the user and the thermal, mechanical or other safety aspects of an appliance may not rely on the operating characteristics of such a control.

2.92 type 2 control. A control that has to be tested for reliability of its operating characteristics.

2.93 unenclosed control. A control that relies on the method of mounting in the appliance for the protection of live parts.

2.94 unique type reference. A marking that consists of one or more letters, numbers, symbols, colour coding, etc., or any combination of similar items such that by quoting them in full to the manufacturer of the control a replacement can be supplied by the manufacturer which will be fully interchangeable with the original, electrically, mechanically, dimensionally and functionally.

2.95 user maintenance. Denotes any periodic process necessary to maintain the control, in or with its equipment, in good order, for which details are given in the manufacturer's instructions to the user.

2.96 VDR (voltage dependent resistor). A resistive element which does not produce a dynamic imbalance of electrons and which shows over at least part of its resistance-voltage characteristic an important decrease in its electrical resistance with increasing voltage.

2.97 velocity sensing control. A control that responds automatically to the velocity or change in velocity of the medium or part to whose velocity it is sensitive.

2.98 working voltage. The voltage to which the part under consideration is subjected when the equipment is operating at its rated voltage under conditions of normal use or likely fault.

2.99 electronic assembly. A group of components at least one of which is an electronic device but in which individual parts may be replaced without damage to the assembly.

NOTE. An example of this is a group of components mounted on a printed circuit board.

For the purposes of this standard, electronic devices, electronic units and electronic assemblies are collectively referred to as electronic parts.

2.100 electronic control. A control that contains at least one electronic device.

2.101 electronic device. A device that produces a dynamic imbalance of electrons.

2.102 electronic unit. A group of components, at least one of which is an electronic device and in which the components cannot be replaced without damage.

NOTE. An example of this is an integrated circuit.

2.103 protective impedance. An impedance connected between live parts and accessible conductive parts, of such a value that the current, in normal use under likely fault conditions in the equipment, is limited to a safe value, and that is so constructed that the reliability is maintained throughout the life of the equipment.

2.104 class D circuit disconnection. A non-cycling interruption by an electronic device of an a.c. circuit for functional disconnection, which provides a disconnection other than by means of an air gap by satisfying certain electrical requirements in at least one pole. The disconnection may be obtained by an automatic function or a manual function but is secure against any subsequent infringement by an automatic function between defined limits of that function. (See 7.2.20.)

NOTE 1. Some controls may incorporate circuit disconnections of more than one class.

NOTE 2. Class D circuit disconnection ensures that, for all non-sensing controls, the function controlled by the disconnection is secure and that, for all sensing controls, the function controlled is secure between the limits of the activating quantity declared in 7.2.20.

NOTE 3. See appendix F for guidance on the use of class D disconnection.

2.105 operating time. A period of operation of an automatic function at the maximum cycling rate assigned to the control by the manufacturer which represents a similar degree of usage to that likely to occur (at varying cycle rates) during the duty hours indicated in table 18 for the type of appliance or equipment in which the control is to be used.

NOTE. For controls where the cycling rate of an automatic function is substantially independent of the applications of the control, e.g. energy regulators, manufacturers may declare an operating time together with a maximum cycling rate as an alternative to a declaration of a total number of operations, see 7.2.7.

2.106 indirectly operated control. An incorporated control intended to be operated by means which are not tested with the control.

NOTE. A switch supplied without an actuating member but intended for manual use with such a member is not considered to be an indirectly operated switch.

3. General requirement

3.1 Controls shall be so designed and constructed that, in normal use, they function reliably and cause no danger to persons or surroundings even in the event of such careless use as may occur in normal service.

In general, compliance with the requirements of the standard is checked by carrying out all the tests specified.

3.2 Where this standard is used for the purpose of granting nationally recognized certificates or certification marks, designs or constructions to which the tests specified do not fully apply but which give an equivalent degree of safety and durability of safety may be regarded as complying with the requirements of this standard, subject to the findings of a special investigation by the authority granting the certificate or certification mark and pending the issue of an amendment or extension to this standard.

4. General notes on tests

4.1 Tests according to this standard are type tests.

4.2 Unless otherwise specified the samples shall be tested as delivered after mounting, fixing or installing in the most unfavourable position or orientation declared by the manufacturer.

If the test results are influenced by the temperature of the ambient air this shall be maintained at $20 \pm 5^\circ\text{C}$ except that, in cases of doubt, it shall be maintained at $23 \pm 2^\circ\text{C}$.

4.3 An integrated control shall be tested in the particular appliance or part thereof. All other controls shall be tested separately as detailed in this standard.

Free-standing controls intended to be used with a non-detachable flexible cable or cord shall be tested with the type of flexible cable or cord intended to be connected to the control.

4.4 Unless otherwise specified the tests shall be carried out in the order of the clauses of this standard. It will be necessary to refer to appendix A in order to obtain values of parameters for the tests of controls for use in any particular type of appliance or any particular application.

4.5 Except where otherwise stated, one sample shall be used for each of the tests specified in clauses 7 to 11 and 18 to 25. The sets of samples given in table 1 shall be subjected to the remaining tests.

If the temperature for the automatic function of a control which provides circuit disconnection is outside the range 20°C to 30°C , it may be necessary to test additional samples that are adjusted to have circuit disconnection within the range 20°C to 30°C .

4.6 If the controls are intended for more than one rated voltage and/or rated current, the tests specified in clause 17 shall be made on sets of samples for each combination of rated voltage and rated current.

Controls with a.c. and d.c. ratings shall be treated as separate submissions for endurance tests. When testing controls designed for d.c., only the possible influence of polarity on the operation of the control shall be taken into consideration by the testing authority.

NOTE. At the option of the testing authority a reduced number of submissions may be made, the test or tests being made at the rating(s) which provide the most arduous test(s).

4.7 If one sample fails during the tests specified in clauses 12 to 17 such as to cause non-compliance with the provisions of the appropriate subclause, the test that caused the failure and those preceding, which may have influenced the result

of that test, shall be repeated on another set of samples, all of which shall then comply with the repeated tests.

NOTE. The manufacturer may submit, together with the first set of samples, the additional set(s) which may be wanted should one or more than one sample fail. The testing authority may then, without further request, test the additional samples and may only reject them if a further failure occurs. If the additional sets of samples are not submitted at the same time, a failure of one sample may entail a rejection.

Table 1. Number of samples for tests specified in clauses 12 to 17

Control as classified by function	Number in set
Thermostats	3
Temperature limiters	3
Self-resetting cut-outs	3
Non-self-resetting cut-outs	3
Thermal links*	6
Energy regulators	3
Motorized controls	3
Manually operated switches	3
Current sensing controls	3
Pressure sensing controls	3
Position sensing controls	3
Light sensing controls	3
Velocity sensing controls	3
Liquid level sensing controls	3
Humidity sensing controls	3
Relays	3

*Further samples of the replaceable part of thermal links will be required as detailed in 17.6.

NOTE. Further samples may be required for the tests specified in 17.4 and 18.2.

4.8 Controls that are otherwise identical but which may be adjusted by the manufacturer, or which may, by the inclusion at the manufacturing stage of alternative components or parts, produce various operating characteristics, operation times or operating sequences, shall, for the purposes of this standard, be treated as separate submissions. Agreement between the testing authority and the manufacturer may allow a multiple submission and the approval of a range of such controls in one report and certificate.

In these cases due attention shall be paid to possible variations in manufacturing deviation and drift of any operating characteristic, operation time, or operating sequence, and to sensor controls for the minimum and maximum acceptable rates of rise and fall of the appropriate activating quantity that may be applicable to different parts of the range.

4.9 If class I controls or controls for class I appliances have parts that require double insulation or reinforced insulation, such parts shall also be checked for compliance with the appropriate requirements specified for class II controls.

Similarly if class I or class II controls or controls for class I or class II appliances have parts declared as operating at extra-low voltage, such parts shall also be checked for compliance with the appropriate requirements specified for class III controls.

4.10 Controls that are designed to sense more than one activating quantity and to which more than one classification is applicable shall in general be tested for each activating

quantity separately, all other activating quantities being maintained constant at the most arduous value within the declared range for each test.

Controls for which requirements are not specified in clause 17 shall be tested in such a manner agreed between the manufacturer and the testing authority that the essential designed operating characteristics, etc., are adequately tested.

4.11 Any control not detailed in table 1 may be tested and approved to this specification except for clause 17. In these cases a test schedule for clause 17 shall be agreed between the manufacturer and the relevant testing authority, such schedules being based wherever possible on the intent of clause 17.

4.12 During the tests specified in this standard, manual actuation may be performed by test equipment if so desired.

4.13 The rated voltage of contacts of controls is considered to be the maximum rated voltage assigned to the control. The minimum supply voltage is then assumed to be 10 % of the rated value unless a range is declared (see the definition of rated voltage range). When, in later clauses in this standard, phrases such as '0.9 or 1.1 times rated voltage' are used, the 0.9 is assumed to refer to the minimum rated voltage and the 1.1 to refer to the maximum rated voltage.

NOTE. If an indicator lamp is incorporated for illuminating functions in a control, it is not expected to provide the illuminating functions when the control is used at a voltage below 94 % of the minimum rated voltage.

4.14 The rates of temperature change declared in 7.2.11 and used in clause 17, that is α_1 and β_1 , shall have a test tolerance of $\pm 12^\circ\text{C/h}$. For the purpose of test the minimum rates of temperature change shall be $15 \pm 12^\circ\text{C/h}$.

NOTE. These minimum rates and tolerances are under consideration.

4.15 Electronic controls shall be tested as electrical controls unless otherwise specified.

4.16 For electronic controls, cumulative stress, as a result of sequential testing, should be avoided. It may be necessary to replace the affected samples or to use additional samples.

NOTE. The number of samples should be kept to a minimum by an evaluation of the relevant circuits.

4.17 Care should be taken that the supply shall be free of such perturbations from external sources as may influence the results of the test.

4.18 If an electronic unit is so enclosed that the testing of individual components is impossible, then the entire electronic unit shall be considered as a whole.

It is, however, permitted to take apart electronic units that are not so vacuum sealed, completely encapsulated, moulded-in or potted that the enclosure forms one moulded part with the enclosed components, for the purpose of establishing creepage distances and clearances between live parts and other metal parts as specified in clause 20.

It is also permitted to take apart any electronic units for the purpose of measuring the distance through insulation between live parts and accessible parts.

4.19 If an electronic unit or assembly is tested separately, the conditions of heat dissipation declared in accordance with 7.2.12 shall be, if necessary, simulated during the tests.

5. Rating and nature of supply

5.1 The maximum rated voltage shall be 500 V

5.2 The maximum rated current shall be 63 A.

6. Classification

Controls shall be classified as follows.

6.1 Nature of supply. Classification according to the nature of the supply shall be as follows:

(a) controls for a.c. only;

NOTE. Controls for a.c. only may be used on d.c. circuits with a maximum rating of 10 % of the a.c. current rating or 0.1 A, whichever is smaller.

(b) controls for d.c. only;

(c) controls for a.c. and d.c.;

(d) controls for specific or multiple supplies.

6.2 Type of circuit to be controlled. Classification according to the type of circuit to be controlled shall be as follows:

(a) controls for substantially resistive loads with power factors of 0.95 or greater;

NOTE. Controls for substantially resistive loads may be used for inductive loads with a power factor of at least 0.8, but only up to 60 % of their rated current. They may also be used for reactive loads with a power factor less than 0.8, provided that the total current does not exceed 5 % of their rated current. Controls may also be used for tungsten lamp loads provided that the steady state current does not exceed 10 % of the rated current.

(b) controls for resistive and inductive loads with a power factor of 0.6 or greater, but less than 0.95;

NOTE 1. Controls for resistive and inductive loads may be such that some of their contacts control resistive loads only, while others control an inductive load.

NOTE 2. Controls for inductive ratings only may be classified under this heading by declaring that the resistive rating equals the inductive rating.

NOTE 3. Controls for resistive and inductive loads may also be used for tungsten lamp loads, provided that the steady state current does not exceed either (a) 10 % of their rated resistive current or (b) 60 % of their rated inductive current, whichever is the greater.

(c) controls for specific types of loads only.

NOTE. Lamp loads, highly inductive loads with a power factor of less than 0.6 and capacitive loads are examples.

6.3 Function. Classification according to the function of the controls shall be as follows:

- (a) thermostat;
- (b) temperature limiter;
- (c) self-resetting thermal cut-out;
- (d) non-self-resetting thermal cut-out;
- (e) thermal link;
- (f) energy regulator;
- (g) motorized control;
- (h) manually operated switch;
- (i) current sensitive control;
- (j) pressure sensing control;
- (k) position sensing control;
- (l) light sensing control;
- (m) velocity sensing control;
- (n) liquid level sensing control;
- (o) humidity sensing control;
- (p) relay;
- (q) indirectly operated switch.

6.4 Exposure of live parts. Classification according to exposure of live parts shall be as follows:

- (a) unenclosed controls;
- (b) enclosed controls.

NOTE. For unenclosed controls the protection against electric shock is provided by the enclosure of the appliance within which the control is mounted.

6.5 Degree of protection against moisture. Classification according to the degree of protection against moisture shall be as follows:

- (a) ordinary controls;
- (b) drip-proof controls;
- (c) splash-proof controls;
- (d) watertight controls.

NOTE 1. Ordinary controls are not provided with any special protection against moisture.

NOTE 2. For the purposes of this standard, unenclosed controls are considered to be ordinary controls. It is, however, understood that a higher degree of protection against moisture may be obtained when the control is mounted in the appliance.

6.6 Terminals. Classification according to terminals shall be as follows:

- (a) controls with one or more terminals intended for connection of conductors of rewirable external cables or flexible cables and cords;
- (b) controls with none of the terminals intended for connection of conductors of rewirable external cables or flexible cables and cords.

NOTE. 'External' denotes external to the appliance for integrated and incorporated controls and external to the control for independently mounted and free-standing controls.

6.7 Ambient temperature limits of the switch head. Classification according to the ambient temperature limits of the switch head shall be as follows:

- (a) controls with a switch head for use at ambient temperatures between a minimum ($T_{\min}$) of 0 °C and a maximum ($T_{\max}$) of 55 °C;
- (b) controls with a switch head for use at ambient temperatures between a specified minimum ($T_{\min}$) and a specified maximum ($T_{\max}$).

$T_{\min}$ shall be not higher than 0 °C;

$T_{\max}$ shall be not lower than 30 °C.

NOTE 1. Preferred values for $T_{\max}$ are 55 °C, 85 °C, 105 °C and 150 °C. There are no preferred values for $T_{\min}$.

NOTE 2. Values of $T_{\max}$ differing from the preferred values are allowed.

6.8 Protection against electric shock. Classification according to protection against electric shock shall be as follows:

(a) controls for integration;

NOTE. These are in accordance with the class of the appliance in which they are integrated.

(b) controls for incorporation:

- (1) in class I appliances;
- (2) in class II appliances;
- (3) in class III appliances.

NOTE 1. For definitions of class I, class II and class III appliances see BS 3456 : Part 101.

NOTE 2. Controls for incorporation in any class of appliance may be used for a different class if the appropriate provisions are made in the appliance.

(c) independently mounted controls:

- (1) class I independently mounted controls;
- (2) class II independently mounted controls;
- (3) class III independently mounted controls.

- (d) free-standing controls:
 - (1) class I free-standing controls;
 - (2) class II free-standing controls;
 - (3) class III free-standing controls.

6.9 Protection against deposition of dirt. Classification according to protection against deposition of dirt shall be as follows:

- (a) controls for use in dirt-free situations;
- (b) controls for use in normal situations;
- (c) controls for use in dirty situations.

NOTE. Compliance with the requirements for normal or dirty situations may be achieved either by using the appropriate creepage and clearance distances specified in clause 20 or by suitable enclosure to create a dirt-free situation.

6.10 Class of circuit disconnection provided by each function. Classification according to class of circuit disconnection provided by each function shall be as follows:

- (a) class A disconnection;
- (b) class B disconnection;
- (c) class C disconnection;
- (d) class D disconnection.

NOTE 1. Different functions of the control may provide different circuit disconnections.

NOTE 2. PTC, NTC and VDR elements that provide a control function are deemed to be class C disconnection.

6.11 Duration of operation of the control. Classification according to the duration of operation of the control shall be as follows:

- (a) controls for continuous operation;
- (b) controls for short-time or intermittent operation.

NOTE. Independently mounted and free-standing controls are classified only for continuous operation.

6.12 Whether or not any operating characteristic is tested for reliability. Classification according to whether or not any operating characteristic is tested for reliability shall be as follows:

- (a) type 1 controls;
- (b) type 2 controls.

6.13 Temperature limit of the mounting surface of the control. Classification according to the temperature limit of the mounting surface of the control shall be as follows:

- (a) controls with mounting surface unsuitable for use at a temperature exceeding the ambient temperature referred to in 6.7.
- (b) controls with mounting surface suitable for use at a temperature (T_s , see 7.1.4) exceeding the ambient temperature referred to in 6.7.

6.14 Sockets. Classification of plug-in controls according to sockets shall be as follows.

- (a) *Integral socket*

This is where the socket has been designed as an integral part of the control and which, for test purposes, the socket and the plug-in portion are to be considered as one unit and may be separated in normal use only with the aid of a tool.

In these cases the terminals or terminations for connection are considered to be those of the socket.

The socket shall be marked with a unique type reference distinctive from that of the plug-in part of the control.

- (b) *Ordinary socket*

This is a commercially available socket: any one of several proprietary sockets may be used by the customer equipment manufacturer and an independent certification of the plug-in control is desirable. For this type of

construction it is necessary for certain interference requirements to be established and the control manufacturer shall declare the following parameters:

- (1) maximum 'pin' temperature;
- (2) minimum pull-off force (having in mind the declared methods of mounting).

NOTE. For this type of socket a manufacturer may submit an ordinary socket which has been modified to provide the minimum pull-off force and the maximum pin temperature for which his control is suitable. The test report will contain this information, such that the Appliance Test House can accept other proprietary sockets provided that, by test, the parameters for the alternative socket are contained within the test report values for the control.

- (c) *Certified socket*

A socket-outlet not forming part of the control, but which conforms with a published British Standard. In this construction the plug-in portion of the control shall comply with the relevant parts of the British Standard. A socket complying with the requirements of BS 1363 is considered to be a typical example.

7. Marking and manufacturer's declarations

7.1 Marking. All markings which are required by this standard shall comply with the legibility and durability requirements detailed in appendix B.

7.1.1 Integrated controls shall be marked in accordance with the items shown in table 2.

This requirement does not apply to the marking of terminals of integrated controls where such terminals are only to be used for connection to the internal wiring of appliances.

NOTE. It is sufficient if the marking is on parts of the appliance other than the control if such marking is so placed that it is clear that it refers to the control or, in the case of items 13 to 16 of table 2, if a wiring diagram is suitably fixed to the appliance.

7.1.2 Incorporated controls shall be marked in accordance with the items shown in table 2.

NOTE 1. The requirements for marking of all items, with the exception of items 1 and 2, are considered to be complied with if the required information is supplied by the control manufacturer to enable the appliance manufacturer to comply with the marking requirements of this specification.

NOTE 2. Incorporated controls intended for sale or supply other than to an original equipment manufacturer may require additional information or marking.

7.1.3 Independently mounted and free-standing controls shall be marked in accordance with the items shown in table 2.

7.1.3.1 If, for independently mounted controls, it is necessary to take special precautions when installing the control, details of these shall be given in an instruction sheet which accompanies the control. If such a control is not provided with a non-detachable flexible cord or cable intended to be connected to a plug or with other means for disconnection from the supply having a class A circuit disconnection requirement, the instruction sheet shall state that means for disconnection from the supply having a contact separation of at least 3 mm in all poles must be incorporated in the fixed wiring.

NOTE. Special precautions may for example be necessary for controls for 'building-in', i.e. installation in the fabric of a building. In order to ensure that, after building-in conditions necessary to meet the specification are achieved, the instruction sheet for controls for building-in should include clear information with regard to the following:

- (a) dimensions of the space to be provided for the control;
- dimensions and position of the means for supporting and fixing the control within this space;

- (b) minimum creepage distances and clearances between the various parts of the control and the surrounding parts of the fitment;
- (c) minimum dimensions of ventilating openings and their correct arrangement;
- (d) connection of the control to the supply and the interconnection of separate components, if any.

7.1.3.2 For independently mounted and free-standing class controls the following information shall be given on a label attached to the end of the flexible cable or cord if supplied with the control, otherwise the label shall be attached to or near the input terminals. For class I controls other than those intended to be permanently connected to fixed wiring the information shall also be included in the user instructions:

'WARNING – THIS CONTROL MUST BE EARTHED'

7.1.3.3 For independently mounted and free-standing class I controls supplied with a flexible cable or cord having cores coloured green-and-yellow, brown and blue the user instructions and a label, attached to the flexible cable or cord, shall state the following:

'IMPORTANT

The wires in this mains lead are coloured in accordance with the following code.

Green-and-yellow:	Earth
Blue:	Neutral
Brown:	Live

NOTE. For the purpose of this label 'Live' refers only to the line. Throughout the remainder of this standard the word 'live' is used in the sense employed in the definition of 'live part' in clause 2.

In addition, the user instructions and label shall include the substance of the following:

'Because the colours of the wires in the mains lead of this control may not correspond with the colours or

markings identifying the terminals in your plug, proceed as follows:

The wire which is coloured green-and-yellow must be connected to the terminal in the plug which is marked with the letter E or by the earth symbol $\perp$ or coloured green or green-and-yellow.

The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.

The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red'.

For class II controls supplied with a flexible cable or cord having cores coloured brown and blue, the user instructions and label shall be as specified for class I controls but omitting the warning and the reference to the earth core.

NOTE. For class I controls the label specified in 7.1.3.2 may be used for this purpose. A separate label is not required.

7.1.3.4 For independently mounted and free-standing controls any of the information declared in 7.2 which is necessary for the safe installation, connection and operation of the control shall be given in an instruction sheet which accompanies the control.

7.1.4 The requirements for marking given in table 2 apply where marked 'X', except that for requirement references 12, 23, 24, 25 and 26, the required information may be contained in the manufacturer's installation and/or user instructions; '—' denotes that there is no requirement for a marking.

Table 2. Marking requirements

Control category			Requirement reference	Details of requirement
Integrated controls	Incorporated controls	Independently mounted and free-standing controls		
—	X	X	1	The name or trademark of the manufacturer or responsible vendor (see note 9)
—	X	X	2	The unique type reference (see note 9)
—	—	X	3	Rated voltage or voltage range in volts (see note 2)
—	—	X	4	The nature of supply if the control is not intended for both a.c. and d.c. or if the rating is different for a.c. and d.c. (see note 1)
—	—	X	5	The frequency or frequency range if this is necessary for the correct working of the control
—	—	X	6	For controls for substantially resistive loads, the rated current or current range or the rated wattage or wattage range of the load to be controlled (see note 2)
—	—	X	7	For controls for resistive and inductive loads, the rated current or current range in amperes, or the rated input or input range in volt-amperes of the load to be controlled, both at a power factor of 0.6 (see note 2)
—	—	X	8	For controls for specific loads, the full details of the specific load to be controlled (see note 2)

Table 2 (continued)

Control category			Requirement reference	Details of requirement
Integrated controls	Incorporated controls	Independently mounted and free-standing controls		
—	—	X	9	For controls classified under 6.7(b) the values of $T_{\min}$ and $T_{\max}$ (see note 3)
—	—	X	10	The symbol for the degree of protection against moisture, if applicable
—	—	X	11	The symbol for class II construction for class II controls
—	—	X	12	For multi-circuit controls, the rated current for each circuit and/or for each terminal, if it is different, the marking to be so arranged as to make it clear whether the rating is applicable to the circuit and/or to the terminal (see notes 4 and 5)
X	X	X	13	Unless the method of connection to the supply mains is of no importance or is self-evident, terminals intended for the connection of line supply conductors shall be indicated by the letter L or by an arrow (or arrows) pointing towards the terminal(s), and terminals intended exclusively for the neutral supply conductor shall be indicated by the letter N. See also 7.1.3.1
X	X	—	14	The markings should preferably be on the main body of the control. They may, however, be placed on covers or other parts that are not detachable when the control is mounted as in normal use
X	X	X	15	Earthing terminals shall be indicated by the symbol $\perp$ (see note 10)
X	X	X	16	All terminals shall be suitably indicated, their purpose shall be self-evident, or the control circuitry shall be visually apparent. If the control has terminals intended for supply conductors, the arrow(s) or the letter L or N shall not be used to identify the other terminals (see note 10)
X	X	X	17	Controls intended to be adjusted during installation or independently mounted or free-standing controls to be regulated in normal use shall be provided with an indication for the direction of regulation to increase or decrease the value that is being changed. An indication of + or — is sufficient
X	X	X	18	Those parts of thermal links that have to be replaced shall be so marked as to enable them to be identified from a catalogue or the like even after they have been operated
—	—	X	19	The different positions of actuating members used for regulation and for indexed positions shall be indicated by figures, letters or other visual means (see note 6)
X	X	X	20	Additional information and marking shall not give rise to misunderstanding. Information and marking on a control required by approval authorities in excess of the requirements of 7.1 is permitted, provided that it is not possible for this excess information and marking to be confused with that required by 7.1 For incorporated controls a single current marking indicates that at least one contact pair within the control is suitable for the marked current (see note 11).
X	X	X	21	When symbols or abbreviations are used, they shall be as indicated in note 7
—	—	X	22	If the control can be adjusted to suit different rated voltages or different rated inputs, the voltage or input to which the control can be adjusted shall be easily and clearly discernible (see note 8)
X	X	X	23	It shall be indicated where terminals intended for the connection of external supply conductors are for fixed cables, for flexible cables or cords or for any of these. If a range of conductors greater than that shown in table 3 is to be accepted, this shall be indicated

Table 2 (concluded)

Control category			Requirement reference	Details of requirement
Integrated controls	Incorporated controls	Independently mounted and free-standing controls		
X	X	X	24	For screwless terminals for rewirable external conductors it shall be made clear how connection and disconnection are intended to be effected
—	X	X	25	For controls classified under 6.13(b), the upper limit of temperature of the mounting surface T_s shall be indicated together with a description of the area which may be in contact with a hot surface
—	—	X	26	For electronic controls the values of any d.c. component produced on the supply in normal use or any d.c. component to earth under fault conditions

NOTE 1. If there is no marking for nature of supply, the control is deemed to be for both a.c. and d.c.

NOTE 2. If wattage, wattage range, volt-amperes, or volt-amperes range is used, the voltages of item 3 are a voltage range.

NOTE 3. If T_{min} is 0 °C, only T_{max} need be marked.

NOTE 4. For independently mounted and free-standing controls the marking of a single current only indicates that all closed contact pairs are suitable for that marked current concurrently in the most onerous circuit configuration.

NOTE 5. This requirement includes making it clear, for example, in a double pole control whether the separate poles are intended for switching one phase each of one load, or whether each pole can be used as a single pole switch on separate loads.

NOTE 6. If figures are used for indicating the different positions the OFF position is indicated by the figure 0. The ON position and/or positions for greater output, input, speed, cooling effect, etc., are indicated by a higher figure.

The figure 0 is not used for any other indication unless it is so positioned and associated with other numbers that its meaning is obvious as, for example, in a digital programming keyboard. The position of moving contacts of all controls should in indexed positions correspond to the indications.

NOTE 7. Symbols

amperes	A
watts	W
volts	V
alternating current	~
hertz	Hz
direct current	— — —
drip-proof construction	 (one drop)
splash-proof construction	 (one drop in a triangle)
watertight construction	 (two drops)
class II construction	
the temperature limit(s) of the switch head	$T_{min} \quad T \quad T_{max}$ (The letter T preceded by the value of T_{min} in °C if less than 0 °C and followed by the value of T_{max} in °C if other than 55 °C, for example —20/45)
the mounting surface temperature limit	T_s

For current and voltage markings, figures may be used alone, the figures for the rated current being marked before or above that for the rated voltage and separated from it by a line.

For controls for resistive and inductive loads, the rated current for the inductive load is placed between brackets and immediately follows the rated current for resistive load.

The symbol for the nature of supply is placed adjacent to the marking of ratings.

The marking for current voltage and nature of supply may accordingly be as follows:

$$40(10) \text{ A } 250 \text{ V} \sim \text{ or } 40(10)/250 \sim \text{ or } \frac{40(10)}{250} \sim$$

NOTE 8. For controls where frequent changes in voltage setting are not required, this requirement is considered to be complied with if the rated voltage or the rated input to which the control can be adjusted can be determined from a wiring diagram fixed to the control; the wiring diagram may be on the inside of a cover which has to be removed to connect the supply conductors.

This diagram may be on a card which is riveted to the cover or on a paper or similar label secured to the cover by an adhesive but it is not to be a label loosely attached to the control.

NOTE 9. For incorporated controls these markings are on the exterior surface of the control but need not be visible when mounted.

NOTE 10. It is not necessary for these markings to be visible after connection of conductor(s) to the terminals.

NOTE 11. Marking of ratings other than those declared but included in ranges specified in 4.13 and the notes to 6.1 and 6.2 is not considered misleading.

7.2 Manufacturer's declarations. The following declarations shall be made by the manufacturer of the control at the time of submission for approval.

7.2.1 The full information listed in the column headed 'Details of requirement' in table 2 shall be declared for all controls.

The classification according to the function of the control as detailed in 6.3 shall be declared.

NOTE. If more than one rated voltage and/or current is declared, additional tests are required, see 4.6.

7.2.2 The classification according to exposure of live parts as detailed in 6.4 shall be declared.

7.2.3 The classification according to whether any terminals are intended for connection to conductors of rewirable external cables, flexible cables or flexible cords as detailed in 6.6(a) shall be declared. When terminals are intended for the connection of supply conductors it shall be further declared whether they are intended for the connection of fixed wiring and/or flexible cables or cords. If internal terminals are so designed that normal solid circular conductors cannot be accepted (see 10.2.1) this shall also be