

Specification for

Portable residual current

devices

Dispositifs (de protection) portatifs à courant
différentiel-résiduel — Spécifications

Tragbare Nullstromgeräte

UDC 621.3.014:621.3.035.223.632:621.3-182.4 :001.4:620.1

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Power Electrical Engineering Standards Policy Committee (PEL/-) to Technical Committee PEL/11, upon which the following bodies were represented:

- ASTA Certification Services
- Association of Control Manufacturers (TACMA (BEAMA Ltd.))
- British Lawn Mower Manufacturers' Federation
- Consumer Policy Committee of BSI
- Department of Trade and Industry (Consumer Safety Unit, CA Division)
- Electrical Installation Equipment Manufacturers' Association (BEAMA Ltd.)
- Electricity Supply Industry in England and Wales
- Electronic Components Industry Federation
- Health and Safety Executive
- Institution of Electrical Engineers
- National Inspection Council for Electrical Installation Contracting
- Portable Electric Tool Manufacturers' Association

This British Standard, having been prepared under the direction of the Power Electrical Engineering Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 September 1992

© BSI 1992
First published March 1989
Second edition September 1992

The following BSI references relate to the work on this standard:
Committee reference PEL 11
Draft for comment 90 32904 DC

ISBN 0 580 21068 5

Amendments issued since publication

Amd. No.	Date	Text affected

Contents

	Page
Committees responsible	Inside front cover
Foreword	2
Specification	
1 Scope	3
2 Definitions and symbols	3
3 Classification	4
4 Rating	4
5 Marking and labelling	4
6 Service conditions	6
7 Design and construction	6
8 Type tests	9
9 Routine tests	19
Appendices	
A Relevant requirements and tests of standards for compatible plugs, adaptors and socket-outlets	20
B Function of test circuit	21
C Measurement of creepage distances and clearances	22
Tables	
1 High voltage test values	10
1(a) Limits of temperature rises	11
2 Endurance test sequence	13
3 Torque values for screws and nuts	15
4 Application of glow-wire test	18
Figures	
1 Test circuit for earth fault breaking current test	24
2 Tumbling barrel	25
3 Typical circuit diagram for a portable rcd	26
4 Test circuit for circuit fault current test	27
5 Apparatus for flexing test	28
6 Apparatus for pressure test	29
7 Ball pressure test apparatus	30
8 Glow wire with thermocouple	30
9 Glow wire test apparatus	31
10 Arrangements and dimensions of the electrodes for the tracking test	32
11 Dispositions of portable rcd for testing test circuit operation	32

Foreword

This British Standard has been prepared under the direction of the Power Electrical Engineering Standards Policy Committee. It supersedes BS 7071 : 1989, which is withdrawn.

This edition introduces technical changes but it does not reflect a full review or revision of the standard, which will be undertaken in due course.

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

Specification

1 Scope

This British Standard specifies requirements for portable residual current devices (portable rcds) (including devices using auxiliary sources and devices with electronic circuitry) for operation on an a.c. supply and having a rated voltage not exceeding 250 V a.c. single phase, a rated current not exceeding 16 A, a rated frequency not exceeding 400 Hz and a rated residual operating current not exceeding 30 mA. Portable rcds incorporate a plug-pin portion and/or socket-outlet portion(s) and may include terminals for external flexible cords where appropriate. Portable rcds with an intentional time delay are not covered by this standard.

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

2 Definitions and symbols

2.1 Definitions

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

2.1.1 residual current (I_{Δ}). The root mean square (r.m.s.) value of the vector resultant of the instantaneous values of the currents flowing in the main circuit of the residual current device.

2.1.2 portable residual current device (portable rcd).

A device which incorporates an auxiliary sensing circuit that will automatically disconnect the main circuit at a predetermined value of residual current.

2.1.3 interlocked portable rcd. A portable rcd incorporating an interlock (either mechanical or electrical) which prevents the contacts of the portable rcd from being closed on-load.

2.1.4 rewirable portable rcd. A portable rcd so constructed that a cable or flexible cord can be fitted or replaced using general purpose tools.

2.1.5 non-rewirable portable rcd. A portable rcd so constructed that it forms a construction unit with the flexible cord such that the flexible cord cannot be separated from the portable rcd without making it permanently useless, and the portable rcd cannot be opened by hand or by using a general purpose tool, e.g. a screwdriver and/or pliers, without making the portable rcd permanently useless.

NOTE. A portable rcd is considered to be permanently useless when, for reassembly of the portable rcd, parts or materials other than the original need to be used.

2.1.6 tripping current ($I_{O,\Delta}$). The minimum value of residual current that causes the device to open.

2.1.7 rated tripping current ($I_{O,\Delta,N}$) (rated residual operating current). The value of residual current, assigned by the manufacturer, at which the device opens under specific conditions.

2.1.8 rated non-tripping current ($I_{\phi,\Delta,N}$). The value of residual current, assigned by the manufacturer, at which the device does not open under specified conditions.

2.1.9 rated current of a device (I_N). The r.m.s. value of current, assigned by the manufacturer, which the main circuit of the device is capable of carrying continuously under specified conditions of use and behaviour.

2.1.10 prospective current. The current (r.m.s. value of the a.c. component) that would flow in the circuit due to the applied voltage if each main current path of the device were replaced by a link of negligible impedance but without any other circuit change.

NOTE. For the purpose of this definition the term 'device' includes the short length of cable or cord used to connect the device to the test circuit.

2.1.11 rated voltage (U_N). The r.m.s. value of voltage, assigned by the manufacturer, to which the performance of the device is referred.

2.1.12 pole. The portion of a switching device associated exclusively with one electrically separated conducting path of its main circuit and excluding those portions which provide a means for mounting and operating all poles together.

NOTE. All the conducting parts of a switching device included in the circuit which it is designed to close or open are considered to be the main circuit.

2.1.13 switched pole. A pole containing contacts for opening and closing the current path.

2.1.14 switched neutral. A switched pole, in the neutral current path, with contacts not intended to make or break current but arranged to open after and to close before the contacts in any other switched pole of the main current path.

2.1.15 main contacts. The fixed and moving contacts in the main current carrying paths.

2.1.16 test circuit. An integral circuit to enable the protective function of the device to be checked.

2.1.17 integral auxiliary source. An auxiliary source intended to supply the auxiliary circuit(s), which is derived from the same mains supply within the device as the load being protected.

2.1.18 portable rcd with integral overcurrent protection. A portable rcd designed to perform the additional function of overload and/or short circuit protection.

NOTE. This includes a portable rcd with a socket-outlet and/or plug-pin portions as an integral part of its construction, which can supply a local load only through either a fused plug or its integral overcurrent protection.

2.1.19 termination. A means by which an electrical connection can be made between the appropriate cable or flexible cord and the conducting part of the portable rcd using special purpose tools, e.g. soldering, welding and crimping.

2.1.20 terminal. A means by which the user can make an electrical connection between the appropriate cable or flexible cord and the conducting parts of the portable rcd without the use of special tools.

2.1.21 pillar terminal. A terminal in which the conductor is inserted into a hole or cavity where it is clamped under the end of the screw or screws or through an intermediate clamping member to which pressure is applied by the end of the screw.

2.1.22 screw terminal. A terminal in which the conductor is clamped under the head of the screw, the clamping pressure being applied either directly by the head of the screw or through an intermediate metallic part in direct contact with the screw, such as a washer, clamping plate or antispread device.

2.1.23 stud terminal. A terminal in which the conductor is clamped under a nut, the clamping pressure being applied either directly by a suitably shaped nut or through an intermediate part, such as a washer, clamping plate or antispread device.

2.1.24 rcd adaptor. A portable rcd comprising a plug-pin portion and socket-outlet(s) as integral parts of the portable rcd's construction, the plug-pins being of the same rating and to the same standard as the socket-outlet portion.

2.1.25 rcd plug. A portable rcd comprising a plug-pin portion and terminals for connection of a flexible cord as integral parts of the rcd plug's construction or with a flexible cord connected.

2.1.26 portable rcd socket-outlet. A portable rcd comprising socket-outlet(s) portions as integral parts of the device with terminals for connection of a flexible cord or with a flexible cord connected.

2.1.27 in-line portable rcd. A portable rcd comprising integral input and output flexible cords permanently connected to the rcd to which appropriate plugs, socket connections or appliances can subsequently be connected.

2.1.28 functional earth circuit. For the purposes of this standard a functional earth circuit is one connected to earth for protection against supply faults, suppression and similar functions.

2.1.29 accessible external surface of a portable rcd. All surfaces which can be touched by test finger I of BS 3042 : 1971 when the portable rcd is in normal use or, in the case of a portable rcd with plug pins, when it is in full engagement with a corresponding socket-outlet.

2.2 Symbols

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

- I = current
- U = voltage

qualified by the following subscripts:

- N = rated
- = open
- ∅ = non-opening
- △ = residual (out-of-balance)
- a = auxiliary

3 Classification

A portable rcd shall be classified according to the following:

- (a) the type of portable rcd, as follows:
 - (1) portable rcd adaptor; or
 - (2) portable rcd plug; or
 - (3) portable rcd socket-outlet; or
 - (4) in-line portable rcd;
- (b) whether it is rewirable or non-rewirable;
- (c) the number of poles, as follows:
 - (1) single-pole with switched neutral; or
 - (2) double pole;
- (d) the type of switching, as follows:
 - (1) on-load closing; or
 - (2) on-load closing prevented (interlocked portable rcd).

4 Rating

A portable rcd shall be rated in terms of the following:

- (a) voltage;
- (b) current;
- (c) frequency;
- (d) tripping current.

5 Marking and labelling

5.1 The portable rcd shall be marked legibly and in a durable manner with the following details:

- (a) the rated voltage (U_N);
- (b) the rated current (I_N);
- (c) the rated tripping current ($I_{O,\Delta,N}$);
- (d) the symbol for nature of supply;
- (e) the frequency of supply if other than 50 Hz;
- (f) the manufacturer's or responsible vendor's name or distinguishing mark;
- (g) the type reference (which may be a catalogue number);
- (h) the number and date of this British Standard, i.e. BS 7071 : 1992;

(i) the details concerning the operation of the test circuit including such words as 'Test each time before use';

(j) the closed and open positions of the portable rcd;
NOTE. The symbols given in 5.4 may be used.

(k) a diagram of connections, if a diagram of connections is not separately supplied with the device;

(l) the words 'Supply Fault' adjacent to the reverse polarity indicator, if fitted.

The test details in items (i), (j) and (l) shall be visible when the portable rcd is in normal use. All other marking shall be on the external surface.

5.2 The terminals for the connection of the neutral and line conductors shall be identified by the symbols N and L respectively. Where it is necessary to distinguish between supply and load terminals, they shall be clearly identified by suitable marking.

5.3 Terminals for the connection of protective conductors shall be marked with the symbol for earth.

5.4 If symbols are used they shall be as follows:

amperes	A
volts	V
frequency	Hz
alternating current	~ *
line	L
neutral	N
earth	 * preferred or $\perp$ *
fuse	 *
ON	I *
OFF	O *

NOTE. For the marking of the rated current and rated voltage of the portable rcd figures may be used alone, the figures for the current rating being placed before or above those for the rated voltage and separated by a line. If a symbol for nature of supply is used, it is placed next to the marking for rated current and rated voltage. Examples are as follows:

13 A 250 V ~

13/250 ~

$\frac{13}{250}$ ~

5.5 Compliance with 5.1 to 5.4 shall be checked by inspection and by the tests described in 8.7.

5.6 When a rewirable portable rcd is fitted with a fuse link, the rating of the fuse link shall be indicated, e.g. 'Fitted with X ampere fuse' (where X denotes the rating of the fuse link).

NOTE. This information may be provided on a removable tag or label or it may be given in accompanying literature or on a card such as a retail blister card, to which the portable rcd is fixed.

Compliance shall be checked by inspection.

5.7 Unless supplied direct to a manufacturer for incorporation in other equipment, flexible cords shall be supplied with a label or instruction indicating the colour coding of the cores of the flexible cords.

5.7.1 A label or instruction provided for the flexible output cord of an rcd plug or an in-line portable rcd shall include the following:

**'IMPORTANT
Output**

This cable shall be fixed to the device to be protected.

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

Green/Yellow	Earth (if any)
Blue	Neutral
Brown	Live'.

5.7.2. The label or instruction for the flexible input cord of a portable rcd socket-outlet or an in-line portable rcd shall include the following:

**'IMPORTANT
Input**

This cable shall be affixed to the power input plug.

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

Green/Yellow	Earth (if any)
Blue	Neutral
Brown	Live'.

5.7.3 Compliance with 5.7.1 and 5.7.2 shall be checked by inspection.

5.8 A portable rcd shall be provided with an instruction sheet for its use. The following text shall be included:

(a) a detailed procedure for testing before use arranged as a logical sequence of actions;

(b) a statement that the device shall not be used if it fails to operate correctly in accordance with the instructions;

(c) adequate instructions on the safe connection of any appropriate flexible cords including reference to BS 6500, the number and colour of cores, the correct cross-sectional area of the conductors and, in the case of portable rcd socket-outlets and in-line portable rcd's, an instruction that a maximum length of 2 m of flexible cord should be connected between the device and the corresponding plug;

(d) a statement detailing the appropriate British Standards and ratings of any integral or associated overcurrent protective devices necessary for the safe operation of the portable rcd and any associated cables;

(e) a statement warning against storage or use outside the service conditions (see clause 6) and misuse such as dropping, immersion, etc.

*BS 6217 gives guidance on these symbols.

(f) a statement that electricity can be dangerous and that the use of a portable rcd should not be regarded as a substitute for basic electrical safety precautions, and specific mention of the need to unplug equipment to achieve isolation before any inspection or repair of that equipment is attempted;

(g) a statement warning the user to seek advice from the manufacturer, responsible vendor or a competent electrician if the portable rcd repeatedly trips with an appliance connected or if it fails to trip when tested in accordance with the instructions.

Compliance shall be checked by inspection.

6 Service conditions

A portable rcd complying with this standard shall be suitable for use under the following conditions of service:

- (a) an ambient temperature range of -5°C to $+40^{\circ}\text{C}$, with an average value not exceeding $+35^{\circ}\text{C}$ measured over any 24 h period;
- (b) an altitude not exceeding 2000 m above sea level;
- (c) an atmosphere not subject to abnormal pollution by smoke, chemical or flammable fumes, salt-laden spray, prolonged periods of high humidity or other abnormal conditions.

NOTE 1. Portable rcds complying with this standard may not be suitable for exposure to direct radiation from the sun or to other sources of heat likely to raise the temperature above the designated ambient temperature, nor for subjection to excessive vibration.

NOTE 2. Where service conditions differ from those prescribed above the advice of the manufacturer or responsible vendor should be sought.

7 Design and construction

7.1 General

7.1.1 The portable rcd shall be so designed and constructed that in normal use it performs reliably and without danger to the user or to the surroundings.

7.1.2 The portable rcd shall be capable of meeting all the relevant requirements of this standard and the tests specified in clauses 8 and 9.

7.1.3 Where tolerances are not specified the values given shall be regarded as nominal.

7.1.4 For a portable rcd incorporating overcurrent protection as an integral part of its construction, such overcurrent protection shall comply with the appropriate British Standard, as declared by the manufacturer (e.g. fuse links shall comply with BS 1362 and circuit-breakers shall comply with BS 3871 : Part 1).

Compliance shall be checked by inspection of the marking or by testing to the appropriate standard.

7.1.5 A portable rcd incorporating plug pins and/or socket contacts, intended to engage with socket-outlets or plugs complying with other British Standards, shall be so designed and constructed that such plug pins and/or socket contacts comply with the appropriate requirements specified in those British Standards.

NOTE. For BS 1363 configurations the relevant tests are referred to in appendix A.

Compliance shall be checked by the tests referred to in 8.28.

7.2 Temperature rise

A portable rcd and its surroundings shall not attain temperatures in excess of those specified in the appropriate British Standard for the appropriate plugs and socket-outlets.

Compliance shall be checked by the test described in 8.4.

7.3 Provision for testing residual current operation

Provision shall be made for testing the automatic opening of the portable rcd main contacts by an integral test circuit.

Operation of the test circuit shall excite the current-balance transformer(s) and the exciting ampere-turns produced by the test circuit shall not exceed 2.5 times the exciting ampere-turns produced by the rated tripping current flowing in one pole of the portable rcd.

The test circuit shall be arranged for external operation in such a way that the protection afforded by the cover or enclosure is not impaired. To safeguard against loss, the push button or the operating handle of the test circuit shall not be removable without the use of tools nor until the cover has been removed from the portable rcd.

NOTE. Appendix B gives information on the function of the test circuit.

Compliance shall be checked by the tests described in 8.29.

7.4 Voltage limits for auxiliary source supplies

A portable rcd that depends on an integral auxiliary source for operation shall perform its protective function at any value of the source voltage between 0.70 and 1.1 times its rated voltage.

Compliance shall be checked by the tests described in 8.10.2.

7.5 Construction

7.5.1 A portable rcd shall have adequate mechanical strength and be so constructed as to withstand such handling as may be expected in normal use.

Compliance shall be checked by the tests described in 8.11.

7.5.2 The enclosure of the portable rcd shall be sealed by the manufacturer to prevent any access other than to replaceable fuses and rewirable terminals.

NOTE. This means that the enclosure cannot be opened by hand or by using general purpose tools, e.g. a screwdriver and/or pliers, without rendering the portable rcd permanently useless. A portable rcd is considered to be permanently useless when, for reassembly, parts or materials other than the original need to be used. This does not apply to the replacement of a fuse link.

Compliance shall be checked by inspection, the appropriate mechanical strength tests of this standard and manipulation by hand and/or the use of general purpose tools.

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

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

Compliance shall be checked by the tests of **8.13.2** and the relevant tests referred to in **8.2.8**.

7.5.4 Ferrous parts shall be adequately protected against rusting.

Compliance shall be checked by the test described in **8.13.1**.

7.6 Operating mechanism

7.6.1 The portable rcd shall be arranged for automatic opening under earth fault conditions.

Compliance shall be checked by the tests described in **8.9** and **8.10**.

7.6.2 It shall be impossible to hold the portable rcd contacts closed by the operating mechanism under fault conditions in which tripping should occur.

Compliance shall be checked by the tests described in **8.10.2**.

7.6.3 The position of the contacts shall be reliably indicated. Neon or other electroluminescent parts shall not be used for this purpose.

It shall be impossible for the indicating device to assume the open position unless all moving contacts are also in the open position.

Compliance shall be checked by inspection and the test described in **8.31**.

7.6.4 The portable rcd contacts shall be incapable of unintentional reclosure as a result of mechanical shock or vibration.

Compliance shall be checked by the test described in **8.11.2**.

7.6.5 The portable rcd shall be capable of withstanding without excessive wear or other harmful effects, the electrical and mechanical stresses occurring in use. Compliance shall be checked by the tests described in **8.12**.

7.6.6 A portable rcd shall either function as normal or trip automatically on connection to supply terminals with reversed polarity (L and N).

7.6.7 The portable rcd shall not be fitted with an intentional time delay.

Compliance shall be checked by the test described in **8.10.3**.

7.7 Connection arrangements

7.7.1 Terminals in a rewirable portable rcd shall permit the connection, without special preparation, of flexible cords having nominal conductor cross-sectional areas of 0.5 mm^2 to 1.5 mm^2 .

Compliance shall be checked by inspection, by a manual test and by the tests described in **8.18**.

7.7.2 Where pillar terminals are used they shall have clamping screws of sufficient length to extend to the far side of the conductor hole. The end of the screw shall be slightly rounded so as to minimize damage to the conductors.

The sizes of the conductor hole and the clamping screw shall be such that the clearance between the sides of the major diameter of the clamping screw and the conductor hole does not exceed 0.4 mm.

Compliance shall be checked by inspection and measurement.

7.7.3 Terminal screws shall have a nominal (outside) diameter as given in table 3.

Compliance shall be checked by inspection and measurement.

7.7.4 Terminals of a portable rcd shall be so located or shielded that should a wire of a stranded conductor escape when the conductors are fitted, there is no risk of accidental connection between live parts and accessible external surfaces.

Compliance shall be checked by the test described in **8.17**.

7.7.5 A non-rewirable portable rcd fitted with a flexible cord shall be provided with soldered, welded, crimped or similar terminations; screw-type and 'snap-on' terminals shall not be used.

Crimped connections shall not be made on to presoldered ends of flexible cords.

For all these methods of termination, not more than one strand, or 5 % of the total number of strands of the conductor, whichever is the greater, shall be fractured during connection.

Compliance shall be checked by inspection and measurement.

7.8 Screws, current carrying parts and connections

7.8.1 Screwed connections, electrical and otherwise, shall withstand the mechanical stresses occurring in normal use. Screws transmitting electrical contact pressure shall screw into metal and shall be of metal which is not soft nor liable to creep.

Compliance shall be checked by inspection and by the tests described in **8.18**.

7.8.2 Screws accessible to the user shall not be of insulating material if their replacement by a metal screw would affect the safety or performance requirements of the portable rcd.

Compliance shall be checked by inspection.

7.8.3 Contact pressure in electrical connections shall not depend on the dimensional stability of insulating materials other than ceramic or mica.

Compliance shall be checked by inspection.

7.8.4 Thread-forming or thread-cutting screws for the connection of current-carrying parts and parts of the earthing circuit shall be used only when screwed into metal parts. Such screws shall not be accessible during installation or in normal use.

Compliance shall be checked by inspection.

7.8.5 Screws which make a mechanical connection between different parts of the device shall be locked against loosening, if the connection carries current, including earth fault currents.

Compliance shall be checked by inspection and manual test.

7.9 Cord anchorage and the connection of flexible cords

7.9.1 Cord anchorages in the portable rcd shall anchor the cord securely.

Compliance shall be checked by the tests referred to in **8.5**.

7.9.2 The cord entry to the portable rcd shall be so shaped as to prevent damage to the cord which could be caused by excessive bending.

Compliance shall be checked by inspection.

7.9.3 Flexible cords supplied with a portable rcd shall be coloured as indicated on the instructions described in **5.7**.

Compliance shall be checked by inspection.

7.9.4 A portable rcd supplied fitted with a flexible cord shall be so designed that the flexible cord is not subjected to excessive bending where it enters the portable rcd.

Compliance shall be checked by the test described in **8.19**.

7.9.5 Flexible cords fitted to a portable rcd socket-outlet or in-line portable rcd shall comply with BS 6500. The maximum length of the flexible input cord fitted shall not exceed 2 m.

Compliance shall be checked by inspection and measurement.

7.10 Accessibility of live parts

7.10.1 The portable rcd shall be so designed that when installed in normal use, live parts are not accessible.

Compliance shall be checked by the tests referred to in **8.20**.

7.10.2 Where a portable rcd has a resilient enclosure it shall be so designed and constructed that when assembled

and wired as in normal use there is no risk that, as a result of undue pressure, live parts could penetrate the cover or become so disposed as to reduce creepage distances and clearances to values below those specified in **7.12**.

Compliance shall be checked by the tests described in **8.21**.

7.11 Provision for earthing

All accessible metal parts of a portable rcd shall be in effective electrical contact with the earth socket contacts and/or earthing plug pin, except for metal parts on, or screws in or through, non-conducting material, and separated by such material from current-carrying parts in such a way that in normal use they can not become live, which need not be in effective electrical contact with the earthing socket contact or earthing plug pin.

NOTE. Metal parts having an accessible surface coating of lacquer or enamel are taken to be accessible metal parts for the purposes of this requirement.

Compliance shall be checked by the following tests:

- (a) for metal parts insulated from live parts, by the test described in **8.3**;
- (b) for metal parts connected to an earthing terminal or earthing plug pin, by the test described in **8.22**.

7.12 Creepage distances, clearances and distances through insulation

7.12.1 The minimum clearance through air and the minimum creepage distances on main current carrying circuits shall be 2.5 mm for the following cases:

- (a) between live parts and any other metal parts;
- (b) between live parts and the accessible external surface of the portable rcd;
- (c) between component parts in any fused line circuit that is separated by the removal of the fuse link.

Where printed circuit boards are used the guidance given in BS 6221 : Part 3 shall be followed.

NOTE. These requirements do not apply to :

- (a) any flexible cord connected to a portable rcd.
- (b) electronic components forming a functional earth circuit.

Compliance shall be checked by the tests described in **8.25**.

7.12.2 The isolation distance between contacts in the same conductive path shall be at least 3 mm.

Compliance shall be checked by inspection and measurement.

7.12.3 The portable rcd shall have either a minimum distance of 2 mm through insulation between live parts and the accessible external surface or the minimum distance shall be made up of 2 mm through air and 1 mm insulation provided the parts are so located that there is no likelihood of the distance through air being reduced by distortion or movement of the parts.

NOTE. These requirements do not apply to :

- (a) any flexible cord connected to a portable rcd.
- (b) electronic components forming a functional earth circuit.

Compliance shall be checked by the tests described in **8.21**.

7.13 Resistance to humidity

The portable rcd shall be proof against humid conditions which may occur in normal use.

Compliance shall be checked by the test described in **8.14**.

7.14 Ability to withstand through fault current

The portable rcd shall be capable of withstanding the thermal and electromagnetic stresses which may occur under through fault conditions before the back-up protection clears.

Compliance shall be checked by the tests described in **8.16**.

7.15 Resistance to heat

The portable rcd shall be resistant to heat.

Compliance shall be checked by the tests described in **8.26**.

7.16 Resistance to abnormal heat, fire and tracking

The portable rcd shall be proof against abnormal heat, fire and tracking.

Compliance shall be checked by the tests described in **8.27**.

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

7.17 Insulation resistance and electric strength

The insulation resistance and electric strength of a portable rcd shall be adequate.

Compliance shall be checked by the tests described in **8.3** and **8.8**.

7.18 Core balance requirement

The portable rcd shall not be subject to nuisance tripping due to an inherent unbalance in the transformer when subject to moderate current surges.

Compliance shall be checked by the test described in **8.6**.

7.19 Loss of supply neutral

The portable rcd shall automatically trip or shall continue to give protection in the event of a loss of the supply neutral.

Compliance shall be checked by the test described in **8.23**.

8 Type tests**8.1 General**

Type tests as specified in **8.2** to **8.31** shall be made on samples representing each type of portable rcd.

NOTE 1. A test for electronic component reliability is under consideration.

NOTE 2. Routine tests are given in clause **9**.

8.2 Conditions

8.2.1 Tests shall be made at rated voltage $\pm 5\%$, at rated frequency $\pm 10\%$ and at an ambient temperature of $20 \pm 5^\circ\text{C}$ unless otherwise stated in this standard.

8.2.2 The specified sequences shall be completed without any adjustment being made to the samples.

8.2.3 The portable rcd shall be positioned and wired as in normal use unless otherwise stated and in compliance with any requirements specified by the manufacturer.

8.2.4 Flexible cords used for the tests shall comply with BS 6500 and be of the appropriate size according to the rating of the portable rcd unless otherwise specified in the appropriate clause.

8.2.5 A separate sample shall be used for each of the test sequences given in **8.2.8** except for test sequence **8**, which may require more than one sample (see appendix A). Each sample shall be in a clean, new condition.

8.2.6 The tests shall be performed in the order given for each test sequence.

8.2.7 When routine tests as described in clause **9** are carried out as part of the type test sequences of **8.2.8** all of **8.2** shall be complied with.

8.2.8 The portable rcd shall be deemed to comply with this standard provided that there are no failures during the following test sequences.

NOTE. The type testing sequences may be modified by the requirements referred to in appendix A.

Test sequence 1

- | | |
|----------------------------------|-----------------|
| (a) Routine tests | clause 9 |
| (b) Verification of construction | 8.24 |

Test sequence 2

- | | |
|--|-----------------|
| (a) Routine tests | clause 9 |
| (b) High impulse voltage | * |
| (c) Temperature rise | 8.4 |
| (d) Transformer balance | 8.6 |
| (e) Tests for reverse polarity | 8.30 |
| (f) Portable rcd performance | 8.10 |
| (g) Insulation resistance | 8.8 |
| (h) Resistance to excessive residual stresses and to rusting | 8.13 |

Test sequence 3

- | | |
|---|-----------------|
| (a) Routine tests | clause 9 |
| (b) Loss of supply neutral | 8.23 |
| (c) Endurance | 8.12 |
| (d) Condition of tested sample | 8.15 |
| (e) Portable rcd performance | 8.10 |
| (f) Reliability of contact position indicator | 8.31 |

*This test is under consideration and will be added by amendment.