

Specification for

Residual current-operated circuit-breakers

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Committees responsible for this British Standard

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- Association for Short Circuit Testing Authorities
- Department of Trade (Consumer Safety Unit, CS Division)
- Electrical Installation Equipment Manufacturers' Association (BEAMA)
- Electricity Supply Industry in England and Wales
- Electronic Components Industry Federation
- Health and Safety Executive
- Institution of Electrical Engineers
- National Economic Development Office
- National Inspection Council for Electrical Installation Contracting

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Foreword

This revision of BS 4293 has been prepared under the authority of the Power Electrical Engineering Standards Committee. It revises the requirements for current-operated earth-leakage circuit-breakers previously given in the 1968 edition of BS 4293 to take account of developments in such circuit-breakers and to make the standard more suitable for certification purposes, BS 4293:1968 is now withdrawn.

The opportunity has been taken to adopt the internationally agreed name, i.e. residual current-operated circuit-breaker, for what have previously been known as current-operated earth-leakage circuit-breakers, but throughout this standard, for the sake of brevity, the term “circuit-breaker” is used.

The residual current-operated circuit-breakers covered by this British Standard are primarily intended to give protection by automatic disconnection of supply against the risk of dangerous and possibly lethal electric shocks and whilst the standard specifies the operational characteristics of these devices, details of how they should be selected and installed to provide the desired level of protection are prescribed in the “Regulations for Electrical Installations” Engineers (IEE) (see Appendix D). These regulations make reference to residual current devices and it should be noted that the residual current-operated circuit-breaker is a particular type of residual current device.

These circuit-breakers also provide a high degree of protection against the possibility of fire resulting from earth fault currents which can persist for lengthy periods but are of such magnitude that the overcurrent protective devices in the circuit concerned do not operate.

The circuit-breakers covered by this standard are suitable for use in household, agricultural, commercial and industrial electrical installations.

Three appendices have been included to assist users in the proper application of residual current-operated circuit-breakers and attention is particularly directed to Appendix D.

A typical circuit diagram for a residual current-operated circuit-breaker is given in Figure 3.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies the requirements for residual current-operated circuit-breakers (including circuit-breakers utilizing auxiliary sources and circuit-breakers with electronic circuitry) having a rated voltage not exceeding 660 V, a rated current not exceeding 125 A and a rated frequency not exceeding 400 Hz. Circuit-breakers complying with this standard are also suitable for use as isolators.

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 definitions given in 2.1.1 and 2.1.2 apply.

2.1.1 General

2.1.1.1

residual current I_{Δ}

the r.m.s. value of the vector resultant of the instantaneous values of the currents flowing in the main circuit of the residual current-operated circuit-breaker

2.1.1.2

residual current-operated circuit-breaker (rccb)

a device for making and breaking a circuit, and for breaking a circuit automatically when the residual current exceeds a predetermined amount

NOTE For the purposes of this standard the term circuit-breaker includes both the mechanism for interrupting the circuit and also any associated residual current sensing devices.

2.1.1.3

tripping current I_{Δ}

the minimum value of residual current that causes the circuit-breaker to open

2.1.1.4

pole

the portion of a circuit-breaker associated exclusively with one electrically separated conducting path of its main circuit and provided with contacts intended to connect and disconnect the main circuit itself and excluding those portions which provide a means for mounting and operating all poles together

NOTE The term does not include any switched neutral.

2.1.1.5

switched neutral

contacts not intended to make or break current and arranged to close before and open after the main contacts

2.1.1.6

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 circuit-breaker were replaced by a link of negligible impedance but without any other circuit change

NOTE For the purpose of this definition the term circuit-breaker includes the short length of cable used to connect the circuit-breaker to the test circuit (see 8.2).

2.1.1.7

main contacts

the fixed and moving contacts in the main current carrying circuits

2.1.1.8

test device

a device to enable the protective function of the circuit-breaker to be checked

2.1.1.9

integral auxiliary source

an auxiliary source intended to supply the auxiliary circuit(s) which is derived from the same mains supply within the circuit-breaker as the load being protected.

2.1.1.10

separate auxiliary source

an auxiliary source intended to supply the auxiliary circuit(s) derived from a source separate from the mains supply feeding the load

NOTE See reference to separate auxiliary supply in Appendix D.

2.1.1.11

residual current-operated circuit-breaker with integral overcurrent protection

a residual current-operated circuit-breaker designed to perform the additional function of overload and/or short circuit protection

NOTE For the purpose of this standard, this includes a circuit-breaker with a socket outlet as an integral part of its construction which can supply a local load only through a fused plug.

2.1.1.12

time-delay circuit-breaker

a circuit-breaker which has its automatic opening intentionally delayed

2.1.1.13

earth fault breaking current

the value of current which the circuit-breaker, without the aid of any back-up protection, can satisfactorily break at rated voltage

2.1.2 Electrical characteristics

2.1.2.1

rated tripping current $I_{o\Delta n}$ (rated residual operating current)

the value of residual current, assigned by the manufacturer, at which the circuit-breaker opens under specified conditions

2.1.2.2

rated non-tripping current $I_{\phi\Delta n}$

the value of residual current, assigned by the manufacturer, at which the circuit-breaker does not open under specified conditions

2.1.2.3

rated current of a circuit-breaker I_n

the r.m.s. value of current, assigned by the manufacturer, which the main circuit of the circuit-breaker is capable of carrying continuously under specified conditions of use and behaviour

2.1.2.4

rated voltage U_n

The r.m.s. value of voltage, assigned by the manufacturer, to which the performance of the circuit-breaker is referred

2.1.2.5

rated voltage of the separate auxiliary source U_{an}

the value of the voltage of the separate auxiliary source by which the circuit-breaker is designated and to which the operating functions of the circuit-breaker are referred, under specified conditions

NOTE Circuit-breakers may have one or more values of rated voltage of the separate auxiliary source or one or more ranges of this source.

2.1.2.6 *Text deleted.*

2.2 Symbols

For the purposes of this British Standard the following symbols apply

I is the current

U is the voltage

qualified by the following subscripts:

n is rated

o is open

ϕ is non-opening

Δ is out-of-balance

a is auxiliary

3 General

3.1 Circuit-breakers incorporating overcurrent protection.

If a circuit-breaker incorporates overcurrent protection as an integral part of its construction, such overcurrent protection shall comply with the requirements of the appropriate standard, as declared by the manufacturer.

3.2 Portable circuit-breaker units. Portable units incorporating socket outlets or plug and/or socket connections shall also comply with the relevant Parts of the appropriate British Standards for such plugs and sockets. An instruction label shall be fitted indicating the need to test such devices each time they are used.

NOTE Further requirements for portable units are under consideration.

4 Ratings

4.1 Rating of circuit-breakers. Circuit-breakers shall be rated in terms of the following:

- number of poles;
- voltage;
- current;
- tripping current;
- frequency.

The rated tripping current shall not exceed 3 A. The rated frequency shall not exceed 400 Hz.

NOTE Preferred ratings for voltage, current, tripping current and frequency are given in Appendix A.

4.2 Arrangement of poles. The arrangement of poles shall be one of the following (see Figure 1):

- a single pole with switched or solid neutral;
- double pole;
- double pole with switched or solid neutral;
- three pole;
- three pole with switched or solid neutral;
- four pole.

5 Marking

Circuit-breakers shall be marked legibly and in a durable manner with the following particulars:

- rated voltage;
- rated current;
- rated tripping current;
- frequency, if other than 50 Hz;
- manufacturer's or responsible vendor's name or distinguishing mark;
- type reference where more than one type is manufactured;
- country of manufacture;