BS IEC 60755-1:2022

BSI Standards Publication

General safety requirements for residual current operated protected devices

Part 1: Residual current operated protective devices for DC systems

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National foreword

This British Standard is the UK implementation of IEC 60755-1:2022.

The UK participation in its preparation was entrusted to Technical Committee PEL/23/1, Circuit breakers and similar equipment for household use.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

GENERAL SAFETY REQUIREMENTS FOR RESIDUAL CURRENT OPERATED PROTECTED DEVICES –

Part 1: Residual current operated protective devices for DC systems

FOREWORD

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IEC 60755-1 has been prepared by subcommittee 23E: Circuit breakers and similar equipment for household use, of IEC technical committee 23: Electrical accessories. It is an International Standard.

This document is intended to be used in conjunction with IEC 60755.

The text of this International Standard is based on the following documents:

Draft	Report on voting
23E/1273/FDIS	23E/1299/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

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This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 60755 series, published under the general title *General safety requirements for residual current operated protected devices*, can be found on the IEC website.

This International Standard is to be used in conjunction with IEC 60755:2017.

The following differing practices of a less permanent nature exist in the countries indicated below:

– IEC 60755:2017, IEC 60755:2017, 5.3.1.12: 1 000 A, 2 000 A, 2 500 A, 7 500 A and 9 000 A are also considered preferred values (Korea and Japan);
– IEC 60755:2017, IEC 60755:2017, 8.1.1: multiple settings are not allowed (Australia, Germany, Denmark, the UK and Switzerland);
– IEC 60755:2017, IEC 60755:2017, 8.1.2: the colours red and green are not used for contact position indication (US).

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

Residual current devices are used for protection against electric shocks.

In IEC 60364 (all parts), residual current devices are used for automatic disconnection of supply in case of fault (see Clause 411 of IEC 60364-4-41:2005+AMD1:2017) and residual current devices with rated residual operating current not exceeding 30 mA are used as additional protection (see Clause 415 of IEC 60364-4-41:2005+AMD1:2017). The IEC has developed a set of standards for residual current operated protective devices intended to be used in AC systems.

DC systems are used for applications such as photovoltaic installations, data and telecom centres and electric vehicle charging systems. In addition, standards for plugs and socket-outlets for ICT equipment installed in data centres and telecom centres have been published.

Residual current devices for DC systems are used to provide fault protection and/or additional protection (according to IEC 60364-4-41:2005 and IEC 60364-4-41:2005/AMD1:2017).

This document defines the operating characteristics for residual current operated protective devices for DC systems. Details of how they should be installed to provide the desired level of protection are specified in the various parts of the IEC 60364 series. The operating characteristics given in this document are based on the information contained in IEC 60479 (all parts).

This document has been prepared as a Group Safety Publication by subcommittee 23E in accordance with its Group Safety Function for residual current devices. It is intended for use by technical committees in the preparation of standards for residual current unit, function or devices when it is intended to provide protective measures according to IEC 60364 (all parts). It is not intended for use as a stand-alone document, for example, for certification.

This document is intended for use in conjunction with IEC 60755. Where a particular subclause of IEC 60755 is not mentioned in this Part 1, that subclause applies as far as is reasonable. Where this Part 1 states "addition", "deletion" or "replacement", the corresponding requirement, test specification or explanatory material in IEC 60755 should be adapted accordingly.

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GENERAL SAFETY REQUIREMENTS FOR RESIDUAL CURRENT OPERATED PROTECTED DEVICES –

Part 1: Residual current operated protective devices for DC systems

Replacement of Clause 1 of IEC 60755:2017 by:

1 Scope

This document gives requirements, recommendations and information for the drafting of standards for residual current operated protective devices, intended to be used in DC systems, hereafter referred to as DC-RCDs.

NOTE 1 When referring to IEC 60755, "RCD" shall be understood as "DC-RCD".

This document is primarily intended to be used as a reference for drafting product safety standards for:

– DC-RCD intended for general use;
– DC-RCD specifically intended to be incorporated in a specific item of equipment;
– DC-RCD embedded in an equipment.

This document is applicable for standards covering devices:

– which detect a residual current,
– compare it to a reference value, and
– open the contacts when the residual current exceeds this reference value.

Any association of devices, each one of them performing separately one or two of the above-mentioned functions but acting together in order to accomplish all three functions, is also covered by this document.

DC-RCDs are intended to provide fault protection, the exposed conductive parts of the installation being connected to a protective conductor, in accordance with IEC 60364-4-41:2005 and IEC 60364-4-41:2005/AMD1/2017.

DC-RCDs having a rated residual operating direct current not exceeding 80 mA and having a rated voltage not exceeding 220 V DC for single-pole or 440 V DC for two-pole_are also used as a provision for additional protection, according to IEC 60364-4-41.

NOTE 2 Further requirements for higher voltages are under consideration.

NOTE 3 The value of 80 mA was the result of a calculation based on the content of clause 6 of IEC 60479-1:2018 and 5.3.4 of IEC 60479-2:2019.

NOTE 4 In Austria the value of 80 mA is considered as provisional until a broader and more solid set of data than the actual basis of the IEC 60479 series is available for DC.

In accordance with IEC 60364-4-42, residual current devices with a rated residual operating current not exceeding 300 mA can also be used to provide protection against fire hazards due to insulation faults.

DC-RCDs are suitable for isolation. They are suitable for use in TN, TT, and, under specific conditions, IT systems.

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DC-RCDs are resistant to unwanted tripping including the case where surge voltages (as a result of switching transients or induced by lightning) cause loading currents in the installation without occurrence of flashover.

This group safety publication is primarily intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51. It is not intended for use by manufacturers or certification bodies.

One of the responsibilities of a technical committee is, wherever applicable, to make use of group safety publications in the preparation of its publications. The requirements, test methods or test conditions of this group safety publication will not apply unless specifically referred to or included in the relevant publications.

2 Normative references

Clause 2 of IEC 60755:2017 is applicable except as follows:

Addition:

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-16, *Electromagnetic compatibility (EMC) – Part 4-16: Testing and measurement techniques – Test for immunity to conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz*

IEC 61000-4-17, *Electromagnetic compatibility (EMC) – Part 4-17: Testing and measurement techniques – Ripple on d.c. input power port immunity test*

IEC 61000-4-29, *Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests*

IEC 61543:2022, *Residual current-operated protective devices (RCDs) for household and similar use – Electromagnetic compatibility*

3 Terms and definitions

Clause 3 of IEC 60755:2017 is applicable except as follows:

Addition:

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3.101
residual operating direct current
value of residual direct current which causes the DC residual current device to operate under specified conditions

[SOURCE: IEC 60050-442:2019, 442-05-72]

3.102
residual non-operating direct current
value of residual direct current at and below which the DC residual current device does not operate under specified conditions

[SOURCE: IEC 60050-442:2019, 442-05-73]

3.103
residual direct current making and breaking capacity
value of a residual prospective direct current which a DC residual current device can make, carry for its opening time and break under specified conditions of use and behaviour

[SOURCE: IEC 60050-442:2019, 442-05-74, modified]

3.104
conditional direct short-circuit current
value of a prospective direct current, which a DC residual current device without integral short-circuit protection, but protected by a short-circuit protective device in series, can withstand under specified conditions of use and behaviour

[SOURCE: IEC 60050-442:2019, 442-05-75]

3.105
conditional residual direct short-circuit current
value of a residual direct prospective current, which a DC residual current device without integral short-circuit protection, but protected by a short-circuit protective device in series, can withstand under specified conditions of use and behaviour

[SOURCE: IEC 60050-442;2019, 442-05-76, modified]

3.106
mid-point
common point between two symmetrical circuit elements the opposite ends of which are electrically connected to different line conductors of the same circuit

[SOURCE: IEC 60050-195:1998, 195-02-04]

3.107
M-pole
part of a DC-RCD associated exclusively with one electrically separated conducting path intended to connect and to disconnect the mid-point

3.108
time constant
rise time $T = L/R$ (ms) of a prospective direct current to reach a value of 0,632 times the maximum peak current

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3.109
rated direct making and breaking capacity
I_m
value of a prospective direct current, which a DC residual current device is capable of making and breaking at a stated voltage under specified conditions of use and behaviour

4 Classification

Clause 4 of IEC 60755:2017 is applicable except as follows:

Deletion of Subclause 4.4.

4.10 According to the number of poles and current paths

Subclause 4.10 of IEC 60755:2017 is applicable except as follows:

Replacement of notes to 4.10.1 and 4.10.3:

NOTE In this case, the M-path does not contain any switching contact.

Deletion of 4.10.5 and 4.10.6.

4.15 According to the intended use

Deletion in note 1:

e.g. IEC 61008-1

Addition:

4.101 According to the current direction through the poles

4.101.1 Polarised DC-RCD

4.101.2 Non-polarised DC-RCD

5 Characteristics of residual current devices

5.1 Summary of characteristics

Subclause 5.1 of IEC 60755:2017 is applicable except as follows:

Deletion of the third dash.

Replacement of the fourth, fifth, sixth and seventh dashes:

– rated direct making and breaking capacity I_m (see 5.2.4);
– rated residual operating direct current $I_{\Delta n}$ (see 5.2.5);
– rated residual non-operating direct current $I_{\Delta no}$ (see 5.2.6);
– rated residual direct making and breaking capacity $I_{\Delta m}$ (see 5.2.7);

Replacement of the ninth, tenth and eleventh dashes:

– operating characteristics (see 5.2.10)
– rated conditional short-circuit direct current I_{nc} (see 5.2.8);

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