

# INTERNATIONAL STANDARD

**Residual current operated circuit-breakers with integral overcurrent protection  
for household and similar uses (RCBOs) –  
Part 1: General rules**



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Part 1: General rules**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RESIDUAL CURRENT OPERATED CIRCUIT-BREAKERS  
WITH INTEGRAL OVERCURRENT PROTECTION  
FOR HOUSEHOLD AND SIMILAR USES (RCBOs) –****Part 1: General rules**

## FOREWORD

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IEC 61009-1 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 fourth edition cancels and replaces the third edition published in 2010, Amendment 1:2012 and Amendment 2:2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) harmonization of all clauses between the IEC 61008, IEC 61009 and IEC 60755 series using blocks and modules approach;

- b) harmonization of all tables and figures between the IEC 61008, IEC 61009 and IEC 60755 series;
- c) terms and definitions are now referred to IEC 62873-2;
- d) modification of Subclause 4.1 for classification according to supply conditions;
- e) new Subclauses 8.17 and 9.24 for requirements and tests for the resistance to temporary overvoltages (TOV);
- f) improvement of Subclause 9.7 for test of dielectric properties;
- g) tests for screwless, flat-quick terminals and aluminium conductors are now referred to in the IEC 62873-3 series.

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

Draft	Report on voting
23E/1373/FDIS	23E/1388/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

This International Standard is to be used in conjunction with the relevant product standard, either IEC 61009-2-1:2024 or IEC 61009-2-2:2024. The chosen standard, IEC 61009-2-1:2024 or IEC 61009-2-2:2024, shall be used consistently throughout the standard.

In order to maintain the same structure throughout the IEC 61008 and IEC 61009 series, some elements that are not applicable to a particular device within the scope of this document are labelled void.

In this document, the following print types are used:

- compliance statements: in *italic* type;
- other statements: in normal type.

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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

A list of all parts in the IEC 61009 series, published under the general title *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs)*, can be found on the IEC website.

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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

## INTRODUCTION

The purpose of this document is to harmonize as far as practicable all rules and requirements of a general nature applicable to RCBOs in order to obtain uniformity of requirements and tests and to avoid the need for testing to different standards.

All those parts which can be considered as general have therefore been gathered in this document, e.g., temperature-rise, dielectric properties, etc.

For each type of RCBO, two main documents are used to determine all requirements and tests:

- 1) this document;
- 2) the relevant product standard covering RCBOs:
  - IEC 61009-2-1, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 2-1: RCBOs according to classification 4.1.1;*
  - IEC 61009-2-2, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 2-2: RCBOs according to classification 4.1.2, 4.1.3, 4.1.4, 4.1.5 and 4.1.6.*

For Type F and Type B RCBOs, IEC 62423 applies in addition to the IEC 61009 series.

# RESIDUAL CURRENT OPERATED CIRCUIT-BREAKERS WITH INTEGRAL OVERCURRENT PROTECTION FOR HOUSEHOLD AND SIMILAR USES (RCBOs) –

## Part 1: General rules

### 1 Scope

This document gives general requirements and tests for residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (hereafter referred to as RCBOs), for rated operational voltages not exceeding 440 V AC, with rated frequencies of 50 Hz, 60 Hz or 50/60 Hz and rated currents not exceeding 125 A and rated short-circuit capacities not exceeding 25 000 A.

RCBOs are intended to provide fault protection (previously referred to as protection against indirect contact), the exposed conductive parts of the installation being connected to an appropriate earth electrode. These devices are also intended to protect against overcurrents in the wiring installations of buildings and similar applications. They are also intended to be used to provide protection against fire hazards due to a persistent earth fault current.

RCBOs having a rated residual operating current not exceeding 30 mA are used for fault protection and additional protection in the case of failure of the protective provisions against electric shock.

This document applies to RCBOs performing simultaneously the functions of detection of the residual current, of comparison of the value of this current with the residual operating value and of opening of the protected circuit when the residual current exceeds this value. These devices also perform the function of making, carrying and breaking overcurrents under specified conditions.

NOTE 1 The requirements for RCBOs are in line with the group safety publication IEC 60755.

NOTE 2 RCBOs of type AC and type A are covered by the IEC 61009 series. RCBOs of type F and type B are covered by IEC 62423 in conjunction with the IEC 61009 series.

NOTE 3 Installation and selection rules for RCBOs are given in the IEC 60364 series.

NOTE 4 The content of this document related to operation under residual current conditions is based on IEC 61008-1. The content of this document related to protection against overcurrents is based on IEC 60898-1.

RCBOs are intended to be operated by ordinary or uninstructed persons and designed not to require maintenance.

The requirements of this document apply for standard conditions (see 7.1). Additional requirements can be necessary for RCBOs used in locations which have severe environmental conditions. RCBOs within the scope of this document are intended for use in an environment with pollution degree 2 (see 7.3).

NOTE 5 For environments with higher pollution degrees, enclosures giving the appropriate degree of protection can be used.

NOTE 6 For RCBOs having a degree of protection higher than IP20 special constructions can be required.

RCBOs are suitable for isolation.

Special precautions (e.g. surge protective devices) can be necessary when excessive overvoltages are likely to occur on the supply side (for example in the case of supply through overhead lines, see IEC 60364-4-44 and IEC 60364-5-53).

RCBOs, with the exception of those with an uninterrupted neutral, are suitable for use in IT systems.

RCBOs of the general type are resistant to current surges, 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.

RCBOs of type S are considered to be sufficiently resistant against unwanted tripping even if the surge voltage causes a flashover and a follow-on current occurs.

NOTE 7 Surge protective devices installed downstream of the general type of RCBOs and connected in common mode can cause unwanted tripping.

This document also applies to RCBOs obtained by the assembly of an adaptable residual current device with a circuit-breaker. The mechanical assembly is intended to be effected in the factory by the manufacturer, or on site, in which case the requirements of Annex G apply. It also applies to RCBOs having more than one rated current, provided that the means for changing from one discrete rating to another is not accessible in normal service and that the rating cannot be changed without the use of a tool.

Particular requirements are necessary for RCBOs intended to be used at frequencies other than 50 Hz or 60 Hz.

For RCBOs incorporated in, or intended for association with socket-outlets only, the requirements of this document can be used, as far as applicable, in conjunction with the requirements of IEC 60884-1 or the national requirements of the country where the product is placed on the market.

NOTE 8 Residual current devices (RCDs) with or without overcurrent protection for socket-outlets for household and similar uses are also covered by IEC 62640.

NOTE 9 In DK, plugs and socket-outlets are in accordance with the requirements of the heavy current regulations section 107.

NOTE 10 In the UK, the plug part associated with an RCBO complies with BS 1363-1 and the socket-outlet(s) associated with an RCBO complies with BS 1363-2. In the UK, the plug part and the socket-outlet(s) associated with an RCBO need not comply with any IEC 60884-1 requirements.

This document does not apply to:

- RCBOs intended to protect motors;
- RCBOs the current setting of which is adjustable without a tool;
- RCBOs including batteries.

A guide for the coordination of RCBOs with fuses is given in Annex F.

This document is not intended to be used alone; it is intended to be used in conjunction with the relevant product standard, IEC 61009-2-1 or IEC 61009-2-2.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-2, *High-voltage test techniques – Part 2: Measuring systems*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-3-4, *Environmental testing – Part 3-4: Supporting documentation and guidance – Damp heat tests*

IEC 60228, *Conductors of insulated cables*

IEC 60417, *Graphical symbols for use on equipment*, available at <https://www.graphical-symbols.info/equipment>

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements and tests*

IEC 60664-3, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60695-2-10, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60898-1:2015, *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations – Part 1: Circuit-breakers for AC operation*  
IEC 60898-1:2015/AMD1:2019

IEC 60947-2, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*

IEC 61009-2-1:2024, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 2-1: RCBOs according to classification 4.1.1*

IEC 61009-2-2:2024 *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 2-2: RCBOs according to classification 4.1.2, 4.1.3, 4.1.4, 4.1.5 and 4.1.6*

IEC 61032, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 62873-2, *Residual current operated circuit-breakers for household and similar use – Part 2: Residual current devices (RCDs) – Vocabulary*

IEC 62873-3-1, *Residual current operated circuit-breakers for household and similar use – Part 3-1: Particular requirements for devices with screwless-type terminals for external copper conductors*

IEC 62873-3-2, *Residual current operated circuit-breakers for household and similar use – Part 3-2: Particular requirements for devices with flat quick-connect terminations*

IEC 62873-3-3, *Residual current operated circuit-breakers for household and similar use – Part 3-3: Specific requirements for RCDs with screw-type terminals for external untreated aluminium conductors and with aluminium screw-type terminals for use with copper or with aluminium conductors*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62873-2 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

#### 3.1

##### **live part**

<in electrical installations and equipment> conductive part intended to be energized under normal operating conditions, including the neutral conductor and mid-point conductor, but excluding the PEN conductor, PEM conductor and PEL conductor

[SOURCE: IEC 60050-195:2021, 195-02-19]

#### 3.2

##### **functional earth**

FE

wire or terminal intended to be connected to the PE to continue to provide a supply to the RCBO when the RCBO is supplied from one phase only

#### 3.3

##### **line to neutral voltage**

$U_o$

voltage between line conductor and neutral conductor

#### 3.4

##### **residual current unit**

**RC-unit**

device performing simultaneously the functions of detection of the residual current and of comparison of the value of this current with the residual operating value, and incorporating the means of operating the tripping mechanism of a circuit-breaker with which it is designed to be assembled

## 4 Classification

### 4.1 According to the supply conditions

#### 4.1.1 RCBO operating correctly on the occurrence of residual current

- within the voltage range  $1,1 U_e$  and zero volt; and
- with any number of supply conductors connected.

The RCBO does not open automatically in the event of loss of supply.