IEC 61008-2-2

Edition 2.0 2024-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) –
Part 2-2: RCCBs according to classification 4.1.2, 4.1.3, 4.1.4, 4.1.5 and 4.1.6

Interrupteurs automatiques à courant différentiel résiduel sans dispositif de protection contre les surintensités incorporé pour usages domestiques et analogiques (ID) –
Partie 2-2: ID conformes à la classification en 4.1.2, 4.1.3, 4.1.4, 4.1.5 et 4.1.6

IEC 61008-2-2:2024-11(en-fr)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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RESIDUAL CURRENT OPERATED CIRCUIT-BREAKERS WITHOUT INTEGRAL OVERCURRENT PROTECTION FOR HOUSEHOLD AND SIMILAR USES (RCCBs) –

Part 2-2: RCCBs according to classification 4.1.2, 4.1.3, 4.1.4, 4.1.5 and 4.1.6

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IEC 61008-2-2 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 second edition cancels and replaces the first edition published in 1990. 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 4.1 for classification according to supply conditions;

e) modification of Clause 6 for markings of RCCBs with a functional earth (FE);

f) specific tests for operating characteristics of RCCBs according to classifications 4.1.2, 4.1.3, 4.1.4, 4.1.5 and 4.1.6;

g) specific test conditions for dielectric properties (9.7), temperature rise (9.8), electrical and mechanical endurance (9.10), short-circuit tests (9.11), verification of trip-free (9.15), behaviour in case of loss of the supply voltage (9.17), surge current tests (9.19), reliability (9.20), ageing (9.21) and temporary overvoltage (TOV) (9.24);

h) additional tests for RCCBs with a terminal connected to the FE: connecting capacity of FE terminal (9.200) and limitation of standing current in the FE (9.201).

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

Draft	Report on voting
23E/1370/FDIS	23E/1387/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 IEC 61008-1:2024.

Where this document states "addition", "deletion" or "replacement", the corresponding requirement, test specification or explanatory material in IEC 61008-1:2024 is adapted accordingly.

Where this document defines a new subclause, this subclause number starts at 200 (for example an additional definition in this part would read 3.200).

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/publications.

A list of all parts in the IEC 61008 series, published under the general title *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs)*, 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 in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

RESIDUAL CURRENT OPERATED CIRCUIT-BREAKERS WITHOUT INTEGRAL OVERCURRENT PROTECTION FOR HOUSEHOLD AND SIMILAR USES (RCCBs) –

Part 2-2: RCCBs according to classification 4.1.2, 4.1.3, 4.1.4, 4.1.5 and 4.1.6

1 Scope

IEC 61008-1:2024, Clause 1 is applicable except for the first paragraph, which is replaced by the first paragraph below, and the last paragraph, which is replaced by the second paragraph and note below:

This document applies to residual current operated circuit-breakers, without integral overcurrent protection, for household and similar uses (hereafter referred to as RCCBs), classified according to IEC 61008-1:2024, 4.1.2, 4.1.3, 4.1.4, 4.1.5 and 4.1.6. RCCBs according to this document are intended for voltages not exceeding 440 V AC with frequencies of 50 Hz, 60 Hz or 50/60 Hz and currents not exceeding 125 A, intended principally for protection against shock hazard.

This document applies in conjunction with IEC 61008-1:2024. It specifies requirements, tests and test sequences to verify compliance and is used for certification purposes.

NOTE Devices according to this part are not permitted in: DE

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 61008-1:2024, *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – Part 1: General rules*

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

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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62873-2, in IEC 61008-1 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

3.200
limiting impedance value
R_x
maximum impedance value from the FE to the supply source for which protection is ensured when the RCCB classified in accordance with 4.1.3 is supplied from any one phase only and FE

4 Classification

IEC 61008-1:2024, Clause 4 applies with the following modifications (deletion of 4.1.1):

4.1 According to the supply conditions

4.1.2 RCCB with 2 or 4 current paths operating correctly on the occurrence of residual current within the voltage range of 1,1 U_e and 85 V

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

NOTE In China, the lower limit value of 50 V (line to neutral) is required (for RCCBs with $I_{\Delta n}$ ≤ 30 mA) instead of 85 V.

4.1.3 RCCB according to 4.1.2 fitted with a functional earth (FE) and able to continue to provide protection when supplied from just one phase and FE

4.1.3.1 Does not open automatically in the event of loss of supply and continues to provide residual current protection in the case of supply from just one phase and FE.

4.1.3.2 Does not open automatically in the event of loss of one or more phases and provides protection by opening automatically if supplied from just one phase and FE.

4.1.4 RCCB with 3 current paths operating correctly on the occurrence of residual current within the voltage range of 1,1 U_e and 0,7 U_e

The RCCB does not open automatically in the case of loss of supply.

These devices are not intended to be supplied from single-phase circuits.

4.1.5 RCCB operating correctly on the occurrence of residual current within the voltage range 1,1 U_e and U_x

The device opens automatically, with or without delay, in the event of a supply voltage drop to a value less than U_x.

4.1.6 RCCB according to 4.1.5, however reclosing automatically after restoration of the supply voltage

5 Characteristics of RCCBs

IEC 61008-1:2024, Clause 5 applies with the following modifications.

5.1 Summary of characteristics

IEC 61008-1:2024, 5.1 applies with the following addition:

– minimum operating voltage U_x (see 5.2.1.200);

– rated value R_x (see 5.3.200).

5.2 Rated quantities and other characteristics

Add the following subclause:

5.2.1.200 Minimum operating voltage (U_x)

The minimum operating voltage, where applicable, as declared by the manufacturer for RCCBs.

5.3 Standard and preferred values

Add the following subclause:

5.3.200 Rated values for R_x

The standard value for R_x is 2 Ω for:

– single-pole RCCBs with two current paths; or

– three-pole with four current paths; or

– RCCBs rated 120 V or 120/240 V.

NOTE These devices are intended to be used in TN-systems only.

For other RCCBs, the standard R_x value shall be 6 kΩ unless a lower value is declared by the manufacturer.

6 Marking and other product information

IEC 61008-1:2024, Clause 6 applies with the following addition.

6.200 Marking of RCCBs classified according to 4.1.3

This Subclause 6.200 applies to RCCBs classified according to 4.1.3.

RCCB shall be marked with the rated value R_x in Ω, for values other than those specified in 5.3.200 (e.g. R_x = 5 000 Ω).

This information may be marked on the side or on the back of the device and shall be visible only before the device is installed.

The following additional information is required in the manufacturer's instructions:

– this device will provide protection in installations where the earth loop impedance does not exceed the R_x value.

The FE-wire or terminal shall be identified by the marking "FE".

In addition, if a terminal is used, the marking of the maximum rated connecting capability (e.g. "max 2,5 mm^2") shall be visible close to the terminal.

The following colours are not allowed for the FE-wire:

– green, yellow, blue and green-and-yellow.

The manufacturer's instructions shall state that the FE shall be connected directly to the PE and looping in the FE terminal is not allowed.

Compliance is verified by inspection.

6.201 Marking of RCCBs classified according to 4.1.5 and 4.1.6

For RCCBs classified according to 4.1.5 and 4.1.6 and opening with a delay in the event of failure of the line voltage, the manufacturer shall state in its product information the range of such delay.

Compliance is verified by inspection.

7 Standard conditions for operation in service and for installation

IEC 61008-1:2024, Clause 7 applies.

8 Requirements for construction and operation

IEC 61008-1:2024, Clause 8 applies with the following modifications:

8.1.2 Mechanism

IEC 61008-1:2024, 8.1.2 applies with the following addition:

In the case of RCCBs classified according to 4.1.6, the operating means shall remain in the ON position following automatic opening of the contacts; when the line voltage is re-established, the contacts shall reclose automatically unless in the meantime the operating means has been placed in the OFF position. For this type of RCCB, the operating means shall not be used as a means for indicating the closed and open positions.

8.1.3 Clearances, creepage distances and solid insulation

IEC 61008-1:2024, 8.1.3.1 applies with the following addition:

For RCCBs classified according to 4.1.3, IEC 61008-1:2024, Table 20 applies with the following additional requirement:

In the evaluation of the minimum required clearances and creepage distances, the FE is considered as a live part. In the case of RCCBs provided with flying leads, the measurements are carried out with the RCCB installed as in normal use.

8.1.5 Terminals for external conductors

IEC 61008-1:2024, 8.1.5 applies with the following addition for RCCBs classified according to 4.1.3:

8.1.5.200 Additional requirements for FE terminal or FE-wire

This Subclause 8.1.5.200 applies to RCCBs classified according to 4.1.3.

The rated connecting capacity of the FE terminal shall not exceed 2,5 mm^2 and it shall not be possible to connect a wire greater than 2,5 mm^2.

The RCCB FE-wire shall have a cross-section of at least 0,75 mm^2.

Compliance is checked by the tests of 9.200, inspection and measurement.

8.1.5.201 Screwless or flat quick-connect terminal for FE

This Subclause 8.1.5.201 applies to RCCBs classified according to 4.1.3.

It shall not be possible to connect a wire with cross-sectional area greater than 2,5 mm^2 to an FE terminal.

– If the FE terminal is of a screwless type, it shall be for one conductor only and shall comply with IEC 62873-3-1;
– If the FE terminal is of a flat quick-connect terminations type, it shall be limited to one wire and shall comply with IEC 62873-3-2.

8.12 Requirements for RCCBs in the event of loss of supply

RCCBs shall operate according to their classification in the event of loss of supply (see Table 33).

For RCCBs classified according to 4.1.5 and 4.1.6, U_x shall not be greater than 0,85 U_e (or, if relevant, 0,85 times the minimum value of the range of rated voltages).

RCCBs classified according to 4.1.6 shall not reclose automatically after opening due to a residual current.

Compliance is checked by the test of 9.17.

8.17 Resistance to temporary overvoltages (TOV)

IEC 61008-1:2024, 8.17 applies with the following addition:

For RCCBs classified according to 4.1.3, the following additional requirements regarding the resistance to temporary overvoltages (TOV) apply:

Withstand values of alternating overvoltage levels and duration are given in Table 201.

Compliance of the above requirement is checked by the test of 9.24.200.

8.200 Standing current in the FE under normal conditions

This Subclause 8.200 applies to RCCBs classified according to 4.1.3.

The standing current from the FE through the protective conductor shall not exceed 1 mA under normal supply conditions.

Compliance is checked by the test of 9.201.2.

8.201 Standing current in the FE in the case of RCCB supplied from just one phase and FE

This Subclause 8.201 applies to RCCBs classified according to 4.1.3.

When the RCCB is supplied from just one phase and FE as for single-phase conditions, the standing current in the FE shall not exceed 2 mA.

Compliance is checked by the test of 9.201.3.

9 Tests

IEC 61008-1:2024, Clause 9 applies with the following modifications.

9.1 General

IEC 61008-1:2024, 9.1 applies with the following modification:

Replace the third paragraph by:

The test sequences and the number of samples to be submitted are stated in Annex A.

9.7 Test of dielectric properties

IEC 61008-1:2024, Clause 9.7 applies with the following modifications.

9.7.2 Insulation resistance of the main circuit

IEC 61008-1:2024, 9.7.2 applies with the following additions:

Add at the end of 9.7.2 b) the following:

For RCCBs classified according to 4.1.3, for the purpose of this test, the FE is considered as a pole and the electronic circuit between poles and FE shall be disconnected.

For RCCBs classified according to 4.1.5 and 4.1.6 not remaining in the closed position, each pole is bridged by an external connection;

Add at the end of 9.7.2 c) the following:

For RCCBs classified according to 4.1.3, for the purpose of this test, the FE is connected to all poles.

For RCCBs classified according to 4.1.5 and 4.1.6 not remaining in the closed position, each pole is bridged by an external connection;

9.7.6 Capability of control circuits connected to the main circuit withstanding high DC voltages due to insulation measurements

For RCCBs classified according to 4.1.3, the text of IEC 61008-1:2024, 9.7.6 is replaced by the following:

The test is carried out on the RCCB fixed on a metal support, in the closed position, with all control circuits connected as in service.

A DC voltage source is used with the following characteristics:

– open voltage: 600 V $^{+25}_{0}$ V

– maximum ripple: 5 %

– short-circuit current: 12 mA $^{+2}_{0}$ mA

This test voltage is applied for 1 min, in turn between each pole and the other poles connected together to the frame. For the purpose of this test the FE is considered as part of the frame.

After this treatment, under the conditions of 9.9.1.2.3, the RCCB shall trip with a test current of $I_{\Delta n}$. Only one test is carried out, the break time shall comply with IEC 61008-1:2024, Table 11.

Moreover, the RCCB shall be capable of performing satisfactorily the tests specified in 9.9.1.5.1 or 9.9.1.5.2 as applicable with only one measurement.

9.7.7.2 Verification of clearances with the impulse withstand voltage

IEC 61008-1:2024, 9.7.7.2 applies with the following additions:

Add after the fifth paragraph (before list item a)) the following:

For RCCBs classified according to 4.1.5 and 4.1.6, not remaining in the closed position, each pole is bridged by an external connection.

For the tests according to 9.7.7.2 b), the following applies:

For RCCBs classified according to 4.1.3, the test of 9.7.7.2 b) is carried out by applying the impulse voltage between:

– the metal support connected together with the terminal(s) intended for the protective conductor(s), or FE, and

– the phase pole(s) and neutral pole (or path) connected together.

9.8 Test of temperature-rise

IEC 61008-1:2024, Clause 9.8 applies with the following modifications.

9.8.2 Test procedure

IEC 61008-1:2024, 9.8.2 applies with the following addition:

The test is performed at any convenient voltage, the electronic components being supplied at the rated voltage.