

INTERNATIONAL STANDARD



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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RESIDUAL CURRENT OPERATED CIRCUIT-BREAKERS
FOR HOUSEHOLD AND SIMILAR USE –****Part 3-3: Specific requirements for ~~RCDs~~ devices with screw-type terminals for external untreated aluminium conductors and with aluminium screw-type terminals for use with copper or with aluminium conductors**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62873-3-3:2016. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 62873-3-3 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 2016. This edition constitutes a technical revision.

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

- a) Modification of scope to address other devices in addition to RCDs;
- b) Modification of Clause 8 so that IEC 62873-3-3 can be referred to by other product standards in addition to those for RCDs;
- c) Modification of 9.1 so that IEC 62873-3-3 can be referred to by other product standards in addition to those for RCDs.

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

Draft	Report on voting
23E/1274/FDIS	23E/1306/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.

A list of all parts of the IEC 62873 series published under the general title *Residual current operated circuit-breakers for household and similar use* can be found on the IEC website.

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

- NOTE 2 of Clause 1: the use of aluminium screw-type terminals for use with copper conductors is not allowed (Austria, Australia and Germany);
- NOTE 2 of Clause 1: terminals for aluminium conductors only are not allowed (Austria and Germany);
- NOTE 2 of Clause 1: the use of aluminium conductors is not allowed for final circuits in household and similar installations e.g. offices, shops (Spain);
- NOTE 2 of Clause 1: the minimum cross-sectional area for aluminium conductors is 16 mm² (Denmark).

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.

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

This document is part of the IEC 62873 series described in the outline document IEC 62873-1.

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RESIDUAL CURRENT OPERATED CIRCUIT-BREAKERS FOR HOUSEHOLD AND SIMILAR USE –

Part 3-3: Specific requirements for ~~RCDs~~ devices with screw-type terminals for external untreated aluminium conductors and with aluminium screw-type terminals for use with copper or with aluminium conductors

1 Scope

This part of IEC 62873 applies to ~~RCDs~~ devices equipped with screw-type terminals of copper – or of alloys containing at least 58 % of copper (if worked cold) or at least 50 % of copper (if worked otherwise), or of other metal or suitably coated metal, no less resistant to corrosion than copper and having mechanical properties no less suitable – for use with untreated aluminium conductors, or with screw-type terminals of aluminium material for use with copper or aluminium conductors.

~~This part of IEC 62873 cannot be used alone but it is intended to be applied together with an RCD product standard (IEC 61008-1 or IEC 61009-1) if an RCD is equipped with screw type terminals for external untreated aluminium conductors and with aluminium screw-type terminals for use with copper or with aluminium conductors.~~

This document does not cover the use of aluminium conductors or aluminium terminals for DC applications.

Flexible aluminium conductors are not covered by this document.

NOTE 1 Flexible aluminium conductors are under consideration.

This document cannot be used alone but it is intended to be applied together with the applicable product standard.

In this document, copper-clad and nickel-clad aluminium conductors are considered as aluminium conductors.

NOTE 2 In AT, AU and DE, the use of aluminium screw-type terminals for use with copper conductors is not allowed.

- In AT and DE, terminals for aluminium conductors only are not allowed;
- In ES, the use of aluminium conductors is not allowed for final circuits in household and similar installations e.g. offices, shops;
- In DK, the minimum cross-sectional area for aluminium conductors is 16 mm².

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

~~IEC 61009-1, Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules~~

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

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 terminological databases for use in standardization at the following addresses:

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

3.1

treated conductor

contact area of a conductor that has had its oxide layer on the outside strands scraped away and/or has had a compound added to improve connectability and/or prevent corrosion

3.2

untreated conductor

unprepared conductor

conductor which has been cut and the insulation of which has been removed for insertion into a terminal

Note 1 to entry: A conductor, the shape of which is arranged for introduction into a terminal or the strands of which are twisted to consolidate the end, is considered to be an unprepared conductor.

[SOURCE: IEC 60050-442:1998, 442-01-26]

3.3

equalizer

arrangement used in the test loop to ensure an equipotentiality point and uniform current density in a stranded conductor, without adversely affecting the temperature of the conductor(s)

3.4

reference conductor

continuous length of the same type and size conductor as that used in the terminal unit under test and connected in the same series circuit, which enables the reference temperature and, if required, reference resistance to be determined

3.5

stability factor

S_f

measure of temperature stability of a terminal unit during the current cycling test

4 Classification

Clause 4 of the ~~RCD~~ product standard applies.

5 Characteristics of ~~RCDs~~ devices

Clause 5 of the ~~RCD~~ product standard applies.

6 Marking and other product information

In addition to Clause 6 of the ~~RCD~~ product standard, the following requirements apply.

The terminal marking defined in Table 1 shall be marked on the ~~RCD~~ product, near the terminals.

The other information concerning the number of conductors, the screw torque values (if different from ~~Table 11~~ of the ~~RCD~~ product standard) the type of conductor (solid or stranded) and the cross-sections shall be indicated on the ~~RCD~~ product.

~~NOTE Tables 6, 10, 11 (in IEC 61008-1:2010) and Tables 8, 13, 14 (in IEC 61009-1:2010) have been replaced by the harmonized new numbers: 9, 10 and 11.~~

Table 1 – Marking for terminals

Conductor types accepted	Marking
Copper only	None
Aluminium only	Al
Aluminium and copper	Al/Cu

The manufacturer shall state in his catalogue that, for the clamping of an aluminium conductor, the tightening torque shall be applied with appropriate means.

7 Standard conditions for operation in service and for installation

Clause 7 of the ~~RCD~~ product standard applies.

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8 Requirements for construction and operation

~~Clause 8 of the RCD product standard applies, with the following exceptions:~~

~~The following text is added at the end of 8.1.5.2 of the RCD product standard:~~

The requirements of Clause 8 of this document apply in addition to Clause 8 of the product standard.

For the connection of aluminium conductors, ~~RCDs~~ products shall be provided with screw-type terminals allowing the connection of conductors having nominal cross-sections as shown in Table 2.

Terminals for the connection of aluminium conductors and terminals of aluminium for the connection of copper or aluminium conductors shall have mechanical strength adequate to withstand the tests of ~~9.4 of the RCD product standard~~ reliability of screws, current-carrying parts and connections of the product standard, with the test conductors tightened with the torque indicated in Table 12 of this document, or with the torque specified by the manufacturer, which shall ~~never~~ not be lower than that specified in ~~Table 11 of the RCD product standard~~ Table 12 of this document.

Table 2 – Connectable cross-sections of aluminium conductors for screw-type terminals

Rated current ^a A	Range of nominal cross-sections ^b to be clamped mm ²
Up to and including 25	10
Above 25 up to and including 32	10 to 16
Above 32 up to and including 50	10 to 25
Above 50 up to and including 80	10 to 35
Above 80 up to and including 100	16 to 50
Above 100 up to and including 125	25 to 70

^a It is required that, for current ratings up to and including 50 A, terminals be designed to clamp solid conductors as well as rigid stranded conductors; ~~the use of flexible conductors is permitted. Nevertheless, it is permitted that terminals for conductors having cross-sections up to 10 mm² be designed to clamp solid conductors only.~~

^b Maximum wire sizes of ~~RCD~~ product standard, increased according to Table D.2 of IEC 61545:1996.

Compliance is checked by inspection, by measurement and by fitting in turn one conductor of the smallest and one of the largest cross-section areas as specified.

~~8.1.5.4 of the RCD product standard is replaced by the following text:~~

~~8.1.5.4~~ Terminals shall allow the conductors to be connected without special preparation. This requirement applies for any rating of the terminal, whatever is stated in the product standard.

Compliance is checked by inspection and the tests of Clause 9.

9 Tests

9.1 General

Clause 9 of the ~~RCD~~ product standard applies, with the following modifications/additions:

For the tests which are influenced by the material of the terminal and the type of conductor that can be connected, the test conditions of Table 3 are applied.

Additionally, the test of 9.3 is carried out on terminals separated from the ~~RCD~~ product.

Table 3 – List of tests according to the material of conductors and terminals

Material of terminals	Material according to 8.1.4.4 ^a	Al ^a	
		Cu	Al
Material of conductor (Table 1)	Al Use Tables 2 and 5 of this standard	Cu Use Tables 24 and 25 of the RCD product standard	Al Use Tables 2 and 5 of this standard
9.4—Reliability of screws	Use Table 2 of this standard and Table 26 of the RCD product standard	Use Tables 24, 25 and 26 of the RCD product standard	Use Table 2 of this standard and Table 26 of the RCD product standard
9.5.1—Pull-out test ^b	Use Table 2 of this standard and Table 26 of the RCD product standard	Use Tables 24, 25 and 26 of the RCD product standard	Use Table 2 of this standard and Table 26 of the RCD product standard
9.5.2—Damage of the conductor	Use Table 2 of this standard and Table 26 of the RCD product standard	Use Tables 24, 25 and 26 of the RCD product standard	Use Table 2 of this standard and Table 26 of the RCD product standard
9.5.3—Insertion of the conductor	Use Table 5 of this standard	Use Table 25 of the RCD product standard	Use Table 5 of this standard
9.8—Temperature rise	Use Table 5 of this standard	Use Table 25 of the RCD product standard	Use Table 5 of this standard
9.22—Verification of reliability	Use Table 5 of this standard	Use Table 25 of the RCD product standard	Use Table 5 of this standard
9.2—Cycling test	Use Table 26 of the RCD product standard	Use Table 26 of the RCD product standard	Use Table 26 of the RCD product standard
^a —Use test sequences A and B and number of samples defined in Annex A. For RCDs which are able to be connected to Al or Cu conductors, the test sequences and number of samples have to be doubled (one for the Cu conductor and one for the Al conductor).			
^b —For the pull-out test in 9.5.1, the value for 70 mm ² wire is under consideration.			

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