# IEC 62873-3-1

Edition 2.0 2020-11
REDLINE VERSION

# INTERNATIONAL STANDARD





## Residual current operated circuit-breakers for household and similar use – Part 3-1: Particular requirements for ~~RCDs~~ devices with screwless-type terminals for external copper conductors

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

## Part 3-1: Particular requirements for ~~RCDs~~ devices with screwless-type terminals for external copper conductors

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**This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

International Standard IEC 62873-3-1 has been prepared by subcommittee 23E: Circuit-breakers and similar equipment for household use, of IEC technical committee 23: Electrical accessories.

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 cover screwless-type terminals up to 40 A;
b) Modification of scope to address other devices in addition to RCDs;
c) Modification of Table 1 to cover rated currents up to 40 A;
d) Modification of 8.1 so that IEC 62873-3-1 can be referred to by other product standards in addition to those for RCDs;
e) Modification of 9.1 so that IEC 62873-3-1 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:

| FDIS | Report on voting |
|---|---|
| 23E/1190/FDIS | 23E/1200/RVD |

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document is intended to be referred to by a product standard of subcommittee IEC SC23E (e.g. from the IEC 61008 series, IEC 61009 series, IEC 62606, and IEC 63052).

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

# INTRODUCTION

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

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

## Part 3-1: Particular requirements for ~~RCDs~~ devices with screwless-type terminals for external copper conductors

## 1 Scope

~~This part of IEC 62873 applies to RCDs equipped with screwless terminals, for current not exceeding 20 A primarily suitable for connecting unprepared (see 3.5) copper conductors of cross-section up to 4 mm$^2$.~~

~~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 screwless terminals.~~

~~NOTE In AT, CZ, DK, NL, NO, PO, PT and CH, the upper limit of current for use of screwless terminals is 16 A.~~

This document applies to devices equipped with screwless-type terminals for current not exceeding 40 A, primarily suitable for connecting unprepared copper conductors of cross-section up to 10 mm$^2$.

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

NOTE 1 In CZ, DK, NL, PO and CH, the upper limit of current for use of screwless-type terminals is 16 A.

NOTE 2 In JP, the upper limit of current for use of screwless-type terminals is 30 A.

NOTE 3 The manufacturer can declare in its documentation specific conditions permitting the use of prepared conductors.

In this document, screwless-type terminals are referred to as terminals, and copper conductors are referred to as conductors.

## 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 http://www.iso.org/obp
- IEC Electropedia: available at http://www.electropedia.org/

**3.1**
**clamping unit**
part of the terminal necessary for mechanical clamping and electrical connection of the conductors including parts necessary to ensure correct contact pressure

**3.2**
**universal terminal**
terminal for the connection and disconnection of all types of conductors (rigid and flexible)

Note 1 to entry: In the following countries, only universal screwless-type terminals are accepted: AT, BE, CN, DK, DE, ES, FR, IT, PT, SE and CH.

**3.3**
**non-universal terminal**
terminal for the connection and disconnection of a certain kind of conductor only (e.g. rigid-solid conductors only or rigid-[solid or stranded] conductors only)

**3.4**
**push-wire terminal**
non-universal terminal (see 3.3) in which the connection is made by pushing in rigid (solid or stranded) conductors

**3.5**
**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 as an unprepared conductor.

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

**3.6**
**low-current terminal**
terminal intended to connect a conductor to a device capable of supplying a voltage signal and/or a current not exceeding 300 mA to the device

Note 1 to entry: This does not apply to special terminal constructions intended to connect to flat or other multiwire cables by performing one "clamping action" only for more than one wire (e.g. bus connections).

## 4 Classification

Clause 4 of the ~~RCD~~ product standard, in which this document is referred to, applies.

## 5 Characteristics of ~~RCDs~~ devices

Clause 5 of the ~~RCD~~ product standard, in which this document is referred to, applies.

## 6 Marking and other product information

In addition to Clause 6 of the ~~RCD~~ product standard, in which this document is referred to, the following ~~requirements~~ markings apply:

Universal terminals:

– no marking.

Non-universal terminals:

– terminals declared for rigid-solid conductors shall be marked with the letters "sol";
– terminals declared for rigid (solid and stranded) conductors shall be marked with the letter "r";
– terminals declared for flexible conductors shall be marked with the letter "f".

The markings shall appear on the device or, if the space available is not sufficient, on the smallest package unit or in technical information.

An appropriate marking indicating the length of insulation to be removed before insertion of the conductor into the terminal shall be shown on the ~~RCD~~ product.

The manufacturer shall also provide information, in its literature, on the maximum number of conductors which may be clamped.

## 7 Standard conditions for operation in service and for installation

Clause 7 of the ~~RCD~~ product standard, in which this document is referred to, applies.

## 8 Requirements for construction and operation

### 8.1 General

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

~~In 8.1.5, only 8.1.5.1, 8.1.5.2, 8.1.5.3, 8.1.5.6 and 8.1.5.7 apply.~~

~~Compliance is checked by inspection and by the tests of 9.2 and 9.3 of this standard.~~

~~In addition, the following requirements apply.~~

The requirements of Clause 8 of this document apply in addition to Clause 8 of the product standard, in which this document is referred to.

Compliance is checked by inspection and by the tests of 9.2 and 9.3 of this document.

For low-current terminals, no significant current flow is expected in normal service. Therefore, the tests of 9.3.2 are not performed.

### 8.2 Connection ~~or~~ and disconnection of conductors

The connection ~~or~~ and disconnection of conductors shall be made:

– by the use of a general-purpose tool or by a convenient device integral with the terminal to open it and to assist the insertion or the withdrawal of the conductors (e.g. for universal terminals);

or, for rigid conductors:

– by simple insertion. For the disconnection of the conductors, an operation other than a pull on the conductor shall be necessary (e.g. for push-wire terminals).

Universal terminals shall accept rigid (solid or stranded) and flexible unprepared conductors. They may also accept prepared conductors according to the manufacturer's declaration.

Non-universal terminals shall accept the types of conductors declared by the manufacturer.

Compliance is checked by inspection and by the tests of 9.2 and 9.3 of this document.

### 8.3 Dimensions of ~~connectable~~ conductors

The dimensions of ~~connectable~~ conductors are given in Table 1.

The ability to connect these conductors shall be checked by ~~inspection and by~~ the tests of 9.2 and 9.3 of this document.

**Table 1 – ~~Connectable conductors~~ Conductors and their theoretical diameters**

| ~~Connectable conductors and their theoretical diameter~~ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ~~Metric~~ | | | | | ~~AWG~~ | | | | |
| ~~Rigid~~ | | | ~~Flexible~~ | | ~~Rigid~~ | | | ~~Flexible~~ | |
| | ~~Solid~~ | ~~Stranded~~ | | | | ~~Solid[a]~~ | ~~Class B stranded[a]~~ | | ~~Classes I, K, M, stranded[b]~~ |
| ~~$mm^2$~~ | ~~∅ mm~~ | ~~∅ mm~~ | ~~$mm^2$~~ | ~~∅ mm~~ | ~~gauge~~ | ~~∅ mm~~ | ~~∅ mm~~ | ~~gauge~~ | ~~∅ mm~~ |
| ~~1,0~~ | ~~1,2~~ | ~~1,4~~ | ~~1,0~~ | ~~1,5~~ | ~~18~~ | ~~1,02~~ | ~~1,16~~ | ~~18~~ | ~~1,28~~ |
| ~~1,5~~ | ~~1,5~~ | ~~1,7~~ | ~~1,5~~ | ~~1,8~~ | ~~16~~ | ~~1,29~~ | ~~1,46~~ | ~~16~~ | ~~1,60~~ |
| ~~2,5~~ | ~~1,9~~ | ~~2,2~~ | ~~2,5~~ | ~~2,3~~ | ~~14~~ | ~~1,63~~ | ~~1,84~~ | ~~14~~ | ~~2,08~~ |
| ~~4,0~~ | ~~2,4~~ | ~~2,7~~ | ~~4,0~~ | ~~2,9~~ | ~~12~~ | ~~2,05~~ | ~~2,32~~ | ~~12~~ | ~~2,70~~ |
| ~~NOTE Diameters of the largest rigid and flexible conductors are based on IEC 60228, and, for AWG conductors, on ASTM B172-01a.~~ | | | | | | | | | |
| ~~[a] Nominal diameter + 5 %.~~<br>~~[b] Largest diameter + 5 % for any of the three classes I, K and M.~~ | | | | | | | | | |

| Metric | | | | | AWG | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Rigid | | | Flexible | | Rigid | | | Flexible | |
| | Solid | Stranded | | | | Solid [a] | Class B stranded [a] | | Classes I, K, M, stranded [b] |
| $mm^2$ | ∅ mm | ∅ mm | $mm^2$ | ∅ mm | gauge | ∅ mm | ∅ mm | gauge | ∅ mm |
| 1,0 | 1,2 | 1,4 | 1,0 | 1,5 | 18 | 1,07 | 1,23 | 18 | 1,28 |
| 1,5 | 1,5 | 1,7 | 1,5 | 1,8 | 16 | 1,35 | 1,55 | 16 | 1,60 |
| 2,5 | 1,9 | 2,2 | 2,5 | 2,4 | 14 | 1,71 | 1,95 | 14 | 2,08 |
| 4,0 | 2,4 | 2,7 | 4,0 | 3,0 | 12 | 2,15 | 2,45 | 12 | 2,70 |
| 6,0 | 2,9 | 3,3 | 6,0 | 3,9 | 10 | 2,72 | 3,09 | 10 | 3,36 |
| 10,0 | 3,7 | 4,2 | 10,0 | 5,1 | 8 | 3,43 | 3,89 | 8 | 4,32 |

NOTE Diameters of the largest rigid and flexible conductors are based on Table C.1 of IEC 60228:2004, and, for AWG conductors, on ASTM B 172-17.

[a] Nominal diameter + 5 %.

[b] Largest diameter + 5 % for any of the three classes I, K and M.

### 8.4 Connectable cross-sectional areas

The nominal cross-sections to be clamped are defined in Table 2.

**Table 2 – Cross-sections of copper conductors connectable to screwless-type terminals**

| Rated current<br>A | Nominal cross-sections to be clamped<br>$mm^2$ |
|---|---|
| Low-current terminals | To be declared by the manufacturer |
| Up to and including 13 | 1 up to and including 2,5 |
| Above 13 up to and including 20 | 1,5 up to and including 4 |
| Above 20 up to and including 25 | 1,5 up to and including 6 [a] |
| Above 25 up to and including 32 | 2,5 up to and including 6 [a] |
| Above 32 up to and including 40 | 4 up to and including 10 |

[a] For terminals with two connections per pole, the maximum value is 4 $mm^2$. Two conductors in parallel (also known as ring circuits) are used in some countries.



Compliance is checked by inspection and by the tests of 9.2 and 9.3 of this document.

### 8.5 Insertion and ~~disconnection~~ withdrawal of conductors

The insertion and ~~disconnection~~ withdrawal of the conductors shall be ~~made~~ carried out in accordance with the manufacturer's instructions.

Compliance is checked by inspection.

### 8.6 Design and construction of terminals

Terminals shall be so designed and constructed that:

– each conductor is clamped individually;

– during the operation of connection or disconnection the conductors can be connected or disconnected either at the same time or separately;
– inadequate insertion of the conductor is avoided.

It shall be possible to clamp securely any number of conductors up to the maximum provided for.

Compliance is checked by inspection and by the tests of 9.2 and 9.3 of this document.

NOTE Examples are given in Figure 2.

### 8.7 Resistance to ageing

The terminals shall be resistant to ageing.

Compliance is checked by the test of 9.3.2.

## 9 Tests

### 9.1 General

~~Clause 9 of the RCD product standard applies, with the exception of 9.4 and 9.5.~~

The requirements of Clause 9 of this document apply in addition to Clause 9 of the product standard, in which this document is referred to.

Test of reliability of screws, current-carrying parts and connections, and the test of reliability of screw-type terminals for external copper conductors of Clause 9 of the product standard are replaced here by 9.2 and 9.3.

For short-circuit tests, the device shall be connected with cables having the maximum cross-section according to Table 2 of this document.

### 9.2 Test of reliability of screwless-type terminals

#### 9.2.1 Reliability of screwless system

The test is carried out on three terminals of poles of new samples, with copper conductors of the rated cross-sectional area in accordance with Table 2. The types of conductors shall be in accordance with ~~8.2~~ Table 1, as applicable.

The connection and subsequent disconnection shall be ~~made~~ carried out five times with the smallest diameter conductor, and then successively five times with the largest diameter conductor.

New conductors shall be used each time, except for the fifth time, when the conductor used for the fourth insertion is clamped at the same place. Before insertion into the terminal, wires of stranded rigid conductors shall be re-shaped and wires of flexible conductors shall be twisted to consolidate the ends.

For each insertion, the conductors ~~are~~ shall either be pushed as far as possible into the terminal or shall be inserted so that adequate connection is obvious.

After each insertion, the conductor being inserted is rotated 90° along its axis at the level of the clamped section and subsequently disconnected.

After these tests, the terminal shall not be damaged in such a way as to impair its further use.

### 9.2.2 Test of reliability of connection

Three terminals of poles of new samples are fitted with new copper conductors of the type and of the rated cross-sectional area according to Table 2.

The types of conductors shall be in accordance with ~~8.2~~ Table 1, as applicable.

Before insertion into the terminal, wires of stranded rigid conductors and flexible conductors shall be re-shaped and wires of flexible conductors shall be twisted to consolidate the ends.

It shall be possible to fit the conductor into the terminal without undue force in the case of universal terminals and with the force necessary by hand in the case of push-wire terminals.

The conductor ~~is~~ shall either be pushed as far as possible into the terminal or shall be inserted so that adequate connection is obvious.

After the test, no wire of the conductor shall have escaped outside the terminal.

## 9.3 Tests of reliability of terminals for external conductors

### 9.3.1 Mechanical strength

For the pull-out test, three terminals of poles of new samples are fitted with new conductors of the type and of the minimum and maximum cross-sectional areas according to Table 2.

Before insertion into the terminal, wires of stranded rigid conductors and flexible conductors shall be re-shaped and wires of flexible conductors shall be twisted to consolidate the ends.

Each conductor is then subjected to a pull force of the value shown in Table 3. The pull is applied without jerks for 1 min in the direction of the axis of the conductor.

**Table 3 – Pull forces**

| Cross-sectional area<br>$mm^2$ | Pull force<br>N |
|---|---|
| 1,0 | 35 |
| 1,5 | 40 |
| 2,5 | 50 |
| 4,0 | 60 |
| 6,0 | 80 |
| 10,0 | 90 |

During the test, the conductor shall not slip out of the terminal.

### 9.3.2 Cycling test

~~The test is made with new copper conductors having cross section according to Table 10 of the RCD product standard.~~

~~NOTE 1 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, 11.~~

The test is made with new copper conductors having cross section according to Table 4.

**Table 4 – Test copper conductors corresponding to the rated currents**

| Rated current $I_n$ A | $I_n \leq$ 6 | 6 < $I_n \leq$ 13 | 13 < $I_n \leq$ 20 | 20 < $I_n \leq$ 25 | 25 < $I_n \leq$ 32 | 32 < $I_n \leq$ 40 |
|---|---|---|---|---|---|---|
| S mm² | 1 | 1,5 | 2,5 | 4 | 6 [a] | 10 |

[a] For terminals with two connections per pole, the maximum value is 4 mm². Two conductors in parallel (also known as ring circuits) are used in some countries.

The test is carried out on new samples (a sample is one pole), the number of which is defined below, according to the type of terminals:

– universal terminals for rigid (solid and stranded) and flexible conductors: three samples each (six samples in total);

NOTE ~~2~~ In case of rigid conductors, solid conductors are used (if solid conductors are not available in a given country, stranded conductors can be used).

– non-universal terminals for solid conductors only: three samples;
– non-universal for rigid (solid and stranded) conductors: three samples each (six samples);
– non-universal for flexible conductors only: three samples.

~~A conductor having the cross-section defined in Table 10 of the RCD product standard is connected in series as in normal use to each of the three samples as defined in Figure 1.~~

The conductor of 1 m is connected in series between two terminals to be tested as shown in Figure 1.

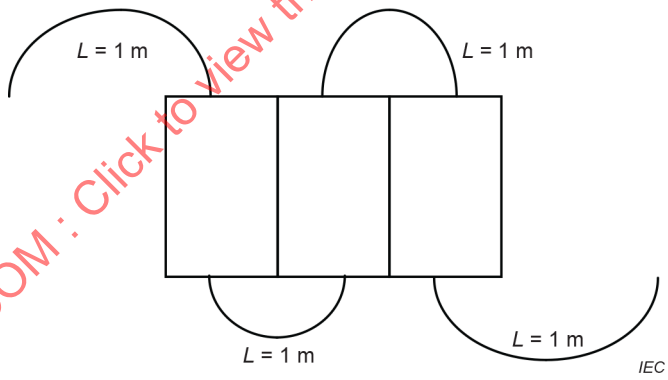



**Figure 1 – Connecting samples**

The sample is provided with a hole (or equivalent) in order to measure the voltage drop on the terminal.

The whole test arrangement, including the conductors, is placed in a heating cabinet which is initially kept at a temperature of (20 ± 2) °C.

To avoid any movement of the test arrangement until all the following voltage drop tests have been completed, the poles should be fixed on a common support.

Except during the cooling period, a test current corresponding to the rated current of the circuit breaker is applied to the circuit.

The samples shall then be subjected to 192 temperature cycles, each cycle having a duration of approximately 1 h, as follows:

The air temperature in the cabinet is raised to 40 °C in approximately 20 min. It is maintained within ±5 °C of this value for approximately 10 min.

The samples are then allowed to cool ~~down in~~ for approximately 20 min to a temperature of approximately 30 °C, forced cooling being allowed. They are kept at this temperature for approximately 10 min and, if necessary for measuring the voltage drop, allowed to cool ~~down~~ further, to a temperature of (20 ± 2) °C.

The maximum voltage drop, measured at each terminal, at the end of the 192nd cycle, with the rated current shall not exceed the smaller of the two following values:

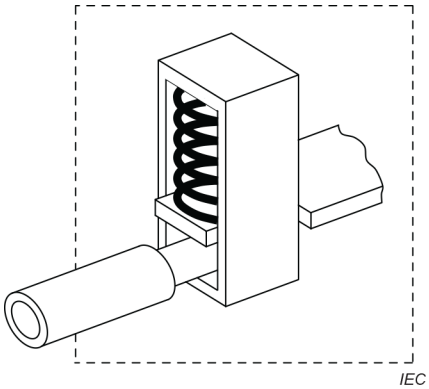
– either 22,5 mV or
– 1,5 times the value measured after the 24th cycle.

The measurement shall be made as near as possible to the area of contact on the terminal.

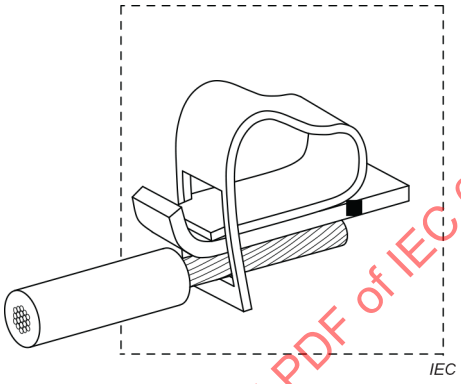
If the measuring points cannot be positioned closely to the point of contact, the voltage drop within the part of the conductor between the ideal and the actual measuring points shall be deducted from the voltage drop measured.

The temperature in the heating cabinet shall be measured at a distance of at least 50 mm from the samples.

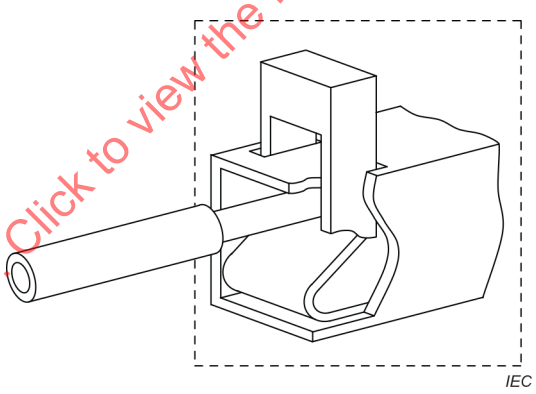
After this test, an inspection with the naked eye, by normal or corrected vision, without additional magnification, shall show no changes evidently impairing further use, such as cracks, deformations or the like.




a) Screwless-type terminal with indirect pressure




b) Screwless-type terminal with direct pressure




c) Screwless-type terminal with actuating element

**Figure 2 – Examples of screwless-type terminals**

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IEC 62606:2013, *General requirements for arc fault detection devices*
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IEC 62873-1, *Residual current operated circuit-breakers for household and similar use – Part 1: Outline of blocks and modules for residual current device standards*

IEC 63052, *Power frequency overvoltage protective devices (POPs) for household and similar applications*

ASTM ~~B172-10~~ B 172-17, *Standard specification for rope-lay-stranded copper conductors having bunch-stranded members, for electrical conductors*

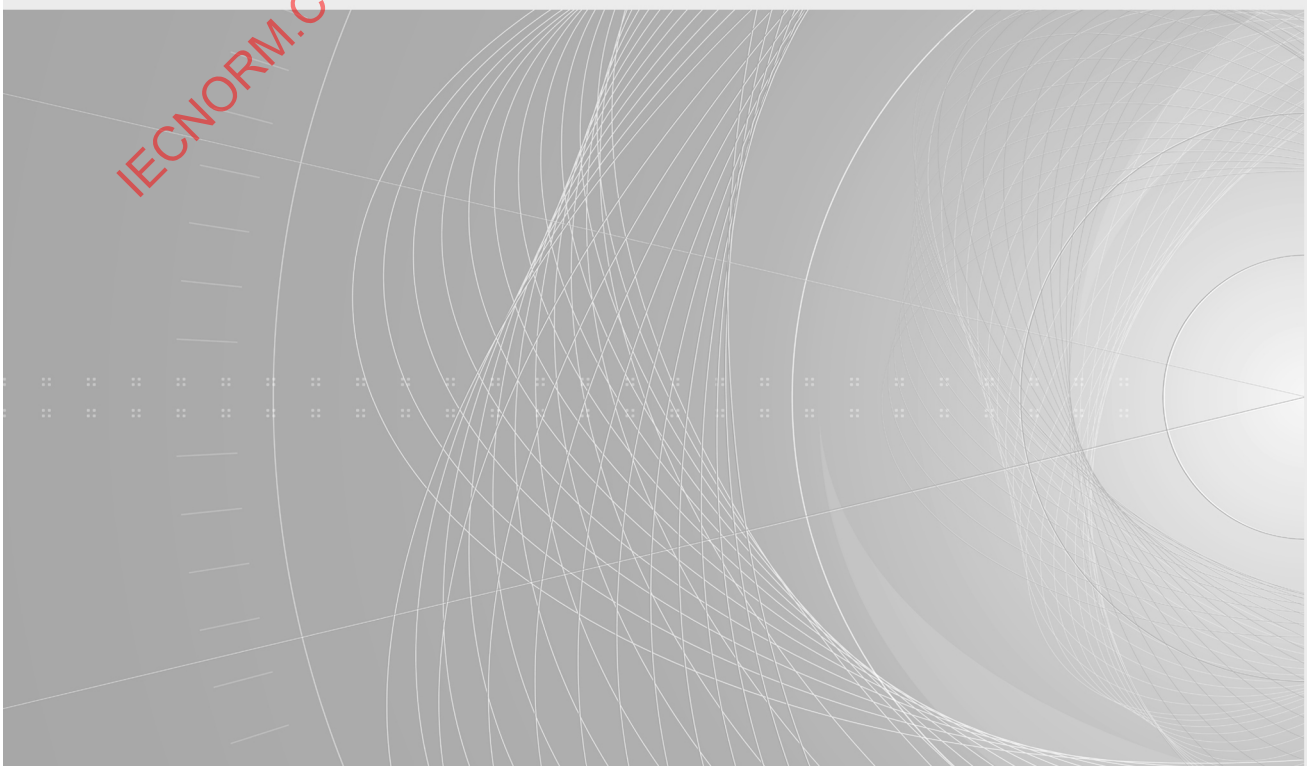
# IEC 62873-3-1

Edition 2.0 2020-11

# INTERNATIONAL STANDARD

## 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 62873-3-1:2020-11(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# 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

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International Standard IEC 62873-3-1 has been prepared by subcommittee 23E: Circuit-breakers and similar equipment for household use, of IEC technical committee 23: Electrical accessories.

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 cover screwless-type terminals up to 40 A;
b) Modification of scope to address other devices in addition to RCDs;
c) Modification of Table 1 to cover rated currents up to 40 A;

d) Modification of 8.1 so that IEC 62873-3-1 can be referred to by other product standards in addition to those for RCDs;

e) Modification of 9.1 so that IEC 62873-3-1 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:

| FDIS | Report on voting |
|---|---|
| 23E/1190/FDIS | 23E/1200/RVD |

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document is intended to be referred to by a product standard of subcommittee IEC SC23E (e.g. from the IEC 61008 series, IEC 61009 series, IEC 62606, and IEC 63052).

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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.

# INTRODUCTION

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

# 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

## 1 Scope

This document applies to devices equipped with screwless-type terminals for current not exceeding 40 A, primarily suitable for connecting unprepared copper conductors of cross-section up to 10 $mm^2$.

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

NOTE 1 In CZ, DK, NL, PO and CH, the upper limit of current for use of screwless-type terminals is 16 A.

NOTE 2 In JP, the upper limit of current for use of screwless-type terminals is 30 A.

NOTE 3 The manufacturer can declare in its documentation specific conditions permitting the use of prepared conductors.

In this document, screwless-type terminals are referred to as terminals, and copper conductors are referred to as conductors.

## 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 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 http://www.iso.org/obp
- IEC Electropedia: available at http://www.electropedia.org/

**3.1**
**clamping unit**
part of the terminal necessary for mechanical clamping and electrical connection of the conductors including parts necessary to ensure correct contact pressure

**3.2**
**universal terminal**
terminal for the connection and disconnection of all types of conductors (rigid and flexible)

Note 1 to entry: In the following countries, only universal screwless-type terminals are accepted: AT, BE, CN, DK, DE, ES, FR, IT, PT, SE and CH.

**3.3**
**non-universal terminal**
terminal for the connection and disconnection of a certain kind of conductor only (e.g. rigid-solid conductors only or rigid-[solid or stranded] conductors only)

**3.4**
**push-wire terminal**
non-universal terminal (see 3.3) in which the connection is made by pushing in rigid (solid or stranded) conductors

**3.5**
**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 as an unprepared conductor.

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

**3.6**
**low-current terminal**
terminal intended to connect a conductor to a device capable of supplying a voltage signal and/or a current not exceeding 300 mA to the device

Note 1 to entry: This does not apply to special terminal constructions intended to connect to flat or other multiwire cables by performing one "clamping action" only for more than one wire (e.g. bus connections).

## 4 Classification

Clause 4 of the product standard, in which this document is referred to, applies.

## 5 Characteristics of devices

Clause 5 of the product standard, in which this document is referred to, applies.

## 6 Marking and other product information

In addition to Clause 6 of the product standard, in which this document is referred to, the following markings apply:

Universal terminals:

– no marking.

Non-universal terminals:

– terminals declared for rigid-solid conductors shall be marked with the letters "sol";
– terminals declared for rigid (solid and stranded) conductors shall be marked with the letter "r";

– terminals declared for flexible conductors shall be marked with the letter "f".

The markings shall appear on the device or, if the space available is not sufficient, on the smallest package unit or in technical information.

An appropriate marking indicating the length of insulation to be removed before insertion of the conductor into the terminal shall be shown on the product.

The manufacturer shall also provide information, in its literature, on the maximum number of conductors which may be clamped.

## 7 Standard conditions for operation in service and for installation

Clause 7 of the product standard, in which this document is referred to, applies.

## 8 Requirements for construction and operation

### 8.1 General

The requirements of Clause 8 of this document apply in addition to Clause 8 of the product standard, in which this document is referred to.

Compliance is checked by inspection and by the tests of 9.2 and 9.3 of this document.

For low-current terminals, no significant current flow is expected in normal service. Therefore, the tests of 9.3.2 are not performed.

### 8.2 Connection and disconnection of conductors

The connection and disconnection of conductors shall be made:

– by the use of a general-purpose tool or by a convenient device integral with the terminal to open it and to assist the insertion or the withdrawal of the conductors (e.g. for universal terminals);

or, for rigid conductors:

– by simple insertion. For the disconnection of the conductors, an operation other than a pull on the conductor shall be necessary (e.g. for push-wire terminals).

Universal terminals shall accept rigid (solid or stranded) and flexible unprepared conductors. They may also accept prepared conductors according to the manufacturer's declaration.

Non-universal terminals shall accept the types of conductors declared by the manufacturer.

Compliance is checked by inspection and by the tests of 9.2 and 9.3 of this document.

### 8.3 Dimensions of conductors

The dimensions of conductors are given in Table 1.

The ability to connect these conductors shall be checked by the tests of 9.2 and 9.3 of this document.

**Table 1 – Conductors and their theoretical diameters**

| Metric | | | | | AWG | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Rigid | | | Flexible | | Rigid | | | Flexible | |
| | Solid | Stranded | | | | Solid [a] | Class B stranded [a] | | Classes I, K, M, stranded [b] |
| $mm^2$ | ∅ mm | ∅ mm | $mm^2$ | ∅ mm | gauge | ∅ mm | ∅ mm | gauge | ∅ mm |
| 1,0 | 1,2 | 1,4 | 1,0 | 1,5 | 18 | 1,07 | 1,23 | 18 | 1,28 |
| 1,5 | 1,5 | 1,7 | 1,5 | 1,8 | 16 | 1,35 | 1,55 | 16 | 1,60 |
| 2,5 | 1,9 | 2,2 | 2,5 | 2,4 | 14 | 1,71 | 1,95 | 14 | 2,08 |
| 4,0 | 2,4 | 2,7 | 4,0 | 3,0 | 12 | 2,15 | 2,45 | 12 | 2,70 |
| 6,0 | 2,9 | 3,3 | 6,0 | 3,9 | 10 | 2,72 | 3,09 | 10 | 3,36 |
| 10,0 | 3,7 | 4,2 | 10,0 | 5,1 | 8 | 3,43 | 3,89 | 8 | 4,32 |

NOTE Diameters of the largest rigid and flexible conductors are based on Table C.1 of IEC 60228:2004, and, for AWG conductors, on ASTM B 172-17.

[a] Nominal diameter + 5 %.

[b] Largest diameter + 5 % for any of the three classes I, K and M.

### 8.4 Connectable cross-sectional areas

The nominal cross-sections to be clamped are defined in Table 2.

**Table 2 – Cross-sections of copper conductors connectable to screwless-type terminals**

| Rated current<br>A | Nominal cross-sections to be clamped<br>$mm^2$ |
|---|---|
| Low-current terminals | To be declared by the manufacturer |
| Up to and including 13 | 1 up to and including 2,5 |
| Above 13 up to and including 20 | 1,5 up to and including 4 |
| Above 20 up to and including 25 | 1,5 up to and including 6 [a] |
| Above 25 up to and including 32 | 2,5 up to and including 6 [a] |
| Above 32 up to and including 40 | 4 up to and including 10 |

[a] For terminals with two connections per pole, the maximum value is 4 $mm^2$. Two conductors in parallel (also known as ring circuits) are used in some countries.



Compliance is checked by inspection and by the tests of 9.2 and 9.3 of this document.

### 8.5 Insertion and withdrawal of conductors

The insertion and withdrawal of the conductors shall be carried out in accordance with the manufacturer's instructions.

Compliance is checked by inspection.

### 8.6 Design and construction of terminals

Terminals shall be so designed and constructed that:

– each conductor is clamped individually;

– during the operation of connection or disconnection the conductors can be connected or disconnected either at the same time or separately;
– inadequate insertion of the conductor is avoided.

It shall be possible to clamp securely any number of conductors up to the maximum provided for.

Compliance is checked by inspection and by the tests of 9.2 and 9.3 of this document.

NOTE Examples are given in Figure 2.

### 8.7 Resistance to ageing

The terminals shall be resistant to ageing.

Compliance is checked by the test of 9.3.2.

## 9 Tests

### 9.1 General

The requirements of Clause 9 of this document apply in addition to Clause 9 of the product standard, in which this document is referred to.

Test of reliability of screws, current-carrying parts and connections, and the test of reliability of screw-type terminals for external copper conductors of Clause 9 of the product standard are replaced here by 9.2 and 9.3.

For short-circuit tests, the device shall be connected with cables having the maximum cross-section according to Table 2 of this document.

### 9.2 Test of reliability of screwless-type terminals

#### 9.2.1 Reliability of screwless system

The test is carried out on three terminals of poles of new samples, with copper conductors of the rated cross-sectional area in accordance with Table 2. The types of conductors shall be in accordance with Table 1, as applicable.

The connection and subsequent disconnection shall be carried out five times with the smallest diameter conductor, and then successively five times with the largest diameter conductor.

New conductors shall be used each time, except for the fifth time, when the conductor used for the fourth insertion is clamped at the same place. Before insertion into the terminal, wires of stranded rigid conductors shall be re-shaped and wires of flexible conductors shall be twisted to consolidate the ends.

For each insertion, the conductors shall either be pushed as far as possible into the terminal or shall be inserted so that adequate connection is obvious.

After each insertion, the conductor being inserted is rotated 90° along its axis at the level of the clamped section and subsequently disconnected.

After these tests, the terminal shall not be damaged in such a way as to impair its further use.