



DPC: 25 / 30506644 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 16 January 2025

Origin: International

Latest date for receipt of comments: 5 March 2025

Project No. 2024/03623

Responsible committee: PEL/23/1 Circuit breakers and similar equipment for household use

Interested committees:

Title: BS EN IEC 62423 Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

**WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD.
THIS DRAFT IS NOT CURRENT BEYOND 5 March 2025**

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <http://standardsdevelopment.bsigroup.com>

Responsible Committee Secretary: **Mr Simon Bounds (BSI)**
Direct tel: **0208 996 7281**
E-mail: simon.bounds@bsigroup.com

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



23E/1397/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 62423 ED3

DATE OF CIRCULATION:

2025-01-10

CLOSING DATE FOR COMMENTS:

2025-04-04

SUPERSEDES DOCUMENTS:

23E/1395A/RR

IEC SC 23E : CIRCUIT-BREAKERS AND SIMILAR EQUIPMENT FOR HOUSEHOLD USE

SECRETARIAT:

Italy

SECRETARY:

Mr Sergio Bossi

OF INTEREST TO THE FOLLOWING COMMITTEES:

SC 121A

HORIZONTAL FUNCTION(S):

ASPECTS CONCERNED:

Electromagnetic Compatibility, Safety

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses

NOTE FROM TC/SC OFFICERS:

Copyright © 2025 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

Link to Committee Draft (CD) online document:

<https://osd.iec.ch/#/editor/archive/7b47c97f-2853-49ad-aa0d-31f2b69d8d16/en/CD/1>

How to access

This link will lead you to the Online Standards Development (OSD) platform for national mirror committee's comments. It replaces the project content, which is usually circulated as a PDF.

For OSD NC Managers

If not already done, your respective National Committee Administrator will create your profile via Symphony (<https://symphony.iec.ch>) as an OSD NC Manager to oversee the comment resolution process for the preparation of your national comments. Once you have been granted access via Symphony, please use your usual IEC credentials to access the link.

If you do not have access, please contact your National Committee Administrator or our OSD support team.

For OSD NC Commenters

If not already done, your OSD NC Manager will create your profile via Symphony as an OSD NC Commenter. Once you have been granted access via Symphony, please use your usual IEC credentials to access the link. You may then provide your comments directly in the OSD.

As an alternative solution, OSD NC Commenters who wish to continue using the IEC comment form can use the regular template together with a PDF of the draft document downloadable from the OSD platform. However, please note that line numbers are no longer available, and it is not possible to add tables and graphics or use track changes.

For Voters

Once all your national comments have been resolved, it is no longer necessary to upload the comment form to the IEC Voting System anymore. Instead, please use the following radio buttons in the IEC Voting System to indicate whether or not your National Committee has submitted comments in the OSD:

Comment: ☐ **No Comment at this stage** ☐ **Comments in OSD**

Reference materials

We recommend that OSD NC Managers and OSD NC Commenters review the available materials to better understand the member commenting on the OSD platform. This includes:

- latest videos and presentations on the [OSD webpage](#), and
- step-by-step explanations on [Helpscout](#).

Contact

Should you require any assistance, please contact the OSD project team at osd_support@iec.ch.

CONTENTS

FOREWORD	6
INTRODUCTION	8
1 Scope	9
2 Normative references	9
3 Terms and definitions	9
4 Classification	10
4.1 According to behaviour in presence of d.c. components	10
5 Characteristics	10
5.1 Type F residual current device	10
5.2 Type B residual current device	10
5.2.1 General	10
5.2.2 Standard values of break time and non-actuating time for residual direct currents which result from rectifying circuits and for residual smooth direct current	11
5.2.3 Values of tripping current according to frequencies which differ from the rated frequency 50/60 Hz	11
6 Marking and other product information	12
6.1 Marking for Type F RCDs	12
6.2 Marking for Type B RCDs	12
7 Standard conditions for operation in service and for installation	13
8 Conditions for construction and operation	13
8.1 Conditions for Type F and Type B RCDs – Requirements for operation in case of sinusoidal residual currents comprising of multi-frequency components resulting from control equipment supplied from single phase .	13
8.2 Conditions for Type B RCDs	13
8.2.1 Operation in response to the type of residual current	13
8.3 Behaviour of Type F and Type B RCDs	15
8.3.1 Behaviour of RCDs in the case of surge residual currents	15
8.3.2 Behaviour of RCDs in the case of inrush residual currents	15
8.3.3 Behaviour in case of residual pulsating direct currents in presence of a standing smooth direct current of 0,01 A	15
9 Tests	15
9.1 Tests for Type F and Type B RCDs	15
9.1.1 General	15
9.1.2 Verification of the correct operation in case of a steady increase of composite residual current	15
9.1.3 Verification of the correct operation in case of sudden appearance of composite residual current	16
9.1.4 Verification of the correct operation for four-pole Type F RCD powered on two poles only	16
9.1.5 Verification of behaviour at surge currents up to 3 000 A (8/20 µs surge current test)	16
9.1.6 Verification of behaviour in the case of inrush residual currents	17
9.1.7 Verification of the correct operation in case of residual pulsating direct currents in presence of a standing smooth direct current of 0,01 A	17

9.2	Tests for Type B RCDs	17
9.2.1	Verification of the operating characteristic at the reference temperature (20 ± 5) °C.....	17
9.2.2	Tests at the temperature limits	20
9.2.3	Verification of the correct operation for three- and four-pole Type B RCDs powered on two poles only	20
9.2.4	Verification of the correct operation of B type RCDs at minimum voltage 20	
9.2.5	Verification of the RCD after test sequences	20
9.2.6	Verification of the B type RCD after EMC tests	20
9.2.7	Figures.....	21
Annex A (normative)	Number of samples to be submitted and test sequences to be applied for verification of conformity for type F RCCBs	27
Annex B (normative)	Number of samples to be submitted and test sequences to be applied for verification of conformity for Type F RCBOs.....	30
Annex C (normative)	Number of samples to be submitted and test sequences to be applied for verification of conformity for Type B RCCBs.....	33
Annex D (normative)	Number of samples to be submitted and test sequences to be applied for verification of conformity for Type B RCBOs	36
Annex E (normative)	Routine tests for Type F and Type B RCDs	39
E.1	Tripping test	39
E.2	Dielectric strength test	39
E.3	Performance of the test device	39
Bibliography		40
Figure 1	– Example of a test circuit for the verification of correct operation in case of residual sinusoidal alternating currents composed of multi-frequency components resulting from single-phase supplied speed motor control equipment	22
Figure 2	– Test circuit for the verification of the behaviour of the RCD in case of inrush residual currents	22
Figure 3	– Test circuit for the verification of correct operation in case of residual sinusoidal alternating current up to 1 000 Hz.....	23
Figure 4	– Test circuit for 2-, 3- and 4-pole Type B RCD to verify the correct operation in case of a residual alternating current superimposed on a smooth direct current ...	24
Figure 5	– Test circuit for 2-, 3- and 4-pole Type B RCD to verify the correct operation in case of a residual pulsating direct current superimposed on a smooth direct current 25	
Figure 6	– Test circuit for Type B RCD to verify the correct operation in case of residual pulsating direct currents which may result from rectifying circuits	25
Figure 7	– Test circuit for 2-, 3- and 4-pole Type B RCD to verify the correct operation in case of a residual smooth direct current	26
Table 1	– Type B RCDs – Standard values of break time and non-actuating time for residual direct currents which result from rectifying circuits and for residual smooth direct current.....	11
Table 2	– Type B RCDs – Residual non-operating and operating current according to frequencies which differ from the rated frequency 50/60 Hz	11
Table 3	– Different frequency component values of test currents and starting current values (IΔ) for verifying the operating in case of steady increased residual current ...	15

Table 4 – Operating current ranges for composite residual current	16
Table A.1 – Test sequences for Type F RCCBs	27
Table B.1 – Test sequences for Type F RCBOs	30
Table C.1 – Test sequences for Type B RCCBs	33
Table D.1 – Test sequences for Type B RCBOs	36

INTERNATIONAL ELECTROTECHNICAL COMMISSION

Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses –

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62423 has been prepared by subcommittee 23E: Circuit-breakers and similar equipment for household use, of IEC technical committee 23: Electrical accessories.

urn:iec:std:iec:62423:2009-11:::This third edition cancels and replaces the urn:iec:std:iec:62423:2007-05:::first edition published in 2007 and constitutes a technical revision. The main changes from the second edition are as follows:

The text of this standard is based on the following documents:

FDIS	Report on voting
23E/xxx/FDIS	23E/xxx/RVD

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

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

This International Standard is to be read in conjunction with the following standards:

IEC 61008–1:1996, *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – Part 1: General rules*

IEC 61009–1:1996, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules*

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

INTRODUCTION

RCCBs and RCBOs designed according to IEC 61008 and IEC 61009 series are suitable in most of the applications. IEC 61008 and 61009 series provide appropriate requirements and tests for general use in household and similar uses. However, the use of new electronic technology in equipment may result in particular residual currents not covered in IEC 61008 and 61009 series. This standard covers specific applications where additional requirements and testing are needed.

This standard includes definitions, additional requirements and tests for Type F and Type B RCCBs and/or RCBOs to cover particular situations.

The tests shall first be applied according to IEC 61008-2-1 or IEC 61008-2-2 for Type F or Type B RCCBs or according to IEC 61009-2-1 or IEC 61009-2-2.

After completion of the tests given either in IEC 61008-2-1 or IEC 61008-2-2 or IEC 61009-2-1 or IEC 61009-2-2 the additional tests given in this standard shall be applied in order to show conformity to this standard (see [Annex A](#), [Annex B](#) for Type F or [Annex C](#), [Annex D](#) for Type B respectively).

The number of samples to be submitted and test sequences to be applied for verification of conformity for Type F RCCBs and Type F RCBOs are given in [Annex A](#) and [Annex B](#) respectively.

The number of samples to be submitted and test sequences to be applied for verification of conformity for Type B RCCBs and Type B RCBOs are given in [Annex C](#) and [Annex D](#) respectively.

This standard introduces Type F RCDs (F for Frequency) with rated frequency 50 Hz or 60 Hz intended for protection of circuits with frequency inverters supplied between phase and neutral or phase and earthed middle conductor taking into account the necessary features for these particular situations in addition to the cases covered by type A RCDs. Type F RCDs cannot be used where electronic equipment with double bridge rectifiers supplied from two phases is found or if a smooth d.c. residual current can occur.

In case of a frequency inverter, e.g. used for motor speed control, supplied between phase and neutral, a composite residual current including the power frequency, the motor frequency and the chopper clock frequency of the frequency inverter may occur in addition to alternating or pulsating d.c. residual currents.

This standard introduces Type B RCDs to be used in case of residual pulsating rectified direct current which results from one or more phases, and smooth d.c. residual current in addition to the cases covered by Type F RCDs. For these applications, two, three or four pole Type B RCDs can be used.

Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses –

1 Scope

The scope of IEC 61008–1 and IEC 61009–1 applies with the following additions.

This standard specifies requirements and tests for Type F and Type B RCDs (Residual Current Devices). Requirements and tests given in this standard are in addition to the requirements of Type A residual current devices. This standard can only be used together with IEC 61008-2-1 or IEC 61008-2-2 or IEC 61009-2-1 or IEC 61009-2-2 as relevant.

Type F RCCBs (Residual Current Circuit Breaker) and Type F RCBOs (Residual current Circuit Breaker with Overcurrent protection) with rated frequency 50 Hz or 60 Hz are intended for installations when frequency inverters are supplied between phase and neutral or phase and earthed middle conductor and are able to provide protection in case of residual sinusoidal alternating currents at the rated frequency, residual pulsating direct currents and composite residual currents that may occur.

Type B RCCBs and Type B RCBOs are able to provide protection in case of residual sinusoidal alternating currents up to 1 000 Hz, residual pulsating direct currents and residual smooth direct currents.

RCDs according to this standard are not intended to be used in d.c. supply systems.

For the purpose of verification of conformity, test sequences and number of samples are provided in [Annex A](#), [Annex B](#), [Annex C](#) and [Annex D](#) of this standard.

The complete test sequence for type test of Type F RCCBs and Type F RCBOs is given in [Table A.1](#) and [Table B.1](#) respectively. The complete test sequence for type test of Type B RCCBs and Type B RCBOs is given in [Table C.1](#) and [Table D.1](#) respectively.

NOTE 1 Throughout the document, the term RCD refers to RCCBs and RCBOs.

NOTE 2 Type F and type B RCDs have high resistance against unwanted tripping, even if the surge voltage causes a flashover and a follow-on current occurs, and in case of inrush residual currents with a maximum duration of 10 ms which can occur in case of switching ON electronic equipment or EMC-filters.

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 60479-1:2018, *Effects of current on human beings and livestock - Part 1: General aspects*

IEC 60479-2:2019, *Effects of current on human beings and livestock - Part 2: Special aspects*

IEC 61008–1:1996, *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – Part 1: General rules*

IEC 61009–1:1996, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

smooth direct current

a direct current which is ripple free

3.2

Type B residual current device

residual current device for which tripping is ensured as for Type F according to this standard and in addition:

- for residual sinusoidal alternating currents up to 1 000 Hz,
- for residual alternating currents superimposed on a smooth direct current
- for residual pulsating direct currents superimposed on a smooth direct current
- for residual pulsating rectified direct current which results from two or more phases
- for residual smooth direct currents whether suddenly applied or slowly increased independent of polarity

3.3

Type F residual current device

residual current device for which tripping is ensured as for Type A according to IEC 61008–1 or IEC 61009–1, as applicable, and in addition:

- for composite residual currents, whether suddenly applied or slowly rising intended for circuit supplied between phase and neutral or phase and earthed middle conductor
- for residual pulsating direct currents superimposed on smooth direct current

4 Classification

According to IEC 61008–1 or IEC 61009–1, as applicable with the following addition:

4.1 According to behaviour in presence of d.c. components

- Type F RCDs
- Type B RCDs

5 Characteristics

5.1 Type F residual current device

Residual current device for which tripping is ensured as for Type A according to IEC 61008–1 or IEC 61009–1, as applicable, and in addition,

- for composite residual currents, whether suddenly applied or slowly rising intended for circuit supplied between phase and neutral or phase and earthed middle conductor (see 8.1);
- and for residual pulsating direct currents superimposed on smooth direct current of 0,01 A (see 8.3.3).

The above specified residual currents may be suddenly applied or slowly rising.

5.2 Type B residual current device

5.2.1 General

Residual current device for which tripping is ensured as for Type F and in addition

- for residual sinusoidal alternating currents up to 1 000 Hz (see 8.2.1.1),
- for residual alternating currents superimposed on a smooth direct current of 0,4 times the rated residual current ($I_{\Delta n}$) (see 8.2.1.3),

- for residual pulsating direct currents superimposed on a smooth direct current of 0,4 times the rated residual current ($I_{\Delta n}$) or 10 mA, whichever is the highest value (see 8.2.1.3),
- for residual direct currents which may result from rectifying circuits, i.e.,
 - two-pulse bridge connection line to line for 2-, 3- and 4-pole devices (see 8.2.1.4),
 - three-pulse star connection or six-pulse bridge connection for 3- and 4-pole devices (see 8.2.1.5),
- for residual smooth direct currents (see 8.2.1.6).

NOTE In NL, this characteristic is modified.

The above specified residual currents may be suddenly applied or slowly increased independent of polarity.

5.2.2 Standard values of break time and non-actuating time for residual direct currents which result from rectifying circuits and for residual smooth direct current

Table 1 – Type B RCDs – Standard values of break time and non-actuating time for residual direct currents which result from rectifying circuits and for residual smooth direct current

Type	I_n <i>A</i>	$I_{\Delta n}$ <i>A</i>	Standard values of break time and non-actuating time at a residual operating current (I_{Δ}) equal to				
			<i>s</i>				
			$2 I_{\Delta n}$	$4 I_{\Delta n}$	$10 I_{\Delta n}$	5 A, 10 A, 20 A, 50 A, 100 A, 200 A a	
General	Any value	Any value	0,3	0,15	0,04	0,04	Maximum break times
S	≥ 25	$> 0,030$	0,5	0,2	0,15	0,15	Maximum break times
			0,13	0,06	0,05	0,04	Minimum non-actuating times
For Type B RCBOs any value exceeding the lower limit of the overcurrent instantaneous tripping range are not tested.							
^{aa} The tests are only made during the verification of the correct operation as mentioned in 9.2.1.4, list item b) according to 6 a), and 9.2.1.5, list item b) according to 6 b).							

5.2.3 Values of tripping current according to frequencies which differ from the rated frequency 50/60 Hz

Table 2 – Type B RCDs – Residual non-operating and operating current according to frequencies which differ from the rated frequency 50/60 Hz

Frequency Hz	Residual non-operating current $I_{\Delta n}$	Residual operating current $I_{\Delta n}$
150	$0,5 I_{\Delta n}$	$2,4 I_{\Delta n}^a$
400	$0,5 I_{\Delta n}$	$6 I_{\Delta n}^a$
1 000	$I_{\Delta n}$	$14 I_{\Delta n}^{ab}$
NOTE 1 The definitions of “residual non-operating current and of “operating currents” are those of IEC 61008–1 and IEC 61009–1.		
NOTE 2 The waveform for the given frequencies is sinusoidal.		
aa The values correspond to the threshold of ventricular fibrillation according to IEC 60479-1:2018 in combination with the frequency factor for ventricular fibrillation according to IEC 60479-2:2019.		
bb IEC 60479 series gives no factors for frequencies above 1 kHz.		