

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

**Interrupteurs automatiques à courant différentiel résiduel avec dispositif de protection contre les surintensités incorporé pour usages domestiques et analogues (DD) – Partie 1: Règles générales**

[IEC 61009-1:2010](https://standards.iteh.ai/Document-Preview/IEC-61009-1-2010)

<https://standards.iteh.ai/Document-Preview/IEC-61009-1-2010>





## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2013 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

#### IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

#### IEC online collection - [oc.iec.ch](http://oc.iec.ch)

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Recherche de publications IEC -

[webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC online collection - [oc.iec.ch](http://oc.iec.ch)

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [sales@iec.ch](mailto:sales@iec.ch).

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

**Interrupteurs automatiques à courant différentiel résiduel avec dispositif de  
protection contre les surintensités incorporé pour usages domestiques et  
analogues (DD) –**

**Partie 1: Règles générales**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 29.120.50

ISBN 978-2-8322-1101-4

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**



## REDLINE VERSION

## VERSION REDLINE



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

**Interrupteurs automatiques à courant différentiel résiduel avec dispositif de protection contre les surintensités incorporé pour usages domestiques et analogues (DD) – Partie 1: Règles générales**

## CONTENTS

FOREWORD.....	10
INTRODUCTION.....	12
1 Scope.....	13
2 Normative references .....	15
3 Terms and definitions .....	16
3.1 Definitions relating to currents flowing from live parts to earth .....	16
3.2 Definitions relating to the energization of a residual current circuit-breaker .....	16
3.3 Definitions relating to the operation and functions of residual current circuit-breakers .....	17
3.4 Definitions relating to values and ranges of energizing quantities .....	20
3.5 Definitions relating to values and ranges of influencing quantities .....	24
3.6 Definitions relating to terminals .....	24
3.7 Definitions relating to conditions of operation .....	26
3.8 Definitions relating to constructional elements .....	27
3.9 Definitions relating to tests .....	28
3.10 Definitions relating to insulation coordination.....	28
4 Classification.....	30
4.1 According to the method of operation .....	30
4.1.1 RCBO functionally independent of line voltage (see 3.3.8).....	30
4.1.2 RCBO functionally dependent on line voltage (see 3.3.9) .....	30
4.2 According to the type of installation .....	31
4.3 According to the number of poles and current paths .....	31
4.4 According to the possibility of adjusting the residual operating current .....	31
4.5 According to resistance to unwanted tripping due to voltage surges .....	31
4.6 According to behaviour in presence of d.c. components .....	31
4.7 According to time-delay (in presence of a residual current) .....	31
4.8 According to the protection against external influences .....	31
4.9 According to the method of mounting .....	32
4.10 According to the method of connection .....	32
4.11 According to the instantaneous tripping current (see 3.4.18) .....	32
4.12 According to the $I^2t$ characteristic .....	32
<b>4.13 According to the type of terminals .....</b>	<b>32</b>
5 Characteristics of RCBOs.....	32
5.1 Summary of characteristics .....	32
5.2 Rated quantities and other characteristics .....	33
5.2.1 Rated voltage .....	33
5.2.2 Rated current ( $I_n$ ) .....	33
5.2.3 Rated residual operating current ( $I_{\Delta n}$ ).....	34
5.2.4 Rated residual non-operating current ( $I_{\Delta no}$ ) .....	34
5.2.5 Rated frequency .....	34
5.2.6 Rated short-circuit capacity ( $I_{cn}$ ).....	34
5.2.7 Rated residual making and breaking capacity ( $I_{\Delta m}$ ).....	34
5.2.8 RCBO type S.....	34
5.2.9 Operating characteristics in case of residual currents with d.c. components.....	34
5.3 Standard and preferred values .....	34

5.3.1	Preferred values of rated voltage ( $U_n$ ) .....	34
5.3.2	Preferred values of rated current ( $I_n$ ) .....	35
5.3.3	Standard values of rated residual operating current ( $I_{\Delta n}$ ) .....	35
5.3.4	Standard value of residual non-operating current ( $I_{\Delta no}$ ) .....	35
5.3.5	Standard values of rated frequency .....	35
5.3.6	Values of rated short-circuit capacity .....	36
5.3.7	Minimum value of the rated residual making and breaking capacity ( $I_{\Delta m}$ ) .....	36
5.3.8	Limiting values of break time and non-actuating time for RCBO of type AC and A .....	36
5.3.9	Standard ranges of overcurrent instantaneous tripping .....	37
5.3.10	Standard values of rated impulse withstand voltage ( $U_{imp}$ ) .....	38
6	Marking and other product information.....	38
7	Standard conditions for operation in service and for installation.....	40
7.1	Standard conditions.....	40
7.2	Conditions of installation .....	41
7.3	Pollution degree .....	41
8	Requirements for construction and operation.....	41
8.1	Mechanical design.....	41
8.1.1	General .....	41
8.1.2	Mechanism .....	42
8.1.3	Clearances and creepage distances (see also Annex B).....	43
8.1.4	Screws, current-carrying parts and connections.....	46
8.1.5	Terminals for external conductors.....	47
8.1.6	Non-interchangeability .....	50
8.2	Protection against electric shock .....	50
8.3	Dielectric properties and isolating capability .....	51
8.4	Temperature-rise.....	51
8.4.1	Temperature-rise limits.....	51
8.4.2	Ambient air temperature .....	52
8.5	Operating characteristics.....	52
8.5.1	Under residual current conditions .....	52
8.5.2	Under overcurrent conditions .....	52
8.6	Mechanical and electrical endurance .....	54
8.7	Performance at short-circuit currents.....	54
8.8	Resistance to mechanical shock and impact.....	54
8.9	Resistance to heat .....	54
8.10	Resistance to abnormal heat and to fire .....	54
8.11	Test device.....	54
8.12	Requirements for RCBOs functionally dependent on line voltage.....	55
8.13	<del>Behaviour of RCBOs in case of a single-phase overcurrent through a three- pole or four-pole RCBO</del> Void .....	55
8.14	Behaviour of RCBOs in case of current surges caused by impulse voltages .....	55
8.15	Behaviour of RCBOs in case of earth fault currents comprising a d.c. component .....	55
8.16	Reliability .....	56
8.17	Electromagnetic compatibility (EMC) .....	56



9	Tests.....	56
9.1	General.....	56
9.2	Test conditions.....	57
9.3	Test of indelibility of marking.....	58
9.4	Test of reliability of screws, current-carrying parts and connections.....	58
9.5	Test of reliability of screw-type terminals for external copper conductors.....	59
9.6	Verification of protection against electric shock.....	62
9.7	Test of dielectric properties.....	62
9.7.1	Resistance to humidity.....	62
9.7.2	Insulation resistance of the main circuit.....	63
9.7.3	Dielectric strength of the main circuit.....	64
9.7.4	Insulation resistance and dielectric strength of auxiliary circuits.....	64
9.7.5	Secondary circuit of detection transformers.....	65
9.7.6	Capability of control circuits connected to the main circuit withstanding high d.c. voltages due to insulation measurements.....	65
9.7.7	Verification of impulse withstand voltages (across clearances and across solid insulation) and of leakage current across open contacts.....	66
9.8	Test of temperature-rise.....	71
9.8.1	Ambient air temperature.....	71
9.8.2	Test procedure.....	71
9.8.3	Measurement of the temperature of parts.....	71
9.8.4	Temperature-rise of a part.....	71
9.9	Verification of the operating characteristic.....	72
9.9.1	Verification of the operating characteristics under residual current conditions.....	72
9.9.2	Verification of the operating characteristic under overcurrent conditions.....	75
9.10	Verification of mechanical and electrical endurance.....	77
9.10.1	General test conditions.....	77
9.10.2	Test procedure.....	77
9.10.3	Condition of the RCBO after test.....	78
9.11	Verification of the trip-free mechanism.....	78
9.11.1	General test conditions.....	78
9.11.2	Test procedure.....	78
9.12	Short-circuit tests.....	78
9.12.1	General conditions for test.....	78
9.12.2	Test circuit for short-circuit performance.....	79
9.12.3	Values of test quantities.....	80
9.12.4	Tolerances on test quantities.....	81
9.12.5	Power factor of the test circuit.....	81
9.12.6	Measurement and verification of $I^2t$ and of the peak current ( $I_p$ ).....	81
9.12.7	Calibration of the test circuit.....	81
9.12.8	Interpretation of records.....	82
9.12.9	Condition of the RCBO for test.....	82
9.12.10	Behaviour of the RCBO during short-circuit tests.....	83
9.12.11	Test procedure.....	83
9.12.12	Verification of the RCBO after short-circuit test.....	87
9.12.13	Verification of the rated residual making and breaking capacity ( $I_{\Delta m}$ ).....	88



9.13	Verification of resistance to mechanical shock and impact .....	89
9.13.1	Mechanical shock .....	89
9.13.2	Mechanical impact .....	89
9.14	Test of resistance to heat .....	92
9.15	Test of resistance to abnormal heat and to fire .....	93
9.16	Verification of the operation of the test device at the limits of rated voltage .....	94
9.17	Verification of the behaviour of RCBOs functionally dependent on line voltage, classified under 4.1.2.1, in case of failure of the line voltage .....	94
9.17.1	Determination of the limiting value of the line voltage ( $U_x$ ).....	94
9.17.2	Verification of the automatic opening in case of failure of the line voltage .....	95
9.17.3	Verification of the correct operation, in presence of a residual current, for RCBOs opening with delay in case of failure of the line voltage .....	95
9.17.4	Verification of correct operation of RCBOs with three or four current paths, in presence of a residual current, the neutral and one line terminal only being energized.....	95
9.17.5	Verification of the reclosing function of automatically reclosing RCBOs .....	95
9.18	<del>Verification of the limiting value of overcurrent in case of a single-phase load through a three-pole or four-pole RCBO</del> Void .....	95
9.19	Verification of behaviour of RCBOs in case of current surges caused by impulse voltages.....	96
9.19.1	Current surge test for all RCBOs (0,5 $\mu$ s/100 kHz ring wave test).....	96
9.19.2	Verification of behaviour at surge currents up to 3 000 A (8/20 $\mu$ s surge current test).....	96
9.20	<del>Verification of resistance of the insulation against an impulse voltage</del> Void .....	97
9.21	<del>Verification of correct operation of residual currents with d.c. components</del> Void .....	98
9.21.1	<del>Type A residual current devices.....</del>	98
9.22	Verification of reliability.....	99
9.22.1	Climatic test.....	99
9.22.2	Test with temperature of 40 °C .....	101
9.23	Verification of ageing of electronic components .....	101
9.24	Electromagnetic compatibility (EMC).....	102
9.24.1	Tests covered by the present standard .....	102
9.24.2	Tests to be carried out according to IEC 61543.....	102
9.25	Test of resistance to rusting .....	102
Annex A (normative)	Test sequence and number of samples to be submitted for certification purposes.....	131
Annex B (normative)	Determination of clearances and creepage distances .....	138
Annex C (normative)	Arrangement for the detection of the emission of ionized gases during short-circuit tests.....	145
Annex D (normative)	Routine tests .....	148
Annex E (normative)	Special requirements for auxiliary circuits for safety extra-low voltage .....	149
Annex F (normative)	Coordination between RCBOs and separate fuses associated in the same circuit .....	150
Annex G (normative)	Additional requirements and tests for RCBOs consisting of a circuit-breaker and a residual current unit designed for assembly on site .....	151

Annex H (informative) Void .....	155
Annex IA (informative) Methods for determination of short-circuit power-factor .....	156
Annex IB (informative) Glossary of symbols.....	158
Annex IC (informative) Examples of terminals.....	159
Annex ID (informative) Correspondence between ISO and AWG copper conductors .....	162
Annex IE (informative) Follow-up testing programme for RCBOs.....	163
<b>Annex J (normative) Particular requirements for RCBOs with screwless type terminals for external copper conductors .....</b>	<b>167</b>
<b>Annex K (normative) Particular requirements for RCBOs with flat quick-connect terminations.....</b>	<b>175</b>
<b>Annex L (normative) Specific requirements for RCBOs with screw-type terminals for external untreated aluminium conductors and with aluminium screw-type terminals for use with copper or with aluminium conductors .....</b>	<b>182</b>
Bibliography .....	192
Figure 1 – Thread-forming tapping screw (3.6.10).....	103
Figure 2 – Thread-cutting tapping screw (3.6.11).....	103
Figure 3 – Jointed test finger (9.6) .....	104
Figure 4 – Test circuit for the verification of	
– operating characteristics (9.9.1)	
– trip-free mechanism (9.11)	
– behaviour in case of failure of line voltage (9.17.3 and 9.17.4) for RCBOs functionally dependent on line voltage.....	105
Figure 5 – Test circuit for the verification of the correct operation of RCBOs, in the case of residual pulsating direct currents.....	106
Figure 6 – Test circuit for the verification of the correct operation in case of residual pulsating direct currents in presence of a standing smooth direct current of 0,006 A.....	107
<del>Figure 7 – Test circuit for the verification of the suitability of an RCBO for use in IT systems (9.12.11.2.2) .....</del>	<del>109</del>
<del>Figure 7 – Typical diagram for all short-circuit tests except for 9.12.11.2.2.....</del>	<del>110</del>
<del>Figure 8 – Test circuit for the verification of the rated short-circuit capacity of a single-pole RCBO with two current paths (9.12).....</del>	<del>111</del>
<del>Figure 8 – Typical diagram for short-circuit tests according to 9.12.11.2.2.....</del>	<del>112</del>
<del>Figure 9 – Test circuit for the verification of the rated short-circuit capacity of a two-pole RCBO, in case of a single phase circuit (9.12) .....</del>	<del>113</del>
<del>Figure 9 – Detail of impedances <math>Z</math>, <math>Z_1</math> and <math>Z_2</math> .....</del>	<del>113</del>
<del>Figure 10 – Test circuit for the verification of the rated short circuit capacity of a three-pole RCBO on a three phase circuit (9.12)-Void.....</del>	<del>114</del>
<del>Figure 11 – Test circuit for the verification of the rated short-circuit capacity of a three-pole RCBO with four current paths on a three-phase circuit with neutral (9.12)-Void .....</del>	<del>115</del>
<del>Figure 12 – Test circuit for the verification of the rated short-circuit capacity of a four-pole RCBO on a three phase circuit with neutral (9.12)-Void .....</del>	<del>116</del>
Figure 13 – Example of calibration record for short-circuit test.....	117
Figure 14 – Mechanical shock test apparatus (9.13.1) .....	118
Figure 15 – Mechanical impact test apparatus (9.13.2.1) .....	119
Figure 16 – Striking element for pendulum impact test apparatus (9.13.2.1) .....	120
Figure 17 – Mounting support for sample for mechanical impact test (9.13.2.1) .....	121

Figure 18 – Example of mounting an unenclosed RCBO for mechanical impact test (9.13.2.1) .....	122
Figure 19 – Example of mounting of panel mounting type RCBO for the mechanical impact test (9.13.2.1) .....	123
Figure 20 – Application of force for mechanical impact test of rail mounted RCBO (9.13.2.2) .....	124
Figure 21 – Ball-pressure test apparatus (9.14.2) .....	124
Figure 22 – <del>Test circuit for the verification of the limiting value of overcurrent in case of a single-phase load through a three-pole or four-pole RCBO (9.18)Void</del> .....	125
Figure 23 – Stabilizing period for reliability test (9.22.1.3) .....	126
Figure 24 – Reliability test cycle (9.22.1.3) .....	127
Figure 25 – Example of a test circuit for verification of ageing of electronic components (9.23) .....	128
Figure 26 – Damped oscillator current wave, 0,5 µs/100 kHz .....	128
Figure 27 – Test circuit for the ring wave test at RCBOs .....	129
Figure 28 – Surge current impulse 8/20 µs .....	129
Figure 29 – Test circuit for the surge current test at RCBOs .....	130
<del>Figure B.1 to B.10 – Illustrations of the application of creepage distances</del> .....	<del>139</del>
<del>Figure B.1 – Examples of methods of measuring creepage distances and clearances</del> .....	<del>144</del>
Figure C.1 – Test arrangement .....	146
Figure C.2 – Grid .....	147
Figure C.3 – Grid circuit .....	147
Figure IC.1 – Examples of pillar terminals .....	159
Figure IC.2 – Example of screw terminals and stud terminals .....	160
Figure IC.3 – Example of saddle terminals .....	161
Figure IC.4 – Examples of lug terminals .....	161
<del>Figure J.1 – Connecting samples</del> .....	<del>172</del>
<del>Figure J.2 – Examples of screwless-type terminals</del> .....	<del>173</del>
<del>Figure K.1 – Example of position of the thermocouple for measurement of the temperature-rise</del> .....	<del>178</del>
<del>Figure K.2 – Dimensions of male tabs</del> .....	<del>179</del>
<del>Figure K.3 – Dimensions of round dimple detents (see Figure K.2)</del> .....	<del>180</del>
<del>Figure K.4 – Dimensions of rectangular dimple detents (see Figure K.2)</del> .....	<del>180</del>
<del>Figure K.5 – Dimensions of hole detents</del> .....	<del>180</del>
<del>Figure K.6 – Dimensions of female connectors</del> .....	<del>181</del>
<del>Figure L.1 – General arrangement for the test</del> .....	<del>190</del>
<del>Figure L.2</del> .....	<del>190</del>
<del>Figure L.3</del> .....	<del>191</del>
<del>Figure L.4</del> .....	<del>191</del>
<del>Figure L.5</del> .....	<del>191</del>
<del>Figure L.6</del> .....	<del>191</del>
Table 1 – Standard values of rated short-circuit capacity .....	36
Table 2 – Limiting values of break time and non-actuating time for alternating residual currents (r.m.s. values) for type AC and A RCBO .....	36

Table 3 – Maximum values of break time for half-wave residual currents (r.m.s. values) for type A RCBO .....	38
Table 4 – Ranges of overcurrent instantaneous tripping.....	38
Table 5 – Rated impulse withstand voltage as a function of the nominal voltage of the installation.....	38
Table 6 – Standard conditions for operation in service .....	41
Table 7 – Minimum clearances and creepage distances.....	45
Table 8 – Connectable cross-sections of copper conductors for screw-type terminals.....	48
Table 9 – Temperature-rise values .....	52
Table 10 – Time-current operating characteristics.....	53
Table 11 – Requirements for RCBOs functionally dependent on line voltage .....	55
Table 12 – List of type tests .....	56
Table 13 – Test copper conductors corresponding to the rated currents .....	57
Table 14 – Screw thread diameters and applied torques .....	59
Table 15 – Pulling forces .....	60
<del>Table 16 – Conductor dimensions .....</del>	<del>61</del>
Table 17 – Test voltage of auxiliary circuits .....	65
<del>Table 18 – Test voltage across the open contacts for verifying the suitability for isolation, referred to the rated impulse withstand voltage of the RCBO and the altitude where the test is carried out.....</del>	<del>67</del>
<del>Table 19 – Test voltage for verification of impulse withstand voltage for the parts not tested in 9.7.7.1.....</del>	<del>69</del>
Table 20 – List of short-circuit tests.....	79
Table 21 – Power factor ranges of the test circuit .....	81
Table 22 – Ratio between service short-circuit capacity ( $I_{CS}$ ) and rated short-circuit capacity ( $I_{CN}$ ) – (factor $k$ ).....	85
Table 23 – Test procedure for $I_{CS}$ in the case of single- and two-pole RCBOs .....	86
Table 24 – Test procedure for $I_{CS}$ in the case of three- and four-pole RCBOs .....	86
Table 25 – Test procedure for $I_{CN}$ .....	87
Table 26 – Tripping current ranges for type A RCBOs.....	75
Table 27 – Tests <del>to be applied for EMC covered by this standard</del> .....	102
<del>Table 28 – Test voltage for verifying the suitability for isolation, referred to the rated impulse withstand voltage of the RCBO and the altitude where the test is carried out.....</del>	<del>69</del>
<del>Table 29 – Tests to be carried out according to IEC 61543 .....</del>	<del>102</del>
Table A.1 – Test sequences.....	131
Table A.2 – Number of samples for full test procedure .....	134
Table A.3 – Number of samples for simplified test procedure .....	136
Table A.4 – Test sequences for RCBOs having different instantaneous tripping currents.....	137
Table A.5 – Test sequences for RCBOs of different classification according to 4.6 .....	137
Table IE.1 – Test sequences during follow-up inspections .....	163
Table IE.2 – Number of samples to be tested .....	166
<del>Table J.1 – Connectable conductors.....</del>	<del>169</del>
<del>Table J.2 – Cross-sections of copper conductors connectable to screwless-type terminals .....</del>	<del>170</del>
<del>Table J.3 – Pull forces .....</del>	<del>171</del>

Table K.1 – Informative table on colour code of female connectors in relationship with the cross section of the conductor .....	176
Table K.2 – Overload test forces .....	177
Table K.3 – Dimensions of tabs.....	178
Table K.4 – Dimensions of female connectors .....	181
Table L.1 – Marking for terminals .....	183
Table L.2 – Connectable cross-sections of aluminium conductors for screw-type terminals .....	184
Table L.3 – List of tests according to the material of conductors and terminals .....	185
Table L.4 – Connectable conductors and their theoretical diameters .....	185
Table L.5 – Cross sections (S) of aluminium test conductors corresponding to the rated currents.....	186
Table L.6 – Test conductor length .....	187
Table L.7 – Equalizer and busbar dimensions.....	187
Table L.8 – Test current as a function of rated current.....	189
Table L.9 – Example of calculation for determining the average temperature deviation D....	189

**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[IEC 61009-1:2010](#)

<https://standards.iteh.ai/catalog/standards/iec/36eb0d69-b140-468c-a52f-3c801aadf6bb/iec-61009-1-2010>

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

## 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.

**This consolidated version of the official IEC Standard and its amendments has been prepared for user convenience.**

**IEC 61009-1 edition 3.2 contains the third edition (2010) [documents 23E/682/FDIS and 23E/686/RVD], its amendment 1 (2012) [documents 23E/741/FDIS and 23E/745/RVD] and its amendment 2 (2013) [documents 23E/796/FDIS and 23E/820/RVD].**

**In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions and deletions are displayed in red, with deletions being struck through. A separate Final version with all changes accepted is available in this publication.**