

**Rikkevoolukaitselülitid ilma sisseehitatud
liigvoolukaitseta, kasutamiseks majapidamises
ja muudel taolistel juhtudel. Osa 1: Üldreeglid**

Residual current operated circuit-breakers without
integral overcurrent protection for household and
similar uses (RCCB's) - Part 1: General rules

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61008-1:2004 sisaldab Euroopa standardi EN 61008-1:2004 ingliskeelset teksti.

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This standard is ratified with the order of Estonian Centre for Standardisation dated 16.11.2004 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

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EUROPEAN STANDARD

EN 61008-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 2004

ICS 29.120.50

Supersedes EN 61008-1:1994 + A2:1995 + A11:1995 + A12:1998
+ A13:1998 + A14:1998 + A17:2000

English version

**Residual current operated circuit-breakers
without integral overcurrent protection
for household and similar uses (RCCB's)
Part 1: General rules
(IEC 61008-1:1996 + A1:2002, modified)**

Interrupteurs automatiques
à courant différentiel résiduel
pour usages domestiques et analogues
sans dispositif de protection contre les
surintensités incorporées (ID)
Partie 1: Règles générales
(CEI 61008-1:1996 + A1:2002, modifiée)

Fehlerstrom-/Differenzstrom-
Schutzschalter ohne eingebauten
Überstromschutz (RCCBs)
für Hausinstallationen und
für ähnliche Anwendungen
Teil 1: Allgemeine Anforderungen
(IEC 61008-1:1996 + A1:2002, modifiziert)

This European Standard was approved by CENELEC on 2004-03-16. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of the International Standard IEC 61008-1:1996 and its amendment 1:2002, prepared by SC 23E, Circuit-breakers and similar equipment for household use, of IEC TC 23, Electrical accessories, together with common modifications prepared by the Technical Committee CENELEC TC 23E, Circuit breakers and similar devices for household and similar applications, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 61008-1 on 2004-03-16.

This European Standard supersedes EN 61008-1:1994 + corrigendum Dec. 1997 + A2:1995 + A2:1995/corrigendum Dec. 1997 + A11:1995 + A11:1995/corrigendum Dec. 1997 + A12:1998 + A12:1998/corrigendum Apr. 1998 + A13:1998 + A14:1998 + A17:2000.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2005-04-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2009-04-01

This European Standard was prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directives. See Annex ZZ.

Annexes, clauses, subclauses, figures and tables that are additional to those in IEC 61008-1 are prefixed with the letter Z.

Endorsement notice

The text of the International Standard IEC 61000-8-1:1996 + A1:2002 was approved by CENELEC as a European Standard with agreed common modifications as given below.

Clause	Common modification
Contents	Add: Annex ZA (normative) Normative references to international publications with their corresponding European publications Annex ZB (normative) Special national conditions Annex ZC (informative) A-deviations Annex ZZ (informative) Coverage of Essential Requirements of EC Directives Table Z1 – Survey of the types of RCCBs according to their method of operation Table Z2 – Test voltage across the open contacts for verifying the suitability for isolation, referred to the altitude where the test is carried out
1	In the first paragraph in the last but one line add, after "not exceeding 125 A", the words "for fixed installations".
	Replace note 3 by: RCCB's within the scope of this standard are intended for used in an environment pollution degree 2. They are suitable for isolation. Devices to this standard are suitable for use in IT systems if the requirements of the installation rules are met.
	Renumber the existing notes 4 through 6 to become notes 3 through 5.
	Replace the second dashed indent after (the new) note 4 by: – RCCBs integrated in one unit with a socket-outlet or designed exclusively for being associated locally with a socket-outlet in the same mounting box.
	Replace note 5 by: NOTE 5 Until a specific EN for SRCDs is prepared and approved, for RCCBs integrated in one unit with a socket-outlet or designed exclusively for being associated locally with a socket-outlet in the same mounting box the requirements of this standard in conjunction with those of IEC 60884-1 may be used as far as applicable.
	Add at the end of the clause: This standard contains all requirements necessary to ensure compliance with the operational characteristics required for these devices by type tests. It also contains the details relative to test requirements and methods of testing necessary to ensure reproducibility of test results. This standard states a) the characteristics of RCCBs, b) the conditions with which RCCBs shall comply, with reference to 1) their operation and behaviour in normal service, 2) their operation and behaviour in case of short-circuits, 3) their operation under residual current conditions, 4) their dielectric properties, 5) EMC,

Clause	Common modification
	c) the tests intended for confirming that these conditions have been met and the methods to be adopted for the tests, d) the data to be marked on the devices, e) the test sequences to be carried out and the number of samples to be submitted for certification purposes (see Annex A), f) the routine tests to be carried out on each RCCB to reveal unacceptable variations in material or manufacture, likely to affect safety (see Annex D).
2	Replace the text of Clause 2 by: NOTE Normative references to international publications are listed in Annex ZA (normative).
3.3.16	Replace "current paths" by "poles".
3.3.Z1	Add the following new definition: 3.3.Z1 plug-in RCCB a RCCB having one or more plug-in terminals (see 3.6.Z1) and designed for use with appropriate means for the plug-in connection
3.6.Z1	Add the following new definition: 3.6.Z1 plug-in terminal terminal the electrical connection and disconnection of which can be effected without displacing the conductors of the corresponding circuit. The connection is effected without the use of a tool and is provided by the resilience of the fixed and/or moving parts and/or by springs
3.7	Delete 3.7.6 and 3.7.7.
3.Z1	After 3.8, add the following new definitions: 3.Z1 <i>Definitions related to insulation coordination</i> 3.Z1.1 insulation coordination the mutual correlation of insulation characteristics of electrical equipment taking into account the expected micro-environment and the influencing stresses (1.3.1 of IEC 60664-1) 3.Z1.2 working voltage the highest r.m.s. value of the a.c. or d.c. voltage across any particular insulation which can occur when the equipment is supplied at rated voltage (1.3.5 of IEC 60664-1) NOTE 1 Transients are disregarded. NOTE 2 Both open circuit conditions and normal operating conditions are taken into account. 3.Z1.3 overvoltage any voltage having a peak value exceeding the corresponding peak value of maximum steady-state voltage at normal operating conditions (1.3.7 of IEC 60664-1)

Clause	Common modification
	3.21.4 impulse withstand voltage the highest peak value of impulse voltage of prescribed form and polarity, which does not cause breakdown of the insulation under specific conditions (1.3.8.1 of IEC 60664-1) 3.21.5 overvoltage category a numeral defining a transient overvoltage condition (1.3.10 of IEC 60664-1) 3.21.6 macro-environment the environment of the room or other location, in which the equipment is installed or used (1.3.12.1 of IEC 60664-1) 3.21.7 micro-environment the immediate environment of the insulation which particularly influences the dimensioning of the creepage distances (1.3.12.2 of IEC 60664-1) 3.21.8 pollution any addition of foreign matter, solid, liquid or gaseous that can result in a reduction of electric strength or surface resistivity of the insulation (1.3.11 of IEC 60664-1) 3.21.9 pollution degree a numeral characterising the expected pollution of the micro-environment (1.3.13 of IEC 60664-1) NOTE The pollution degree to which equipment is exposed may be different from that of the macro-environment where the equipment is located because of protection offered by means such as an enclosure or internal heating to prevent absorption or condensation of moisture. 3.21.10 isolation (isolating function) function intended to cut off the supply from the whole installation or a discrete section of it by separating it from every source of electrical energy for reasons of safety (3.6.10 of IEC 60898-1) 3.21.11 isolating distance the clearance between open contacts, meeting the safety requirements specified for isolation purposes (3.6.11 of IEC 60898-1) 3.21.12 clearance (see Annex B) shortest distance in air between two conductive parts along a string stretched the shortest way between these conductive parts NOTE For the purpose of determining a clearance to accessible parts, the accessible surface of an insulating enclosure shall be considered conductive as if it was covered by a metal foil wherever it can be touched by a hand or a standard test finger according to Figure 3. 3.21.13 creepage distance (see Annex B) shortest distance along the surface of an insulating material between two conductive parts NOTE For the purpose of determining a creepage distance to accessible parts, the accessible surface of an insulating enclosure shall be considered conductive as if it was covered by a metal foil wherever it can be touched by a hand or a standard test finger according to Figure 3.

Clause	Common modification
4.1	Replace the note by the following specification: The selection of the various types is made according to HD 384 and non conflicting national wiring rules. Table Z1 lists the types of RCCBs according to the various applications but does not exclude the use of RCCBs of any classification for protection over and above that required by the relevant wiring rules.
	Add:

Table Z1 – Survey of the types of RCCBs according to their method of operation

Classification	4.1.1	4.1.2.2a)	4.1.2.1 b)	4.1.2.2b)
Marking of use	Without	E1	E2	E3
Protection	Indirect contact and additional protection ^a	Indirect contact and additional protection ^a	Additional protection ^a	Additional protection ^{a b}
Service continuity ^c	Yes	Yes	No	Yes

^a Additional protection, provided only for RCCBs with $I_{\Delta n} \leq 0,03$ A.

^b Only devices integrated in one unit with a socket-outlet or designed exclusively for being associated locally with a socket outlet in a same mounting box.

^c This information is given for guidance only.

4.1.2.1	Replace item a) by "deleted". Add, after b): RCCBs of type 4.1.2.1b) shall comply with the relevant requirements of 8.12.
4.1.2.2	Delete the note.
4.1.2.2a)	Replace the text in brackets by "(additional requirements are under consideration)".
4.2	Replace the text by "Deleted".
4.3	Delete "single-pole RCCB with two current paths;" and "three-pole RCCB with four current paths;".
4.4	Replace the text by "Deleted".
4.21	Add the following new subclause: 4.21 According to the range of ambient air temperature – RCCBs for use at ambient air temperatures between -5 °C and +40 °C; – RCCBs for use at ambient air temperatures between -25 °C and +40 °C.
5.1	Delete the first dashed item.
	Add the following item to the list: – ranges of ambient air temperature (see 5.3.Z1)
5.2.1.Z1	Add: 5.2.1.Z1 Rated impulse withstand voltage (U_{imp}) The rated impulse withstand voltage of an RCCB shall be equal to or higher than the standard values of rated impulse withstand voltage given in 5.3.Z2.
5.2.3	Delete the note.
5.3.1	Replace "preferred" by "standard" (twice).

Clause	Common modification
	Replace the Table by:

RCCBs	Circuit supplying the RCCB	Rated voltage
Two-pole with two current path	Single phase, phase to neutral or phase to phase	230 V
	Single phase, phase to phase	400 V
Three-pole with three current path	Three phase (3-wire)	400 V
Four-pole	Three phase (4-wire)	400 V

5.3.3	Delete the value "0,006 A".
5.3.7	Replace the first line by: The preferred value of rated frequency is 50 Hz.
5.3.12	Replace, in the last but one line "9.22.1.1" by "9.21.1".
5.3.12	Table 1: replace "500 A" by " 500 A**" Add the following note: ** The verification of the break times at these values is only made for the test of 9.9.2.3.
5.3.Z1	Add the following new subclause: 5.3.Z1 Standard ranges of ambient air temperature The standard ranges of ambient air temperature are: – -5 °C to +40 °C; – -25 °C to +40 °C
5.3.Z2	Add the following new subclause : 5.3.Z2 Standard value of rated impulse withstand voltage (U_{imp}) Standard value of the rated impulse voltage (U_{imp}) is 4 kV. NOTE 1 For test voltages to check the insulation see 9.20. NOTE 2 For test voltages to check the isolation distance across open contacts see Table Z2.
6	The text of Clause 6 becomes 6.Z1 with the following modifications: 6.Z1 Standard marking c) Add "with the symbol ~" d) Delete "and/or 60 Hz" f) Add "($I_{\Delta n}$) in A or mA" g) Replace the text by "Deleted" h) Add "(I_m)" l) Add "($I_{\Delta m}$)" between "capacity" and ", if different from..." and add "(I_m)" at the end

Clause	Common modification
	Replace item n) by: n) symbol of the method of operation according to Table Z1 of 4.1 if the RCCB is functionally dependent on the line voltage; p) Add "unless the correct mode of connection is evident" Add the following item: s) RCCBs according to 4.Z1 shall be marked with the symbol  (the value -25 included in the snowflake symbol according to Figure 0027 of ISO 7000), if relevant;
	In the second paragraph after s): Replace "under e), f), and o) " by "under e), f), m), o) and r) (for A type only)". Replace "under a), b), c) ,k), l) and p)" by "under a), b), c), k), p), r) (for AC type only) and s)". Add before the last sentence: Information under h), (I_m) and l) ($I_{\Delta m}$) may be put on the side or on the back or in the documentation, but both shall be indicated together.
	Add between the second and third paragraph after s): If a degree of protection higher than IP20 according to EN 60529 is marked on the device, it shall comply with it, whichever the method of installation. If the higher degree of protection is obtained only by a specific method of installation and/or with the use of specific accessories (e.g. terminal covers, enclosures, etc.), this shall be specified in the manufacturer's literature.
	Add at the end: The suitability for isolation, which is provided by all RCCBs of this standard, may be indicated by the symbol  on the device. When affixed, this marking may be included in a wiring diagram, where it may be combined with symbols of other functions, (e.g. other symbols of IEC TC3). When the symbol is used on its own (i.e. not in a wiring diagram), combination with symbols of other functions is not allowed. Specifications on appropriate recommendations to the user to regularly operate the test device are under consideration.
6.22	Add the following new subclause: 6.22 Additional marking Additional marking to other standards (EN or IEC or other) is allowed under the following conditions: – the RCCB shall comply with all the requirements of the additional standard; – the relevant standard to which the additional marking refers shall be indicated adjacent to this marking and shall be clearly differentiated or separated from the standard marking according to 6.Z1. <i>Compliance is checked by inspection and by carrying out all the test sequences required by the relevant standard. Equivalent or less severe test sequences need not be repeated.</i>
6.23	Add the following new subclause:

6.Z3 Guidance table for marking

	Marking and other product information	Marking may be on the RCCB itself			Product information in the catalogue
		If, for small devices the space available does not allow all the above data to be marked, at least this information shall be marked and visible when the device is installed.	This information may be marked on the side or on the back of the device and be visible only before the device is installed.	Alternatively the information may be on the inside of any cover which has to be removed in order to connect the supply wires.	
	Each RCCB shall be marked in a durable manner with all or, for small apparatus, part of the following data: The minimum requirements are indicated by the symbol "X"				Any remaining information not marked shall be given in the manufacturer's catalogues.
a)	the manufacturer's name or trademark;		X		
b)	type designation, catalogue number or serial number;		X		
c)	rated voltage(s) with the symbol ~;		X		
d)	rated frequency, if the RCCB is designed frequencies other than 50Hz (see 5.3.7)				X
e)	rated current	X			
f)	rated residual operating current ($I_{\Delta n}$) in A or in mA	X			
h)	rated making and breaking capacity (I_m)				X(*)
j)	the degree of protection (only if different from IP20);				X
k)	the position of use (symbol according to IEC 60051), if necessary;		X		
l)	rated residual making and breaking capacity ($I_{\Delta m}$), if different from rated short-circuit capacity (I_m)				X(*)
m)	the symbol S (S in a square) for type S devices;	X			
n)	indication that the RCCB is functionally dependent on line voltage, if applicable		X	X	
o)	operating means of the test device, by the letter T;	X			
p)	wiring diagram unless the correct mode of operation is evident,		X	X	
r)	operating characteristic in presence of residual currents with d.c. components - RCCBs of type AC with the symbol  - RCCBs of type A with the symbol 		X		
s)	RCCBs according to 4.2.1 shall be marked with the symbol  (snowflake enclosing -25) if relevant Indication of the terminal for the neutral with "N"	X	X		
	Additional marking of performance to other standards		X		
	Symbol of rated conditional breaking capacity with a fuse **	X(**)	X		

(*) $I_{\Delta m}$ and I_m (if different of $I_{\Delta m}$) may be anywhere on the device or in the catalogue but shall be together.

(**) Under consideration

NOTE Specifications on appropriate recommendations to the user to regularly operate the test device are under consideration.

Clause	Common modification
7.1	In Table 2, second column, add to "-5 °C to +40 °C²⁾" in the same box, the range "-25 °C to +40 °C²⁾". Modify footnote 7) to read: 7) Extreme limits of -20 °C and 60 °C, for RCCBs for use in the range of -5 °C to +40 °C and of -35 °C and 60 °C, for RCCBs for use in the range of -25 °C to +40 °C, are admissible during storage and transportation. These conditions should be taken into account in the design of the device.
	In Table 2, second column, after "2 000 m", add a footnote reference "⁸⁾". Add footnote 8) as follows: 8) For installations at higher altitudes, it is necessary to take into account the reduction of the dielectric strength and of the cooling effect of the air. RCCBs intended to be so used shall be designed specially or used according to an agreement between manufacturer and user. Information given in the manufacturer's catalogue may take the place of such an agreement.
7.21	Add the following new subclause: 7.21 Pollution degree RCCBs to this standard are intended for environment with pollution degree 2, i.e.: normally, only non-conductive pollution occurs; occasionally, however, a temporary conductivity caused by condensation may be expected.
8.1.1	Replace the second paragraph by: It shall not be possible to alter the operating characteristics of the RCCB by means of external interventions. Delete the third paragraph.
8.1.2	Replace the second paragraph by: The switched neutral pole (see 3.3.15) of four-pole RCCBs shall not close after and shall not open before the other poles. <i>Compliance is checked by inspection and by manual test, using any appropriate means (e.g. indicator lights, oscilloscope, etc.).</i>
	Add after the sixth paragraph: RCCBs shall provide in the open position (see 8.3.13) an isolation distance in accordance with the requirements necessary to satisfy the isolating function (see 8.3). Indication of the open and closed position of the main contacts shall be provided by one or both of the following means: – the position of the actuator (this being preferred); or – a separate mechanical indicator. If a separate mechanical indicator is used to indicate the position of the main contacts, this shall show the colour red for the closed position (ON) and the colour green for the open position (OFF). The means of indication of the contact position shall be reliable. RCCBs shall be designed so that the actuator, front plate or cover can only be correctly fitted in a manner which ensures correct contact position indication (see Clause 6). <i>Compliance is checked by inspection and by the tests of 9.9 and 9.11.2.</i> When means are provided or specified by the manufacturer to lock the operating means in the open position, locking in that position shall only be possible when the main contacts are in the open position. NOTE Locking of the operating means in the ON position is permitted for particular applications. <i>Compliance is checked by inspection, taking into account the instructions of the manufacturer.</i>

Clause	Common modification
8.1.2	Delete the eighth paragraph and the relevant note.
	Delete the note before the last paragraph.
8.1.3	Replace 8.1.3 by: 8.1.3 Clearances and creepage distances The minimum required clearances and creepage distances are given in Table 3 which is based on the RCCB being designed for operating in an environment with pollution degree 2. However, the clearances of item 2, 4 and 5 may be reduced provided that the tests at rated impulse voltage are withstood. The insulating materials are classified into Material Groups on the basis of their comparative tracking index (CTI) according to 2.7.1.1 and 2.7.1.3 of IEC 60664-1 and measured according to IEC 60112.
	Replace Table 3 by the following table:

Table 3 – Minimum clearances and creepage distances

	Minimum clearances mm	Minimum creepage distances ^{e, f}											
		mm											
		Group IIIa ^h (175V ≤ CTI < 400V) ^d				Group II (400V ≤ CTI < 600V) ^d				Group I (600V ≤ CTI) ^d			
	Rated voltage V	Working voltage ^e V											
Description	230 V/400 V 230 V 400 V	> 25 ≤ 50 ⁱ	120	250	400	> 25 ≤ 50 ⁱ	120	250	400	> 25 ≤ 50	120	250	400
1. between live parts which are separated when the main contacts are in the open position ^a	4,0	1,2	2,0	4,0	4,0	0,9	2,0	4,0	4,0	0,6	2,0	4,0	4,0
2. between live parts of different polarity ^a	3,0	1,2	1,5	3,0	4,0	0,9	1,5	3,0	3,0	0,6	1,5	3,0	3,0
3. between circuits supplied from different sources, one of which being PELV or SELV ^g	8,0		3,0	6,0	8,0		3,0	6,0	8,0		3,0	6,0	8,0
		Rated voltage V											
		230 - 400				230 - 400				230 - 400			
4. between live parts and - accessible surfaces of operating means - screws or other means for fixing covers which have to be removed when mounting the RCCB - surface on which the RCCB is mounted ^b - screws or other means for fixing the RCCB ^b - metal covers or boxes ^b - other accessible metal parts ^c - metal frames supporting flush-type RCCBs	3,0	4,0				3,0				3,0			
5. between metal parts of the mechanism and: - accessible metal parts ^c - screws or other means for fixing the RCCB - metal frames supporting flush-type RCCBs													
^a For auxiliary and control contacts the values are given in the relevant standard. ^b The values are doubled if clearances and creepage distances between live parts of the device and the metallic screen or the surface on which the RCCB is mounted are not dependent on the design of the RCCB only, so that they can be reduced when the RCCB is mounted in the most unfavourable condition. ^c Including a metal foil in contact with the surfaces of insulating material which are accessible after installation for normal use. The foil is pushed into corners, grooves, etc., by means of a straight unjointed test finger according to 9.6 (see Figure 3) ^d See IEC 60112. ^e Interpolation is allowed in determining creepage distances corresponding to voltage values intermediate to those listed as working voltage. For determination of creepage distances see Annex B. ^f Creepage distances cannot be less than the associated clearances. ^g To cover all different voltages including ELV in an auxiliary contact. ^h For material group IIIb (100 V ≤ CTI < 175 V) the values for material group IIIa multiplied by 1,6 apply. ⁱ For working voltages up to and including 25 V reference may be made to IEC 60664-1.													
NOTE 1 The values given for 400 V are also valid for 440 V.													
NOTE 2 The parts of the neutral path, if any, are considered to be live parts.													
NOTE 3 Care should be taken to provide adequate clearances and creepage distances between live parts of different polarity of RCCBs e.g. of the plug-in type mounted close to one another.													

Clause	Common modifications
8.1.5.2	Delete the note after Table 4.
8.1.Z1	Add the following new subclause: 8.1.Z1 Non-interchangeability For RCCBs intended to be mounted on bases forming a unit therewith (plug-in type or screw-in type) it shall not be possible, without the aid of a tool, to replace a RCCB when mounted and wired as for normal use by another of the same make having a higher rated current. <i>Compliance is checked by inspection.</i> NOTE The expression "as for normal use" implies that the RCCB is installed according to the manufacturer's instructions.
8.1.Z2	Add the following new subclause: 8.1.Z2 Mechanical mounting of plug-in type RCCBs The mechanical mounting of plug-in type RCCBs shall be reliable and have adequate stability. 8.1.Z2.1 Plug-in type RCCBs, the holding in position of which does not depend solely on their plug-in connection(s) <i>Compliance of the mechanical mounting is checked by the relevant tests of 9.12.</i> 8.1.Z2.2 Plug-in type RCCBs, the holding in position of which depends solely on their plug-in connection(s) <i>Compliance of the mechanical mounting is checked by the relevant tests of 9.12.</i>
8.3	Replace 8.3 by: 8.3 Dielectric properties and isolating capability RCCBs shall have adequate dielectric properties and shall ensure isolation. <i>Compliance is checked by the requirements referred to in 8.3.Z1 to 8.3.Z3.</i> Control circuits connected to the main circuit shall not be damaged by high d.c. voltage due to insulating measurements which are carried out after RCCBs are installed. <i>Compliance is checked by the test of 9.7.6.</i> 8.3.Z1 Dielectric strength at power frequency RCCBs shall have adequate dielectric properties at power frequency. <i>Compliance is checked by the tests of 9.7.1, 9.7.2, 9.7.3 and 9.7.4 (if applicable).</i> <i>After the endurance tests of 9.10 and after the short-circuit tests of 9.11, the RCCBs shall withstand the test of 9.7.3 but at the reduced test voltage specified in 9.10.3 and 9.11.2.1 i) respectively and without the previous humidity treatment of 9.7.1.</i> 8.3.Z2 Isolating capability RCCBs shall be suitable for isolation. <i>Compliance is checked by the verification of compliance with the minimum clearances and creepage distances of item 1 of Table 3 of 8.1.3 and by the tests of 9.7.Z1.1 and 9.7.Z1.2.</i> 8.3.Z3 Dielectric strength at rated impulse withstand voltage (U_{imp}) RCCBs shall adequately withstand impulse voltages. <i>Compliance is checked by the test of 9.20.</i>

Clause	Common modifications
8.11	Delete the first sentence of the third paragraph. "In the case of RCCBs having ... shall be used."
8.12	Replace in the first paragraph "current paths" by "poles".
	Add at the end of the subclause: Specific requirements for RCCBs classified in 4.1.2.2a) are under consideration.
8.21	Add the following new subclause : 8.21 Behaviour of RCCBs at low ambient air temperatures RCCBs for use in the range of –25 °C to +40 °C (see 4.Z1) shall operate reliably at low temperatures. <i>Compliance is checked by the tests of 9.24.</i>
9.1.1	Add the following note before Table 7: NOTE To verify compliance of additional marking to 6.Z2, if any, tests are carried out according to the relevant standard. In Table 7 replace the 5 th dash by: – Dielectric properties and isolating capability In Table 7 add the following dashed item: – Behaviour at low ambient air temperatures of RCCBs classified for use in the range of –25 °C to +40 °C
9.2	Delete the note after Table 8.
9.4	Add before Table 9 the two following paragraphs: <i>Plug-in connections are tested by plugging the RCCB in and pulling it out five times.</i> <i>After the test the connections shall not have become loose nor shall their electrical function be impaired.</i>
9.5.3	In Table 11 replace the two "under consideration" by "19" and "1,83".
9.7	Amend the title to read: 9.7 Test of dielectric properties and isolating capability
9.7.2	In the last line of item b) replace "current paths" by "poles". Add after b): NOTE To this purpose samples specially prepared by the manufacturer should be submitted to the test sequences implying this test.
9.7.3	In the first paragraph delete " <i>electronic components, if any, being disconnected for the test</i> ". Replace the second line of the fifth paragraph by: – 2 000 V for a) to d) of 9.7.2; <i>electronic components, if any, having been disconnected for test b) (see relevant note for 9.7.2 b)</i>

Clause	Common modifications																						
9.7.Z1	Add a new subclause: 9.7.Z1 Verification of impulse withstand voltages (across clearances and across solid insulation) and of leakage current across open contacts 9.7.Z1.1 Verification of impulse withstand voltage across the open contacts (suitability for isolation) <i>The test is carried out on a RCCB fixed on a metal support as in normal use.</i> <i>The impulses are given by a generator producing positive and negative impulses having a front time of 1,2 μs, and a time to half-value of 50 μs, the tolerances being:</i> – $\pm 5\%$ for the peak value; – $\pm 30\%$ for the front time; – $\pm 20\%$ for the time to half-value. <i>The surge impedance of the test apparatus shall have a nominal value of 500 Ω.</i> <i>The shape of the impulses is adjusted with the RCCB under test connected to the impulse generator. For this purpose appropriate voltage dividers and voltage sensors shall be used.</i> <i>Small oscillations in the impulses are allowed provided that their amplitude near the peak of the impulse is less than 5 % of the peak value.</i> <i>For oscillations on the first half of the front, amplitudes up to 10 % of the peak value are allowed.</i> <i>The 1,2/50 μs impulse voltage according to Figure 6 of IEC 60060-1 is applied between the line terminals connected together and the load terminals connected together with the contacts in the open position.</i> <i>Three positive impulses and three negative impulses are applied, the interval between consecutive impulses being at least 1 s for impulses of the same polarity and being at least 10 s for impulses of the opposite polarity.</i> <i>The test impulse voltage values shall be chosen in Table Z2, in accordance with the rated impulse voltage of the RCCB as given in 5.3.Z2. These values are corrected for barometric pressure and/or altitude at which the tests are carried out, according to Table Z2.</i> <i>There shall be no disruptive discharges during the test.</i> Table Z2 – Test voltage across the open contacts for verifying the suitability for isolation, referred to the altitude where the test is carried out <table><tr><th rowspan="3">Rated impulse voltage withstand U_{imp} kV</th><th colspan="5">Test voltages at corresponding altitude</th></tr><tr><th colspan="5">$U_{1,2/50}$ a.c. peak kV</th></tr><tr><th>Sea level</th><th>200 m</th><th>500 m</th><th>1 000 m</th><th>2 000 m</th></tr><tr><td>4</td><td>6,2</td><td>6,0</td><td>5,8</td><td>5,6</td><td>5,0</td></tr></table> 9.7.Z1.2 Verification of leakage currents across open contacts (suitability for isolation) <i>Each pole of RCCB having been submitted to one of the applicable tests of 9.11.2.2, or 9.11.2.3, or 9.11.2.4a), or 9.11.2.4b) or 9.11.2.4c) is supplied at a voltage 1.1 times its rated operational voltage, the RCCB being in the open position.</i> <i>The leakage current flowing across the open contacts is measured and shall not exceed 2 mA.</i>	Rated impulse voltage withstand U_{imp} kV	Test voltages at corresponding altitude					$U_{1,2/50}$ a.c. peak kV					Sea level	200 m	500 m	1 000 m	2 000 m	4	6,2	6,0	5,8	5,6	5,0
Rated impulse voltage withstand U_{imp} kV	Test voltages at corresponding altitude																						
	$U_{1,2/50}$ a.c. peak kV																						
	Sea level	200 m	500 m	1 000 m	2 000 m																		
4	6,2	6,0	5,8	5,6	5,0																		
9.8.3	Replace the title by: 9.8.3 Measurement of the temperature of parts																						

Clause	Common modifications
9.9.2	Delete the second paragraph.
9.9.3	Add after the second paragraph: NOTE Preheating may be carried out at reduced voltage but auxiliary circuit shall be connected to their normal operating voltage (particularly for components depending on line voltage). Delete the last paragraph.
9.9.4	Delete the last paragraph.
9.10.2	Delete the note.
9.10.3	Replace the second sentence of the last but one paragraph by: <i>One test only is made with measurement of break time. The latter shall not exceed the value specified in Table 1 at $I_{\Delta n}$.</i>
	Replace the last paragraph by: <i>The RCCB shall then perform satisfactorily the dielectric strength test specified in 9.7.3 but at a voltage of 900 V, for 1 min, and without previous humidity treatment.</i>
9.11.2.1	Delete the note after the first paragraph.
item a)	In the first line, delete "5" and "8" and replace "7" by "Z1" and "9" by "Z2". Delete the first and fourth dashed line. In the fourth paragraph before item b), delete the words: " <i>– across the terminals of the pole, for single-pole RCCBs;</i> "
item b)	Replace in the last line " $\pm 5, 0 \%$ " by " $0, - 5 \%$ ".
item d)	Replace in the first paragraph and in the note " 105% " by " 110% ".
item i)	Replace the first paragraph, including the first indent, by: <i>After each of the tests applicable carried out in accordance with 9.11.2.2, 9.11.2.3 and 9.11.2.4 c), the indicator means shall show the open position of the contacts. If during the tests of 9.11.2.4 a) and 9.11.2.4 b) the RCCB does not trip, the open position of the indicator means shall be checked after the tripping test at $1,25 I_{\Delta n}$. Furthermore, the RCCB shall show no damage impairing its further use and shall be capable, without maintenance, of</i> – <i>complying with the leakage current test across open contacts according to 9.7.Z1.2;</i>
	Replace the second sentence of the last but two paragraphs of item i) by: <i>One test only is made on one pole taken at random, with measurement of break time: the latter shall not exceed the value specified in Table 1 at $I_{\Delta n}$.</i>
9.11.2.3	Amend the title to read: 9.11.2.3 Verification of the rated residual making and breaking capacity ($I_{\Delta m}$) of RCCBs and verifying their suitability for use in IT systems
	Add the following new subclause: <i>c) Verification of suitability in IT systems</i> <i>For the verification of the suitability in IT systems, this test is repeated on new samples</i> – <i>at a voltage 105 % of the rated phase to phase voltage value.</i> – <i>and with a current of 500 A or $10 I_n$ whichever is the greater.</i> <i>The test sequence being O – t – CO.</i> <i>For the O operation on the first tested pole the auxiliary switch T is synchronised with respect to the voltage wave so that the circuit is closed on the point 0° on the wave for this operation.</i> <i>For the following O operations on the other poles to be tested (see A.2) this point is shifted each time by 30° with respect to the point on wave of the previous test, with a tolerance of $\pm 5^\circ$.</i>

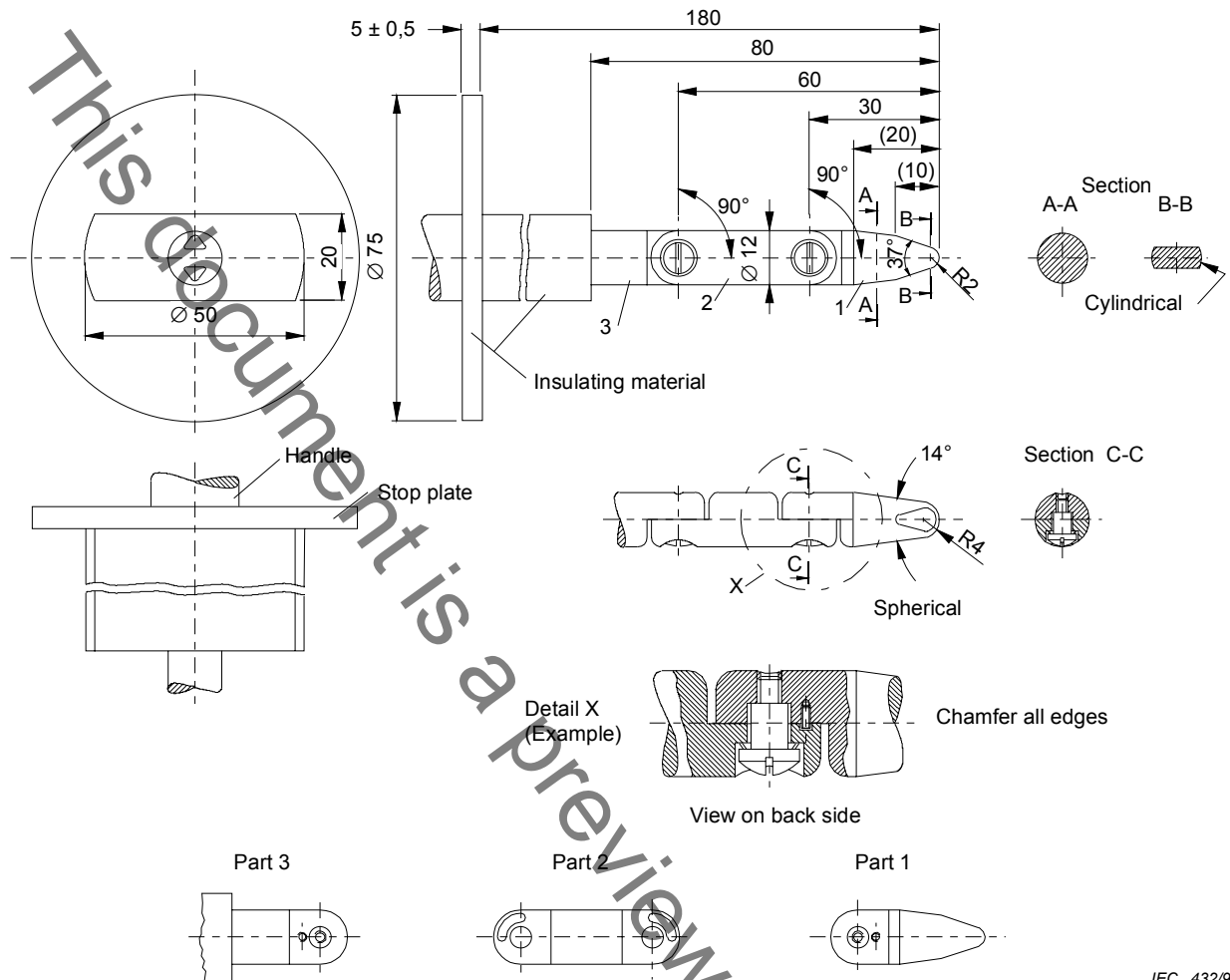
Clause	Common modifications
9.12.2	Replace the first two dashes by: – 9.12.2.2 for RCCBs intended to be mounted on a rail and for all types of plug-in RCCBs designed for surface mounting; – 9.12.2.3 for plug-in type RCCBs, the holding in position of which depends solely on their connections.
9.12.2.2	Add after the first paragraph: <i>Plug-in RCCBs designed for surface mounting are mounted complete with the appropriate means for the plug-in connection but without cables being connected and without any cover-plate.</i>
9.12.2.3	Replace the existing subclause by: <i>Plug-in type RCCBs, the holding in position of which depends solely on their connections, are mounted, complete with the appropriate plug-in base but without cables being connected and without any cover-plate, on a vertical rigid wall.</i> <i>A force of 20 N is applied to the RCCB portion at a point equidistant between the plug-in connections, without jerks for 1 min (see Figure Z4).</i>
9.13.1	Replace the second sentence of the fourth paragraph by: <i>Only one test is made, on one pole taken at random, with measurement of break time: the latter shall not exceed the value specified in Table 1 at $I_{\Delta n}$.</i>
9.14	Replace in the first line "clauses 4 to 10 of IEC 60695-2-1/0" by "IEC 60095-2-10".
9.15.2	Delete note 2.
9.17.1	Starting from the seventh line, replace the text by: <i>All the values measured shall be less than 0,70 times the rated voltage (or, if relevant, 0,70 times the minimum value of the range of rated voltages).</i> <i>At the end of these measurements the RCCB is supplied with a voltage just above the highest measured value and it shall be verified that the RCCB operates in a period of time corresponding to the value specified in Table 1 for $I_{\Delta n}$, when a current equal to $1,25 I_{\Delta n}$ is applied.</i> <i>It shall also be verified that for any value of the line voltage less than the lowest measured value it shall not be possible to close the apparatus by the manual operating means.</i>
9.17.2	Replace in the title "automatic opening" by "behaviour".
	Add after item a): <i>No tripping shall occur if the voltage is switched off for a time not exceeding 0,03 s.</i>
	Add after item b): RCCBs classified in 4.1.2.1 b) are additionally submitted to the following test. <i>The RCCB, previously energized with the rated voltage and brought to the closed position, is opened by hand or by operating the test device. The rated voltage is then switched off at the line side of the RCCB and suddenly re-established: the RCCB shall not close automatically.</i> <i>The test is carried out five times.</i>
9.17.4	Replace the title by: 9.17.4 Verification of correct operation of RCCBs with three or four poles, in presence of a residual current, the neutral and one line terminal only being energized Second line: add between "line" and "only" the word "terminal".
9.17.5	Replace by "Deleted".

Clause	Common modifications
9.18	Delete the note.
9.18.1	In the title replace "current paths" by "poles".
9.20	Replace the third paragraph by: <i>A first series of tests is made at an impulse voltage of 6 kV peak, the impulses being applied between the phase pole(s), connected together, and the neutral pole of the RCCB or, in absence of the neutral pole, on one pole taken at random.</i> Delete, in the last line of the fourth paragraph, the words "(or path)".
9.22	Add, after the first line: Specifications on verification of reliability of electronic circuits are under consideration. Delete the note.
9.22.1.5	Replace the second sentence by: <i>One test only is made on one pole taken at random, with measurement of the break time: the latter shall not exceed the value specified in Table 1 at $I_{\Delta n}$.</i>
9.22.2	In the second paragraph replace "Table 4" by "Table 8".
	Replace the second sentence of the last paragraph by: <i>One test only is made on one pole taken at random, with measurement of the break time- the latter shall not exceed the value specified in Table 1 at $I_{\Delta n}$.</i>
9.23	Delete in the title "of electronic components". Replace the second sentence of the last paragraph by: <i>One test only is made one pole taken at random, with measurement of the break time: the latter shall not exceed the value specified in Table 1 at $I_{\Delta n}$.</i>

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Clause	Common modifications
9.Z1	Add the following new subclause:
	9.Z1 Verification of the correct operation at low ambient air temperatures for RCCBs for use at temperatures between -25 °C and +40 °C <i>Enclosed-type RCCBs are tested in their enclosure, unenclosed-type RCCBs are mounted in an individual enclosure with a degree of protection IP55, and are connected as for normal use (see Figure 4a).</i> NOTE 1 No drain hole in the enclosure shall be opened for this test. NOTE 2 RCCBs tested in enclosures IP55 may also be used in enclosures of a degree of protection other than IP55 within the temperature range of -25 °C to +40 °C. <i>The RCCB (including the enclosure) is brought into a suitable test chamber with an ambient air temperature of (23 ± 2) °C and a relative humidity of (93 ± 3) %. The volume ratio of the test chamber to the test samples (including enclosures) shall be greater than 50.</i> <i>The RCCB is in the ON-position without load and shall be subjected to the following cycle (see Figure Z3).</i> <i>For the first 6 h (stabilization period) the temperature is kept at (23 ± 2) °C and the humidity at (93 ± 3) %. Within the next 6 h the ambient air temperature is decreased to (-25 ± 2) °C without any supply of humidity. This temperature of (-25 ± 2) °C is kept for 6 h. Within the next 6 h the temperature is increased to $(+23 \pm 2)$ °C and the relative humidity is increased to (93 ± 3) % (end of the first cycle). This cycle is performed five times.</i> <i>During these cycles the RCCB shall not trip.</i> <i>During the fifth cycle, at the end of the period at (-25 ± 2) °C, an a.c. residual current is passed through one pole of the RCCB (see Figure 4a)</i> <i>– for RCCBs of the general type, the residual current is calibrated to $1,25 I_{\Delta n}$ and established by closing S2. One test only is made on one pole taken at random. The break time measured shall not exceed the value specified in Table 1 for $I_{\Delta n}$;</i> <i>– for RCCBs of type S the residual current is calibrated to $1,25 \times 2 I_{\Delta n}$ and established by closing S2. One test only is made on one pole taken at random. The break time measured shall not exceed the value specified in Table 1 for $2 I_{\Delta n}$.</i> <i>In addition, RCCBs of type A are tested with pulsating d.c. residual currents immediately after the above test with a.c. residual current, the test circuit corresponding to Figure 4b</i> <i>– for RCCBs of the general type, the residual current is calibrated to $1,25 \times 2 I_{\Delta n}$ for RCCBs with $I_{\Delta n} \leq 0,01$ A, and to $1,25 \times 1,4 I_{\Delta n}$ for RCCBs with $I_{\Delta n} > 0,01$ A. The current delay angle shall be $= 0^\circ$, the position of S_3 is set at random, and the current is established by closing S_2. One test only is made on one pole taken at random. The break time measured shall not exceed the value specified in Table 1 for $I_{\Delta n}$.</i> <i>– for RCCBs of type S the residual current is calibrated to $1,25 \times 1,4 \times 2 I_{\Delta n}$, current delay angle shall be $= 0^\circ$, the position of S_3 is set at random, and the current is established by closing S_2. One test only is made on one pole taken at random. The break time measured shall not exceed the value specified in Table 1 for $2 I_{\Delta n}$.</i> <i>After these tests a visual inspection shall show that the materials have not undergone deterioration impairing the further use of the RCCB and it shall be possible to switch on the RCCB, without the presence of any residual current, at the temperature of -25 °C.</i>

Clause	Common modifications
Figure 3	Replace the existing figure by the following:



IEC 432/99

Dimensions in millimetres

Tolerances on dimensions without specific tolerance

on angles $\begin{matrix} 0 \\ -10' \end{matrix}$

on linear dimensions:

up to 25 mm $\begin{matrix} 0 \\ -0,05 \end{matrix}$

over 25 mm: $\pm 0,2$

Material of finger: e.g. heat-treated steel

Both joints of this finger may be bent through an angle of $90^\circ + 10^\circ$, but in the one and same direction only.

Using the pin and groove solution is only one of the possible approaches in order to limit the bending angle to 90° . For this reason dimensions and tolerances of these details are not given in the drawing. The actual design must ensure a 90° bending angle with a 0 to + 10° tolerance.

Figure 3 – Standard test finger

Clause	Common modifications
Figure 4a	Add the following dashed item in the title: – behaviour at low ambient air temperature of RCCBs for use in the range of -25 °C to +40 °C (9.Z1)
Figure 5	Delete.
Figure 7	Replace by Figure Z1.

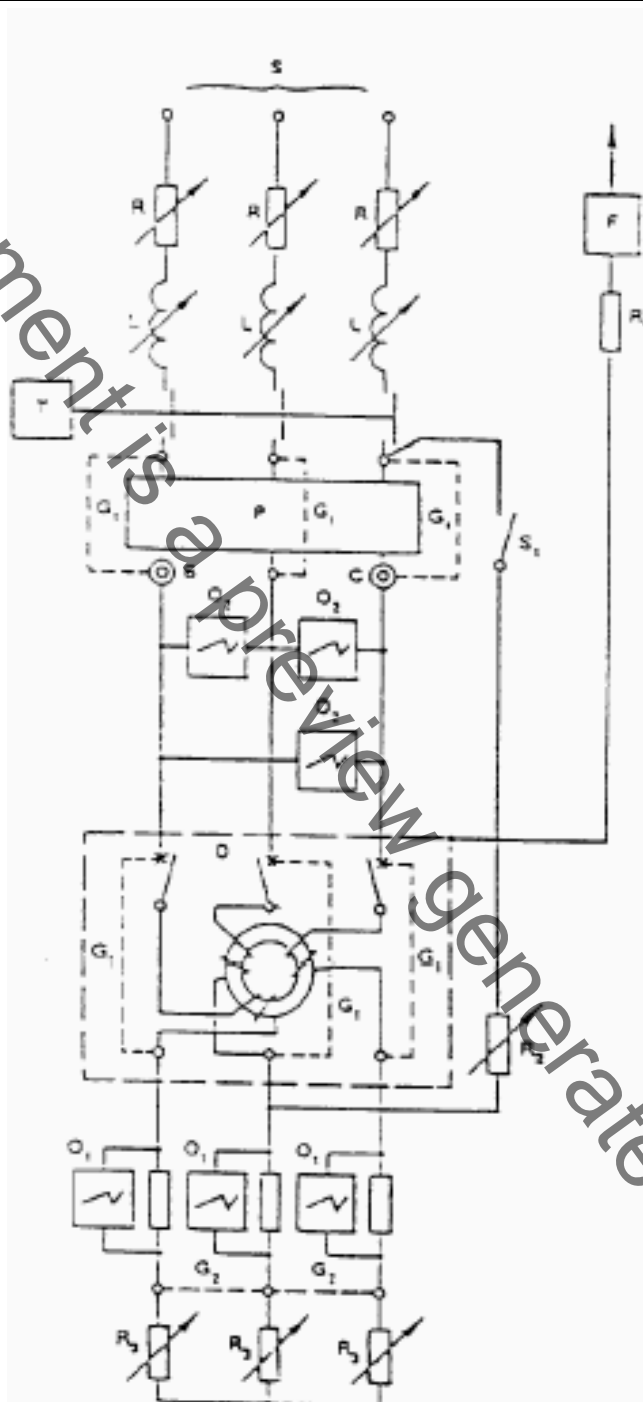


Figure Z1 – Test circuit for the verification of the rated making and breaking capacity and of the co-ordination with a SCPD of a three-pole RCCB on three-phase circuit (9.11)

Clause	Common modifications
Figure 8	Delete
Figure 9	Replace by Figure Z2.

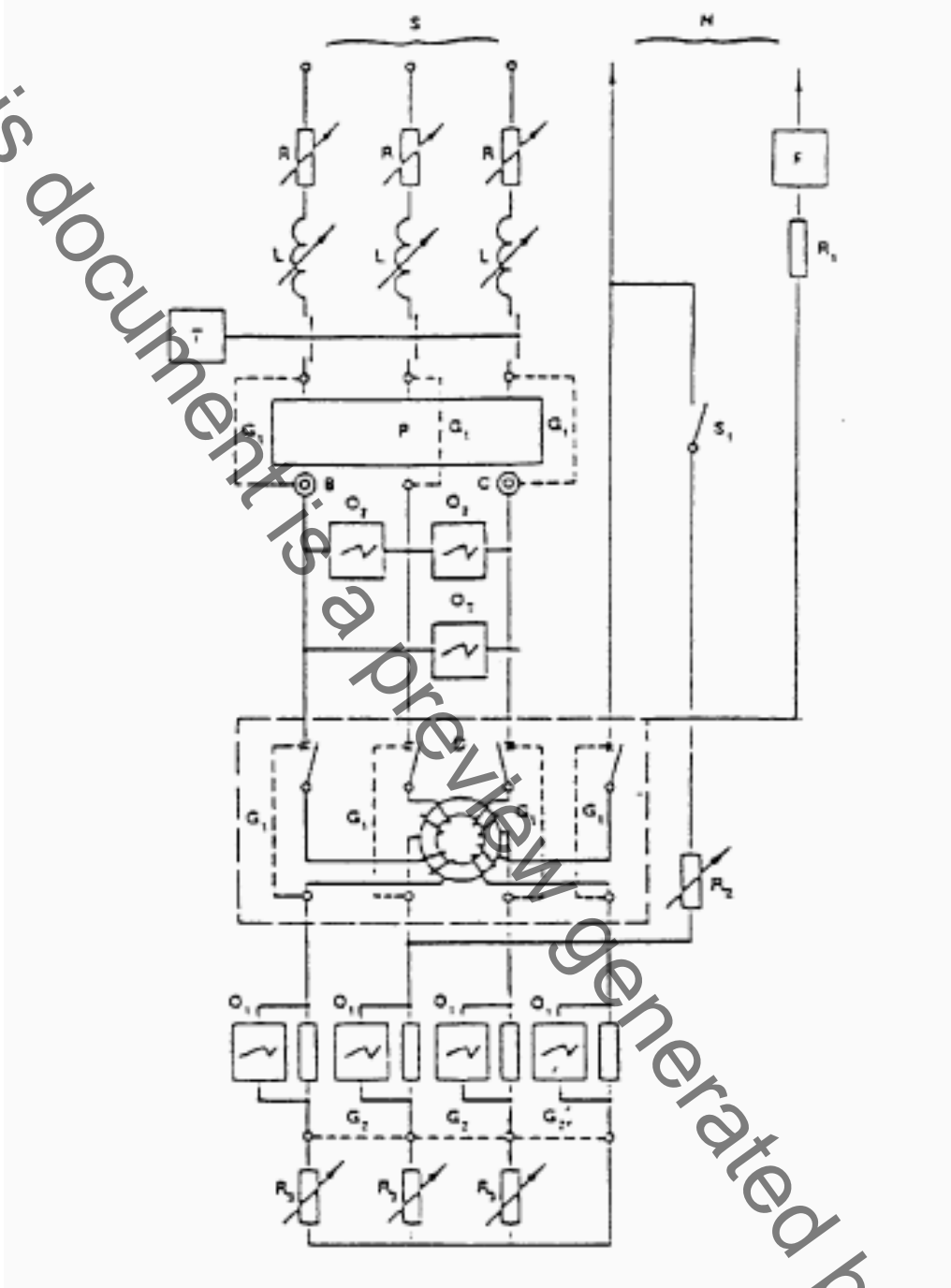


Figure Z2 – Test circuit for the verification of the rated making and breaking capacity and of the co-ordination with a SCPD of a four-pole RCCB on a three-phase circuit with neutral (9.11)

Clause	Common modifications
Figure 22	Delete in the title "of electronic components".
Figure Z3	Add the following new figure:

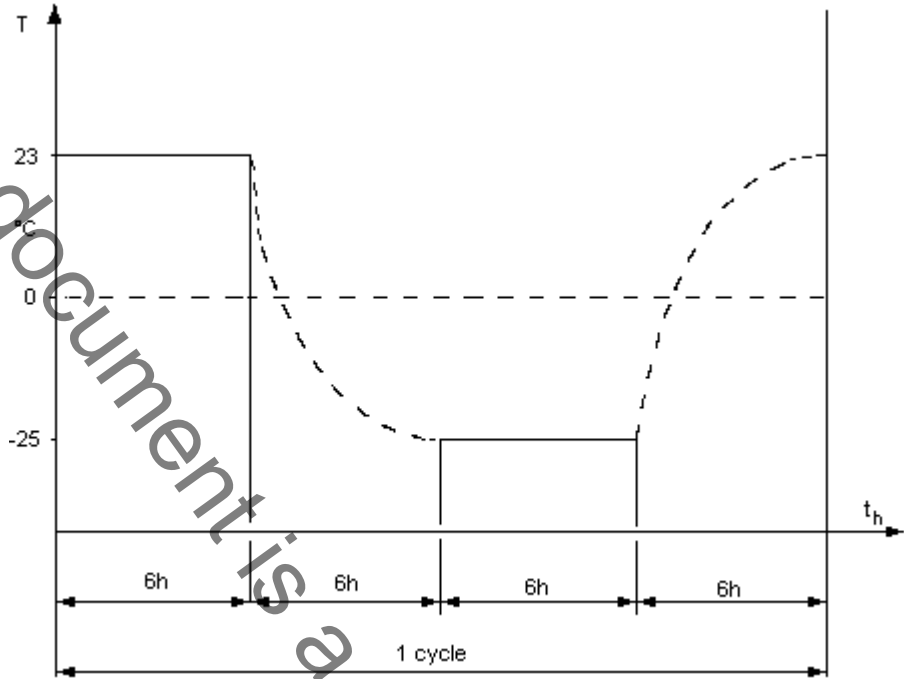
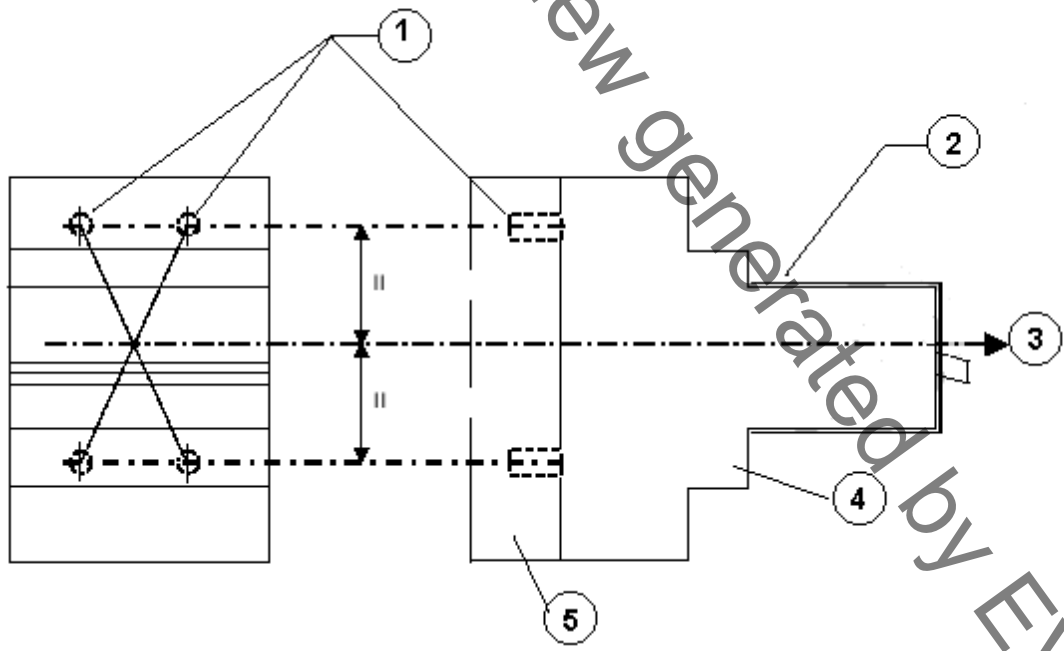


Figure Z3 – Test cycle for low temperature test (9.24)

Figure Z4	Add the following new figure:
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- 1 Plug-in connection
- 2 Arrangement for application of the force
- 3 Force
- 4 RCCB
- 5 Base

Figure Z4 – Example of application of force for mechanical test on two-pole plug-in RCCB, the holding in position of which depends solely on the plug-in connections (9.13.2.4)

Clause	Common modifications
Annex A	
Table A.1	In the test sequence D ₁ replace “9.11.2.3” by “9.11.2.3 a), b)”
	Add the new test sequences D ₂ and H

D ₂	9.11.2.3.c)	<i>Verification of the suitability in IT system</i>
H	9.24	<i>Verification of correct operation at low ambient air temperature of RCCBs for use in the range of –25 °C to +40 °C</i>

A.2	Delete the last paragraph.
Table A.2	Add the new test sequences D ₂ and H

D ₂	3	3	3
H	3	2	3

Table A.3	Add the new test sequences D ₂ and H
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D ₂	3 max. rating I_n min. rating $I_{\Delta n}$	3 max. rating I_n min. rating $I_{\Delta n}$	3 max. rating I_n min. rating $I_{\Delta n}$
H ^{h)}	3 max. rating I_n min. rating $I_{\Delta n}$ 3 min. rating I_n max. rating $I_{\Delta n}$	3 max. rating I_n min. rating $I_{\Delta n}$ 3 min. rating I_n max. rating $I_{\Delta n}$	3 max. rating I_n min. rating $I_{\Delta n}$ 3 min. rating I_n max. rating $I_{\Delta n}$

Table A.3	Delete notes c), d) and e).
	Add note h): h) If a range of RCCBs of the same fundamental design are submitted, only the samples with the maximum number of poles need to be tested.

Clause	Common modifications
Annex E	Replace existing Table E.2 by the following:

Table E.2

Test sequence	Table of IEC 61543	Reference condition of IEC 61543	Phenomena	Number of samples	Minimum number of samples which shall pass the tests	Maximum number of samples for repeated tests
E.2.1	5	2.3	Conducted unidirectional transients of the ms and μ s time scale	3 $I_{\Delta n \text{ min}}$ any I_n	2	3
E.2.2	5	2.1 and 2.5	Conducted radio-frequency disturbances and radiated radio-frequency electromagnetic fields	3 $I_{\Delta n \text{ min}}$ any I_n	2	3
	5	2.2	Conducted unidirectional transients of the ns time scale (burst)			
E.2.3	6	3.1	Electrostatic discharges	3 $I_{\Delta n \text{ min}}$ any I_n	2	3
* For devices containing a continuously operating oscillator, the test of CISPR 14 shall be carried out on the samples prior to the tests of this sequence.						
NOTE On request of the manufacturer the same set of samples may be subjected to more than one test sequence.						

Annex ID	Delete
Annexes	Add the following annexes ZA, ZB, ZC and ZZ.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60038	1983	IEC standard voltages	HD 472 S1	1989
IEC 60050-151	1978	International Electromechanical Vocabulary (IEV) – Chapter 151	–	–
IEC 60050-441	1984	International Electromechanical Vocabulary (IEV) – Chapter 441 Switchgear controlgear and fuses	–	–
IEC 60051	Series	Direct acting indicating analogue electrical measuring instruments and their accessories	EN 60051	Series
IEC 60060-2	1994	High-voltage test techniques – Part 2: Measuring systems	EN 60060-2	1994
IEC 60068-2-30	1980	Environmental testing - Part 2: Tests – Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle)	EN 60068-2-30	1999
IEC 60112	2003	Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions	EN 60112	2003
IEC 60364, mod.	Series	Electrical installations of buildings	HD 384	Series
IEC 60417	Data-base	Graphical symbols for use on equipment. Index survey and compilation of the single sheets	–	–
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529	1991
IEC 60664-1 + A1 + A2	1992 2000 2002	Insulation co-ordination for equipment within low voltage systems – Part 1: Principles, requirements and tests	EN 60664-1	2003
IEC 60695-2-10	2000	Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure	EN 60695-2-10	2001
IEC 60755	1983	General requirements for residual current operated protective devices	–	–
IEC 60884-1	2002	Plugs and socket-outlets for household and similar purposes– Part 1: General requirements	–	–
IEC 61009	Series	Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses	EN 61009	Series
IEC 61543	1995	Residual current-operated protective devices (RCDs) for household and similar use – Electromagnetic compatibility	EN 61543	1995
ISO 7000	1989	Graphical symbols, for use on equipment Index and synopsis	–	–
CISPR 14-1	2000	Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission	EN 55014-1	2000

Annex ZB (normative)

Special national conditions

Special national condition: National characteristic or practice that cannot be changed even over a long period, e.g. climatic conditions, electrical earthing conditions.

For the countries in which the relevant special national conditions apply these provisions are normative, for other countries they are informative.

Country Special national condition

Germany In Germany only the use of RCCB's of type A (sensitive to pulsating D.C. – see 3.1.3) is allowed.

Ireland EN 61008-1 (referred to as Part 1) is applicable with the modifications as given below.
For RCCB's functionally dependent of line voltage IEC 61008-2-2 applies in conjunction with Part 1.

Netherlands For all RCCB's, EN 61008-1 (referred to as Part 1) is applicable with the modifications as given below.

- For RCCB's functionally independent of line voltage EN 61008-2-1 applies in conjunction with Part 1.
- For RCCB's functionally dependent of line voltage IEC 61008-2-2 applies in conjunction with Part 1.

Netherlands **Add to clause 6:**

Devices not in compliance with the modified sub-clauses 9.11.2.3 and 9.21.1.1 as given below shall be marked with the symbol



(IT in circle and crossing lines as per IEC 60947-2, indicating not suitable for use in IT systems)

Furthermore, in the manufacturer's instruction sheet it shall be clearly indicated that the device provides protection against residual pulsating direct currents only, when used in a supply system with an earthed neutral conductor. For this purpose the following text shall appear in the instruction sheet:

"Waarschuwing:

Deze aardlekschakelaar biedt alleen bescherming tegen pulserende gelijkstromen naar aarde of naar gestel, indien de te beveiligen toestellen gevoed worden door een eenfase stroomketen waarvan de nul aardpotentiaal heeft."

(Translation: "Warning: This RCCB provides protection against pulsating residual direct currents only, where the appliance is fed by a single phase supply, the neutral being at earth potential")

Country Special national condition

Netherlands **Modify** subclause 9.11.2.3 as follows:

9.11.2.3 Verification of the rated residual making and breaking capacity ($I_{\Delta m}$) of RCCBs and verifying their suitability for use in IT systems

This test is intended to verify the ability of the RCCB to make, to carry for a specified time and to break residual short-circuit currents.

a) Test conditions

The RCCB shall be tested according to the general test conditions prescribed in 9.11.2.1, no SCPD being inserted in the circuit, but connected in such a manner that the short-circuit current is a residual current.

For this test the resistors R3 are not used, the circuit being left open.

The current paths which have not to carry the residual short-circuit current are connected to the supply voltage at their line terminals.

The connections G1 of negligible impedance are replaced by the RCCB and by connections having approximately the impedance of the SCPD.

The auxiliary switch St remains closed.

The test is performed as follows

b) Test procedure

The following sequence of operations is performed on each pole, except for the pole exclusively for the neutral, if any:

O – t – CO – t – CO.

For the breaking operation the auxiliary switch T is synchronised with respect to the voltage wave so that the point of initiation is $45^\circ \pm 5^\circ$. The same pole shall be used as reference for the purpose of synchronization for the different samples.

c) Verification of suitability in IT systems

For the verification of the suitability in IT system, the following test is performed on new samples

- *at a voltage 105% of the rated phase to neutral voltage value for the pole exclusively for the neutral, if any*
- *at a voltage 105 % of the rated phase to phase voltage value for the other poles.*
- *and with a current of 500 A or $10 I_n$ whichever is the greater.*

The test sequence being

O- t- CO.

For the O operation of the neutral pole the auxiliary switch T is synchronised with respect to the voltage wave so that the circuit is closed on the point 60° on the wave for this operation

For the O operation on the first tested pole the auxiliary switch T is synchronised with respect to the voltage wave so that the circuit is closed on the point 0° on the wave for this operation .

For the following O operations on the other poles to be tested (see A.2) this point is shifted each time by 30° with respect to the point on wave of the previous test, with a tolerance of $\pm 5^\circ$.

Country Special national condition

Netherlands **Replace** the text of subclause 9.21.1.1 by:

9.21.1.1 Verification of the correct operation of RCCB type A suitable for all earthing systems in case of a steady increase of the residual pulsating current

The RCCB D is connected according to figure 4d and connected in turn to the following supply systems:

- *phase to earthed neutral ;*
- *phase to phase of a three phase supply, starpoint earthed;*
- *two phases midpoint earthed.*

When connected to each of the supply systems the following tests are carried out:

The auxiliary switches S1 and S2 and the RCCB D shall be closed. Each combination of two poles of the device shall be tested twice in position I as well as in position II of the auxiliary switch S3.

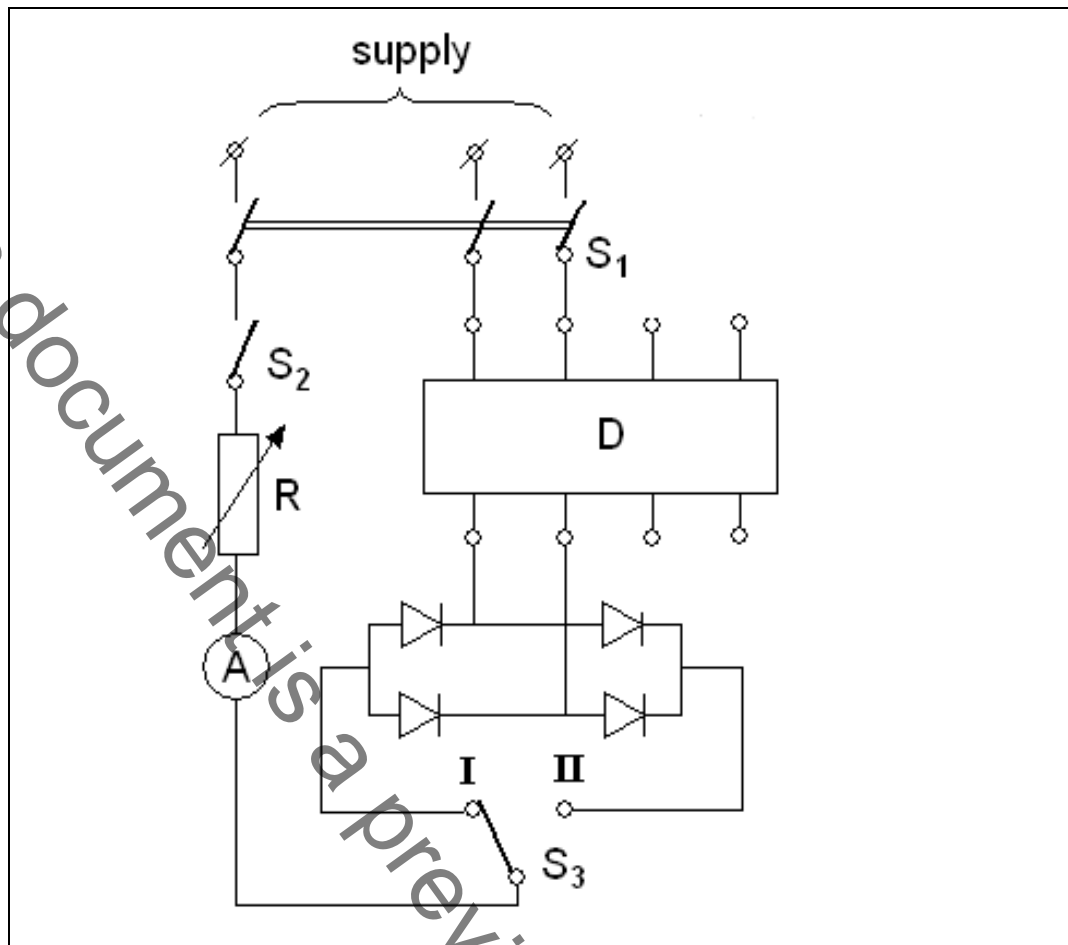
At every test the peak value of current shall be steadily increased starting from zero at an approximately rate of $2 I_{\Delta n}/30$ ampere per second for devices with $I_{\Delta n} > 0,01$ A and $2,8 I_{\Delta n}/30$ ampere per second for devices with $I_{\Delta n} = 0,01$ A.

For each test the peak value of tripping current shall be between:

- *$0,7 I_{\Delta n}$ and $2,8 I_{\Delta n}$ for devices rated $I_{\Delta n} > 0,01$ A and*
- *$0,7 I_{\Delta n}$ and $4 I_{\Delta n}$ for devices rated $I_{\Delta n} = 0,01$ A.*

NOTE 1 In case of half pulse rectified current the peak value of the current is 2 x greater than the RMS value of that current.

NOTE 2 According to IEC 60479-2 clause 4.4.1 constitutes a d.c current with a peak value $2\sqrt{2}$ higher than the r.m.s value of a 50 Hz current; the same risk with respect to the probability of ventricular fibrillation in event of shock durations longer than approximately 1,5 times the period of the cardiac cycle.

CountrySpecial national condition

- S = Supply in turn for each of the test series:
 Phase neutral 230 V, between phases 230 V and 2 x 115 V
 A = Ammeter (measuring peak value)
 S1 = All-pole switch
 S2 = Single pole switch
 S3 = Two-way switch
 R = Variable resistor
 D = RCCB under test
 Di = Diode

Figure 4d -Test circuit for the verification of the correct operation of RCCBs for use in all earthing systems (TN, TT and IT), in case of residual pulsating direct currents

**United
Kingdom**

EN 61008-1 (referred to as Part 1) is applicable with the modifications as given below.

For RCCB's functionally dependent of line voltage IEC 61008-2-2 applies in conjunction with Part 1.

Annex ZC (informative)

A-deviations

A-deviation: National deviation due to regulations, the alteration of which is for the time being outside the competence of the CENELEC national member.

This European Standard falls under Directive 73/23/EEC.

NOTE (from CEN/CENELEC IR Part 2:2002, 2.17) Where standards fall under EC Directives, it is the view of the Commission of the European Communities (OJ No C 59, 1982-03-09) that the effect of the decision of the Court of Justice in case 815/79 Cremonini/Vrankovich (European Court Reports 1980, p. 3583) is that compliance with A-deviations is no longer mandatory and that the free movement of products complying with such a standard should not be restricted except under the safeguard procedure provided for in the relevant Directive.

A-deviations in an EFTA-country are valid instead of the relevant provisions of the European Standard in that country until they have been removed.

<u>Clause</u>	<u>Deviation</u>
---------------	------------------

1, note 5	Denmark
------------------	----------------

(Heavy Current Regulations Section 107-2-D1, 4 ed.)

Replace "IEC 60884-1" by "the relevant national standard(s)".

Add the following requirement after note 5:

Socket-outlets for household and similar use shall comply with DS/IEC 60884-1 and the Heavy Current Regulations Section 107-2-D1.

Spain

(*Reglamento Electrotécnico de Baja Tensión RD 842/2002.*)

Replace "IEC 60884-1" by "the relevant national standard(s)".

Add the following requirement after note 5:

Socket-outlets for household and similar use shall comply with Standard series UNE 20315.

United Kingdom

(*"The Plugs and Sockets etc. (Safety) Regulations 1994 (Statutory Instrument 1768)"*)

The UK Plug and Socket Safety Regulations, 1994, require that all plugs and socket-outlets comply with the requirements of BS 1363.

Note 5 of Clause 1 of this standard does not apply in the UK.

Annex ZZ
(informative)

Coverage of Essential Requirements of EC Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and within its scope the standard covers all relevant essential requirements as given in Article 4 of the EC Directive 89/336/EC.

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directive concerned.

WARNING: Other requirements and other EC Directives may be applicable to the products falling within the scope of this standard.

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**NORME
INTERNATIONALE
INTERNATIONAL
STANDARD**

**CEI
IEC**

61008-1

Edition 2.1

2002-10

Edition 2:1996 consolidée par l'amendement 1:2002
Edition 2:1996 consolidated with amendment 1:2002

**Interrupteurs automatiques à courant différentiel
résiduel pour usages domestiques et analogues
sans dispositifs de protection contre
les surintensités incorporé (ID) –**

**Partie 1:
Règles générales**

**Residual current operated circuit-breakers
without integral overcurrent protection
for household and similar uses (RCCBs) –**

**Part 1:
General rules**



Numéro de référence
Reference number
CEI/IEC 61008-1:1996+A1:2002

Numérotation des publications

Depuis le 1er janvier 1997, les publications de la CEI sont numérotées à partir de 60000. Ainsi, la CEI 34-1 devient la CEI 60034-1.

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**INTERRUPTEURS AUTOMATIQUES À COURANT DIFFÉRENTIEL RÉSIDUEL
POUR USAGES DOMESTIQUES ET ANALOGUES
SANS DISPOSITIF DE PROTECTION
CONTRE LES SURINTENSITÉS INCORPORÉ (ID) –****Partie 1: Règles générales****AVANT-PROPOS**

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Une ligne verticale dans la marge indique où la publication de base a été modifiée par l'amendement 1.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RESIDUAL CURRENT OPERATED CIRCUIT-BREAKERS
WITHOUT INTEGRAL OVERCURRENT PROTECTION
FOR HOUSEHOLD AND SIMILAR USES (RCCBs) –****Part 1: General rules**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61008-1 has been prepared by subcommittee 23E: Circuit-breakers and similar equipment for household use, of IEC technical committee 23: Electrical accessories.

This consolidated version of IEC 61008-1 is based on the second edition (1996) [documents 23E/245+251/FDIS and 23E/259+268/RVD] and its amendment 1 (2002) [documents 23E/487/FDIS and 23E/501/RVD].

It bears the edition number 2.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

Dans la présente norme, les caractères d'imprimerie suivants sont employés:

- Prescriptions proprement dites: caractères romains.
- *Modalités d'essais: caractères italiques.*
- Notes: petits caractères romains.

Le comité a décidé que le contenu de la publication de base et de son amendement 1 ne sera pas modifié avant 2003. A cette date, la publication sera

- reconduite;
- supprimée;
- remplacée par une édition révisée, ou
- amendée.

In this standard, the following print types are used:

- Requirements proper: in roman type.
- *Test specifications: in italic type.*
- Notes: in smaller roman type.

The committee has decided that the contents of the base publication and its amendment 1 will remain unchanged until 2003. At this date, the publication will be

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

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INTRODUCTION

Cette partie comprend les définitions, prescriptions et essais couvrant tous les types d'ID. Pour l'application à un type spécifique cette partie doit s'appliquer en conformité avec la partie correspondante, comme suit:

Partie 2-1: Applicabilité des règles générales aux interrupteurs différentiels fonctionnellement indépendants de la tension d'alimentation.

Partie 2-2: Applicabilité des règles générales aux interrupteurs différentiels fonctionnellement dépendants de la tension d'alimentation.

INTRODUCTION

This part includes definitions, requirements and tests, covering all types of RCCBs. For the applicability to a specific type this part shall apply in conjunction with the relevant part, as follows:

Part 2-1: Applicability of the general rules to RCCBs functionally independent of line voltage.

Part 2-2: Applicability of the general rules to RCCBs functionally dependent on line voltage.

INTERRUPTEURS AUTOMATIQUES À COURANT DIFFÉRENTIEL RÉSIDUEL POUR USAGES DOMESTIQUES ET ANALOGUES SANS DISPOSITIF DE PROTECTION CONTRE LES SURINTENSITÉS INCORPORÉ (ID) –

Partie 1: Règles générales

1 Domaine d'application

La présente Norme internationale s'applique aux interrupteurs automatiques à courant différentiel résiduel fonctionnellement indépendants ou fonctionnellement dépendants de la tension d'alimentation, pour usages domestiques et analogues sans dispositif de protection contre les surintensités incorporé (en abrégé «ID» dans la suite du texte), de tension assignée ne dépassant pas 440 V alternatifs et de courant assigné ne dépassant pas 125 A, principalement destinés à la protection contre les chocs électriques.

Ces appareils sont destinés à la protection des personnes contre les contacts indirects, les parties métalliques accessibles de l'installation étant reliées à une prise de terre de valeur appropriée. Ils peuvent être utilisés pour assurer la protection contre les dangers d'incendie résultant d'un courant de défaut persistant à la terre sans que le dispositif de protection contre les surcharges du circuit n'intervienne.

Les ID de courant différentiel de fonctionnement assigné inférieur ou égal à 30 mA sont aussi utilisés comme moyen de protection complémentaire en cas de défaillance des autres mesures de protection contre les chocs électriques.

La présente norme s'applique aux appareils remplissant à la fois les fonctions de détection du courant résiduel, de comparaison de la valeur de ce courant à une valeur de fonctionnement différentiel et d'ouverture du circuit protégé quand le courant différentiel résiduel dépasse cette valeur.

NOTE 1 Les prescriptions pour les ID entrent dans le cadre de la CEI 60755. Ils sont essentiellement destinés à être mis en oeuvre par des personnes non averties et conçus pour ne pas être entretenus. Ils peuvent faire l'objet de certification.

NOTE 2 Les règles d'installations et d'utilisation des ID sont indiquées dans la CEI 60364.

NOTE 3 Les ID du domaine d'application de la présente norme sont considérés comme appropriés pour le sectionnement (voir 8.1.3).

Des précautions spéciales (par exemple parafoudres) peuvent être nécessaires lorsque des surtensions excessives sont susceptibles de se produire en amont (par exemple dans le cas d'une alimentation par lignes aériennes) (voir CEI 60364-4-443).

Les ID du type général sont résistants aux déclenchements indésirables y compris les cas où des ondes de surtension (résultant de transitoires de manoeuvre ou induites par des coups de foudre) produisent des courants de charge dans l'installation sans qu'il se produise d'amorçage.

Les ID du type S sont considérés comme suffisamment résistants aux déclenchements indésirables même si l'onde de surtension provoque un amorçage et qu'un courant de suite se produit.

NOTE 4 Les parafoudres installés en aval d'un ID de type général et connectés en mode commun peuvent provoquer des déclenchements indésirables.

NOTE 5 Pour les ID ayant un degré de protection supérieur à IP20, des constructions spéciales peuvent être nécessaires.

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

Part 1: General rules

1 Scope

This International Standard applies to residual current operated circuit-breakers functionally independent of, or functionally dependent on, line voltage, for household and similar uses, not incorporating overcurrent protection (hereafter referred to as RCCBs), for rated voltages not exceeding 440 V a.c. and rated currents not exceeding 125 A, intended principally for protection against shock-hazard.

These devices are intended to protect persons against indirect contact, the exposed conductive parts of the installation being connected to an appropriate earth electrode. They may be used to provide protection against fire hazards due to a persistent earth fault current, without the operation of the overcurrent protective device.

RCCBs having a rated residual operating current not exceeding 30 mA are also used as a means for additional protection in case of failure of the protective means against electric shock.

This standard applies to devices performing simultaneously the functions of detection of the residual current, of comparison of the value of this current with the residual operating value and of opening of the protected circuit when the residual current exceeds this value.

NOTE 1 The requirements for RCCBs are in line with the general requirements of IEC 60755. RCCBs are essentially intended to be operated by uninstructed persons and designed not to require maintenance. They may be submitted for certification purposes.

NOTE 2 Installation and application rules of RCCBs are given in IEC 60364.

NOTE 3 RCCBs within the scope of the present standard are considered as suitable for isolation (see 8.1.3).

Special precautions (e.g. lightning arresters) may be necessary when excessive overvoltages are likely to occur on the supply side (for example in the case of supply through overhead lines) (see IEC 60364-4-443).

RCCBs of the general type are resistant to unwanted tripping including the case where surge voltages (as a result of switching transients or induced by lightning) cause loading currents in the installation without occurrence of flashover.

RCCBs of the S type are considered to be sufficient proof against unwanted tripping even if the surge voltage causes a flashover and a follow-on current occurs.

NOTE 4 Surge arresters installed downstream of the general type of RCCBs and connected in common mode may cause unwanted tripping.

NOTE 5 For RCCBs having a degree of protection higher than IP20 special constructions may be required.

Des prescriptions particulières sont nécessaires pour

- les interrupteurs différentiels avec la protection contre les surintensités incorporée (voir CEI 61009);
- les ID incorporés dans ou destinés seulement à l'association avec des socles et fiches de prises de courant ou des connecteurs à usages domestiques et analogues.

NOTE 6 Pour le moment, pour les ID incorporés dans ou destinés seulement aux socles ou fiches de prises de courant, les prescriptions de cette norme en conjonction avec celles de la CEI 60884-1 peuvent être utilisées pour autant qu'elles sont applicables.

Les présentes spécifications s'appliquent pour des conditions d'environnement normales (voir 7.1). Des prescriptions complémentaires peuvent être nécessaires pour des ID utilisés dans des locaux présentant des conditions sévères d'environnement.

Les ID comportant des batteries ne sont pas couverts par cette norme.

2 Références normatives

Les documents de référence suivants sont indispensables pour l'application du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

CEI 60038: 1983, *Tensions normales de la CEI*

CEI 60050(151): 1978, *Vocabulaire Electrotechnique International (VEI) – Chapitre 151: Dispositifs électriques et magnétiques*

CEI 60050(441): 1984, *Vocabulaire Electrotechnique International (VEI) – Chapitre 441: Appareillage et fusibles*

CEI 60051: *Appareils mesureurs électriques indicateurs analogiques à action directe et leurs accessoires*

CEI 60060-2: 1994, *Technique des essais à haute tension – Partie 2: Systèmes de Mesure*

CEI 60068-2-28: 1990, *Essais d'environnement – Partie 2: Essais – Guide pour les essais de chaleur humide*

CEI 60068-2-30: 1980, *Essais d'environnement – Partie 2: Essais – Essai Db et guide. Essai cyclique de chaleur humide (cycle de 12 + 12 heures)*

CEI 60364-4-443: 1995, *Installations électriques des bâtiments – Partie 4: Protection pour assurer la sécurité – Chapitre 44: Protection contre les surtensions – Section 443: Protection contre les surtensions d'origine atmosphérique ou dues à des manoeuvres*

CEI 60364-5-53: 1994, *Installations électriques des bâtiments – Cinquième partie: Choix et mise en oeuvre des matériels électriques – Chapitre 53: Appareillage*

CEI 60417: 1973, *Symboles graphiques utilisables sur le matériel. Index, relevé et compilation des feuilles individuelles*

CEI 60529: 1989, *Degrés de protection procurés par les enveloppes (Code IP)*

CEI 60695-2-1/0: 1994, *Essais relatifs aux risques du feu – Partie 2: Méthodes d'essais – Section 1/ feuille 0: Méthodes d'essais au fil incandescent – Généralités*

CEI 60755: (1983), *Règles générales pour les dispositifs de protection à courant différentiel résiduel*

Particular requirements are necessary for

- Residual current operated circuit-breakers with integral overcurrent protection (see IEC 61009);
- RCCBs incorporated in or intended only for association with plugs and socket-outlets or with appliance couplers for household or similar general purposes.

NOTE 6 For the time being, for RCCBs incorporated in, or intended only for socket-outlets or plugs, the requirements of this standard in conjunction with the requirements of IEC 60884-1 may be used as far as applicable.

The requirements of this standard apply for normal environmental conditions (see 7.1). Additional requirements may be necessary for RCCBs used in locations having severe environmental conditions.

RCCBs including batteries are not covered by this standard.

2 Normative references

The following referenced documents are indispensable for the application 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 60038: 1983, *IEC standard voltages*

IEC 60050(151): 1978, *International Electrotechnical Vocabulary (IEV) – Chapter 151: Electrical and magnetic devices*

IEC 60050(441): 1984, *International Electrotechnical Vocabulary (IEV) – Chapter 441: Switchgear, controlgear and fuses*

IEC 60051, *Direct acting indicating analogue electrical measuring instruments and their accessories*

IEC 60060-2: 1994, *High-voltage test techniques – Part 2: Measuring Systems*

IEC 60068-2-28: 1980, *Environmental testing – Part 2: Tests – Guidance for damp heat tests*

IEC 60068-2-30: 1990, *Environmental testing – Part 2: Tests – Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle)*

IEC 60364-4-443: 1995, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 44: Protection against overvoltages – Section 443: Protection against overvoltages of atmospheric origin or due to switching*

IEC 60364-5-53: 1994, *Electrical installations of buildings – Part 5: Selection and erection of electrical equipment – Chapter 53: Switchgear and controlgear*

IEC 60417: 1973, *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets*

IEC 60529: 1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60695-2-1/0: 1994, *Fire hazard testing – Part 2: Test methods – Section 1/sheet 0: Glow-wire tests methods – General*

IEC 60755:1983, *General measurements for residual current-operated protective devices*

CEI 60884-1: 1994, *Prises de courant pour usages domestiques et analogues – Partie 1: Règles générales*

CEI 61009, *Interrupteurs automatiques à courant différentiel résiduel avec protection contre les surintensités incorporées pour installations domestiques et analogues (DD)*

3 Définitions

Pour les besoins de la présente norme, les définitions suivantes s'appliquent.

Quand les termes «tension» ou «courant» sont utilisés, ils impliquent les valeurs efficaces, à moins qu'il n'en soit précisé autrement.

NOTE Un glossaire des symboles figure en annexe IB.

3.1 Définitions relatives aux courants circulant entre les parties actives et la terre

3.1.1

courant de défaut à la terre

courant qui s'écoule à la terre lors d'un défaut d'isolement

3.1.2

courant de fuite

courant qui s'écoule des parties actives de l'installation à la terre, en l'absence de tout défaut d'isolement

3.1.3

courant continu pulsé

courant de forme ondulatoire pulsé (VEI 101-04-34) prenant à chaque période de la fréquence assignée la valeur 0 ou une valeur ne dépassant pas 0,006 A en courant continu pendant un intervalle de temps, exprimé en mesure angulaire, d'au moins 150°

3.1.4

angle α de retard de conduction

intervalle de temps, exprimé en mesure angulaire, pendant lequel le point de départ de la conduction est retardé par commande de phase

3.2 Définitions relatives à l'alimentation d'un ID

3.2.1

grandeur d'alimentation

grandeur électrique d'excitation qui, seule ou en combinaison avec d'autres grandeurs électriques, doit être appliquée à un ID pour qu'il puisse fonctionner dans des conditions spécifiées

3.2.2

grandeur d'alimentation d'entrée

grandeur d'alimentation par laquelle l'ID est mis en action, lorsqu'elle est appliquée dans des conditions spécifiées

Ces conditions peuvent impliquer, par exemple, l'alimentation de certains organes auxiliaires

3.2.3

courant différentiel résiduel (I_{Δ})

somme vectorielle des valeurs instantanées des courants circulant dans le circuit principal de l'interrupteur différentiel (exprimé en valeurs efficaces)

IEC 60884-1: 1994, *Plugs and socket-outlets for household and similar purposes – Part 1: General requirements*

IEC 61009, *Residual current-operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs)*

3 Definitions

For the purpose of this standard, the following definitions apply.

Where the terms "voltage" or "current" are used, they imply r.m.s. values, unless otherwise specified.

NOTE For glossary of symbols see annex IB.

3.1 Definitions relating to currents flowing from live parts to earth

3.1.1

earth fault current

current flowing to earth due to an insulation fault

3.1.2

earth leakage current

current flowing from the live parts of the installation to earth in the absence of an insulation fault

3.1.3

pulsating direct current

current of pulsating wave form (IEV 101-04-34) which assumes, in each period of the rated power frequency, the value 0 or a value not exceeding 0,006 A d.c. during one single interval of time, expressed in angular measure, of at least 150°

3.1.4

current delay angle α

the time, expressed in angular measure, by which the starting instant of current conduction is delayed by phase control

3.2 Definitions relating to the energization of a residual current circuit-breaker

3.2.1

energizing quantity

an electrical excitation quantity which alone, or in combination with other such quantities, shall be applied to a RCCB to enable it to accomplish its function under specified conditions

3.2.2

energizing input-quantity

energizing quantity by which the RCCB is activated when it is applied under specified conditions

These conditions may involve, for example, the energizing of certain auxiliary elements

3.2.3

residual current (I_{Δ})

vector sum of the instantaneous values of the current flowing in the main circuit of the RCCB (expressed as r.m.s. value)