IEC 61008-1

Edition 3.0   2013-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 2
AMENDEMENT 2

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

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

IEC 61008-1:2010/A2:2013

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FOREWORD

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

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

FDIS	Report on voting
23E/795/FDIS	23E/819/RVD

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

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

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• withdrawn,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

The contents of the corrigendum of January 2014 have been included in this copy.

4.11 According to the type of terminals

Replace Note 3 introduced by Amendment 1 by the following new Note 3:

NOTE 3   The requirements for RCCBs equipped with this type of terminals are given in Annex L.

8.1.3 Clearances and creepage distances (see Annex B)

Replace the third paragraph of this subclause, and the modifications brought to it by Amendment 1, as follows:

The clearances of items 2 and 4 (except accessible surface after installation, see Note 1) may be reduced provided that the measured clearances are not shorter than the minimum allowed in IEC 60664-1 for homogenous field conditions.

Add the following new note after the third paragraph and renumber the existing notes of this subclause, introduced by Amendment 1, accordingly:

NOTE 1   Accessible surface after installation means any surface accessible by the user when the RCD is installed according to the manufacturer's instructions. The test finger can be applied to determine whether a surface is accessible or not.

8.5 Operating characteristics

Replace "9.9 and 9.21" by "9.9.1, 9.9.2, 9.9.3 and 9.9.4"

8.15   Behaviour of RCCBs in case of earth fault currents comprising a d.c. component

Replace the second paragraph as follows:

Compliance is checked by the tests of 9.9.3.

Table 9 – List of type tests

In the table, delete the following item:

–   Behaviour of RCCBs in case of an earth fault current comprising a d.c. component   9.21

9.7.2   Insulation resistance of the main circuit

Replace the existing text in item c) with the following text:

c)   with the RCCB in the closed position, between all poles connected together and the frame including a metal foil or part in contact with the outer surface of the housing of insulating material but with the terminal areas kept completely free to avoid flashover between terminals and the metal foil;

Replace 9.9 and the modifications brought to it by Amendment 1 by the following:

9.9   Verification of the operating characteristics

9.9.1   Test circuit and test procedure

The RCCB is installed as for normal use.

The test circuit shall be of negligible inductance. For tests according to 9.9.2, the test circuit shall correspond to Figure 4. For tests according to 9.9.3, the test circuit shall correspond to Figure 5 or Figure 6, as applicable.

The instruments for the measurement of the residual current shall display (or allow to determine) the true r.m.s. value.

NOTE   The information for instrument measurement is available at the following CTL webserver:

<http://www.iecee.org/ctl/sheet/pdf/CTL%20DSH%20251B%20Beijing%202009_05_15.pdf>

Unless otherwise specified, the tests are performed with no load at the reference temperature of 20 °C ± 5 °C.

The RCCB shall perform the tests of 9.9.2, 9.9.3 and 9.9.4, as applicable. Each test is made on one pole only, taken at random, with five measurements, unless otherwise specified.

For RCCBs having more than one rated frequency, the tests shall be carried out at the lowest and highest frequency, except for test in 9.9.2.5, where verification is performed at only one frequency.

For RCCBs having multiple settings of residual operating current, the tests shall be made for each setting.

9.9.2   Tests for all RCCBs

9.9.2.1   Verification of correct operation in case of a steady increase of residual current

The test switches S_1 and S_2 and the RCCB being in the closed position, the residual current is steadily increased, starting from a value not higher than 0,2 $I_{\Delta n}$, trying to attain the value of $I_{\Delta n}$ within 30 s, the tripping current being measured each time.

All five measured values shall be situated between $I_{\Delta no}$ and $I_{\Delta n}$.

9.9.2.2 Verification of correct operation on closing on a residual current

The test circuit being calibrated at the rated value of the operating residual current $I_{\Delta n}$ and the test switches S_1 and S_2 being closed, the RCCB is closed on the circuit so as to simulate service conditions as closely as possible. The break time is measured five times. No measurement shall exceed the limiting value specified for $I_{\Delta n}$ in Table 1, according to the type of RCCB.

9.9.2.3 Verification of correct operation in case of sudden appearance of sinusoidal a.c. residual current

a) All types

The test circuit being successively calibrated at each of the values of residual current specified in Table 1, the test switch S_2 and the RCCB being in the closed position, the test voltage is suddenly established by closing the test switch S_1.

The RCCB shall trip during each test.

Five measurements of the break time are made at each value of residual current.

No value shall exceed the relevant specified limiting value given in Table 1.

b) Additional test for type S

The test circuit being successively calibrated at each of the values of residual current specified in Table 1, the test switch S_1 and the RCCB being in the closed position, the residual current is suddenly established by closing the test switch S_2 for periods corresponding to the relevant minimum non-actuating times, with a tolerance of $^{0}_{-5}$ %.

Each application of residual current shall be separated from the previous one by an interval of at least 1 min.

The RCCB shall not trip during any of the tests.

9.9.2.4 Verification of correct operation in case of sudden appearance of residual currents between 5 $I_{\Delta n}$ and 500 A

The test circuit is calibrated at any two values of the residual current chosen at random within the range 5 A to 200 A, among the following list 5 A, 10 A, 20 A, 50 A, 100 A, 200 A.

NOTE   In Australia the measurement of the break time is made at 5 A, 10 A, 20 A, 50 A, 100 A, 200 A.

The test switch S_1 and the RCCB being in the closed position, the residual current is suddenly established by closing the test switch S_2.

The RCCB shall trip during each test. The break time shall not exceed the times given in Table 1.

The test is made once for each value of the residual current with measurement of the break time.

9.9.2.5 Verification of correct operation with load

The tests of 9.9.2.2 and 9.9.2.3 are repeated, the pole under test and one other pole of the RCCB being loaded with rated current, this current being established shortly before the test.

For the test of 9.9.2.3, the switch S_1 and RCCB are in closed position. The residual current is established by closing S_2.

9.9.2.6 Tests at the temperature limits

The RCCB shall perform the tests specified in 9.9.2.3 under the following conditions, successively:

a) ambient temperature: –5 °C, off-load;

b) ambient temperature: +40 °C, the RCCB having been previously loaded with the rated current, at any convenient voltage, until it attains thermal steady-state conditions.

   In practice these conditions are reached when the variation of temperature-rise does not exceed 1 K per hour.

For the tripping tests in b), the flow of rated current may be interrupted, provided that the total interruption period does not exceed 30 s. As soon as the sum of interruption periods exceed 30 s, the RCCB shall be loaded again with rated current for 5 min before next tripping time measurement.

NOTE Preheating may be carried out at any convenient voltage at either 50 Hz or 60 Hz but auxiliary circuits shall be connected to their normal operating voltage (particularly for components depending on line voltage).

9.9.3 Additional verification of correct operation at residual currents with d.c. components for type A RCCBs

9.9.3.1 Verification of correct operation in case of a continuous rise of residual pulsating direct current

The test shall be performed according to Figure 5.

The auxiliary switches S_1 and S_2 and the RCCB shall be closed. The relevant thyristor shall be controlled in such a manner that current delay angles α of 0°, 90° and 135° are obtained. Each pole of the RCCB shall be tested twice at each of the current delay angles, in position I as well as in position II of the auxiliary switch S_3.

For each test, the current shall be steadily increased at an approximate rate of $1,4\ I_{\Delta n}/30$ amperes per second for RCCBs with $I_{\Delta n} > 0,01$ A, and at an approximate rate of $2\ I_{\Delta n}/30$ amperes per second for RCCBs with $I_{\Delta n} \leq 0,01$ A, starting from zero. The tripping current shall be in accordance with Table 20.

Table 20 – Tripping current ranges for type A RCCBs

Angle, α °	Tripping current A	
	Lower limit $I_{\Delta n}$	Upper limit $I_{\Delta n}$
0	0,35	
90	0,25	1,4 or 2 (5.3.12)
135	0,11	

9.9.3.2 Verification of correct operation in case of suddenly appearing residual pulsating direct currents

The RCCB shall be tested according to Figure 5.

The circuit being successively calibrated at the values specified hereafter and the auxiliary switch S_1 and the RCCB being in the closed position, the residual current is suddenly established by closing the switch S_2.

The test is carried out at each value of residual current specified in Table 2, according to the type of RCCB.

Two measurements of the break time are made at each value of residual current, at a current delay angle α = 0° with the auxiliary switch S_3 in position I for the first measurement and in position II for the second measurement.

No value shall exceed the specified limiting values.

9.9.3.3 Verification of correct operation with load

The tests of 9.9.3.1 are repeated, the pole under test and one other pole of the RCCB being loaded with the rated current, this current being established shortly before the test.

NOTE   The loading with rated current is not shown in Figure 5.

9.9.3.4 Verification of correct operation in case of residual pulsating direct currents superimposed by a smooth direct current of 0,006 A

The RCCB shall be tested according to Figure 6 with a half-wave rectified residual current (current delay angle α = 0°) superimposed by a smooth direct current of 0,006 A.

Each pole of the RCCB is tested in turn, twice at each of positions I and II.

The half-wave current I_1, starting from zero, being steadily increased at an approximate rate of 1,4 $I_{\Delta n}$ /30 amperes per second for RCCBs with $I_{\Delta n}$ > 0,01 A and 2 $I_{\Delta n}$ /30 amperes per second for RCCBs with $I_{\Delta n}$ ≤ 0,01 A, the device shall trip before this half-wave current I_1 reaches a value not exceeding 1,4 $I_{\Delta n}$ or 2 $I_{\Delta n}$ respectively.

9.9.4 Particular test conditions for RCCBs functionally dependent on line voltage

For RCCBs functionally dependent on line voltage, each test is made at the following values of the line voltage, applied to the relevant terminals: 1,1 and 0,85 times the rated line voltage.

9.21 Verification of correct operation of residual currents with d.c. components

*Replace the title and text of this subclause by "*Void*".*

Replace 9.24 by the following:

9.24 Electromagnetic compatibility (EMC)

9.24.1 Tests covered by the present standard

Tests listed in Table 21 are covered by the present standard and need not be repeated.

Table 21 – Tests covered by this standard

Reference to Tables 4 and 5 of IEC 61543:1995, Amendment 1:2004	Electromagnetic phenomena	Tests of IEC 61008-1
T.1.3	Voltage amplitude variations	9.9.4 and 9.17
T.1.4	Voltage unbalance	9.9.4 and 9.17
T.1.5	Power-frequency variations	9.2
T.1.8	Magnetic fields	9.11 and 9.18
T.2.4	Current oscillatory transients	9.19

9.24.2 Additional tests

Tests listed in Table 23 shall be carried out according to test sequences H, I and J listed in Annex A of the present standard.

Table 23 – Test to be carried out according to IEC 61543

Reference to Tables 4, 5 and 6 of IEC 61543:1995, Amendment 1:2004	Electromagnetic phenomena
T1.1	Harmonics, interharmonics
T1.2	Signalling voltage
T2.3	Surges
T2.1	Conducted sine-wave form voltages or currents
T2.5	Radiated electromagnetic field
T2.2	Fast transients (burst)
T2.6	Conducted common mode disturbances in the frequency range lower than 150 kHz
T3.1	Electrostatic discharges

For devices containing a continuously operating oscillator, the test of CISPR 14-1 shall be carried out on the samples prior to the tests of IEC 61543.

Figure 19 – Example of mounting of panel mounting type RCCB for the mechanical impact test (9.21.2.1)

Replace "9.21.2.1" by "9.12.2.1" in the title of Figure 19.

Figure 23 – Current ring wave 0,5 µs/100 kHz

Add the following note to the figure:

NOTE   Care should be taken that the oscillating wave is guaranteed at least up to the 5th full period (50 µs).

Annex A – Test sequence and number of samples to be submitted for certification purposes

Table A.2 – Number of samples for full test procedure

In footnote [d] replace "9.9.2 and 9.9.3" *by* "9.9.2.1, 9.9.2.2, 9.9.2.3, 9.9.2.4 and 9.9.2.5".

Table A.3 – Number of samples for simplified test procedure

Change in the first column D_2 by D_0.

Insert the new line D_2 after the line D_0 as follows:

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 $I_{\Delta n}$

Add a footnote [j] to test sequence G:

[j]   If the requirement to test max. rating I_n and minimum rating $I_{\Delta n}$ does not cover all the possible range of RCBOs, the minimum $I_{\Delta n}$ shall in any case be chosen for the test.

Annex IE – Follow-up testing programme for RCCBs

Table IE.1 – Test sequences during follow-up inspections

In sequence Y1, replace "9.9.4" *by* "9.9.2.6".

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