BS EN 61557-11:2009

BSI British Standards

Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. — Equipment for testing, measuring or monitoring of protective measures —

Part 11: Effectiveness of residual current monitors (RCMs) type A and type B in TT, TN and IT systems

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National foreword

This British Standard is the UK implementation of EN 61557-11:2009. It is identical to IEC 61557-11:2009.

The UK participation in its preparation was entrusted to Technical Committee PEL/85, Measuring equipment for electrical and electromagnetic quantities.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 11: Effectiveness of residual current monitors (RCMs) type A and type B in TT, TN and IT systems

(IEC 61557-11:2009)

Sécurité électrique dans les réseaux de distribution basse tension de 1 000 V c.a. et 1 500 V c.c. - Dispositifs de contrôle, de mesure ou de surveillance de mesures de protection - Partie 11: Efficacité des contrôleurs d'isolement à courant différentiel résiduel (RCM) de type A et de type B dans les réseaux TT, TN et IT (CEI 61557-11:2009)

Elektrische Sicherheit in Niederspannungsnetzen bis AC 1 000 V und DC 1 500 V - Geräte zum Prüfen, Messen oder Überwachen von Schutzmaßnahmen - Teil 11: Wirksamkeit von Differenzstrom-Überwachungsgeräten (RCMs) Typ A und Typ B in TT-, TN- und IT-Systemen (IEC 61557-11:2009)

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Foreword

The text of document 85/338/FDIS, future edition 1 of IEC 61557-11, prepared by IEC TC 85, Measuring equipment for electrical and electromagnetic quantities, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61557-11 on 2009-02-01.

This standard is to be used in conjunction with EN 61557-1:2007.

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)	2009-11-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2012-02-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61557-11:2009 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60364-4-41	NOTE	Harmonized as HD 60364-4-41:2007 (modified).
IEC 60364-5-53	NOTE	Clause 534 (in IEC/A1:2002) harmonized as HD 60364-5-534:2008 (modified).
IEC 60364-6	NOTE	Harmonized as HD 60364-6:2007 (modified).
IEC 60947-2	NOTE	Harmonized as EN 60947-2:2006 (not modified).
IEC 61008-1	NOTE	Harmonized as EN 61008-1:2004 (modified).

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 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC/TR 60755	2008	General requirements for residual current operated protective devices	-	-
IEC 61010-1	2001	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	EN 61010-1 + corr. June	2001 2002
IEC 61326-2-2	- [1)]	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-2: Particular requirements - Test configurations, operational conditions and performance criteria for portable test, measuring and monitoring equipment used in low-voltage distribution systems	EN 61326-2-2	2006 [2)]
IEC 61557-1	- [1)]	Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 1: General requirements	EN 61557-1	2007 [2)]
IEC 61557-6	- [1)]	Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 6: Effectiveness of residual current devices (RCD) in TT, TN and IT systems	EN 61557-6	2007 [2)]
IEC 62020	1998	Electrical accessories - Residual current monitors for household and similar uses (RCMs)	EN 62020	1998

[1)] Undated reference.

[2)] Valid edition at date of issue.

CONTENTS

ELECTRICAL SAFETY IN LOW VOLTAGE DISTRIBUTION SYSTEMS UP TO 1 000 V a.c. AND 1 500 V d.c. – EQUIPMENT FOR TESTING, MEASURING OR MONITORING OF PROTECTIVE MEASURES –

Part 11: Effectiveness of residual current monitors (RCMs) type A and type B in TT, TN and IT systems

1 Scope

This part of IEC 61557 specifies the requirements for testing equipment applied to the testing of the effectiveness of residual current monitors (RCMs) of type A and type B, which are already installed in distribution systems.

This test equipment can be used in any kind of network like a TN, TT or IT system. The test equipment may also be used for testing directionally discriminating RCMs in IT-Systems.

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/TR 60755:2008, *General requirements for residual current operated protective devices*

IEC 61010-1:2001, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61326-2-2, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-2: Particular requirements – Test configurations, operational conditions and performance criteria for portable test, measuring and monitoring equipment used in low-voltage distribution systems*

IEC 61557-1, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 1: General requirements*

IEC 61557-6, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 6: Effectiveness of residual current devices (RCD) in TT, TN and IT systems*

IEC 62020:1998, *Electrical accessories – Residual current monitors for household and similar uses (RCMs)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61557-1, IEC 61557-6 and the following apply.

3.1
residual current monitor (RCM)
device or association of devices which monitors the residual current in an electrical installation and which activates an alarm when the residual current exceeds the operating value of the device

[IEC 62020, definition 3.3.1]

3.2
earth fault current
I_e
current flowing to earth due to an insulation fault

[IEC 62020, definition 3.1.1]

3.3
test current
I_T
test current superimposed by the test equipment for testing the effectiveness of the RCM

3.4
residual current
I_Δ
vector sum of the instantaneous values of the current flowing in the main circuit of the RCM (expressed as r.m.s. value)

[IEC 62020, definition 3.2.3]

3.5
rated residual operating current
$I_{\Delta N}$
value of residual current assigned by the manufacturer which causes the RCM to operate under specified conditions

[IEC 62020, definitions 3.2.4 and 3.4.1 combined]

3.6
residual operating current
$I_{\Delta o}$
value of residual current which causes the RCM to operate under specified conditions

[IEC 62020, definition 3.2.4]

3.7
residual non-operating current
$I_{\Delta no}$
value of residual current at which and below which the RCM does not operate under specified conditions

[IEC 62020, definition 3.2.5]

3.8
actuating time
t_a
time taken for a RCM to change from the non-alarm state to the alarm state in response to the sudden appearance of a residual current which exceeds the preset level

[IEC 62020, definition 3.3.12]

3.9
residual current monitor (RCM) type A
RCM for which monitoring is ensured for residual sinusoidal alternating currents and residual pulsating direct currents, whether suddenly applied or slowly rising

[IEC 62020, definition 3.3.8, modified]

3.10
residual current monitor (RCM) type B
RCM for which monitoring is ensured for residual sinusoidal alternating currents, with residual pulsating direct currents and smooth residual direct currents independent of polarity, whether suddenly applied or slowly rising

[IEC/TR 60755, definition 5.2.9.3, modified]

4 Requirements

The following requirements as well as those given in IEC 61557-1 shall apply.

4.1 Operating test

The testing equipment shall be capable of verifying that the residual operating current of a RCM type A tested with an a.c. test current is lower or equal to the value of the rated residual operating current.

Testing of RCMs type A shall be conducted with a suddenly applied calibrated a.c. current at zero crossing.

The tests shall be carried out with a sinusoidal, or mains-derived quasi sinusoidal, test current.

If the test equipment is capable of producing half-wave test currents, testing of residual current monitors (RCMs) type A may be carried out alternatively with half-wave test currents and/or a.c. current with superimposed ±6 mA d.c. according to IEC 62020.

In case of pulsed d.c. current, the test equipment shall be capable of testing in both polarities.

When testing RCMs of type B with a d.c. test current, it shall be verified that the residual operating current is lower or equal to 2 times the value of the rated residual operating current.

Testing of RCMs type B shall be conducted separately with a suddenly applied, calibrated a.c. current and a continuously rising smooth direct current.

The steepness of the continuous rate of rising shall not be higher than $2 \times I_{\Delta N}$ / 5 s.

If the continuous rate of rising is simulated by a stepwise or linearly increasing test current, the increase shall not be higher than $2 \times I_{\Delta N}$ / 30 (see Figures 1 to 3).

In both cases the starting current shall be below $0{,}2 \times I_{\Delta N}$.

The operating uncertainty of the increasing test current I_T shall not exceed ±10 % of the rated residual operating current $I_{\Delta N}$.

The operating uncertainty of the calibrated test current I_T shall not exceed 0 % to +10 %.

The test period shall be adapted to the set actuating time of the RCM and it shall be possible to extend the test period up to 10 s.

4.2 Non-operating test

When a test at 50 % or less of the rated residual operating current to test the reliability of the RCM is included, the minimum test period shall be 10 s. The alarm shall not be activated.

When a non-operating test at 50 % or less of the rated residual operating current is included, the operating uncertainty of the calibrated test current shall not exceed 0 % to –10 % of the specified non-operating test current.

NOTE Existing leakage currents downstream can influence the verification.

4.3 Test of actuating time

If the set actuating time of the RCM is being tested with the test equipment, the setting of the test period on the test device shall have a resolution of minimum 0,5 s ranging up to 10 s. The setting uncertainty shall not exceed 0 % to –10 % of the set value. The test shall solely be performed with calibrated a.c. test current.

Other methods for the acquisition of the actuating time via optical recognition or interfacing are permissible.

NOTE The general function of RCMs is not the disconnecting of the power supply when a residual current above the value of the rated residual operating current occurs. The RCM indicates the increase of the residual current above the residual operating current with a signalling device, for example a lamp, buzzer, contact relay or interface-signal. Thus the response time may only be tested via the visual or additional electrical detection of this signal.

According to IEC 62020 the response time of RCMs may only amount to a maximum of 10 s. The response time shall be specified by the manufacturer or shall be adjustable on the device.

If the RCM is being used for the purpose of disconnection, the tests covered by IEC 61557-6 shall apply.

4.4 Operating conditions

The operating uncertainty applies according to the test conditions specified in IEC 61557-1 and additionally

– the protective conductor is free of extraneous voltage,

– the system voltage remains constant during tests,

– the circuit behind the RCM is free of leakage currents,

– sinusoidal half-wave or full-wave current with rated frequency, respectively smooth direct current (see 4.1),

– the a.c. test current I_T shall be switched on at a zero crossing,

– the test period shall be 10 s for the maximum test current for which the test equipment is designed,

– the time limit may be omitted when testing with current higher than 500 mA,

– the resistance of the probes is within the limits stated by the manufacturer.

4.5 Prevention of danger by fault voltages exceeding 50 V a.c. or 120 V d.c. in the monitored system during measurement

This can be achieved by the following:

– automatic disconnection in accordance with IEC 61010-1:2001, Figure 1, if the residual voltage is above 50 V a.c. or 120 V d.c.;

– application of test current I_T, gradually or permanently adjustable, where the test starts a maximum current of a.c. 3,5 mA or 15 mA d.c. in accordance with IEC 61010-1:2001, 6.3.2 b), including parallel test circuits, is permitted. The possibility to change the test current I_T

without generating a dangerous residual voltage shall be clearly identifiable, for instance on a voltmeter.

In special locations the touch voltage limit is 25 V a.c or 60 V d.c.

The operating uncertainty for the detection of the fault voltage shall not exceed 0 % to –20 % of the limit.

4.6 Prevention of danger caused by overvoltages when the system is connected

If the system is connected to 120 % of the nominal voltage of the system for which the test equipment is designed, neither the operator shall be harmed nor the device be damaged. Protective devices shall not be activated. If the device is intended to be used in IT systems, the nominal voltage of the test equipment is the phase to phase voltage.

If the test equipment is accidentally connected to 173 % of the nominal voltage in TN or TT systems for which the test equipment is designed for the duration of 1 min, neither the operator shall be harmed nor the device be damaged. In this case, protective devices may be activated.

4.7 Electromagnetic compatibility (EMC)

The electromagnetic compatibility shall be in accordance with IEC 61326-2-2.

5 Marking and operating instructions

5.1 Markings

In addition to the marking in accordance with IEC 61557-1, the following information shall be provided on the measuring equipment.

Rated residual operating current or rated residual operating currents of the RCM for which the test equipment has been designed for an actuating time of 10 s.

NOTE Other rated residual operating currents for lower actuating times may be marked in addition.

5.2 Operating instructions

The operating instructions shall state the following in addition to the statements given in IEC 61557-1.

5.2.1 Information

a) Information about special test configurations to avoid unintended tripping of RCDs (see Annex B);

b) information to avoid unintended influences on the operation of the system;

c) information for recalibration cycles and safety tests of the test equipment after repair and instructions for periodical tests.

5.2.2 Warnings

a) If the detecting circuit for the fault voltage has no probe and if a possible voltage between the protective conductor and earth influences the measurements, a warning shall be included.

b) Where the detecting circuit for the fault voltage uses the N-conductor as a probe, a warning shall be given to test the connection between the neutral point of the distribution system and earth before the test is started; a possible voltage between the N-conductor and earth may influence the measurements.

c) A warning that leakage currents in the circuit following the RCM may influence measurements and test results.

d) The earth electrode resistance of a detecting circuit for the fault voltage with a probe shall not exceed the value stated by the manufacturer.

e) A warning that the potential fields of other earthed installations may influence the determination of the fault voltage.

f) A warning that for special locations the touch voltage is limited to 25 V a.c or 60 V d.c.

6 Tests

6.1 General

The following tests in addition to those required according to IEC 61557-1 shall be executed.

Tests shall be carried out with rated residual operating currents, in addition with the values of the non-operating test currents I_T, if applicable.

The test circuit shall be adapted to test the function of the fault voltage detection circuit at the limits of the fault voltage for which the equipment is designed and in addition at the appropriate $R_A = R_{Amax}$ for each range.

The test circuit shall be adapted to each test method employed. The manufacturer's instructions shall be heeded.

NOTE $R_{Amax} = \frac{U_L}{I_{\Delta N}} \times I_{\Delta o}$ $R_{Amax} = \frac{U_L}{I_T}$

where

U_L is the conventional touch voltage limit;

I_T is the test current superimposed by the test circuit;

R_A is the total earthing resistance ($R_A = R_{Amax}$);

$I_{\Delta N}$ is the rated residual operating current;

$I_{\Delta o}$ is the residual operating current.

6.2 Operating uncertainty

The operating uncertainty shall be determined in accordance with Table 1. In this process, the intrinsic uncertainty shall be determined under the following reference conditions:

– nominal voltage of the rated range of the device,
– nominal frequency of the rated range of the device,
– reference temperature 23 °C ± 2 °C,
– reference position in accordance with the manufacturer's instructions,
– protective conductor free from extraneous voltages,
– 100 Ω resistance of the auxiliary earth electrode in a TT system.

The operating uncertainty thus evaluated shall not exceed the limits specified in 4.1 to 4.2.

a) Compliance with the permissible operating uncertainty when detecting the fault voltage shall be tested for measurements with and without a probe.

b) Compliance with the requirements in accordance with 4.5 shall be tested *(routine test)*.

c) The overload protection in accordance with 4.6 shall be tested *(type test).*

d) Compliance with the tests in this clause shall be recorded.

Table 1 – Calculation of operating uncertainty

Intrinsic uncertainty or influence quantity	**Reference conditions or specified operating range**	**Designation code**	**Requirements or test in accordance with the relevant parts of series IEC 61557**	**Type of test**
Intrinsic uncertainty	Reference conditions	A	Part 11, 6.2	R
Position	Reference position ±90°	E_1	Part 1, 4.2	R
Supply voltage	At the limits stated by the manufacturer	E_2	Part 1, 4.2, 4.3	R
Temperature	0 °C and 35 °C	E_3	Part 1, 4.2	T
Resistance of the probes	Within the limits stated by the manufacturer	E_5	Part 11, 4.4	T
System voltage	85 % to 110 % of the nominal voltage	E_8	Part 11, 4.4, 4.5	T
Operating uncertainty	$B = \pm (\lvert A \rvert + 1{,}15\sqrt{E_1^2 + E_2^2 + E_3^2 + E_5^2 + E_8^2})$		Part 11, 4.1 Part 11, 4.2 Part 11, 4.3 Part 11, 4.5	R

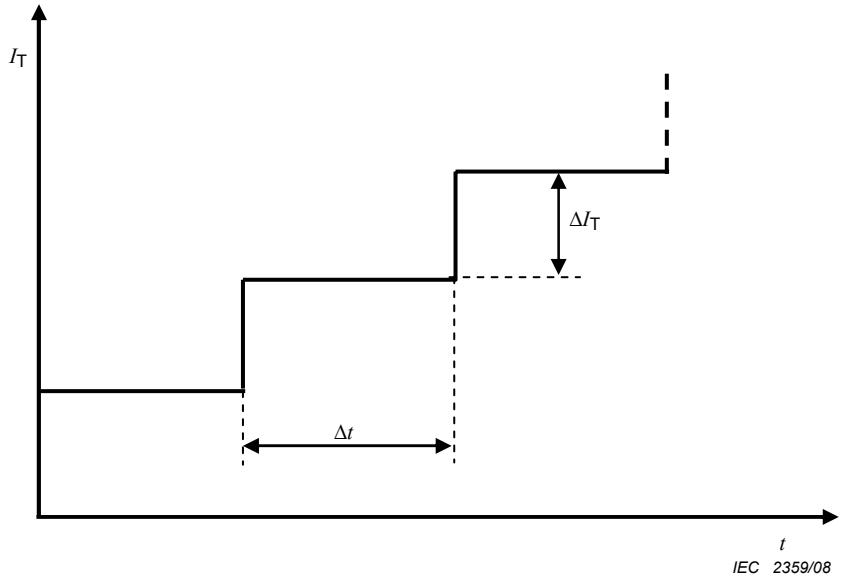
A = intrinsic uncertainty

E_n = variations

R = routine test

T = type test

$$B(\%) = \pm \frac{B}{\text{fiducial value}} \times 100\,\%$$



$$\Delta I_T \leq 2\ I_{\Delta N} / 30 \qquad \Delta I_T / \Delta t \leq 2\ I_{\Delta N} / 5\ \text{s}$$

Key (for Figures 1 to 3)

t time

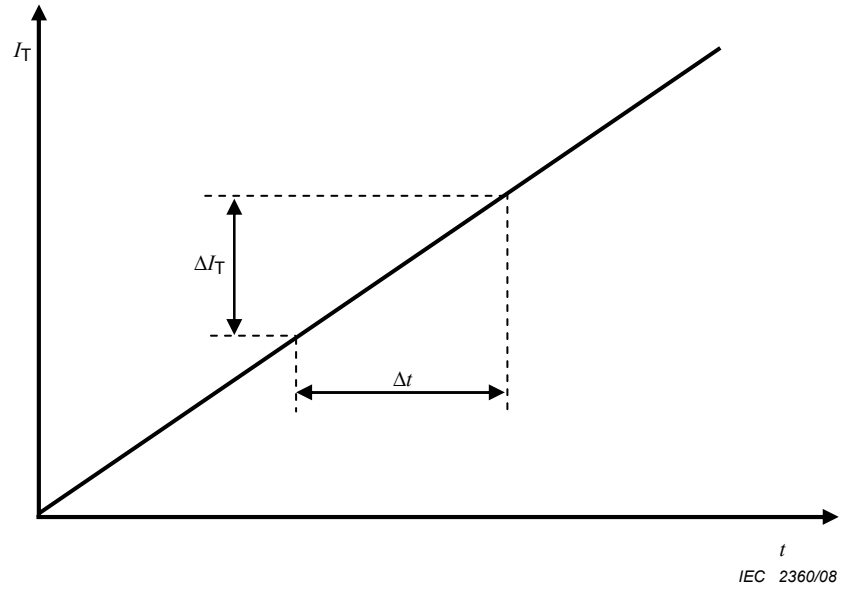
$I_{\Delta N}$ rated residual operating current

I_T smooth direct test current

ΔI_T steepness of continuous rising test current or steps of stepwise rising test current

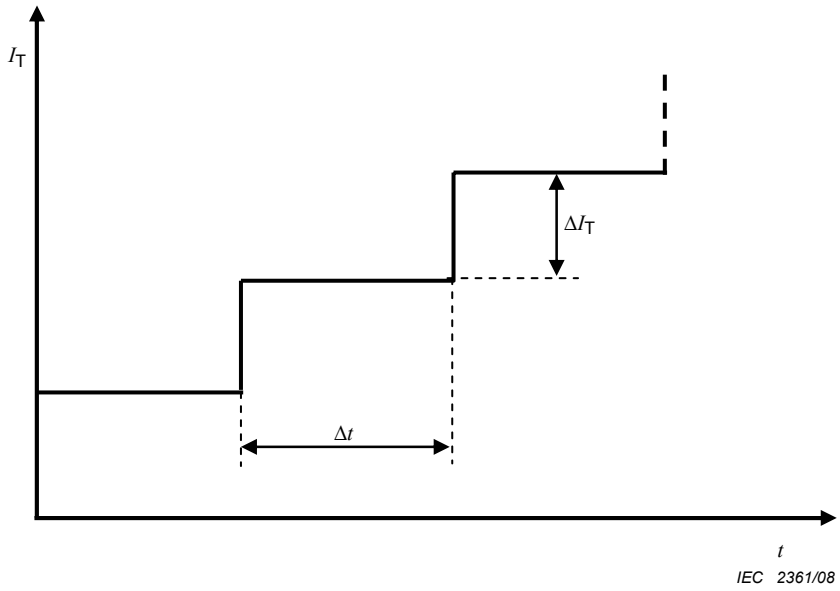
Δt time for one step for stepwise rising test current or time for steepness of continuous rising test current

Figure 1 – Maximum steepness of stepwise rising smooth direct test current (I_T)



$$\Delta I_T / \Delta t \leq 2\ I_{\Delta N} / 5\ \text{s}$$

Figure 2 – Maximum increase of linearly increasing smooth direct test current (I_T)



$$\Delta I_T \leq 2 \times 30\ \text{mA} / 30 \leq 2\ \text{mA}$$

Example for ΔI_T = 2 mA: $\Delta t \geq (2\ \text{mA} \times 5\ \text{s}) / (2 \times 30\ \text{mA}) \geq 167\ \text{ms}$
Example for ΔI_T = 0,5 mA: $\Delta t \geq (0{,}5\ \text{mA} \times 5\ \text{s}) / (2 \times 30\ \text{mA}) \geq 42\ \text{ms}$

NOTE 1 Existing leakage currents downstream may influence the verification.

NOTE 2 The actual rise time depends on the system capacitance and the resistive load of the test equipment.

NOTE 3 Smooth d.c. test current refers to direct current with a.c. ripple up to 10 % (peak to peak).

NOTE 4 A slow continuous or stepwise increase of the d.c. test current is required to prevent the a.c. sensitive part of the RCM type B from operating during the d.c. test.

Figure 3 – Example for linearly increasing smooth direct test current (I_T): $I_{\Delta N}$ = 30 mA

Annex A
(informative)

Differences between RCMs and RCDs

A.1 Scope

This Annex A gives guidelines for specifying the differences between residual current monitors (RCMs) and residual current protective devices (RCDs). The understanding is important in the design of test equipment and for testing RCMs in electrical installations.

A.2 Reference documents and definition of function

Table A.1 shows the differences by definition according to the respective product standard.

Table A.1 – Normative reference and definition of function of RCM and RCD

	Product Standard	Definition of function
RCM	IEC 62020:1998, 3.3.1	A residual current monitor (RCM) is a device or an association of devices which monitors the residual current in an electrical installation, and which activates an alarm when the residual current exceeds the operating value of the device
RCD	IEC/TR 60755:2008, 3.3.1	A residual current device (RCD) is a mechanical switching device or association of devices designed to make, carry and break currents under normal service conditions and to cause the opening of the contacts when the residual current attains a given value under specified conditions

IEC 62020 is the only product standard for RCMs. RCMs covered by this standard are not intended to be used as protective devices, but may be used in conjunction with protective devices (see IEC 60364-4-41).

IEC/TR 60755 is the basic product standard for RCDs. Variations of RCDs are covered by other product standards, for example IEC 61008-1 and IEC 60947-2.

If RCMs are used together with switching devices and this combination fulfils the respective RCD standards, for example IEC 60947-2 for MRCDs, this combination has to be tested in the installation with equipment covered by IEC 61557-6.

A.3 Requirements from product standards for testing RCMs

Table A.2 shows the requirements from the product standard IEC 62020:1998 which should apply when testing RCMs in installations.

Table A.2 – Requirements for testing RCMs according to product standard IEC 62020:1998

Requirement	Explanation	Consequence for testing
Type of RCM	Type A (type a.c. is not allowed) Type B existing, but is not covered by IEC 62020	Test with the applicable waveforms
Rated residual operating current	Values to be defined by the manufacturer Preferred values are : 0,006 A, 0,01 A, 0,03 A, 0,1 A, 0,3 A, 0,5 A Values can be fixed or adjustable	Test with the values defined by the manufacturer and appropriate device settings for adjustable devices should be considered The operating tolerances of the RCM (residual operating and non-operating current) are equal to that of RCDs
Actuating time	For RCMs only a maximum actuating time is defined: 10 s The actuation time can be fixed or adjustable	Defined or adjusted actuating times should be considered
Preferred values of rated frequency	RCMs type A: 50 Hz and/or 60 Hz – manufacturer can define other values, but frequency response is not defined in the product standard RCMs type B: see RCDs type B	RCDs type A: preferred value is 50 Hz RCDs type B: frequency response is limited to 1 000 Hz
Indication of the fault condition	RCMs should be provided with means for indicating the fault condition RCMs may be fitted with a resetting function to manually reset the RCM to the non-alarm state after removal of the fault. RCMs not fitted with resetting function should reset automatically after removal of the fault Where an audible alarm is provided in addition, the audible alarm should reset automatically after removal of the fault	Different to RCDs, tripping of the RCM can not be recognized due to switching off of the monitored voltage Recognition of tripping can only be performed by monitoring or controlling the respective alarm function: Examples of alarm functions: – visual indicator (required) – audible alarm (optional) – alarm contact (optional) – alarm via digital interface (optional)
Disconnection of an external CT	If the RCM is equipped with an external residual current transformer (CT), the RCM should give a warning, if the CT is disconnected	Disconnection is normally checked during the operating test of the RCM

A.4 Main technical differences between RCMs and RCDs

Table A.3 shows the main technical differences between RCMs and RCDs.

Table A.3 – Main technical differences between RCMs and RCDs

Function	RCM	RCD
Operation / Tripping (actuating)	Operation is indicated on the RCM by a visual signal on the front of the device. Additional signals for indicating operation may be : – audible alarm, – alarm contacts, – digital interface. Operation can not be recognized on an outlet, where the test is performed and which is located outside the area where the alarm on the RCM itself can be recognized	Tripping is primarily indicated by switching off the voltage Tripping can be recognized on any outlet or part of the installation where the test is performed
Actuating time	Actuating time can be anywhere between 0 s and 10 s The set or fixed actuating time should be respected Actuating time for RCMs relate to 1 × $I_{\Delta N}$ only	The maximum actuating time of RCDs is defined in the respective RCD standards Actuating time has to follow the time characteristics of the RCD standards for 1 time $I_{\Delta N}$, 2 times $I_{\Delta N}$, 5 times $I_{\Delta N}$
Operating / Tripping values	Operating values can be fixed or adjustable. Adjustment can be in steps or steplessly by switches, potentiometers or by menu settings via displays The set operating values are visible on the front of the RCM	Tripping values are fixed or adjustable in steps. The set values are indicated on the front of the device
Supply voltage dependency	RCMs are voltage dependent devices	RCDs type A may be voltage-dependent or voltage-independant. Standards for voltage-dependent RCDs are under consideration RCDs type B are generally voltage dependant
Indication of the value of the measured residual current	Some RCMs are equipped with functions for the indication of the residual current	RCDs generally have no such indication
Multi-channel devices	RCMs can be multi-channel devices. In this case several residual current sensors (CTs) are connected to one device. Setting operating values and signalling alarms are performed on this device	Generally RCDs are single channel devices

A.5 Special considerations for testing RCMs in the installation

The following points should be considered when testing already installed RCMs:

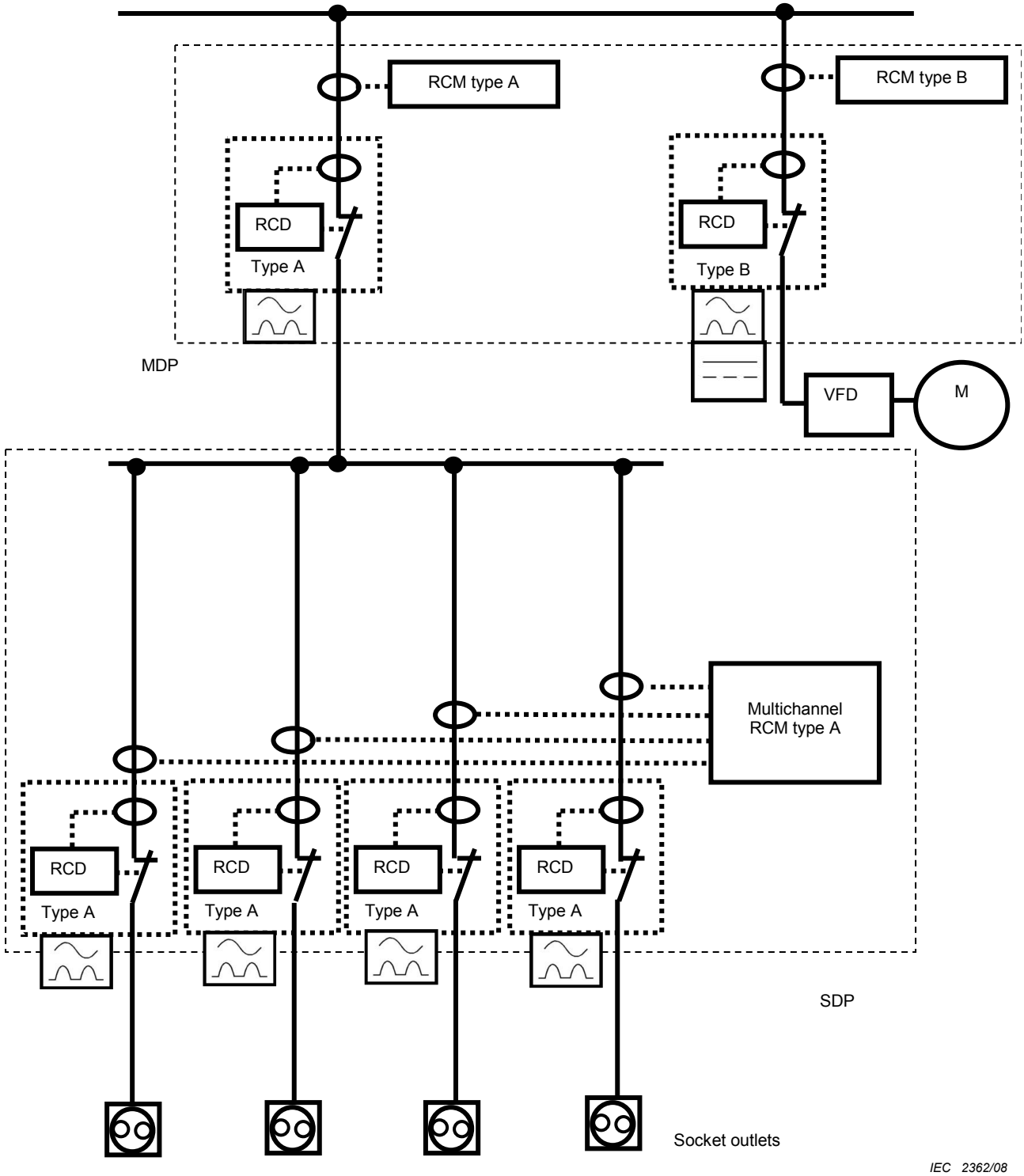
– operation of the RCM should be recognized by watching the alarm indicator on the front of the RCM or on a remote indication device;

– the settings of the test equipment should allow stepwise or continuous increase of the test current;

– for testing the operating value the time for each step or gradual increase of the test current should respect the setting of the actuating time on the RCM (0…10 s).

If other fault-indication is provided, for example audible or remote indications via alarm contact or digital interface, these indications should be tested as well.

Figure A.1 shows a typical installation where RCMs are installed in addition to RCDs.



Key

MDP main distribution panel
SDP sub distribution panel
VFD variable frequency device
M motor
RCD residual current device
RCM residual current monitoring device

Figure A.1 – Typical installation with a combination of RCDs and RCMs

Annex B
(informative)

Safety aspects, test methods and applications

B.1 Safety aspects

Residual current monitors (RCMs) contribute to the safety of installations by preventive measuring and monitoring of residual current. In this context the function of the RCM should be ensured over the lifetime of the RCM by periodic testing.

Periodic verification of the installation including verification of electrical loads and equipment incorporating RCMs is advised. After verification, appropriate corrective measures should be taken, e.g. repairing the installation or replacing faulty equipment, etc. (see IEC/TR 62350).

The main reasons for using RCMs are as follows:

– in supply systems, RCMs may be installed to reduce the risk of operating the protective device (RCD) in event of excessive leakage current in the installation and/or connected appliances according to IEC 60364-5-53.

– an RCM may be installed for detecting fault currents in order to give an alarm to reduce the risk of fire [adapted from IEC 60364-5-53].

– in the case of an installation under normal operation which has an effective preventive maintenance management system, periodic verification may be replaced by adequate procedures of continuous monitoring and by maintenance of the installation including all constituent equipment, by skilled persons. Appropriate records should be kept (see IEC 60364-6).

  RCMs are a part of this management system.

– in IT systems, except where a protective device (RCD) is installed to interrupt the supply in the event of the first insulation fault, an insulation fault location system or an RCM under specified conditions may be provided to indicate the first fault from a live part to exposed-conductive-parts or to earth. In accordance with IEC 60364-4-41, this device should initiate an audible and/or visual signal, which should continue as long as the fault persists.

B.2 Test methods

In general, it is intended to carry out the testing of RCMs without the tripping of protective devices.

After the visual inspection of the system and components (e.g. type of RCM) the applicable test method covered by this standard should be chosen.

If an RCM is installed in addition to an RCD, the test equipment may also be used to compare the tripping characteristics of the RCM and of the RCD. This test is useful in order to determine that the correctly specified RCD has been installed. For this purpose the test should be performed for RCMs type A and/or RCMs type B, where applicable.

B.3 Applications of test methods

The following test methods apply.

1) If only an RCM is installed in the system - no RCD - the test equipment may be connected between line and earth.

2) If an RCM is installed in combination with an RCD, the following tests may be performed
   a) Tripping of RCD is allowed, see B.3 1.
   b) Tripping of RCD is not allowed:
      i) test equipment is connected between LINE upstream and NEUTRAL downstream.
      ii) test equipment is connected between LINE 1 upstream and LINE 2 downstream.
      iii) test equipment is connected between LINE and EARTH, if the RCD is installed downstream.
      iv) test equipment is only connected to additional wiring through the current transformer (CT); this may also apply to testing RCMs with higher rated current.
      v) in case of testing directionally discriminating RCMs in IT systems, two tests may be performed downstream.
3) RCMs installed in combination with electronic equipment, such as motor drives, converters without galvanic separation, etc.

   For testing the effectiveness of RCMs in such applications, in general it is necessary to test on several points of the installation, for example upstream of the motor drive, in the intermediate d.c. circuit of the motor drive and downstream in the electronic motor circuit.

Clause A.2 and the bibliography of this part of IEC 61557 offer additional information on application standards.

IEC/TR 62350 offers more information on potential influences when testing RCMs.

Bibliography

IEC 60364-4-41, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-5-53:2001, *Electrical installations of buildings – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control*

IEC 60364-6, *Low-voltage electrical installations – Part 6: Verification*

IEC 60947-2, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*

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

IEC/TR 62350, *Guidance for the correct use of residual current-operated protective devices (RCDs) for household and similar use*

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