CERTIFICATE
of Conformity

Reference No. : **LCS190815024AS**

Applicant : **SHANGHAI MATIS ELECTRC CO.,LTD.**

Address : **BLOCK C, NO.888, HUANHU WEST 2ND ROAD, PUDONG, SHANGHAI, CHINA**

Trademark : **matis, matismart**

Product : **SMART RECLOSED RCBO**

Model(s) : **MT61SR**

Parameters : **Ue: 230VAC (1P+N), 400VAC(3P+N); Type A, Type AC**
In: 6/10/16/20/25/32/40/50/63/80/100/125A; Curve B/C/D; IΔn: 0.01/0.03/0.1/0.3A;
IΔm:630A; Icn=Ics=6000A

The submitted products have been tested by us with the listed standards and found in compliance with the following European Directives:

The LVD Directive 2014/35/EU

EN 61009-1:2012+A1:2014+A2:2014+A11:2015+A12:2016

The tests were performed in normal operation mode. The test results apply only to the particular sample tested and to the specific tests carried out. This certificate applies specifically to the sample investigated in our test reference number only.

The CE markings as shown below can be affixed on the product after preparation of necessary technical documentation.

Other relevant Directives have to be observed.

CE

Date of issue: September 12, 2019

Center of Testing Service * APPROVED *

Manager

Guangzhou LCS Compliance Testing Laboratory Ltd.
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TEST REPORT

IEC 61009-1

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

Report Number.	LCS190815024AS
Date of issue	September 12, 2019
Total number of pages	78

Applicant's name	SHANGHAI MATIS ELECTRC CO.,LTD.
Address	BLOCK C, NO.888, HUANHU WEST 2ND ROAD, PUDONG, SHANGHAI, CHINA

Test specification:

Standard	IEC 61009-1: 2010+A1: 2012+A2: 2013
Test procedure	Type test
Non-standard test method……..:	N/A

Test Report Form No.	IEC61009-1
Test Report Form(s) Originator	OVE
Master TRF	Dated 2014-01

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

Test item description	SMART RECLOSED RCBO
Trade Mark	matis, matismart
Manufacturer	SHANGHAI MATIS ELECTRC CO.,LTD.
	BLOCK C, NO.888, HUANHU WEST 2ND ROAD, PUDONG, SHANGHAI, CHINA
Model/Type reference	MT61SR
Ratings	Ue: 230VAC (1P+N), 400VAC(3P+N); Type A, Type AC
	In: 6/10/16/20/25/32/40/50/63/80/100/125A; Curve B/C/D; $I_{\Delta n}$: 0.01/0.03/0.1/0.3A;
	$I_{\Delta M}$:630A; Icn=Ics=6000A

Testing procedure and testing location:			
☒	**Testing Laboratory:**	Shenzhen LCS Compliance Testing Laboratory Ltd.	
Testing location/ address ..... :		101, 601, Xingyuan Industrial Park, Gushu Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China	
Tested by.....:		Aic Huang / Test Engineer	
Checked by .....:		Albert Lai / Project Engineer	
Approved by ..... :		Hart Qiu / Technical Director	

List of Attachments (including a total number of pages in each attachment):

Attachment No.1: Component assembly (1 pages)

Attachment No.2: Photo documentation (4 pages)

Summary of testing:

Tests performed (name of test and test clause): The submitted samples were found to comply with the requirements of: ➢ Electrical safety IEC 61009-1: 2010+A1: 2012+A2: 2013 EN61009-1:2012 +A1:2014+A2:2014+A11:2015 +A12:2016	**Testing location:** Shenzhen LCS Compliance Testing Laboratory Ltd. 101, 601, Xingyuan Industrial Park, Gushu Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China

Summary of compliance with National Differences (List of countries addressed):

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Shenzhen LCS Compliance Testing Laboratory Ltd.
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Copy of marking plate

The artwork below may be only a draft.

matis
SMART RECLOSED RCBO
Model: MT61SR
Three phase, 3P+N, 400V,50/60Hz,
6A,10A,16A,20A,25A,32A.40A.50A,63A,80A,100A,125A

SHANGHAI MATIS ELECTRC CO.,LTD.
MADE IN CHINA

Shenzhen LCS Compliance Testing Laboratory Ltd.
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Test item particulars ..... :	
Type of RCBO ..... :	A / AC
Time delay ..... :	~~with /~~ without
Method of operating ..... :	independent of ~~/ dependent on the line voltage~~
Type of installation ..... :	fixed /~~ mobile installation~~
Number of poles ..... :	~~single /~~ two ~~/ three /~~ four pole
Protection against external influences ..... :	~~enclosed /~~ unenclosed
Method of mounting ..... :	Din rail mounting
Method of connection ..... :	Terminal with stirrup
Instantaneous tripping current ..... :	B / C / D
Rated current (I_N)..... :	6, 10, 16, 20, 25, 32, 40, 50, 63, 80, 100, 125A
Rated residual operating current ($I_{\Delta N}$)..... :	0.01, 0.03, 0.1, 0.3A
Rated voltage (U_N)..... :	230 / 400V
Rated impulse withstand voltage (U_{imp})..... :	4kV
Rated frequency (Hz) ..... :	50/60Hz
Rated short-circuit capacity (I_{CN}) ..... :	6000A
Rated residual making and breaking capacity ($I_{\Delta M}$) . :	630A
Nature of supply ..... :	~
Type of terminal ..... :	Screw in
Classification of RCBOs functionally dependent on the line voltage:..... :	~~Yes /~~ No
Opening automatically in case of failure of the line voltage ..... :	Yes /~~ No~~
- reclosing automatically when the line voltage is restored ..... :	Yes /~~ No~~
- not reclosing automatically when the line voltage is restored ..... :	~~Yes /~~ No
Not opening automatically in case of failure of the line voltage ..... :	~~Yes~~ / No
- able to trip in a hazardous situation arising on failure of line voltage ..... :	Yes /~~ No~~
- not able to trip in a hazardous situation arising on failure of line voltage ..... :	~~Yes /~~ No
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object does not meet the requirement.....:	F (Fail)
Testing:	
Date of receipt of test item.....:	August 15, 2019
Date (s) of performance of tests.....:	From August 15, 2019- September 12, 2019

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General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

"*" This symbol refers to not within the scope of CNAS recognition.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided.....:

☐ **Yes**

☒ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies).....: SHANGHAI MATIS ELECTRC CO.,LTD.

4TH FLOOR, BLOCK 7A, SHAHU SCIENCE PARK, NO.183, LANE TINGLAN, WUZHONG, SUZHOU, JIANGSHU, CHINA

General product information:

1. This product is suitable for internal use

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

	TEST SEQUENCE "A_1"		P
6.	MARKING (STANDARD MARKING)		P
	RCBO MARKED WITH:		P
	a) Manufacturer's name or trade mark ..... :	matis	P
	b) Type designation, catalogue number or serial number ..... :	MT61SR	P
	c) Rated voltage(s) (V) ..... :	230 / 400V	P
	d) Rated current (A) ..... :	6,10,16,20,25,32,40,50,63,80, 100, 125	P
	e) Rated frequency ..... :	50 / 60Hz	P
	f) Rated residual operating current(mA) ..... :	10, 30, 100, 300	P
	g) Settings of residual operating current ..... :	Adjustable	P
	h) Rated short-circuit capacity, in amperes ..... :	6000A	P
	j) Reference calibration temperature, if different from 30°C ..... :	°C	P
	k) Degree of protection ..... :	IP20	P
	l) Position of use ..... :		N/A
	m) Rated residual making and breaking capacity, if different from rated short-circuit capacity ..... :	630A	P
	n) Symbol S for type S ..... :		N/A
	p) Operating means of test device by letter T ..... :	T	P
	q) Wiring diagram ..... :	OK	P
	r) Operating characteristic in presence of residual currents with d.c. components		--
	- RCBOs of type AC with the symbol		P
	- RCBOs of type A with the symbol		P
	s) type D RCBOs, the max. instantaneous tripping current, if higher than 20 I_N ..... :		N/A
	Marking on the RCBO itself or on nameplate or nameplates attached to the RCBO and located so that for small devices at least d), f), n), p) and r) (only for type A) is legible when the RCBO is installed		P
	The information under a), b), c), h), l), r) (only for type AC) and s) may be marked on the side or the back of the device and be visible only before the device is installed		P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The information under q) may be on the inside of any cover which has to be removed in order to connect the supply wires		P
	Any remaining information not marked shall be given in the manufacturer's catalogues.		P
	The suitability for isolation, which is provided by all circuit-breakers of this standard, may be indicated by the symbol on the device		P
	If a degree of protection higher than IP20 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 this shall be specified in the manufacturers literature		P
	Open position indicated by "**0**" and closed position by "|"		P
	For push-buttons the OFF push-button shall either be red and/or marked with "**0**"		P
	If necessary to distinguish between supply and load terminals they shall be clearly marked		P
	Terminals for neutral conductor N		P
	Terminal for protective conductor		P
	Marking indelible, easy legible and not on removable parts		P
	Labels not easy to remove and no curling. Test acc. to cl. 9.3: 15 s with water and 15 s with hexane		P
	For universal terminals (rigid-solid, rigid-stranded and flexible conductors:		P
	- no markings		P
	For non-universal terminals:		--
	- terminals for rigid-solid conductors only, marked by the letters "s" or "sol"		P
	- terminals for rigid (solid and stranded) conductors only, marked by the letter "r"		P
	marking on the RCBO or if the space available is not sufficient, on the smallest package unit or in technical information		P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

8.	REQUIREMENTS FOR CONSTRUCTION AND OPERATION		
8.1	MECHANICAL DESIGN		
8.1.1	General		
	Not possible to alter the operating characteristics by means of external interventions other than those specifically intended for changing the setting of the residual operating current.		P
	Changing from one setting to another shall not be possible without a tool. It shall not be possible to disable or inhibit the RCBO function by any means. NOTE In Australia, Germany, Denmark, Italy, the UK and Switzerland, multiple settings are not allowed.		P
	In case of an RCBO having multiple settings of residual operating current, the rating refers to the highest setting.		P
8.1.2	Mechanism		
	Moving contacts of all poles so mechanically coupled that all poles except switched neutral make and break substantially together		P
	Switched neutral of four-pole RCBOs shall not close after and shall not open before the other poles		P
	Neutral pole having adequate making and breaking capacity and RCBO with independent manual operation:		P
	- all poles operate together including neutral pole		P
	Trip-free mechanism		P
	Possible to switch on and off by hand		P
	No intermediate position of the contacts		P
	RCBOs shall provide in the open position an isolating distance in accordance with the requirements necessary to satisfy the isolating function (see 8.3)		P
	Indication of the open and closed position of the main contacts shall be provided by one or both of the following means:		P
	- the position of the actuator (this being preferred)		P
	- a separate mechanical indicator		N/A
	If a separate mechanical indicator is used to indicate the position of the main contacts, this shall show the colour:		N/A

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- red for the closed position (ON)		P
	- green for the opened position (OFF)		P
	The means of indication of the contact position shall be reliable (Compliance is checked by inspection and by the test of 9.9.2.2		P
	RCBOs shall be designed so that the actuator, front plate or cover can only be correctly fitted in a manner which ensures correct indication of the contact position (Compliance is checked by inspection and by the tests of 9.12.12.1 and 9.12.12.2)		N/A
	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. (Compliance is checked by inspection , taking into account the instructions of the manufacturer)		N/A
	If operating means is used for indication it shall, when released, automatically take up the position to that of the moving contacts; operating means shall have two rest positions except that for automatic opening a third distinct position may be provided, when necessary to reset before reclosing		N/A
	When an indicator light is used this shall be lit when the RCBO is in the closed position		P
	The indicator light shall not be the only means to indicate the closed position.		P
	The action of the mechanism shall not be influenced by the position of enclosures or covers and shall be independent of any removable part.		P
	If the cover is used as a guiding means for push-buttons, it shall not possible to remove the buttons from the outside		P
	Operating means securely fixed, not possible to remove them without a tool.		P
	For "up-down" operating means the contacts are closed by the up movement.		P
9.11	Test:		P
	- The RCBO is mounted and wired as in normal use.		P
	- Test circuit according to figure 4.		P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
9.11.2	A residual current equal to 1,5 $I_{\Delta N}$ is passed by closing S_2, the RCBO having been closed and the operating means being held in the closed position. The RCBO shall trip.		N/A
	Test repeated by moving the operating means slowly (1 s) to a position where the current starts to flow. Tripping shall occur without further movement.		N/A
8.1.3	Clearances and creepage distances (external parts) --> see “Clearances and creepage distances internal and external parts”		P
8.1.4	Screws, current-carrying parts and connections		P
8.1.4.1	Connections withstand mechanical stresses occurring in normal use.		P
	Screws for mounting the RCBO are not of thread-cutting type.		P
	Screws and nuts which are operated when mounting and connecting		P
	Test according to cl. 9.4:		--
	- 10 times (screw Ø / torque Nm)	Ø mm Nm	N/A
	- 5 times (screw Ø / torque Nm)	Ø 4.82m 2.0 Nm	N/A
8.1.4.2	Screws with a thread of insulating material operated when mounting the RCBO; correct introduction ensured.		N/A
8.1.4.3	Electrical connections contact pressure not transmitted through insulating material unless there is sufficient resilience in the metallic parts.		N/A
8.1.4.4	Current-carrying parts including parts intended for protective conductors, if any, shall be made of a metal having, under the conditions occurring in the equipment, mechanical strength, electrical conductivity and resistance to corrosion adequate for their intended use. Examples below:		N/A
	- copper		N/A
	- an alloy 58% copper for parts worked cold		N/A
	- an alloy 50% copper for other parts		N/A
	- other metal		N/A
	In case of using ferrous alloys or suitably coated ferrous alloys, compliance to resistance to corrosion is checked by a test of resistance to rusting (see 9.25).		N/A

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The requirements of this subclause do not apply to: contacts, magnetic circuits, heater elements, bimetals, shunts, parts of electronic devices or to screws, nuts, washers, clamping plates, similar parts of terminals and parts of the test circuit		N/A
8.1.5	Terminals for external conductors		P
	Compliance is checked by inspection and by the tests as relevant for the type of connection:		P
	9.5 for screw-type terminals		P
	by specific tests for plug-in or bolt-on RCBOs included in the standard		P
	by the tests of Annexes J, K or L		P
8.1.5.1	Terminals ensure the necessary contact pressure		--
	Test see cl. 9.5 Torque		--
	Ø mm Nm		N/A
	Ø mm Nm		N/A
	Ø mm Nm		N/A
	Max. cross-sect.: ____ mm²		N/A
9.5	Test of reliability of screw-type terminals for external copper conductors		N/A
9.5.1	Pull test:		--
	Terminal shall be suitable for all types of conductors: rigid (solid or stranded) and flexible, unless otherwise specified by the manufacturer.		N/A
	Min. cross-section solid / stranded / flexible (mm²):	mm²	--
	Max. cross-section solid / stranded / flexible (mm²):	mm²	--
	Torque $^{2}/_{3}$ (Nm) .....:	Nm	--
	Pull for 1 min solid / stranded / flexible (N)....:	N	--
	During the test no noticeable move of conductor		P
9.5.2	Min. cross-section (mm²).....:	mm²	--
	Max. cross-section (mm²).....:	mm²	--
	Torque $^{2}/_{3}$ (Nm) .....:	Nm	--
	The conductor shows no damage		P
	Terminals not worked loose and no damage		P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
9.5.3	Terminals fitted with the largest cross-section area specified in Table 8, for stranded and/or flexible copper conductor.		--
	Max. cross-section stranded (mm²)..... :		N/A
	Max. cross-section flexible (mm²) ..... :		N/A
	Torque $^2/_3$ (Nm) ..... :	Nm	--
	After the test no strand of conductor escaped outside		P
8.1.5.2	RCBOs shall be provided with:		N/A
	- terminals which shall allow the connection of copper conductors having nominal cross-sectional areas as shown in Table 8		N/A
Table 8	Rated current (A) / Range of nominal cross sections to be clamped* (mm²): Rigid (solid or stranded) conductors / Flexible conductors ≤ 13: 1 to 2,5 / 1 to 2,5 > 13 ≤ 16: 1 to 4 / 1 to 4 > 16 ≤ 25: 1,5 to 6 / 1,5 to 6 > 25 ≤ 32: 2,5 to 10 / 2,5 to 6 > 32 ≤ 50: 4 to 16 / 4 to 10 > 50 ≤ 80: 10 to 25 / 10 to 16 > 80 ≤ 100: 16 to 35 / 16 to 25 > 100 ≤ 125: 24 to 50 / 25 to 35	to mm²	N/A
	*It is required that, for current ratings up to and including 50 A, terminals be designed to clamp solid conductors as well as rigid stranded conductors. Nevertheless, it is permitted that terminals for conductors having cross-sections from 1 mm² up to 6 mm² be designed to clamp solid conductors only.		--
	- or terminals for external untreated aluminium conductors and with aluminium screw-type terminals for use with copper or with aluminium conductors according to Annex L.		--
8.1.5.3	Means for clamping the conductors in the terminals do not serve to fix any other component. (See tests of sub-clause 9.5)		N/A
8.1.5.4	Terminals for $I_N \leq 32$ A allow the connection of conductors without special preparation.		N/A
8.1.5.5	Terminals have adequate mechanical strength and metric ISO thread or equivalent. (See tests of sub-clauses 9.4 and 9.5.1)		N/A

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.1.5.6	Clamping of conductor without undue damage to conductor. (See tests of sub-clause 9.5.2)		P
8.1.5.7	Clamping of conductor reliably and between metal surfaces. (See tests of sub-clauses 9.4 and 9.5.1)		P
8.1.5.8	Terminals so designed or positioned that no conductor can slip out while the clamping screws or nuts are tightened. (See tests of sub-clause 9.5.3)		P
8.1.5.9	Terminals so fixed or located that they do not work loose when the clamping screws or nuts are tightened or loosened. (See tests of sub-clause 9.4)		P
8.1.5.10	Clamping screws or nuts of terminals for the protective conductors adequately secured against accidental loosening and not possible to unclamp without a tool.		P
8.1.5.11	Screws and nuts of terminals for external conductors shall be in engagement with a metal thread and not be of the tapping screw type.		P
8.1.6	Non interchangeability		--
	Plug-in or screw-in RCBOs must not be replace-able, without aid of a tool, by another of the same make, but having a higher rated current.		P
8.2	PROTECTION AGAINST ELECTRIC SHOCK		--
	Live parts not accessible in normal use		P
	For RCBOs other than plug-in type, external parts, other than screws or other means for fixing covers, which are accessible in normal use shall be of insulating material or be lined throughout with insulating material.		P
	Linings		--
	- reliably fixed		N/A
	- adequate thickness and		N/A
	- mechanical strength		N/A
	Inlet openings for cables or conduits shall be of insulating material or be provided with bushings or similar devices of insulating material.		N/A
	Such devices		--
	- reliably fixed		N/A
	- adequate mechanical strength		N/A
	For plug-in RCBOs external parts other than screws or other means for fixing covers, which are accessible, shall be of insulating material.		N/A

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Metallic operating means insulated from live parts.		N/A
	Metal parts of mechanism not accessible, insulated from accessible metal parts, from metal frames (for flush-type), from screws or other means for fixing the base and from metal plates.		N/A
	Possible to replace plug-in RCBOs easily with-out touching live parts.		N/A
	Lacquer or enamel not considered to provide adequate insulation.		N/A
9.6	Test: Standard test finger		N/A
	Straight test finger with a force of 75 N for 1 min at 35°C ± 2°C		N/A
	Enclosures or covers not deformed to such an extent that live parts can be touched.		N/A
8.9	RESISTANCE TO HEAT		N/A
	RCBO sufficiently resistant to heat		P
9.14.1	Test:		N/A
	- without removable covers .....1 h (100 ± 2) °C		N/A
	- removable covers .....1 h (70 ± 2) °C		N/A
	No change impairing further use and no flow of sealing compound that live parts are exposed		N/A
	No access to live parts even with test finger with a force not exceeding 5 N.		N/A
	The RCBO shall trip with a test current of 1,25 $I_{\Delta N}$ - break time not exceeding the value for $I_{\Delta N}$ in table 2	[ms]	N/A
	Marking still legible after test		N/A
9.14.2	Ball pressure test for external parts of insulating material necessary to retain current-carrying parts or parts of the protective circuit in position:		P
	- T = 125 ± 2°C	Enclosure,125 °C Contact support parts,125 °C Lock,125 °C	P
	After 1 h Ø of impression ≤ 2 mm	1,24 mm,1,12 mm,1,22 mm	P
9.14.3	Ball pressure test for external parts of insulating material not necessary to retain current-carrying parts or parts of the protective circuit in position:	The material of handle is same as enclosure	P
	☐ T = 70 ± 2°C		P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	☐ T = _____ ± 2°C (40°C + max. temperature rise of sub-clause 9.8)		P
	Ø of impression ≤ 2 mm		P
8.1.3	Clearances and creepage distances (internal and external parts)		P
	The minimum required clearances and creepage distances are based on the RCBO being designed for operating in an environment with pollution degree 2		P
	Compliance for item 1 in is checked by measurement and by the test of 9.7.7.4.1 and 9.7.7.4.2. The test is carried out with samples not submitted to the humidity treatment described in 9.7.1.		P
	The clearances of items 2 and 4 (except accessible surface after installation) may be reduced provided that the measured clearances are not shorter than the minimum allowed in IEC 60664-1 for homogenous field conditions.		P
	In this case, after the humidity treatment in 9.7.1, compliance for item 2 and 4 and arrangements of 9.7.2 items b), c), d) and e) is checked:		P
	- Tests according to 9.7.2 to 9.7.6 as applicable		P
	- Test according to 9.7.7.2 with test voltages acc. Table 19 with test arrangements of 9.7.2 items b), c), d), e)		P
	If measurement does not show any reduced clearance, test 9.7.7.2 is not applied		P
	Compliance for item 3, checked by measurement		P
	Parts of PCBs connected to the live parts protected against pollution by the use of a type 2 protection according to IEC 60664-3 are exempt from this verification		P
	The insulating materials are classified into Material Groups on the basis of their comparative tracking index (CTI) acc. to IEC 60664-1 and measured according to IEC 60112		P
	Clearances [mm] U_{imp}		N/A
	4kV (see table 5) **2,5kV(see table 5)**	☐ ☐	N/A
		minimum clearances [mm]	N/A
	1. between live parts which are separated when the main contacts are in the open position		P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	2. between live parts of different polarity		P
	3. between circuits supplied from different sources, one of which being PELV or SELV		P
	4. between live parts and:		N/A
	- accessible surfaces of operating means		N/A
	- screws or other means for fixing covers which have to be removed when mounting the RCBO		N/A
	- surface on which the RCBO is mounted		N/A
	- screws or other means for fixing the RCBO		N/A
	- metal covers or boxes		N/A
	- other accessible metal parts		N/A
	- metal frames supporting flush-type RCBOs		N/A
	Creepage distances [mm] (see table 5)		N/A
	Material group	IIIb ☐ IIIa ☐ II ☐ I ☐	N/A
		minimum creepage distances [mm]	N/A
	1. between live parts which are separated when the main contacts are in the open position		P
	2. between live parts of different polarity		P
	3. between circuits supplied from different sources, one of which being PELV or SELV		P
	4. between live parts and:		--
	- accessible surfaces of operating means		P
	- screws or other means for fixing covers which have to be removed when mounting the RCBO		P
	- surface on which the RCBO is mounted		P
	- screws or other means for fixing the RCBO		P
	- metal covers or boxes		P
	- other accessible metal parts		P
	- metal frames supporting flush-type RCBOs		P
9.25	Test of resistance to rusting:		--

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- 10 min immersed in a cold chemical degreaser such as methyl-chloroform or refined petrol		P
	- 10 min immersed in a 10% solution of ammonium chloride in water at 20°C±5°C		P
	- 10 min in a box containing air saturated with moisture at 20°C±5°C		P
	- 10 min at 100°C		P
	No sign of rust		P
	TEST SEQUENCE "A_2"	**A_2 1 A_2 2 A_2 3**	P
8.10	RESISTANCE TO ABNORMAL HEAT AND TO FIRE		P
	External parts of insulating material are not liable to ignite and to spread fire under fault or overload conditions.		P
9.15	GLOW-WIRE TEST		P
	Test performed on a complete RCBO		P
	Test made on three samples, points of application being different from one sample to another		P
	- External parts of insulating material necessary to retain current-carrying parts or parts of the protective circuit in position.....:	T = 960 ± 15 °C	P
	- All other external parts of insulating material.....:	T = 650 ± 10 °C	P
	No visible flame and no sustained glowing		P
	Flames and glowing extinguish within 30 s after removal		P
	No ignition of tissue paper or scorching of the pinewood board		P
			P
	TEST SEQUENCE "B"	**B1 B2 B3**	--
8	REQUIREMENTS FOR CONSTRUCTION AND OPERATION		--
8.3	DIELECTRIC PROPERTIES AND ISOLATING CAPABILITY		--
	RCBOs have adequate dielectric properties		P
9.7	TEST OF DIELECTRIC PROPERTIES AND ISOLATING CAPABILITY		--
9.7.7.4	Verification of resistance of the insulation of open contact and basic insulation against an impulse voltage in normal conditions		N/A
	These tests are not preceded by the humidity treatment described in 9.7.1.		N/A
	The test is carried out on an RCBO fixed on a metal support		N/A

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The impulses are given by a generator producing positive and negative impulses having a front time of 1,2μs, and a time to half-value of 50μs		N/A
	The shape of the impulses is adjusted with the RCBO under test connected to the impulse generator.		N/A
	For RCBOs with incorporated surge arresters that cannot be disconnected, the shape of the impulses is adjusted without connection of the RCBO to the impulse generator.		N/A
	rated impulse withstand voltage [kV]:		N/A
	see level of test laboratory [m]		N/A
	test voltage (acc. Table 28) [kV]:		N/A
9.7.7.4.2	RCBO in open position (contacts in open position)		N/A
	The impulses are applied between:		N/A
	the line terminals connected together and the load terminals connected together		N/A
9.7.7.4.3	RCBO in closed position		N/A
	All components bridging the basic insulation disconnected		N/A
	A first series of tests is made applying the impulse voltage between the phase pole(s) and the neutral pole (or path) connected together and the metal support connected to the terminal(s) intended for the protective conductor(s), if any		N/A
	A second series of tests is made applying the impulse voltage between the phase pole(s), connected together, and the neutral pole (or path) of the RCBO		N/A
	Five positive impulses and five 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.		N/A
	no disruptive discharges during the test		N/A
9.7.7.5	Verification of the behaviour of components bridging the basic insulation		--
	A new RCBO sample is tested		N/A
	Test only performed on RCBOs, where components bridging the basic insulation have been disconnected during the impulse voltage test of 9.7.7.4.3		N/A

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

	test voltage 1200V+U_0	V			N/A
	The voltage is applied during 5s between the phase pole(s) and the neutral pole (or path) connected together and the metal support connected to the terminal(s) intended for the prospective conductor(s), if any				N/A
	after test, no component bridging the basic insulation should show a visible alteration.				N/A
	Then, the equipment is connected to the mains acc. manufacturer's instruction				N/A
	The RCBO shall trip with a test current of 1,25 $I_{\Delta N}$	[ms]			--
					N/A
	Test switch S_2 and RCBO in the closed position, test voltage established by closing the test switch S_1.				N/A
9.7.1	Resistance to humidity				--
9.7.1.1	Parts which can be removed without a tool are removed, spring lids kept open, inlet openings are left open and if knock-outs one is opened.				P
9.7.1.2	Test conditions: 48 h in humidity cabinet RH = 91% to 95% T = 20 to 30°C ± 1°C	93%...94% 28°C…29°C			--
9.7.1.4	The samples show no damage				P
9.7.2	Insulation resistance of the main circuit measured between 30 and 60 min after this treatment with 500 V DC after 5 s:	B1 [MΩ]	B2 [MΩ]	B3 [MΩ]	--
	a) between the terminals which are electrically connected together when the RCBO is in the closed position ..... ≥ 2 MΩ	> 500	> 500	> 500	P
	b) between each pole and the others connected together (electronic components, connected between current path being disconnected) ..... ≥ 2 MΩ	> 500	> 500	> 500	P
	c) between all poles connected together and the frame..... ≥ 5 MΩ	> 500	> 500	> 500	P
	d) between metal parts of the mechanism and the frame..... ≥ 5 MΩ				N/A
	e) between the frame and a metal foil in contact with the inner surface of the lining of insulating material ..... ≥ 5 MΩ				N/A
9.7.3	Dielectric strength of the main circuit measured with an AC voltage (45-65Hz) for 1 min:				--
	a) electronic components disconnected.....2000 V				P

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IEC 61009-1					
Clause	Requirement + Test	Result - Remark			Verdict
	b) electronic components disconnected.....2000 V				P
	c) electronic components disconnected.....2000 V				P
	d) electronic components disconnected.....2000 V				N/A
	e) electronic components disconnected.....2500 V				N/A
	No flashover or breakdown				P
9.7.4	Insulation resistance of auxiliary circuits measured with 500 V DC after 1 min:	B1 [MΩ]	B2 [MΩ]	B3 [MΩ]	P
	1) between all auxiliary circuits and the frame..... ≥ 2 MΩ				P
	2) between each part of the auxiliary circuits which might be isolated from the other parts and the whole of the other parts connected together..... ≥ 2 MΩ				P
	Dielectric strength of auxiliary circuits measured with an AC voltage at rated frequency for 1 min:				P
	Rated voltage of auxiliary circuits (a.c. or d.c.) — Test voltage (V) ≤ 30 — 600 > 30 ≤ 50 — 1000 > 50 ≤ 110 — 1500 > 110 ≤ 250 — 2000 > 250 ≤ 500 — 2500	V			P
	1) between all auxiliary circuits and the frame				P
	2) between each part of the auxiliary circuits which might be isolated from the other parts and the whole of the other parts connected together				P
	No flashover or perforation				P
9.7.7.2	Verification of clearances with the impulse withstand voltage				P
	If the measurement of clearances of items 2 and 4 in Table 7 shows a reduction of the required length, this test applies.				P
	The test is carried out on an RCBO fixed on a metal support and being in the closed position				P
	The impulses are given by a generator producing positive and negative impulses having a front time of 1,2μs, and a time to half-value of 50μs				P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The shape of the impulses is adjusted with the RCBO under test connected to the impulse generator.		P
	For RCBOs with incorporated surge arresters that cannot be disconnected, the shape of the impulses is adjusted without connection of the RCBO to the impulse generator.		N/A
	test performed with:		--
	- surge impedance of the test apparatus ≤500Ω and surge protective devices disconnected before testing or		N/A
	- hybrid generator with an surge impedance of 2 Ω and surge protective devices not disconnected before testing		N/A
	rated impulse withstand voltage [kV]:	4	--
	see level of test laboratory [m]	<100	--
	test voltage (acc. Table 19) [kV]:	4.9	--
	A first series of tests is made applying the impulse voltage between the phase pole(s) and the neutral pole (or path) connected together and the metal support connected to the terminal(s) intended for the protective conductor(s), if any		N/A
	A second series of tests is made applying the impulse voltage between the phase pole(s), connected together, and the neutral pole (or path) of the RCBO		N/A
	A third series of tests is made applying the impulse voltage between (and not tested during the two first sequences described here above):		N/A
	b) between each pole and the others connected together (electronic components, connected between current path being disconnected)		N/A
	c) between all poles connected together and the frame		N/A
	d) between metal parts of the mechanism and the frame		N/A
	e) between the frame and a metal foil in contact with the inner surface of the lining of insulating material		N/A
	Five positive impulses and five 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.		N/A

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

	no disruptive discharges during the test		P
9.7.5	Secondary circuit of detection transformers		--
	No insulation test, provided that no connection with accessible metal parts or with protective conductor or live parts exists.		N/A
9.7.6	Capability of control circuits connected to the main circuit of withstanding high DC voltages due to insulation measurements		--
	RCBO fixed on metal support in closed position with all control circuits connected as in service.		P
	Open test voltage 600 V +25 / -0 V Maximum ripple 5% Short-circuit current 12 mA +2 / -0 mA Applied for 1 min between each pole and the other poles connected together to the frame.		P

	Type	I_N A	$I_{\Delta N}$ A	Standard values of break time and non-actuating time at a residual current equal to							
				$I_{\Delta N}$	2 $I_{\Delta N}$	5 $I_{\Delta N}$	5 $I_{\Delta N}$ or 0,25A **a)**	5A-200A, 500A **b)**	$I_{\Delta t}$ **c)**		--
	General	Any value	<0,03	0,3	0,15	--	0,04	0,04	0,04	Max. break times	--
			0,03	0,3	0,15	--	0,04	0,04	0,04		--
			>0,03	0,3	0,15	0,04	--	0,04	0,04		--
	S	≥ 25	>0,03	0,5	0,2	0,15	--	0,15	0,15	Max. break times	--
				0,13	0,06	0,05	--	0,04	0,04	Min. non-actuating times	--

	a) value to be decided by the manufacturer for this test		--
	b) The test are only made during verification of the correct operation as mentioned in 9.9.1.2 d) but in any case values exceeding the lower limit of the overcurrent instantaneous tripping range are not tested.		--
	c) The test is made with a current $I_{\Delta t}$ equal to the lower limit of the overcurrent instantaneous tripping range according to type B, C or D, as applicable. For the tests of 9.9.1.3 and 9.9.1.4 b), the current $I_{\Delta t}$ is established so that the vector sum $I_{\Delta t}$ + In is equal to the lower limit of the overcurrent instantaneous tripping range, according to type B, C or D, as applicable.		--

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IEC 61009-1					
Clause	Requirement + Test	Result - Remark			Verdict
9.9.1.2.c)	Verification of the correct operation in case of sudden appearance of residual current by closing S_1, (S_2 and RCBO in closed position):				P
	Maximum break times at:	[ms]	[ms]	[ms]	--
	- $I_{\Delta N}$	24	36	23	P
	- 2 $I_{\Delta N}$	25	27	22	P
	- 5 $I_{\Delta N}$ or	20	21	16	P
	- 0,25 A				N/A
	- $I_{\Delta t}$ 315 A	20	22	18	P
	No value exceeds the relevant specified limiting value				N/A
	Additional test for type S:				--
	Minimum non-actuating time at:	[ms]	[ms]	[ms]	--
	- $I_{\Delta N}$ ..... 0.13 s				N/A
	- 2 $I_{\Delta N}$ ..... 0.06 s				N/A
	- 5 $I_{\Delta N}$ ..... 0.05 s				N/A
	- $I_{\Delta t}$ ..... 0.04 s				N/A
	The test switch S_1 and the RCBO being in the closed position, the test voltage is suddenly established by closing the test switch S_2 for min. non-operating times acc. table 2				N/A
	No tripping during tests				N/A
8.4	TEMPERATURE RISE				--
	Temperature rises do not exceed the limiting values stated in table 7.				P
	Cross-section (mm²)	16 mm²			--
9.8.1	Ambient air temperature (°C)	23.5 °C			--
9.8.2	Test current I_N (A) until steady state values are reached.	63 A			--
	Four pole RCBOs:				P
	Current passing through				P
	- 3 phase poles (1)				P
	- neutral and adjacent pole (2)				P
	Parts ..... Temperature rise K	[K]	[K]	[K]	--
	Terminals for external connections 65	58.5	58.1	58	P

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IEC 61009-1					
Clause	Requirement + Test	Result - Remark			Verdict
	External parts liable to be touched during manual operation of the RCBO, including operating means of insulating material and metallic means for coupling insulated operating means of several poles 40	9.7	10.0	9.4	P
	External metallic parts of operating means 25				N/A
	Other external parts, including that face of the RCBO in direct contact with the mounting surface 60	17.9	23.2	17.8	P
8.16	RELIABILITY				--
	RCBOs operate reliably even after long service.				P
9.22.2	Test with 28 cycles at 40 ± 2°C				--
	Cross-section (mm²)..... :	mm²			--
	Torque $^2/_3$ (Nm) ..... :	Nm			--
	Test current I_N (A)..... :	A			--
	- with current passing ..... 21 h				P
	- without current ..... 3 h				P
	For 4 pole RCBOs with 3 overcurrent protected poles only 3 poles loaded				N/A
	At the end of the last period of 21 h with current passing the temperature rise of the terminals shall not exceed 65K	[K]	[K]	[K]	--
		57.2	58.5	59.1	P
	After cool down the RCBO shall trip with a test current of 1,25 $I_{\Delta N}$ - break time not exceeding the value for $I_{\Delta N}$ in table 2	[ms]	[ms]	[ms]	--
		20	17	22	P
	Test switch S_2 and RCBO in the closed position, test voltage established by closing the test switch S_1.				P
9.23	VERIFICATION OF AGEING OF ELECTRONIC COMPONENTS				--
	168 h at 40 ± 2°C..... :	40°C			--
	Test current I_N (A)..... :	63 A			--
	Cross-section (mm²)..... :	16 mm²			--
	Electronic parts at 1,1 U_N ..... :	264 V			--
	After cool down:				P
	- electronic parts show no damage				P
	The RCBO shall trip with a test current of 1,25 $I_{\Delta N}$ - break time not exceeding the value for $I_{\Delta N}$ in table 2	[ms]	[ms]	[ms]	--

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Test switch S_2 and RCBO in the closed position, test voltage established by closing the test switch S_1		N/A
			N/A
	TEST SEQUENCE "C"	**C_1 1 C_1 2 C_1 3**	N/A
	Tests C_1		N/A
8	REQUIREMENTS FOR CONSTRUCTION AND OPERATION		--
8.6	MECHANICAL AND ELECTRICAL ENDURANCE		--
	RCBOs shall be capable of performing an adequate number of mechanical and electrical operations.		P
9.10	VERIFICATION OF MECHANICAL AND ELECTRICAL ENDURANCE		--
	Test:		--
	- $I_N \leq 25$ A.....2s ON / 13s OFF		P
	- $I_N > 25$ A.....2s ON / 28s OFF		P
	2000 operating cycles		P
	Test voltage U_N (V)..... :	242V	--
	Test current I_N (A)..... :	64.0A	--
	Cos phi = 0,85 - 0,9 ..... :	0.87	--
	Cross-section (mm²)..... :	16 mm²	--
9.10.2	Test procedure		--
	$I_{\Delta N}$ > 0,01 A:		P
	- 1000 cycles manual operation		P
	- 500 cycles test device		P
	- 500 cycles $I_{\Delta N}$		P
	$I_{\Delta N} \leq$ 0,01 A:		--
	- 500 cycles manual operation		N/A
	- 750 cycles test device		N/A
	- 750 cycles $I_{\Delta N}$		N/A
	Without load - manual operation		--
	- $I_N \leq 25$ A..... 2000 cycles		N/A
	- $I_N > 25$ A..... 1000 cycles		P
9.10.3	After test:		--
	No undue wear, no damage, no loosening of connections, no seepage of sealing compound		P

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IEC 61009-1					
Clause	Requirement + Test	Result - Remark			Verdict
	The RCBO shall trip with a test current of 1,25 $I_{\Delta N}$ - break time not exceeding the value for $I_{\Delta N}$ in table 2	[ms]	[ms]	[ms]	--
		23	18	18	P
	Test switch S_2 and RCBO in the closed position, test voltage established by closing the test switch S_1.				P
	Dielectric strength test with 900 V AC for 1 min:				--
	a)				P
	b)				P
	c)				P
	d)				N/A
	e)				N/A
	2,55 I_N through all poles:	161 A			P
		[s]	[s]	[s]	--
	- Opening time ≥ 1s but ≤ 60 s for $I_N \leq 32$ A				N/A
	- Opening time ≥ 1s but ≤ 120 s for $I_N > 32$ A	32.8	43.1	34.7	P
9.12.11.2.1	Test at reduced short-circuit current.....:	Figure 7			--
	Test current:				--
	- 500 A				N/A
	- 10 I_N	643A			P
	Power factor 0,93 - 0,98 .....:	0.95			--
	Each overcurrent protected pole:				--
		[KA²s]	[KA²s]	[KA²s]	--
	Sequence: 6-0 and 3-CO..... I²t max.	3.47	2.99	4.58	P
	I_{peak} (A) max. value .....:	894 A			--
	No permanent arcing				N/A
	No flash-over between poles or between poles and frame				P
	No blowing of the fuse F				P
	No damage, polyethylene sheet shows no hole				P
9.12.12	The RCBO shall show no damage impairing their further use an shall be capable without maintenance to withstand the following tests:				P
9.12.12.1.a)	Leakage current across open contacts, according to 9.7.7.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The RCBO is in the open position	[mA]	[mA]	[mA]	--

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Clause	Requirement + Test	Result - Remark			Verdict
	The leakage current shall not exceed 2 mA	<0.01	<0.01	<0.01	P
9.12.12.1.b)	Dielectric strength test:				P
	Test voltage:				P
	a) 1500 V				P
	b) 1500 V				P
	c) 1500 V				P
	d) 1500 V				N/A
	e) 2000 V				N/A
	During these test, after the test has carried out under the conditions specified in 9.7.2 a), it shall be verified that the indicating means show the open position and during the test carried out under the conditions specified in 9.7.2 b) the indication means shall show the closed position				P
	Tests C_2 2P C63;30 mA; Type A	**C_2 1**	**C_2 2**	**C_2 3**	P
9.12.11.2.2	SHORT CIRCUIT TEST ON RCBOS FOR VERIFYING THEIR SUITABILITY FOR USE IN IT SYSTEMS				P
	figure.....:	Figure 8			--
	Test current:				--
	- 500A	A			N/A
	- 1,2 times the upper limit of the standard range of instantaneous tripping (not exceeding 2500 A)	756 A			P
	Power factor 0,93-0,98:	0.94			P
	test voltage 105% of the rated phase to phase voltage	421 V			P
	test voltage 105% of U_0 for the pole marked N, if any	V			N/A
	Each pole of RCBO is subjected individually to a test in a circuit, the connection of which is shown in Figure 7.				P
		[KA²s]	[KA²s]	[KA²s]	--
	Sequence: O-t-CO.....I²t max.	4.61			P
	I_{peak} (A) max. value .....:	1.08 kA			--
	Sequence .....:	O-t-CO			--
	Point of initiation of the O operation (protected poles): 0 ± 5° for the first tested pole, shifted by 30° for the other poles				P
	Point of initiation of the O operation (neutral pole): 60 ± 5°				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	No flash-over between poles or between poles and frame				P
	No blowing of the fuse F				P
	No damage, polyethylene sheet shows no hole				P
	The RCBO shall show no damage impairing their further use an shall be capable without maintenance to withstand the following tests:				P
9.12.12.1.a)	Leakage current across open contacts, according to 9.7.7.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The RCBO is in the open position	[mA]	[mA]	[mA]	P
	The leakage current shall not exceed 2 mA	<0.01	<0.01	<0.01	P
9.12.12.1.b)	Dielectric strength test:				P
	Test voltage:				P
	a) 1500 V				P
	b) 1500 V				P
	c) 1500 V				P
	d) 1500 V				N/A
	e) 2000 V				N/A
	During these test, after the test has carried out under the conditions specified in 9.7.2 a), it shall be verified that the indicating means show the open position and during the test carried out under the conditions specified in 9.7.2 b) the indication means shall show the closed position				P
	TEST SEQUENCE "D"	**D1**	**D2**	**D3**	--
	TEST D_0				--
8	REQUIREMENTS FOR CONSTRUCTION AND OPERATION				--
8.5	OPERATING CHARACTERISTICS				--
9.9	VERIFICATION OF THE OPERATING CHARACTERISTIC				--
9.9.1	RCBO installed as for normal use, test circuit according to figure 4				P
	For multiple settings of $I_{\Delta N}$ tests are made for each setting				N/A
	RCBOs with more than one rated frequency, tests at the lowest and highest frequency, except for test in 9.9.1.2 e),test at only one frequency.				N/A
	Tests performed with no load at 20 ± 5°C				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

9.9.1.4	For RCBOs functionally dependent on line voltage each test is made at:										N/A
	- 1,1 U_N (V) and						V				--
	- 0,85 U_N (V)						V				--
Table 2	Type	I_N A	$I_{\Delta N}$ A	Limiting values of break time and non-actuating time (s) for type AC and A RCBOs in event of alternating residual currents (r.m.s. values) equal to							--
				$I_{\Delta N}$	2 $I_{\Delta N}$	5 $I_{\Delta N}$	5 $I_{\Delta N}$ or 0,25A **a)**	5A-200A, 500A **b)**	$I_{\Delta t}$ **c)**		--
	General	Any value	<0,03	0,3	0,15	--	0,04	0,04	0,04	Max. break times	--
		Any value	0,03	0,3	0,15	--	0,04	0,04	0,04		--
		Any value	>0,03	0,3	0,15	0,04	--	0,04	0,04		--
	S	≥ 25	>0,03	0,5	0,2	0,15	--	0,15	0,15	Max. break times	--
				0,13	0,06	0,05	--	0,04	0,04	Min. non-actuating times	--
	a) value to be decided by the manufacturer for this test										--
	b) The test are only made during verification of the correct operation as mentioned in 9.9.1.2 d) but in any case values exceeding the lower limit of the overcurrent instantaneous tripping range are not tested.										--
	c) The test is made with a current $I_{\Delta t}$ equal to the lower limit of the overcurrent instantaneous tripping range according to type B, C or D, as applicable. For the tests of 9.9.1.3 and 9.9.1.4 b), the current $I_{\Delta t}$ is established so that the vector sum $I_{\Delta t}$ + In is equal to the lower limit of the overcurrent instantaneous tripping range, according to type B, C or D, as applicable.										--
9.9.1.2	Tests for all RCBOs										N/A
a)	Verification of the correct operation in case of a steady increase of residual current:						[mA]		[mA]	[mA]	--
	- Steady increase from 0,2 $I_{\Delta N}$ to $I_{\Delta N}$ within 30s Tripping current between $I_{\Delta N0}$ and $I_{\Delta N}$						22,9 … 23.6		23,5 … 24.1	21,6 … 22.4	P
b)	Verification of the correct operation at closing on residual current (S_1 and S_2 closed) :						[ms]		[ms]	[ms]	--
	- The RCBO closes on $I_{\Delta N}$, no value exceeds the - specified limiting value						17		23	19	P

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Clause	Requirement + Test	Result - Remark			Verdict
c)	Verification of the correct operation in case of sudden appearance of residual current by closing S_1, (S_2 and RCBO in closed position):				N/A
	Maximum break times at:	[ms]	[ms]	[ms]	--
	- $I_{\Delta N}$	24	36	23	P
	- 2 $I_{\Delta N}$	25	27	22	P
	- 5 $I_{\Delta N}$ or	20	21	16	P
	- 0,25 A				N/A
	- $I_{\Delta t}$ 315 A	20	22	18	P
	No value exceeds the relevant specified limiting value				P
	Additional test for type S:				N/A
	Minimum non-actuating time at:				--
	- $I_{\Delta N}$ ..... 0,13 s				N/A
	- 2 $I_{\Delta N}$ ..... 0,06 s				N/A
	- 5 $I_{\Delta N}$ ..... 0,05 s				N/A
	- $I_{\Delta t}$ ..... 0,04 s				N/A
	The test switch S_1 and the RCBO being in the closed position, the test voltage is suddenly established by closing the test switch S_2 for min. non-operating times acc. table 2				N/A
	No tripping during tests				N/A
d)	Verification of the correct operation in case of sudden appearance of residual current between 5 $I_{\Delta N}$ and 500A among the following list: 5A - 10A - 20A - 50A - 100A - 200A by closing S_2, (S_1 and RCBO in closed position):				N/A
	- ____A (value 1 between 5A and 200A)				N/A
	- ____A (value 1 between 5A and 200A)				N/A
	No value exceeds the relevant specified limiting value				N/A
f) 1)	Tests repeated at -5°C:				N/A
	Verification of the correct operation in case of sudden appearance of residual current by closing S_1, (S_2 and RCBO in closed position):				--
	Maximum break times at:	[ms]	[ms]	[ms]	--
	- $I_{\Delta N}$	18	25	18	P

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Clause	Requirement + Test	Result - Remark			Verdict
	- 2 $I_{\Delta N}$	20	21	20	P
	- 5 $I_{\Delta N}$ or	17	16	17	P
	- 0,25 A				N/A
	- $I_{\Delta t}$ 315 A	17	15	19	P
	No value exceeds the relevant specified limiting value				P
	Additional test for type S:				N/A
	Minimum non-actuating time at:				--
	- $I_{\Delta N}$ ..... 0,13 s				N/A
	- 2 $I_{\Delta N}$ ..... 0,06 s				N/A
	- 5 $I_{\Delta N}$ ..... 0,05 s				N/A
	- $I_{\Delta t}$ ..... 0,04 s				N/A
	The test switch S_1 and the RCBO being in the closed position, the test voltage is suddenly established by closing the test switch S_2 for min. non-operating times acc. table 2				N/A
	No tripping during tests				N/A
e)	Tests repeated, with the pole under test and one other pole of the RCBO loaded with rated current, current being established shortly before the test.	I_N = A			N/A
	Cross-section (mm²)..... :	mm²			--
	Verification of the correct operation at closing on residual current (S_1 and S_2 closed) :	[ms]	[ms]	[ms]	--
	-no value exceeds the specified limiting value				N/A
	Verification of the correct operation in case of sudden appearance of residual current by closing S_2, (S_1 and RCBO in closed position):				N/A
	Maximum break times at:				--
	- $I_{\Delta N}$				N/A
	- 2 $I_{\Delta N}$				N/A
	- 5 $I_{\Delta N}$ or				N/A
	- 0,25 A				N/A
	- $I_{\Delta t}$ _____ A				N/A
	No value exceeds the relevant specified limiting value				N/A
	Additional test for type S:				N/A
	Minimum non-actuating time at:				--

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Clause	Requirement + Test	Result - Remark			Verdict
	- $I_{\Delta N}$ ..... 0,13 s				N/A
	- 2 $I_{\Delta N}$ ..... 0,06 s				N/A
	- 5 $I_{\Delta N}$ ..... 0,05 s				N/A
	- $I_{\Delta t}$ ..... 0,04 s				N/A
	The test switch S_1 and the RCBO being in the closed position, the test voltage is suddenly established by closing the test switch S_2 for min. non-operating times acc. table 2				N/A
	No tripping during tests				N/A
f) 2)	Tests repeated with the RCBO loaded with rated current I_N at +40°C until steady-state conditions are reached	I_N = A			N/A
	Cross-section (mm²)..... :	mm²			--
	Verification of the correct operation in case of sudden appearance of residual current by closing S_1, (S_2 and RCBO in closed position):				N/A
	Maximum break times at:	[ms]	[ms]	[ms]	--
	- $I_{\Delta N}$				N/A
	- 2 $I_{\Delta N}$				N/A
	- 5 $I_{\Delta N}$ or				N/A
	- 0,25 A				N/A
	- $I_{\Delta t}$ _____ A				N/A
	No value exceeds the relevant specified limiting value				N/A
	Additional test for type S:				N/A
	Minimum non-actuating time at:				--
	- $I_{\Delta N}$ ..... 0,13 s				N/A
	- 2 $I_{\Delta N}$ ..... 0,06 s				N/A
	- 5 $I_{\Delta N}$ ..... 0,05 s				N/A
	- $I_{\Delta t}$ ..... 0,04 s				N/A
	The test switch S_1 and the RCBO being in the closed position, the test voltage is suddenly established by closing the test switch S_2 for min. non-operating times acc. table 2				N/A
	No tripping during tests				N/A
8.15	BEHAVIOUR OF RCBOS IN CASE OF EARTH FAULT CURRENTS COMPRISING A DC COMPONENT				--

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

9.9.1.3	VERIFICATION OF THE CORRECT OPERATION AT RESIDUAL CURRENTS WITH DC COMPONENTS										--
	Type A residual current devices										--
	RCBO installed as for normal use, test circuits according to figures 5 and 6										N/A
	RCBOs with more than one rated frequency, tests at the lowest and highest frequency, except for test in 9.9.1.2 e),test at only one frequency.										N/A
	For RCBOs functionally dependent on line voltage each test is made at										N/A
	- 1,1 U_N.....:							V			--
	- 0,85 U_N .....:							V			--
a)	Verification of the correct operation in case of a continuous rise of the residual pulsating direct current (S_1, S_2 and RCBO closed)										N/A
	Test acc. figure 5										--
	Angle α	Tripping current (A)									--
		Lower limit	Upper limit								--
	0°	0,35 $I_{\Delta N}$	1,4 $I_{\Delta N}$ or 2 $I_{\Delta N}$ (sub-clause 5.3.8)								--
	90°	0,25 $I_{\Delta N}$									--
	135°	0,11 $I_{\Delta N}$									--
	Steady increase from zero to:							[mA]	[mA]	[mA]	--
	- 1,4 $I_{\Delta N}$ for $I_{\Delta N}$ > 0,01A with 1,4 $I_{\Delta N}$ /30 A/s										N/A
	- 2 $I_{\Delta N}$ for $I_{\Delta N} \leq$ 0,01 A with 2 $I_{\Delta N}$ /30 A/s										N/A
	α = 0° +/-										N/A
	α = 90° +/-										N/A
	α = 135° +/-										N/A
	No value exceeds the relevant specified limiting values										N/A
b)	Verification of the correct operation in case of suddenly appearing residual pulsating direct currents by closing S_2 (S_1 and RCBO in closed position)										N/A

Table 3	Type	I_N A	$I_{\Delta N}$ A	Maximum values of break time and non-actuating time (s) for type A RCBOs in the event of half-wave pulsating residual currents (r.m.s. values) equal to							
				1,4 $I_{\Delta N}$	2 $I_{\Delta N}$	2,8 $I_{\Delta N}$	4 $I_{\Delta N}$	7 $I_{\Delta N}$	0,35 A	0,5 A	350A **a)**
	General	Any value	<0,03		0,3		0,15			0,05	0,04

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IEC 61009-1												
Clause	Requirement + Test							Result - Remark				Verdict
		Any value	0,03	0,3		0,15			0,04		0,04	--
		Any value	>0,03	0,3		0,15		0,04			0,04	--
	S	≥ 25	>0,03	0,5		0,2		0,15			0,15	--
	a) This value shall be limited to the lower limit of the overcurrent instantaneous tripping ranges according to type B, C or D, as applicable.											--
	Test acc. figure 5											--
	Angle α .....:							α = 0°				--
	RCBOs with $I_{\Delta N}$ < 0,03 A											N/A
	Maximum break times at:							[ms]	[ms]	[ms]		--
	- 2 $I_{\Delta N}$ +/-											N/A
	- 4 $I_{\Delta N}$ +/-											N/A
	- 0,5 A +/-											N/A
	- 350A or +/-											N/A
	- $I_{\Delta t}$ ___ A +/-											N/A
	RCBOs with $I_{\Delta N}$ = 0,03 A											N/A
	Maximum break times at:							[ms]	[ms]	[ms]		--
	- 1,4 $I_{\Delta N}$ +/-											N/A
	- 2,8 $I_{\Delta N}$ +/-											N/A
	- 0,35 A +/-											N/A
	- 350A or +/-											N/A
	- $I_{\Delta t}$ ___ A +/-											N/A
	RCBOs with $I_{\Delta N}$ > 0,03 A											N/A
	Maximum break times at:							[ms]	[ms]	[ms]		--
	- 1,4 $I_{\Delta N}$ +/-											N/A
	- 2,8 $I_{\Delta N}$ +/-											N/A
	- 7 $I_{\Delta N}$ +/-											N/A
	- 350A or +/-											N/A
	- $I_{\Delta t}$ ___ A +/-											N/A
	No value exceeds the specified limiting values											N/A
c)	Verification of the correct operation with the pole under test and one other pole loaded with rated current I_N							I_N = A				N/A
	Test acc. 9.9.1.3 a) repeated, pole under test an one other pole loaded with rated current											--
	Steady increase from zero to:							[mA]	[mA]	[mA]		--

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Clause	Requirement + Test	Result - Remark			Verdict
	- 1,4 $I_{\Delta N}$ for $I_{\Delta N}$ > 0,01A with 1,4 $I_{\Delta N}$ /30 A/s				N/A
	- 2 $I_{\Delta N}$ for $I_{\Delta N} \leq$ 0,01 A with 2 $I_{\Delta N}$ /30 A/s				N/A
	α = 0° +/-				N/A
	α = 90° +/-				N/A
	α = 135° +/-				N/A
	No value exceeds the relevant specified limiting values				N/A
d)	Verification of the correct operation in case of residual pulsating direct currents with α = 0° superimposed by smooth direct current of 0,006 A				N/A
	Test acc. figure 6				--
	Steady increase of pulsating DC current from zero to:	[mA]	[mA]	[mA]	--
	- 1,4 $I_{\Delta N}$ for $I_{\Delta N}$ > 0,01A with 1,4 $I_{\Delta N}$/30 A/s				N/A
	- 2 $I_{\Delta N}$ for $I_{\Delta N} \leq$ 0,01 A with 2 $I_{\Delta N}$ /30 A/s				N/A
	(I_1) α = 0° +/- (I_0) 6mA DC +/-				N/A
	No value exceeds the relevant specified limiting values				N/A
					N/A
	Tests D_1				--
8	REQUIREMENTS FOR CONSTRUCTION AND OPERATION				--
8.12	RCBOS FUNCTIONALLY DEPENDENT ON LINE VOLTAGE				--
	RCBOS FUNCTIONALLY DEPENDENT ON THE LINE VOLTAGE OPERATE CORRECTLY BETWEEN 0,85 AND 1,1 UN				--
9.17	VERIFICATION OF THE BEHAVIOUR OF RCBOS OPENING AUTOMATICALLY IN CASE OF FAILURE OF THE LINE VOLTAGE				--
9.17.1	Limiting value of the line voltage U_x				--
	U_N applied to the line terminals and progressively lowered to attain zero within about 30s until automatic opening occurs	[V]	[V]	[V]	--
	All values less than 0,85 U_N				N/A
	Tripping test:				N/A
	Test voltage (V)..... :	V			--
	Residual current $I_{\Delta N}$..... :	$I_{\Delta N}$ =A			--
	Time corresponding to value for $I_{\Delta N}$ in table 2	[ms]	[ms]	[ms]	--
	No value exceeds the specified limiting values				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	Not possible to close the apparatus by manual operating means below U_x				N/A
9.17.2	Verification of automatic opening in case of failure of the line voltage				--
	RCBO supplied with U_N and line voltage, then switched off				N/A
	Time interval between switching off and opening of the main contacts:	[ms]	[ms]	[ms]	--
a)	RCBOs opening without delay				N/A
	- no value exceeds 0,5 s				N/A
b)	RCBOs opening with delay				N/A
	Values within the range indicated by manufacturer	to		ms	N/A
9.17.3	Verification of the correct operation, in presence of a residual current, for RCBOs opening with delay in case of failure of the line voltage				--
	RCBO connected according to figure 4 at U_N				N/A
	All phases but one switched off by means of S_3				N/A
9.9.1.2	During the delay: Off-load tests at 20 ± 5°C				--
a)	Verification of the correct operation in case of a steady increase of residual current:	[mA]	[mA]	[mA]	--
	- Steady increase from 0,2 $I_{\Delta N}$ to $I_{\Delta N}$ within 30s Tripping current between $I_{\Delta N0}$ and $I_{\Delta N}$ (only if delay > 30s)				N/A
b)	Verification of the correct operation at closing on residual current (S_1 and S_2 closed) :	[ms]	[ms]	[ms]	--
	- The RCBO closes on $I_{\Delta N}$, no value exceeds the specified limiting value				N/A
c)	Verification of the correct operation in case of sudden appearance of residual current by closing S_1, (S_2 and RCBO in closed position):				N/A
	Maximum break times at:	[ms]	[ms]	[ms]	--
	- $I_{\Delta N}$				N/A
	- 2 $I_{\Delta N}$				N/A
	- 5 $I_{\Delta N}$ or				N/A
	- 0,25 A				N/A
	- $I_{\Delta t}$ _____ A				N/A
	No value exceeds the relevant specified limiting value				N/A

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Clause	Requirement + Test	Result - Remark			Verdict
d)	Verification of the correct operation in case of sudden appearance of residual current between 5 $I_{\Delta N}$ and 500A by closing S_2, (S_1 and RCBO in closed position):				N/A
	- ____A (value 1 between 5A and 200A)				N/A
	- ____A (value 1 between 5A and 200A)				N/A
	No value exceeds the relevant specified limiting value				N/A
	Additional test for type S:				--
	Minimum non-actuating time at:				--
	- $I_{\Delta N}$ ..... 0,13 s				N/A
	- 2 $I_{\Delta N}$ ..... 0,06 s				N/A
	- 5 $I_{\Delta N}$ ..... 0,05 s				N/A
	- $I_{\Delta t}$ ..... 0,04 s				N/A
	The test switch S_1 and the RCBO being in the closed position, the test voltage is suddenly established by closing the test switch S_2 for min. non-operating times acc. table 2				N/A
	No tripping during tests				N/A
9.17.4	Verification of the correct operation of RCBOs with 3 or 4 current paths, neutral and one line terminal only being energized in turn				--
	RCBO connected according to figure 4				N/A
9.9.1.2.c)	Verification of the correct operation in case of sudden appearance of residual current by closing S_1, (S_2 and RCBO in closed position):				
	Maximum break times at:	[ms]	[ms]	[ms]	--
	- $I_{\Delta N}$				N/A
	- 2 $I_{\Delta N}$				N/A
	- 5 $I_{\Delta N}$ or				N/A
	- 0,25 A				N/A
	- $I_{\Delta t}$ _____ A				N/A
	No value exceeds the relevant specified limiting value				N/A
	Additional test for type S:				--
	Minimum non-actuating time at:				--
	- $I_{\Delta N}$ ..... 0,13 s				N/A
	- 2 $I_{\Delta N}$ ..... 0,06 s				N/A

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Clause	Requirement + Test	Result - Remark			Verdict
	- 5 $I_{\Delta N}$ ..... 0,05 s				N/A
	- $I_{\Delta t}$ ..... 0,04 s				N/A
	The test switch S_1 and the RCBO being in the closed position, the test voltage is suddenly established by closing the test switch S_2 for min. non-operating times acc. table 2				N/A
	No tripping during tests				N/A
8.14	BEHAVIOUR OF RCBOS IN CASE OF CURRENT SURGES CAUSED BY IMPULSE VOLTAGES				--
9.19.1	Current surge test for all RCBOs (0,5µs/100kHz ring wave test)				--
	One pole of the RCBO submitted to 10 surge current applications, polarity inverted after every two applications				N/A
	Peak value..... :	200A +10/-0% or (25A +10/-0% for $I_{\Delta N} \leq 10mA$)			--
	Virtual front time ..... :	0,5µs ± 30%			--
	Period of following oscillatory wave..... :	10µs ±20%			--
	Each successive reverse peak..... :	60% of preceding peak			--
	No tripping during tests	No trip			P
	After the test the RCBO shall trip with a test current of $I_{\Delta N}$	[ms]	[ms]	[ms]	--
		17	20	18	P
	Test switch S_2 and RCBO in the closed position, test voltage established by closing the test switch S_1				P
	No value exceed the relevant specified limiting value				P
9.19.2	Verification of behaviour at surge currents up to 3000A (8/20µs surge current test)				--
	One pole of the RCBO chosen at random, submitted to 10 surge current applications, polarity inverted after every two applications				P
	Peak value..... :	3000A +10/-0%			P
	Virtual front time ..... :	0,8µs ± 20%			P
	Virtual time of half value ..... :	20µs ± 20%			P
	Peak of reverse current..... :	less than 30 % of peak value			P
9.19.2.2	Test results for S-type RCBOs: No tripping during tests				P
9.19.2.3	Test results for RCBOs of the general type: During the test the RCBO may trip. After any tripping, the RCBO shall be re-closed				P

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Clause	Requirement + Test	Result - Remark			Verdict
	No tripping during tests				P
	After the test the RCBO shall trip with a test current of $I_{\Delta N}$	[ms]	[ms]	[ms]	P
					P
	Test switch S_2 and RCBO in the closed position, test voltage established by closing the test switch S_1				P
	No value exceed the relevant specified limiting value				P
9.12.13	Verification of the rated residual making and breaking capacity $I_{\Delta m}$				P
	$I_{\Delta m}$ (A) .....:	630A			--
	Test circuit according to figure .....:	8			--
	Cross-section (mm²).....:	25 mm²			--
	Grid distance a (mm).....:	35 mm			--
	Prospective current (A).....:	630 A			--
	Prospective current obtained (A).....:	643 A			--
	Power factor .....:	0.93…0.98			--
	Power factor obtained.....:	0.95			--
	I²t max sequence O-t-CO-t-CO	[KA²s]	[KA²s]	[KA²s]	--
		3.06	3.96	2.79	P
	Phases which do not carry the short circuit current during this test shall be connected to the supply voltage at the line terminals				P
	On each pole in turn excluding the switched neutral pole				P
	RCBOs functionally dependent on the line voltage supplied with rated voltage.				P
	No permanent arcing				P
	No flashover				P
	No blowing of fuse F				P
	No damage, polyethylene sheet shows no holes				P
9.12.13.2	The RCBO shall show no damage impairing their further use an shall be capable without maintenance to withstand the following tests:				P
9.7.3	Dielectric strength test of the main circuit:				--
	2 U_N (V) for 1 min .....:	2 U_N = V			--
	a)				P

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Clause	Requirement + Test	Result - Remark			Verdict
	b)				P
	c)				P
	d)				N/A
	e)				N/A
	No flashover or breakdown				P
	Making and breaking I_N at U_N				P
	The RCBO shall trip with a test current of 1,25 $I_{\Delta N}$ - break time not exceeding the value for $I_{\Delta N}$ in table 2	[ms]	[ms]	[ms]	--
		20	27	21	P
	Test switch S_2 and RCBO in the closed position, test voltage established by closing the test switch S_1.				P
	Additional tests for RCBOs functionally depending on line voltage if applicable:				N/A
9.17	VERIFICATION OF THE BEHAVIOUR OF RCBOS OPENING AUTOMATICALLY IN CASE OF FAILURE OF THE LINE VOLTAGE				N/A
9.17.1	Limiting value of the line voltage U_x				N/A
	U_N applied to the line terminals and progressively lowered to attain zero within about 30s until automatic opening occurs	[V]	[V]	[V]	N/A
	All values less than 0,85 U_N				N/A
	Tripping test:				N/A
	Test voltage (V)..... :	V			N/A
	Residual current $I_{\Delta N}$..... :	$I_{\Delta N}$ = A			N/A
	Time corresponding to value for $I_{\Delta N}$ in table 2	[ms]	N/A	[ms]	N/A
	No value exceeds the specified limiting values				N/A
	Not possible to close the apparatus by manual operating means below U_X				N/A
9.17.2	Verification of automatic opening in case of failure of the line voltage				P
	RCBO supplied with U_N and line voltage then switched off				P
	Time interval between switching off and opening of the main contacts:				P
	a) RCBOs opening without delay				P
	- no value exceeds 0,5 s				N/A
	b) RCBOs opening with delay				P
	values within the range indicated by manufacturer:	to ms			N/A

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Clause	Requirement + Test	Result - Remark	Verdict

9.17.3	Verification of the correct operation, in presence of a residual current, for RCBOs opening with delay in case of failure of the line voltage				--
	RCBO connected according to figure 4 at U_N				P
	All phases but one switched off by means of S_3				P
9.9.1.2	During the delay: Off-load tests at 20 ± 5°C				P
a)	Verification of the correct operation in case of a steady increase of residual current:	[mA]	[mA]	[mA]	--
	- Steady increase from 0,2 $I_{\Delta N}$ to $I_{\Delta N}$ within 30s Tripping current between $I_{\Delta N0}$ and $I_{\Delta N}$ (only if delay > 30s)	17.1 … 18.6	27.0 … 28.8	20.3 … 20.8	P
b)	Verification of the correct operation at closing on residual current (S_1 and S_2 closed) :	[ms]	[ms]	[ms]	--
	- The RCBO closes on $I_{\Delta N}$, no value exceeds the specified limiting value	20	19	19	P
c)	Verification of the correct operation in case of sudden appearance of residual current by closing S_1, (S_2 and RCBO in closed position):				P
	Maximum break times at:	[ms]	[ms]	[ms]	--
	- $I_{\Delta N}$	23	20	25	P
	- 2 $I_{\Delta N}$	20	20	23	P
	- 5 $I_{\Delta N}$ or	21	20	1	P
	- 0,25A				N/A
	- $I_{\Delta t}$ 315 A	17	21	21	P
	No value exceeds the relevant specified limiting value				N/A
d)	Verification of the correct operation in case of sudden appearance of residual current between 5 $I_{\Delta N}$ and 500A by closing S_2, (S_1 and RCBO in closed position):				N/A
	- 50 A (value 1 between 5A and 200A)	15	9	18	P
	- 200 A (value 1 between 5A and 200A)	11	20	17	P
	No value exceeds the relevant specified limiting value				P
	Additional test for type S:				--
	Minimum non-actuating time at:	[ms]	[ms]	[ms]	--
	- $I_{\Delta N}$ ..... 0,13 s				N/A
	- 2 $I_{\Delta N}$ ..... 0,06 s				N/A

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Clause	Requirement + Test	Result - Remark			Verdict
	- 5 $I_{\Delta N}$ ..... 0,05 s				N/A
	- $I_{\Delta t}$ ..... 0,04 s				N/A
	The test switch S_1 and the RCBO being in the closed position, the test voltage is suddenly established by closing the test switch S_2 for min. non-operating times acc. table 2				N/A
	No tripping during tests				N/A
9.17.4	Verification of the correct operation of RCBOs with 3 or 4 current paths, neutral and one line terminal only being energized in turn				N/A
	RCBO connected according to figure 4				N/A
9.9.1.2.c)	Maximum break times at:	[ms]	[ms]	[ms]	--
	- $I_{\Delta N}$				N/A
	- 2 $I_{\Delta N}$				N/A
	- 5 $I_{\Delta N}$ or				N/A
	- 0,25 A				N/A
	- $I_{\Delta t}$ _____ A				N/A
	No value exceeds the relevant specified limiting value				N/A
	Additional test for type S:				N/A
	Minimum non-actuating time at:	[ms]	[ms]	[ms]	--
	- $I_{\Delta N}$ ..... 0,13 s				N/A
	- 2 $I_{\Delta N}$ ..... 0,06 s				N/A
	- 5 $I_{\Delta N}$ ..... 0,05 s				N/A
	- $I_{\Delta t}$ ..... 0,04 s				N/A
	The test switch S_1 and the RCBO being in the closed position, the test voltage is suddenly established by closing the test switch S_2 for min. non-operating times acc. table 2				N/A
	No tripping during tests				N/A
8.11	TEST DEVICE				--
	RCBOs provided with a test device				P
	Ampere-turns produced when operating the test device do not exceed 2,5 times the ampere turns produced by $I_{\Delta N}$				P
	Not possible to energize the circuit on the load side by operating the test device when the RCBO is in the open position				P

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Clause	Requirement + Test	Result - Remark	Verdict

9.16	VERIFICATION OF THE OPERATION OF THE TEST DEVICE AT THE LIMITS OF RATED VOLTAGE				--
	a) RCBO at 0,85 U_N, test device actuated 25 times at intervals of 5s	204 V			P
	b) Test a) repeated at 1,1 U_N	264 V			P
	c) Test b) repeated, but only once, the operating means of the test device being held in the closed position for 30s				P
	RCBO operated at each test				P
	No change impairing further use				P
	TEST SEQUENCE "E"	**E1**	**E2**	**E3**	--
	Tests E_0				--
9.9	VERIFICATION OF THE OPERATING CHARACTERISTICS				--
9.9.2	Verification of the Operating characteristics under overcurrent conditions				--
	I_N (A) .....:	A			--
	Cross-section (mm²).....:	mm²			--
	Instantaneous tripping current (B / C / D).....:	D			--
9.9.2.1	Test of time-current characteristic				N/A
a)	Test current 1,13 I_N starting from cold for.....:	1,13 I_N = 71.2 A			--
	- 1 h ($I_N \leq$ 63 A)				P
	- 2 h ($I_N >$ 63 A)				N/A
	No tripping				P
	Then steadily increased within 5 s to 1,45 I_N.....:	1,45 I_N = A			--
	Tripping within	[min]	[min]	[min]	--
	- 1h (< 63 A)	1min16s	6min51s	30s	P
	- 2h (> 63 A)				N/A
b)	Test current 2,55 I_N starting from cold.....:	2,55 I_N = A			--
	Opening time not less than 1 s or more than	[s]	[s]	[s]	--
	- 60 s (≤ 32 A)				N/A
	- 120 s (> 32 A)	22.3	28.9	40.1	P
9.9.2.2	Test of instantaneous tripping:				P
a)	General test conditions				P
	For the lower values of the test current of 9.9.2.2.b), 9.9.2.2.c) and 9.9.2.2.d) respectively the test is made once, at any convenient voltage				P

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Clause	Requirement + Test	Result - Remark			Verdict
	For the upper value of the test current, the two following tests are carried out:				P
	- At any convenient voltage, one opening operation on each combination of two poles connected in series . The tripping time is measured and shall be within the limits of Table 10. test results see b) or c) or d)				P
	- At rated voltage U_0 (phase to neutral) with a power factor between 0,95 and 1 separately on each protected pole of the RCBO The sequence of operation is: O-t-CO-t-CO-t-CO Interval time: > 3 min.				P
	The tripping time of the O operation is measured	[s]	[s]	[s]	--
					N/A
	After each operation the indication means shall show the open position of the contacts				N/A
b)	☐ B				N/A
	Test current 3 I_N starting from cold.....:	3 I_N = A			--
		[s]	[s]	[s]	--
	- Opening time not less than 0,1 s				N/A
	Test current 5 I_N starting from cold.....:	5 I_N = A			--
		[s]	[s]	[s]	--
	- Tripping time less than 0,1 s				N/A
c)	☑ C				N/A
	Test current 5 I_N starting from cold.....:	5 I_N = 316 A			--
		[s]	[s]	[s]	--
	- Opening time not less than 0,1 s				P
	Test current 10 I_N starting from cold.....:	10 I_N = 635 A			--
		[s]	[s]	[s]	--
	- Tripping time less than 0,1 s	9.2ms	8.8ms	10.3ms	P
d)	☑ D				
	Test current 10 I_N starting from cold.....:	10 I_N = 630 A			--
		[s]	[s]	[s]	--
	- Opening time not less than 0,1 s				P
	Test current 20 I_N starting from cold.....:	20 I_N = 1280 A			
		[s]	[s]	[s]	--

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Clause	Requirement + Test	Result - Remark			Verdict
	- Tripping time less than 0,1 s	12.1ms	9.8ms	10.0ms	P
9.9.2.3	Test of effect of ambient temperature on the tripping characteristics:				P
a)	Ambient temperature of (- 5 ± 2)°C .....:	-5 °C			--
	Test current 1,13 I_N.....:	1,13 I_N = 71.2 A			--
	- passed for 1 h				P
	- passed for 2 h				N/A
	Current is then steadily increased within 5s to 1,9 I_N	1,9 I_N = A			--
	Tripping:	[min]	[min]	[min]	--
	- 1 h	1min19s	1mn09s	3min01s	P
	- 2 h				N/A
b)	Ambient temperature of (40 ± 2)°C .....:	40 °C			--
	Test current I_N	I_N = 63.0 A			--
	No tripping within				--
	- 1 h				P
	- 2 h				N/A
	Tests E_1				--
8	REQUIREMENTS FOR CONSTRUCTION AND OPERATION				--
8.8	RESISTANCE TO MECHANICAL SHOCK AND IMPACT				--
	RCBO' shall have adequate mechanical behaviour so as to withstand stresses imposed during installation and use				P
9.13	VERIFICATION TO RESISTANCE TO MECHANICAL SHOCK AND IMPACT				--
9.13.1	Mechanical shock				--
9.13.1.2	Test procedure:				--
	- 50 falls of 40 mm on one side				P
	- 50 falls on opposite side				P
	C turned through 90°				P
	- 50 falls on one side				P
	- 50 falls on opposite side				P
	No opening of RCBO during test				P

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Clause	Requirement + Test	Result - Remark	Verdict

9.13.2	Mechanical impact				--
	- 9.13.2.2 for RCBOs intended to be mounted on a rail				P
	- 9.13.2.3 for plug-in type RCBOs				P
9.13.2.1	Impact test:				P
	10 blows from a height of 10 cm				--
	No damage				P
9.13.2.2	RCBOs for rail mounting:				P
	- downward vertical force of 50 N for 1 min				P
	- upward vertical force of 50 N for 1 min				P
	RCBO shall not become loose during test and shall not show any damage impairing its further use				P
9.13.2.3	RCBOs of plug-in type				N/A
	Under consideration				--
9.12.11.3	Test at 1500 A:				--
	Prospective current of 1500 A				--
	Cross-section (mm²).....:	25 mm²			--
	Grid distance a (mm).....:	a = 35 mm			--
	Power factor 0,93 – 0,98 .....:	0.96			--
	Prospective current obtained.....:	1.54 kA			--
	Power factor .....:	0.96			--
	Test circuit: .....:	Figure			--
	I_{peak} (A) max. value .....:	1.92 kA			--
	Sequence: 6-O and 3-CO I²t max	[KA²s]	[KA²s]	[KA²s]	--
		12.2	11.0	12.6	P
	RCBOs functionally dependent on the line voltage supplied with rated voltage				P
	No permanent arcing				P
	No flash-over between poles or between poles and frame				P
	No blowing of fuse				P
	No damage, polyethylene sheet shows no holes				N/A
9.12.12	The RCBO shall show no damage impairing their further use an shall be capable without maintenance to withstand the following tests:				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

9.12.12.1.a)	leakage current across open contacts, according to 9.7.7.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The RCBO is in the open position	[mA]	[mA]	[mA]	--
	The leakage current shall not exceed 2 mA	<0.01	<0.01	<0.01	P
9.12.12.1.b)	The RCBO shall show no damage impairing their further use an shall be capable without maintenance to withstand the following tests:				--
	Dielectric strength test:				--
	Test voltage:				--
	a) 1500 V				P
	b) 1500 V				P
	c) 1500 V				P
	d) 1500 V				N/A
	e) 2000 V				N/A
	During these test, after the test has carried out under the conditions specified in 9.7.2 a), it shall be verified that the indicating means show the open position and during the test carried out under the conditions specified in 9.7.2 b) the indication means shall show the closed position				P
9.12.12.1	Test current equal to 0,85 times the conventional non-tripping current for:	60.8 A			--
	- 1h starting from cold				P
	- 2h				N/A
	Increasing the current within 5s to 1,1 times the conventional tripping current	100 A			--
	- tripping within	[min]	[min]	[min]	--
	- 1h (< 63 A)	39s	4min01s	1min27s	P
	- 2h (> 63 A)				NA/A
	TEST SEQUENCE "F"	**F1**	**F2**	**F3**	--
	Tests F_0				--
9.12	SHORT-CIRCUITS TEST				--
9.12.11.4	Test above 1500 A				P
b)	Test at service short-circuit capacity I_{cs}				P
	Service short-circuit capacity (A) .....:	A			--

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Clause	Requirement + Test	Result - Remark			Verdict
	Figure ..... :				--
	Cross-section (mm^2)..... :	mm^2			--
	Grid distance a (mm)..... :	mm			--
	Prospective current (A)..... :	A			--
	Prospective current obtained (A)..... :	A			--
	Power factor ..... :				--
	Power factor obtained..... :				--
	Sequence ..... :				--
	I_{peak} (A) max. value ..... :	A			--
	I^2t max. ..... :	[KA^2s]	[KA^2s]	[KA^2s]	--
					P
	RCBOs functionally dependent on the line voltage supplied with rated voltage				N/A
	No permanent arcing				P
	No flash-over between poles or between poles and frame				P
	No blowing of fuse				N/A
	No damage, polyethylene sheet shows no holes				P
9.12.12	The RCBO shall show no damage impairing their further use an shall be capable without maintenance to withstand the following tests:				P
9.12.12.1.a)	Leakage current across open contacts, according to 9.7.7.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The RCBO is in the open position	[mA]	[mA]	[mA]	--
	The leakage current shall not exceed 2 mA	<0.01	<0.01	<0.01	P
9.12.12.1.b)	Dielectric strength test:				--
	Test voltage:				--
	a) 1500 V				P
	b) 1500 V				P
	c) 1500 V				P
	d) 1500 V				N/A
	e) 2000 V				N/A

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IEC 61009-1					
Clause	Requirement + Test	Result - Remark			Verdict
	During these test, after the test has carried out under the conditions specified in 9.7.2 a), it shall be verified that the indicating means show the open position and during the test carried out under the conditions specified in 9.7.2 b) the indication means shall show the closed position				P
	Test current equal to 0,85 times the conventional non-tripping current for:	60.8 A			--
	- 1h starting from cold				P
	- 2h				P
	Increasing the current within 5s to 1,1 times the conventional tripping current	100 A			--
	- tripping within	[min]	[min]	[min]	--
	- 1h (< 63 A)				N/A
	- 2h (> 63 A)				N/A
					N/A
	Tests F_1				--
9.12	SHORT-CIRCUITS TEST				--
9.12.11.4	Test above 1500 A				P
c)	Test at rated short-circuit capacity I_{cn}				P
	Rated short-circuit capacity (A) .....:	6000 A			--
	Figure .....:	8			--
	Cross-section (mm²).....:	25 mm²			--
	Grid distance a (mm).....:	40 mm			--
	Prospective current (A).....:	6000 A			--
	Prospective current obtained (A).....:	6130 A			--
	Power factor .....:	0.65…0.70			--
	Power factor obtained.....:	0.68			--
	Sequence .....:	O-t-CO			--
	I_{peak} (A) max. value .....:	4.56 kA			--
	I^2t max. .....:	[KA²s]	[KA²s]	[KA²s]	--
		44.5	56.7	34.7	N/A
	RCBOs functionally dependent on the line voltage supplied with rated voltage				N/A
	No permanent arcing				N/A
	No flash-over between poles or between poles and frame				N/A

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IEC 61009-1					
Clause	Requirement + Test	Result - Remark			Verdict
	No blowing of fuse				N/A
	No damage, polyethylene sheet shows no holes				N/A
9.12.12	The RCBO shall show no damage impairing their further use an shall be capable without maintenance to withstand the following tests:				P
9.12.12.2.a)	Leakage current across open contacts, according to 9.7.7.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The RCBO is in the open position	[mA]	[mA]	[mA]	--
	The leakage current shall not exceed 2 mA	<0.01	<0.01	<0.01	P
9.12.12.2.b)	Dielectric strength test:				--
	Test voltage:				--
	a) 900 V				P
	b) 900 V				N/A
	c) 900 V				N/A
	d) 900 V				P
	e) 900 V				N/A
	During these test, after the test has carried out under the conditions specified in 9.7.2 a), it shall be verified that the indicating means show the open position and during the test carried out under the conditions specified in 9.7.2 b) the indication means shall show the closed position				P
9.12.12.2.c)	Test current 2,8 I_N.....:	2,8 I_N = A			--
	Tripping within > 0,1 s up to	[s]	[s]	[s]	--
	- 60 s				N/A
	- 120 s				N/A
					N/A
	TEST SEQUENCE "G"	**G1**	**G2**	**G3**	
9.22	VERIFICATION OF RELIABILITY				--
9.22.1	Climatic test				--
	Based on IEC 60068-2-30 taking into account IEC 60068-3-4				P
	28 cycles				P
	Upper temperature 55°C ± 2°C				P
	Initial verification:	[ms]	[ms]	[ms]	--
	Maximum break time at $I_{\Delta N}$	23	29	25	P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

	Test switch S_2 and RCBO in the closed position, test voltage established by closing the test switch S_1.				P
	No value exceeds the specified limiting value				P
	Additional test for type S:				N/A
	Maximum non-actuating time at $I_{\Delta N}$				N/A
	No tripping				N/A
	The test switch S_1 and the RCBO being in the closed position, the test voltage is suddenly established by closing the test switch S_2 for min. non-operating times acc. table 2				N/A
	Climatic test:				--
	No tripping during 28 cycles				P
9.22.1.5	Final verification:				
	The RCBO shall trip with a test current of 1,25 $I_{\Delta N}$ in the test chamber - break time not exceeding the value for $I_{\Delta N}$ in table 2	[ms]	[ms]	[ms]	--
		20	24	19	P
	Test switch S_2 and RCBO in the closed position, test voltage established by closing the test switch S_1.				P
	TEST SEQUENCE "H"	**H1**	**H2**	**H3**	--
IEC 61543:					P
Table 4-T1.1	Harmonics, interharmonics				P
Table 4-T1.2	Signalling voltage				P
Table 5-T2.3	Conducted unidirectional transients of the ms and µs time scale				N/A
	Test results of test sequence H:				--
	see test report No. ..... :				N/A
	Testing location / address ..... :				P
					N/A
					P
	TEST SEQUENCE "I"	**I1**	**I2**	**I3**	--
IEC 61543:					P
Table 5-T2.1	Conducted sine-wave voltages or currents				N/A
Table 5-T2.5	Radiated high-frequency phenomena				P
Table 5-T2.2	Fast transients (burst)				N/A
	Test results of test sequence I:				--
	see test report No. ..... :				P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Testing location / address ..... :		N/A
	TEST SEQUENCE "J"	**J1 J2 J3**	--
IEC 61543:			P
Table 5-T2.6	Conducted common mode disturbances in the frequency range lower than 150 kHz		N/A
Table 6-T3.1	Electrostatic discharges		N/A
	Test results of test sequence J:		--
	see test report No. ..... :		N/A
	Testing location / address ..... :		P
			N/A
			P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX A (NORMATIVE)

Test sequence and number of samples to be submitted for certification purposes
Table A.1 - Test sequences

Test sequence		Clause or subclause	Test (or inspection)
A	A_1	6 8.1.1 8.1.2 9.3 8.1.3 8.1.6 9.11 9.4 9.5 9.6 9.14 8.1.3 9.25	Marking General Mechanism Indelibility of marking Clearance and creepage distances (external parts only) Non-interchangeability Trip free mechanism Reliability of screws, current-carrying parts and connections Reliability of terminals for external conductors Protection against electric shock Resistance to heat Clearances and creepage distances (internal parts) Resistance to rusting
	A_2	9.15	Resistance to abnormal heat and fire
B		9.7.7.4 9.7.7.5 a) 9.7.1 9.7.2 9.7.3 9.7.4 9.7.7.2 9.7.5 9.7.6 9.8 9.22.2 9.23	Resistance of the insulation of open contacts and basic insulation against an impulse voltage in normal conditions Verification of the behaviour of components bridging the basic insulation Resistance to humidity Insulation resistance of the main circuit Dielectric strength of the main circuit Insulation resistance an dielectric strength of auxiliary circuits Verification of clearances with the impulse withstand voltage Secondary circuit of detection transformers Capability of control circuits connected to the main circuits Temperature-rise Reliability at 40°C Ageing of electronic components
C	C_1	9.10 9.12.11.2.1 (and 9.12.12)	Mechanical and electrical endurance Performance at reduced short-circuit currents (Verification of the RCBO after short-circuit tests)
	C_2	9.12.11.2.2 (and 9.12.12)	Short-circuit test for verifying the suitability of RCBOs for use in IT systems (Verification of the RCBO after short-circuit tests)
D	D_0	9.9.1	Operating characteristics under residual current conditions
	D_1	9.17 9.19 9.12.13 9.16	Behaviour in case of failure of the line voltage Behaviour in case of surge currents Performance at $I_{\Delta m}$ Test device
E	E_0	9.9.2	Overcurrent operating characteristics
	E_1	9.13 9.12.11.3 (and 9.12.12)	Resistance to mechanical shock and impact Short-circuit performance at 1500 A
F	F_0	9.12.11.4 b) (and 9.12.12)	Performance at service short-circuit capacity
	F_1	9.12.11.4 c) (and 9.12.12.2)	Performance at rated short-circuit capacity
G		9.22.1	Reliability (climatic tests)
H a) b)		IEC 61543 Table 4-T1.1 IEC 61543 Table 4-T1.2 IEC 61543 Table 5-T2.3	Harmonics, inter harmonics Signalling voltages Conducted unidirectional transients of the ms and μs time scale
I		IEC 61543 Table 5-T2.1 IEC 61543 Table 5-T2.5 IEC 61543 Table 5-T2.2	Conducted sine-wave voltages or currents Radiated electromagnetic field Fast transients (burst)
J		IEC 61543 Table 5-T2.6 IEC 61543 Table 6-T3.1	Conducted common mode disturbances in the frequency range lower than 150 kHz Electrostatic discharges

a) This test may be done on separate samples.

b) 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 this sequence.

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

Table A.2 - Number of samples for full test procedure			
Test sequence	Number of samples	Minimum number of accepted samples (a) (b)	number of samples for repeated tests (c)
A_1	1	1	--
A_2	3	2	3
B	3	2	3
C_1	3	2 (d)	3
C_2	3	2 (d)	3
D	3	2 (d)	3
E	3	2 (d)	3
F_0	3	2 (d)	3
F_1	3	2 (d)	3
G	3	2	3
H (e)	3	2	3
I (e)	3	2	3
J (e)	3	2	3

a) In total a maximum of three test sequences may be repeated.

b) It is assumed that a sample which has not passed a test has not met the requirements due to workmanship or assembly defects which are not representative of the design.

c) In the case of repeated tests, all test results must be acceptable.

d) Except for test of 9.12.10, 9.12.11.2, 9.12.11.3, 9.12.11.4, 9.12.13 as appropriate, which all samples shall pass.

e) At the manufacturer's request, the same set of samples may be subjected to more than one of these test sequences.

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

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

Test sequence	Number of samples according to the number of poles [a) g)]		
	2-poles [b) c)]	3-poles [d) f) j)]	4-poles [e)]
A_1	1 max. rating I_N min. rating $I_{\Delta N}$	1 max. rating I_N min. rating $I_{\Delta N}$	1 max. rating I_N min. rating $I_{\Delta N}$
A_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 $I_{\Delta N}$
B	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 $I_{\Delta N}$
C	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 $I_{\Delta N}$
$D_0 + D_1$	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 $I_{\Delta N}$
D_0	1 for all other ratings of $I_{\Delta N}$ with max. I_N		
$E_0 + E_1$	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 $I_{\Delta N}$
E_0	1 [i)] for all other ratings of I_N with min. $I_{\Delta N}$		
F_0	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 $I_{\Delta N}$
F_1	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 $I_{\Delta N}$
G	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 [k)]			3 [h)] samples of the same rating I_N chosen at random min. rating $I_{\Delta N}$
I			3 [h)] samples of the same rating I_N chosen at random min. rating $I_{\Delta N}$
J			3 [h)] samples of the same rating I_N chosen at random min. rating $I_{\Delta N}$

a) If a test is to be repeated according to the minimum performance criteria of clause A.2, a new set of samples is used for the relevant test. In the repeated test all test results must be acceptable.
b) If only 3-pole or 4-pole RCBOs are submitted, this column shall also apply to a set of samples with the smallest number of poles.
c) Also applicable to 1-pole RCBOs with uninterrupted neutral and 2-pole RCBOs with 1 protected pole.
d) Also applicable to 3-pole RCBOs with two protected poles
e) Also applicable to 3-pole RCBOs with uninterrupted neutral and 4-pole RCBOs with 3 protected poles.
f) This column is omitted when 4-pole RCBOs have been tested.
g) If only one value of $I_{\Delta N}$ is submitted, min. rating $I_{\Delta N}$ and max. rating $I_{\Delta N}$ are replaced by $I_{\Delta N}$.
h) Only the highest number of current paths.
i) For this sequence only the test of 9.9.2 is required.
j) If a 3-pole RCBO with 4 current paths and a 4-pole RCBO are submitted, then only the 4-pole RCBO is tested, with exception of the test of 9.8 of test sequence B for which both types are submitted to the test.
k) 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.

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

Table A.4 - Test sequences for RCBOs having different instantaneous tripping currents

RCBO type tested first	Test sequences for other RCBO types		
	B-type	C-type	D-type
B-type	---	$(E_0 + E_1) + F$	$(E_0 + E_1) + F$
C-type	E_0 a) + B a)	---	$(E_0 + E_1) + F$
D-type	E_0 a) + B a)	E_0 a) + B a) b)	---

a) For this sequence only the tests of 9.8 and 9.9.2.2 are required.

b) When certification is requested at the same time for B-type, C-type and D-type RCBOs having the same rated short-circuit capacity, only test sequence E0 is required if B-type and D-type samples have been tested.

Table A.5 - Test sequences for RCBOs of different classification according to 4.6

Test sequence	Number of samples according to the number of poles a)		
	2-pole b) c)	3-pole d) f)	4-pole e)
$D_0 + D_1$	1 max. rating I_N min. rating $I_{\Delta N}$	1 max. rating I_N min. rating $I_{\Delta N}$	1 max. rating I_N min. rating $I_{\Delta N}$
D_0	1 for all other ratings of $I_{\Delta N}$ with max. $I_{\Delta N}$		

a) If a test is to be repeated according to the minimum performance criteria of clause A.2, a new set of samples is used for the relevant test. In the repeated test all test results must be acceptable.

b) If only 3-pole or 4-pole RCBOs are submitted, this column shall also apply to a set of samples with the smallest number of poles.

c) Also applicable to 1-pole RCBOs with uninterrupted neutral and to 2-pole RCBOs with 1 protected pole.

d) Also applicable to 3-pole RCBOs with 2 protected poles

e) Also applicable to 3-pole RCBOs with uninterrupted neutral and to 4-pole RCBOs with 3 protected poles.

f) This column is omitted when 4-pole RCBOs have been tested.

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX B DETERMINATION OF CLEARANCES AND CREEPAGE DISTANCES	--
B.1	General	--
	In determining clearances and creepage distances, it is recommended that the following points should be considered.	P
B.2	Orientation and location of a creepage distance	--
	If necessary, the manufacturer shall indicate the intended orientation of the equipment or component in order that creepage distances be not adversely affected by the accumulation of pollution for which they were not designed.	P
B.3	Creepage distances where more than one material is used	--
	A creepage distance may be split in several portions of different materials and/or have different pollution degrees if one of the creepage distances is dimensioned to withstand the total voltage or if the total distance is dimensioned according to the material having the lowest CTI.	P
B.4	Creepage distances split by floating conductive part	--
	A creepage distance may be split into several parts, made with insulation material having the same CTI, including or separated by floating conductors as long as the sum of the distances across each individual part is equal or greater than the creepage distance required if the floating part did not exist. The minimum distance X for each individual part of the creepage distance is given in IEC 60664-1:2007, 6.2 (see also Example 11 in Figure B.1).	P
B.5	Measurement of creepage distances and clearances	--
	In determining creepage distances according to IEC 60664-1, the dimension *X*, specified in the following examples, has a minimum value of 1,0 mm for pollution degree 2.	P
	If the associated clearance is less than 3 mm, the minimum dimension *X* may be reduced to one third of this clearance.	P
	The methods of measuring creepage distances and clearances are indicated in Figure B.1. These cases do not differentiate between gaps and grooves or between types of insulation.	P
	The following assumptions are made:	P
	- any recess is assumed to be bridged with an insulating link having a length equal to the specified width *X* and being placed in the most unfavourable position (see Example 3);	P
	- where the distance across a groove is equal to or larger than the specified width *X*, the creepage distance is measured along the contours of the groove (see Example 2);	P
	- creepage distances and clearances measured between parts which can assume different positions in relation to each other, are measured when these parts are in their most unfavourable position.	N/A

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX C ARRANGEMENT FOR THE DETECTION OF THE EMISSION OF IONIZED GASES DURING SHORT-CIRCUIT TESTS	
	The device under test is mounted as shown in figure C.1, which may require adapting to the specific design of the device, and in accordance with the manufacturer's instructions.	N/A
	When required (i.e. during "O" operations), a clear polyethylene sheet (0,05 ± 0,01) mm thick, of a size at least 50 mm larger, in each direction, than the overall dimensions of the front face of the device but not less than 200 mm × 200 mm, is fixed and reasonably stretched in a frame, placed at a distance of 10 mm from	N/A
	– either the maximum projection of the operating means of a device without recess for the operating means;	P
	– or the rim of a recess for the operating means of a device with recess for the operating means.	P
	The sheet should have the following physical properties: Density at 23 °C: 0,92 ± 0,05 g/cm³ Melting-point: 110 °C – 120 °C.	N/A
	When required, a barrier of insulating material, at least 2 mm thick, is placed, as shown in figure C.1, between the arc vent and the polyethylene sheet to prevent damage of the sheet due to hot particles emitted from the arc vent.	P
	When required, a grid (or grids) according to figure C.2 is (are) placed at a distance of "a" mm from each arc vent side of the device.	P
	The grid circuit (see figure C.3) shall be connected to the points B and C (see figures 7 or 8, as applicable).	N/A
	The parameters for the grid circuit are as follows:	P
	Resistor R': 1,5 Ω	N/A
	Copper wire F': length 50 mm, and diameter as required in 9.12.9.1.	P

IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX D ROUTINE TESTS				--
D.1	General				--
	The tests specified in this standard are intended to reveal, as far as safety is concerned, unacceptable variations in material or manufacture.				P
	In general, further tests have to be made to ensure that every RCBO conforms with the samples that withstood the tests of this standard, according to the experience gained by the manufacturer.				N/A
D.2	Tripping test				--
	A residual current is passed through each pole of the RCBO in turn. The RCBO shall not trip at a current less than or equal to 0,5 $I_{\Delta N}$, but it shall trip at $I_{\Delta N}$ within a specified time (see Table 2).	[ms]	[ms]	[ms]	P
					N/A
	The test current shall be applied at least five times to each RCBO and shall be applied at least twice to each pole.				N/A
D.3	Electric strength test				--
	A voltage of substantially sine-wave form of 1 500 V having a frequency of 50 Hz/60 Hz is applied for 1 s as follows:				P
	a) with the RCBO in the open position, between the terminals which are electrically connected together, when the RCBO is in the closed position				N/A
	b) for RCBOs not incorporating electronic components, with the RCBO in the closed position, between each pole in turn and the others connected together				P
	c) for RCBOs incorporating electronic components, with the RCBO in the open position, either between all incoming terminals of poles in turn or between all outgoing terminals of poles in turn, depending on the position of the electronic components.				P
	No flashover or breakdown shall occur				P
D.4	Performance of the test device				--
	With the RCBO in the closed position, and connected to a supply at the appropriate voltage, the test device, when operated, shall open the RCBO.				P
	Where the test device is intended to operate at more than one value of rated voltage, the test shall be made at the lowest value of rated voltage.				P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	ANNEX E SPECIAL REQUIREMENTS FOR AUXILIARY CIRCUITS FOR SAFETY EXTRA-LOW VOLTAGE		--
8.1.3	Clearances and creepage distances		--
	Live parts separated from circuits of higher voltage in accordance with IEC 60364-4-41 subclause 414.4.3		P
9.7.4	Insulation resistance and dielectric strength of auxiliary circuits		--
	Under consideration		--
	ANNEX F COORDINATION BETWEEN RCBOS AND SEPARATE FUSES ASSOCIATED IN THE SAME CIRCUIT		--
	The information given in Annex D of IEC 60898-1:2002 to ensure coordination between circuit-breakers and separate fuses associated in the same circuit may also be applicable to ensure coordination between RCBOs and separate fuses associated in the same circuit.		P

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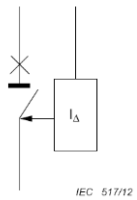
IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

G	**ANNEX G Additional requirements and tests for RCBOs consisting of a circuit-breaker and a residual current unit designed for assembly on site**		
G.4	MARKING AND OTHER PRODUCT INFORMATION		P
G.4.1	MANUFACTURERS NAME OR TRADEMARK		P
	Circuit-breaker and r.c.-unit bear the same manufacturers name or trade mark		P
G.4.2	MARKING		--
G.4.2.1	Marking of the circuit-breaker:		--
	Circuit-breakers comply with IEC 60898		P
G.4.2.2	Marking of the r.c.-unit:		--
	R.c.-unit marked with items a), b), c), e), f), g), k), m), n), q) and if necessary l) according to clause 6		N/A
	Addition:		N/A
	- max. rated current of circuit-breaker for assembling		P
	- Symbol 		P
G.4.2.3	Marking of assembled circuit-breaker and r.c.-unit:		P
	Not visible after assembly on r.c unit:		N/A
	- c)		N/A
	- max. rated current of circuit-breaker for assembling		P
	visible after assembly:		P
	- l) if applicable		N/A
G.4.3	INSTRUCTIONS FOR ASSEMBLY AND OPERATION		P
	Adequate instructions with the r.c. -unit provided		P
	Instructions shall cover at least:		P
	- reference to type(s) and catalogue-no, covering current and voltage ratings, number of poles, of circuit breakers for assembling		N/A
	- derating factors, if any		P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- checking of operation		P
	- verification of tripping operation by use of test button		P
G.5	CONSTRUCTIONAL REQUIREMENTS		P
G.5.1	GENERAL		--
	possible to assemble the RCBO on site only		P
	device may be disassembled on site in accordance with the manufacturer's instructions		P
	For devices declared not suitable for disassembling, the disassembly shall leave permanent visible damage.		N/A
	Compliance is checked according to G.6.4		P
G.5.2	DEGREE OF PROTECTION		--
	Degree of protection of r.c.-unit not less than of circuit-breaker for assembling		N/A
G.5.3	MECHANICAL REQUIREMENTS		--
	Design is such as to prevent incorrect assembly		P
	No loose parts for coupling the tripping mechanisms		N/A
	Fixing means are captive		P
G.5.4	ELECTRICAL COMPATIBILITY		--
	Not possible to assemble a circuit-breaker with a r.c.-unit		N/A
	- of lower rated voltage		P
	- of lower max. current		N/A
	Terminals of r.c.-unit able to clamp nominal cross-sections acc. to table IV of IEC 898 for rated currents of circuit-breakers to be assembled		P
	I_N (A) ..... :	A	N/A
	Cross section (mm²) ..... :	to mm²	P
	Electrical interconnections form part of the r.c.-unit		P
	Not possible to assemble a circuit-breaker with given rated short circuit capacity with a r.c.-unit such as to result in a lower short circuit performance		N/A
	Compliance is checked by inspection and manual test.		N/A
G.6	TYPE TESTS AND VERIFICATIONS		--

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
G.6.2	TEST ON R.C.-UNITS		--
	According to table 10:		P
	- 9.3 / 9.4 / 9.5/		P
	- 9.11 if applicable		P
	- 9.14 / 9.15		P
G.6.3	TESTS ON ASSEMBLED CIRCUIT-BREAKER AND R.C.-UNIT (RCBO)		P
	According to table 10 except:		P
	- 9.3 / 9.5 / 9.9.2.3 / 9.14 / 9.15 do not apply		P
	- 9.4 made on interconnections		N/A
	- 9.12 applies except of 9.12.11.3 unless I_{cn} = 1500 A and of 9.12.11.4 b)		P
	- Conventional non-tripping current 1,13 I_n replaced everywhere by I_n		N/A
G.6.4	VERIFICATION OF MARKING AND CONSTRUCTIONAL REQUIREMENTS OF RCBOS		--
	Compliance with the requirements of G.4.1, G.4.2, G.4.3, G.5.1, G.5.2, G.5.3 and G.5.4 shall be checked by inspection and manual test, as applicable.		P
	For devices declared suitable to be disassembled, compliance with the requirements of G.5.1 is checked by the following test to be performed at the beginning of test sequence D_0 in Table A.1.		N/A
	number of samples acc. D_0+D_1 in Table A.3.		N/A
	The r.c. unit and compatible circuit-breakers as declared by the manufacturer have to be assembled and disassembled five times. The r.c. unit and the compatible circuit breaker are then reassembled and used for the test of test sequence D_0. After each assembly the correct operation of the combination shall be verified by using the test button. The RCBO shall trip each time.		P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

J	**ANNEX J** **Particular requirements for RCBOs with screwless type terminals for external copper conductors**		P
J.1	This annex applies to RCBOs within the scope of Clause 1, equipped with screwless terminals, for current not exceeding 20 A primarily suitable for connecting unprepared (see J.3.6) copper conductors of cross-section up to 4 mm^2.		--
J.6	Marking and other product information		--
	in addition to clause 6:		P
	universal terminals:		N/A
	no markings		P
	non-universal terminals:		P
	terminals for rigid-solid conductors marked by “sol”		N/A
	terminals for rigid (solid and stranded) conductors marked by “r”		N/A
	terminals for flexible conductors marked by “f”		P
	Marking on the RCBO or		N/A
	if the space available is not sufficient on the smallest package unit or in technical information		N/A
	Marking indicating the length of insulation to be removed before insertion of the conductor into the terminal shown on the RCBO		P
	Manufacturer shall provide information in his literature, on the maximum number of conductors which may be clamped.		N/A
J.8	Standard conditions for operating in service and for installation		P
	clause 8 applies with the following modifications: in 8.1.5, only 8.1.5.1, 8.1.5.2, 8.1.5.3, 8.1.5.6 and 8.1.5.7 apply		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2 of this annex, instead of 9.4 and 9.5.		P
J.8.1	Connection or disconnection of conductors		P
	The connection or disconnection of conductors shall be made:		P
	- by the use of a general purpose tool or by a convenient device integral with the terminal to open it and to assist the insertion or the withdrawal of the conductors (e.g. for universal terminals)		P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- or, for rigid conductors by simple insertion. For the disconnection of the conductors an operation other than a pull on the conductor shall be necessary (e.g. for push-wire terminals).		P
	Universal terminals shall accept rigid (solid or stranded) and flexible unprepared conductors.		P
	Non-universal terminals shall accept the types of conductors declared by the manufacturer.		P
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2.		P
J.8.2	Dimensions of connectable conductors		P
	The dimensions of connectable conductors are given in Table J.1.		
	The ability to connect these conductors shall be checked by inspection and by the tests of J.9.1 and J.9.2.		P
J.8.3	Connectable cross-sectional areas		N/A
	nominal cross-sections to be clamped acc. table J.2		N/A
	compliance checked by inspection and tests of J.9.1 and J.9.2.		N/A
J.8.5	Design and construction of terminals		P
	terminals so designed and constructed that:		P
	- each conductor clamped individually		P
	- during operation of connection or disconnection the conductors can be connected or disconnected either at the same time or separately		N/A
	- inadequate insertion of the conductor is avoided		N/A
	It shall be possible to clamp securely any number of conductors up to the maximum provided for		P
	compliance checked by inspection and tests of J.9.1 and J.9.2.		N/A
J.8.6	Resistance to ageing		--
	compliance checked by the test of J.9.3.		N/A
J.9	Tests		--
	Clause 9 applies, by replacing 9.4 and 9.5 by the following tests		N/A
J.9.1	Test of reliability of screwless terminals		--
J.9.1.1	Reliability of screwless system		N/A

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	three terminals of poles of new samples, with copper conductors of the rated cross sectional area in accordance with Table J.2, types of conductors in accordance with J.8.1.		N/A
	The connection and subsequent disconnection shall be made five times with:		N/A
	Min. cross-section (mm²).....:	mm²	N/A
	Max. cross-section (mm²).....:	mm²	N/A
	new conductors used each time, except for the fifth time, when the conductor used for the fourth insertion is clamped at the same place. Before insertion into the terminal, wires of stranded rigid conductors re-shaped and wires of flexible conductors twisted to consolidate the ends.		N/A
	After each insertion, the conductor being inserted rotated 90 ° along its axis at the level of the clamped section and subsequently disconnected.		N/A
	After tests, the terminal not damaged in such a way as to impair its further use.		N/A
J.9.1.2	Test of reliability of connection		--
	three terminals of poles of new samples, with copper conductors of the rated cross sectional area in accordance with Table J.2, types of conductors in accordance with J.8.1.		N/A
	Before insertion into the terminal, wires of stranded rigid conductors and flexible conductors reshaped and wires of flexible conductors twisted to consolidate the ends.		N/A
	possible to fit the conductor into the terminal without undue force in the case of universal terminals and with the force necessary by hand in the case of push-wire terminals.		N/A
	conductor pushed as far as possible into the terminal or inserted so that adequate connection is obvious.		N/A
	Min. cross-section (mm²).....:	mm²	N/A
	Max. cross-section (mm²).....:	mm²	N/A
	After the test, no wire of the conductor shall have escaped outside the terminal.		N/A
J.9.2	Tests of reliability of terminals for external conductors: mechanical strength		--

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

	three terminals of poles of new samples fitted with new conductors of the type and of the minimum and maximum cross-sectional areas acc. Table J.2.				N/A
	Min. cross-section (mm²)..... :	mm²			N/A
	Max. cross-section (mm²)..... :	mm²			N/A
	wires of stranded rigid conductors and flexible conductors reshaped and wires of flexible conductors twisted to consolidate the ends.				N/A
	Pull for 1 min, min. cross-section (N) ..... :	N			N/A
	Pull for 1 min, max. cross-section (N) ..... :	N			N/A
	During the test no noticeable move of conductor				N/A
J.9.3	Cycling test				--
	Universal, rigid conductors - 3 samples Universal, flexible conductors - 3 samples				N/A
	Non-universal, solid conductors - 3 samples				N/A
	Non-universal, rigid (solid) stranded conductors - 3 samples Non-universal, rigid (stranded) stranded conductors - 3 samples				N/A
	Non-universal, flexible conductors - 3 samples				N/A
	Cross-section (mm²)..... :	mm²			N/A
	Test current I_N (A) ..... :	A			N/A
	samples subjected to 192 temperature cycles				N/A
	Voltage drop after 192 cycles:				--
	voltage drop, measured at each terminal, at the end of the 192nd cycle, exceeded not the smaller of the two following values:				N/A
	– 22,5 mV				N/A
	– 1,5 times the value measured after the 24th cycle				N/A
		sample 1	sample 2	sample 3	--
		[mV]	[mV]	[mV]	--
	- rigid solid conductors..... :				N/A
	- rigid stranded conductors..... :				N/A
	- flexible conductors..... :				N/A
	Voltage drop after 24th cycle:				--
		sample 1	sample 2	sample 3	--
		[mV]	[mV]	[mV]	--
	- rigid solid conductors..... :				N/A

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IEC 61009-1					
Clause	Requirement + Test	Result - Remark			Verdict
	- rigid stranded conductors..... :				N/A
	- flexible conductors..... :				N/A
	after this test: no changes evidently impairing further use, such as cracks, deformations or the like.				N/A

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict

K	**ANNEX K** **Particular requirements for RCBOs with flat quick-connect terminations**		P
K.1	This annex applies to RCBOs within the scope of Clause 1, equipped with flat quick-connect terminations consisting of a male tab (see K.3.2) with nominal width 6,3 mm and thickness0,8 mm, to be used with a mating female connector for connecting electrical copper conductors according to the manufacturer's instructions, for rated currents up to and including 16 A.		--
K.6	Marking and other product information		--
	in addition to clause 6, addition after the lettered item k):		--
	Information regarding the female connector acc. to IEC 61210 and type of conductor to be used shall be given in the manufacturers' instructions:		P
	l) manufacturer´s name or trade mark		P
	m) type reference		P
	n) information on cross-sections of conductors and colour code of insulated female connectors (see Table K.1)		P
	o) the use of only silver or tin-plated copper alloys		P
K.8	Requirements for construction and operation		--
	Clause 8 applies, with the following exceptions:		P
	subclause 8.1.3 applies, the female connectors being fitted to the male tabs of the RCBO		P
	replace the contents of 8.1.5 by the following:		P
K.8.2	Terminals for external conductors		--
K.8.2.1	Male tabs and female connectors shall be of a metal having mechanical strength, electrical conductivity and resistance to corrosion adequate for their intended use.		P
K.8.2.2	The nominal width of the male tab is 6,3 mm and the thickness 0,8 mm, applicable to rated currents up to and including 16 A. NOTE 1:The use for rated currents up to and including 20 A is accepted in BE, FR, IT, PT, ES and US		P
	The dimensions of the male tab shall comply with those specified in Table K.3 and in figures K.2, K.3, K.4 and K.5		P

		Dimensions of tabs according Table K.3		Measured in mm	--
		Minimum [mm]	Maximum [mm]		--
A	Dimple	0,7	1,0		P

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IEC 61009-1						
Clause	Requirement + Test			Result - Remark		Verdict
	Hole	0,5	1,0			P
B	Dimple	7,8 min				P
	Hole	7,8 min				P
C	Dimple	0,77	0,84			P
	Hole	0,77	0,84			P
D	Dimple	6,20	6,40			P
	Hole	6,20	6,40			P
E	Dimple	3,6	4,1			P
	Hole	4,3	4,7			P
F	Dimple	1,6	2,0			P
	Hole	1,6	2,0			P
J	Dimple	8°	12°			P
	Hole	8°	12°			P
M	Dimple	2,2	2,5			P
	Hole	---	---			---
N	Dimple	1,8	2,0			P
	Hole	---	---			---
P	Dimple	0,7	1,8			P
	Hole	0,7	1,8			P
Q	Dimple	8,9 min	---			---
	Hole	8,9 min	---			---
	Dimensions of the female connector which may be fitted-on are given in Figure K.6 and in Table K.4.					P
				--	request acc. table K.3	measured value	--
				B_3 max	7,8mm		P
				L_2 max	3,5mm		P
K.9	Tests						--
	clause 9 applies with the following modifications:						P
	replace the contents of 9.5 by the following text:						P
K.9.1	Mechanical overload-force						--
	Test done on 10 terminals of RCBOs, mounted as in normal use when wiring takes place.						P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Axial push force, and successively the axial pull force gradually applied to the male tab integrated in the RCBO		P
	Push 96N		P
	Pull 88N		P
	No damage occurred to the tab or to the RCBO in which the tab is integrated.		P
	addition to 9.8.3:		P
	Fine -wire thermocouples shall be placed in such a way as not to influence the contact or the connection area. An example of placement is shown in fig K.1		P
L	**ANNEX L** **Specific requirements for RCBOs with screw-type terminals for external untreated aluminium conductors and with aluminium screw-type terminals for use with copper or with aluminium conductors**		P
L.6	Marking and other product information		--
	In addition to clause 6 the following apply:		P
	Terminal marking according table L.1, on the RCBO, near the terminals		P
	Conductor types accepted:		P
	Copper only	☐ None	P
	Aluminium only	☐ “Al”	P
	Aluminium and copper	☐ “Al/Cu”	P
	Other information concerning the number of conductors, screw torque (if different from table 10) and cross-section shall be indicated on the RCBO	Nm mm^2	P
L.7	Standard conditions for operation in service		--
	Clause 7 applies		P
L.8	Constructional requirements		--
	Clause 8 applies with the following exceptions:		P
8.1.5.2	add the following text at the end of 8.1.5.2:		--
	For connection of aluminium conductors, RCBOs shall be provided with screw-type terminals allowing the connection of conductors having nominal cross-sections as shown in table L.2		P

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IEC 61009-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Terminals for the connection of aluminium conductors and terminals of aluminium for the connection of copper or aluminium conductors shall have mechanical strength adequate to withstand the tests of 9.4, with the test conductors tightened with the torque indicated in table 14, or with the torque specified by the manufacturer, which shall never be lower than that specified in table 14.		P
	Compliance is checked by inspection, by measurement and by fitting in turn one conductor of the smallest and one of the largest cross-section areas as specified		P
8.1.5.4	replace the text of 8.1.5.4 by the following:		--
	Terminals shall allow the conductors to be connected without special preparation		P
	Compliance is checked by inspection and by the tests of L.9		P
L.9	Tests		--
	Clause 9 applies with the following modifications/additions:		P
	For the tests which are influenced by the material of the terminal and the type of conductor that can be connected, the test conditions of table L.3 are applied		P
	Additionally the test of L.9.2 is carried out on terminals separated from the RCBO		P
L.9.2	Current cycling test		--
	This test is carried out on separate terminals		P
L.9.2.3	Test arrangement		--
	The general arrangement of the samples shall be as shown in figure L.1		P
	90 % of torque stated by the manufacturer or selected in table 10 used for the specimens	torque: Nm	P
	The test is carried out with conductors according to table L.5. The length of the test conductor from the point of entry to the screw-type terminal specimens to the equalizer shall be as in table L.6	cross-section: mm^2 minimum conductor length: mm	P
	Cross section of equalizer not greater than that given in table L.7	max. cross-section: mm^2	N/A
L.9.2.5	Test method and acceptance criteria		--

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IEC 61009-1				
Clause	Requirement + Test	Result - Remark		Verdict
	Test loop subjected to 500 cycles of 1h current-on and 1h current-off, starting at an a.c. current value of 1,12 times the test current value determined in table L.8	test current: A		N/A
	Near the end of each current-on period of the first 24 cycles, the current shall subsequently be adjusted to raise the temperature of the reference conductor to 75°C			P
	At the end of the 25th cycle the test current shall be adjusted the last time and the stable temperature shall be recorded as the first measurement. No further adjustment of test current for the remainder of the test			N/A
	Temperatures recorded for at least one cycle of each working day, and after approximately 25, 50, 75, 100, 125, 175, 225, 275, 350, 425 and 500 cycles			P
	For each screw-type terminal:			P
	- the temperature rise shall not exceed 110 K			P
	- the stability factor Sf shall not exceed ± 10 °C			P
	ambient air temperature: °C	25.0		°C
		max. temperature rise [K]	max. stability factor Sf [°C]	--
	Terminal block	43.1	85	P
	Internal wire	41.4	105	P
	PCB	78.1	130	P
	Enclosure outside	34.3	65	P
	Amibient	25.1	85	P

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Attachment No. 1: Component assembly

APPENDED TABLE Critical components					
Object / part no.	Manufacturer / trademark	Type / model	Technical data	Standard	Mark(s) of Conformity
Plastic material	Suzhou Banleantone International Logistics CO,.Ltd	PA66	PA66	IEC/EN60998-2-1,IEC/EN60998-1	Test with appliance
Terminal block material	Foshan Huaru Copper Industry Co., Ltd	COPPER	COPPER	IEC/EN60998-2-1,IEC/EN60998-1	Test with appliance

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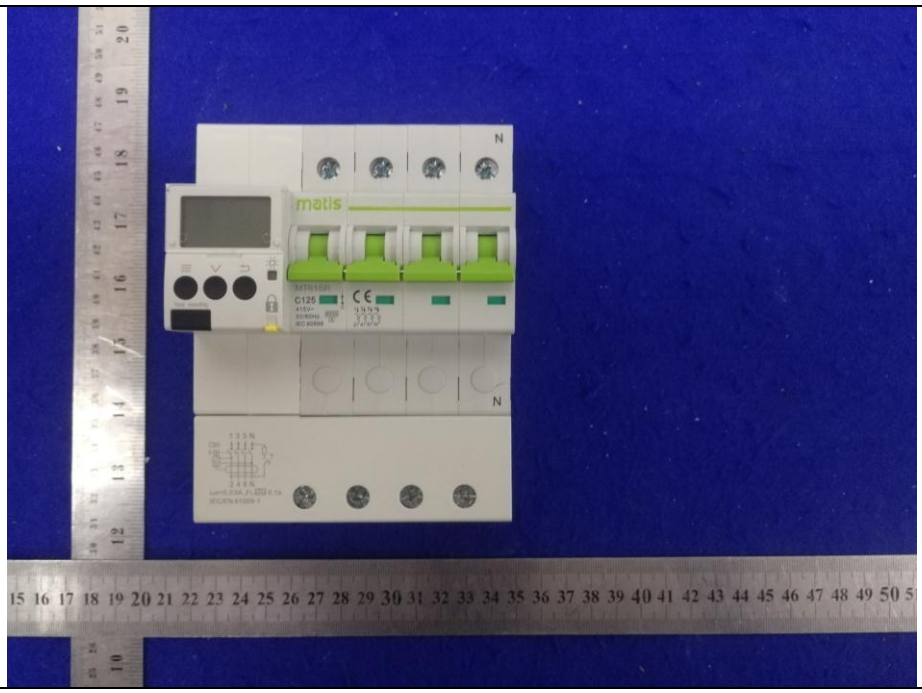
Attachment No. 2: photo documentation

Details of: External View

Details of: External View



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Details of: External View

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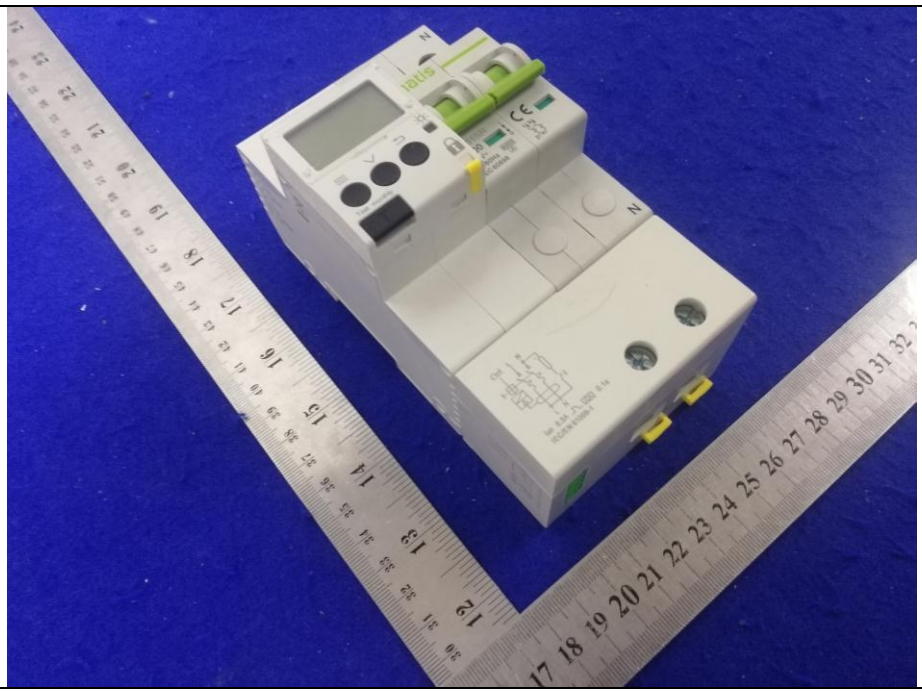
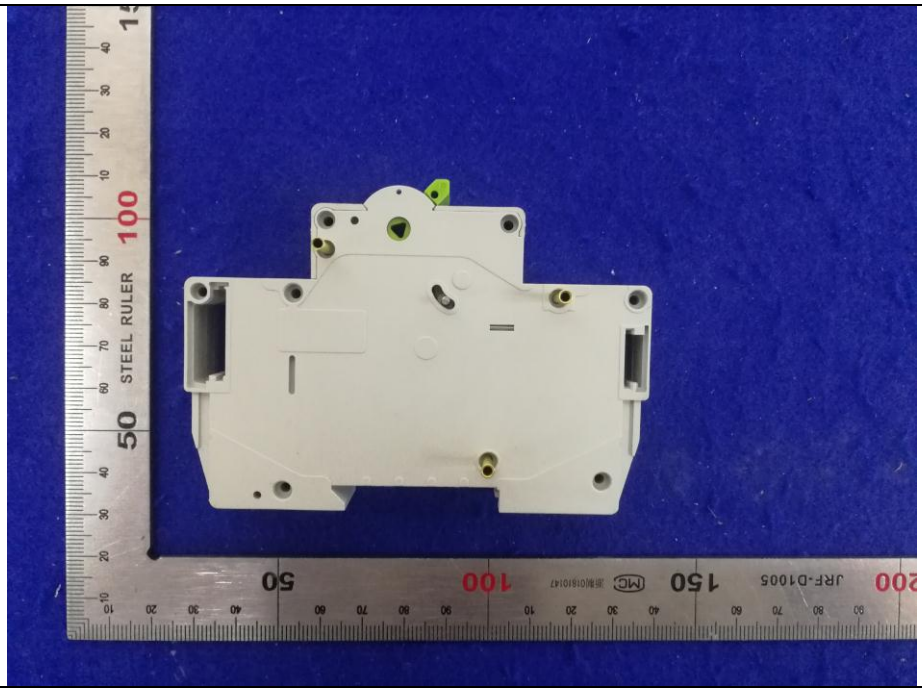


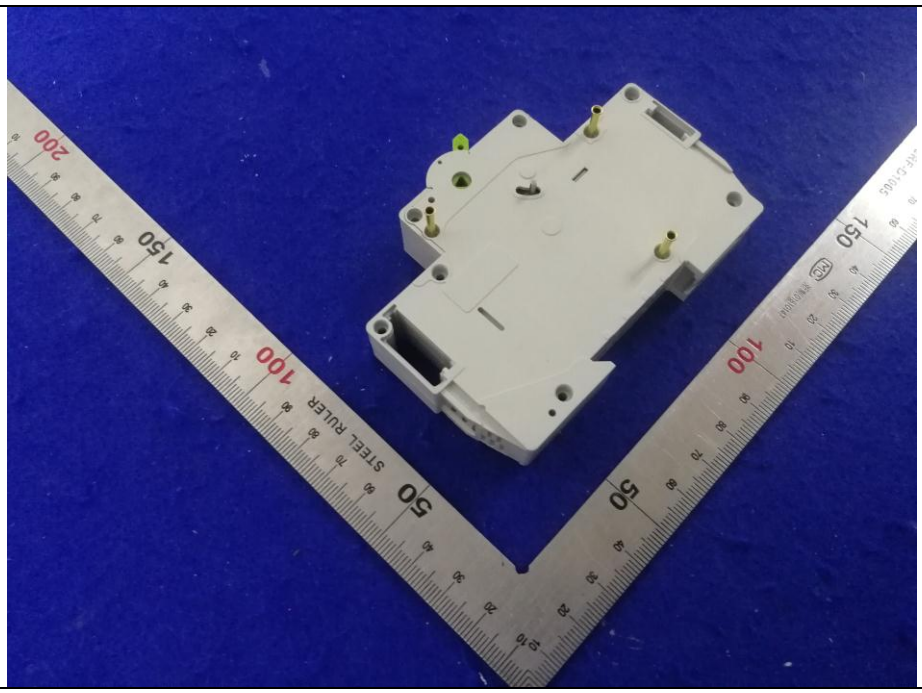
Shenzhen LCS Compliance Testing Laboratory Ltd.
Add：101, 601, Xingyuan Industrial Park, Gushu Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
Tel：+(86) 0755-82591330 | Fax：+(86) 0755-82591332 | E-mail：webmaster@lcs-cert.com | http:// www.lcs-cert.com

Attachment No. 2: photo documentation

Details of: External View



Details of: External View



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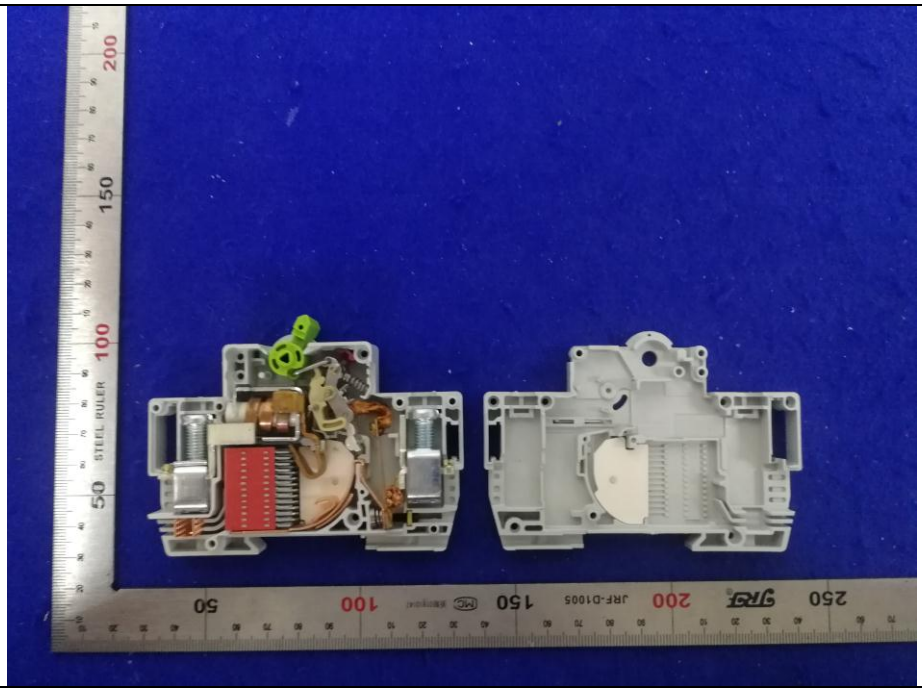
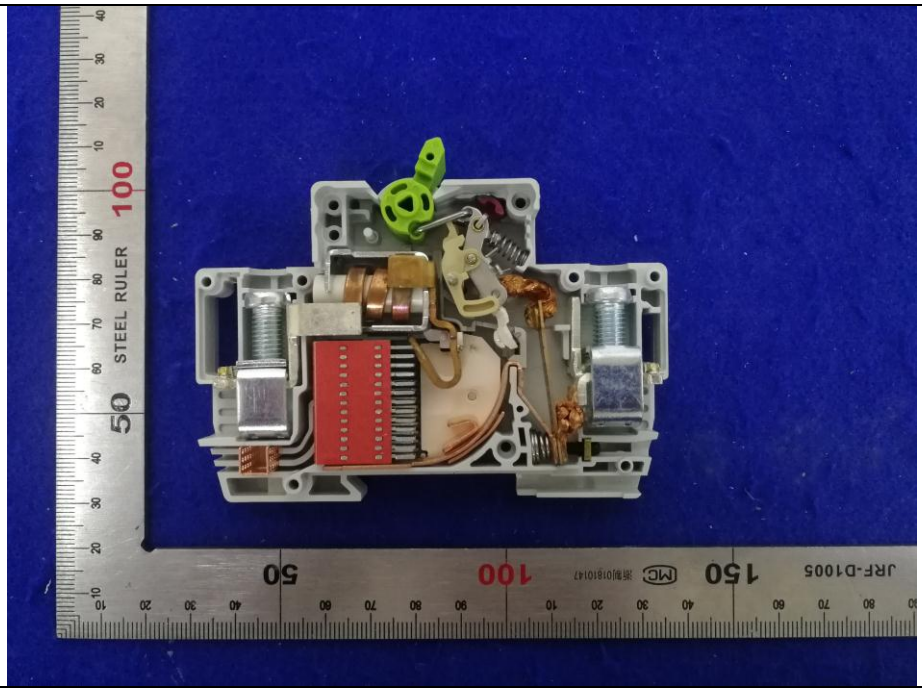
Attachment No. 2: photo documentation

Details of: Internal view



Details of: Internal view



----------End of test report----------

Shenzhen LCS Compliance Testing Laboratory Ltd.
Add：101, 601, Xingyuan Industrial Park, Gushu Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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Vojenský technický ústav, s.p.
odštěpný závod VTÚPV
Víta Nejedlého 691, 682 01 Vyškov, Czech Republic

CERTIFICATE
Nº VTÚPV – 082/ 2022 / ZAHR

Applicant: **Shanghai Matis Electric Co., Ltd.**
上海麦豆电气有限公司
Room 320, 83 Huanhu West Third Road, Pudong New Area, Shanghai, China

Product: **Smart Reclosed RCBO**

Tested Model: MT61SR
Derived Models: MT84SR, MT51RA+MRO50, MT51RA+ML50H, MT51RAN+ML60-B, MT51RAN+MM22

Manufacturer: **Shanghai Matis Electric Co., Ltd.**
Room 320, 83 Huanhu West Third Road, Pudong New Area, Shanghai, China

Rating and principal characteristics: Power supply: 400 V;
Rated Current: 125 A;
Frequency: 50/60 Hz

Test results are described in the Test Reports No.:
B-S2206A1957 (tests made by Beide (Shenzhen) Product Service Limited)

The sample of tested product conforms with the requirements of the following standards harmonized with LVD Directive No. 2014/35/EU

- EN 63024:2018
- EN 61009-1:2012+A1:2014+A11:2015+A2:2014+A12:2016

This certificate is valid until: **18. 08. 2027**

After preparation of the necessary technical documentation as well as the conformity declaration, the required CE marking can be affixed on the product. Other relevant directives have to be observed.
The CE mark shall appear according to this sample:

CE

odštěpný závod VTÚPV VTÚPV VOJENSKÝ TECHNICKÝ ÚSTAV, s.p.

Vyškov 18. 08. 2022

Tel./Fax: +420 910 105 580
e-mail: milan.bezdek@vtusp.cz
http://www.vtusp.cz

Milan Bezděk
Certification Head

EU Declaration of Conformity

We, **Shanghai Matis Electric Co., Ltd.**
Room 320, 83 Huanhu West Third Road, Pudong New Area, Shanghai, China

Declare that the product described below is in conformity with the Directive:

2014/35/EU Low Voltage Directive

Product: **Smart Reclosed RCBO**
Models: **MT61SR, MT84SR, MT51RA+MRO50, MT51RA+ML50H, MT51RAN+ML60-B, MT51RAN+MM22**

Having been examined to the requirements of the following standards:

EN 63024:2018, EN 61009-1:2012+A1:2014+A11:2015+A2:2014+A12:2016

CE

Representative: _____
(signature & stamp)

Place/Date: 2022.07.12

TYPE	Power supply （V）	Standard Input Power (W)	Rated Current (A)	Dia (mm)
MT61SR	230/400VAC	1VA	125	
MT84SR	230/400VAC	1VA	100	
MT51RA+ MRO50	230/400VAC	1VA	40	
MT51RA+ ML50H	230/400VAC	1VA	63	
MT51RAN +ML60-B	230/400VAC	1VA	50	
MT51RAN +MM22	230/400VAC	1VA	40	
SHANGHAI MATIS ELECTRIC CO.,LTD.				

APPLICATION FOR LOW VOLTAGE DIRECTIVE

On Behalf of

SHANGHAI MATIS ELECTRIC CO.,LTD.

Smart Reclosed RCBO

Model : **MT84SR,MT51RA+MRO50,MT51RA+ML50H, MT51RAN+ML60-B,MT51RAN+MM22,MT61SR**

Prepared For : **SHANGHAI MATIS ELECTRIC CO.,LTD.**
Room 320, 83 Huanhu West Third Road, Pudong New Area, Shanghai

Prepared By : **Beide (Shenzhen) Product Service Limited**
China: 6F, Bldg E, Hourui 3rd Ind Zone, Xixiang, Bao'an Dist, Shenzhen, China

Date of Test	**:**	**2022-06-13 to 2022-06-22**
Date of Report	**:**	**2022-06-22**
Report Number	**:**	**B-S2206A1957**

LVD Report

EN 63024
Requirements for automatic reclosing devices (ARDs) for circuit-breakers, RCBOs and RCCBs for household and similar uses
EN 61009-1
Residual Current Circuit Breakers with integral overcurrent protection for household and similar uses (RCBOs)
Part 1: General rules

Testing laboratory ..... :	Beide (Shenzhen) Product Service Limited
Address ..... :	6F, Bldg E, Hourui 3rd Ind Zone, Xixiang, Bao'an Dist, Shenzhen, China
Report body..... ..... :	Beide (Shenzhen) Product Service Limited
Address (China)..... :	6F, Bldg E, Hourui 3rd Ind Zone, Xixiang, Bao'an Dist, Shenzhen, China
Applicant ..... :	SHANGHAI MATIS ELECTRIC CO.,LTD.
Address ..... :	Room 320, 83 Huanhu West Third Road, Pudong New Area, Shanghai
Client ID.....:	CA2180
Report Query.....:	CERTIFICATE QUERY
Standard ..... :	EN 63024:2018, EN 61009-1:2012+A1:2014+A11:2015+A2:2014+A12:2016
Test Result ..... :	Compliance with EN 63024:2018 EN 61009-1:2012+A1:2014+A11:2015+A2:2014+A12:2016
Procedure deviation ..... :	N.A.
Non-standard test method ..... :	N.A.
Type of test object ..... :	Smart Reclosed RCBO
Trademark ..... :	/
Model/type reference ..... :	MT61SR
Rating ..... :	Rated Voltage Ue: 230/415VAC,50/60Hz Rated Current: 6A,10A,16A,20A,25A,32A,40A,50A,63A,80A,100A,125A Curve: B, C, D Poles: 2P, 4P Residual Current: 10mA, 30mA, 100mA, 300mA; Type: AC, A, B
Manufacturer ..... :	SHANGHAI MATIS ELECTRIC CO.,LTD.
Address ..... :	Room 320, 83 Huanhu West Third Road, Pudong New Area, Shanghai

General remarks

This report shall not be reproduced except in full without the written approval of the testing laboratory.

The test results presented in this report relate only to the item(s) tested.

"(see appended table)" refers to a table appended to the report.

“(see remark #)” refers to a remark appended to the report.

“(see Annex #)” refers to an annex appended to the report.

Throughout this report a comma (point) is used as the decimal separator.

Remark:

1. Photos view:

(See appendix 1)

2. Copy of marking plate:

(See appendix 2)

Possible test case verdicts :		
test case does not apply to the test object ……..	:	N (.A.)
test object does meet the requirement …….……	:	P(ass)
test object does not meet the requirement …….	:	F(ail)

Name and address of the testing laboratory : **Beide (Shenzhen) Product Service Limited**
6F, Bldg E, Hourui 3rd Ind Zone, Xixiang,
Bao'an Dist, Shenzhen, China

Reported by : Austin.Zhong — 2022-06-22
Signature / Austin.Zhong — Date

Checked by : Anna Deng — 2022-06-22
Signature / Anna.Deng — Date

Approved by : — 2022-06-22
Signature / Martin Wang — Date

BEIDE (SHENZHEN) PRODUCT SERVICE LIMITED Beide Compliance Laboratory CERTIFICATION

EN 63024			
Clause	Requirement – Test	Result - Remark	Verdict

4	Classification		P
4.1	According to the method of construction		P
4.1 .1	ARD assembled in factory by the manufacturer.		P
4.1 .2	ARD assembled on site.		N
4.2	According to the associated MPD		P
4.2.1	ARD for circuit-breakers.		N
4.2.2	ARD for RCCBs.		N
4.2.3	ARD for RCBOs.		P
4.3	According to the type of assessment means		N
4.3.1	ARD without assessment means (see Annex A).		N
4.3.2	ARD with assessment means.		N
4.3.2.1	ARD with means of assessment of the prospective residual current: a) operation blocked after assessment of an excessive residual current in the installation (see Annex B); b) remains in tripped condition after the assessment of an excessive residual current in the installation (see Annex C).		N
4.3.2.2	ARD with means of assessment of the prospective line current: a) operation blocked after assessment of an overcurrent in the installation (see Annex B);b) remains in tripped condition after the assessment of an overcurrent in the installation (seeAnnex C).		N
4.4	According to the safety means during the assessment		P
4.4.1	ARD with assessment means operating by using a method based on the limitation of the test voltage.		N
4.4.2	ARD with assessment means operating by using a method based on the limitation of the test current.		P
4.5	According to the connection to FE		P
4.5.1	ARD with FE connection for assessment means.		N
4.5.2	ARD without FE connection.		P
4.6	According to maximum number of reclosing operations		P
4.6.1	ARD with maximum number of reclosing operations declared by manufacturer and lower than or equal to 3.		N
4.6.2	ARD with maximum number of reclosing operations declared by manufacturer and higher than 3		P

EN 63024			
Clause	Requirement – Test	Result - Remark	Verdict
4.7	According to mechanical interlock between MPD operating means and ARD enabling/disabling system		P
4.7.1	ARD with mechanical interlock between MPD operating means and ARD enabling/disabling system.		N
4.7.2	ARD without mechanical interlock between MPD operating means and ARD enabling/disabling system.		P
5	Characteristics		P
5.1	Summary of characteristics The characteristics of the MPD standards and the following apply: – protection against external influences; – method of mounting; – method of connection; – value of rated operational voltage; – value of rated frequency; – values of operating and non-operating rated resistance to earth, if applicable; – values of operating and non-operating rated resistance between live parts, if applicable; – range of ambient air temperature.		P
5.2	Rated quantities		P
5.2.1	Rated voltage		N
	Preferred values o f rated voltage are: 1 20 V, 230 V, 400 V. Wherever in this document there is a reference to 230 V or 400 V, they can be read as 220 V or 240 V, 380 V or 41 5 V, respectively.		N
5.2.2	Rated operational voltage (U e)		P
	The rated operational voltage (hereafter referred to as rated voltage) of an ARD is the value of voltage assigned by the manufacturer to which its performance is referred.	415V	P
5.2.3	Rated frequency		P
	The rated frequency of an ARD is the power frequency for which the ARD is designed and to which the values of the other characteristics correspond. Preferred values of rated frequency are: 50 Hz, 60 Hz and 50/60 Hz.	50/60Hz	P
5.2.4	Rated non-operating resistance to earth (R d0)		N
	The R d0 is the rated value of resistance between live parts and earth below which the re- closing of the MPD is not permitted. The R d0 value is stated by the manufacturer under the test conditions in this product document.		N
5.2.5	Rated operating resistance to earth (R d)		P
	The R d is the rated value of resistance between live parts and earth above which the re- closing of the MPD is permitted. The R d value is stated by the manufacturer under the test conditions in this product document. The R d shall be rounded up to the two significant digits.		P
5.2.6	Rated non-operating resistance between live parts (R cc0)		N

EN 63024			
Clause	Requirement – Test	Result - Remark	Verdict
	The R cc0 is the rated value of resistance between live parts below which the reclosing of the MPD is not permitted. The R cc0 value is stated by the manufacturer under the test conditions in this product document. The R cc0 value shall be rounded up to the two significant digits.		N
5.2.7	Rated operating resistance between live parts (R cc)		N
	The R cc is the rated value of resistance between live parts above which the reclosing of the MPD is permitted. The R cc value is stated by the manufacturer under the test conditions in this product document. The R cc shall be rounded up to the last two more significant digits.		N
6	Marking and other product information		P
6.1	Standard marking Each ARD shall be marked in a durable manner with all the following data: a) manufacturer's name or trade mark; b) type designation, catalogue number or serial number; c) wiring diagram, except if the connection mode is self-evident; d) rated voltage(s) with the symbol (IEC 6041 7-5032); e) ARD or according to the IEC reference standard; f) protection degree (only if different from IP20). Moreover, the following markings shall be placed on the products or in the instruction sheets accompanying the product: g) the rated frequency; ARDs with more than one rated frequency (e.g. 50/60 Hz) shall be marked accordingly; h) the rated non-operating resistance between live parts and earth R d0 , if applicable; i) the rated operating resistance between live parts and earth R d , if applicable; j) the rated non-operating resistance between live parts R cc0 , if applicable; k) the rated operating resistance between live parts R cc , if applicable; l) assembling method if applicable; m) earthing system in which the devices may be used; n) "warning: before accessing active parts, disable the automatic reclosing function and switch off the main protective device" or other warning having the same meaning. It is recommended that the text be written in the appropriate language(s); o) instructions about the reset of the ARD and the need for checking the MPD and the installation in case of blocked condition. p) for ARD classifed according to 4.Z1 .2, ambient air temperature with the symbol (the value -25 included in the snow fake symbol according to ISO 7000:201 4, Figure 0027). For devices according to 4.1 .2, the information of the ambient air temperature shall not be visible after assembly.	See lable	P

EN 63024			
Clause	Requirement – Test	Result - Remark	Verdict
6.2	Instructions for assembly and operation The manufacturer shall provide adequate instructions with the ARD. If the ARD is classified according to 4.1 .2, these instructions shall cover at least the following: – reference to the type(s) and catalogue number(s), covering current and voltage ratings, number of poles, etc. of the MPD with which the ARD is designed to be assembled; – method of assembly; – need for checking operation after assembly to verify the mechanical operation; – ambient air temperature of the combination (MPD and ARD). Compliance is checked by inspection.		P
7	Standard conditions for operation in service		P
7.1	General The ARD complying with this document shall be capable of operating under the standard conditions given by the relevant MPD standard(s). For the ARD and MPD, the relevant clauses of the MPD standards apply: a) IEC 60898-1 :201 5, Clause 7 and IEC 60898-2:201 6, Clause 7, for ARDs classified according to 4.2.1 (circuit- breakers); b) IEC 61 008-1 :201 0, Clause 7, for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, Clause 7, for ARD classified according to 4.2.3 (RCBOs).		P
7.2	Conditions of installation		P
	The ARD shall be installed in accordance with the manufacturer's instructions. The ARD classified according to 4 . 1 . 2 shall only be installed together with the circuit- breakers, RCBOs and RCCBs declared by the manufacturer.		P
7.3	Pollution degree		P
	ARDs accordin g to this document are intended for an environment with pollution degree 2 (only non-conductive pollution occurs except that, occasionally, a temporary conductivity caused by condensation is to be expected).		P
8	Requirements for construction and operation		P
8.1	Mechanical design		P
8.1.1	General		P
8.1.2	Mechanism		P
8.1.2.1	The ARD shall be so designed and constructed as not to change the functional characteristic of the MPD. Compliance is checked by inspection and by the test of 9.5.1.		P

EN 63024			
Clause	Requirement – Test	Result - Remark	Verdict
8.1 .2.2	The ARD and the MPD shall be associated in a proper way and the association shall be made in such way to avoid uncorrected matching. Compliance is checked by inspection and with information detailed in 6.2.		P
8.1.2.3	For devices according to 4. 7. 1 , it shall not be possible to enable the ARD if the MPD has been previously manually opened by the actuator. It is permitted that the enabling system of the ARD may also cause the closing of the MPD during the same manual operation. Compliance is checked by visual inspection and test of 9.5.2.		P
8.1.2.4	The ARD shall be provided with an enabling and disabling system.The enabling and disabling system shall be manufactured in such a way that it can be directly operated by the user or by means of a tool of common usage. The enabling and disabling system shall be able to correctly operate for a suitable number of operating cycles. Compliance is checked by visual inspection and the test of 9.5.3		P
8.1.2.5	Manual opening of the MPD shall be possible at every time. This condition is considered as fulfilled if the manual opening is not possible without the disabling of the ARD. For devices according to 4.7.1, if the ARD is enabled, manual opening of the MPD using the actuator shall always disable the automatic reclosing. Compliance is checked by inspection and by the test of 9.5.2.		P
8.1.2.6	When the ARD is disabled: a) the MPD shall operate independently from the ARD, in particular it shall be possible to activate the test device, if any; b) it shall be possible to see the symbol (IEC 6041 7-5008) when the contacts of the MPD are in isolating condition. Compliance to the point a) is checked by manual test. Compliance to the point b) is checked by visual inspection and the dielectric tests according to 9.1 1 .		N
8.1.2.7	When the ARD is enabled: For devices according to 4.7.1 : a) it shall not be possible to see on the MPD the symbol (IEC 6041 7-5008) which shows the position of the contacts; b) it shall be possible to activate the test device with the exception of ARD with a reclosing time higher than 3 s where it is not accepted; c) the marking stated in the reference standard of the MPD shall be visible with the exception of the symbol (IEC 6041 7-5008) as stated in a). Compliance is checked by visual inspection.		N

EN 63024			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.2.8	The ARD shall never perform a number of consecutive reclosing operations greater than those declared by the manufacturer within its reset time. The reset time (see 3.20) shall not be less than 5 s. For devices according to 4.6.1 , the maximum number of operations shall not be greater than 3. Compliance is checked by the test of 9.5.4. For devices according to 4.6.2, the maximum number of operations shall be declared by the manufacturer. Compliance is checked by the test of 9.5.4.		P
8.1.3	Clearances and creepage distances The minimum required clearances and creepage distances are given in Table 2 which is based on the ARD being designed for operating in an environment with pollution degree 2. However, the clearances of items 2 and 4 may be reduced provided that the tests at rated impulse voltage are withstood. The values of Table 2 shall be verified for the ARD and the interface with the MPD. The insulating materials are classified into material groups on the basis of their comparative tracking index (CTI) according to 4.8.1 .2 and 4.8.1 .3 of IEC 60664-1 :2007.		P
8.1.4	Clearances and creepage distances for electronic circuits connected between live parts or between live parts and the earth For electronic circuits connected between live parts, or between live parts and the eart circuit when the contacts are in the closed position, the verification of the clearances and creepage distances is replaced by the tests of 9.6 and 9.7.		P
8.1.5	Screws, current-carrying parts and connections For the ARD and MPD, the relevant subclause(s) of the MPD standard(s) applies: a) IEC 60898-1 :201 5, 8.1 .4 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0 and IEC 61 008-1 :201 0/AMD1 :201 2, 8.1 .4 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0 and IEC 61 008-1 :201 0/AMD1 :201 2, 8.1 .4 for ARD classified according to 4.2.3 (RCBOs). Compliance is checked by the tests of 9.8.		P
8.1.6	Terminals for external conductors For the ARD and MPD, the relevant subclause(s) of the MPD standard(s) applies: a) IEC 60898-1 :201 5, 8.1 .5 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0 and IEC 61 008-1 :201 0/AMD1 :201 2, 8.1 .5 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0 and IEC 61 008-1 :201 0/AMD1 :201 2, 8.1 .5 for ARD classified according to 4.2.3 (RCBOs). The range of nominal cross-section for wires clamped to the FE terminal, if any, shall be between 1 mm 2 and 2,5 mm 2 . Compliance is checked by the tests of 9.9. Compliance is checked by inspection.		P
8.2	Protection against electric shock		P

EN 63024			
Clause	Requirement – Test	Result - Remark	Verdict
	For the ARD and MPD, the relevant subclause of the MPD standard applies: a) IEC 60898-1 :201 5, 8.2 for ARD classified according to 4.2.1 (circuit-breakers); b) b) IEC 61 008-1 :201 0, 8.2 for ARD classified according to 4.2.2 (RCCBs); c) c) IEC 61 009-1 :201 0, 8.2 for ARD classified according to 4.2.3 (RCBOs). Compliance is checked by the tests of 9.1 0.		P
8.3	Dielectric properties and isolating capability		P
	The ARD and MPD shall not influence the suitability for isolation of the MPD. Compliance is checked by the tests of 9.1 1 .		P
8.4	Temperature rise		P
	For the ARD and MPD, the corresponding subclause of the MPD standard applies: a) IEC 60898-1 :201 5, 8.4 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0, 8.4 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, 8.4 for ARD classified according to 4.2.3 (RCBOs). Compliance is checked by the tests of 9.1 2.		P
8.5	Mechanical and electrical endurance		P
	ARD and MPD shall be capable of performing an adequate number of cycles of operations. Compliance is checked by the tests of 9.1 3.		P
8.6	Performance at short-circuit currents		P
	Performances in case of short-circuit currents of the MPD shall not be influenced by the ARD. Performances of the ARD shall not be influenced by short-circuits occurring in the installation. Compliance is checked by the tests of 9.1 4.		P
8.7	Resistance to mechanical shock and impact		P
	The relevant subclause of the MPD standard applies: a) IEC 60898-1 :201 5, 8.9 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0, 8.8 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, 8.8 for ARD classified according to 4.2.3 (RCBOs). Compliance is checked by the tests of 9.1 5.		P
8.8	Resistance to heat		P

EN 63024			
Clause	Requirement – Test	Result - Remark	Verdict
	The relevant subclause of the MPD standard applies: a) IEC 60898-1 :201 5, 8.1 0 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0, 8.9 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, 8.9 for ARD classified according to 4.2.3 (RCBOs). Compliance is checked by the tests of 9.1 6.		P
8.9	Resistance to abnormal heat and to fire		P
	The relevant subclause of the MPD standard applies: a) IEC 60898-1 :201 5, 8.1 1 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0, 8.1 0 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, 8.1 0 for ARD classified according to 4.2.3 (RCBOs). Compliance is checked by the tests of 9.1 7.		P
8.10	Operating characteristics		P
8.1 0.1	The ARD classified according to 4.3.1 , after tripping of the MPD, shall reclose it. Compliance is checked by the test of 9.1 3.		N
8.1 0.2	The ARD classified according to 4.3.2.1 , after tripping of the MPD, shall perform the prospective earth-fault current assessment, and it shall reclose only if the prospective residual current does not exceed a given value. Compliance is checked by the tests of 9.1 8.2.		N
8.1 0.3	The ARD classified according to 4.3.2.2, after tripping of the MPD, shall perform the prospective line current assessment, and it shall reclose only if the line current does not exceed a given value. Compliance is checked by the tests of 9.1 8.3.		N
8.1 0.4	The ARD classified according both to 4.3.2.1 and 4.3.2.2, after tripping of the MPD, shall perform both the prospective earth-fault current and line current assessment and it shall reclose only if prospective residual current and line current do not exceed a given value. Compliance is checked by the tests of 9.1 8.2 and 9.1 8.3.		N
8.1 0.5	The ARD shall never perform a number of consecutive reclosing operations greater than those declared by the manufacturer, and for devices according to 4.6.1 , the maximum number of operation shall not be greater than 3. Compliance is checked by the test of 9.5.4. 8.1 0.8 The standing current from the FE to the protective conductor shall not exceed 1 ,0 mA under normal supply conditions. Compliance is checked by the test of 9.1 8.5.		N

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Clause	Requirement – Test	Result - Remark	Verdict
8.1 0.6	The ARD shall operate independently of the influence of distributed capacities in the installation. Compliance is checked by the test of 9. 1 8. 4. 1 (for ARDs classified according to 4. 3. 2. 1) and 9. 1 8. 4. 2 (for ARDs classified according to 4.3.2.2).		P
8.1 0.7	The admissible behaviour of the ARD, depending on line voltage and on MPD condition, is described in Table 3.		N
8.11	Assessment means for ARD according to 4.3.2		N
8.1 1.1	General		N
8.1 1.2	Assessment means operating by limitation of the test voltage		N
	The limitation of voltage shall be provided by a transformer with a reinforced insulation between the primary and the secondary circuit. The reinforced isolation shall be designed for a working voltage equal to 300 V for a transformer supplied by a rated voltage equal to 230 V, and 600 V for ARD for a transformer supplied by a rated voltage equal to 400 V. Compliance of the transformer is checked by the requirements of 9.7.4. The maximum voltage used to provide the assessment shall be lower than 24 V r.m.s. Compliance is checked by the test of 9.1 9.1 .		N
8.1 1.3	Assessment means operating by limitation of the test current		N
	The ARD shall be so designed that the steady-state current shall not exceed 1 ,0mA AC or 2,0 mA DC. under normal operation in tripping conditions. Compliance is checked by test of 9.1 9.2.		N
8.12	Safety in blocked condition		P
	The ARD shall be so designed that in blocked condition, the safety of the user is ensured. Compliance is checked by test of 9.1 9.3.		P
8.13	Test device		P
	The relevant subclause of the MPD document applies: a) IEC 61 008-1 :201 0, 8.1 1 for ARD classified according to 4.2.2 (RCCBs); b) IEC 61 009-1 :201 0, 8.1 1 for ARD classified according to 4.2.3 (RCBOs). Compliance is checked by the tests of 9.20.		P
8.14	Ageing		N
	The relevant subclause of the MPD document applies: a) IEC 61 008-1 :201 0, 8.1 6 for ARD classified according to 4.2.2 (RCCBs); b) IEC 61 009-1 :201 0, 8.1 6 for ARD classified according to 4.2.3 (RCBOs). Compliance is checked by the tests of 9.21 .		N

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Clause	Requirement – Test	Result - Remark	Verdict
8.15	EMC		N
	The ARD shall operate reliably in presence of electromagnetic disturbances and shall comply with relevant EMC requirements. Compliance is checked according to 9.22		N
9	Test		P
9.1	General		P
	The MPD to be fitted with the ARD shall comply with its relevant product document: a) IEC 60898-1 or IEC 60898-2, as applicable for ARDs classified according to 4.2.1 (circuit- breakers); b) IEC 61 008-1 for ARDs classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 for ARDs classified according to 4.2.3 (RCBOs).		P
9.2	Test condition		P
	The ARD assembled with its MPD is mounted individually according to the manufacturer's instructions and in free air, at an ambient temperature as required by the standard for the MPD unless otherwise specified. ARDs designed for installation in individual enclosures are tested in the smallest of such enclosures specified by the manufacturer.		P
9.3	Measurement of the reclosing time after the tripping of the MPD		P
	The ARD assembled with the MPD is supplied at rated voltage. The MPD is caused to open automatically (e.g. by means of a tripping release). After the opening of the MPD, the ARD shall reclose. The test is carried out by measuring the time interval for which the supply voltage is not present downstream.		P
9.4	Test of indelibility of marking		P
	The test is made by rubbing the marking by hand for 1 5 s with a piece of cotton soaked with water and again for 1 5 s with a piece of cotton soaked with aliphatic solvent hexane with a content of aromatics of maximum 0,1 % by volume, a kauri butanol value of 29, an initial boiling-point approximately 65 °C, a dry-point of approximately 69 °C and a density of approximately 0,68 g/cm 3 . Marking made by impression, moulding, or engraving is not subjected to this test. After this test, the marking shall be easily legible. The marking shall also remain easily legible after all the tests of this document. It shall not be easily possible to remove labels and they shall show no curling.		P
9.5	Verification of the non-influence of the ARD on the correct operation of the MPD		P
9.5.1	Verification of the operating characteristics of the MPD		P

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Clause	Requirement – Test	Result - Remark	Verdict
	For the ARD and MPD, the relevant subclause(s) of the MPD standard(s) applies: a) IEC 60898-1 :201 5, 8.1 .2 1 , 9.1 0.2 and 9.1 0.3 (only at the upper limit of instantaneous tripping current) or IEC 60898-2:201 6 as applicable, 9.1 0.3 (only at the upper limit of instantaneous tripping current), for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0 and IEC 61 008-1 :201 0/AMD2:201 3, 8.1 .2 1 , 9.9.2.1 , 9.9.2.2, 9.9.2.3 a), 9.1 5, for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, IEC 61 009-1 :201 0/AMD1 :201 2 and IEC 61 009-1 :201 0/AMD2:201 3, 8.1 .2 1 , 9.9.1 .2 a), 9.9.1 .2 b), 9.9.1 .2 c) 1), 9.9.2.1 , 9.9.2.2 a) (only at the upper limit of instantaneous tripping current), 9.1 1 , for ARD classified according to 4.2.3 (RCBOs). Verification has to be carried out with enabled as well as with disabled ARD.		P
9.5.2	Verification of the impossibility of the activation of the ARD when the MPD has been manually opened		P
	This test procedure only applies to devices according to 4.7.1 . The ARD is assembled as in normal use and supplied at rated voltage. The MPD is manually opened. If the enabling and disabling system is accessible and if it is independent from the main actuator, the test is carried out by applying a force equal to 20 N to the enabling /disabling system according to the manufacturer's instruction. The force is applied for 1 min in the direction of normal actuation. During the test the ARD shall not reclose the MPD. The supply voltage is then switched off with the ARD in open position and then restored after 3 min: the ARD shall not reclose the MPD. The ARD is then reset according to the manufacturer's instruction and the test is repeated once.		P
9.5.3	Verification of the enabling/disabling system of the ARD		P
	The ARD assembled with the MPD is installed as in normal use and supplied at rated voltage. The test is carried out by means of 1 000 cycles of the enabling system with an operation frequency not less than 2 cycles per minute. At the end of the test, the enabling system shall be able to work correctly. The ARD being in the enabled position, the MPD is caused to open automatically (e.g., by means of a tripping release or by a residual current). It shall be reclosed automatically. The ARD being in the disabled position, the MPD is caused to open automatically (e.g., by means of a tripping release or by a residual current). The ARD being supplied as in normal use, no automatic reclosing shall occur during at least 1 min or a time given by the manufacturer.		P

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Clause	Requirement – Test	Result - Remark	Verdict
9.5.4	Verification of the maximum number of consecutive reclosing		P
	The MPD is caused to open automatically (e.g. by means of a tripping release or by a residual current). After the tripping and reclosing time (reclosing time may vary depending on number of reclosing operations), the ARD shall reclose and show the appropriate signal according to the manufacturer's instructions. Reclosing time should be declared by manufacturer to testing laboratory as some products may have a reclosing time up to several hours.		P
9.6	Tests of creepage distances and clearances for electronic circuits (abnormal conditions)		P
9.6.1	These tests replace the verifications of creepage distances and clearances of electronic circuits connected between live parts (phases and neutral) and/or between live parts and the earth circuit. The ARD shall not create fire and/or shock hazards under abnormal conditions likely to occur in service. The conditions under which a component is used within an ARD unit shall be in accordance with the operating characteristics marked on the component and/or given in the data provided by the manufacturer.		P
9.6.2	When the ARDs are exposed to abnormal conditions, no part shall reach temperatures likely to cause danger of fire to the surroundings of the ARD, and no live parts shall become accessible. Compliance is checked by subjecting the ARD to a heating test under fault conditions as described in 9.6.3.		P
9.6.3	Unless otherwise specified, the tests are made on ARD, connected and loaded as in normal use.		P
9.7	Requirements for capacitors, specific resistors and inductors used in electronic circuits		N
9.7.1	General		N
	These requirements apply for capacitors (see 9.7.2), specific resistors and inductors (see 9.7.3), and inductors and windings (see 9.7.4) used in electronic circuits connected between live parts (phases and neutral) and/or between live parts and the earth circuit when the contacts are in the closed position.		N
9.7.2	Capacitors		N
	Capacitors, – the short-circuiting or disconnection of which would cause an infringement of the requirements under fault conditions with regard to shock or fire hazard; – the short-circuiting of which would cause a current of 0,5 A or more through the terminals of the capacitor; – for suppression of electromagnetic interference, shall comply with IEC 60384 (all parts).		N
9.7.3	Resistors		N

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Clause	Requirement – Test	Result - Remark	Verdict
	Resistors, the short-circuiting or interruption of which would cause an infringement of the requirements with regard to the protection against fire and electric shock in case of a defect, shall have an adequately constant value under the overload conditions prevailing in the electronic switch. These resistors shall comply with the requirements of 1 4.1 of IEC 60065:201 4. Tests already carried out on resistors and inductors complying with IEC 60065 are not required to be repeated.		N
9.7.4	Inductors and windings		N
	Inductors and windings shall comply with the requirements of IEC 61 558 (all parts) and the relevant parts of IEC 61 558 (all parts), as applicable.		N
9.8	Test of reliability of screws, current-carrying parts and connections		P
	For the ARD and MPD, the relevant subclause of the MPD standard applies: a) IEC 60898-1 :201 5, 9.4 for ARD classified according to 4.2.1 (circuit- breakers); b) IEC 61 008-1 :201 0, 9.4 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, 9.4 for ARD classified according to 4.2.3 (RCBOs).		P
9.9	Test of reliability of terminals for external conductors		P
	For the ARD and MPD, the relevant subclause(s) of the MPD standard(s) applies: a) IEC 60898-1 :201 5, 9.5 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0 and IEC 61 008-1 :201 0/AMD1 :201 2, 9.5 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0 and IEC 61 009-1 :201 0/AMD1 :201 2, 9.5 for ARD classified according to 4.2.3 (RCBOs).		P
9.10	Verification of protection against electric shock		P
	For the ARD and MPD, the relevant subclause of the MPD standard applies: a) IEC 60898-1 :201 5, 9.6 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0, 9.6 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, 9.6 for ARD classified according to 4.2.3 (RCBOs).		P
9.11	Test of dielectric properties and isolating capability		P

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Clause	Requirement – Test	Result - Remark	Verdict
	The following subclauses of the standard for the MPD apply: a) IEC 60898-1 :201 5, 9.7 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0, IEC 61 008-1 :201 0/AMD1 :201 2 and IEC 61 008-1 :201 0/AMD2:201 3, 9.7 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, IEC 61 009-1 :201 0/AMD1 :201 2 and IEC 61 009-1 :201 0/AMD2:201 3, 9.7 for ARD classified according to 4.2.3 (RCBOs), with the following modifications: – where the standard requires that the protective device is in open position, the test is carried out with the MPD and ARD in manually opened condition according to the manufacturer's instructions. All the other tests are carried out with the ARD in all possible conditions; – where the standard requires that the protective device is in open position, the test is carried out with the ARD in isolation condition (e.g. the symbol (IEC 6041 7-5008) is visible); – if the ARD is provided with a terminal intended for the connection of protective conductors, this is connected to the frame; – if the ARD is provided with a terminal intended for the connection of functional earthing conductors, this is not connected to the frame.		P
9.12	Temperature rise		P
	For the ARD and MPD, the following subclauses of the MPD standard apply, a current equal to its rated current is passed simultaneously through all the poles of the MPD and the ARD supplied as for normal use with rated voltage: a) IEC 60898-1 :201 5, 9.8 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0, 9.8 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, 9.8 for ARD classified according to 4.2.3 (RCBOs). The test current in the MPDs may be generated at reduced voltage but the ARD shall be supplied at their rated voltage. For this reason, tests shall be made on samples specially prepared by the manufacturer or according to its instructions.		P
9.13	Verification of the mechanical and electrical endurance – Verification of thereclosing system of the ARD		N
9.1 3.1	General test conditions		N
9.1 3.2	Test procedure		N
9.1 3.3	Condition of the ARD after the test		N
9.14	Short-circuit test		P
9.1 4.1	General conditions for short-circuit test		P
	The ARD and MPD shall be in a new and clean condition.		P
9.1 4.2	Test circuit and test quantities		P

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Clause	Requirement – Test	Result - Remark	Verdict
	For the ARD and MPD, the relevant subclause of the MPD standard applies: a) IEC 60898-1 :201 5, 9.1 2.2 and 9.1 2.4 for ARD classified according to 4.2.1 (circuit- breakers); b) IEC 61 008-1 :201 0 and IEC 61 008-1 :201 0/AMD1 :201 2, 9.1 1 .2.1 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0 and IEC 61 009-1 :201 0/AMD1 :201 2, 9.1 2.2 and 9.1 2.3 for ARD classified according to 4.2.3 (RCBOs).		P
9.1 4.3	Test procedure		P
	For the ARD and MPD, the relevant subclause(s) of the MPD standard(s) applies: a) IEC 60898-1 :201 5, 9.1 2.1 1 .4.2, or IEC 60898-2:201 6, 9.1 2.1 1 .4.2, as applicable, for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0 and IEC 61 008-1 :201 0/AMD1 :201 2, 9.1 1 .2.4 a) for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 008-1 :201 0 and IEC 61 008-1 :201 0/AMD1 :201 2, 9.1 1 .2.3 b) for ARD classified according to 4.2.2 (RCCBs); d) IEC 61 009-1 :201 0 and IEC 61 009-1 :201 0/AMD1 :201 2, 9.1 2.1 1 .4 b) for ARD classified according to 4.2.3 (RCBOs); e) IEC 61 009-1 :201 0 and IEC 61 009-1 :201 0/AMD1 :201 2, 9.1 2.1 3 for ARD classified according to 4.2.3 (RCBOs). In case of ARDs classified according to 4.3.1 and 4.6.2, the CO operation shall be performed for a number of times equal to the maximum number of reclosing operations, and the time interval between the consecutive CO operations shall be that stated by the manufacturer with the ARD operating as in normal use. In case of ARDs classified according to 4 . 3 . 2 , the ARD shall be disabled and the MPD shall be closed manually. After the tests, the ARD shall be verified according to 9.1 4.4.		P
9.1 4.4	Condition of the ARD after the test		P
	After the test, the ARD and MPD shall perform the following test of the relevant subclause of the MPD standard under the test conditions of Clause 9: a) IEC 60898-1 :201 5, 9.1 2.1 2.1 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0, 9.1 1 .2.1 i) for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, 9.1 2.1 2.1 for ARD classified according to 4.2.3 (RCBOs). After the test, compliance with 9.5.4 is checked. Compliance with 9.1 8.2 and/or 9.1 8.3 as applicable is also checked for devices classified according to 4.3.2.		P
9.15	Resistance to mechanical shock and impact		P

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Clause	Requirement – Test	Result - Remark	Verdict
	For the ARD and MPD, the following subclauses of the MPD standard apply: a) IEC 60898-1 :201 5, 9.1 3 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0, 9.1 2 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, 9.1 3 for ARD classified according to 4.2.3 (RCBOs).		P
9.16	Test of resistance to heat		P
	For the ARD and MPD, the following subclauses of the MPD standard apply: a) IEC 60898-1 :201 5, 9.1 4 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0, 9.1 3 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, 9.1 4 for ARD classified according to 4.2.3 (RCBOs). In case of ARD according to 4.1 .2, the test is carried out only on the ARD part.		P
9.17	Resistance to abnormal heat and to fire For the ARD and MPD, the following subclauses of the MPD standard apply: a) IEC 60898-1 :201 5, 9.1 5 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0 and IEC 61 008-1 :201 0/AMD1 :201 2, 9.1 4 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0 and IEC 61 009-1 :201 0/AMD1 :201 2, 9.1 5 for ARD classified according to 4.2.3 (RCBOs). In case of ARD according to 4.1 .2, the test is carried out only on the ARD part.		P
9.18	Verification of the operating characteristics		N
9.1 8.1	General.		N
9.1 8.2	Verification of the reclosing subordinated to the measurements of the resistance to earth		N

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Clause	Requirement – Test	Result - Remark	Verdict
	a) The test circuit shall correspond to Figure 3 or Figure 4 as applicable. The resistor R1 shall be adjusted at any convenient value which leads the ARD and MPD to trip. The resistor R2 shall be adjusted to the value equal to R d . The MPD is made to trip by closing the test switch S1 , and immediately after the tripping of the ARD, the switch S1 shall be opened. The ARD shall reclose. The test is repeated three times on a pole taken at random which shall not be the switched neutral. Each test shall be separated from the previous reclosing by an interval of at least 30 s. b) The test circuit shall correspond to Figure 3 or Figure 4 as applicable. The resistor R1 shall be adjusted at any convenient value which leads the ARD and MPD to trip. The resistor R2 shall be adjusted to the value equal to R d0. The MPD is made to trip by closing the test switch S1, and immediately after the tripping of the ARD and MPD, the switch S1 shall be opened. The ARD shall not reclose and ARD shall show the appropriate signal according to the manufacturer's instructions. After this test, the resistor R2 is removed and the ARD classified according to 4. 3. 2. 1 a) shall not reclose; the ARD classified according to 4.3.2.1 b) shall reclose according to the manufacturer's instructions. The test is repeated three times on a pole taken at random which shall not be the switch neutral. Each test shall be separated from the previous reclosing by the reset of the ARD.		N
9.1 8.3	Verification of the reclosing subordinated to the measurements of the resistance between live parts		N
	a) The test circuit shall correspond to Figure 5. The resistor R1 shall be adjusted to the value equal to R cc. The MPD is caused to open automatically (e.g. by means of a tripping release), and immediately after the tripping of the ARD and MPD, the switch S1 shall be closed. The ARD shall reclose. The test is repeated three times on one possible combination of live parts taken at random. Each test shall be separated from the previous one by an interval of at least 3 min. b) The test circuit shall correspond to Figure 5. The resistor R1 shall be adjusted to the value equal to R cc0. The MPD is caused to open automatically (e.g. by means of a tripping release); immediately after the tripping of the ARD and MPD, the switch S1 shall be closed. The ARD shall not reclose and the ARD shall show the appropriate signal according to the manufacturer's instructions.		N
9.1 8.4	Verification of the influence of the distributed capacities in the installation on the operating characteristic		N
9.1 8.4.1	Verification of the reclosing subordinated to the measurements of the resistance between live parts to earth		N

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Clause	Requirement – Test	Result - Remark	Verdict
	The test conditions specified in 9.1 8.2 a) and 9.1 8.2 b) apply by inserting a capacitor of 1 00 nF in parallel to the resistor R2. The test shall be carried out at 0,85 and 1 ,1 time the rated voltage at the following temperatures: (−5 ± 2) °C, (20 ± 2) °C, (40 ± 2) °C after the steady state is reached.		N
9.1 8.4.2	Verification of the reclosing subordinated to the measurements of the resistance between live parts		N
	The test conditions specified in 9.1 8.3 a) and 9.1 8.3 b) apply by inserting a capacitor of 1 00 nF in parallel to the resistor R1. The test shall be carried out at 0,85 and 1 ,1 times the rated voltage at the following temperatures: (−5 ± 2) °C, (20 ± 2) °C, (40 ± 2) °C after the steady state is reached.		N
9.1 8.5	Verification of the maximum current in FE under normal condition		N
	The ARD is installed as in normal use and supplied at a voltage 1 ,1 times its rated voltage. The test circuit shall be in accordance with Figure 6. The resistor R1 shall be adjusted at a value of 1 Ω. The test current in the resistor R1 is measured by the use of an appropriate mean (e.g., oscilloscope, ammeter). The test current shall not exceed 1 ,0 mA r.m.s. The device is then made to trip, and the measurement is performed again.		N
9.19	Verification of the safety during the assessment		P
9.1 9.1	Verification of the limitation of the voltage		N
	The ARD and the MPD are installed as in normal use, supplied at 1,1 rated voltage and without any load. The MPD is made to trip and the voltage on the load terminals of the ARD and MPD is measured by an appropriate means (e.g. oscilloscope, voltmeter) before the ARD recloses. The voltage shall not exceed 24 V r.m.s. In case of an ARD provided with an FE, the following test shall be carried out.		N
9.1 9.2	Verification of the limitation of the test current		P

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Clause	Requirement – Test	Result - Remark	Verdict
	The ARD is installed as in normal use and supplied at a voltage 1 ,1 times its rated voltage. The test circuit shall correspond to Figure 3 or Figure 4 as applicable. The resistor R1 shall be adjusted at any convenient value which leads the ARD to trip. The resistor R2 shall be replaced by a connection of negligible value. The test current in the resistor R2 is measured by the use of an appropriate means (e.g.oscilloscope, ammeter). The test current shall not exceed 1 ,0 mA r.m.s or 2,0 mA DC. In case of an ARD provided with an FE, the following test shall be carried out. The ARD and the MPD are installed as in normal use, supplied at 1,1 rated voltage and without any load. The MPD is made to trip. The test current in the FE is measured by the use of an appropriate means (e.g. oscilloscope, ammeter). The test current shall not exceed 1 ,0 mA r.m.s or 2,0 mA DC.		P
9.1 9.3	Verification of the safety in blocked condition		P
	The ARD is installed as in normal use and supplied at a voltage 1 ,1 times its rated voltage. The MPD shall be made to trip for the maximum number of consecutive reclosing operations as declared by the manufacturer in order to get the ARD in blocked condition. For ARDs classified as 4.4.1 , the verification is made by repeating the test of 9.1 9.1 . For ARDs classified as 4.4.2, the verification is made by repeating the test of 9.1 9.2. For ARDs classified as 4.3.1 , the relevant subclause of the MPD standard applies, without the humidity treatment: a) IEC 60898-1 :201 5, 9.7.3 for ARD classified according to 4.2.1 (circuit-breakers); b) IEC 61 008-1 :201 0, 9.7.3 for ARD classified according to 4.2.2 (RCCBs); c) IEC 61 009-1 :201 0, 9.7.3 for ARD classified according to 4.2.3 (RCBOs).		P
9.20	Verification of the operation of the test device at the limits of rated voltage		P
	For the ARD and MPD, the relevant subclause of the MPD standard applies: a) IEC 61 008-1 :201 0, 9.1 6 for ARD classified according to 4.2.2 (RCCBs); b) IEC 61 009-1 :201 0, 9.1 6 for ARD classified according to 4.2.3 (RCBOs). It may be necessary to increase the interval time between two consecutive operations up to the reset time.		P
9.21	Verification of ageing		N

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Clause	Requirement – Test	Result - Remark	Verdict
	The ARD and MPD are placed for a period of 1 68 h in an ambient temperature of (40 ± 2) °Cand loaded with the rated current. The voltage on the electronic parts shall be 1 ,1 times the rated voltage. After this test, the ARD and MPD in the cabinet are allowed to cool down to approximatelyroom temperature without current passing. The electronic parts shall show no damage. After the test, compliance with 9.5.4 is checked. Compliance with 9.1 8.2 or 9.1 8.3 as applicable is also checked for devices classified according to 4.3.2.		N
9.22	Electromagnetic compatibility		N
9.22.1	General		N
9.22.2	Low-frequency electromagnetic phenomena		N
9.22.3	High-frequency immunity		N
9.22.4	Electrostatic discharges		N
9.22.5	Electromagnetic emission of ARDs		N
9.22.6	Performance criteria		N

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Clause	Requirement – Test	Result - Remark	Verdict
4	**Classification**		P
4.1	According to the method of operation		P
4.1.1	RCBO functionally independent of line voltage		P
4.1.2	RCBO functionally dependent on line voltage		P
4.2	According to the type of installation		N
4.3	According to the number of poles and current paths		P
4.4	According to the possibility of adjusting the residual operating current		N
4.5	According to resistance to unwanted tripping due to voltage surges		P
4.6	According to behaviour in presence of d.c. components		N
4.7	According to time-delay (in presence of a residual current)		P
4.8	According to the protection against external influences	enclosed-type RCBO	P
4.9	According to the method of mounting	surface-type RCBO;	P
4.10	According to the methods of connection	screw-in type.	P
4.11	According to the instantaneous tripping current	C-Type	P
4.12	According to the I2t characteristic		P
4.13	According to the type of terminals		P
4.Z1	According to the range of ambient air temperature		P
5	**Characteristics of RCBOs**		P
5.1	Summary of characteristics		P
5.2	Rated quantities and other characteristics		P
5.2.1	Rated voltage		P
5.2.1.1	Rated operational voltage (*U*e)		P
5.2.1.2	Rated insulation voltage (*U*i)		P
5.2.1.3	Rated impulse withstand voltage (*U*imp)		P
5.2.2	Rated current (*I*n)		P
5.2.3	Rated residual operating current (*I*_n)		P

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Clause	Requirement – Test	Result - Remark	Verdict
5.2.4	Rated residual non-operating current (*I*_no)		P
5.2.5	Rated frequency	50/60Hz	P
5.2.6	Rated short-circuit capacity (*I*cn)		P
5.2.7	Rated residual making and breaking capacity (*I*_m)		P
5.2.8	RCBO type S		N
5.2.9	Operating characteristics in case of residual currents with d.c. components		N
5.2.9.1	RCBO type AC		N
5.2.9.2	RCBO type A		N
5.3	Standard and preferred values		P
5.3.1	values of rated voltage (*U*n)		P
5.3.2	Preferred values of rated current (*I*n)		P
5.3.3	Standard values of rated residual operating current (*I*_n)		P
5.3.4	Standard value of residual non-operating current (*I*_no)		P
5.3.5	Value of rated frequency	50/60Hz	P
5.3.6	Values of rated short-circuit capacity (*I*cn) and of rated residual making and breaking capacity (*I*Δm)		P
5.3.6.1	Standard values up to and including 10 000 A		P
5.3.6.2	Values above 10 000 A up to and including 25 000 A		N
5.3.8	Limiting values of break time and non-actuating time for RCBO of type AC and A		N
5.3.8.1	Limiting values of break time and non-actuating time for alternating residual currents (r.m.s. values) for type AC and A		N
5.3.8.2	Maximum values of break time for half-wave residual currents (r.m.s. values) for type A		N
5.3.9	Standard ranges of overcurrent instantaneous tripping	Type C	P
5.3.10	Standard values of rated impulse withstand voltage (*U*imp)		P
5.3.Z1	Standard ranges of ambient air temperature		P
6	**Marking and other product information**		P
6.Z1	Standard marking		P
6.Z2	Additional marking		P
7	**Standard conditions for operation in service and for installation**		P
7.1	Standard conditions		P
7.2	Conditions of installation		P

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Clause	Requirement – Test	Result - Remark	Verdict
7.3	Pollution degree		P
8	**Requirements for construction and operation**		P
8.1	Mechanical designs		P
8.1.1	General		P
8.1.2	Mechanism		P
8.1.3	Clearances and creepage distances		P
8.1.4	Screws, current-carrying parts and connections		P
8.1.5	Terminals for external conductors		P
8.1.6	Non-interchangeability		P
8.1.Z1	Mechanical mounting of plug-in type RCBOs		N
8.1.Z1.1	Plug-in type RCBOs, the holding in position of which does not depend solely on their plug-in connection(s)		N
8.1.Z1.2	Plug-in type RCBOs, the holding in position of which depends solely on their plug-in connection(s)		N
8.2	Protection against electric shock		P
8.3	Dielectric properties and isolating capability		P
8.4	Temperature-rise		P
8.4.1	Temperature-rise limits		P
8.4.2	Ambient air temperature		P
8.5	Operating characteristics		P
8.5.1	Under residual current conditions		P
8.5.2	Under overcurrent conditions		P
8.5.2.1	Standard time-(over)current zone		P
8.5.2.2	Conventional quantities		P
8.5.2.3	Overcurrent tripping characteristic		P
8.5.2.4	Effect of the ambient air temperature on the overcurrent tripping characteristic		P
8.5.2.Z1	Effect of single phase loading of multi-pole RCBO on the tripping characteristic		P
8.6	Mechanical and electrical endurance		P
8.7	Performance at short-circuit currents		P
8.8	Resistance to mechanical shock and impact		P
8.9	Resistance to heat		P
8.10	Resistance to abnormal heat and to fire		P
8.11	Test device		P

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Clause	Requirement – Test	Result - Remark	Verdict
8.12	Requirements for RCBOs functionally dependent on line voltage		P
8.14	Behaviour of RCBOs in case of current surges caused by impulse voltages		P
8.15	Behaviour of RCBOs in case of earth fault currents comprising a d.c. component		P
8.16	Reliability		P
8.17	Electromagnetic compatibility		N
8.Z1	Behaviour of RCBOs at low ambient air temperatures		P
9	**Tests**		P
9.1	General		P
9.2	Test conditions		P
9.3	Test of indelibility of marking	rubbing the marking by hand for 15 s with a piece of cotton soaked with water and again for 15 s with a piece of cotton soaked with aliphatic solvent After test, the marking easily legible. The marking also remain easily legible	P
9.4	Test of reliability of screws, current-carrying parts and connections		P
9.5	Tests of reliability of screw-type terminals for external copper conductors		P
9.6	Verification of protection against electric shock		P
9.7	Test of dielectric properties and isolating capability		P
9.7.1	Resistance to humidity		P
9.7.1.1	Preparation of the RCBO for test		P
9.7.1.2	Test conditions	93%,25°C. 48H	P
9.7.1.3	Test procedure		P
9.7.1.4	Condition of the RCBO after the test		P
9.7.2	Insulation resistance of the main circuit		P

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Clause	Requirement – Test	Result - Remark	Verdict
9.7.3	Dielectric strength of the main circuit		P
9.7.4	Insulation resistance and dielectric strength of auxiliary circuits		P
9.7.5	Secondary circuit of detection transformers		P
9.7.6	Capability of control circuits connected to the main circuit withstanding high d.c. voltages due to insulation measurements		P
9.7.7	Verification of impulse withstand voltages (across clearances and across solid insulation) and of leakage current across open contacts		P
9.7.7.1	General testing procedure for the impulse withstand voltage tests		P
9.7.7.2	Verification of clearances with the impulse withstand voltage		P
9.7.7.3	Verification of leakage currents across open contacts (suitability for isolation		P
9.7.7.4	Verification of resistance of the insulation of open contacts and basic insulation against an impulse voltage in normal conditions		P
9.7.7.5	Verification of the behaviour of components bridging the basic insulation		P
9.8	Test of temperature-rise		P
9.8.1	Ambient air temperature		P
9.8.2	Test procedure		P
9.8.3	Measurement of the temperature of parts		P
9.8.4	Temperature-rise of a part		P
9.9	Verification of the operating characteristic		P
9.9.1	Verification of the operating characteristic under residual current conditions		P
9.9.1.1	Test circuit and test procedure		P
9.9.1.2	Tests for all RCBOs		P
9.9.1.3	Verification of correct operation at residual currents with d.c. components		P
9.9.1.4	Particular test conditions for RCBOs functionally dependent on line voltage		P
9.9.2	Verification of the operating characteristic under overcurrent conditions		P
9.9.2.1	Test of time-(over)current characteristic		P
9.9.2.2	Test of instantaneous tripping and of correct opening of the contacts		P
9.9.2.3	Test of effect of ambient temperature on the tripping characteristic		P

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Clause	Requirement – Test	Result - Remark	Verdict
9.9.2.Z1	Test of effect of single phase loading on the over-current tripping characteristic of RCBO with three or four current paths		P
9.10	Verification of mechanical and electrical endurance		P
9.10.1	General test conditions		P
9.10.2	Test procedure		P
9.10.3	Condition of the RCBO after test		P
9.11	Verification of the trip-free mechanism		P
9.11.1	General test conditions		P
9.11.2	Test procedure		P
9.12	Short-circuit tests		P
9.12.1	General conditions for test		P
9.12.2	Test circuit for short-circuit performance		P
9.12.3	Values of test quantities		P
9.12.4	Tolerances on test quantities		P
9.12.5	Power factor of the test circuit		P
9.12.6	Measurement and verification of *I*2*t* and of the peak current (*I*p)		P
9.12.7	Calibration of the test circuit		P
9.12.8	Interpretation of records		P
9.12.9	Condition of the RCBO for test		P
9.12.9.1	Test in free air		P
9.12.9.2	Test in enclosures		P
9.12.10	Behaviour of the RCBO during short-circuit tests		P
9.12.11	Test procedure		P
9.12.11.1	General		P
9.12.11.2	Test at reduced short-circuit currents		P
9.12.11.3	Test at 1500A		P
9.12.11.4	Test above 1 500 A		N
9.12.12	Verification of the RCBO after short-circuit test		P
9.13	Mechanical Stresses		P
9.13.1	Mechanical shock		P
9.13.1.1	Test device		P
9.13.1.2	Test procedure		P
9.13.2	Resistance to mechanical stresses and impact		P
9.14	Test of resistance to heat		P

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Clause	Requirement – Test	Result - Remark	Verdict
9.15	Test of resistance to abnormal heat and to fire		P
9.16	Verification of the operation of the test device at the limits of rated voltage		P
9.17	Verification of the behaviour of RCBOs functionally dependent on line voltage, classified under 4.1.2.1, in case of failure of the line voltage		P
9.17.1	Determination of the limiting value of the line voltage (*U*x)		P
9.17.2	Verification of the behaviour in case of failure of the line voltage		P
9.17.3	Verification of the correct operation, in presence of a residual current, for RCBOs opening with delay in case of failure of the line voltage		P
9.17.4	Verification of correct operation of RCBOs with three or four in presence of a residual current, the neutral and one line terminal only being energized		N
9.19	Verification of behaviour of RCBOs in case of current surges caused by impulse voltages		P
9.19.1	Current surge test for all RCBOs (0,5 µs/100 kHz ring wave test)		P
9.19.2	Verification of behaviour at surge currents up to 3 000 A (8/20 µs surge current test)		P
9.19.2.1	Test conditions		P
9.19.2.2	Test results for S-type RCBOs		N
9.19.2.3	Test results for RCBOs of the general type		P
9.20	Verification of resistance of the insulation against an impulse voltage		P
9.21.1	Type A residual current devices		N
9.22	Verification of reliability		P
9.22.1	Climatic test		P
9.22.1.1	Testing chamber		P
9.22.1.2	Severity		P
9.22.1.3	Test procedure		P
9.22.1.4	Recovery		P
9.22.1.5	Final verification		P
9.22.2	Test with temperature of 40 °C		P
9.23	Verification of ageing		P
9.24	Electromagnetic compatibility		N
9.24.1	Tests covered by the present standard		N
9.24.2	Additional tests		N
9.25	Test of resistance to rusting		P
9.Z1	Verification of the correct operation at low ambient air temperatures for RCBOs for use at temperatures between -25 °C and +40 °C		P

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Clause	Requirement – Test	Result - Remark	Verdict

	TABLE: Heating test		P
	Test Voltage (V)..... :	400V	—
	Ambient (C)..... :	23.7°C	—

Thermocouple locations:	**Max. temperature rise measured, ∆ T (K)**	**Max. temperature rise limit, ∆ T (K)**
Terminal	38.5	65
Enclosure	9.6	40
Switch	14.8	60
Supplementary information:		

	TABLE: Dielectric strength		P
Test voltage applied between:		**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**
Between each pair of the terminal		2000VAC	No
Supplementary information:			

	TABLE: Resistance to heat and fire - Glow wire tests							P
Object/ Part No./ Material	**Manufacturer / trademark**	**Glow wire test (GWT); (°C)**						**Verdict**
		550	**650**		**750**		**850**	
			te	**ti**	**te**	**ti**		
Enclosure	/	--	0	0	--	--	--	P

Object/ Part No./ Material	**Manufacturer / trademark**	**Glow-wire flammability index (GWFI), °C**				**GW ignition temp. (GWIT), °C**		**Verdict**
		550	**650**	**750**	**850**	**675**	**775**	
--	--	--	--	--	--	--	--	--

The test specimen passed the glow wire test (GWT) with no ignition [(te – ti) ≤ 2s] (Yes/No):	Yes
If no, then surrounding parts passed the needle-flame test of annex E (Yes/No) .....:	N/A
The test specimen passed the test by virtue of most of the flaming material being withdrawn with the glow-wire (Yes/No)? .....:	No
Ignition of the specified layer placed underneath the test specimen (Yes/No).....:	No

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Clause	Requirement – Test	Result - Remark	Verdict

Supplementary information:

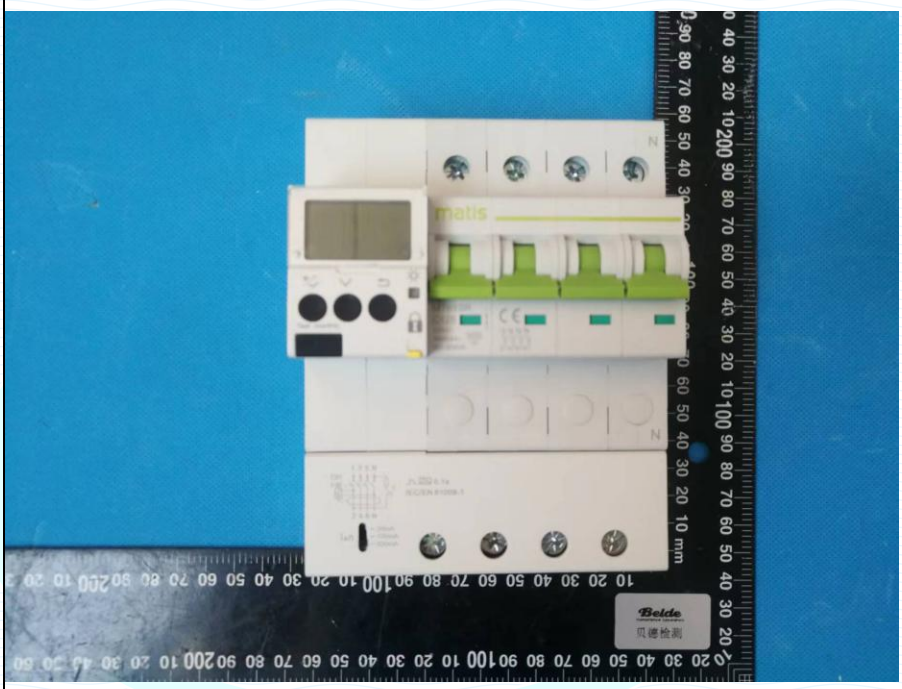
- 550 °C GWT not relevant (or applicable) to parts of material classified at least HB40 or if relevant HBF
- The GWIT pre-selection option, the 850 °C GWFI pre-selection option, and the 850 °C GWT are not relevant (or applicable) for attended appliances

	TABLE: 1 - List of components and circuits relied on for safety	P

Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Mark(s) of conformity[1)]**
Enclosure	ANHUI KÜAIJIEELECTRONICS CO LTD	PC-1	V-0,	UL

Appendix 1

Whole views of EUT

Photo 1 View: [√] front [ ] rear [ ] right side [ ] left side [ ] top [ ] bottom [ ] internal	

Appendix 2

Product marking of EUT

Smart Reclosed RCBO
Model: MT61SR

Rated Voltage Ue: 400VAC,50/60Hz
Rated Current: 125A
Poles: 4P

SHANGHAI MATIS ELECTRIC CO.,LTD.

CE