Test Report issued under the responsibility of:

TEST REPORT
IEC 60947-5-1
Part 5: Control circuit devices and switching elements
Electromechanical control circuit devices

Report Number..... :	(2023)FQIIDQ-1043
Date of issue..... :	2023-12-13
Total number of pages	50
Name of Testing Laboratory preparing the Report ..... :	Fujian Inspection and Research Institute for Product Quality (FQII)
Applicant's name ..... :	ZHEJIANG GEYA ELECTRICAL CO.,LTD
Address..... :	Wenzhou Bridge Industrial Zone, Beibaixiang Town, Yueqing, Zhejiang, P.R.China
Test specification:	
Standard ..... :	IEC 60947-5-1:2016 to be used in conjunction with IEC 60947-1:2007, IEC 60947-1:2007/AMD1:2010, IEC 60947-1:2007/AMD2:2014
Test procedure ..... :	CB Scheme
Non-standard test method ..... :	N/A
TRF template used..... :	IECEE OD-2020-F1:2023, Ed.1.6
Test Report Form No. ..... :	IEC60947_5_1H
Test Report Form(s) Originator .... :	DEKRA Certification B.V.
Master TRF ..... :	Dated 2023-11-10

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

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

General disclaimer:

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 NCB. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description ..... :	Floatless relay
Trade Mark ..... :	GEYA
Manufacturer ..... :	ZHEJIANG GEYA ELECTRICAL CO.,LTD / Wenzhou Bridge Industrial Zone, Beibaixiang Town, Yueqing, Zhejiang, P.R.China
Model/Type reference ..... :	GRL8-01,GRL8-02
Ratings ..... :	Uimp:2.5kV;Ui:250V;Ith:10A; AC-15:Ue/Ie:250V/2.5A;Utilization Category:AC-15;IP20.

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

☒	**CB Testing Laboratory:**	Fujian Inspection and Research Institute for Product Quality(FQII)	
Testing location/ address.....:		No.6,Shuangfeng Road, Hongshan,Gulou District,Fuzhou, Fujian 350002 China & No.101,Baozhen Road,Mawei, Mawei District,Fuzhou,Fujian 350015 China	
Tested by (name, function, signature).....:		Yang Jilin (Engineer)	
Approved by (name, function, signature)...:		Wei Yunming (Chief Engineer)	
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address.....:			
Tested by (name, function, signature).....:			
Approved by (name, function, signature)...:			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address.....:			
Tested by (name + signature).....:			
Witnessed by (name, function, signature) .:			
Approved by (name, function, signature)...:			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address.....:			
Tested by (name, function, signature).....:			
Witnessed by (name, function, signature) .:			
Approved by (name, function, signature)...:			
Supervised by (name, function, signature) :			

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

Attachment 1: EMC(3 pages,37 to 39)

Summary of testing:

Sample allocation and test items according to IEC 60947-5-1, see the table below:

Type	Ue/Ie	Utilization category	Sequence
GRL8-02	250V/2.5A	AC-15	I, II, III, IV, V, VI,EMC

Tests performed (name of test and test clause):

TEST SEQUENCE I

Test No.1 – Operating limits of contactor relays (8.3.3.2), if applicable(N/A)

Test No. 2 - Temperature rise (8.3.3.3)

Test No. 3 - Dielectric properties (8.3.3.4)

Test No. 4 - Mechanical properties of terminals (8.2.4 of IEC 60947-1)

TEST SEQUENCE II

Test No. 1 - Making and breaking capacities of switching elements

under normal conditions (8.3.3.5.3)

Test No. 2 - Dielectric verification (8.3.3.5.6b)

TEST SEQUENCE III

Test No. 1 - Making and breaking capacities of switching elements

under abnormal conditions (8.3.3.5.4)

Test No. 2 - Dielectric verification (8.3.3.5.6b)

TEST SEQUENCE IV

Test No. 1 - Performance under conditional short-circuit current (8.3.4)

Test No. 2 - Dielectric verification (8.3.4.4.b)

TEST SEQUENCE V

Test No. 1 - Degree of protection of enclosed control circuit-devices

(Annex C of IEC 60947-1)

Test No. 2 - Verification of actuation force or moment (8.2.5) (N/A)

TEST SEQUENCE VI

Test No. 1 - Measurement of clearances and creepage distances , if applicable (7.1.3)

Test No. 2 - Verification of limitation of rotation of a rotary switch (8.2.6)(N/A)

TEST FOR EMC

Testing location:

No.6,Shuangfeng Road, Hongshan,Gulou District,Fuzhou,Fujian 350002 China & No.101,Baozhen Road,Mawei, Mawei District,Fuzhou,Fujian 350015 China

Note: The test voltage L1/L2/L3 is phase voltage in the CB report.	

Summary of compliance with National Differences

Include only National Differences evaluated and declared by member countries of IECEE CB Scheme. Non-member countries or national or regional standards can be included for information in the General Product Information section of the Test Report but will not to be listed on CB Test Certificate. (See OD 2037, item 7.1).

- IECEE Member countries that are also CENELEC members
  Compliance with Group Differences evaluated ☐ yes ☐ No ☐ N/A
- IECEE Member countries with published National Differences which were evaluated:
  Insert countries (ISO codes) or N/A
- IECEE Member countries that did not publish any National Differences:
  Insert countries (ISO codes) or N/A

To support compliance with published National Differences, attach a compilation of relevant ND and/or GD TRFs to the CB Test Report

Use of uncertainty of measurement for decisions on conformity (decision rule) :

☐ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").

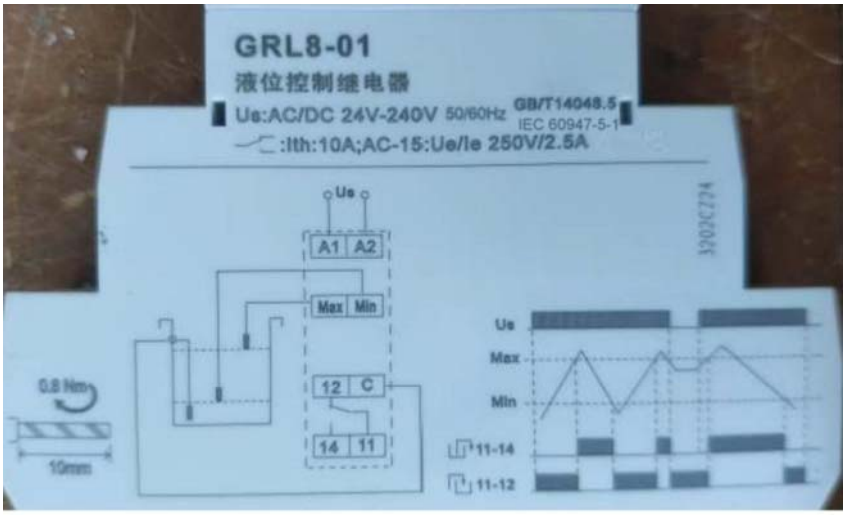
☐ Other: … (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)

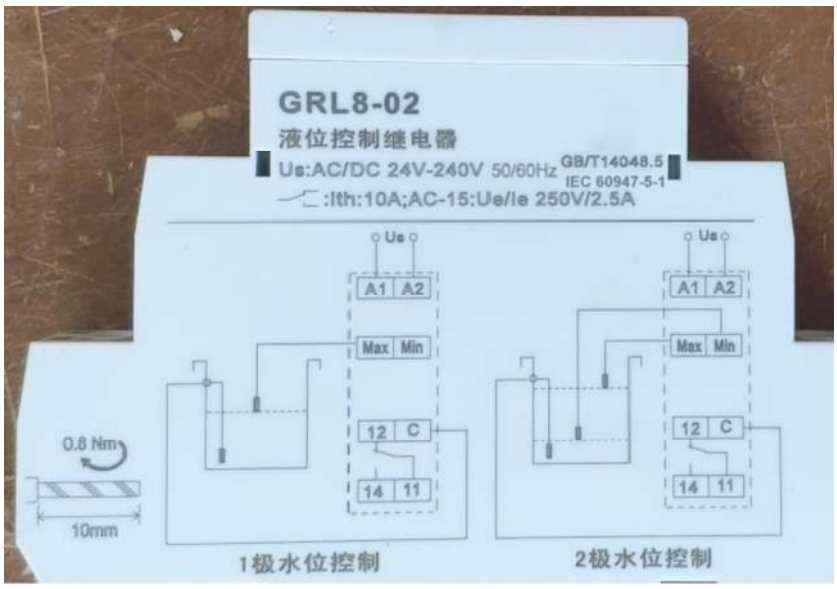
Information on uncertainty of measurement:
The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.
IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.

Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.





Test item particulars .....:	
Classification of installation and use .....:	Normal conditions
Supply Connection.....:	N/A
Kind of control circuit device.....:	☐ manual control switches, e.g. push-buttons, rotary switches, foot switches, etc.
	☐ electromagnetically operated control switches, either time delayed or instantaneous, e.g. contactor relays
	☐ pilot switches, e.g. pressure switches, temperature sensitive switches (thermostats)
	☐ position switches
	☒ associated control equipment, e.g. indicator lights, etc.
Kind of switching elements.....:	☐ auxiliary contacts of a switching device (e.g. contactor, circuit-breaker, etc) which are not dedicated exclusively for use with the coil of that device
	☐ interlocking contacts of enclosure doors
	☐ control circuit contacts of rotary switches
	☐ control circuit contacts of overload relays
Number of poles.....:	N/A
Kind of current.....:	☒ ac and/or ☐ dc
Interrupting medium.....:	☒ air, ☐ oil, ☐ gas, ☐ vacuum, ☐ ...
Operating conditions.....:	
Method of operations.....:	☐ manual
	☒ electromagnetic
	☐ pneumatic
	☐ electro-pneumatic
Method of control .....:	☒ automatic
	☐ non-automatic
	☐ semi-automatic

Rated and limiting values for switching elements:	
Voltages:	
- rated operational voltage Ue (V) ..... :	250
- rated insulation voltage Ui (V) ..... :	250
- rated impulse withstand voltage Uimp (kV) ..... :	2.5
Currents:	
- conventional free air thermal current Ith (A) ..... :	10
- conventional enclosed thermal current Ithe (A)..... :	N/A
- rated operational current Ie (A) ..... :	2.5
Rated frequency (Hz)..... :	50/60
Utilization category..... :	AC-15
Short-circuit characteristic:	
- rated conditional short-circuit current (kA)..... :	1
- kind of protective device..... :	Fuse,RT14-20, 10A
Electrically separated contact elements..... :	N/A
Actuating quantities for pilot switches ..... :	N/A
Pilot switches having two or more contact elements... :	N/A
Indication of contact elements of same polarity..... :	N/A
IP code, in case of an enclosed control device ..... :	IP20
Pollution degree ..... :	3
Suitability for isolation, with the symbol 07-13-06 of IEC 60617-7 ..... :	N/A

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 .....:	2023-10-07
Date (s) of performance of tests.....:	2023-10-10~2023-11-13

General remarks:

"(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.

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).....:	ZHEJIANG GEYA ELECTRICAL CO.,LTD./ Floor3-5,Building 5, No.91, Binjiang Road, Guantou Village, Beibaixiang Town, Leqing City, Zhejiang Province,P.R.China

General product information and other remarks:

GRL8- ☐
(1) (2)

(1) Floatless relay
(2) Design Serial Number:01,02

IEC 60947-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
5	**PRODUCT INFORMATION**		
5.2	Marking		P
	Data shall be preferably marked on the equipment:		
	a - manufacturer's name or trademark	GEYA	P
	b - type designation or serial number	GRL8-02	P
	Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:		
	c - number of this standard	IEC 60947-5-1	P
	d - rated operational voltages	250V	P
	e - utilization category and rated operational currents, at the rated operational voltages of the control circuit device	AC-15:Ue/Ie:AC250V/2.5A	P
	f - rated insulation voltage:	250V	P
	g - rated impulse withstand voltage	2.5kV	P
	h - vacant		N/A
	i - IP code, in case of enclosed control circuit device	IP20	P
	j - pollution degree	3	P
	k - type and maximum ratings of short-circuit protective device	RT14-20,10A	P
	l - conditional short-circuit current	1kA	P
	m - suitability for isolation, where applicable, with the symbol S00288 of IEC 60617		N/A
	n - indication of contact elements of same polarity		N/A
	Marking of data under n) shall be included on the nameplate of the control circuit device in order to ensure proper wiring at installation.		N/A
	o) length of insulation to be removed before insertion of the conductor into the terminal.	10mm	P
	p) for non-universal screwless terminals: – “s” or "sol" for terminals declared for rigid-solid conductors; – "r" for terminals declared for rigid (solid and stranded) conductors; – "f" for terminals declared for flexible conductors.		N/A

IEC 60947-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The indication "s", "sol", "r" or "f" for non-universal screwless terminals shall be marked on the device or, if the space available is not sufficient, on the smallest package unit or in technical information provided with the product.		N/A
5.2.2	Terminal identification and marking (see 7.1.8.4 of IEC 60947-1)		
	Clearly and permanently identified according IEC 60445 and Annex L, unless superseded by relevant standard.		N/A
	Neutral terminal identified by letter ..... :		N/A
	Protective earth terminal identified by letter		N/A
5.2.3	Functional markings		
	Actuators may be identified by symbols in the form of engravings, but if a stop button carries any symbol engraved or marked this symbol shall be a circle or oval		N/A
	Letters or words may be used where space is available		N/A
	Symbols shall be in accordance with IEC 60417		N/A
5.2.4	Emergency stop		
	Actuator shape and colour, background colour and direction of unlatching for emergency stop devices with mechanical latching function shall be in accordance with 4.2 of IEC 60947-5-5		N/A
5.2.5	Operating diagram		
5.2.5.1	General		
	As rotary switches may have multiplicity of contacts elements and a multiplicity of actuator positions, it necessary that the manufacturer indicates the relationship between the actuator positions and the associated contact elements position		N/A
5.2.5.2	Position indication and contact position		
	Sub clause 7.1.6.1 of IEC 60947-1 applies		N/A
	The position indication shall be clear, and the associated text or symbols shall be indelible and easily legible		N/A
5.2.5.3	Terminal markings for operating diagrams		
	Terminal markings shall be clearly identifiable with respect to the operating diagram (see also Annex M)		P
5.2.6	Time delay markings		

IEC 60947-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The manufacturer shall indicate, for each time-delay contact element, the characteristic of the delay, according to 2.4.1.1 or 2.4.1.2		N/A
5.3	Instructions for installation, operation and maintenance		
	The manufacture shall specify, in his documents or catalogues:		
	- the conditions for installation, operation and maintenance, if any, of the equipment during operation and after a fault		P
	- the specify the measures to be taken with regard to EMC, if any,		N/A
	- equipment only suitable in environment A shall provided with the following notice	..... This product has been designed for environment B may cause unwanted electromagnetic disturbances in which case the user may be required to take adequate mitigation measures.	N/A
	- if necessary, the instructions for transport, installation and operation of the equipment shall indicate the measures that are particular importance for the proper and correct installation, commissioning and operation of the equipment.		P

IEC 60947-5-1			
Clause	Requirement + Test	Result - Remark	Verdict

6	**Normal service, mounting and transport conditions**		
6.1.1	Ambient temperature		
	Ambient air temperature does not exceed +40 °C and its average over 24 hours does not exceed +35°C and the lower limit is –5°C		P
6.1.2	Altitude		
	Altitude of side of installation does not exceed 2000m		P
6.1.3	Atmospheric conditions		
6.1.3.1	Relative humidity does not exceed 50 % at max temp +40 °C, higher rel. hum may at lower temperatures e.g. 90% at +20 °C		P
6.1.3.2	Pollution degree		
	Unless otherwise stated, equipment for: - industrial use shall have a degree 3, depending upon micro-environment - household and similar shall have degree 2	Degree 3	P
6.1.4	Shock and vibration		
	Under consideration		
6.2	Conditions during transport and storage		
	Under consideration		
6.3	Mounting		
	According manufacturer’s instruction	See manufacturer’s instruction	P
6.3.1	Mounting of single hole mounted devices		
	Dimensions according Table 2		N/A
6.3.1.1	Location of key recess (if any)		
	Dimensions according Table 3		N/A
6.3.1.2	Range of panel thickness		
	The device shall be capable of being mounted on any thickness between 1 and 6 mm		N/A
6.3.1.3	Grouping of devices		
	The distances a between the mounting centres in the same row and b between the centre lines of the rows shall be not less than those given in table 3. Distances a and b may be interchanged		N/A

IEC 60947-5-1			
Clause	Requirement + Test	Result - Remark	Verdict

7	**CONSTRUCTIONAL AND PERFORMANCE REQUIREMENTS**		
7.1	Constructional requirements		
7.1.1	General		
	Sub clause 7.1 of IEC 60947-1 applies except for 7.1.2, 7.1.3, 7.1.7, 7.1.9 and 7.1.13, and with the following additions:		P
7.1.2	Materials		
7.1.2.2	Glow-wire testing		
		See Table	P
7.1.2.3	Test based on flammability category		
		See Table	N/A
7.1.3	Current-carrying parts and their connection		
	No contact pressure through insulating materials		P
7.1.4	Clearances and creepage distances		
	Clause 7.1.4 of IEC 60947-1 applies		
	Clearances		
	Minimum values are given in Table 13 and Table 15 of IEC 60947-1		
	Rated impulse withstand voltage	See test sequence I	
	Minimum clearance - Case B (mm)		
	Minimum clearance - Case A (mm)	1.5	
	Measured clearances (mm) ..... :	7.80	P
	Creepage distances		
	Pollution degree ..... :	3	
	Comparative tracking index (V) ..... :	≥175	
	Material group ..... :	IIIa	
	Rated insulation voltage Ui (V) ..... :	250	
	Minimum creepage distances (mm) ..... :	4	
	Measured creepage distances (mm) ..... :	8.00	P
7.1.5	Actuator		
7.1.5.1	Insulation		
	Clause 7.1.5.1 of IEC 60947-1 applies		N/A
7.1.5.2	Direction		
	Clause 7.1.5.2 of IEC 60947-1 applies		N/A
7.1.5.3	Actuating force (or moment)		

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Clause	Requirement + Test	Result - Remark	Verdict
		See test sequence V	N/A
7.1.5.4	Limitation of rotation (of rotary switch)		
	When actuators with limited or unidirectional movement are used, they shall be fitted with robust means of limitation, capable of withstanding five times the actual maximum actuating moment.		N/A
7.1.5.5	Emergency stop		
	The actuator shall preferably latch in the actuated position with the control contact open. This latching shall be released by a separate action, e.g. by pulling, rotation, or by means of a key.		N/A
7.1.6	Indication of the contact position		
	Clause 7.1.6 of IEC 60947-1 applies		N/A
7.1.7	Conditions for control switches suitable for isolation		
	A control switch suitable for isolation shall be manually operated with a direct opening action (see Annex K) and shall comply with the isolating function in the open position (see 2.1.19 and 7.1.7 of IEC 60947-1).		N/A
	The open position of a control switch suitable for isolation shall be a position in which the switch can remain when no actuating force is applied.		N/A
	In order to avoid unintentional reclosing, it shall be possible to prevent the operation of the control switches suitable for isolation when the contact elements are in the open position. This may be obtained by padlocking or by a latch which shall only be releasable by a special tool or key.		N/A
7.1.8	Terminals		
		See clause 8.2.4	P
7.1.10	Provisions for protective earthing		
	Clause 7.1.10 of IEC 60947-1 applies		N/A
7.1.11	Enclosures for equipment		
	Clause 7.1.11 of IEC 60947-1 applies		N/A
7.1.12	Degree of protection of enclosed equipment		
	Degree of protection ..... :	IP20	
	Test for first characteristic		

IEC 60947-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Test for first numeral ..... :	☐ 1: ☒ 2: ☐ 3: ☐ 4: ☐ 5: ☐ 6:	P
	Test for second characteristic		
	Test for second numeral ..... :	☐ 1: ☐ 2: ☐ 3: ☐ 4: ☐ 5: ☐ 6: ☐ 7: ☐ 8:	N/A
7.1.14	Class II control circuit devices		
	These devices shall not be provided with means for protective earthing (see IEC 61140)		N/A
	For class II control circuit devices insulated by encapsulation, see Annex F	See annex F	N/A
7.1.15	Requirements for control devices with integrally connected cables		
		See annex G	N/A
7.2	Performance requirements		
	Subclauses 7.2.1.1 and 7.2.2 of IEC 60947-1 apply with the following additions:		P
7.2.1.2	Limits of operation of contactor relays		
	The limits of operation for contactor relays shall be in accordance with IEC 60947-4-1	See clause 8.3.3.2	N/A
7.2.3	Dielectric properties		
	Subclause 7.2.3 of IEC 60947-1 applies with the following addition	See clause 8.3.3.4	P
	For class II control circuit devices insulated by encapsulation	See Annex F	N/A
7.2.4	Ability to make and break under normal and abnormal load conditions		
7.2.4.1	Making and breaking capacities		
	Making and breaking capacities under normal conditions as state in table 4	See clause 8.3.3.5.3	P
	Making and breaking capacities under abnormal conditions as state in table 5	See clause 8.3.3.5.4	P
7.2.4.3	Durability		

IEC 60947-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Sub-clause 7.2.4.3 of IEC 60947-1 applies with the following additions:	N/A	
	Mechanical durability	See Annex C	N/A
	Electrical durability	See Annex C	N/A
7.2.5	Conditional short-circuit current		
	The switching element shall withstand the stresses resulting from short-circuit current under the conditions specified in 8.3.4		P
7.2.7	Additional requirements for control switches suitable for isolation		
	Control switches suitable for isolation shall be tested according to 8.3.3.4 of IEC 60947-1 with a value of test voltage as specified in Table 14 or IEC 60947-1 corresponding to the rated impulse withstand voltage Uimp declared by the manufacturer.		N/A
	Other additional requirements applicable to such control switches are under consideration		
7.2.8	Maximum recovery time		
	For equipment incorporating electronic circuits the maximum recovery time and the measuring method shall be stated by the manufacturer		N/A
7.3	Electromagnetic compatibility (EMC)		
	Subclause 7.3 of IEC 60947-1 applies with the following additions:		P
	The control circuit device to be tested shall have all the essential design details of the type which it represents and shall be in a clean and new condition.		P
	The EMC tests shall be conducted at rated operational voltage Ue, or if the rated operational voltage is given as a range, then the test shall be conducted at a voltage which represents the worst case condition.		P
	Maintenance or replacement of parts during or after a testing cycle is not permitted.		P
	The products covered by this standard are intended for use in environment A.		P
	Contactor relays incorporating electronic circuits shall follow the requirements of 8.3.2.2 of IEC 60947-4-1		N/A

IEC 60947-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.3.1	TEST SEQUENCE I (sample No.#01, GRL8-02)		
Test No. 1	- operating limits of contactor relays (8.3.3.2)		
Test No. 2	- temperature rise (Clause 8.3.3.3.)		
Test No. 3	- dielectric properties (Clause 8.3.3.4)		
Test No. 4	- mechanical properties of terminals (8.2.4 of IEC 60947-1)		
8.3.3.2	Operating limits of contactor relays		
8.3.3.2.1	Power-operated equipment:		
8.2.1.2.1	Electromagnetic contactors and starters		
	rated control supply voltage Us (V) ..... :		
	frequency (Hz) ..... :		
	declared ambient temperature(>40 °C) for 100% Us		
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us . :		N/A
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. ..... :		N/A
	ambient temperature(-5 °C) for 100% Us		
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us . :		N/A
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. ..... :		N/A
8.2.1.2.2	Contactors and starters with electronically controlled electromagnet		
	Rated control supply voltage Us (V) ..... :		
	Frequency (Hz) ..... :		
	Declared ambient temperature(>40 °C) for 100% Us		
	Limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us . :		N/A
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. ..... :		N/A
	Ambient temperature(-5 °C) for 100% Us		
	Limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us . :		N/A
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. ..... :		N/A
8.2.1.2.3	Electro-pneumatic contactors and starters		
	Rated air supply pressure(Bar) ..... :		

IEC 60947-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Declared ambient temperature(>40 °C) for 100% of the rated air supply pressure(Bar)		
	Limits of close satisfactorily at any value between 85% and 110% of rated air supply pressure(Bar) .. :		N/A
	Limits of drop out and open fully are: 75% to 10% of rated air supply pressure(Bar) ..... :		N/A
	Ambient temperature(-5 °C) for 100% of the rated air supply pressure(Bar)		
	Limits of close satisfactorily at any value between 85% and 110% of rated air supply pressure(Bar) .. :		N/A
	Limits of drop out and open fully are: 75% to 10% for the rated air supply pressure(Bar) ..... :		N/A
8.3.3.3	Temperature rise		
	ambient temperature 10-40 °C ..... :	24.6	
	test enclosure W x H x D (mm x mm x mm) ..... :		
	material of enclosure ..... :		
	NO-contacts, test conditions:		
	- rated operational current Ie (A) ..... :		N/A
	- cable cross-section (mm²) ..... :		N/A
	- cable length (m) ..... :		N/A
	- temperature rise of NO terminals (K) ..... :		N/A
	NC-contacts, test conditions:		
	- rated operational current Ie (A) ..... :	10.0	P
	- cable cross-section (mm²) ..... :	1.5	P
	- cable length (m) ..... :	1	P
	- temperature rise of NC terminals (K) ..... :	See table	P
	Coils and electromagnets, test conditions:		
	- rated control supply voltage Us (V / Hz) ..... :		N/A
	- Class of insulating material ..... :		N/A
	- temperature rise of coil and electromagnets (K) ... :	See table	N/A
8.3.3.4	Dielectric properties		
	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		
	- verification by measurement of clearances instead of testing		N/A
	- rated impulse withstand voltage (V) ..... :	2.5kV	P
	- test Uimp auxiliary circuits (kV) ..... :	2.95	P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		
	- rated insulation voltage (V) ..... :	250	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- control and auxiliary circuits, test voltage (V) for 60 sec ..... :	1.50kV	P
8.2.4	Mechanical and electrical properties of terminals		
8.2.4.2	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm²) :	2.5(main circuit)/ 2.5(auxiliary and control circuit)	P
	diameter of thread (mm) ..... :	3.0	P
	torque (Nm) ..... :	0.8	P
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm²) ..... :	1.5(main circuit)/ 1.5(auxiliary and control circuit)	P
	number of conductor of the smallest cross section . :	2	P
	diameter of bushing hole (mm) ..... :	6.5	P
	height between the equipment and the platen (mm) ..... :	260	P
	mass at the conductor(s) (kg) ..... :	0.4(main circuit)/ 0.4(auxiliary and control circuit)	P
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		
	force (N) ..... :	40(main circuit)/ 40(auxiliary and control circuit)	P
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.3	Flexion test		
	conductor of the largest cross-sectional area (mm²) :	2.5(main circuit)/ 2.5(auxiliary and control circuit)	P
	number of conductor of the largest cross-section ... :	1	P
	diameter of bushing hole (mm) ..... :	9.5(main circuit)/ 9.5(auxiliary and control circuit)	P
	height between the equipment and the platen (mm) ..... :	280(main circuit)/ 280(auxiliary and control circuit)	P

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Clause	Requirement + Test	Result - Remark	Verdict
	mass at the conductor(s) (kg) ..... :	0.7(main circuit)/ 0.7(auxiliary and control circuit)	P
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		
	force (N) ..... :	50(main circuit)/ 50(auxiliary and control circuit)	P
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.3	Flexion test		
	conductor of the largest and smallest cross-sectional area (mm²) ..... :	2.5/1.5(main circuit)/ 2.5/1.5(auxiliary and control circuit)	P
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional :	2/1	P
	diameter of bushing hole (mm) ..... :	9.5/6.5(main circuit)/ 9.5/6.5(auxiliary and control circuit)	P
	height between the equipment and the platen (mm) ..... :	280/260(main circuit)/ 280/260(auxiliary and control circuit)	P
	mass at the conductor(s) (kg) ..... :	0.7/0.4(main circuit)/ 0.7/0.4(auxiliary and control circuit)	P
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		
	force (N) ..... :	50/40(main circuit)/ 50/40(auxiliary and control circuit)	P
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.5	Test for insertability of unprepared round copper conductors having the maximum cross-section		
	The test shall be carried out using the appropriate gauge form A or form B specified in Table 7.	B2(main circuit)/ B2(auxiliary and control circuit)	P
	The measuring section of the gauge shall be able to penetrate freely into the terminal aperture to the full depth of the terminal (see also note to Table 7).		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Alternatively, the test can be carried out by inserting the largest conductor of type and rated cross-section among those recommended by the manufacturer, the diameter of which corresponds to the theoretical diameter according to Table 7a, after the insulation has been removed and the end has been reshaped. The stripped end of the conductor shall be able to enter completely within the clamping unit aperture, without use of undue force.		N/A
8.2.4.7	Electrical performance of screwless-type clamping units		
	If terminals are used which are qualified according to IEC 60999-1 and the operating conditions of the terminals in the device are according to the operating conditions specified by the manufacturer of the terminals, then the test does not need to be performed.		N/A
	Sub clause 8.2.4.7 of IEC 60947-1 applies with the following changes:		N/A
	– The test shall be done on the connecting device equipped with the clamping units; – The number of specimens shall be at least 8; – The test shall be done as a single 8 test: • Eight clamping units shall be tested to the declared voltage drop; • If the number of failed clamping units does not exceed two, the test is considered passed.		N/A
	test current (A) ..... :		N/A
	voltage drop ＜ 15 mV. (V) ..... :		N/A
8.2.4.8	Ageing test for screwless-type clamping units		
	If terminals are used which are qualified according to IEC 60999-1 and the operating conditions of the terminals in the device are according to the operating conditions specified by the manufacturer of the terminals, then the test does not need to be performed.		N/A
	Subclause 8.2.4.8 of IEC 60947-1 applies with the following changes:		N/A
	The test shall be done on the connecting device equipped with the clamping units.		N/A
	test current (A) ..... :		N/A
	maximum temperature for the temperature cycles shall be 40°C. Max. temperature (°C) ..... :		N/A
	voltage drop ≤ 22,5 mV or 1,5 times the value measured after the 24th cycle. (V) ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.1	TEST SEQUENCE II (sample No.#02, GRL8-02)		
Test No. 1	- Making and breaking capacities of switching elements under normal conditions (8.3.3.5.3)		
Test No. 2	- Dielectric verification (8.3.3.5.6.b)		
8.3.3.5.3	Making and breaking capacities of switching elements under normal conditions		
	contact element (figure / form) ..... :	form C	
	contact polarity..... :	Same polarity	
	utilization category (AC / DC)..... :	AC-15	
	rated operational voltage Ue (V) ..... :	250	
	rated operational current Ie (A) or power (kW) ..... :	2.5A	
No.1	- test voltage U/Ue = 1,1 (V) ..... :	L1: 277 L2: L3:	P
	- power factor/time constant ..... :	L1: 0.31/0.33 L2: L3:	P
	- make operations: test current I/Ie (A) ..... :	L1: 27.6 L2: L3:	P
	- break operations: test current I/Ie (A) ..... :	L1: 2.78 L2: L3:	P
	- a.c. test: Inductor shunted by a resistor taking 3% of the total power consumed - d.c. test: test current increase from zero to steady-state value within limits of figure 9		P
	- on-time (ms) ..... :	NO:83.4~121 NC:84.7~112	P
	- operating cycles per minute ..... :	6	P
	- number of operating cycles ..... :	50	P
	- test voltage U/Ue = 1,0 (V) ..... :	L1: 252 L2: L3:	P
	- power factor/time constant ..... :	L1: 0.31/0.33 L2: L3:	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- make operations: test current I/Ie (A) ..... :	L1: 25.1 L2: L3:	P
	- break operations: test current I/Ie (A) ..... :	L1: 2.53 L2: L3:	P
No. 2	- on-time (ms) ..... :	NO:93.3~111 NC:95.0~103	P
	- operating cycles per minute ..... :	Rapidly	P
	- number of operating cycles ..... :	10	P
No. 3	- on-time (ms) ..... :	NO:83.5~121 NC:84.0~113	P
	- operating cycles per minute ..... :	60	P
	- number of operating cycles ..... :	990	P
No. 4	- on-time (ms) ..... :	NO:101~102 NC:92.7~101	P
	- operating cycles per minute ..... :	6	P
	- number of operating cycles ..... :	5000	P
	Behaviour and condition during and after the test:		
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
8.3.3.5.6.b	Dielectric verification:		
	dielectric test voltage (V) 2 xUe with a min.of 1000V:	1.00kV	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.1	TEST SEQUENCE III (sample No.#03, GRL8-02)		
Test No. 1	- Making and breaking capacities of switching elements under abnormal conditions (8.3.3.5.4)		
Test No. 2	- Dielectric verification (8.3.3.5.6.b)		
8.3.3.5.4	Making and breaking capacities of switching elements under abnormal conditions:		
	contact element (figure / form) ..... :	form C	
	contact polarity..... :	Same polarity	
	utilization category (AC / DC)..... :	AC-15	
	rated operational voltage Ue (V) ..... :	250	
	rated operational current Ie (A) or power (kW) ..... :	2.5A	
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,1 (V) ..... :	L1: 277 L2: L3:	P
	- power factor/time constant ..... :	L1: 0.29 L2: L3:	P
	- make operations: test current I/Ie (A) ..... :	L1: 25.1 L2: L3:	P
	- break operations: test current I/Ie (A) ..... :	L1: 25.1 L2: L3:	P
	- a.c. test: Inductor shunted by a resistor taking 3% of the total power consumed - d.c. test: test current increase from zero to steady-state value within limits of figure 9		P
	- on-time (ms) ..... :	NO:116~117 NC:125~126	P
	- operating cycles per minute ..... :	6	P
	- number of operating cycles ..... :	10	P
	Behaviour and condition during and after the test:		
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.3.5.6.b	Dielectric verification:		
	dielectric test voltage (V) 2 xUe with min.of 1000V.. :	1.00kV	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.1	TEST SEQUENCE IV (sample No.#04, GRL8-02)		
Test No. 1	- Performance under conditional short-circuit current (8.3.4)		
Test No. 2	- Dielectric verification (8.3.3.5.6.b)		
8.3.4	Performance under conditional short-circuit current		
	contact element (figure / form) ..... :	form C	
	contact polarity..... :	Same polarity	
	type of SCPD ..... :	RT14-20	
	ratings of SCPD (A / V) ..... :	10A	
	prospective current (kA) ..... :	1	
	test voltage (V) U/Ue = 1,1 (V) ..... :	285	P
	r.m.s. test current obtained (kA) ..... :	1.01	P
	power factor (max. 0,7) ..... :	0.69	P
	first CO operation by closing the separate making switch: test Ip / I²dt (kA / kA²s) ..... :	NO:567A/411A^{2}s NC:556A/450A^{2}s	P
	time interval between test (min. 3 min) ..... :	3min	P
	second CO operation by closing the separate making switch: test Ip / I²dt (kA / kA²s) ..... :	NO:622A/451A^{2}s NC:620A/430A^{2}s	P
	time interval between test (min. 3 min) ..... :	3min	P
	third making operation to closed switching elements: test Ip / I²dt (kA / kA²s) ..... :	NO:614A/436A^{2}s NC:631A/427A^{2}s	P
	Behaviour of the equipment during the test:		
	switching elements open by the normal actuating system		P
8.3.3.5.6.b	Dielectric verification:		
	dielectric test voltage (V) 2 xUe with min.of 1000V.. :	1.00kV	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.1	TEST SEQUENCE V (sample No. #05, GRL8-02)		
Test No. 1	- Degree of protection of enclosed control circuit-devices (Annex C of IEC 60947-1)		
Test No. 2	- Verification of actuation force or moment (8.2.5)		
Annex C	Degree of protection of enclosed control circuit-devices		
	The enclosed control circuit devices shall comply with the requirements of Annex C of IEC60947-1		P
8.2.5	Verification of actuation force or moment		
	When required in 7.1.5.3, the minimum actuating force or moment shall be tested during sequence V of 8.3.1. The performance shall be as stated in 7.1.5.3		N/A
7.1.5.3	Actuating force (or moment)		
	The force (or moment) required to operate the actuator shall be compatible with the intended application, taking into account the size of the actuator, the type of enclosure or panel, the environment of the installation and the use for which it is intended		N/A
	The minimum starting force (or moment) shall be sufficiently large to prevent inadvertent operation; e.g. push-buttons and rotary switches to be used with enclosures complying with degrees of protection IPX5 or IPX6 shall not become actuated when hit by the jet of water applied during the test of the enclosed equipment.		N/A
	Minimum force (N)		N/A
	Minimum moment (Nm)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

8.3.1.	TEST SEQUENCE VI (sample No. #06, GRL8-02)		
Test No. 1	- Measurement of clearances and creepage distances (7.1.4 of IEC 60947-1)		
Test No. 2	- Verification of limitation of rotation of a rotary switch (8.2.6)		
7.1.4	Measurement of clearances and creepage distances		
	Clearances and creepage distances	See clause 7.1.4	P
8.2.6	Verification of limitation of rotation of a rotary switch		
	When this test is required in 7.1.4.5, it shall be tested during sequence VI of 8.3.1 The test sample shall be mounted according to the manufacturer's instructions		N/A
7.1.4.5	Limitation of rotation (of a rotary switch)		
	When actuators with limited or unidirectional movement are used, they shall be fitted with robust means of limitation, capable of withstanding five times the actual maximum actuating moment		N/A
8.2.6	The operating moment shall be measured five times and the maximum value recorded (Nm)..... :		N/A
	The maximum moment value, multiplied by five, shall be applied to the actuator by forcing it against the means of limitation. The moment shall be applied for 10 s (Nm)..... :		N/A
	Means of limitation has not moved, become loose or prevented the actuator's normal operation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.4	TEST FOR EMC(sample No.#10, GRL8-02)		
8.4.1.	General		
	Control circuit devices having only passive components are not required to be tested.		P
	Subclauses 8.3.2.1 of IEC 60947-1 and 8.3.2.4 of IEC 60947-1 apply with the following additions:		
	Control circuit devices intended to be mounted in a hole of a panel shall be mounted in a hole which is located in the centre of a grounded square metal plate.		P
	Control circuit devices intended to be mounted on surfaces or on standard rails shall be mounted directly on the grounded square metal plate or on the standard rail which is fixed on the grounded square metal plate.		P
	Control circuit devices intended to be mounted in associated metal enclosures shall be mounted in the grounded metal enclosure with the smallest dimension available or on the grounded square metal plate, whichever configuration yields the worst results.		P
	The dimension of the square metal plate shall be (300 ± 50) mm and the thickness 1,5 $_{0}^{+0,5}$ mm.		P
	If not required otherwise by horizontal standard the connecting leads shall be 2 $_{0}^{+0,1}$ m. If the length of the connecting leads is other than 2 m. Cable length (m)……:		P
	For control circuit devices not having integral cables, the type of cable or wire used shall be specified by the manufacturer: Type of cable…….:		P
	The test sample shall be in the ON-status or in the OFF-status, whichever is the worse. Tested state :	ON / OFF	P
	Where a range of control circuit devices are made according to the same principle and design, and using the same type of components, tests may be performed on representative samples.		P
8.4.2	Immunity		
8.4.2.1	Electrostatic discharges.		
	The test shall be performed according to IEC 61000-4-2 and 7.3.2.4, and shall be repeated 10 times at each measuring point, with a minimum time interval of 1 s between pulses.	See attachment 1	P
8.4.2.2	Radiated radio-frequency electromagnetic fields		
	The test shall be performed according to IEC 61000-4-3 and 7.3.2.5.	See attachment 1	P
8.4.2.3	Electrical fast transients/bursts		

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Clause	Requirement + Test	Result - Remark	Verdict
	The test shall be performed according to IEC 61000-4-4 and 7.3.2.6, with all the connecting leads placed in the capacitive coupling clamp.	See attachment 1	P
8.4.2.4	Surges		
	The test shall be conducted using the methods of IEC 61000-4-5. Capacitive coupling shall be preferred. Surges shall be supplied between:		P
	a) between terminals intended to be connected to the power supply;		P
	b) between each output terminal and each terminal intended to be connected to the power supply		P
	The test voltage values are those of Table 8 but shall not exceed the corresponding U_{imp} value(s) given by the manufacturer following 7.2.3 of IEC 60947-1. Test voltages (V)……..:	AC250V	P
	The repetition rate shall be one surge per minute, with the number of pulses being five positive and five negative.	See attachment 1	P
8.4.2.5	Conducted disturbances induced by radio-frequency fields		
	The test shall be performed according to IEC 61000-4-6 and 7.3.2.8.	See attachment 1	P
8.4.2.6	Power-frequency magnetic fields		
	The test shall be performed according to IEC 61000-4-8 and 7.3.2.9.	See attachment 1	P
8.4.2.7	Voltage dips and interruptions		
	The test shall be performed according to IEC 61000-4-11 and 7.3.2.10.	See attachment 1	P
8.4.3	Emission		
	The test shall be performed according to CISPR 11, group 1, class A, and 7.3.3.	See attachment 1	P

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Clause	Requirement + Test	Result - Remark	Verdict

Annex C of IEC 60947-1	**DEGREE OF PROTECTION OF ENCLOSED CONTROL CIRCUIT-DEVICES**		
C.1	Scope		
	This annex applies to degrees of protection of enclosed switchgear and control gear at rated voltages not exceeding 1000 V a.c. or 1500 V d.c. hereafter referred as ”equipment”		P
C.2	Object		
	Clause 2 of IEC 60529 applies with additional requirements of this annex		P
C.3	Definitions		
	Clause 3 of IEC 60529 applies except that ”Enclosure” is replaced by the following:		P
	”A part providing a specified degree of protection of equipment against certain external influences and a specified degree of protection against approach to or contact with live parts and moving parts”		P
C.4	Designation		
	Clause 4 of IEC 60529 applies except for letters H, M and S		N/A
C.5	Degrees of protection against access to hazardous parts and against ingress of solid foreign objects indicated by the first characteristic numeral		
	Clause 5 of IEC 60529 applies		P
C.6	Degrees of protection against ingress of water indicated by the second characteristic numeral		
	Clause 6 of IEC 60529 applies		N/A
C.7	Degrees of protection against access to hazardous parts indicated by the additional letter		
	Clause7 of IEC 60529 applies		N/A
C.8	Supplementary letters		
	Clause 8 of IEC 60529 applies		N/A
C.9	Examples of designations with IP Code		
	Clause 9 of IEC 60529 applies		N/A
C.10	Marking		
	Clause 10 of IEC 60529 applies with the following addition:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	If the IP Code is designated for one mounting position only, it shall be indicated by the symbol 0623 of ISO 7000 placed next to the IP Code specifying this position of the equipment, e.g. vertical		N/A
C.11	General requirements for the tests		
C.11.1	Clause 11.1 of IEC 60529 applies		P
C.11.2	Clause 11.2 of IEC 60529 applies with the following additions:		P
	All tests are made in the unenergized state		P
	Certain devices(e.g. exposed faces of push-buttons) can be verified by inspection		P
	The temperature of the test sample shall not deviate from the actual temperature by more than 5 K		P
	Where equipment is mounted in an empty enclosure which already has an IP code the following requirements apply:		
	a) For IP1X to IP4X and additional letters A to D This shall be verified by inspection and compliance with the enclosure manufacturer's instructions		N/A
	b) For IP6X dust test This shall be verified by inspection and compliance with the enclosure manufacturer's instructions		N/A
	c) For IP5X dust test and IP1X to IP8X water tests testing of the enclosed equipment is only required where the ingress of dust or water may impair the operation of the equipment		N/A
C.11.3	Sub clause 11.3 of IEC 60529 applies with the following addition:		N/A
	Drain and ventilating holes are treated as normal openings		N/A
C.11.4	Clause 11.4 of IEC 60529 applies		P
C11.5	Where an empty enclosure is used as a component of an enclosed equipment, Clause 11.5 of IEC 60529 applies		N/A
C.12	Degrees of protection against access to hazardous parts indicated by the first characteristic numeral		
	Clause 12 of IEC 60529 applies except for 12.3.2		P
C.13	Degrees of protection against ingress of solid foreign objects indicated by the first characteristic numeral		
	Clause 13 of IEC 60529 applies except for		P
C.13.4	Dust test for first characteristic numerals 5 and 6		

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Clause	Requirement + Test	Result - Remark	Verdict
	Enclosed equipment having a degree of protection IP5X shall be tested according to category 2 of 13.4 of IEC 60 529		N/A
	Enclosed equipment having a degree of protection IP6X shall be tested according to category 1 of 13.4 of IEC 60 529		N/A
C.13.5.2	Acceptance conditions for first characteristic numeral 5		
	The following text to be added:		
	Where dust deposits could raise as to the correct functioning and safety of the equipment, a preconditioning and a dielectric test shall be conducted as follows:		N/A
	The preconditioning, after dust test, shall be verified by test Ca: damp heat, steady state, according to IEC 60068-2-3, under the following conditions.		N/A
	The equipment shall be prepared so that the dust deposits are subjected to the test by leaving open the lid and/or removing parts, where possible without the aid of tool		N/A
	Before being placed in the chamber the equipment shall be stored at room temperature at least 4 h before the test		N/A
	The test duration shall be 24 consecutive hours		N/A
	After this period the equipment is to be removed from the chamber within 15 min and submitted to a power-frequency dielectric test for 1 min, the value being 2 Uemax with a minimum of 1000 V (V)..... :	Utest (V):	N/A
C.14	Tests for protection against ingress of water indicated by the second characteristic numeral		
C.14.1	Clause 14.1 of IEC 60529 applies		N/A
C.14.2	Clause 14.2 of IEC 60529 applies		N/A
C.14.3	Clause 14.3 of IEC 60529 applies with following addition:		N/A
	The equipment's then submitted to a power-frequency dielectric test for 1 min, the value being 2 Ue_{max} with a minimum of 1000 V (V) ..... :	Utest (V):	N/A
C.15	Tests for protection against access to hazardous parts indicated by additional letter		
	Clause 15.1 of IEC 60529 applies		N/A
C.16	Summary of responsibilities of relevant technical committees		

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Clause	Requirement + Test	Result - Remark	Verdict
Annex C	**SPECIAL TESTS - DURABILITY TESTS**		N/A
Annex E	**ITEMS SUBJECT TO AGREE BETWEEN MANUFACTURER AND USER**		N/A
Annex F	**CLASS II CONTROL CIRCUIT DEVICES INSULATED BY ENCAPSULATION REQUIREMENTS AND TESTS**		N/A
Annex G	**ADDITIONAL REQUIREMENTS FOR CONTROL CIRCUIT DEVICES WITH INTEGRALLY CONNECTED CABLES**		N/A
Annex H	**ADDITIONAL REQUIREMENTS FOR SEMICONDUCTOR SWITCHING ELEMENTS FOR CONTROL CIRCUIT DEVICES**		N/A
Annex J	**SPECIAL REQUIREMENTS FOR INDICATOR LIGHTS AND INDICATING TOWERS**		N/A
Annex K	**SPECIAL REQUIREMENTS FOR CONTROL SWITCHES WITH DIRECT OPENING ACTION**		N/A
Annex L	**SPECIAL REQUIREMENTS FOR MECHANICALLY LINKED CONTACT ELEMENTS**		N/A
Annex N	**Procedure to determine reliability data for electromechanical devices in control circuits used in functional safety applications**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

Annex M	**TERMINAL MARKING, DISTINCTIVE NUMBER AND DISTINCTIVE LETTER FOR CONTROL CIRCUIT DEVICES(#09)**		
M.1	General		
	This annex applies to control switches and contactor relays irrespective of their construction, having terminal marking.		P
M.2	Terminal marking rule		
M.2.1	General		
	Terminal marking in accordance with this annex is based, in principle, on a two-digit number.		P
M.2.2	Function digit		
	Sub clause L.3.2.1 of IEC 60947-1 applies.		P
M.2.3	Sequence digit		
	The tens digit is a continuous sequence number beginning with 1 (except for control switches designated 01 and contactor relays designated 01E), independent of the contact function		P
	Terminals belonging to the same contact are marked with the same sequence digit.		P
	For contactor relays having 10 contact elements, the sequence digit 0 is used instead of 10.		N/A
	The sequence digit may be omitted from the terminal marking only if additional information provided by the manufacturer or the user clearly gives such digit.		P
M.2.4	Numbering method		
	The contact terminals shall be numbered sequentially from left to right on the device; for devices with tiers of terminals, the numbering shall begin with the tier nearest to the mounting level.		P
M.3	Distinctive number distinctive letter		
M.3.1	General		
	The quantity and type of the contact elements of a control switch according to this annex are indicated by a distinctive number. Contacts of contactor relays are indicated by a distinctive number followed by a distinctive letter.		N/A
M.3.2	Distinctive number		

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	The first digit of the distinctive number gives the quantity of make contact elements and the second digit the quantity of break contact elements. The third digit, if any, shall give the quantity of change-over contact elements in control switches.		N/A
M.3.3	Distinctive letter		
	The distinctive letter indicates the location of the contact elements of a contactor relay in relation to each other and their terminal marking.		N/A
M.4	Terminal numbering sequence		
	For control switches having the same distinctive number, the terminal marking is specified in Table M.1.		P
	The position of the contact elements of the control switch need not correspond to that shown on diagrams of Table M.1.		P
M.5	Contactor relays designated by the distinctive letter E		
	For contactor relays having the same distinctive number and the distinctive letter E, independently of their construction, the sequence of the contact elements within the device is specified in accordance with the diagrams of Table M.2.		N/A
M.6	Contactor relays designated by the distinctive letter X, Y or Z		
M.6.1	Contactor relays designated by the distinctive letter Z		
	If the location of the contact elements within the device (but not the terminal marking) differs from the provisions of Clause M.5, the device shall be designated by the distinctive letter Z instead of the distinctive letter E.		N/A
M.6.2	Contactor relays designated by the distinctive letter X		
	If the location of the contact elements within the device and the terminal marking both differ from the requirements of Clause M.5, the device shall be designated by the distinctive letter X instead of the distinctive letter E.		N/A
	The device shall comply with the requirements of Clauses M.2 and M.3.		N/A
M.6.3	Contactor relays designated by the distinctive letter Y		
	Devices consisting of combinations of contact elements and terminal marking in accordance with Table M.3 shall be designated by the distinctive letter Y instead of the distinctive letter E.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

Attachment 1:EMC

8.4	Test for EMC (#10, GRL8-02)		
8.4.2	**Immunity**		P
8.4.2.1	**Electrostatic discharges**		P
	Air discharge:8kV	8	
	Parts of discharge: non-metallic	—	
	Contact discharge: 4kV	4	
	Parts of discharge: metallic	—	
	Indirect application: 4kV	4	
	Parts of discharge: coupling plane	HCP,VCP	
	Times:10 times each polarity		
	Intervals of ≥1s:	1s	
	The tests shall be performed on two-phase poles.		
	Performance criterion B applies.	B	

8.4.2.2	**Radiated radio-frequency electromagnetic fields**		P
	Field strength:10V/m, 3V/m,1V/m		
	Frequency range:		
	(80~1000)MHz,(1.4~2)GHz,(2~2.7)MHz		
	Carrier signal: amplitude modulation depth 80%, frequency 1kHz sine wave		
	The tests performed at each of the following frequencies:	1kHz	
	Polarization:		
	horizontal	H	
	vertical	V	
	The tests shall be performed on two-phase poles.		
	Performance criterion A applies.	A	

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Clause	Requirement + Test	Result - Remark	Verdict
8.4.2.3	**Electrical fast transient/burst(EFT/B)**		P
	Test level:2kV	2	
	Applied time:1min	1min	
	Signal port:1kV	1	
	Performance criterion B applies.	B	
8.4.2.4	**Surges:1.2/50μs~8/20μs**		P
	Test level:2kV（common mode）	2	
	1kV（contrast mode）	1	
	Times:5 times each polarity	5	
	Interval: 1min	1min	
	Performance criterion B applies.	B	
8.4.2.5	**Conducted disturbances induced by radio-frequency fields**		P
	Test level:10V	10	
	Inject parts:	—	
	Frequency range:150kHz~80MHz		
	Carrier signal: amplitude modulation depth 80%, frequency 1kHz sine wave		
	Modulating frequency:1kHz		
	Performance criterion A applies.	A	
8.4.2.6	**Power frequency magnetic fields**		P
	Magnetic field intensity:30A/m		
	Test frequency:		
	Relative position of coil and specimen:		
	Performance criterion A applies.	A	
8.4.2.7	**Voltage dips and interruptions**		P
	Voltage dips:		
	Test class:0%, Period:0.5		
	Test class:0%, Period:1		
	Performance criterion B	B	
	Test class:40%, Period:10/60		
	Test class:70%, Period:25/30		
	Test class:80%, Period:250/20		
	Performance criterion C	C	
	Interruptions		
	Test class:0%, Period:250/100		
	Performance criterion C	C	

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Clause	Requirement + Test	Result - Remark	Verdict

8.4.3	**Power supply terminal RF disturbances (150kHz~30MHz)** Environment A applies.			A	P
	Radiated type	Frequencies(MHz)	Limits(dB)		
	Conductive emission	0.15~0.5	79dB peaks 66dB average		
		0.5~5.0	73dB peaks 60dB average		
		5~30	73dB peaks 60dB average		
	Radiated RF disturbances (30MHz~1000MHz) Environment A applies.			A	P
	Radiated type	Frequencies(MHz)	Limits(dB)		
	Radiated RF	30~230	40		
		230~1000	47		
	*Measurement at 10m away from the test sample.				

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Clause	Requirement + Test	Result - Remark	Verdict

8.3.3.3	**TABLE: Heating Test(#01)**		**P**
	Test voltage (V) ..... :	-	
	Ambient (°C) ..... :	24.6	

Thermocouple Locations	**Max. temperature measured, (°C)**	**Max. temperature limit, (°C)**
NO-contacts terminals	—	—
NC-contacts terminals	17.4	65
Manual operating means: ☐metallic/☐non-metallic	—	—
Parts intended to be touched but not hand-held: ☐metallic/☒non-metallic	7.0	40
Parts which need not be touched during normal operation: ☐metallic/☒non-metallic	6.2	50
Parts which need not be touched during normal operation: ☐metallic/☐non-metallic	—	—
Supplementary information:		

	TABLE: Heating test, resistance method		**N/A**
	Test voltage (V) ..... :		—
	Ambient, t_1 (°C) ..... :		—
	Ambient, t_2 (°C) ..... :		—

Temperature rise of winding	**R_1 (Ω)**	**R_2 (Ω)**	**ΔT (K)**	**Max. dT (K)**	**Insulation class**
Supplementary information:					

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Clause	Requirement + Test	Result - Remark	Verdict

8.3.3.4	TABLE: Dielectric Strength(#01)		P
Test voltage applied between:		**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**
between live parts of the switching element and parts of the control switch intended to be earthed		N/A	N/A
between live parts of the switching element and surfaces of the control switch likely to be touched in service, conductive or made conductive by a metal foil.		2.95kV	No
between live parts belonging to electrically separated switching elements.		2.95kV	No
Supplementary information:			

	TABLE: Clearance And Creepage Distance Measurements					P
clearance cl and creepage distance dcr at/of:	**Up (V)**	**U r.m.s. (V)**	**Required cl (mm)**	**cl (mm)**	**required dcr (mm)**	**dcr (mm)**
Between each pole and the other poles	2.5kV	250	1.5	7.80	4	8.00
live parts in each voltage	—	—	—	—	—	—
Between live parts and other exposed live parts	2.5kV	250	1.5	13.0	4	15.0
Supplementary information:						

	TABLE: Distance Through Insulation Measurements			N/A
Distance through insulation di at/of:	**U r.m.s. (V)**	**Test voltage (V)**	**Required di (mm)**	**di (mm)**
Supplementary information:				

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Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Needle- flame test (NFT)				**N/A**
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict

Supplementary information:

NFT not relevant (or applicable) for Parts of material classified as V-0 or V-1
NFT not relevant (or applicable) for Base material of PCBs classified as V-0 or if relevant VTM-0

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Clause	Requirement + Test	Result - Remark	Verdict

	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**		
Terminal support components		-	-	-	31s	1s	-	P
Hull		-	no ignition	no ignition	-	-	-	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 [(t_e – t_i) ≤ 2s] (Yes/No):								Yes
If no, then surrounding parts passed the needle-flame test of annex E (Yes/No)..... :								
The test specimen passed the test by virtue of most of the flaming material being withdrawn with the glow-wire (Yes/No)? ..... :								Yes
Ignition of the specified layer placed underneath the test specimen (Yes/No) ..... :								No
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.								

List of test equipment used:

A completed list of used test equipment shall be provided in the Test Reports when a Manufacturer Testing Laboratory according to CTF stage 1 or CTF stage 2 procedure has been used.
Note: This page may be removed when CTF stage 1 or CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date

Statement of Measurement Uncertainty

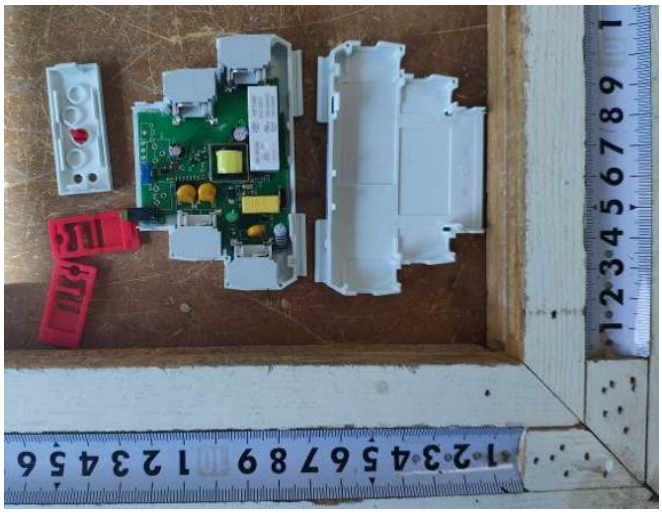
The Test Report shall include a statement concerning the uncertainty of the measurement systems used for the tests conducted when it is required by the standard, client or other authorities.
In such cases, the table below is to be used for reporting U of M.

This page may be removed from the final Test Report when not required. See also clause 4.8 in OD 2020 for more details.

Clause #	Parameter/ Measurement / test method	Requirement % or k	Calculated U of M*

*Note: Calculations leading to the reported value are on file with the NCB

Photographs

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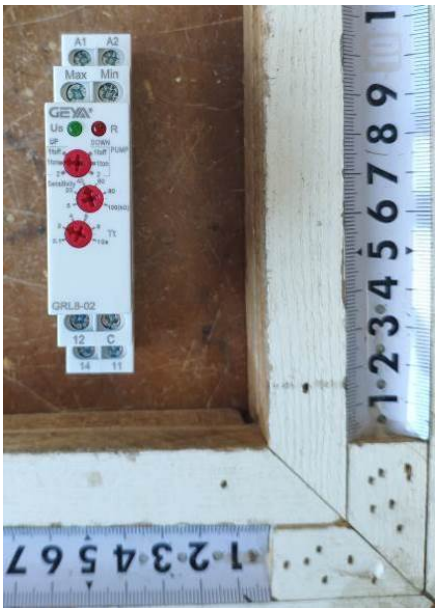
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Min
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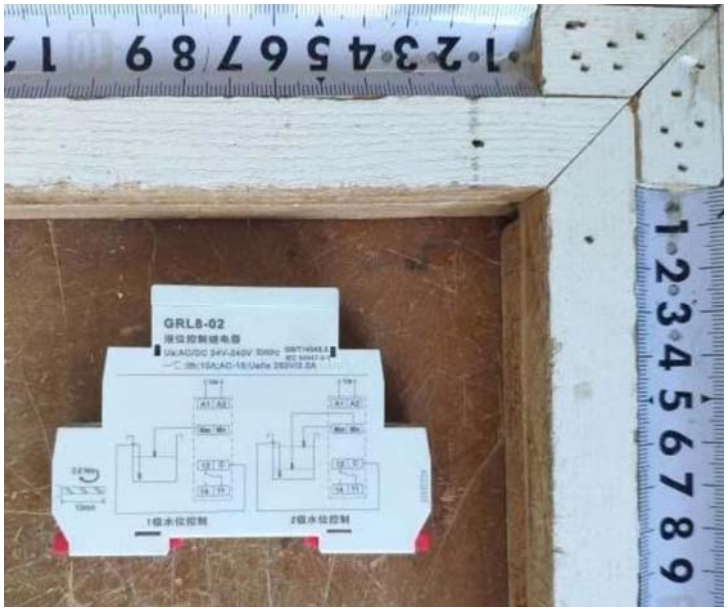
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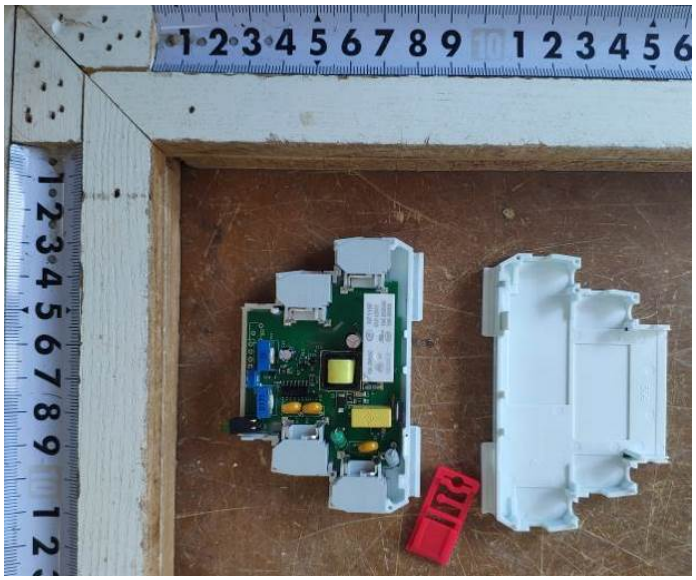

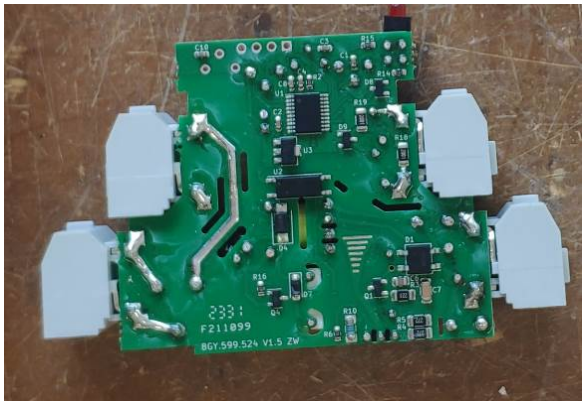
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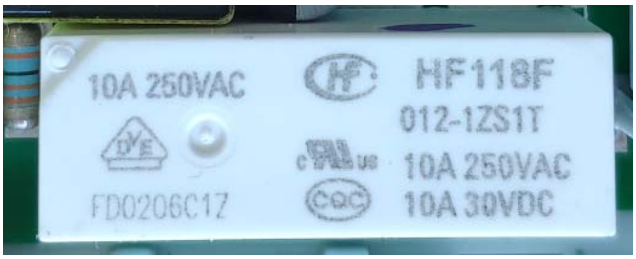
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